Roads & Maritime

NSW Timber Truss Road Bridges

Overarching Conservation Management Plan

February 2018

ENDORSED
CONSERVATION MANAGEMENT PLAN

Heritage Council of New South Wales

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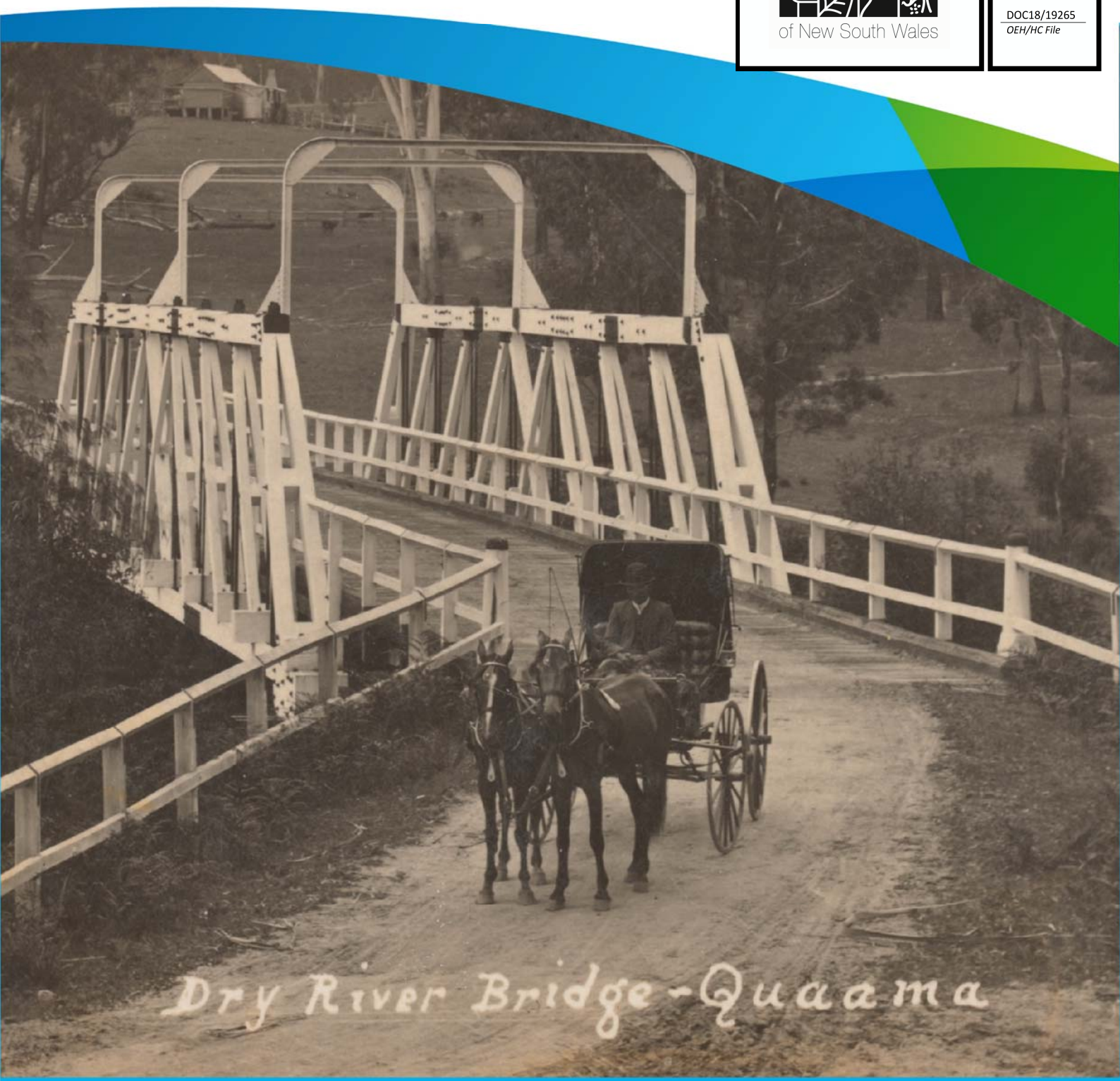

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Roads and Maritime Services

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Overarching Conservation Management Plan

February 2018

Prepared by Roads and Maritime Services

Document controls

Approval and authorisation

Title	NSW Timber Truss Road Bridges Overarching Conservation Management Plan
Accepted on behalf of NSW Roads and Maritime Services	Michael Crowley Director Environment
Signed:	
Dated	15 February 2018

Executive summary

Purpose

The purpose of this Conservation Management Plan (CMP) is to guide the conservation and management of the bridges to be retained under the Timber Truss Road Bridges Conservation Strategy into the future, with a continuing role and use in the life of communities.

This overarching Conservation Management Plan (CMP) provides a methodology to address the collective conservation and management of the timber truss bridge population identified in the *Timber Truss Road Bridges – A Strategic Approach to Conservation 2012* (the Strategy). It is acknowledged that the list of bridges subject to the Strategy will be reviewed within 12 months of the endorsement of this CMP, and as necessary from time to time afterwards. For each individual bridge a more detailed bridge specific CMP will be written by Roads and Maritime informed by this overarching CMP.

This overarching CMP will also inform all decision making for conservation and management and guide ongoing use of each State Heritage Register listed timber truss bridge until bridge specific CMPs are endorsed.

Statement of significance

The timber truss bridge population of NSW is of State heritage significance. It is significant in demonstrating through its diversity the long-term application of engineering and technical excellence to support the regional settlement and development of New South Wales by making use of superb local timbers to create enduring bridge crossings. Because of their almost unique association with the development of New South Wales, the timber truss bridge population has significance for communities across the State, and many are also considered important parts of the local identity.

The timber truss bridges made use of readily available local materials, avoiding wherever possible expensive imported materials and supporting the development of local industries. The bridges demonstrate some of the unique qualities of New South Wales hardwoods that were plentiful in NSW, and were known to be among the strongest and most durable in the world.

Each bridge has associations with the engineer responsible for the design and development of that truss type, including W.C. Bennett, J.A. McDonald, Percy Allan, E.M. de Burgh and H. H. Dare.

The designs of the bridges reflect the ingenuity of the original designers, who were a group of internationally renowned engineers working collaboratively, building on each other's expertise and ideas, to design a group of bridges which reflect engineering and technical excellence. Their responses to changes in available resources is demonstrated in the five types of timber truss bridges used on roads in NSW – Old PWD, McDonald, Allan, de Burgh and Dare trusses.

The bridges have fitted neatly into the landscapes of NSW for over 100 years, being aesthetically pleasing in scale, proportion and materials used. The timber truss bridges retaining their original black and white colour schemes are aesthetically distinctive and have landmark qualities.

Over 400 timber truss road bridges were built in NSW between 1856 and 1936, of which only 51 remain today, most under the care of Roads and Maritime Services as part of the operational road network. The remainder are owned and managed by local government and other government agencies.

Summary and intent of conservation policies

As the primary custodian of the remaining timber truss road bridges of New South Wales, Roads and Maritime will manage and conserve a representative sample as identified in the Strategy that reflects the diversity of the original population for future generations as part of the operational road

network.

In 2010, Roads and Maritime prepared the *Timber Truss Road Bridges – A Strategic Approach to Conservation* (the Strategy), which underwent extensive public consultation in 2011 and was endorsed by the Heritage Council of NSW in 2012. It was written to conserve a representative population with the clear and correct understanding that the continued usage of these bridges as functioning crossings for vehicles as part of the road network is integral not only to their cultural significance but also to their survival.

Policy	Summary content
Policy 1	Retention of cultural significance of the timber truss bridge population - Roads and Maritime will conserve a representative population that reflects the diversity of timber truss bridges as part of the operational road network - Cultural significance of these bridges will be protected or enhanced - Conservation will be in accordance with the principles of the *Burra Charter* - All current and future owners, managers and consent authorities will be advised and jointly responsible for conservation - Conservation will be done in collaboration with relevant experts
Policy 2	Adoption, implementation and review of the overarching CMP - Roads and Maritime will adopt this CMP - Roads and Maritime will resource implementation of this CMP - Roads and Maritime will train relevant staff in the use of this CMP - Roads and Maritime will make this CMP available to the public - Roads and Maritime will review this CMP every five years and submit to the Heritage Council for endorsement
Policy 3	Prepare bridge specific CMPs - Roads and Maritime will prepare bridge specific CMPs - SHR listings for bridges to be retained will be updated to reflect new information
Policy 4	Conservation of a representative timber truss bridge population - - Roads and Maritime will review the list of bridges to be retained and those to be demolished, in keeping with the Strategy - The updated list will be submitted for endorsement by the Heritage Council of NSW
Policy 5	Listings - - Bridges to be retained will be nominated for SHR listing if they are not already listed on the SHR - Applications for delisting will be submitted for bridges to be replaced with SOHIs - Any bridges owned by local Councils, acquired by Roads and Maritime for conservation will be added to the Roads and Maritime S170 and nominated to the SHR where relevant
Policy 6	Use of bridges - Roads and Maritime will engage with communities about use - Timber truss bridges to be retained will be used for vehicular traffic or other identified requirements - Unacceptable uses will not be supported - Roads and Maritime will arrange for removal and relocation of utilities from timber truss bridges where possible
Policy 7	Maintenance and repair - Appropriate ongoing repair and maintenance will be carried out - Suitable high-quality timber will be sourced to enable conservation work - Roads and Maritime will conduct relevant training and ensure skills transfer - Roads and Maritime will prepare an Incident Response Plan for each bridge to be retained - Timber elements will be replaced before unacceptable deterioration occurs

Policy 8	New work - Elements will be conserved in accordance with their level of significance - New works and adaptations may be required to ensure continued operability - Excellence in design and quality in construction will be provided - Roads and Maritime will explore and develop the use of new means by with the bridges may continue to fulfil their required functions - Approvals will be undertaken in accordance with relevant processes
Policy 9	Interpretation - Cultural significance of these bridges will be effectively communicated - Interpretation of the timber truss bridges will be based on the NSW State historical themes - Roads and Maritime will develop a heritage interpretation strategy to apply to both bridges and site and materials from bridges that have been replaced - Interpretation will conform to relevant guidelines - Roads and Maritime will commission a comprehensive publication on the heritage significance of the timber truss bridges of New South Wales
Policy 10	Protection and enhancement of visual setting - - Development in the vicinity is to be carefully managed not to have an unacceptable visual impact - Signage in the vicinity should be minimized - Vegetation in the vicinity of the bridges should be kept to a minimum - Relevant planning and statutory controls must be adhered to
Policy 11	Archival recording - - Records will be managed to ensure permanent retention as State records - Photographic archival recording before, during and after any works - A complete archival recording will be undertaken of all extant bridges - Full documentation of methods and materials used during any works - Representative sample retained as a moveable heritage collection Information used to assist effective heritage interpretation of population
Policy 12	Sustainability - Roads and Maritime will implement a recycling policy, timber procurement policy and a skills development program for timber bridge conservation
Policy 13	Archaeology - Relevant Aboriginal stakeholders will be consulted about any proposed impact - The Roads and Maritime Cultural Heritage Guidelines and the archaeological provisions of the Heritage Act 1977 will be adhered to. - The Roads and Maritime Unexpected Heritage Items Procedure will be followed to manage any unexpected finds during works
Policy 14	Reporting - Reporting to the Heritage Council will be undertaken in accordance with the Timber Truss Bridge Strategy

Table A: *Summary list of policies in this overarching Conservation Management Plan.*

Contents

Appendices

1 Introduction

1.1 Purpose

The purpose of this Conservation Management Plan (CMP) is to guide the conservation and management of the bridges to be retained under the Timber Truss Road Bridges Conservation Strategy into the future, with a continuing role and use in the life of communities.

This overarching CMP is intended to provide a methodology to address the collective conservation and management of the timber truss bridge population identified in the Timber Truss Road Bridges Strategy. The list of bridges to be retained in the Strategy will be reviewed within 12 months of the endorsement of this CMP. The review of the list is driven by an increased understanding of the original technology of the bridges and of community needs. The review will ensure an ongoing balance between operational network needs and heritage obligations and does not seek to reduce the number of bridges to be retained.

For each individual bridge a more detailed bridge specific CMP will be written by Roads and Maritime informed by this overarching CMP.

This overarching CMP is also intended to inform all decision making for the conservation and management of each State listed timber truss bridge until bridge specific CMPs are endorsed.

1.2 Background

Roads and Maritime manages most of the remaining timber truss road bridges in NSW. Over 400 were built in the 80 years between 1856 and 1936, and these bridges represent an important part of the heritage of New South Wales, with 28 currently listed on the State Heritage Register (SHR).

In 2010, Roads and Maritime prepared *Timber Truss Road Bridges – A Strategic Approach to Conservation* (the Strategy). The Strategy detailed a methodology for assessing the conservation suitability and approach to managing the (then) 48 remaining timber truss bridges managed by Roads and Maritime listed on the SHR and Roads and Maritime's s170 register. Of the 48 bridges 30 were listed on the SHR and the other 18 on Roads and Maritime's s170 Register. Since then two bridges – Five Day Creek and Tabulam - have been removed from the SHR in accordance with the Strategy leaving the total number currently listed on the SHR at 27.

In 2011, with the support of the Heritage Council of NSW, Roads and Maritime consulted the community and stakeholders regarding the Strategy, which was amended in response to establish the approach that would be taken to ensure the conservation of the timber truss bridge population. The final version of the Strategy was endorsed by the NSW Heritage Council in August 2012. It identified twenty-six bridges that could meet both heritage conservation and road operability requirements. Conservation and management of timber truss bridges since that date has been undertaken consistently with the Strategy.

The Strategy requires Roads and Maritime to develop conservation planning documentation to set out how individual bridges are to be managed and how the overall heritage values of the retained population will be conserved. Roads and Maritime has committed to the development of a suite of conservation documents including this overarching Conservation Management Plan (CMP).

1.3 Contributors

This CMP has received input from many people, including but not limited to:

- Sarah Jane Brazil, Heritage Division of the NSW Office of Environment and Heritage (OEH);
- Gary Estcourt, Heritage Division of the NSW Office of Environment and Heritage (OEH);
- Tony Brassil, Senior Heritage Consultant, Extent Heritage Pty. Ltd.;
- Sally Durham, Denis Gojak and Ian Berger, Environment Branch, Roads and Maritime;
- Lakshman Prasad, Bridge Engineering, Roads and Maritime;
- Bridge Maintenance Planners and Bridge Works Managers from Roads and Maritime:
    - Alan Pottie and Sam Millie, South West Region;
    - Daniel Weber and Phil Peak, Western Region;
    - Dony Castro and Aruna Wickramasinghe, Southern Region;
    - Deve Manchanayake and Steve Hoolihan, Hunter Region;
    - David Hislop and Peter Young, Northern Region;
    - Ram Ramanan, Sydney Region.

1.4 Scope

This CMP applies to timber truss road bridges included on the list of bridges to be retained in the Timber Truss Bridges Strategy and/or the NSW State Heritage Register.

Tables 1 and 2 show the list of bridges to be retained and those to be demolished under the current Strategy. It is acknowledged that the list of bridges in the Strategy will be reviewed within 12 months of the endorsement of this CMP and as necessary from time to time; any revised list will be submitted to the Heritage Council for endorsement.

Bridge	LGA	2012 listing	Strategy listing	Comment
Old PWD				
Clarence Town	Dungog	SHR	SHR	
Monkerai	Great Lakes	SHR	SHR	
McDonald				
Galston	Hornsby	SHR	SHR	Traditional construction
Junction	Tumut	SHR	SHR	
McKanes	Lithgow City	SHR	SHR	
Allan				
Beryl	Mid-Western Regional	S170	S170	Central West group
Carrathool	Carrathool	SHR	SHR	
Dunmore	Maitland City	SHR	SHR	
Hinton	Maitland City	SHR	SHR	
Morpeth	Maitland City	SHR	SHR	
Paytens	Forbes	S170	S170	Central West group
Rossi	Goulburn-Mulwaree	SHR	SHR	Traditional construction
Swan Hill	Wakool	SHR	SHR	
Victoria	Wollondilly	SHR	SHR	Traditional construction
Wallaby Rocks	Bathurst Regional	SHR	SHR	Central West group
Wee Jasper	Yass Valley	SHR	SHR	
deBurgh				
Barham	Wakool	SHR	SHR	
Cobram	Berrigan	S170	SHR	Traditional construction Added to SHR 2016
Middle Falbrook	Singleton	SHR	SHR	

St Albans	Hawkesbury City	SHR	SHR	
Dare				
Briner	Clarence Valley	S170	SHR	
Colemans	Lismore City	SHR	SHR	
New Buildings	Bega Valley	SHR	SHR	
Rawsonville	Dubbo City	S170	S170	Central West group
Scabbing Flat	Wellington	S170	S170	Central West group
Warroo	Forbes	S170	S170	Central West group

Table 1: Timber Truss Bridges identified for retention in the Strategy

Bridge	LGA	2012 listing	Comment / current status
McDonald			
Crankies Plains	Bombala	SHR	
Five Day Creek	Kempsey	SHR	Removed from SHR
Allan			
Abercrombie	Bathurst Regional	S170	
Barrington	Gloucester	S170	
Boonanga	Moree Plains	S170	Removed from S170
Charleyong	Palerang	S170	Removed from S170
Gundaroo	Upper Lachlan	S170	Removed from S170
Thornes	Goulburn-Mulwaree	S170	Removed from S170
Tooleybuc	Wakool	SHR	
Vacy	Dungog	SHR	
deBurgh			
Beckers	Singleton	SHR	
Crookwell	Upper Lachlan	S170	Removed from S170
Holman	Cowra	S170	Removed from S170
Lansdowne	Goulburn-Mulwaree	S170	Removed from S170
Tabulam	Kyogle	SHR	Removed from SHR
Dare			
Bulga	Singleton	SHR	
Coonamit	Wakool	SHR	
Coorei	Dungog	SHR	
Gee	Wakool	SHR	
Korns Crossing	Tweed	S170	
Mungindi	Moree Plains	S170	Removed from S170
Sportsmans Creek	Clarence Valley	S170	

Table 2: Bridges proposed to be replaced under the Strategy

A map showing the geographical distribution of all timber truss road bridges extant in 2012 is given in Appendix B. Figure 1.1 below shows the distribution of the SHR listed timber truss road bridges which are managed by Roads and Maritime and covered by this overarching CMP.

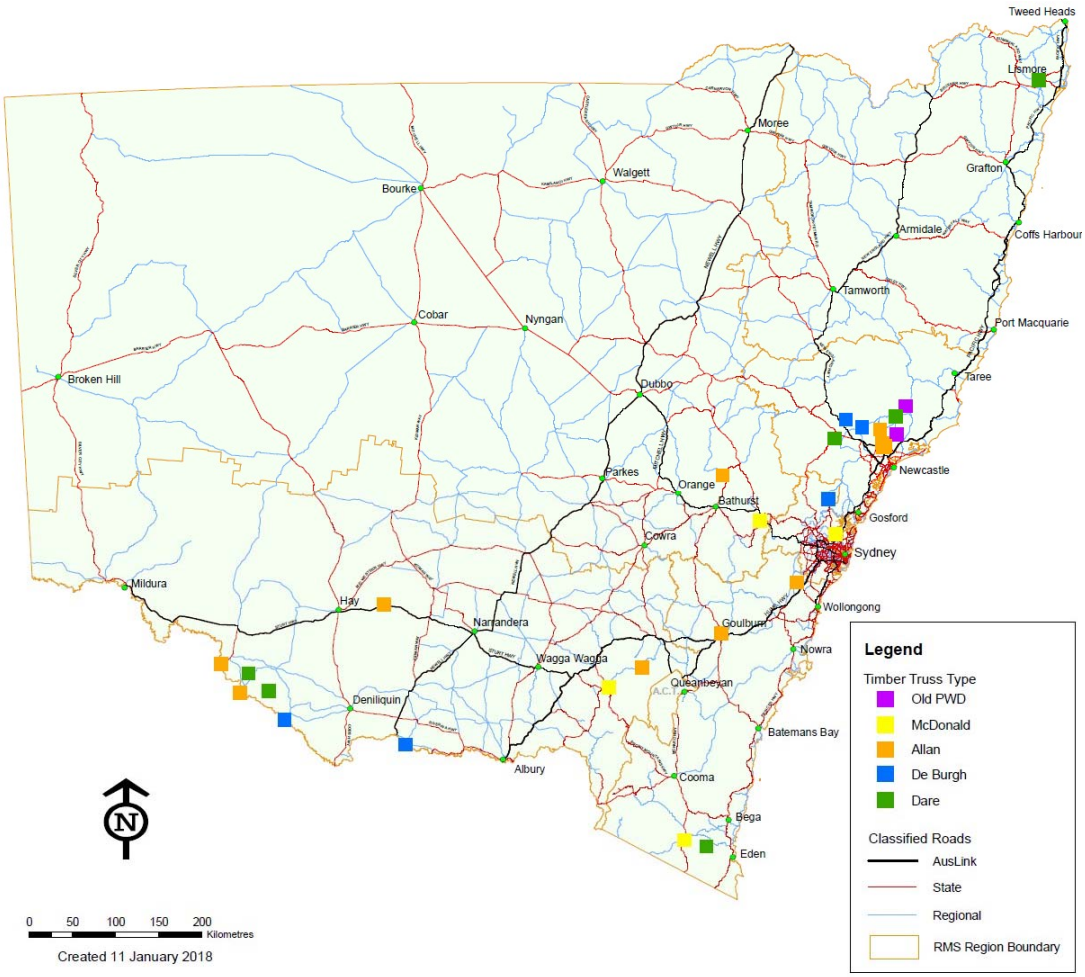


Figure 1.1: Roads and Maritime timber truss bridges on State Heritage Register (source: Roads and Maritime)

Curtilage is defined as the area of land surrounding a heritage item which is essential for retaining and interpreting its significance. A curtilage is used to establish the boundaries of a zone worthy of special protection, and should contain all elements contributing to the heritage significance, conservation and interpretation of a heritage item.

The heritage curtilage for timber truss bridges listed on the SHR managed by Roads and Maritime is generally set as a horizontal buffer of approximately five to ten metres from the outward side and termination of the bridge deck and includes all piers, trusses and abutments. The curtilage also extends in space above and below deck level.

1.5 Methodology

The primary purpose of a CMP is to establish the significance of the timber truss bridges and establish policies to manage change. This report has been prepared according to the methodology recommended by the Heritage Council of NSW in *Assessing Heritage Significance*, and is consistent with the guidelines set out in *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*, 2013 (*Burra Charter)* and in the *Conservation Plan*.[1]

[1] *Assessing Heritage Significance*, NSW Heritage Manual, NSW Heritage Office, 2001; Burra Charter, 2013; James Semple Kerr, *The Conservation Plan*, 7th edition, Australia ICOMOS, January 2013.

1.6 Terminology

The terminology in this report is consistent with the definitions given in the *Burra Charter*, see Appendix C, with bridge specific terminology as defined and illustrated in this section.

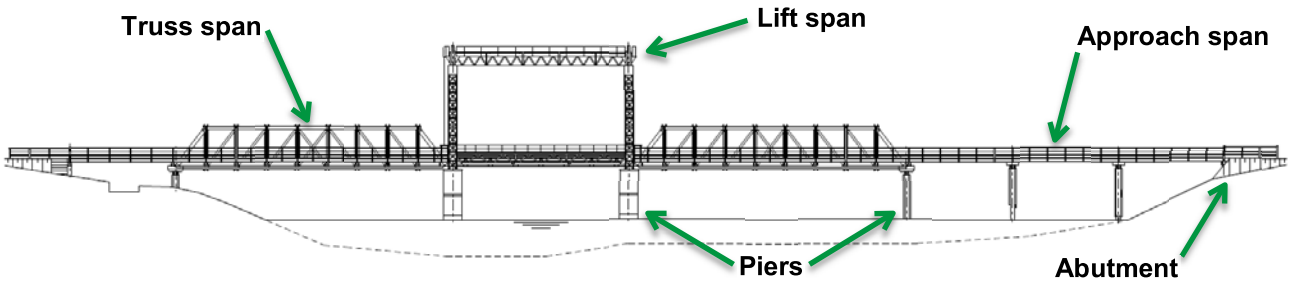


Figure 1.2: Diagram of a timber truss bridge showing different components (source: author)

Bridge means a structure carrying a road and sometimes a pathway across a river or creek.

A bridge consists of a superstructure and a substructure:

- *Substructure* means the lower parts of the bridge such as abutments and piers.
- *Superstructure* means the upper parts of the bridge such as the different span types.

There are different types of spans which can form a bridge superstructure. In the timber truss road bridges of New South Wales, there are three basic span types which may be present on a bridge:

- **Truss span** means a span which includes trusses (see definition for truss below).
- **Approach span** means a shorter and simpler span providing access to the truss span.
- **Lift span** means a span which can be lifted to allow tall vessels to travel under the bridge.

Truss means a special class of structure in which members are connected at joints in a manner that permits rotation so that the individual members can only carry either tension or compression.

Timber Truss means a special class of truss where some or all the members are timber. The timber trusses covered in this report are categorised into five types as detailed in Section 2.3.

2 Historical context

2.1 The need for bridges

Controlling land for pastoral development became the predominant social, economic and political issue in New South Wales once convict transportation began to decrease in the 1830s. Squatters took up land outside the settled districts without clear legal title, and created a demand for communication well beyond the 'great roads' that successive governors considered necessary to maintain central authority. The ad hoc tracks and bush roads that were created to service these outlying districts were unformed and unimproved. Bridges were seldom built, as the un-engineered attempts could not handle travelling stock, the main users of these routes. The substantial works created using convict labour had no equivalent in post-transportation New South Wales.

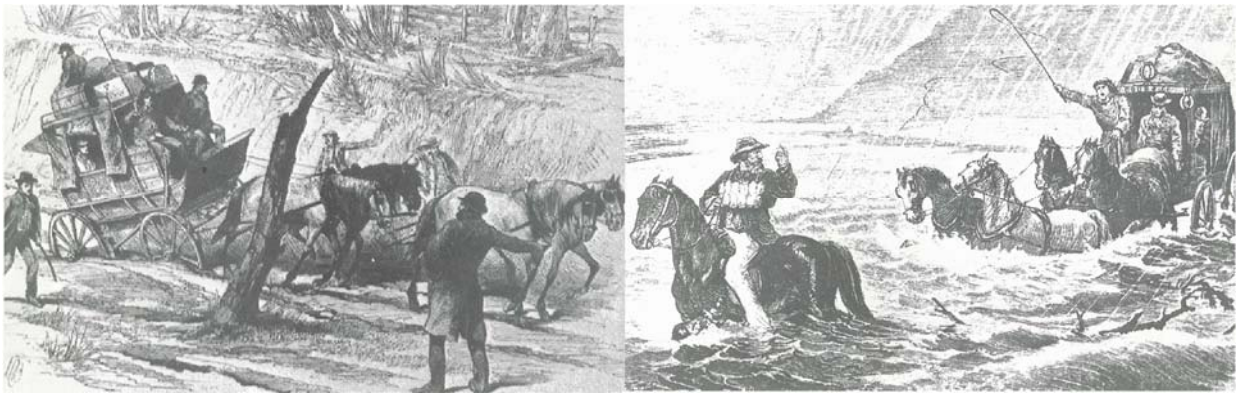


Figure 2.1: New South Wales road transport and river crossings in the 1850s.[2]

The situation transformed with the influx of additional population and investment beginning with the gold rushes in the early 1850s. The need for better road transport had become urgent because trade and commerce was being stifled and goods damaged at the prevailing river fords. The NSW government saw a need for a better road system because a significant amount of its rural wealth was being exported via the inland river system through the rival ports of Melbourne and from Goolwa in South Australia. Travel generally too was slow, uncomfortable and potentially dangerous for the growing regional communities. Fatalities at river fords were not uncommon.

There was always strong community pressure for new bridges. For many of the timber truss bridges, records of years of agitation for a bridge are available in digitised newspaper articles:

> *In wet seasons, this stream is subject to sudden freshets, during which its waters rush on with impetuous force. Crossing on horseback, or with vehicle, at such times, is attended with much danger, and when it is running moderately high it becomes a thing impossible*.[3]

When the funding and engineering plans were approved for bridges, there was often much excitement and celebration in local communities, and again this is sometimes recorded in print:

> *The Cobram Bridge. – The satisfactory news is at last to hand that plans for the Cobram bridge are completed, and that they are ready for inspection and approval by the Inspector-General of Public Works… This is such happy information that the local population is inclined to throw up its collective hat, and otherwise express its jubilation*.[4]

It was not uncommon for celebrations to be arranged by local communities to mark the driving of the first pile for a timber truss bridge, and it was very common for timber truss bridges to have considerable opening ceremonies upon completion with sometimes hundreds and sometimes over

[2] DMR, *The Roadmakers*, Sydney: Department of Main Roads, NSW, 1976, pp 40-41.
[3] *Australian Town and Country Journal*, 3 August 1901, p 40 (agitation for Allan truss over Mumnurra Brook).
[4] Albury Banner and Wodonga Express, Friday 16 February 1900, p.23 (de Burgh truss over Murray River).

a thousand attendees. Some timber truss bridges (such as Gillies Bridge, a de Burgh truss near Rothbury) enjoyed more than one opening celebration. Gillies Bridge received two official openings with two separate christenings and two quite different names given (neither of which were 'Gillies Bridge'). The first opening was by the Contractor on Thursday 15 May 1902:

> *The bridge at Rothbury was formally opened on Thursday evening by the contractor, Mr. W.F. Oakes… Mr Oakes had everything ready: red, white and blue ribbons tied across the bridge, and a bottle of wine, slung so as to strike a small rock in the centre of the bridge. The bottle was broken by Miss Bessie Nicholson, and ribbons broke by the first buggy. It was christened the Coronation bridge*.[5]

The second opening was a month later by the local member, Mr Gillies, on Wednesday 18 June:

> *Wednesday 18th of June, is the anniversary of Waterloo. It will be remembered for years to come as the anniversary of the opening of the bridge, the School of Arts, and one of the best entertainments given in the district. The bridge was gaily decorated with the flags of all nations, an evergreen arch being in the centre, from which was suspended the bottle of wine used for the christening…. Mr. Gillies…. Praised Rothbury to the skies, and, stating he would speak later, handed the bottle to Mrs. Gillies, who smashed it against a bolt, declaring the bridge open for traffic, and naming it the Rothbury Bridge. The vehicles were then driven to and fro across the bridge, breaking the usual ribbons*.[6]

Such activities were the normal expression of public passion for these public works through the timber truss bridge era, especially when the bridges were constructed near a town.

They echo today in the enthusiasm for centenary celebrations such as at Hinton for the Centenary celebration on 8 April 2001 (Figure 2.2).

Figure 2.2: Hinton Bridge Centenary 2001 (source: Roads and Maritime)

[5] *The Maitland Daily Mercury*, Tuesday 20 May 1902, p 4.
[6] *The Maitland Daily Mercury*, Thursday 19 June 1902, p 4.

2.2 The unique hardwood timbers of New South Wales

When Europeans first explored Australia, they were less than impressed by the Australian timbers. Captain James Cook said in 1770 that the trees were so "hard and ponderous" that they were pretty much useless. Surgeon John White reported in 1790 that, "I do not know any one purpose for which it (Australian timber) will answer except for firewood; and for that it is excellent; but in other respects it is the worst wood that any country or climate ever produced."[7]

Various newspaper articles of the late 1700s and very early 1800s describe the difficulties the convicts had in dealing with the Australian timbers due to their "monstrous bulk", hardness and incredible weight.[8] The trees in the immediate vicinity of the settlement at Sydney were too crooked, too hard to work, and too damaged by fire to be used as a structural material.

Soon, however, timbers were discovered in New South Wales which would rival any in the world. Australian Red Cedar (*Toona ciliata*) was discovered in the Hawkesbury Flats and gangs of convicts were immediately sent to cut them down. Sixty logs from the Hawkesbury were exported to India as early as 1795, followed by loads to England, China, South Africa and New Zealand.[9]

Between 1855 and 1886, there were international exhibitions of timber in Paris, Melbourne, London, Sydney and New Zealand. The judges sawed the samples, planed them, nailed them and tested them for strength. Australian timbers met high praise.[10] Experiments were made at the foundry of P.N. Russell & Co. in 1860 which showed how much tougher the ironbark is than Baltic or American timber. The conclusion made was that whatever span had been possible with timber in other countries could certainly be imitated, if not surpassed, in New South Wales.[11] This discovery and announcement was followed the same year by a government decree that local materials and skills were to be used as much as possible to minimise expensive imports of iron.

Figure 2.3: Forest of young Black-Butt Trees and Tallow-wood Logs for Transport in 1800s.[12]

In 1896, J. J. C. Bradfield, famous for the design of the Sydney Harbour Bridge, reported on the comparative strength of ironbark and iron, and found that, for the same weight, ironbark is more than three times stronger than iron in tension, and almost twice as strong as iron in compression.[13]

[7] E.G. Trueman, *Timber Bridge Conservation in NSW*, Sydney: Hughes Trueman Ludlow, 1984, p 18.
[8] "Sydney", *Sydney Gazette and New South Wales Advertiser*, Sunday 7 August 1803, p 2.
[9] Eric Rolls, "A Land Changed Forever*", In the Living Forest: An Exploration of Australia's Forest Community*, edited by John Keeney, 2005, pp 16-19.
[10] Eric Rolls, "A Land Changed Forever", 2005, p 16.
[11] *The Sydney Morning Herald*, Wednesday 16 May 1860, p 4.
[12] J.H. Maiden, "Timbers of the Colony", *New South Wales: the Mother Colony of the Australia*s, edited by F. Hutchinson, Sydney: Charles Potter, Government Printer, Phillip Street, 1896.
[13] J.J.C. Bradfield, "Some Notes on Australian Timbers", read before the University of Sydney Engineering Society on 28 May 1896.

Again in 1896, Botanist J.H. Maiden wrote that, “Ironbark stands alone as the embodiment of the combination of a number of qualities valued in timber, viz., hardness, strength, and durability… one of the main reasons why colonial timbers are not more used is because users are nervous through ignorance… I plead for a wider interest to be taken in our trees and our timbers, and that in place of the apathy which exists… it may be realised that study of them is not only full of interest, but, as a mental discipline alone, worthy of attention by the best intellects of the Colony.”[14]

By 1904, the rapid disappearance of hardwoods was increasing due to the recognition of its value by the commercial world of Europe, South Africa, and the East. Around this time, the duty of inspecting exported timber fell to the Department of Public Works (PWD). It was thought that, whatever views may be held as to the advisableness of sending away large quantities of our best timbers, it was desirable that all such exports should be properly inspected and classed. In 1907 it was reported that excessive exports had greatly increased the price of timber, and that unless there be some check given to the trade, national works were likely to be seriously handicapped.[15] As Henry Lawson lamented, “But still the steamers sail out with our timber and wool and gold”.[16]

Figure 2.4: Australian Hardwood Sleepers and Girders being loaded at Darling Harbour for South Africa, 1903[17]

Percy Allan of the PWD rather discourteously described the difficulties in obtaining large long lengths of timber for timber truss bridges in 1895: “Again, some of the flitches are 53’ 6” long and, having to be free of heart and sapwood, are difficult to obtain, and this oftentimes occasioned delay in the erection of the structures, the simple-minded sawmill proprietor supplying all the short and profitable sizes in the bridge, and then pleading inability to supply the more costly flitches.”[18]

The national and interstate export of NSW’s superior hardwoods had a direct and significant impact on the construction and development of timber truss bridges. New designs had to evolve that would respond to the changed timber supply and availability.

[14] J.H. Maiden, “Timbers of the Colony”, New South Wales: the Mother Colony of the Australias, edited by F. Hutchinson, Sydney: Charles Potter, Government Printer, Phillip Street 1896, pp 168-180.
[15] NSW Legislative Assembly: *Reports of the Department of Public Works*, 1903 p 64; 1901 p 73; 1899 p 12.
[16] H. Lawson, *When I was King and Other Verses*, Syd.: Angus and Robertson, 1906, Australian Engineers.
[17] NSW Legislative Assembly: Report of the PWD for Year Ended 30 June, 1903.
[18] Percy Allan, “Timber Bridge Construction in New South Wales”, read before the Engineering Section of the Royal Society of NSW on 18 Sept 1895, *Journal and proceedings of the Royal Society of NSW*, Vol 29, 1895, p VI. N.B. "heart" is also sometimes called "pith" and is the very middle bit of the tree which started as the very fast growing sapling, and so the wood is brittle, weak and subject to deterioration.

2.3 History of timber truss bridge design in New South Wales

Truss principles were first utilised in the simple pitched roofs, where the thrust of the rafters was provided for by the provision of a lower horizontal tie-beam. With the addition of inclined braces and a central king-post, such truss frames were used in Roman timber roofs.[19]

Development of the truss was slow. In the fifteenth century, Leonardo da Vinci analysed the forces in triangulated structures, and produced a design for a timber truss bridge.[20] A century later, Palladio published *The Four Books of Architecture*, in which two timber truss bridges were illustrated.[21] Until the 19th Century, design was purely intuitive, based on experience. Even Howe and Pratt, who introduced the most significant truss developments, could not make accurate calculations of their systems. The first rational discussion of the determination of stresses and proportioning truss members was made in 1847 by Squire Whipple in his *Work on Bridge Building*. In 1858 Rankine published his Applied Mechanics, which remains a classic work on the theory of structures.[22]

Between 1856 and 1936, over 400 timber truss road bridges were built in New South Wales.[23] Five exceptional engineers working for the NSW Department of Public Works applied their sound engineering principles to design these elegant and durable timber truss bridges, some of which continue to carry vehicles today that are larger and heavier and faster than the original designers could possibly have imagined. The vast majority of these bridges can be divided into five types:

- Old PWD trusses designed by William Christopher Bennett, 1824-1889, Fig 2.5(1);
- McDonald trusses designed by John Alexander McDonald, 1856-1930, Fig 2.5(2);
- Allan trusses designed by Percy Allan, 1861-1930, Fig 2.5(3);
- De Burgh trusses designed by Ernest Macartney de Burgh, 1863-1929, Fig 2.5(4); and
- Dare trusses designed by Henry Harvey Dare, 1867- 1949, Fig 2.5(5).

The earlier timber trusses, designed in the 1850s to 1880s, made use of the vast resource of large, long, strong and durable NSW hardwoods. However, as the comparative strength and durability of NSW hardwoods became known around the world, so much of it was exported that these earlier types of timber truss bridges could no longer be built. The later bridges, designed in the 1890s to 1900s still made use of the strength and durability of NSW hardwoods, but limited the sizes of these timbers to smaller shorter sections which were still readily available. The five different truss types were a technical response to changes in availability of resources.

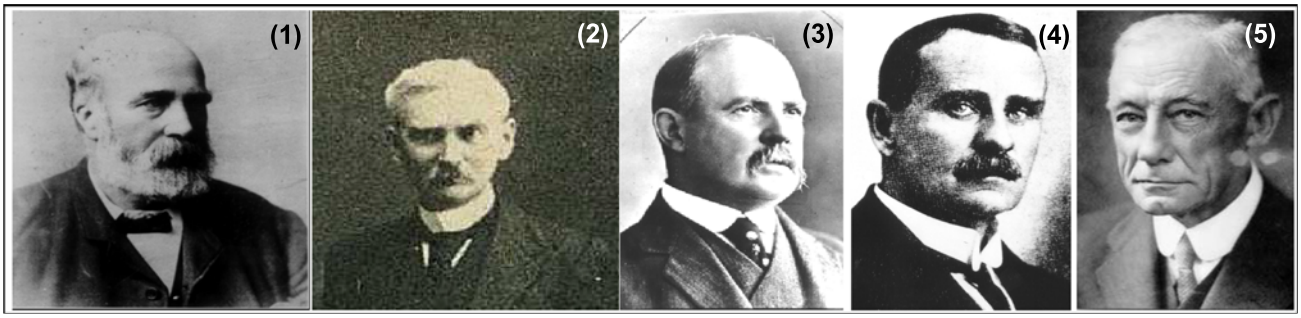
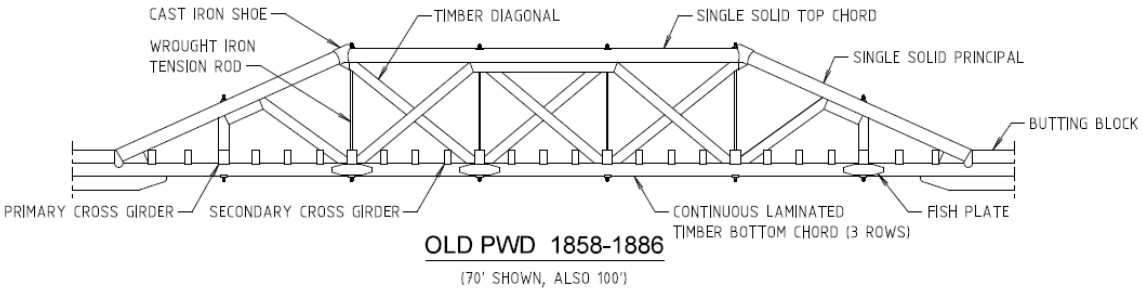


Figure 2.5: The timber truss bridge engineers, Bennett, McDonald, Allan, de Burgh and Dare.[24]

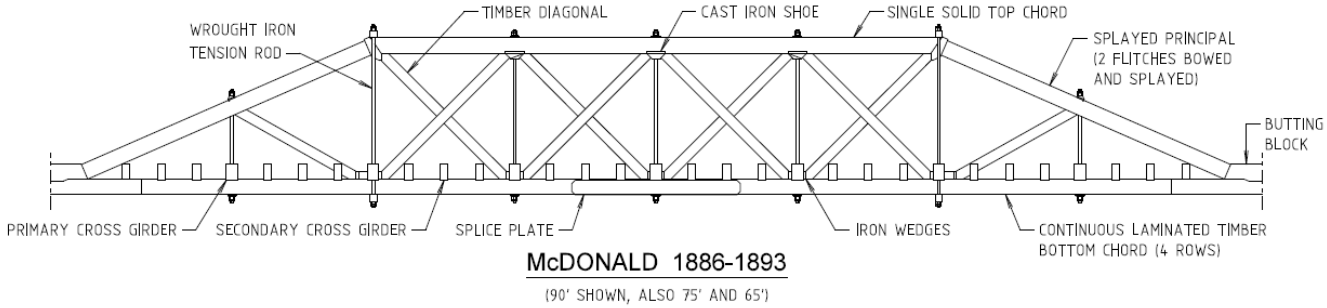
[19] Lynn Heather Mackay, *Timber Truss Bridges in New South Wales*, a thesis submitted in partial fulfilment of the requirements for the degree of Bachelor of Architecture at the University of Sydney, 1972, p 1.
[20] Lynn Heather Mackay, *Timber Truss Bridges in New South Wales*, 1972, p 1.
[21] Palladio, Andrea, *I Quattro Libri dell' Architettura*, [The Four Books of Architecture]: Venice, 1570.
[22] Lynn Heather Mackay, *Timber Truss Bridges in New South Wales*, 1972, pp 5-6.
[23] Don Fraser, Timber Truss Bridges NSW Database, unpublished, 1998.
[24] Sources 1 & 4: MBK, *Study of Relative Heritage Significance of All Timber Truss Road Bridges in NSW*, 1998, pp 23, 37; 2: "Pix from the past", Gisborne Photo News, No. 239, 22 May 1974, p 56; 3: "Mr Percy Allan, Noted Engineer's Death", *The Sydney Morning Herald*, Thursday 8 May 1930, p 12; 5: Engineering Heritage, Sydney http://www.engheritage-sydney.org.au/PDFs/Darlington.pm.pdf.

2.3.1 Old PWD trusses



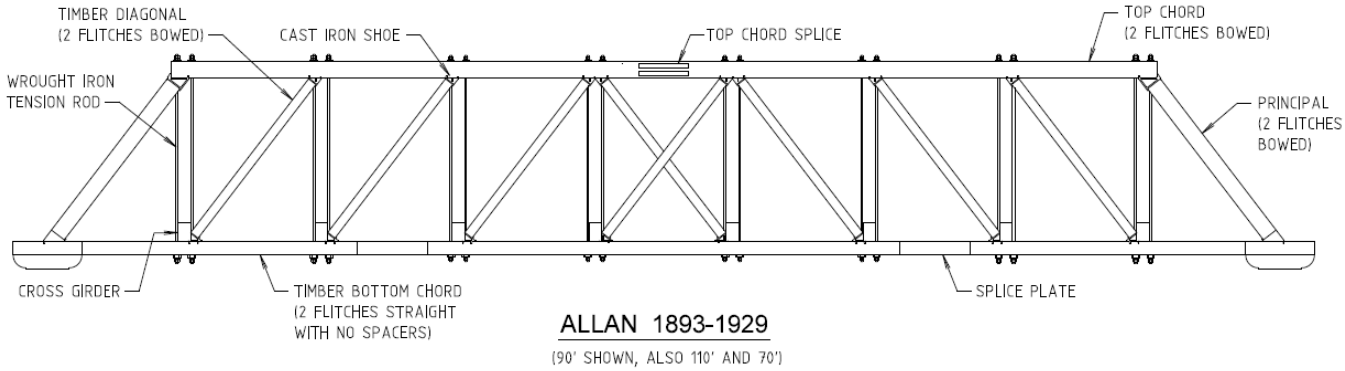
Of approximately 150 Old PWD type timber truss bridges built between 1858 and 1886, only two remain in 2017, both in the care of Roads and Maritime. The historical context which drove the design of these bridges is primarily the plentiful high quality hardwood. The design is an example of innovative and practical engineering in a time when large and long timbers were readily available and vast numbers of bridges were being built, but budgets were tight and skilled workmen were few. These bridges were not designed as permanent structures because in the new Colony, the required routes were very likely to be diverted by circumstances impossible to anticipate.[25]

2.3.2 McDonald trusses



Of approximately 90 McDonald type timber truss bridges built between 1886 and 1893, four remain in 2017 (all in the care of Roads and Maritime). The historical context which drove the design of these bridges is similar to the Old PWD in that large, long, quality hardwoods were still plentiful and permanent bridges were not considered economical. The changes in design stem from the growing knowledge of timber as a structural material due to extensive testing at the University of Sydney in 1886, and the increasing heavy vehicle loads requiring that bridges be designed for a minimum distributed live load of 4kPa and a traction engine weighing 16 tons.[26]

2.3.3 Allan trusses

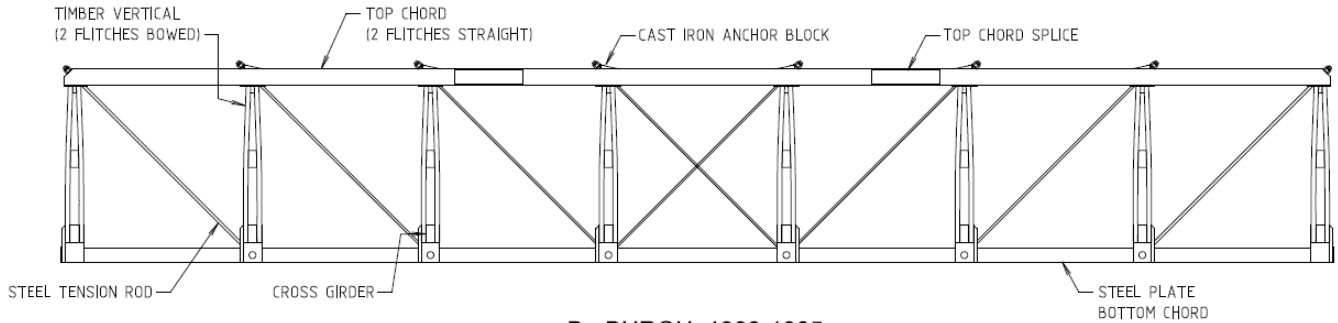


[25] Percy Allan, "Timber Bridge Construction in New South Wales", 1895, p XII.

[26] Percy Allan, "Timber Bridge Construction in New South Wales", 1895, p I; Ian Bowie, "Australia's First Materials Testing Machine", *ASHET News*, Australian Society for History of Engineering and Technology Newsletter, Vol 3, No 4 Oct 2010, p 5.

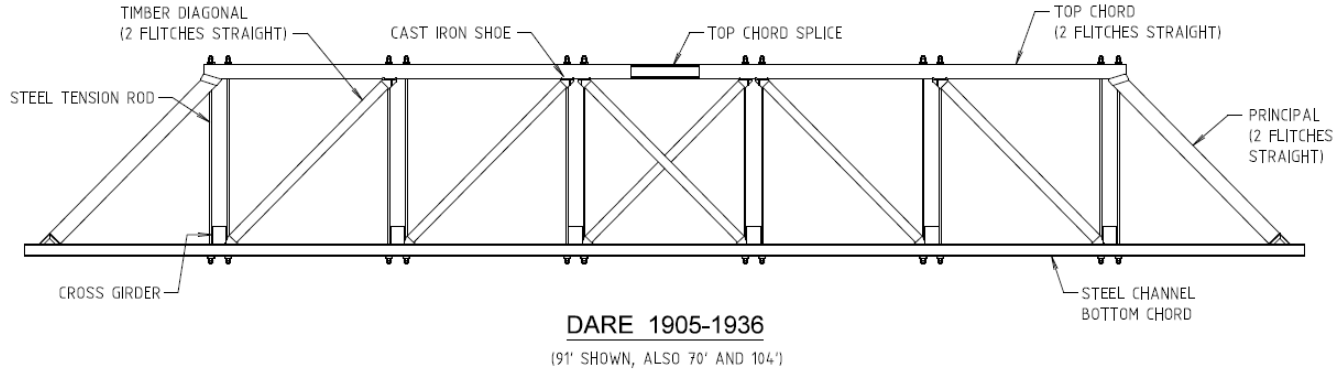
Of over 100 Allan type timber truss bridges built between 1893 and 1929, 20 remain in 2017 (16 in the care of Roads and Maritime). The historical context which drove the design was the increasing difficulty in obtaining large long timbers. Allan introduced two important innovations in his timber truss design. The first was the detailing of timbers (shapes and connections) to enable the replacement of deteriorated timber, thereby giving his timber bridges the same life expectancy as metal bridges. The second innovation was his splice connection in the bottom chord which was much stronger than previous bottom chord connections, and was subsequently used as far away as the United States.

2.3.4 De Burgh trusses



Of approximately 20 de Burgh type timber truss bridges built between 1900 and 1905, eight remain in 2017 (7 in the care of Roads and Maritime). The historical context for these bridges was the fact that materials other than timber had become increasingly available and economical. The de Burgh truss includes the greatest variety of materials found in any of the NSW timber truss bridges, including mass concrete and reinforced concrete (piers), rolled steel (bottom chords), cast steel (washer blocks), wrought iron (cross girders), cast iron (anchor blocks), brass (in bearings) and, of course, timber (top chords, verticals, stringers and decks). This indicates the excellence in design and understanding, using each material to its best advantage. The result was a stiffer and stronger truss, so that de Burgh achieved the longest span (50m) timber truss bridge in NSW.[27][30]

2.3.5 Dare trusses



Of approximately 40 Dare type timber truss bridges built between 1905 and 1936, 17 remain in 2017 (12 in the care of Roads and Maritime). The historical context which drove the design was a desire to combine the best aspects from the de Burgh and Allan trusses, while avoiding the primary problems with each. The problem with the Allan truss was the tendency for the timber bottom chords to fail, and the perceived problem with the de Burgh truss was the uncertainty of the pinned connections due to inability to inspect them after construction.[28][31] The Dare truss has the simplest geometry and allows the easiest replacement of individual timbers of any of the five truss types.

[27] Don Fraser, "Timber Bridges of New South Wales", *Transactions of Multi-Disciplinary Engineering, Institution of Engineers Australia*, Vol. GE9 No.2 1985, p 99.
[28] Henry Harvey Dare, "Recent Road-Bridge Practice in NSW", *Proceedings of the Institution of Civil Engineers (London)*, Vol 115, 1903-04, pp 388.

3 Documentary and physical evidence

3.1 Documentary evidence

Available documentation regarding NSW timber truss road bridges is extensive. For most bridges, scanned copies of the original signed design drawings are kept by Roads and Maritime. For each of the bridges managed by Roads and Maritime, there is generally an old hard copy corporate general file for the bridge as well as a corresponding regional file. These files contain bridge specific maintenance and other information including photographs generally from the late 1920s to the early 1990s. From the 1990s, bridge condition information and photographs from regular inspections have been stored in the Roads and Maritime Bridge Information System (BIS).

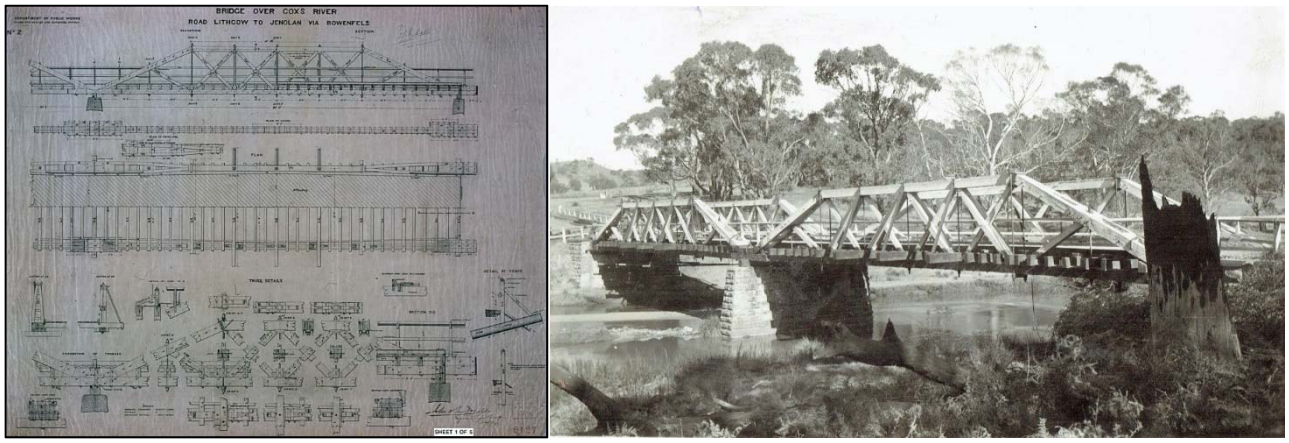


Figure 3.1: Example of original design drawing and early photo of McKanes Bridge (source: Roads and Maritime)

For information prior to the late 1920s, Roads and Maritime has the "Blue Book" which was the original register held by the Department of Public Works (PWD) and which contains notes about maintenance carried out on a number of timber truss bridges while under the control of the PWD. Roads and Maritime also have the original calculation books of Percy Allan and John McDonald, which include some calculations made for timber truss bridges. The calculation book of Henry Harvey Dare is also part of the documentary evidence, and it is held by the State Archives and Records NSW. Some of the original designers also wrote technical papers and reports about their bridge designs, many of which have been digitised and are available through various State and university libraries.

Although most of the original construction specifications have been lost, scanned copies of two original timber truss bridge construction specifications from the very late 1920s have been found. It is known from old photographs that some timber truss bridges had their trusses prefabricated off site and then lifted into position with cranes or barges, whereas other trusses were constructed in-situ supported on temporary falsework including temporary timber piles driven into the waterways. It is difficult to determine the original construction methodology for a particular bridge unless there are detailed reports in digitised newspapers or unless construction photographs can be found.

Important documentary evidence for many timber truss bridges can also be found in Government Gazettes, digitised newspapers from National Library of Australia, Online parish / land title maps, *Main Roads* journals and the Department of Public Works and Department of Main Roads annual reports.

Digitised newspapers often provide insights into the social significance of the bridge for the local communities covering the initial need for the bridge as well as changing needs and perceptions.

There are two detailed and insightful academic studies on the topic of the history of timber truss bridges, and these are "Timber Truss Bridges in New South Wales" by Lynn Heather Mackay in 1972 and "Timber Bridge Conservation in New South Wales" by Harry Trueman in 1984. Don

Fraser (then associate professor in structural engineering at the University of NSW) has also written extensively on timber truss bridges in many published and unpublished documents in which he has examined in some detail every timber truss bridge constructed in NSW.

3.2 Physical evidence

There is generally no original timber fabric on a timber truss bridge as timbers are replaced as required (approximately every 30 years) with new timbers in order to keep the bridge functioning. For this reason, the shapes and sizes and detailing of timber members in a timber truss bridge must be compared with original drawings to determine whether or not they match the design details of the original designers.

When changes to timber detailing have occurred, they are rarely an improvement. Changes are generally due to difficulties in obtaining the correctly sized timbers or efforts to simplify installation of replacement timbers. Some changes have been introduced due to the physical impossibility of replacing a particular element in accordance with the original design. The cumulative impact of the various changes introduced over time often has the effect of considerably weakening the structure.

Some original metal fabric may be present on timber truss bridges, although it can be difficult to tell what is original and what has been replaced. Cast iron shoes are sometimes original, although sometimes they have been replaced either with new cast iron or welded steel shoes similar to the original or with welded steel shoes having no respect to the original. Similarly, tension rods are sometimes original steel or original wrought iron, but sometimes they have been replaced to replicate the original details in either wrought iron or steel, and sometimes they have been replaced with new steel tension rods of larger dimensions and slightly different detailing. For this reason, a careful analysis and assessment of metal components is required on each bridge.

Some of the rolled steel sections used in the later timber truss bridges may have foundry marks which indicate where the steel came from (generally from the UK). In the case of top chord splice plates, sometimes the metal may be from a different timber truss bridge as it was sometimes convenient for timber bridge maintenance crews to move these splice plates from bridge to bridge when top chord timbers were being replaced, so foundry marks are not necessarily conclusive evidence that the metal was original fabric from the particular bridge under consideration.

A common misunderstanding is the idea that the timber decks commonly found on timber truss bridges are largely original in detailing. Because the existing timber decking is not clearly new work, it is easily mistaken for the original form of decking. Many people imagine that these bridges are rustic rather than engineered. For this reason, physical evidence must be examined in the light of documentary evidence (especially early drawings, specifications and photographs).

The original decking usually consisted of tarred 4” (100 mm) thick timber planking laid diagonally or transversely on the timber cross girders. Originally a tarred surface was provided in order to minimise the slipperiness of the exposed timber deck so that vehicles and cattle could cross safely as well as to provide a protection against water to maximise the durability of the timber deck. Much care was taken to achieve a smooth safe deck surface. This means that the aesthetic of the original bridges was considerably less determined by the timber deck (which was smooth and dark and visually recessive) and considerably more focused on the truss with its white-painted timber. Each of the five truss types incorporated slightly different detailing to ensure proper drainage, with some incorporating metal pipe scuppers, some having metal grate scuppers, some omitting the kerbs so that decks could be free draining off the side, and others incorporating a slight convex curvature of the deck (deck cross-fall).

The fact that the original designers even considered providing drainage for timber decks should alert us to the fact that leaky timber decks today are very different to the timber decks originally provided on timber truss bridges. The fact that these timber deck details (ie. timber planks with tar seal) were used with very little modification by all five timber truss designers indicates that the details worked well at the time in which they were used. This is a testament to the quality of the timber which they were using, as the timber available today does not achieve the same results.

Although built of locally sourced timber, these bridges were no more ad hoc, rustic and vernacular than the Sydney Harbour Bridge. Their complexity as engineering structures, fine-tuned through experience and increasingly through material science, must not be overlooked in favour of fading paintwork, rusting metal and rattling decks being hailed as hallmarks of age and authenticity.

4 Analysis of significance

This overarching Conservation Management Plan is intended to provide an assessment of the significance of the timber truss bridge population and a methodology to address its collective management. For each individual timber truss bridge to be retained, a more detailed bridge specific Conservation Management Plan will be prepared by Roads and Maritime. These detailed Conservation Management Plans will provide an assessment of the significance of the individual bridges and contain policies relating to these individual timber truss bridges.

4.1 Assessment criteria

The process by which cultural significance is assessed is set out in the *Burra Charter* and the *NSW Heritage Manual*. Cultural significance is defined in the *Burra Charter* as the "*aesthetic, historic, scientific, social or spiritual value for past, present or future generations*". Seven heritage assessment criteria, based upon the *Burra Charter* definitions of cultural significance, have been gazetted to allow consistency in assessment of heritage items across New South Wales. A copy of the criteria with the NSW Heritage Council guidelines for inclusion or exclusion is in Appendix D.

4.2 Assessment of significance

4.2.1 Criterion A – Historical

The five different truss types are historically significant as they demonstrate the changing availability and economy of materials with time, and the sophistication in engineering design making best use of the resources available to provide local engineering designs of world class standard.

The bridges are associated with the expansion of the NSW road network, and the contribution of that road system to settlement, development and economic activity throughout New South Wales.

The NSW timber truss road bridge population therefore meets this criterion at a State level.

4.2.2 Criterion B – Associative

Each bridge has associations with the engineer responsible for the design and development of that truss type, including W.C. Bennett, J.A. McDonald, Percy Allan, E.M. de Burgh and H. H. Dare. All these engineers were world class engineers working for the NSW Department of Public Works.

The bridges also have associations with the work of Professor Warren, first professor of engineering at Sydney University, who provided extensive scientific analysis of local hardwoods.

The NSW timber truss road bridge population therefore meets this criterion at a State level.

4.2.3 Criterion C – Aesthetic / Technical

The bridges demonstrate technical sophistication as individual designs, as truss types and as a population of timber truss bridges. Their remarkable performance and longevity, compared with overseas examples, testify to the excellence of their design and quality of materials.

The designs of the bridges reflect the ingenuity of the original designers, who were a group of internationally renowned engineers working collaboratively, building on each other's expertise and ideas, to design a group of bridges which reflect engineering and technical excellence. Their responses to changes in available resources and skills is demonstrated in the five types of timber truss bridges used on roads in NSW – Old PWD, McDonald, Allan, de Burgh and Dare trusses.

The bridges are nationally and internationally rare for the degree of development they demonstrate in engineering design. The design of the NSW timber truss bridges was refined to a higher standard than elsewhere in the world, making use of hardwood timbers not available elsewhere.

The bridges demonstrate some of the unique qualities of New South Wales hardwoods that were plentiful in NSW at that time, and were known to be among the strongest and most durable in the world.

The bridges have fitted neatly into the landscapes of NSW for over 100 years, being aesthetically pleasing in scale, proportion and materials used. The timber truss bridges retaining their original black and white colour schemes are aesthetically distinctive and have landmark qualities.

The NSW timber truss road bridge population therefore meets this criterion at a State level.

4.2.4 Criterion D – Social

Because of their almost unique association with the development of New South Wales, the timber truss bridge population has significance for communities across the State. Some of the bridges are highly valued by local populations and are considered important parts of the local identity. There is often a correlation between the proximity of a bridge to a population centre, as well as its frequency of use, and its social value. Some bridges which do not meet the community needs (either due to frequent closures, width restrictions, load restrictions or safety concerns) are considerably less valued by communities that rely upon them.

The social significance of these bridges extends beyond their local communities. This can be demonstrated by the fact that some bridges are listed on the Register of National Trust (non-statutory) and have had plaques installed by Engineers Australia The NSW timber truss road bridge population therefore meets this criterion at a State level.

4.2.5 Criterion E – Scientific / Archaeological

Some of the bridges contain metal elements which are probably original fabric, including cast iron shoes, wrought iron tension rods and metal bottom chords. These may provide a future opportunity for materials testing and analysis to yield further information about the properties of metals used in bridges in the late 1800s and early 1900s. Remnants and re-used elements of earlier crossings may provide information about the succession of crossings at a single location.

However, the information gained by this analysis would not be substantial, and would also be available elsewhere. Archaeological potential in the vicinity of the bridges, of construction camps and work area is likely to be uncommon.

The NSW timber truss road bridge population therefore does not this criterion at a state level.

4.2.6 Criterion F – Rarity

Over 400 timber truss road bridges were built in NSW between 1856 and 1936. This report identifies 51 remaining bridges, many of which are likely to be replaced within the next 20 years, leaving less than 30 remaining as rare examples of a far larger original population.

The NSW timber truss road bridge population therefore meets this criterion at a State level.

4.2.7 Criterion G – Representativeness

The remaining NSW timber truss road bridge population ranges from the earlier periods of construction in the 1880s through to the 1930s. Each timber truss bridge is representative of its truss type, especially for the relevant span length due to the standardisation of the designs.

The remaining bridges include various different span lengths of the five different truss types, and are therefore able to demonstrate much of the design intent of the original designers. The bridges are somewhat dispersed throughout the State which demonstrates something of their original wide geographical usage. The bridges also contain a wide variation in span configurations (sometimes a single truss span, sometimes multiple truss spans and approach spans, sometimes also lift spans) which demonstrates the flexibility of the original designers in using the timber trusses in bridges. The remaining bridges to be conserved into the future continue to have a role and use in the life of communities by being an integral part of the NSW road network as originally intended.

The NSW timber truss road bridge population therefore meets this criterion at a State level.

4.3 Statement of significance

Statements of significance for each individual bridge will be developed in the bridge specific CMPs, and should be consistent with the statement of significance for the total population given here.

The timber truss bridge population of NSW is of State heritage significance. It is significant in demonstrating through its diversity the long-term application of engineering and technical excellence to support the regional settlement and development of New South Wales by making use of superb local timbers to create enduring bridge crossings. Because of their almost unique association with the development of New South Wales, the timber truss bridge population has significance for communities across the State, and many are also considered important parts of local identity.

The timber truss bridges made use of readily available local materials, avoiding wherever possible expensive imported materials and supporting the development of local industries. The bridges demonstrate some of the unique qualities of New South Wales hardwoods that were plentiful in NSW, and were known to be among the strongest and most durable in the world.

Each bridge has associations with the engineer responsible for the design and development of that truss type, including W.C. Bennett, J.A. McDonald, Percy Allan, E.M. de Burgh and H. H. Dare.

The designs of the bridges reflect the ingenuity of the original designers, who were a group of internationally renowned engineers working collaboratively, building on each other's expertise and ideas, to design a group of bridges which reflect engineering and technical excellence. Their responses to changes in available resources, skills and evolving traffic pressures is demonstrated in the five types of timber truss bridges used on roads in NSW – Old PWD, McDonald, Allan, de Burgh and Dare trusses.

The bridges have fitted neatly into the landscapes of NSW for over 100 years, being aesthetically pleasing in scale, proportion and materials used. The timber truss bridges retaining their original black and white colour schemes are aesthetically distinctive and have landmark qualities.

Over 400 timber truss road bridges were built in NSW between 1856 and 1936. Of these only 51 remain, many of which are likely to be replaced within the next 20 years, leaving less than 30 remaining as rare examples of a far larger original population.

4.4 Assessment of heritage integrity for a timber truss bridge

There are different ways of understanding heritage integrity or intactness. Often, this would be assessed by looking at how much of the fabric of the place is original, or can be dated to some significant period, or can provide specific information on the sequence of changes of human usage of the place. For a timber truss bridge, this is not a helpful way of assessing heritage integrity because none of the timber fabric is original fabric due to cyclical replacement, on average every 30 years due to deterioration.

Heritage integrity in the case of a timber truss bridge is best defined as the extent to which the existing elements of the truss are consistent with the original design in form, fabric and function.

- The **form** includes the configuration of the bridge, the rhythm of multiple trusses and their extension with approach spans or interruption through a lift span. It also includes how the overall bridge and the strong horizontal line of the road deck relates to the form of the river, its banks and terraces. Within that view the form is strongly influenced by the general shape of the truss as viewed from a distance as well as the shapes and sizes and interactions of the various components of the truss viewed close up.

Modularity and repetition of components is inherent in the form at all levels from the bridge, to the truss to individual components.

- The **fabric** includes the type of material as originally specified, whether it be New South Wales hardwood, metal, masonry or concrete (not necessarily the age of the material).

- The **function** includes the general use of the bridge to carry traffic, enable industry, open up land and connect communities as well as the particular structural function of an element (eg, compression or bending member, shear connection, primary load bearing member).

4.5 Significance grading of components

A methodology for grading of components is provided in *Assessing Heritage Significance* with the criteria and terminology copied in the following table.[29] This recognises that different components of a place may make a different relative contribution to its heritage value and that loss of integrity or condition may diminish significance. *Assessing Heritage Significance* also recognises that, while it is useful to refer to the following table when assessing this aspect of significance it may need to be modified to suit its application to each specific item. In the case of a timber truss bridge, the reference to "high degree of original fabric" is not necessarily applicable.

Grading	Justification	Status
Exceptional	Rare or outstanding element directly contributing to an item's State significance.	Fulfils criteria for State listing.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.	Fulfils criteria for State listing.
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance.	Fulfils criteria for State listing.
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfil criteria for State listing.
Intrusive	Damaging to the item's heritage significance.	Does not fulfil criteria for State listing.

Not all elements in a timber truss bridge contribute to it fulfilling the criteria for State listing. For example, even if the original timber railings on a bridge had not been modified at all, they may not directly contribute to the bridge's significance. Using the heritage assessment criteria adopted by the Heritage Council of NSW, the railings do not meet the guidelines for inclusion for any of the criteria. In contrast, the top chords, assessed by the same seven criteria (tabulated below), meet the guidelines for inclusion under five criteria as directly contributing to the item's significance.

[29] Assessing Heritage Significance, NSW Heritage Manual, NSW Heritage Office, 2001, p 11.

Elements	Railings	Top Chords
Historical	Does not meet criterion: common and simple railing used widely (not only on bridges) with no particular historical importance or significance.	Meets Criterion: demonstrates strength and durability of New South Wales hardwoods and demonstrates design development of truss type.
Associative	Does not meet criterion: common railing with no association with any significant event, person or group.	Meets Criterion: demonstrates design innovation of particular designer with detailing unique to the truss type.
Aesthetic / Technical	Does not meet criterion: no landmark qualities but visually recessive, no technological innovations introduced.	Meets Criterion: aesthetically distinctive and demonstrating technical achievement as a distinguishing feature of truss type.
Social	Does not meet criterion.	Does not meet criterion.
Scientific / Archaeological	Does not meet criterion: no original fabric, no archaeological potential.	Does not meet criterion: no original fabric, no archaeological potential.
Rarity	Does not meet criterion: not rare.	Meets Criterion: top chord detailing unique to truss type and only a small number of any truss type remains.
Representative	Does not meet criterion: no significant distinguishing features demonstrated.	Meets Criterion: demonstrates distinguishing feature of truss type.

Ancillaries (such as railings, decking, approach spans, piers and abutments) are substantially less significant than the truss spans. The significance of the ancillaries is functionality because they are necessary for the bridge to function as a bridge but they are not significant in and of themselves.

The table below gives general guidance on typical significance gradings for components which may be found on a timber truss bridge. The significance values given are assuming that the components are in good condition and have not been substantially modified. Each individual component of each bridge must be assessed separately to confirm or adjust significance. Different components may emphasise particular aspects of significance at different scales.

Component (in good condition and not substantially modified)	Significance
Primary truss members (eg: top chords, bottom chords, diagonals)	Exceptional
Secondary truss members (eg: sway bracing, wind bracing, cross girders)	Moderate
Masonry piers or abutments, especially those reused from a previous bridge	High/Moderate
Reinforced or unreinforced concrete piers or abutments as per original design	Moderate
Typical timber trestle piers or timber abutments	Moderate
Typical timber girder approach spans	Moderate
Kerb and railings	Moderate
Decking with running surface (eg, seal)	Moderate
Moveable spans (eg, lift spans, bascule and tower spans etc)	Exceptional

Table 2: Typical gradings of significance for common components in timber truss road bridges.

The use of the “intrusive” significance grading should only be used where the element has been modified to such an extent that it is now damaging to the item’s heritage, causing difficulties in interpreting not only that element, but causing difficulties in interpreting the bridge as a whole. For example, the decking at McKanes Bridge (a McDonald truss) still consists of planks of New South Wales hardwood timber as it did originally, but the shape, look, feel and function of the decking has been so substantially modified that it now detracts from the significance of the bridge as a whole

and causes considerable difficulties in the interpretation of the McDonald truss design.

The existing timber decking is easily mistaken for original or original style decking, confirming for many people that these bridges are rustic rather than engineered. This compromises the ability to interpret the real significance of a bridge from engineering and design perspective.

5 Constraints and opportunities

5.1 Roads and Maritime responsibilities

Roads and Maritime manages almost six thousand bridges and major culverts. The Roads and Maritime 2020 Strategic Plan (August 2015) outlines strategic priorities for maintaining timber truss bridges as operational assets.

The Roads and Maritime strategic priorities are:

- Making safety paramount;
- Delivering our infrastructure program;
- Meeting customer and community needs;
- An organisation that delivers; and
- Enhancing economic and social outcomes.

5.1.1 Making Safety Paramount

The *Work Health and Safety Act 2011* and the *Work Health and Sa*fety Regulation 2011 are administered by SafeWork NSW, and aim to secure the health and safety of workers and workplaces, which includes construction or maintenance people working on bridges. The legislation also requires designers to consider safety for workers and users of any structure.

The safety risks on timber bridges are significant, including working at heights, working near traffic, working near overhead powerlines, working over water, working with hazardous materials (timber preservatives, termite treatments and possibly lead paint) and manual handling. In order to meet legislative safety requirements, sometimes traditional methods of construction and repair are not feasible, and so changes must be introduced to facilitate safe maintenance of a bridge.

In the NAASRA (National Association of Australian State Road Authorities) *Highway Bridge Design Specification* of 1965, there are design requirements for roadway railings on bridges, for footway railings on bridges, and for 'crash resisting railings' on bridges. Even in 1965, barriers were only designed to actually resist impact loads from vehicles on 'bridge structures carrying traffic over busy thoroughfares', otherwise design loads were approximately 2 kN/m (kiloNewtons per metre). In 1992, the AUSTROADS *Bridge Design Code* came into effect, and barrier loads increased to 90 kN. In 2004 a new Australian Standard for Bridge Design, AS 5100 introduced a design load up to 500 kN to resist heavy vehicles. In the 2017 revision, that design load has further increased to 600 kN.

Neither timber rails or unsupported metal rails have any ability to prevent a vehicle from falling off the bridge. On the contrary, timber rails are a spearing risk to errant vehicles and their passengers. There have been a number of instances of vehicles driving off the sides of timber truss bridges in NSW, with some fatalities. Photographs below are typical of what happens when a car loses control at a timber truss bridge.

Figure 5.1: Vehicle recovery after crash on timber truss bridge (source: Roads and Maritime).

5.1.2 Delivering our infrastructure program

Addressing the State's deficient rural bridges is a key priority for NSW Government investment. A new and dedicated infrastructure development program called Bridges for the Bush was set up in 2012 to fund the necessary upgrade of the network in line with the Strategy which had been endorsed by the Heritage Council of NSW. This initiative is a commitment from the NSW Government to improve road freight productivity by replacing or upgrading bridges at key locations in regional NSW. The NSW road network is critical to the movement of freight in Australia with half the nation's road freight and three quarters of all interstate road freight journeys on NSW roads. With the road freight task predicted to nearly double by 2030, significant investment in the NSW road network is required to meet the demand for increased access of larger, safer and heavier freight vehicles. It will be necessary to upgrade timber truss bridges to meet these growing needs.

5.1.3 Meeting customer and community needs

The best way to conserve a heritage structure is to keep it operational. A bridge that looks like it is held together with ad hoc repairs or poor workmanship, left to deteriorate until traffic restrictions are put in place is less likely to be valued by the community. A community is more likely to value a bridge if its inherent elegance and design excellence is revealed and maintained. It is also more likely to value a structure if convenience and operation is maximised and inconvenience minimised. Community sentiment can be assisted by education through interpretation, but if the bridge does not safely and efficiently perform its primary intended function as a transport link across the river, then the social significance is substantially diminished.

Balancing requirements considered important by the community and users may impose conflicting demands on how the bridge's significance can be conserved. Conserving form or function or fabric may come at the expense of the others. While the emphasis for individual bridges must be arbitrated through individual CMPs some general principles can apply.

Article 3.2 of the *Burra Charter* states that, "Changes to a place should not distort the physical or other evidence it provides, nor be based on conjecture." Similarly, the ICOMOS *Principles for Historic Timber Structures* emphasise the importance of authenticity and load-bearing function.

Therefore, any new works that might be required for strength or safety should be able to be interpreted as such, and the original design intent should not be obscured in the process. Any conservation works on the bridge should aim to enhance its social significance by community focused design. A community focused design will include, but not be limited to, the following:

- Elegance in Design: The bridge, and any additions to it, should be in keeping with the elegance and simplicity of the original, with any additions designed to be visually recessive;
- Road Safety: The Bridge should be safe for vehicles and for pedestrians where appropriate. This may require sensitively upgraded barrier rails, alignments and approach treatments;
- Transparency in Design: Design should enable the inquisitive to determine the original details, fabric and form where possible by not obscuring this by changes and additions;
- Durability in Design: The design should be detailed to maximise service life so that

community impact of traffic diversions due to bridge closures is minimised;

- Strength for Modern Vehicles: The bridge should be strengthened to carry today's vehicles so that inconvenient load restrictions are minimised, and community benefit maximised; and
- Interpretation: Information on the bridge and its history should be made readily available, and where appropriate, included in the vicinity of the bridge.

5.1.4 An organisation that delivers

Roads and Maritime has invested heavily in understanding timber truss bridges in the current context so that a representative population can be conserved into the future. With almost 160 years of experience and over 400 timber truss bridges constructed, operated and maintained, there is a wealth of corporate knowledge within Roads and Maritime which cannot be found elsewhere. This corporate knowledge and new research have been used to develop proven methods for conserving timber truss bridges as part of the operational road network of New South Wales.

5.1.5 Enhancing economic and social outcomes

An intangible economic benefit of the timber truss bridges is their heritage value, and conserving these bridges in a way which continues to meet network needs enhances their heritage value. The bridges also have tourism potential, and this could be enhanced through appropriate information being provided, for example, at local tourist offices as well as on-line and site-based interpretation.

5.1.6 Obligations under the Timber Truss Bridge Strategy 2012+

The purpose of the Strategy was to determine which representative bridges were viable to keep in the future and to focus conservation efforts on them. The aims to conserve a representative population with the clear and correct understanding that the continued usage of these bridges as functioning crossings for vehicles as part of the road network is integral not only to their cultural significance but also to their survival. It also aims to ensure the bridges' continued operability through heritage sensitive upgrades and selective use of materials and methods.

The Strategy was predicated on the retention of a representative population of timber truss road bridges to be managed within the operational road network. Candidate bridges were selected on the basis of their ability to continue to carry traffic, potentially following capacity upgrading, and contribution to the diversity of the retained population. Of the 48 bridges remaining in 2012, the Strategy identified 26 as suitable candidates for long-term retention as part of the road network. The remaining 22 bridges would be replaced with new structures within the next two decades.

When the Strategy was endorsed, 65 bridges remained with 48 being managed by Roads and Maritime. In the past five years 14 bridges have been demolished (seven within the Roads and Maritime portfolio and seven managed by local Councils), leaving a total of 51 remaining with 41 managed by Roads and Maritime.

The Strategy recognises Roads and Maritime's role as the custodian of the heritage significance of the population of timber bridges, and under the Strategy Roads and Maritime is required to:

- Retain a minimum of 26 timber truss road bridges until 2032, and retain a minimum of 20 beyond 2032, with the "central west group" not committed to long term;
- Use traditional methods and materials where possible (where upgrading is not required);
- Upgrade (for strength and safety) bridges as required in order to ensure their ongoing safety and operability. The Strategy mentions the need to make use of modern materials to achieve required load capacities. A summary of possible modifications is given in Appendix C. (However all design solutions for upgrades and any other works must be developed on a case by case basis);
- Continue to improve conservation knowledge and skills through training;
- Continue to improve engineering knowledge and understanding through research;

- Continue to retain and improve in-house timber bridge carpentry skills through training;
- Continue to promote the heritage significance of timber truss road bridges;
- Prepare a comprehensive book on the heritage significance of NSW timber truss bridges;
- Prepare a heritage interpretation strategy that will apply to all timber truss bridges;
- Implement recycling of used bridge timbers policy for all bridges to be removed;
- Implement the Timber Procurement Strategy to ensure adequate timber supply;
- Undertake a heritage study of all 26 movable span bridges within its control;
- Nominate bridges to be retained (excluding the central west group) for inclusion on SHR;
- Prepare an environmental assessment guideline for timber truss bridge replacement;
- Follow the statutory process for delisting SHR listed bridges to be replaced;
- Develop conservation planning documentation to set out how individual bridges are to be managed and how the overall heritage values of the retained population will be conserved; and
- Report to the NSW Heritage Council every two years on the implementation of the Strategy.

Since the Strategy is over five years old, Roads and Maritime will review the list of bridges to be retained within 12 months of the endorsement of this CMP.

5.2 Roads and Maritime responsibilities

Bridges are there to be used, and they were constructed because a crossing was needed. The original needs (safe access for vehicles, people and animals) generally remain. The specifics of those needs, however, have changed, with heavier, faster, wider and more numerous vehicles requiring a crossing and with increased community expectations of safety and road efficiency.

The most common approach to conservation was originally an attempt to minimise change, and if necessary to preserve bridges by building a new concrete bridge, keeping the old bridge either as a pedestrian crossing or simply a part of the scenery. Unfortunately, deterioration occurred far more quickly than anticipated, and most of these bridges had to be demolished due to safety concerns.

The example in Figure 5.2 was an Allan truss over Johnston's Creek at Glebe. On average, such bridges lasted ten years.

Figure 5.2: Failed pedestrian crossing (source: J. McPhail, 2005)

During the 1990s the RTA began to grapple with these problems differently, considering whether

these bridges could be strengthened if increased loads were the issue, and whether the decks could be modified if noise was the issue, and whether the approach spans could be replaced and widened if safety was the issue, rather than planning the demolition of the trusses.

The challenge was to achieve increased strength, safety and serviceability without losing the aspects of the bridges which were most significant. The truss would continue to be the main structural component of the bridge because replacing it with a different functional element, even if concealed, would adversely impact its significance. Similarly, changing the arrangement of the truss would alter the aesthetics and engineering logic of the truss and compromise its values.

5.3 Statutory context for conservation and management

The NSW timber truss road bridges are recognised as items of State and local heritage significance and some may also have national heritage values. They are therefore subject to a range of heritage-related environmental planning legislation which provides the statutory framework for managing heritage in New South Wales. Working within the bounds of this statutory framework as described in this section will assist in giving the Heritage Council the required level of assurance that the timber truss bridges are going to be managed and conserved into the future.

5.3.1 State Heritage Register listing and Heritage Council of NSW Approvals

The SHR is a list of heritage items of particular importance to the people of New South Wales. It includes items and places (buildings, works, relics, movable objects or precincts) of State heritage significance endorsed by the Heritage Council of NSW and the Minister. The SHR is established under Section 22 of the *Heritage Act*, and pursuant to Section 57(1) of the Act, the approval of the Heritage Council of NSW is required for any proposed development within the site including subdivision, works to the grounds or structures or disturbance of archaeological 'relics'.

The *Heritage Act* requires minimum standards of maintenance and repair for items on the SHR to ensure heritage significance is retained. These standards are set out in the *Heritage Regulation 2012*, and relate to weatherproofing, fire protection, security and maintenance.

5.3.2 Exemptions from Heritage Act approval

Section 57(2) of the *Heritage Act 1977* provides for a number of exemptions to Section 57(1) approval requirements, meaning that a Section 60 approval does not need to be sought.

Routine maintenance and minor repairs consistent with standard exemptions would not require Heritage Council approval before commencing. Certain minor developments may be exempt if they are identified in an endorsed bridge specific CMP. Other works including minor structural alteration, major refurbishment, safety and operational upgrades, would require approval of the Heritage Council of NSW, either as a Section 57 exemption or a Section 60 application.

5.3.3 Archaeology

The *Heritage Act 1977* affords automatic statutory protection to 'relics'. The Act defines a 'relic' as:

> *any deposit, artefact, object or material evidence that:*
> *(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement and*
> *(b) is of State or local heritage significance.*

Any excavation or works to a site listed on the SHR likely to disturb relics would require an approval to carry out a Section 57(1) activity, except in accordance with a gazetted exemption.

In the event that substantial or unexpected archaeological relics are encountered within the curtilage, the Office of Environment and Heritage (OEH) should be notified, pursuant to Section 146 of the *Heritage Act 1977*. Further assessment, and possibly further approval, may be required at the discretion of OEH. The Roads and Maritime archaeological protocols cover the process to be

followed in such circumstances.

5.3.4 Aboriginal heritage

Legislative protection of Aboriginal objects and places comes under the *National Parks and Wildlife Act 1974* (NPW Act). It is an offence under that Act to disturb or otherwise alter Aboriginal archaeological items without the express permission of the Director General of the NSW National Parks and Wildlife Service (NPWS). The Act provides statutory protection for all Aboriginal objects and places (consisting of any material evidence of the Indigenous occupation of NSW) under Section 90 and for 'Aboriginal places' (areas of cultural significance to the Aboriginal community) under Section 84. Aboriginal objects and places are afforded automatic statutory protection in NSW whereby it is an offence to damage, deface or destroy Aboriginal sites without prior consent.

5.3.5 State owned Heritage Management Principles

The State Owned Heritage Management Principles were issued in 2004 under Section 170A (2) of the *Heritage Act 1977*. The following items are particularly relevant to timber truss road bridges which are to be retained:

Citation	Quotation	Implication
3. Lead by Example	State agencies should lead by example by adopting appropriate heritage management strategies, processes and practices. The public sector should set the standard for the community in the management of heritage assets.	Conservation should be of the highest standard.
4. Conservation Outcomes	Heritage assets should be conserved to retain their heritage significance to the greatest extent feasible. State agencies should aim to conserve assets for operational purposes or to adaptively reuse assets in preference to alteration or demolition.	Significance should be conserved to the greatest extent feasible.
8. Maintenance of Heritage Assets	Heritage assets are to be maintained in a manner which retains heritage significance, with the objective of preventing deterioration and avoiding the need for expensive "catch-up" maintenance and major repairs.	Bridges should not be allowed to fall into disrepair despite any load limits.
9. Alterations	Alterations should be planned and executed to minimise negative impacts on heritage significance (including curtilage and setting), and appropriate mitigating measures should be identified.	Any alterations must minimise negative heritage impacts.

The Heritage Asset Management Guidelines were issued in 2004 under Section 170A (3) of the *Heritage Act 1977*. The following items are particularly relevant to timber truss road bridges which are to be retained:

Citation	Quotation	Implication
2.2 Adoption of the Burra Charter (p 17)	State agencies should adopt the *Burra Charter* for the making of management decisions for heritage assets. In accordance with the Burra Charter, management decisions should also consider other factors affecting the future of a heritage asset such as the owner's needs, resources, external constraints and its physical condition.	Management decisions need to be made in accordance with the *Burra Charter*.

3.6 Interpretation of Heritage Significance (p 20)	The heritage significance of many heritage assets is not readily apparent and should be explained by interpretation, in accordance with the document, Heritage Interpretation Guidelines. Interpretation should enhance understanding and enjoyment, and be culturally appropriate.	A Heritage interpretation strategy should be prepared for each bridge and the population.
3.27 Contemporary & Design Excellence of New Additions (p 25)	New additions to heritage assets, including new constructions in the vicinity of heritage significance, should be identifiable as having been designed and built in the present. New additions are to include contemporary design elements and materials as appropriate, as well as being sympathetic to identified heritage values. Designs should be executed with appropriate materials and finishes.	Any new work on the bridges must exhibit engineering excellence and be sympathetic to heritage value.
3.29 Removal of Intrusive Elements (p 25)	Wherever practical, elements identified as being "intrusive" to the heritage significance of a heritage asset should be removed.	Intrusive elements should be removed.

5.3.6 State agency heritage and conservation registers

Section 170 of the *Heritage Act 1977* requires that all Government departments or agencies must maintain a Heritage and Conservation Register, which includes all assets owned or in the care and control of the relevant department or agency that are of State or local heritage significance.

All timber truss bridges under the care and control of Roads and Maritime are included in the relevant Heritage and Conservation Register. Under Section 170A of the *Heritage Act*, 14 days prior notice to the Heritage Council of NSW is required in the event that Roads and Maritime:

a) removes any item from its register under Section 170; or
b) transfers ownership of any item entered in its register; or
c) ceases to occupy or demolishes any place, building or work entered in its register.

5.3.7 Local Environmental Plan and Local Council approvals

The *NSW Environmental Planning and Assessment Act 1979* establishes Local Environmental Plans (LEPs) as the relevant local planning instrument in any council-controlled area in NSW. Although some of the bridges are listed on various LEPs as heritage items, this does not restrict or prohibit any development by Roads and Maritime, as Clause 5.12 generally states that,

> *Infrastructure development and use of existing buildings of the Crown*
> *(1) This Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under State Environmental Planning Policy (Infrastructure) 2007.*
> *(2) This Plan does not restrict or prohibit, or enable the restriction or prohibition of, the use of existing buildings of the Crown by the Crown.*

The State Environmental Planning Policy (Infrastructure) 2007, Clause 94 (1) states that,

> *Development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land.*

5.3.8 Total asset management

The NSW Government has established various requirements and standards for the delivery of government services and infrastructure in NSW. The Government's 'Strategic Management Framework' summarises and defines the various processes which NSW Government agencies are required to use in order to plan activities and services, to allocate resources and to report on performance. Total Asset Management (TAM) is a part of the framework, seeking to ensure the strategic management of physical assets to best support the delivery of agency services.

With constant reference to whole-of-government planning, the agency's Corporate Plan, and its Service Delivery Strategy, the TAM approach requires asset managers to assess what assets are needed to support successful service delivery. It then calls for detailed plans for the management of those assets which are to be acquired, maintained or disposed of. The Total Asset Management approach provides an overarching context for decisions in relation to timber truss bridges.

5.3.9 Border Bridges – Victorian Stakeholders

Some of the bridges are located at border crossings where Victorian legislation may be relevant although NSW is generally responsible for managing and maintaining these bridges. For these bridges which cross the Murray River, the abutment and approach road within Victoria is an asset of VicRoads, a Victorian government agency. Half of all funding must also come from Victoria.

Relevant legislation includes the Victorian Heritage Act 1995 and the Victorian Planning and Environment Act 1987. These are given effect by the NSW-Victoria Border Bridges Agreement.

6 Conservation Policies

The policies in this section provide for the care and management of the population of NSW timber truss road bridges to ensure that representative samples are conserved as State Heritage items. The policies provide for the retention and enhancement, through appropriate conservation and interpretation, of the heritage values of the bridges including their settings and ongoing operations.

6.1 Best practice in heritage management

The policies in this overarching CMP provide for the care and management of the population of NSW timber truss road bridges to ensure that representative samples are conserved as State Heritage items. The policies provide for the retention and enhancement, through appropriate conservation and interpretation, of the heritage values of the bridges including their settings and ongoing operations.

Policy 1: Retention of cultural significance of the timber truss bridge population

a) As the primary custodian of the remaining timber truss road bridges of NSW, Roads and Maritime will conserve a representative sample (as identified in the Strategy) that reflects the diversity of the original population for future generations as part of the operational road network.

b) Timber truss bridges are places of exceptional cultural significance and will be maintained and conserved in such a way which protects or enhances their cultural significance.

c) Conservation of timber truss bridges will accord with the definitions and principles of *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance* and include all significant components and attributes of the place and its setting.

d) All current and future owners, managers and consent authorities responsible for the care and management of timber truss bridges to be retained will be advised of, and be jointly responsible for, the conservation of the heritage significance of the bridges.

e) The conservation management of the timber truss bridges will be undertaken in consultation with heritage practitioners with relevant expertise and experience working in collaboration with structural engineers with relevant expertise and experience as required.

Policy 2: Adoption, implementation and review of the overarching CMP

a) The conservation policies set out in this document will be formally adopted by Roads and Maritime as a guide to future conservation and development of timber truss bridges.

b) Roads and Maritime will make resources available for the implementation of these polices during any works to the timber truss bridges or their setting, including routine maintenance.

c) Roads and Maritime will ensure that this document is both available for, and understood by staff co-ordinating and undertaking the ongoing maintenance of timber truss bridges.

d) This overarching CMP will be made available to the public. Copies of this CMP will be lodged with all relevant administrative, maintenance, heritage and archival bodies/agencies, as well as being held by Roads and Maritime, and be readily available for public reference.

e) This CMP will be reviewed every five years to incorporate any changes in conservation methodology or practice, changes in legislation or user requirements, and any new historical evidence that comes to light. The effectiveness of conservation treatments to the structures will also be considered and if required, corrective action recommended. The

reviewed CMP will be submitted to the Heritage Council for endorsement.

Policy 3: Preparation of bridge specific Conservation Management Plans

a) Roads and Maritime will prepare conservation management plans for each of the bridges to be retained to guide the management and conservation of these bridges. Conservation management plans will be submitted for endorsement by the Heritage Council of NSW or its delegate.

b) The SHR listings for the timber truss bridges to be retained will be updated to reflect the findings of the conservation management plans with regard to significance and history.

6.2 Conserving a representative sample of timber truss road bridges

The Strategy was prepared in 2010, underwent extensive public consultation in 2011, and was endorsed in 2012. The purpose of the Strategy was to determine which representative bridges were viable to keep into the future and to focus conservation efforts those bridges, ensuring their continued operability, while allowing for the delisting and demolition of other unviable bridges.

Policy 4: Conservation of a representative timber truss bridge population

a) In keeping with the intent of the 2012 strategy, Roads and Maritime will review the list of bridges to be retained and those to be demolished.

b) The updated list will be submitted for endorsement by the Heritage Council of NSW.

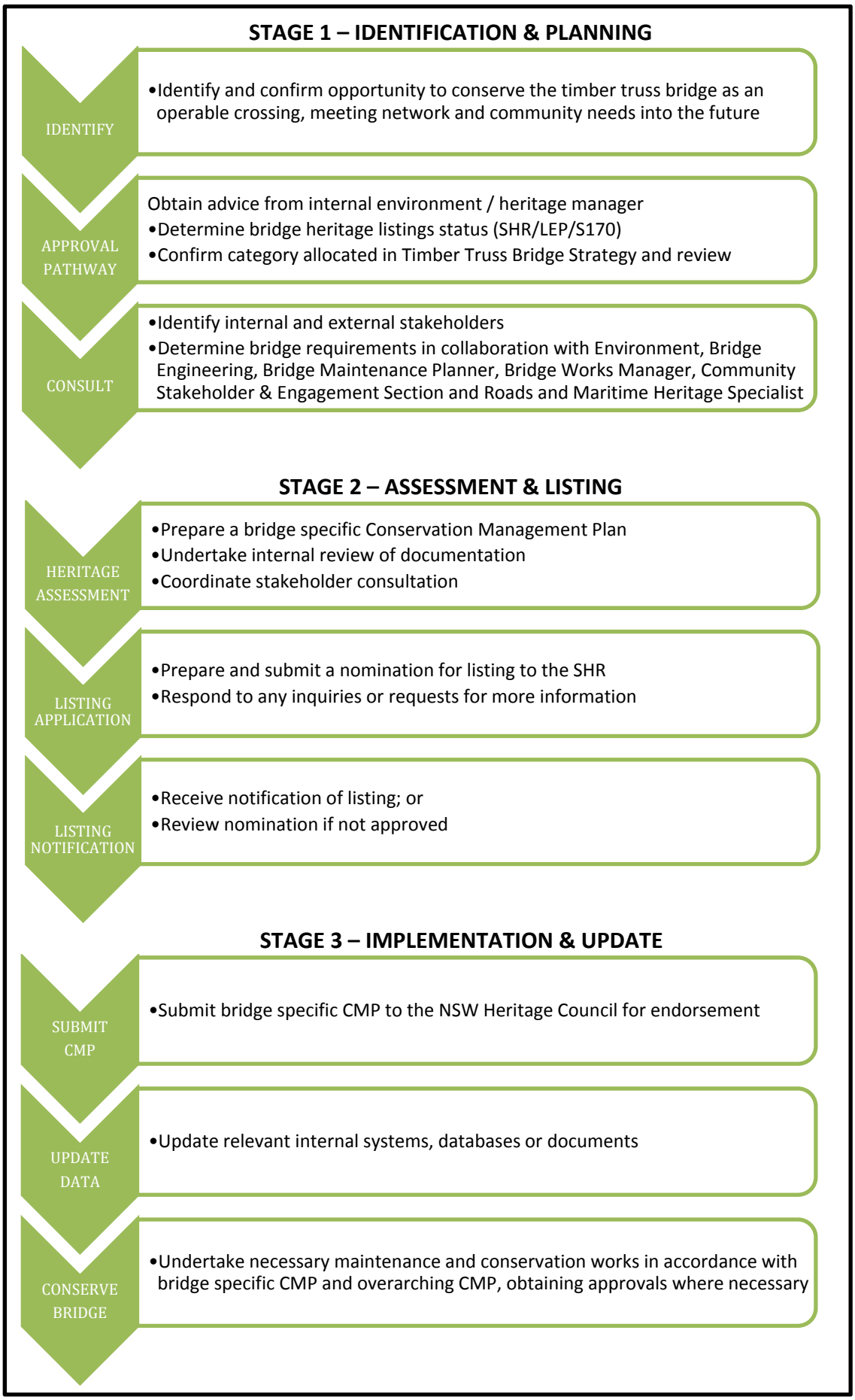
Policy 5: Listings

a) The bridges to be retained on the updated list will be nominated for inclusion on the State Heritage Register (SHR) if they are not already listed on the SHR.

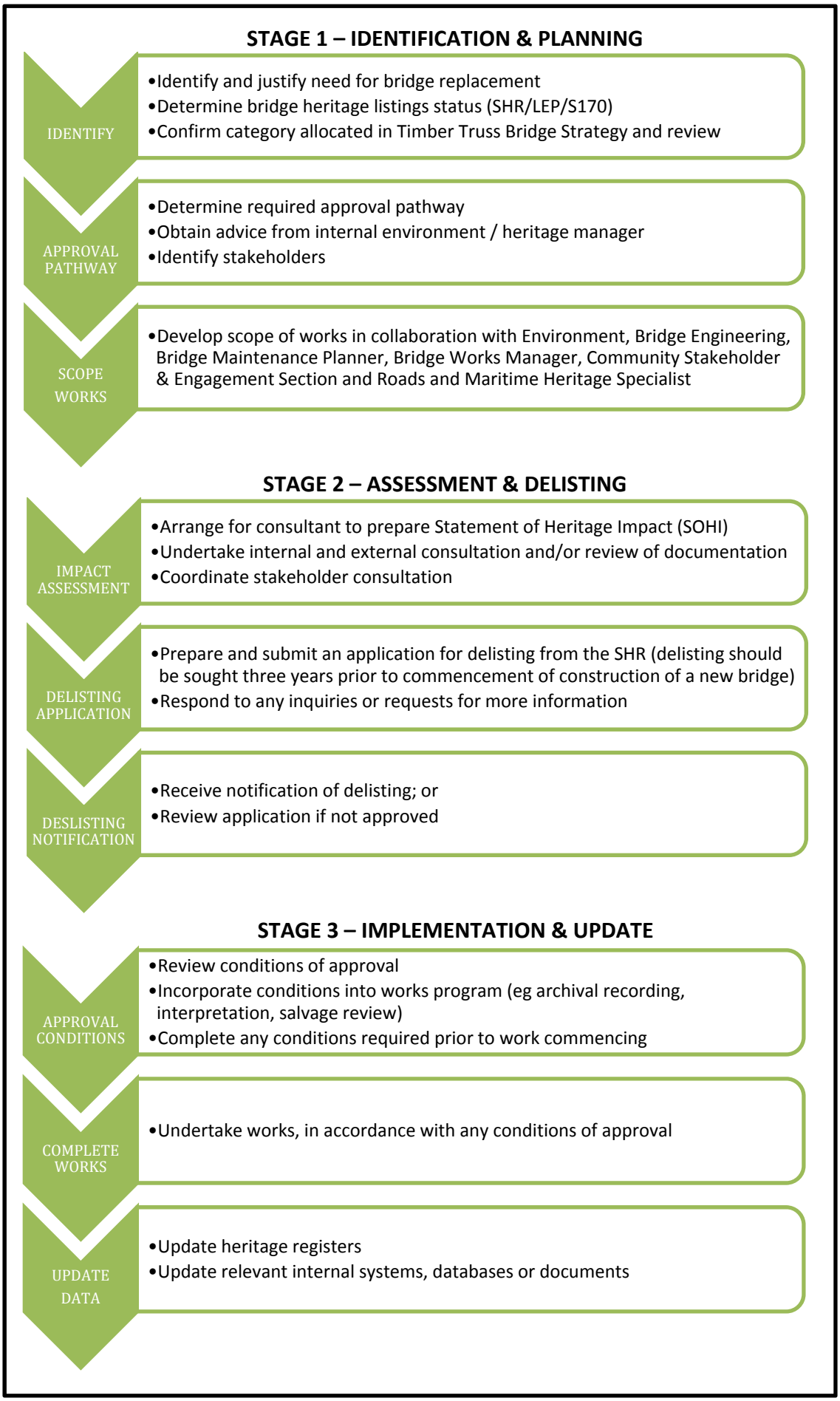
b) For the replacement of bridges which are not viable for retention, applications to the Heritage Council for delisting will be accompanied by a statement of heritage impact (SOHI).

c) Any bridges owned by local Councils, acquired by Roads and Maritime for conservation will be added to the Roads and Maritime S170 register in addition to nomination to the SHR, where relevant.

Process for listing bridge on State Heritage Register



Approval process for delisting and bridge replacement



6.3 Ensuring bridges have a role and use in life of communities

The continued use of these bridges as functioning crossings for vehicles and pedestrians is integral to their cultural significance and their survival. New work will be required to adapt the bridges to changing transportation needs.

Policy 6: Use of the bridges

a) Roads and Maritime will continue to engage with local communities to ensure that the timber truss bridges to be retained are managed in a way that meets community needs.

b) Timber truss bridges to be retained will be used for vehicular traffic. The continued usage of these bridges as functioning crossings for both commercial (freight, farming machinery and buses) and private passenger vehicles is integral to their cultural significance.

c) Unacceptable uses of timber truss bridges include any uses or activities that may cause or accelerate physical damage to the fabric or views to and from the bridges (e.g. utilities).

d) Roads and Maritime will seek to arrange for the removal and relocation of existing utilities from timber truss bridges were possible and when opportunity arises.

Policy 7: Maintenance and repair

The timber in timber truss bridges is generally not original fabric, and requires replacement from time to time. Some of the original designs were specifically detailed to accommodate these regular replacements of timber elements, and so the removal of deteriorated fabric and its replacement with new timber fabric of suitable species is essential for the conservation of these bridges.

a) Ongoing repair and maintenance will be carried out to ensure that the minimum standards of maintenance under the Heritage Act are met, and that each significant element in each bridge retains its level of significance. Works will be undertaken by suitably skilled workers with proven expertise in the relevant field and under adequate supervision.

b) Roads and Maritime will develop a forward program to ensure that sufficient suitable high quality timber is made available for identified conservation works on timber truss bridges.

c) Roads and Maritime will ensure that the knowledge, skills, techniques and practices that support the continued conservation of timber truss bridges is maintained. Specialist engineering and technical knowledge will be captured, further developed and passed on.

d) Roads and Maritime will prepare an Incident Response Plan for each bridge to be retained to minimise the risk and duration of emergency works, and manage such works so that the public and the bridges are kept safe, and so that works do not impact significant fabric.

e) Timber elements in trusses will be replaced as required before deterioration affects the safety or serviceability of a bridge. New timbers will be cut to the original design dimensions as shown on original design drawings (unless modified dimensions are approved by the Heritage Council of NSW as required for strength or due to availability of timbers) and original detailing using NSW hardwood of suitable strength and durability.

Policy 8: New work

New work will be required to adapt the bridges to changing transportation needs. The endorsed Strategy acknowledged the need to include the use of modern materials in capacity upgrades for most of the timber truss bridges to be retained in order to ensure that they have sufficient strength and safety for modern vehicles. The Strategy highlighted in particular that ancillaries (piers,

abutments, approach spans and railings) will generally require replacement with modern materials and designs, and truss spans will often require some form of sympathetic strengthening.

These policies aim to ensure that new works and new materials are not damaging to heritage significance, but are comparable with the old in quality and do not dominate the trusses in bulk, scale or character. Appropriate contemporary design using modern materials and techniques can be an effective way of distinguishing new work from original so long as it is used with care and design excellence.

a) Elements of the bridges will be conserved in accordance with their level of significance.

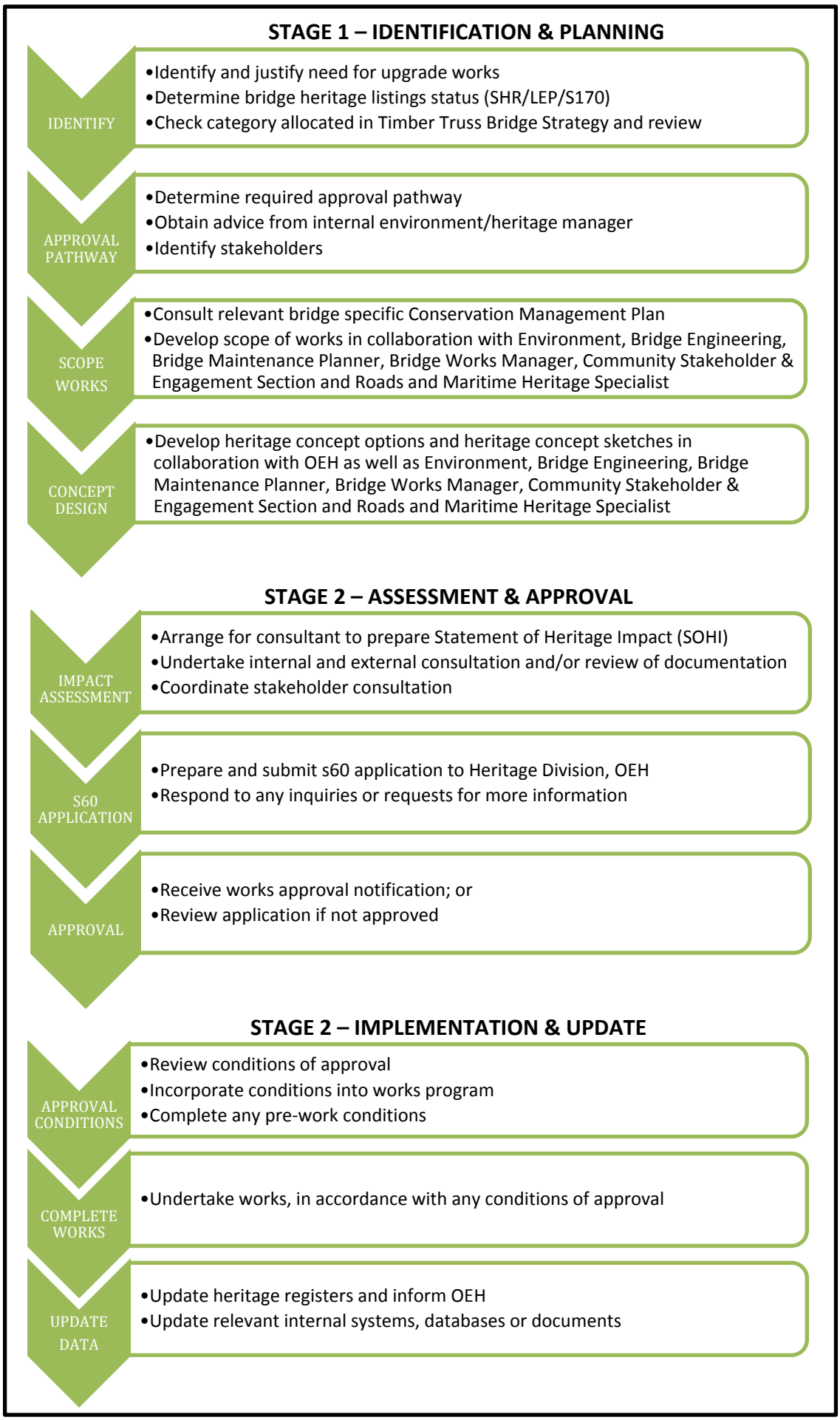
b) Timber truss bridges will continue to carry traffic appropriate to their place in the road network. They may be adapted to ensure their continued serviceability provided this does not compromise their heritage significance. Subject to relevant approvals, this may include introducing new materials to meet load, safety and durability requirements in order to enable the bridge to remain as a vital part of the NSW road network, strengthening truss spans to ensure loads can be carried safely and to ensure effective traffic barriers can be installed.

c) Roads and Maritime will match the excellence of the originals in the quality of design and construction of any modifications or new works.

d) Roads and Maritime will continue to explore and develop means by which these bridges may continue to effectively fulfil their required function. This may include the use of new methods and materials to strengthen the structures, extend their usable life, ensure their operability and achieve conservation objectives where this can be done in a subtle and sympathetic way and where this is reasonable and feasible. Such changes are subject to the standard approval processes of the *Heritage Act 1977* for those bridges on the SHR.

e) For works not covered by Standard or Specific Exemptions or by exemptions identified in an endorsed bridge specific CMP, applications to the Heritage Council for approval for specific works will be submitted, accompanied by a statement of heritage impact (SOHI) and, if required, the relevant statutory application under the *Heritage Act*. The approval and decision making process for structural upgrades is given on the following page.

Upgrade works – decision making and approval process



6.4 Interpretation and appreciation of timber truss bridges

There are some misconceptions with regard to heritage timber truss road bridges (e.g. they are inherently too weak for modern vehicles, they are inherently unsafe, they are inherently noisy, heritage listing inherently prohibits any change). This not only means that the bridges are not fully appreciated, but these perceptions can also lead to local communities lobbying for a new concrete bridge, often wishing to conserve the timber bridge off line only when it is too late. Accurate, interesting and relevant interpretive material is critical for assisting local and regional communities to appreciate their timber truss bridges, which will, in turn, assist with conservation.

Policy 9: Interpretation

a) The heritage significance of the timber truss bridge population and each of the timber truss bridges to be retained will be communicated through effective heritage interpretation.

b) Interpretation of the timber truss bridges will be based on the historical themes and historical analyses documented in the bridge specific CMPs and this overarching CMP.

c) In accordance with the Strategy, Roads and Maritime will continue to develop a heritage interpretation strategy that will apply to both bridges to be retained and to the sites and materials from bridges that have been replaced, to identify suitable means of capturing and sharing information about the heritage significance of these places.

d) Interpretation will conform to the Heritage Division's Interpreting Heritage Places and Items Guidelines and with Roads and Maritime's Heritage Interpretation Guideline.[30]

e) In accordance with the Strategy, Roads and Maritime will commission a comprehensive publication on the heritage significance of the timber truss bridges of New South Wales.

Policy 10: Protection and enhancement of visual setting

a) Any development proposed for the land adjacent to a bridge, whether inside or outside the curtilage, should be considered carefully to ensure that it does not have an unacceptable visual impact which could cause a reduction in the aesthetic significance of the bridge.

b) Signage in the vicinity of the bridges should be minimised to what is necessary for safety and identification so that it does not create visual clutter and block views.

c) Vegetation in the vicinity of the bridges should be kept to a minimum. Weeds should be removed, and vegetation clearance should be taken with a view to improving the visual setting, and to reduce the risk of fire by creating a cleared area that acts as a fire break.

d) Any relevant planning and statutory controls must be adhered to when considering development or works adjacent to a bridge.

[30] NSW Heritage Office, Heritage Information Series, *Interpreting Heritage Places and Items Guidelines*, 2005; NSW Roads and Maritime, Heritage Interpretation Guideline, Draft February 2016.

6.5 Documentation and approvals

Well managed records are important as they enhance the understanding of the heritage item, its significance and the impact of change as part of the conservation and management process.

Policy 11: Archival recording

a) The records created by Roads and Maritime relating to the timber truss bridges are recognised as an integral part of the heritage portfolio. They will be managed to ensure permanent retention as State records, but must also be made available so that they can be readily accessed by bridge managers, engineers and heritage practitioners where required.

b) Immediately before, during and after any works being undertaken, an inspection will be completed, detailing and photographing the condition and defects of all elements.

c) A complete archival recording will be undertaken of all extant timber truss bridges maintained by Roads and Maritime including 3D mapping (laser scanning) of the bridges.

d) All methods and materials used during any work done to any timber truss bridge (whether it is to be retained or demolished) will be fully documented with written information and appropriate photographs. Records, reports and photographs of any work carried out on the bridge will be placed in a permanent archive to enable retrieval of information afterwards.

e) A representative sample of original fabric assessed to be of heritage significance (such as cast iron shoes), but to be removed from the timber truss bridges will be suitably archived and recorded on the Roads and Maritime Section 170 Heritage and Conservation Register.

f) Information recorded will be used to promote and enhance interpretation both of individual bridges and of the timber truss bridge population in general to the communities of NSW.

Policy 12: Sustainability

a) In accordance with the Strategy, Roads and Maritime will implement the following sustainability policies in relation to the timber truss bridges:

    a. Implement the *Recycling of used bridge timbers policy* for all bridges to be removed.

    b. Implement the *Timber Procurement Strategy* to ensure adequate timber supply.

    c. Implement a skills development program to ensure the skills required for timber bridge conservation and maintenance are retained within Roads and Maritime.

Policy 13: Archaeology

a) Roads and Maritime will consult with relevant Aboriginal stakeholders about any proposed project or works that may impact on areas of Aboriginal archaeological potential or cultural significance. Wherever harm to Aboriginal relics is considered likely in the course of works, an AHIP shall be obtained, in accordance with Section 90(1) of the NPW Act 1974.

b) Any subsurface disturbance of land that may have archaeological potential will be carried out in accordance with the Roads and Maritime Services Cultural Heritage Guidelines and the archaeological provisions of the *Heritage Act 1977*. A Due Diligence Assessment will be provided for any works which disturb the land outside of an AHIP area (including, cutting, filling, ground penetration, stockpiles, mounds, etc). The Assessment shall be in accordance with the NSW Office of Environment & Heritage's Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010).

c) The Roads and Maritime Services *Unexpected Heritage Items - Heritage Procedure 02, November 2015*, must be followed to manage the discovery of all unexpected heritage items (both Aboriginal and non-Aboriginal) that are discovered during Roads and Maritime activities.

Policy 14: Reporting to the NSW Heritage Council

a) In accordance with the Strategy, Roads and Maritime will report to the NSW Heritage Council every two years on the following issues with the identified information:

   a. Management of the timber truss bridge portfolio:
      - work activities planned in the coming five years for all timber truss bridges.
      - work activities undertaken in the past two years for all timber truss bridges.

   b. Implementation of the bridge replacement program:
      - bridges identified for replacement.
      - funding for replacement sought.
      - funding for replacement allocated.

   c. Implementation of the moveable span bridge operability heritage assessment: [31]
      - identification of bridges requiring works.
      - progress of works to make movement mechanism operable.

   d. Status of the heritage interpretation strategy:
      - Progress on production of a comprehensive timber truss bridge book.
      - Progress on production of other supporting interpretative material.

   e. Installation of on-site interpretation:
      - Interpretation installations undertaken in the past two years.
      - Information about locations and maintenance plan.
      - Copy of interpretation material as applicable.

   f. Status of the sustainable conservation actions:
      - Timber recycling policy (bridges dismantled in previous 2 years where policy applies / issues affecting recyclable recovery).
      - Timber procurement strategy (stockpile quantities of timber held by Roads and Maritime quantities added / quantities used).
      - Training / skills development program (reporting on which courses have been held in previous two year period and number of attendees).

[31] As an outcome of the Strategy, Roads and Maritime commissioned a Moveable Span Bridge Study, which was completed in March 2015 by GHD in conjunction with the Environment Branch of Roads and Maritime.

7 Implementation of CMP

The conservation policies in Section 6 provide for the ongoing care and management of the population of NSW timber truss road bridges, so as to ensure the conservation of their cultural heritage values. Effective policy implementation requires a range of actions to be completed in a timely manner. In this final section of the CMP, critical actions are identified and scheduled.

Year	Action by Roads and Maritime	Priority
Year 1	Submit this overarching CMP to OEH for endorsement.	High
	Formally adopt this CMP and integrate with all other documentation, planning and management processes relating to timber truss bridges.	High
	Train relevant Roads and Maritime stakeholders in the use of this CMP.	Medium
	Review the list of bridges to be retained in consultation with OEH, Engineers Australia, National Trust, and other relevant stakeholders.	Very High
	Prepare an Incident Response Plan for each bridge to be retained.	Medium
	Continue to prepare bridge specific CMPs for timber truss bridges to be retained, submit to OEH for endorsement and train staff in use of CMP.	High
	Continue to actively conserve timber truss bridges to be retained by appropriate maintenance, repair and management.	Medium
	Continue to engage with communities to ensure timber truss bridges to be retained are managed in such a way that meets community needs.	High
	Where modifications are required to bridges in order to meet community needs, follow process set out in flowchart provided in Figure 6.3.	High
	Provide Vic Roads and Heritage Victoria with a copy of the endorsed CMP for their information	Medium
Years 2-4	Nominate bridges to be retained to OEH for inclusion on the SHR.	Medium
	Continue to prepare bridge specific CMPs for timber truss bridges to be retained, submit to OEH for endorsement and train staff in use of CMP.	High
	Continue to actively conserve timber truss bridges to be retained by appropriate maintenance, repair and management.	Medium
	Continue to engage with communities to ensure timber truss bridges to be retained are managed in such a way that meets community needs.	High
	Where modifications are required to bridges in order to meet community needs, follow process set out in flowchart provided in Figure 6.3.	High
Year 5	Continue to prepare bridge specific CMPs for timber truss bridges to be retained, submit to OEH for endorsement and train staff in use of CMP.	High
	Continue to actively conserve timber truss bridges to be retained by appropriate maintenance, repair and management.	Medium
	Continue to engage with communities to ensure timber truss bridges to be retained are managed in such a way that meets community needs.	High
	Where modifications are required to bridges in order to meet community needs, follow process set out in flowchart provided in Figure 6.3.	High
	Review this CMP.	Medium

8 Abbreviations and Terminology

Term / Acronym	Description
Abutment	The support for the far end of each outer span
BIS	Roads and Maritime's Bridge Information System
Burra Charter	*The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance,* 2013
Chord	The horizontal members of a truss, either the lower, the bottom chord, or the upper, the top chord
CMP	Conservation Management Plan
Compression	Pushing force, opposite to tension
DMR	NSW Department of Main Roads (now Roads and Maritime)
Heritage Act	*Heritage Act 1977* (NSW)
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the *Environmental Planning and Assessment Act 1979* (NSW)
MRB	Main Roads Board (now Roads and Maritime)
NAASRA	National Association of Australian State Road Authorities
OEH	Heritage Division of the Office of Environment and Heritage
Pier	The vertical support for the adjacent ends of two spans
Pile	Vertical member driven deep into the ground to form part of a pier
PWD	Department of Public Works (now Roads and Maritime)
Roads and Maritime	NSW Roads and Maritime Services
RTA	NSW Roads and Traffic Authority (now Roads and Maritime)
S170 Register	Roads and Maritime Section 170 Heritage and Conservation Register
SHR	State Heritage Register
SOHI	Statement of heritage impacts
Strategy	*Timber Truss Road Bridges – A Strategic Approach to Conservation*, as prepared by Roads and Maritime and endorsed by Heritage Council in 2012
Tension	Pulling force, opposite to compression
Truss	A structure made of triangles with members connected at joints to permit rotation, so each member carries either tension or compression only
WHS	Work Health and Safety

Appendix A

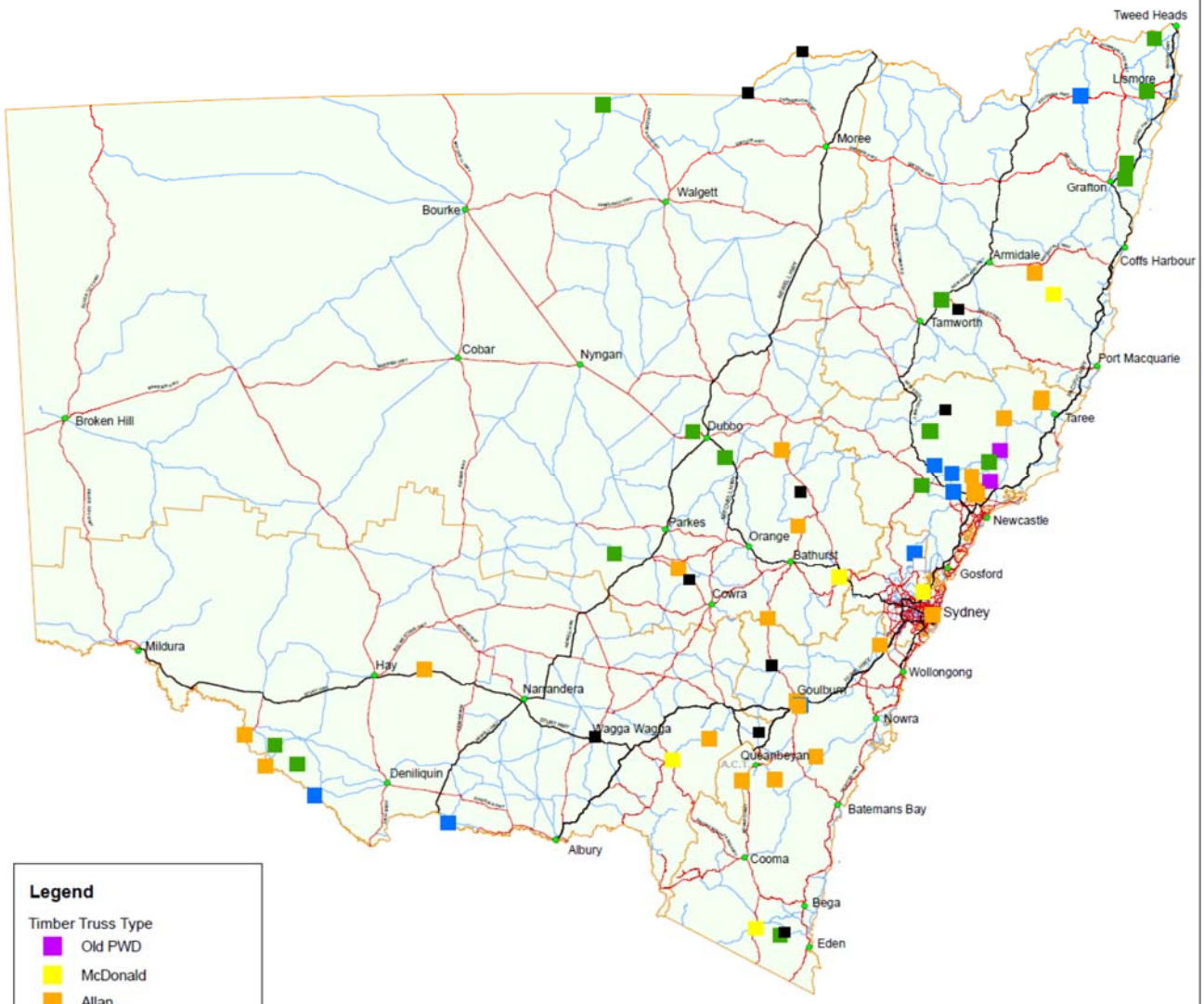
List of timber truss road bridges extant in 2012

Name and location of bridge	Extant	SHR	Managed	Strategy	Truss Type
Monkerai Bridge, Karuah River	Yes	Yes	RMS	Keep	Old PWD 70’
Clarence Town Bridge, Williams River	Yes	Yes	RMS	Keep	Old PWD 100’
Tunks Creek, Galston Gorge	Yes	Yes	RMS	Keep	McDonald 65’
Junction Bridge, Tumut River	Yes	Yes	RMS	Keep	McDonald 75’
Crankies Plains, Coolumbooka River	Yes	Yes	RMS	Demolish	McDonald 75’
Five Day Creek, Kempsey	No	No	RMS	Demolish	McDonald 75’
McKanes Bridge, Cox’s River	Yes	Yes	RMS	Keep	McDonald 90’
Beryl Bridge, Wyaldra Creek	Yes	No	RMS	Keep	Allan 70’
Boonangar Bridge, Barwon River	No	No	RMS	Demolish	Allan 70’
Tooleybuc Bridge, Murray River	Yes	Yes	RMS	Demolish	Allan 70’
Carrathool Bridge, Murrumbidgee River	Yes	Yes	RMS	Keep	Allan 70’
Abercrombie River, Tuena	Yes	No	RMS	Demolish	Allan 70’ & 90’
Victoria Bridge, Stonequarry Creek	Yes	Yes	RMS	Keep	Allan 90’
Wallaby Rocks, Turon River	Yes	Yes	RMS	Keep	Allan 90’
Hinton Bridge, Paterson River	Yes	Yes	RMS	Keep	Allan 90’
Vacy Bridge, Paterson River	Yes	Yes	RMS	Demolish	Allan 90’
Barrington Bridge, Barrington River	Yes	No	RMS	Demolish	Allan 90’
Swan Hill Bridge, Murray River	Yes	Yes	RMS	Keep	Allan 90’
Payten’s Bridge, Lachlan River	Yes	No	RMS	Keep	Allan 90’
Yass River, Gundaroo	No	No	RMS	Demolish	Allan 90’
Thornes Bridge, Mulwaree Ponds	No	No	RMS	Demolish	skew Allan 90’
Charleyong Bridge, Mongarlowe River	Yes	No	RMS	Demolish	Allan 90’
Goodradigbee River, Wee Jasper	Yes	Yes	RMS	Keep	Allan 90’
Rossi Bridge, Wollondilly River	Yes	Yes	RMS	Keep	Allan 90’
Morpeth Bridge, Hunter River	Yes	Yes	RMS	Keep	Allan 110’
Dunmore Bridge, Paterson River	Yes	Yes	RMS	Keep	Allan 110’
Green Gully, Queens Pinch	No	No	Council	N/A	Allan 70’
Pyrmont Bridge, Darling Harbour	Yes	Yes	SHFA	N/A	Allan 82’
Duffs Bridge, Dingo Creek	No	No	Council	N/A	Allan 90’
Marlee Bridge, Dingo Creek	No	No	Council	N/A	Allan 90’
Styx River, Jeogla	Yes	No	Council	N/A	Allan 90’
Molonglo River, Foxlow	Yes	No	Council	N/A	Allan 90’
Pretty Point Bridge, Mataganah Creek	No	No	Council	N/A	Allan 90’
Tharwa Bridge, Murrumbidgee River, ACT	Yes	Yes	ACT	N/A	Allan 90’
Hampden Bridge, Murrumbidgee River	No	No	Council	N/A	Allan 110’
Beckers Bridge, Webbers Creek	Yes	Yes	RMS	Demolish	De burgh 91’
Crookwell River, James Park	No	No	RMS	Demolish	De burgh 91’
Lansdowne Bridge, Mulwaree Ponds	Yes	No	RMS	Demolish	De burgh 91’
Glennies Creek, Middle Falbrook	Yes	Yes	RMS	Keep	De burgh 91’
Tabulam Bridge, Clarence River	Yes	No	RMS	Demolish	De burgh 104’
Barham Bridge, Murray River	Yes	Yes	RMS	Keep	De burgh 104’
Cobram Bridge, Murray River	Yes	Yes	RMS	Keep	De burgh 104’
Holman Bridge, Lachlan River	No	No	RMS	Demolish	De burgh 104’
St Albans Bridge, Macdonald River	Yes	Yes	RMS	Keep	De burgh 117’
Gillies Bridge, Black Creek	Yes	No	Council	N/A	De burgh 70’
Warroo Bridge, Lachlan River	Yes	No	RMS	Keep	Dare 70’
Cooreei Bridge, Williams River	Yes	Yes	RMS	Demolish	Dare 91’
Korns Crossing, Rous River	Yes	No	RMS	Demolish	Dare 91’
Briner Bridge, Upper Coldstream River	Yes	No	RMS	Keep	Dare 91’
Border Bridge, Barwon River	No	No	RMS	Demolish	Dare 91’
Coonamit Bridge, Wakool River	Yes	Yes	RMS	Demolish	Dare 91’
Rawsonville Bridge, Macquarie River	Yes	No	RMS	Keep	Dare 91’
Gee Gee Bridge, Wakool River	Yes	Yes	RMS	Demolish	Dare 91’
Scabbing Flat Bridge, Macquarie River	Yes	No	RMS	Keep	Dare 91’
New Buildings Bridge, Towamba River	Yes	Yes	RMS	Keep	Dare 91’
Bulga Bridge, Wollombi Brook	Yes	Yes	RMS	Demolish	Dare 104’
Colemans Bridge, Leycester Creek	Yes	Yes	RMS	Keep	Dare 104’
Sportsmans Creek, Lawrence	Yes	No	RMS	Demolish	Dare 104’
Junction Bridge, Rouchel Brook	Yes	No	Council	N/A	Dare 70’
Birrie River Bridge, Goodooga	Yes	No	Council	N/A	Dare 70’
Bells Bridge, Hunter River	Ruin	No	Council	N/A	Dare 84’
Woolbrook Bridge, Macdonald River	No	No	Council	N/A	Dare 91’
Cameron Bridge, Rouchel Brook	Yes	No	Council	N/A	Dare 100’
Bendemeer Bridge, Macdonald River	Yes	No	Council	N/A	Dare 104’
Mill Creek Bridge, Wiseman’s Ferry	Yes	No	Council	N/A	Unique

Appendix B

Map of timber truss road bridges extant in 2012

Timber truss road bridges since 2012



Legend

Timber Truss Type
- Old PWD
- McDonald
- Allan
- De Burgh
- Dare
- Miscellaneous
- Demolished

Classified Roads
- AusLink
- State
- Regional
- RMS Region Boundary

0 50 100 150 200 Kilometres

Created 11 January 2018

Appendix B

Appendix C

Summary of possible bridge modifications identified in the Timber Truss Bridge Strategy

Component	Risks / Issues	Modification
Railing	Injury / fatality	Replace timber rails with visually recessive and heritage sympathetic steel traffic barrier (highlighted in the Strategy)
Decking	WHS to keep tight / maintain	Replace existing decking (which is very different from original decking) with stress laminated timber deck and spray seal (highlighted in Strategy for most bridges, required on all)
Approach span	Cannot take traffic barrier	Replace approach spans with new visually recessive approach spans which can accommodate traffic barrier (highlighted in the Strategy for most bridges)
Typical Timber piers (significant timber piers to be conserved)	Like for like not possible, flood	Replace typical timber piers with new visually recessive steel piers which reflect the form and function of the original piers (Strategy highlights need for replacement of piers with "modern heritage-sympathetic design and materials")
Iron piers	Graphitisation, scour, flood	Cast iron piers contain original fabric, but tend to suffer graphitisation and will require strengthening and protection
Timber abutments	Like for like not possible, flood	Replace timber abutments with new visually recessive concrete abutments designed to block termites from trusses (Strategy highlights need for replacement of abutments with "modern heritage-sympathetic design and materials")
Truss span cross girders	Cannot take traffic barrier	Replace with steel cross girders which reflect the form and function of the original cross girders as much as possible (highlighted in Strategy for most bridges, required on all)
Timber bottom chords of truss	Subject to sudden failure	Laminated timber bottom chords (old PWD and McDonald trusses) can be strengthened with external steel plates to ensure no sudden failure but Allan truss bottom chords cannot be strengthened and should be replaced with new steel bottom chords detailed to accurately reflect the original form and function including all connection details as possible (the Strategy highlights the need for steel in bottom chords)
Sway braces	Top chord buckling	Top chords of trusses generally require strengthening and the least intrusive way is to replace sway braces with new sway braces detailed to provide lateral restraint to top chords (the Strategy highlighted the need for some form of sway brace modifications on many bridges, required on most bridges)
Cast iron shoes	Sudden brittle fracture	Replace with new ductile cast iron shoes cast to match the originals and retain a representative sample of original cast iron shoes in a moveable collection (preserving originals in a moveable collection is an important heritage mitigation)
Tension rods	Overloaded	Often not original fabric, subject to damage during maintenance or from errant vehicles or from overloading – replace with new steel tension rods of diameter appropriate to loading required, but in keeping with original design intent
Truss diagonals	Overloaded	In some truss types (especially Allan and Dare) the first diagonal in from the principal is generally insufficiently strong for modern vehicles and requires replacement with slightly larger timbers detailed to minimise any cumulative impacts (eg. no change to cast iron shoe) (highlighted in the Strategy)

Monorails (not original components)	Access	Most timber truss bridges have steel beams (monorails) installed near bottom chords to allow safe inspection and maintenance access. These are required, but consideration should be given to minimising visual intrusiveness.

Appendix D

Burra Charter definitions

Place *means a geographically defined area. It may include elements, objects, spaces and views. Place may have tangible and intangible dimensions.*

Cultural significance *means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups.*

Fabric *means all the physical material of the place including elements, fixtures, contents and objects.*

Conservation *means all the processes of looking after a place so as to retain its cultural significance.*

Maintenance *means the continuous protective care of a place, and its setting. Maintenance is to be distinguished from repair which involves restoration or reconstruction.*

Preservation *means maintaining a place in its existing state and retarding deterioration.*

Restoration *means returning a place to a known earlier state by removing accretions or by reassembling existing elements without the introduction of new material.*

Reconstruction *means returning a place to a known earlier state and is distinguished from restoration by the introduction of new material.*

Adaptation *means changing a place to suit the existing use or a proposed use.*

Use *means the functions of a place, including the activities and traditional and customary practices that may occur at the place or are dependent on the place.*

Compatible use *means a use which respects the cultural significance of a place. Such a use involves no, or minimal, impact on cultural significance.*

Setting *means the immediate and extended environment of a place that is part of or contributes to its cultural significance and distinctive character.*

Related place *means a place that contributes to the cultural significance of another place.*

Related object *means an object that contributes to the cultural significance of a place but is not at the place.*

Associations *mean the connections that exist between people and a place.*

Meanings *denote what a place signifies, indicates, evokes or expresses to people.*

Interpretation *means all the ways of presenting the cultural significance of a place.*

Appendix E

Heritage assessment criteria

Criterion A – Historical

An item is important in the course, or pattern, of NSW's cultural or natural history.

Guidelines for INCLUSION
• shows evidence of a significant human activity
• is associated with a significant activity or historical phase
• maintains or shows the continuity of a historical process or activity

Guidelines for EXCLUSION
• has incidental or unsubstantiated connections with historically important activities or processes
• provides evidence of activities or processes that are of dubious historical importance
• has been so altered that it can no longer provide evidence of a particular association

Criterion B – Associative

An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history.

Guidelines for INCLUSION
• shows evidence of a significant human occupation
• is associated with a significant event, person, or group of persons

Guidelines for EXCLUSION
• has incidental or unsubstantiated connections with historically important people or events
• provides evidence of people or events that are of dubious historical importance
• has been so altered that it can no longer provide evidence of a particular association

Criterion C – Aesthetic / Technical

An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW.

Guidelines for INCLUSION
• shows or is associated with, creative or technical innovation or achievement
• is the inspiration for a creative or technical innovation or achievement
• is aesthetically distinctive
• has landmark qualities
• exemplifies a particular taste, style or technology

Guidelines for EXCLUSION
• is not a major work by an important designer or artist
• has lost its design or technical integrity
• its positive visual or sensory appeal or landmark and scenic qualities have been more than temporarily degraded
• has only a loose association with a creative or technical achievement

Criterion D – Social

An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons.

Guidelines for INCLUSION
• is important for its associations with an identifiable group
• is important to a community's sense of place

Guidelines for EXCLUSION
• is only important to the community for amenity reasons
• is retained only in preference to a proposed alternative

Criterion E – Scientific / Archaeological

An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history.

Guidelines for INCLUSION
• has the potential to yield new or further substantial scientific and/or archaeological information
• is an important benchmark or reference site or type
• provides evidence of past human cultures that is unavailable elsewhere

Guidelines for EXCLUSION
• the knowledge gained would be irrelevant to research on science, human history or culture
• has little archaeological or research potential
• only contains information that is readily available from other resources or archaeological sites

Criterion F – Rarity

An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history.

Guidelines for INCLUSION
• provides evidence of a defunct custom, way of life or process
• demonstrates a process, custom or other human activity that is in danger of being lost
• shows unusually accurate evidence of a significant human activity
• is the only example of its type
• demonstrates designs or techniques of exceptional interest
• shows rare evidence of a significant human activity important to a community

Guidelines for EXCLUSION
• is not rare
• is numerous but under threat

Criterion G – Representativeness

An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments.

Guidelines for INCLUSION
• is a fine example of its type
• has the principal characteristics of an important class or group of items
• has attributes typical of a particular way of life, philosophy, custom, significant process, design, technique or activity
• is a significant variation to a class of items
• is part of a group which collectively illustrates a representative type
• is outstanding because of its setting, condition or size
• is outstanding because of its integrity or the esteem in which it is held

Guidelines for EXCLUSION
• is a poor example of its type
• does not include or has lost the range of characteristics of a type
• does not represent well the characteristics that make up a significant variation of a type.

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