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Cosmos Archaeology Pty Ltd

Gee Gee Bridge over the Wakool River Cunninyeuk

ARCHIVAL PHOTOGRAPHIC RECORDING

Noorong Road,
Cunninyeuk, NSW 2622

June 2019

Sydney 46 Gale Road
Maroubra, NSW, 2035

Northern NSW 2 Queen St
Murwillumbah, NSW
P.O. Box 42 Condong, 2484

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Cosmos Archaeology Pty Ltd

Sam Millie – Level 2

Roads and Maritime Services

PO Box 484,

Wagga Wagga NSW 2650

30th October 2019

Dear Sam,

Re: Gee Gee Bridge over the Wakool River, Archival Photographic Recording:

Enclosed are three copies of the commissioned archival photographic record of the Gee Gee Bridge over the Wakool River, New South Wales. Digital photography for this record was conducted on 12th November, 2018, by Jane Mitchell in accordance with the NSW Heritage Office guidelines on the *Photographic Recording of Heritage Items Using Film Or Digital Capture* (2006).

Three copies of the reports have been produced, as per the archival recording brief.

All copies have:

- A statement of heritage significance for the Gee Gee Bridge;
- Still photographic recording of the Gee Gee Bridge;
- Annotated plans showing where the photographs were taken from;
- Proof sheets of selected digital images (thumbnails) and associated catalogue sheets;
- Thirty-six (36) labelled prints of selected digital images;
- A USB thumb drive of the selected digital images and associated catalogue sheets, as well as digital copies of the archival report as both PDF and Word formats. The digital copies have been configured to meet Web Content Accessibility Guidelines (WCAG) 2.0, Level AA.

Gee Gee Bridge, Cunninyeuk
Archival Photographic Recording
FINAL

Prepared for:

Transport for NSW

By:

Jane Mitchell

Milly Bendell

Gina Scheer

December 2018

Updated June 2019 and

submitted in October 2019

Cosmos Archaeology Job Number J18/16

Cover Image: Facing north-west, showing the Dare truss supports of Gee Gee bridge and abutments, spanning the Wakool River. Photographer: Jane Mitchell, 12 November 2018.

20.107
ISBN: 978-1-922338-46-4

Contents

EXECUTIVE SUMMARY

This report is the Archival Photographic Recording for the old Gee Gee Bridge over the Wakool River prepared in June 2019 by Cosmos Archaelology for Transport for NSW in accordance with NSW Heritage guidelines to meet the conditions of approval for the delisting of this bridge from the State Heritage Register. The photographic recording also includes the old floodplain approach bridge which was not listed on the State Heritage Register, but is included for context and reference.

The old Gee Gee Bridge is a Dare type timber truss built in 1929. There were five main styles of timber truss bridges throughout NSW that were used in successive order, including: Old Public Works Department trusses designed by William Christopher Bennett, used from 1824 to 1889; McDonald trusses designed by John Alexander McDonald, used from 1856 to 1930; Allan trusses designed by Percy Allan, used from 1861 to 1930; de Burgh trusses designed by Ernest Macartney de Burgh, used from 1863 to 1929; and Dare trusses designed by Henry Harvey Dare, used from 1867 to 1949.

The photos were taken in October 2018 prior to the bridge's planned demolition in 2020 and show all aspects of the old Gee Gee Bridge including various significant heritage features such as the steel bottom chord, tension rods, cast iron shoes, timber truss elements and rocker bearings.

Hard copies of this completed Heritage Archival Photographic Recording are intended to last for 100 years and have been issued to the Murray River Council Library in Barham, the NSW Heritage Library in Parramatta via their head office in Goulburn Street Sydney, and the Transport for NSW Library in St Hilliers Road Auburn.

All copies of the report include: a brief report addressing the history and significance of the bridge including a historical summary relevant to the bridge and the statement of heritage significance; the original construction specifications for Gee Gee Bridge; still photographic recording of the Gee Gee Bridge; annotated plans showing the location and direction of each photograph; proof sheets of selected digital images (thumbnails) and associated catalogue sheets cross referenced to the relevant plans and photographs; labelled prints of selected digital images; a USB thumb drive of the selected digital images and associated catalogue sheets, as well as digital copies of the archival report as both PDF and Word formats.

Figure 1: The Gee Gee Bridge over the Wakool River, on Noorong Road, Cunninyeuk. *(Base image: Google Earth).*

[1] **Roads and Maritime, 2012**, *Timber Truss Bridge Conservation Strategy*: Submissions Report and Revised Conservation Strategy.

Figure 2: Location of the Gee Gee bridge over the Wakool River, on Noorong Road, Cunninyeuk. *(Base image: Google Earth).*

The following abbreviations are used throughout this report:

LEP	Local Environment Plan
NSW	New South Wales
OEH	Office of Environment and Heritage (NSW)
Roads and Maritime	Roads and Maritime Services (NSW)
RTA	Roads and Traffic Authority (NSW)

1.0 PROJECT DESCRIPTION

In 2012, Transport for NSW committed to the Heritage Timber Truss Bridge program which was established to improve transport needs and also provide heritage conservation for heritage listed timber truss bridges. The Strategy identified 48 timber truss bridges which were managed by Transport for NSW. Of these 48, 26 would be retained and 22 would be progressively replaced over the next 15 years, including the Gee Gee Bridge. In order to reduce the loss of significance regarding demolition of the existing bridge, this archival recording is required for the Gee Gee Bridge prior to its removal.

The Gee Gee Bridge was a State listed heritage item on the State Heritage Register (Listing No 01469). Note that the northern flood relief bridge and a connecting earth mound, built in c.1930s, was not included in the curtilage of the State heritage item. In March 2018 the OEH notified Transport for NSW that the bridge had been removed from the State Heritage Register. Reasons included the following:

- The bridge's identification as part of Transport for NSW's *Timber Truss Bridge Conservation Strategy (2012)* for replacement and removal,
- The poor condition of the bridge,
- Limited prospects for conservation and associated economic costs.

A gazette notice was subsequently published on 23 March 2018 in the NSW Government Gazette No. 33.

The bridge is also an item of local heritage significance, listed in Schedule 5 of the Wakool Shire Council LEP 2013 (item no. 4300138). The bridge was also listed in the Roads and Maritime Heritage and Conservation Register (item no. 13). The curtilage of the Gee Gee Bridge was restricted to the bridge itself and the land immediately surrounding its abutments.

This archival recording has been prepared in line with the guidelines as set out in the *Photographic Recording of Heritage Items Using Film or Digital Capture* (revised 2006) and *How to prepare archival records of heritage items* (1998), prepared by the NSW Heritage Division, OEH.

This archival recording consists of the following elements:

- A brief report addressing the history and significance of the bridge; including a historical summary relevant to the bridge and the statement of heritage significance;
- The original construction specifications for Gee Gee Bridge;
- Relevant plans showing the location and direction of each photograph, in this location aerial photographs have been used;
- Photographic catalogue sheets cross referenced to the relevant plans and to the photographs;
- Three proof sheets showing all photographs taken (approximately up to 16 photographs per sheet);
- Additional photographic catalogue sheet and proof sheet showing the 22 detailed photographs provided separately in 2019 by Transport for NSW staff
- An estimated 14 selected prints from the colour digital photographs; and

- A DVD containing the report, plans and all digital photographs taken in both RAW and TIFF format. This is lodged in the plastic sleeve inside each folder provided.

Five sets of the final archival recording have been provided; this includes three bound hard copies and two unbound hard copies. Their distribution is to be undertaken by Transport for NSW and must include a folder provided to Wakool Shire Council.

1.1 Authorship

Jane Mitchell, Archaeologist at Cosmos Archaeology, undertook the archival photography for this recording in 2018.

Subsequent photographs of details were provided in 2019 by Transport for NSW staff members Sam Millie and Dave Stratton.

Milly Bendell, Archaeologist at Cosmos Archaeology prepared the draft report.

Amy Evans and Amie Nicholl, Transport for NSW staff members provide additional specific historical information from a draft Conservation Management Plan for new bridges.

Gina Scheer completed the report and managed the project.

2.0 HISTORY AND SIGNIFICANCE

2.1 History of the Gee Gee Bridge

The historic outline presented in this section is based on information from a number of sources, including the Statement of Heritage Impact report prepared in 2015 in relation to the demolition and replacement of the Gee Gee Bridge. [2] Information and details has also been obtained from the State Heritage Register, Roads and Maritime Section 170 Heritage and Conservation Register listings for the Gee Gee Bridge; and in 2019 further information was provided by Transport for NSW from an in-house draft Conservation Management Plan (2019) addressing new buildings and bridges.

The construction of Gee Gee Bridge over Wakool River began in 1928 and it is a single Dare type timber truss road bridge. Timber truss road bridges have played a significant role in the expansion and improvement of the NSW road network. Timber truss bridges were preferred by the Public Works Department from the mid-19th to the early 20th century because they were relatively cheap to construct and used mostly local materials. There were five main styles of timber truss bridges throughout the state that were used in successive order, including:

- Old PWD (Old Public Works Department) trusses designed by William Christopher Bennett, also called the Bennett Truss, used from 1824 to 1889;
- McDonald trusses designed by John Alexander McDonald, used from 1856 to 1930;
- Allan trusses designed by Percy Allan, used from 1861 to 1930
- DeBurgh trusses designed by Ernest Macartney de Burgh, used from 1863 to 1929; and,
- Dare trusses designed by Henry Harvey Dare, used from 1867 to 1949.

Prior to bridges being built, river crossings were often dangerous in times of rain, which caused bulk freight movement to be prohibitively expensive for most agricultural and mining produce. Only the high-priced wool clip of the time was able to carry the costs and inconvenience imposed by the generally inadequate river crossings that often existed prior to the timber truss bridge construction. The financially troubled governments of the day applied pressure to the Public Works Department to produce as much road and bridge work for as little cost as possible, using local materials. This condition effectively prohibited the use of iron and steel, as these, prior to the construction of the steel works at Newcastle in the early 20th century, had to be imported from England.

In 1903 engineer Harvey Dare was in charge of highway bridge design. Dare worked on a number of De Burgh Truss bridges around 1900 but in 1903 he returned to the Howe-type truss as used by Allan. He substituted a pair of steel members for the timber lower chord and redesigned the lower chord joints to eliminate the pins of the De Burgh truss. Dare's simplified, composite variant of the Allan truss proved the most cost-effective timber truss yet seen in NSW.

The historical context which drove the design of the Dare truss was a desire to combine the best aspects from the de Burgh and Allan trusses designs, while avoiding the primary problems with each. The primary problem with the Allan truss was the

[2] **The Heritage Group, NSW Government Architects Office, August 2015**, *Statement of Heritage Impact – Gee Gee Timber Truss bridge Cunninyeuk,* prepared for Transport for NSW; **NSW Environment and Heritage**, 'Gee Gee Bridge' listing on the State Heritage Inventory, de-listed March 2018.

tendency for the timber bottom chords to fail. The primary problem with the de Burgh truss was the expensive metal fabrication that was involved, due to the Pratt truss configuration and pinned connections. The Dare truss has the simplest geometry overall and in its members, and it also allows the easiest replacement of timbers.

Dare had his own unique and very simple geometry of square panels and forty-five degree angles. Allan's bowed top chord design did not perform the structural intention Allan had hoped for, so Dare did away with the bow, simplifying not only the timber fabrication, but also fabrication of the cast iron shoes. Even though the Dare truss has a slightly longer span than the nearest equivalent Allan truss, the top chord timbers are shorter in the Dare truss, and therefore easier to obtain.

The Dare truss uses less timber than the Allan truss (no timber in bottom chord, less timber in top chord and less number of timber diagonals). This does put additional stress on the connections between the top chords and the principals and diagonals.

The Dare truss bridges have the highest survival rate of timber truss bridges in NSW. Significant features of a Dare truss bridge like that of the Gee Gee Bridge include the following:

- **Steel bottom chord** - Consisting of two parallel steel channels sections with riveted splice connections, the bottom chords at Gee Gee are typical of the Dare truss design. Dare's metal bottom chord differed from de Burgh's as de Burgh used flat plates rather than channels.
- **Tension Rods** - The metal tension rods are typical of all five truss types, consisting of round metal bars with upset threaded ends. The tension rods are provided in matching pairs at each panel point, and placed either side of the cross girders. There are three sizes (2", 1¾" and 1½"). Tapered washer plates are provided at the top and bottom of each tension rod to distribute the load to the top and bottom chords.
- **Cast Iron Shoes** - All five truss types use cast iron shoes, but each truss uses different details. The cast iron shoes at Gee Gee are typical of very late Dare trusses. Detailing of cast iron shoes in Dare trusses changed throughout the construction period of the Dare trusses, with Dare and other designers apparently experimenting with different shapes and connections. They are provided at the top and bottom of all timber diagonals in order to provide a solid connection between the timber diagonals and the timber top chord or metal bottom chord.
- **Rocker Bearings** - The first three types of timber truss bridges did not require bearings because they had timber bottom chords. Most Dare and de Burgh trusses had simple metal bearings consisting of a flat metal bearing plate which sits on a cast metal bed plate, sometimes with a low-friction material included to enable sliding. For only a handful of late Dare trusses, a different bearing system was introduced, and this is the metal rocker bearing which exists at Gee Gee Bridge – it enables thermal movements of the steel bottom chord as well as rotations of the support as heavy vehicles travel across the bridge. It exists only at Gee Gee, Coonamit, and Cameron's Bridge over Rouchel Brook.

2.1.1 Gee Gee Crossing[3]

The earliest crossing at Gee Gee may have been constructed some time during the mid or late 19th century. The crossing would have served Cunninyeuk Station, a large sheep station between the Wakool and Niemur Rivers. When it was put up for sale in 1906, it was listed as a 29,000-acre property in the Moulamein district 'on the Deniliquin-Swan Hill stock route' (Figure 3).[4]

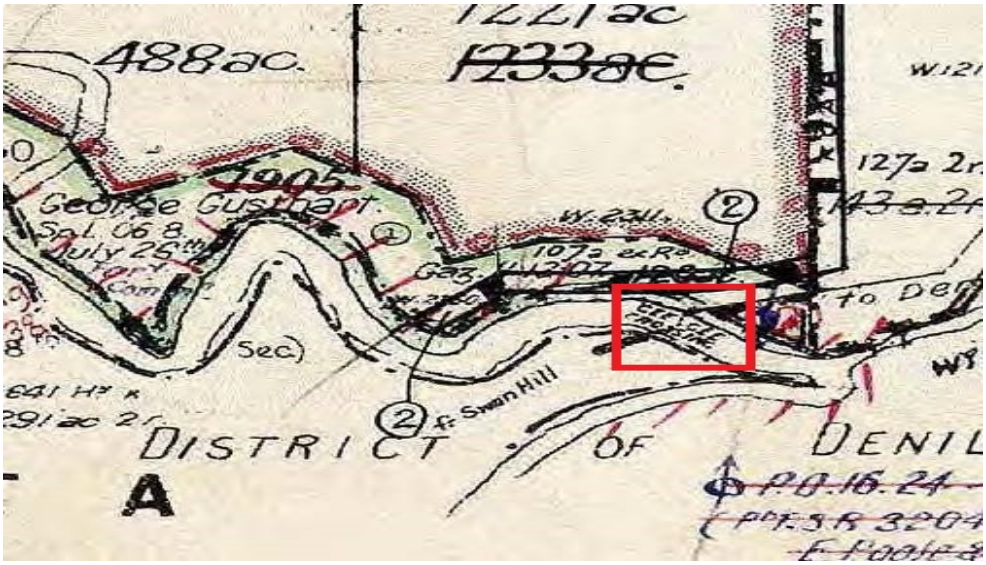

Figure 3: Detail from Map of the Parish of Cunninyeuk, Department of Lands, 1915 showing (in red) the Gee Gee crossing. *(Source: NSW Land & Property Information)*

It is possible the earlier crossing was a natural ford, or at best a 'corduroy' type crossing which involves logs laid over long stringers spanning the creek (a similar one was used at the Coonamit Ferry on the Wakool in the early 20th century).[5] The original Gee Gee crossing appears to have been located a little way downstream of the current bridge.

The Minister for Railways was advised by the supervising surveyor that the 'Gee Gee Crossing' would be a suitable place for a railway bridge over the Wakool as part of the proposed railway from Gonn crossing on the Murray to Balranald. In 1926, Wakool Shire Council deliberated on the Public Works proposal for: *"*National Works – Coonamit lift bridge and Gee Gee Crossing bridge. Two bridges over rivers and creeks to serve Gonn Railway line to Stony Crossing in various places provided the Shire Council of Wakool finds one third of the estimated cost of £10,000*…".*[6]

To which Council objected, minuting, *"*that [the] clerk [should] point out the absurdity of a lift span bridge at Coonamit, that the council are of opinion such a construction would be waste of public money. That our engineer report on the estimated costs, as shown by department's letter*".*[7]

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[3] **The Heritage Group, NSW Government Architects Office, August 2015**, *Statement of Heritage Impact – Gee Gee Timber Truss bridge Cunninyeuk,* prepared for Transport for NSW.

[4] **Australian Town and Country Journal, 19 September 1906** *p.3.*

[5] *Sw***an Hill Guardian, 7 December 1914** *p.2.*

[6] **Riverina Recorder, 8 June 1921.**

[7] **Riverina Recorder, 29 September 1926**, *p.4.*

By 1928, the need for road networks across the district had significantly grown. The road to Swan Hill was becoming a functioning stock route and a tender was received in May 1928 for 'Erection of composite truss bridge' the lowest bid being that of 'A. C. Burdett, £5918'.[8] The Gee Gee Bridge construction began in 1928 (Figure 4).

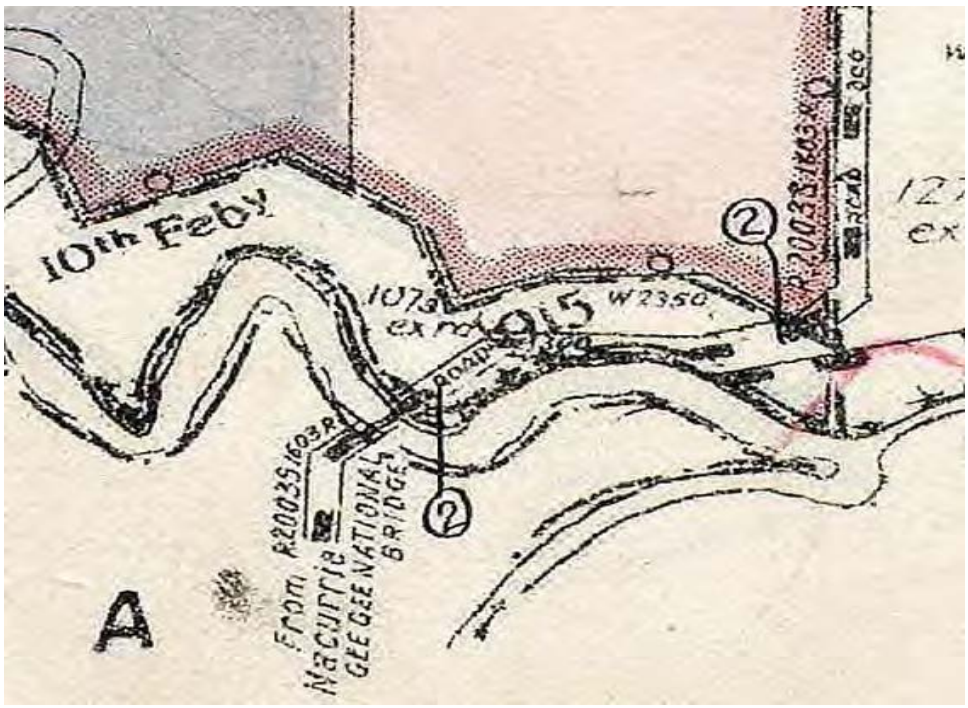


Figure 4: Detail from Map of the Parish of Cunninyeuk, Dept of Lands 1938, showing the 'National Bridge *(Source: NSW Land & Property information)*

The Wakool Shire Council contacted the Department of Public Works shortly after the main bridge was completed, to advise that: 'the (completed) section… would be quite useless when the river is at its normal height owing to the two shallower channels between the completed section and the northern bank of the river'.[9]

This work experienced delays and contractual issues of one kind or another. An additional timber beam flood relief bridge was eventually constructed in 1933 for the sum of £2341.[10] Formations (i.e. northern and southern earthworks) were finished in 1934 or possibly in early 1935.[11]

[8] **SMH, 9 May 1928** *p. 11.*

[9] **RTA File 469.66**, cited in Statement of Heritage Impact for Gee Gee Bridge by Austral GHD, extract provided by Transport for NSW

[10] Ibid.

[11] **Riverina Recorder, 29 September 1934,** *p.4*

Figure 5: Gee Gee bridge, 1940s. (Source: Transport for NSW).

2.2 Bridge Construction Summary

The Gee Gee Bridge was a single Dare timber truss road bridge. It has a single timber truss span of 27.7m (91ft). There are 3 timber approach spans at the north and 2 at the south giving the bridge an overall length of 72.5m (238ft).

The superstructure is supported by timber trestles and provides a dual lane carriageway with a minimum width of 5.5 metres. A timber post and rail guard rail extend the full length of the bridge. There is also a flood relief bridge measuring 113-metres-long and 15 spans located to the north of the main bridge and a 60-metre earth embankment in between this structure and the bridge. The roadway falls approximately one metre in height between the flood relief bridge and the main bridge.

The substructure is currently in fair condition. Almost all of the timber trestles have been either substantially rebuilt, doubled or strengthened with semi-permanent steel or timber props and cross bracing.

The Gee Gee Bridge superstructure (deck and truss) is in good condition, having been replaced in the early 2000s. The truss has been substantially rebuilt with timber principals, top chords and the bracing largely replaced. The steel bottom chord of the truss is original. The steel monorail I-beams located parallel to the steel bottom chords are used as scaffold supports and are only temporary. Metal shoes and hangers and some other fixings and parts of the handrail may be original, but the timber ordinance handrail and posts are in fair condition.

The Roads and Maritime Services S170 heritage and conservation register's recording of the bridge identified the following in relation to condition: 'Original condition assessment: 'Good' (Last updated: 03/08/2005.)'.

2.3 Significance Assessment

The assessment of significance provided in the Statement of Heritage Impact (2015) is reproduced below, unaltered.[12]

Criterion a) *An item is important in the **course or pattern** of NSW's **cultural or natural history** (or the cultural or natural history of the local area);*

The bridge has historical significance through its association with the expansion of the NSW road network, its ability to demonstrate historically important concepts such as the gradual acceptance of American design ideas in NSW, and its association with Harvey Dare.

Criterion b) 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**;

The bridge does not meet this criterion.

Criterion c) *An item is important in demonstrating **aesthetic characteristics** and / or a high degree of **creative or technical achievement** In NSW (or the local area);*

The bridge exhibits the technical excellence of its design, as all of the structural detail is clearly visible. In the context of its landscape it is visually attractive. As such, the bridge has a small amount of aesthetic significance.

Criterion d) *An item has strong or special **associations with a particular community or cultural group** in NSW (or the local area) for **social, cultural or spiritual reasons**;*

Timber truss bridges are prominent to road travellers and NSW has, in the past, been referred to as the "timber truss bridge state". Through this, the complete set of bridges gain some social significance, as they could be said to be held in reasonable esteem by many travellers in NSW.

The Gee Gee Crossing generally has social significance locally for its association with farming, roads and travelling stock reserves in the Wakool Shire district.

Criterion e) *An item has **potential to yield information** that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);*

The bridge has technical significance because it is a Dare truss and is representative of some major technical developments that were made in timber truss design by the Public Works Department.

Criterion f) *An item possesses **uncommon, rare or endangered** aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);*

In 2011 there were 18 surviving Dare trusses in NSW of the 44 built. There are 62 timber truss road bridges surviving from the over 400 built[13].

[12] *Opp Cit*, Statement of Heritage Impact – Gee Gee Timber Truss bridge Cunninywuk.
[13] *Op Cit*

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

Representative of Dare truss bridges.

2.4 Statement of Significance

The assessment of significance on the Roads and Maritime Section 170 Heritage and Conservation Register listing (with 'Date significance updated' noted as 13 September 2005) is reproduced below, unaltered.[14]

> *The Gee Gee bridge is a Dare type timber truss bridge, and was completed in 1929. In 1998 it was in good condition. As a timber truss road bridge, it has many associational links with important historical events, trends, and people, including the expansion of the road network and economic activity throughout NSW, and Harvey Dare, the designer of this type of truss. Dare trusses were fifth in the five stage design evolution of NSW timber truss road bridges. They were similar to Allan trusses, but contain improvements which make them stronger and easier to maintain. This engineering enhancement represents a significant evolution of the design of timber truss bridges, and gives Dare trusses some technical significance. In 1998 there were 27 surviving Dare trusses in NSW of the 40 built, and 82 timber truss road bridges survive from the over 400 built. The Gee Gee bridge is a representative example of Dare timber truss road bridges, and is assessed as being State significant, primarily on the basis of its technical and historical significance.*

[14] **NSW Environment and Heritage**, 'Gee Gee Bridge' listing on the State Heritage Inventory, delisted March 2018.

3.0 ARCHIVAL INVENTORY

3.1 Past Assessments

There are a number of previous assessments that directly address the Gee Gee Bridge. They include, in chronological order, the following reports:

- **NSW Environment and Heritage**, 'Gee Gee' listing on the State Heritage Inventory database, delisted March 2018.
- **NSW Road and Traffic Authority, 2010** *Timber Truss Bridge Strategy,* Appendix C – Allan Truss Bridge Profiles.
- **Futurepast Heritage Consulting Pty Ltd and Transport for NSW, August 2012**, *Timber Truss Bridge Conservation Strategy: Submissions report and revised conservation strategy,* report prepared for Transport for NSW.
- **The Heritage Group, August 2015,** Statement of Heritage Impact – Gee Gee Timber Truss bridge Cunninyeuk, prepared for Transport for NSW.

The remainder of this archival photographic recording encompasses the original construction specifications and the following contents:

- Relevant plans showing the location and direction of each photograph, in this location aerial photographs have been used;
- Photographic catalogue sheets cross referenced to the relevant plans and to the photographs;
- Three proof sheets showing all photographs taken of the Bridge and the approach bridge (approximately up to 16 photographs per sheet);
- Additional photographic catalogue sheet and proof sheet showing the 22 detailed photographs provided separately in 2019 by Transport for NSW staff
- An estimated 14 selected prints from the colour digital photographs; and
- A USB thumb drive containing the report, plans and all digital photographs taken in both RAW and TIFF format. This is lodged in the plastic sleeve inside each folder provided.

ANNEX A – COPY OF ORIGINAL CONSTRUCTION SPECIFICATIONS

No. 21, 1927-28. H. R. & B. A

DEPARTMENT OF PUBLIC WORKS, N.S.W.

HARBOURS, ROADS, AND BRIDGES BRANCH.

CONTRACT FOR CONSTRUCTION

OF A

COMPOSITE TRUSS BRIDGE

OVER

WAKOOL RIVER, AT GEE-GEE CROSSING,

ROAD, SWAN HILL TO DENILIQUIN.

SPECIFICATION.

1. Description of Contract.

THIS Contract is to include the whole of the work required for the manufacture, supply, and delivery of all materials for, and the construction, erection, and final completion of Composite Truss Bridge with Approach Spans and Approaches over Wakool River at Gee-Gee Crossing, as shown on Plans and described in detail in Specification.

2. Tenders.

Tenderers to state the lump sum for which they will be prepared to complete all the works shown on the Plans and described in detail in Specification; and a Schedule of Prices is to be attached to the Tender, by which any material alteration, addition, or deduction ordered by the Engineer, shall be measured and allowed for. Such material alteration, addition, or deduction shall in no way vitiate or set aside the Contract.

All Tenders to be on the printed form supplied; no others will be taken into consideration.

3. Duty.

The payment of duty (if any) on materials required under this Contract must be included by Contractor in his lump sum.

4. Commencing Operations.

Immediately after the execution of the Contract documents, the Contractor is to obtain, and deliver on the site, sufficient materials and plant to ensure the uninterrupted progress and continuance of the works after they have been commenced.

5. Damage by Trees.

All trees on the site likely to do any damage to the bridge or approaches by falling or interfering in any way to be cut down stump high, or root-felled, as directed, and removed from the vicinity of the bridge or approaches.

6. Temporary Office.

The Contractor shall supply a moveable wooden office for the sole use of the officer appointed by the Department to superintend the works. Such office shall not be less than 8 ft. x 6 ft. x 8 ft. high, inside measurement, with boarded floor, moveable window sash, and door with lock; to be ventilated and weatherproof, and furnished with approved drawing table, office stool, and chair.

The Contractor shall have the said office kept clean and in good order.

At the completion of the Contract the temporary office to become the property of the Contractor.

THIS is the Specification marked "A," referred to in annexed Agreement with His Majesty the King, dated the 19th day of July, A.D. 1928.

Witness—

† 50747—B

[illegible signature] A. C. Burdett

[illegible signature]

7. Inspection.

The steel and iron work will be inspected at the Contractor's works during manufacture, but such inspection will not prevent the ultimate rejection of any steel and iron work in which defects or errors may be found previous to the completion of the Contract.

The timber will be inspected at the site of Bridge, or, if submitted for inspection by the Contractor at Sydney, Singleton, Grafton, or intermediate stations on the Northern and North Coast lines, it will be finally inspected by an officer of the Public Works Department at established depots or before placing on trucks; but should the Engineer or his responsible officers find that any portion of such timber has become damaged or rendered unfit for use in transit or through neglect on the part of the Contractor to properly stack and protect it at the site of the works, the pieces found so defective shall be liable to be condemned, and the Contractor shall replace the timber so condemned at his entire cost and expense. It is to be at all times understood that the inspection and passing of the timber at the places abovementioned shall not be taken as relieving the Contractor of his responsibility to deliver same at the site of the works, or as relieving him of any other obligation imposed by the Specification, or by the General Conditions.

It is also to be understood that the final inspection as above will only apply where timber has been submitted for inspection in the finished scantling in which it is to be used in the work. Such inspection will not prevent the rejection at site of work of any timber which, upon cutting or dressing to its finished size, is found to be defective, or which, after seasoning, is found to be under size.

Any timber, therefore, which is not thoroughly seasoned at date of inspection, must be of such dimensions as to allow the finished sizes, shown on Plans or specified, to be placed in the work after it is seasoned and wrought.

The white lead, oil and turpentine used for painting are to be of pure quality, and samples for testing will be taken by the Inspector when the material has been delivered at site of work, and no painting to be undertaken until materials have been approved. Clean containers for samples to be provided by Contractor.

Dampcourse to have a minimum thickness of 0·15 in. and to consist of at least 75 per cent. of bitumen, and to be reinforced by hessian or other similar material not to exceed 12 per cent. of the total weight. Samples for testing will be taken by the Inspector when the material has been delivered at site of works; to be submitted to a bending test round a cylinder 4 in. diameter at a temperature of 65 deg. Fahrenheit, for a period of twenty-four hours and to show no fracture.

All remaining materials will be inspected at site of Bridge, and the Engineer reserves the power of testing and rejecting any of such materials.

8. Design.

The Bridge to consist of one 91 ft. composite truss span and five approach spans, three of 30 ft. and two of 28 ft., measured between centres of piers and abutments. The trusses to stand 21 ft. 6 in. apart, centre to centre; each truss to be 13 ft. 2 in. deep between centres of triangulations and 13 feet deep between centres of chords, and have seven panels of 13 feet each. Planking on truss spans to rest on longitudinal timber-stringers secured to timber cross-girders, pitched as shown. Planking on approach spans to rest on longitudinal girders.

The carriage-way to be 18 feet wide in the clear throughout, between kerb-logs.

The abutments and piers to be of timber.

Refuge to be provided on pier No. 3.

9. Plans.

No. 1.—General elevation and Plans.
No. 2.—Abutments and Piers.
No. 3.—Approach Spans and Fencing.
No. 4.—91 ft. Composite Truss-span.
No. 5.—91 ft. Composite Truss-span details.

The cost of a complete set of Plans, with Specification, will be £1 10s., to be paid to the Accountant, Public Works Department, Sydney.

10. Rolled and Forged Steel, Cast Steel and Cast Iron.

The steel and iron to be of approved quality and the Engineer reserves the power to test and reject from time to time any portion of the steel or ironwork used or proposed to be used in this Contract.

Test pieces from the rolled sections will be selected by the Engineer to be cut lengthwise and crosswise from plates and lengthwise from other sections. Those from wrought or cast material to be of forms and dimensions specified. All specimens required for testing must be supplied by the Contractor free of charge, and the carriage on same to the place where tests are to be made must be paid by Contractor.

After receipt of specimens from Contractor, the cost of making all tests and preparing all specimens for the testing machine will be borne by the Department.

If the materials tested do not fully conform to the standards indicated and show uniformity in results, the plates, bars, and other sections, forgings or castings from which the test pieces have been taken and all material of similar manufacture, shall be rejected.

The steel to be made by the Basic open hearth process, and rolled sections to be of uniform quality, free from cracks, scales, and blisters, laminations and all other defects; and to be of uniform thickness with regular edges and of the dimensions and weights specified. Any variation in sectional area, transverse dimensions, or weight exceeding 2½ per cent. from that specified, to be sufficient cause for rejection. One cubic foot of steel to be taken as equivalent to 490 lb.

Tests.—Tensile and cold or quenched bend tests will be made on specimens of rolled and forged steel as follows :—

For plates.—One each tensile and bend test for each thickness of plates cut both with and across the grain.

For rounds and other sections.—One each tensile and bend test specimen for each size of bar, except for suspension rods, for which two each tensile and bending test specimens for each size of bar will be required.

Bending and flattening tests will be made on not more than 4 per cent. of manufactured rivets.

Tensile test specimens to be of such dimensions that the following test pieces may be prepared.—For plates and sections other than rounds the test piece will be 18 in. long, having a length narrower than the remainder of the bar of 9 in., with a width of $2\frac{1}{2}$ in. for $\frac{5}{16}$ in. thickness, 2 in. for $\frac{3}{8}$ in. to $\frac{7}{8}$ in. thickness, and $1\frac{1}{2}$ in. for thickness over $\frac{7}{8}$ in. Gauge length will be 8 in.

Round bars will be turned to dimensions varying in length from 1 ft. 10 in. for a $1\frac{3}{8}$ in. diameter bar to 1 ft. $3\frac{1}{2}$ in. for a $\frac{3}{4}$ in. diameter bar, and the diameter of the central portion varying from 1 in. to $\frac{9}{16}$ in. Gauge lengths will be four or eight times the diameter of the central portion of the test piece.

The steel to comply with the following requirements :—

Section.	Ultimate tensile strength in tons per sq. in.		Minimum elongation.
	Min.	Max.	
Plates and all sections other than rounds, under $\frac{3}{8}$ in. thick	28	33	16 per cent. in 8 in.
Plates and all sections other than rounds, $\frac{3}{8}$ in. and over in thickness.	28	33	20 per cent. in 8 in.
Round bars other than rivet steel	28	33	20 per cent. in 8 diameters, or 24 per cent. in 4 diameters.
ınd bars for rivets	25	30	25 per cent. in 8 diameters, or 30 per cent. in 4 diameters.

Bend test specimens to be of such dimensions that the following test pieces may be prepared :—

For flat sections, to be not less than $1\frac{1}{2}$ in. wide. Round sections will be tested as rolled. The length of test pieces to be 12 in.

Bend test pieces to stand bending cold without fracture, or after being heated to blood red and quenched in water not exceeding 80 deg. Fah. bending through 180 deg. round a bar of diameter not exceeding three times the thickness of the test piece. Bend test may be by pressure or blows.

Manufactured rivets.—The shank of manufactured rivets to stand bending cold through 180 deg. flat on itself without sign of fracture on convex side, and the head to stand flattening out whilst red hot until its diameter is two and a half times that of shank without cracking at the edges.

The steel castings to be thoroughly annealed in a properly constructed furnace. One specimen each for tensile and bend tests from each melt. The specimen to be cast on the casting and not to be cut therefrom until after annealing and stamping by the Engineer, and to be of such dimensions that the following test pieces may be prepared :—The tensile test piece to be $15\frac{1}{2}$ in. long, and $\frac{9}{16}$ in. diameter for a length of $2\frac{1}{2}$ in. at the centre of the bar. The ultimate tensile strength to be between the limits of 26 and 35 tons per sq. in. with an elongation of not less than 15 per cent. measured on a gauge line of 2 in.

The bend test piece to be 1 in. x $\frac{3}{4}$ in. x 12 in. long machined with edges rounded to $\frac{1}{16}$ in. radius, and to stand bending cold over the thinner section through an angle of 90 deg. without fracture, the internal radius of bend being not greater than 1 in. Bend test may be by pressure or blows.

The iron castings to be of the best grey metal, remelted in a cupola. Castings to be uniform in quality, sound, free from flaws, cracks, sand-holes, air bubbles, scoriae, or other defects, and no stopping, plugging, burning or welding will be allowed, unless with the permission of the Engineer. Branded test bars 2 in. x 1 in. x 3 ft. 6 in. to be cast vertically in the presence of the Inspector from the cupola from which castings are being run, to be then marked with the date and submitted for testing, one specimen required from each melt. These bars will be tested on edge in cross breaking on 3 ft. centres, and must stand a load of 28 cwt. applied at the centre with deflection of not less than $\frac{1}{3}$ in. without fracture. A blow from a hammer must produce an indentation on the rectangular edge of castings without flaking the metal.

All plates and sections to be of uniform thickness, with regular edges. The sizes shown or specified to be the finished sizes. Joints to be made only at such positions as shown upon the Plans. Edges, butts, and bearing surfaces to be milled or planed where shown or specified. The greatest care to be taken in making all welds, so as to ensure perfect soundness. Cover plates and wrappers to be fitted accurately to the section which they have to cover. Forged work to be neatly finished with a surface of reasonable smoothness, to the approval of the Engineer. All parts which will be inaccessible for painting after fixing to receive two coats of paint, as specified, before fixing.

Castings to be of uniform thickness, with clean and smooth surfaces, and filleted at internal angles, unless shown square :—all runners, seams, &c., to be cut off. Allowance to be made on all castings for contraction and machining, so that they will finish to dimensions shown on Plans.

Punched holes, perfectly parallel, and at right angles to the plane of the plates or straps will be allowed only in bearing plates for stringers, rings, tang straps and hoop straps. Burr to be removed from edges of all punched holes. In all other work the rivet holes to be drilled to accurate templates, the respective pieces where possible secured under drill and bored right through to proper size to admit the rivets when heated, the pieces to be then taken apart and the burr removed from edges of holes. All holes to be $\frac{1}{16}$ in. larger in diameter than the bar from which rivets or bolts are made. Riveting to be executed in the neatest and most workmanlike manner.

The work to be kept properly bolted together while it is being riveted, and no drifting will be allowed, except for the purpose of drawing assembled section into position. No drift having a diameter larger than any part than the hole in which it is used will be allowed. Where work can in no other way be made to coincide, holes to be reamered true to such size as may be directed, and rivets of corresponding size

to be used. All rivets to be heated uniformly, put in and riveted while hot, perfectly fill the holes and be tight in same; to be finished with cup heads of size shown concentric to the rivet hole; snap to be of same dimensions as head. Care to be taken that all rivets are countersunk where plates when fixed will bear on other work; where rivets are to be countersunk the sinking to be drilled to size shown, and rivet heads made flush with surface. Loose, burned, badly formed or otherwise defective rivets to be cut out, and where impossible to cut out without injury to adjacent metal, shanks to be removed by drilling. Wherever possible rivets to be machine driven, and field riveting to be reduced to a minimum.

Whenever necessary for the division of the work for shipment the rivets to be left out, but the holes in all cases to be drilled in splices, care being taken that they correspond accurately with dimensions shown on Plan.

All necessary field rivets, with 10 per cent. added, of proper length and diameter of each size for completing the work to be provided by the Contractor, packed in boxes with the numbers and size marked on the outside.

Steel Bolts.—Unless otherwise shown on Plans, all bolts through timber-work to have square heads and nuts, with two square washers to each bolt; bolts through metalwork to have hexagonal heads and nuts, and rounded ends, with one round washer to each bolt under nut; heads to be countersunk, if required; threads to be accurately cut on the bar of the bolt, and screwed to Whitworth's standard; no welding on of screwed ends will be permitted; all nuts to fit hand tight. Unless otherwise shown, bolts to be screwed four diameters in length, and washers for bolts to be as follow :—

Diameter of Bolt.	Square Washers.	Round Washers.
1¼ in.	3½ in. x 3½ in. x ¼ in.	2½ in. diameter x ¼ in.
1⅛ in.	3½ in x 3½ in. x ¼ in.	2¼ in. „ x ¼ in.
1 in. ...	3 in. x 3 in. x ¼ in.	2 in. „ x ¼ in.
⅞ in....	2½ in. x 2½ in. x $\frac{3}{16}$ in. ...	1¾ in. „ x $\frac{3}{16}$ in.
¾ in.	2½ in. x 2½ in. x $\frac{3}{16}$ in. ...	1½ in. „ x $\frac{3}{16}$ in.
⅝ in....	2 in. x 2 in. x ⅛ in.	1¼ in. „ x ⅛ in.
½ in.	1½ in. x 1½ in. x ⅛ in.	1 in. „ x ⅛ in.

Minor parts, wood screws, coach screws, and set screws.—Contractor is to supply the whole of the wood screws with 5 per cent. added, and also all coach screws, set screws, and other minor metalwork necessary for the construction of the work.

11. Weights, Packing, Marking.

The Contractor is, at his own expense, to provide means of accurately ascertaining, in the presence of the Engineer, the weights of all pieces of the metalwork, and, if required, all portions to have weights legibly marked thereon in white paint, and the whole to be legibly marked with the name of the work.

All small parts, bolts, nuts, spikes, screws, and washers to be packed in cases with the contents and weights legibly marked outside in paint. All the bearing surfaces, bright work, and all the threads of bracing rods to be coated with white lead and tallow; the metalwork and any overhanging bar sections or plates to be protected so as to avoid bending during transit. All packing to be at Contractor's expense.

Forwarding lists detailed as in Schedule, and giving actual weights to be supplied in triplicate by Contractor before forwarding work.

12. Timber.

Timber employed to be tallow-wood, grey box, or ironbark, at the option of Contractor, for the handrails; tallow-wood, ironbark, white mahogany, grey gum, red gum, grey box, blackbutt, or brush box, at option of Contractor, for the planking and kerbs; ironbark, grey gum, red gum, tallow-wood, or grey box for the sheathing and gravel-boards; ironbark, tallow-wood, or grey box for the girders, cross girders, capwales, fencing, and pier bracing; and ironbark, tallow-wood, grey gum, red gum, or grey box for driven piles, and ironbark for the remainder of the work; all to be of approved quality, sound, straight, free from sapwood, large or loose knots, wanes, shakes, gum-veins, cores, or other defects; to have clean sharp arrises, and to be of the full dimensions shown or specified.

Round timber to have the bark peeled off. The diameter of girders and corbels to be measured at the centre of the log, exclusive of the bark.

Hewn timber to be square, smooth, and free from axe marks, and show no heartwood on the outside,

Sawn timber to be absolutely free from heart, and to be so fixed that the surface which was farthest from the heart of the tree will be the outermost in the work other than planking, and uppermost in the planking.

To ensure as much seasoning as possible, all timber for truss work to be delivered at site within twenty-six weeks of date of notification of acceptance of tender, after which date should any of this timber not be delivered, progress payments on account of any work executed under the Contract, notwithstanding anything in the General Conditions to the contrary, will be suspended until the remainder of the timber is delivered.

All timber for truss work to be protected on ends with white lead paint. Timber to be stacked in such a manner that the air may freely circulate through it until required for use.

In the event of any variation in the Contract, the net quantity of all timber shown on Plans or specified to be paid for under this Contract, shall be ascertained as follows :—

The net measurements of hewn, sawn or dressed timber shall be the width multiplied by the depth and length (tenons included). All framed work will be paid for to extremes, but no allowance will be made for scarfs or tenons.

The net measurement of round timber shall be the actual number of lineal feet (tenons included) fixed in the work, but no allowance will be made for scarfs, or tenons.

13. Painting.

The cast-iron shoes and the remainder of the metalwork to be cleaned free from all rust, scale, and dirt, and after inspection and before forwarding to site, to be dipped in boiled linseed oil. Machined surfaces to be coated with white lead and tallow, properly mixed.

The whole of the metalwork, after erection *in situ* is completed, to be thoroughly scraped, brushed, and washed clean with fresh water, to the satisfaction of the Engineer. When this part of the work has been passed, all places where rust spots have been to receive a coat of thin paint before the application of the priming coat over the whole surface.

The inner surfaces of shoes and all metalwork which may be inaccessible for painting when fixed is, before being placed in position, to receive two coats of paint. The whole of the exposed metalwork to then receive three coats of paint, the finishing colour to be white.

The exposed ironwork in handrails and fencing to receive a priming coat of paint, and two coats of black varnish.

The whole of the exposed timber in ordnance fencing, the timberwork in trusses, all the handrailing and kerbs where exposed to view, the cross-girders outside the kerbs, the outer surface of outer stringers, girders, and corbels, and the ends of flooring planks, to be thoroughly cleaned, and receive a coat of raw linseed oil, to be then stopped with white-lead putty, and then to receive three finishing coats of white paint. All tenons, mortises, joints, and butting surfaces, and any timber, if inaccessible for painting when fixed, to receive, before being fixed in position, two coats of white lead and oil.

Paint for metalwork and timber to be mixed as follows :—

First or Priming Coat for ironwork and paint for rust spots, to consist of red lead mixed with a sufficient quantity of raw linseed oil to bring it to a proper consistency. Boiled linseed oil or turpentine to be added only if directed by the Engineer.

First or Priming Coat for timberwork to consist of white lead and raw linseed oil, in the following proportions :—

18 lb. white lead.
4 pints raw linseed oil.

Second and Third Coats for timberwork and metalwork to consist of pure white lead ground in oil, raw linseed oil, and turpentine, in the following proportions :—

15 lb. white lead.
4 pints raw linseed oil.
1 pint turpentine.

Should the paint require thinning, raw linseed oil to be added to bring it to the required consistency. Boiled linseed oil or turpentine to be added only if directed by the Engineer.

No paint to be applied during or immediately after wet weather, or while surface of timber or iron-work is wet, and an interval of forty-eight hours must elapse between each application.

14. Tarring.

The flooring planks, when laid, to receive on the upper surface between kerbs one coat, composed of 7 parts coal tar, 4 parts of Stockholm tar, and 1 part of pitch, thoroughly melted together, and applied hot; to be well sprinkled with a layer of clean sharp sand and lime. The gravel boards and sheathing to be tarred with the same composition, the edges and ends of planks to receive one thorough coat, and the remainder two coats, laid on hot. All tarring to be completed before painting is commenced, and no tar is to be applied during or immediately after wet weather, or while surface of timber is wet.

15. Abutments and Piers.

Piles of abutments, and of piers Nos. 1, 2, and 5, to be not less than 12 in. and 18 in. diameter at small and large ends respectively. Piers Nos. 2 and 5 to be braced with wales and braces 10 in. x 5 in.

Piers Nos. 3 and 4 to each consist of 5 vertical piles, hewn 14 in. x 14 in., arranged in pairs under heels of trusses and one in centre, also two stump piles hewn 14 in. x 14 in., carrying up and down stream raking struts, hewn 14 in. x 14 in. Piles specified to be hewn may be left round below ground, the diameter at small end to be not less than 12 in. Piers to be stayed with wales and braces sawn 12 in. x 6 in. notched 1 in. over piles.

Piers to be bolted together with bolts and washers of sizes shown on Plans.

Piles of abutments and piers to be driven to the depths shown on Plans, but if at that depth the penetration exceeds 2 inches in piers 3 and 4, 3 inches in piers 1, 2, and 5, and 6 inches in abutments for three blows of a 1 ton ram falling 10 ft. on a perfectly sound pile-head (not brushed) the driving shall, if required by the Engineer, be continued until such test is obtained. If before contract depth is reached the penetration is less than $\frac{1}{2}$ in. for three blows, the driving is to be discontinued, if directed. The approximate depth of driving is shown on Plans, which will be taken as the contract depth; all deviations from this depth will be added to or deducted from the Contract at Schedule rates.

No scarfing of piles will be permitted, except where shown, and where contract depth has to be exceeded, piles must be supplied of the full length required.

Piles to have a steel ring 2 in. x 1 in., fitted on their heads to prevent splitting during driving, and to be pointed as shown. All piles to have the length from the point cut into the timber at two points above the ground or water at intervals of 5 feet, Roman figures to be used.

16. Capwales, Wing Pieces, and Sheathing.

Capwales to be sawn or hewn, free from heart, 12 in. x 6 in., of lengths shown on Plans, and secured to piles by $\frac{7}{8}$ in. bolts, as shown.

After capwales have been fitted truly on pileheads the holes are to be bored for the $\frac{7}{8}$-in. bolts first through capwales and piles, after which the capwales are to be removed, and the holes $\frac{7}{8}$-in. in diameter through pile heads are to be enlarged to $1\frac{1}{4}$-in. diameter. All butting surfaces to be painted before re-erecting the capwales.

Wing pieces, 17 in. diameter, to be notched over ends of capwales of abutment A, and be secured thereto with 1 in. bolts; the heels of wing pieces to be sunk 6 ft. into solid ground.

As soon as the capwales are in position, the landward side of abutments to be sheathed with 4-in. sawn planking from the depths shown to underside of capwales; the sheathing to be secured to piles and wing pieces by $\frac{3}{8}$-in. square spikes 7 in. long, one spike at each intersection. Sheathing to be in one length. No joints will be allowed.

The spaces between the top of capwales and the underside of deck planking to be filled with 4-in. sawn planks, the girders being notched $1\frac{1}{2}$ in. to admit of the requisite lengths being inserted.

17. Corbels.

Corbels under bottom chords of trusses on piers to be hewn 12 in. x 12 in. x 5 ft. long, tightly notched 1 in. over, and secured to capwales and piles with 1 in. tang bolts at piers 3 and 4.

Inner corbels under cross-girders over piers 3 and 4 to be hewn 12 in. x 12 in., with 12 in. x $6\frac{1}{2}$ in. packings interposed, all 5 ft. long, tightly notched 1 in. over, and secured with 1 in. and $\frac{7}{8}$ in. bolts, as shown.

Corbels over piers 1, 2 and 5 to be 8 ft. long, hewn under outer girders, and of round timber under inner girders, of sizes shown on Plans. Ends of corbels to be shaped as shown, and the upper and lower surfaces to be adzed flat, to be tightly notched 1 in. over and secured to capwales with 1 in. bolts as shown. Dressed keys to be fitted to 8 ft. corbels as shown.

18. Girders of Approach Spans.

On timber beam spans the outer girders are to be hewn 13 in. x 12 in., and the inner ones to be 18 in. in diameter; the girders to be adzed off to a true bearing to receive floor planks, to be seated securely, and secured to corbels of piers with $\frac{7}{8}$-in. diameter bolts.

Steel straps 3 in. x $\frac{1}{2}$ in. x 2 ft. 2 in. long to be secured over girders to corbels with $\frac{7}{8}$ in. bolts at piers Nos. 1, 2 and 5.

Bearers under refuge to be $13\frac{1}{2}$ in. x 5 in., secured with $\frac{3}{4}$ in. bolts.

19. Cast-iron Bearings.

Cast-iron bearings to be of dimensions shown, the bedplates to be secured to corbels of piers each with two $1\frac{1}{4}$-in. holding-down bolts and washers. The top bearing surfaces of bedplates to be smoothly planed, tool marks running in line with the bottom chords, but under surface of bedplates need not be planed if castings are true. The fixed bearings and rockers to be bored for the $3\frac{1}{2}$-in. diameter steel turned pins, and the rolling face of rockers to be turned to a radius of 11 in.

Rockers to be held down with $1\frac{1}{4}$ in. set screws.

20. Cast-iron Shoes.

Cast-iron shoes, off patterns A, B, C, D, E, F, G and H, rights and lefts where required to be of dimensions shown. Date of casting and letters showing pattern to be cast on respective shoes. Shoes on bottom chords to be carefully bedded in 8-lb. sheet lead, and to be a good fit on bearing surfaces, but need not, at the discretion of the Engineer, be machined if castings are true, except upon the butting edges, where they bear against the plates on chord. These edges are to be machined.

Shoes B, C, D, to be fitted with two $\frac{3}{4}$-in. coach screws, 4 in. long, for securing to top chords. Shoes E, F, and G to be secured to bottom chord each with two $\frac{3}{4}$-in. bolts. Shoes A to be secured to braces each with two $\frac{7}{8}$ in. bolts.

Shoes H to be secured to bottom chord with $\frac{7}{8}$ in. and $\frac{3}{4}$ in. turned and fitted bolts and fastened to end posts each with two $\frac{7}{8}$ in. bolts. Internal angles of all castings to be filleted to a radius of $\frac{1}{2}$ in. unless otherwise shown.

21. Bottom Chords.

The bottom chords of truss spans cambered 2 in. at centre as shown to be constructed each in three lengths. Each chord to consist of two steel channel bars, 10 in. x $3\frac{1}{2}$ in., x 24·46 lb. per foot, spaced 6 inches apart for general length, splayed in end bays to 9 in. apart at bearings where they are to be connected together by diaphragms of 3-in. x 3-in. x $\frac{3}{8}$-in. ⌊ bar and $\frac{3}{8}$-in. steel plate, secured with $\frac{3}{4}$-in. rivets. Channels to have 8 in. x $\frac{1}{4}$ in. doubling plate, over three centre panels, stitch riveted with $\frac{3}{4}$-in. rivets.

Bearing-plates under cross-girders at panel points to be $\frac{1}{2}$ in. thick, machined on edges butting against shoes, all secured with $\frac{7}{8}$ in. rivets, countersunk on top, as shown.

T bar cleats 4 in. x 4 in. x $\frac{1}{2}$ in., 6 in. long at ends of chords, and 12 in. long at intermediate panel points, secured with $\frac{3}{4}$-in. rivets, to be provided for attachment of wind bracing rods.

Joint cover-plates to be $\frac{5}{16}$ in. thick, secured with $\frac{7}{8}$ in. rivets.

All holes in chords, cover-plates, butt joints and plates for cross-girders, to be drilled.

Channel-bars to be machined on ends.

The chords to be assembled in manufacturer's yard, with windbracing complete, and to be to the satisfaction of the Engineer before forwarding to site.

Chords to be packed with Oregon timber, if necessary, to protect them against damage in transit to site.

22. Forged Washer-plates.

Forged washer-plates to be of dimensions shown with holes bored out of solid. Lower washer-plates to be secured to channel-bars of chords, each with four $\frac{3}{4}$-in. rivets.

23. Suspension Rods.

Steel rods, 2 in., $1\frac{3}{4}$ in. and $1\frac{1}{2}$ in. diameter, for general lengths, to be arranged as shown on Plan No. 4; the ends of rods to be upset to $2\frac{1}{2}$ in., $2\frac{1}{4}$ in. and 2 in. diameter respectively, and screw-cut with Whitworth angular threads.

Rods to be fitted with hexagonal nuts and round washers, as shown; no welds will be allowed in rods; the rods to be finished so that screw-cut ends and nuts of a size may be interchangeable without shake. Nuts to be bored out of solid, screw cut, and faced.

24. Windbracing.

The windbracing to consist of one adjustable and one plain rod per panel.

The adjustable steel rods to be in two lengths, each $\frac{7}{8}$ in. diameter, upset at inner ends and screwed 1 in. diameter over thread. The outer end of rods to have jaws forged on to the dimensions shown, secured to steel tees on chords, with $\frac{7}{8}$-in. turned pins, and split pins as shown. The two lengths of adjustable rods to be connected together by steel turnbuckles 2 in. diameter x 12 in. long and locknuts as shown.

The plain steel rods to be in one length with jaws and pins for connecting to steel tees on chords, as above.

25. Top Chords.

Top chords of trusses to consist of two wrought timbers, each 13 in. x 6 in., having saw-fitted butt-joints with steel channel cover-plates, 10 in. x $3\frac{1}{2}$ in. x 5 ft. long, weighing 24·46 lb. per foot, secured with $\frac{7}{8}$-in. bolts. Wrought timber packings to be fitted between chord timbers and secured as shown. Weatherings of No. 16 gauge galvanised iron, 27 in. wide, to be secured with 2 in. galvanised lead-headed wire nails over all joints and packing pieces, and at ends of chords where timbers are in contact.

not necessarily prefabricated. fitted for bridge?

26. Diagonal Bracing.

Braces J of trusses to consist of two wrought timbers, 13 in. x 6 in.

Braces K and L to each consist of two wrought timbers, 9 in. x 5 in., and 8 in. x $4\frac{1}{2}$ in. respectively, ~~wrought timber.~~

Counter-braces M to consist of two wrought timbers, each 8 in. x $4\frac{1}{2}$ in. Timbers to be bowed around counter-brace N.

Counter-braces N to be single wrought timber 8 in. x 7 in.

All braces to be accurately fitted into shoes at ends, and secured thereto with $\frac{7}{8}$-in. bolts, as shown.

Wrought timber packings to be fitted between brace timbers and secured as shown.

27. Side-braces.

Side-braces for trusses to be steel T bars, 6 in. x 3 in. x $\frac{1}{2}$ in., secured to top chords and cross-girders, with $\frac{7}{8}$-in. bolts. Those at hip joints to be set to clear hip castings, as shown.

28. Cross-girders.

Cross-girders to be hewn 15 in. x 12 in. and 15 in. x 13 in. of lengths shown, checked for bracing-shoes where required, chamfered at ends, and secured, as shown. Ends of cross-girders under refuge at pier 3 to be reduced to 12 in. x 12 in.

29. Stringer Bearing-plates.

Bearing plates for ends of stringers to be 12 in. x $\frac{3}{8}$ in., of lengths shown, secured to cross-girders with $\frac{7}{8}$-in. bolts in $\frac{15}{16}$ in. holes, as shown.

30. Longitudinal Stringers.

The longitudinal stringers to be hewn 12 in. deep x 12 in. wide, notched over bearing plates on cross-girders, and secured thereto with $\frac{7}{8}$-in. bolts in slotted holes.

31. Flooring.

Floor to consist of 4-in. sawn planking, from 6 in. to 10 in. wide, laid transversely, as shown. All planks to run the entire width of bridge in one length; to be laid flush and close, and secured to girders and stringers by $\frac{3}{8}$-in. square spikes, 7 in. long, two spikes at each intersection; heads of spikes to be drifted down $\frac{1}{4}$ in., and surface of the floor left smooth, all inequalities being adzed down. The planking on refuge to be sawn timber $2\frac{1}{2}$ in. thick, secured with stout wire nails, 5 inches long.

32. Kerbs.

Kerb-logs to be sawn 6 in. x 6 in., laid with butt joints, secured through planking and girders or stringers by $\frac{3}{4}$-in. bolts and $\frac{3}{4}$-in. driven bolts 13 in. long, spaced as shown. Kerbing to run the entire length of bridge, and be chamfered 1 in. x 1 in. on inner edge. Kerb on refuge to be 4 in. x 3 in. on edge chamfered and securely nailed to posts and planking.

33. Damp-course.

The upper surface of girders of beam-spans, and stringers of truss-span and refuge, to be covered with bituminous damp-course of approved quality, laid with 2 in. laps. Laps to be payed with the cement supplied with the damp-course, and damp-course to be well tacked to girders and stringers, and at laps, with special tacks supplied with damp-course.

Damp-course to be flush with the outer edge of outer girders and stringers, and turned down 2 inches and tacked along all inner edges of girders and stringers, as shown.

34. Handrails.

Posts to be 6 in. x 4 in., secured to girders, corbels, or stringers and kerbs by $\frac{3}{4}$-in. bolts; end posts to be of the dimensions shown, secured with $\frac{7}{8}$-in. and $\frac{3}{4}$-in. bolts; steel rings on tops of end posts, $1\frac{1}{2}$ in. x $\frac{1}{4}$ in., to be shrunk on, and secured each with four 3-in. wood screws.

Top rail to be 4 in. x 4 in., laid arris uppermost, in notches cut in top of posts, and secured thereto by hoopstraps of 2 in. x $\frac{1}{8}$ in. iron, with $\frac{1}{2}$-in. cup-headed bolts.

Lower rail to be 4 in. x 3 in., notched to each post, and secured by $\frac{1}{2}$-in. cup-headed bolts, washers at joints in rails to be $2\frac{1}{2}$ in. x $2\frac{1}{2}$ in. x $\frac{3}{16}$ in.

Posts on refuge to be 4 in. x 4 in., secured to bearers by $\frac{3}{4}$-in. bolts.

Top rail on refuge to be 4 in. x 3 in. rounded on top edges to 1 in. radius (halved and mortised over posts), and secured thereto with 5-in. wire nails.

Lower rail on refuge to be 4 in. x 2 in., notched to posts, and secured with 4-in. wire nails.

Posts and rails to be wrought and framed. Joints in rails to occur only on posts.

Rails to be housed and tenoned to end posts.

On roadway and on refuge one row of galvanised steel fencing wire, No. 8 gauge, to be placed below lower rail, to pass through holes bored in posts, and to be properly strained in position.

35. Approaches.

As soon as the abutments have been completed the approaches to be undertaken at once. Embankments to be formed to side slopes and gradients shown, and to have a uniform convexity, as shown on cross-sections.

After grubbing the area to be covered by the embankment, and burning off all logs, stumps, roots, brush, or rubbish, the embankment shall be commenced at its lowest point, and carried up in horizontal layers, 6 in. to 12 in. deep, for the full width of the embankment. The embankments to be thoroughly, consolidated to the satisfaction of the Engineer.

All excavation for embankments must be made at approved places, and the excavated areas to be sloped and trimmed as directed, and left neat and tidy.

Any subsidence or injury to embankment or side slopes during the progress of the works must be made good by Contractor. No allowance will be made for such extra material, as payment will only be made for the net dimensions shown on Plans.

If the material for banks is taken from side cutting, any such excavation must be made at a distance of at least 20 yards from site of bridge, and downstream thereof, and in such positions as will be pointed out by the Engineer.

36. Fencing.

When embankments are thoroughly consolidated to the satisfaction of the Engineer, the fencing to be undertaken.

Ordnance fencing as shown to be wrought on exposed faces. All scarf-joints of rails to be made as shown or directed over posts only. Rails to be housed and tenoned to end posts.

Split fencing to be constructed as shown on Plan. Posts to be 8 in. x $2\frac{1}{2}$ in., checked into sills 9 in. diameter x 5 ft. long, and secured by 1 in. treenails; struts 4 in. x $2\frac{1}{2}$ in., to be notched into post and sill, and secured to post by $\frac{1}{2}$-in. bolt and to sill by $\frac{3}{8}$ in. square spikes, 7 in. long as shown; corner or end posts, 12 in. diameter x 9 ft. long, to be let 4 ft. into ground; rails to be 8 in. x 2 in., each 9 ft. long. Tenons at end of rails to be 6 in. long, adzed carefully to fit into 7 in. x 3 in. mortises, shouldered square with the saw, and finished so as to butt close up to posts. Top rails to be shouldered down, and bottom rails to be shouldered up.

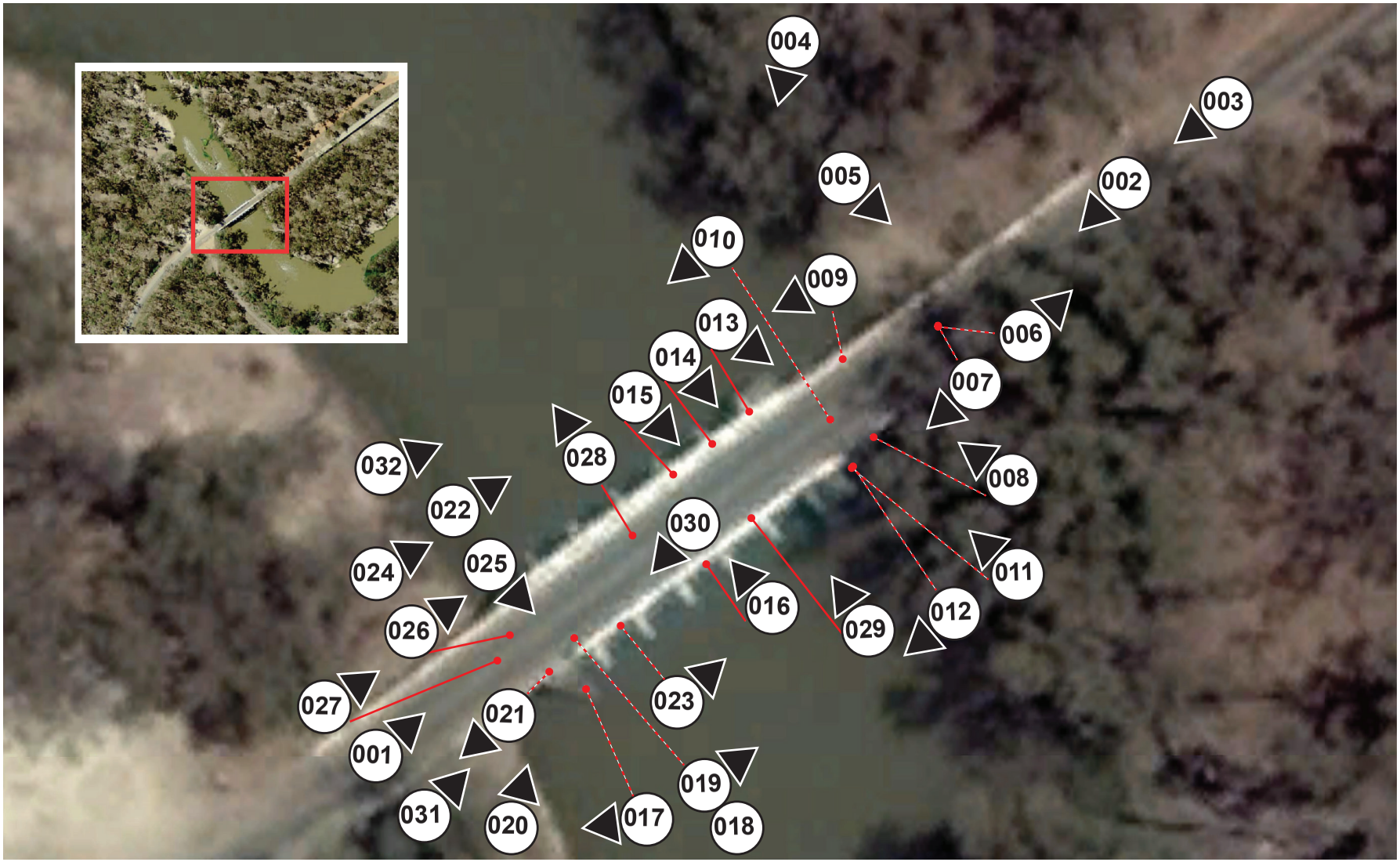
Two rows of galvanised steel fencing wire, No. 8 gauge, to pass through holes bored into posts, and to be properly strained in position, between lower rail and surface of ground.

Posts to be set uniform and upright, and fencing to be erected to a true line at the top; the earth around all posts to be well rammed.

R. VOWELL,
Chief Engineer,
Harbours, Roads, and Bridges.

Department of Public Works, New South Wales,
30th November, 1927.

Photograph Location Map 1: Digital Photographs 001 - 031



Key

- 001 — Photograph number and direction
- 002 001 — Multiple photographs taken from the same location
- Photograph taken from where the red dot is located
- Photograph taken from beneath the bridge

N

Gee Gee Bridge over the Wakool River, NSW

ARCHIVAL PHOTOGRAPHY DIGITAL IMAGE CATALOGUE SHEET No.1

PROJECT NAME	Gee Gee Bridge over the Wakool River Archival Recording		
CAMERA	Nikon D750	**LENSES**	24-85 mm
SENSOR SIZE	35.9mm x 24.0mm	**35 MM LENS EQUIVALENT**	24-85 mm
PROOF #	D-1	**PHOTOGRAPHER**	Jane Mitchell

IMAGE FILE NO.	DATE	DESCRIPTION	ORIENTATION
001	12/11/2018	General view of road and bridge surface from south western approach	Facing NE
002	12/11/2018	General view of road and bridge surface from north eastern approach	Facing SW
003	12/11/2018	View of approach to Gee Gee bridge from Gee Gee approach bridge	Facing SW
004	12/11/2018	General view of Dare truss northern view of the river	Facing SE
005	12/11/2018	Northern abutment	Facing NW
006	12/11/2018	Northern abutment from underneath bridge	Facing NE
007	12/11/2018	Second approach span	Facing SW
008	12/11/2018	General view of Dare truss northern side of the river	Facing SW
009	12/11/2018	Third approach span	Facing SW
010	12/11/2018	Stringers from northern side of river bank	Facing SW
011	12/11/2018	Span attached to bridge deck showing date carving	Facing SW
012	12/11/2018	Relationship between span, bridge deck and truss from northern river bank	Facing SW
013	12/11/2018	Condition of timber on bridge deck north side	Facing NW
014	12/11/2018	Inside north corner Dare truss from bridge deck	Facing NW
015	12/11/2018	Close up join Dare truss	Facing NW
016	12/11/2018	View through Dare truss from middle of bridge deck	Facing NE
017	12/11/2018	Southern abutment	Facing SE
018	12/11/2018	Close up first span southern side	Facing NE
019	12/11/2018	First span southern side	Facing NE
020	12/11/2018	General view span and dare truss configuration	Facing NE
021	12/11/2018	Southern abutment and stringers	Facing SE
022	12/11/2018	General view Dare truss and span from southern river bank	Facing NW
023	12/11/2018	Second span from southern river bank	Facing NE
024	12/11/2018	View of two southern spans and Dare truss	Facing NW
025	12/11/2018	Guard rail and southern abutment	Facing NW
026	12/11/2018	View along eastern river side of bridge	Facing NE
027	12/11/2018	View along eastern bridge side of bridge	Facing NE
028	12/11/2018	Guard rail on east side of bridge, southern end	Facing NE
029	12/11/2018	View of Dare truss from bridge deck	Facing E
030	12/11/2018	View of bridge deck	Facing SW
031	12/11/2018	View of bridge deck	Facing NE
032	12/11/2018	Dare truss	Facing NW

Scales (if used): 20 cm increments

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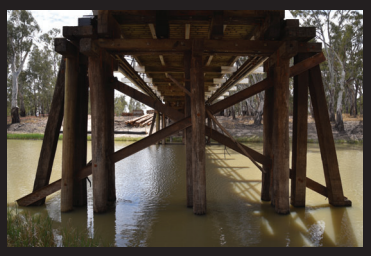

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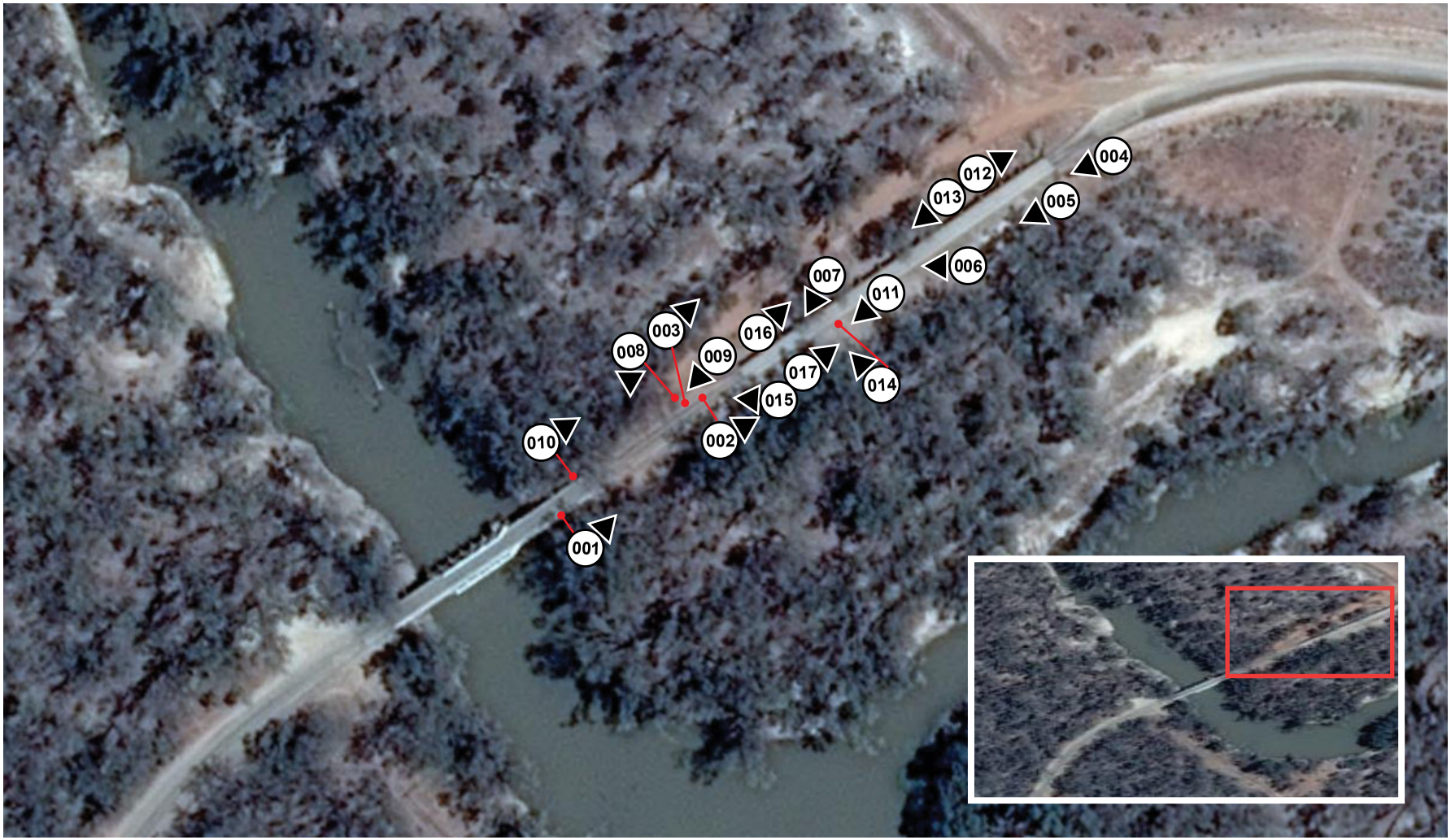
RAUDINO SHEARING

Photograph Location Map 2: Digital Photographs Bridge Approach 001 - 017



Key

- 001 ▶ Photograph number and direction
- 002 001 ▶ Multiple photographs taken from the same location
- Photograph taken from where the red dot is located
- Photograph taken from beneath the bridge

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Gee Gee Approach Bridge over the Wakool River, NSW

ARCHIVAL PHOTOGRAPHY DIGITAL IMAGE CATALOGUE

SHEET No. 2

PROJECT NAME	Gee Gee Bridge over the Wakool River Archival Recording		
CAMERA	Nikon D750	**LENSES**	24-85 mm
SENSOR SIZE	35.9mm x 24.0mm	**35 MM LENS EQUIVALENT**	24-85 mm
PROOF #	D-1	**PHOTOGRAPHER**	Jane Mitchell

IMAGE FILE NO.	DATE	DESCRIPTION	ORIENTATION
A001	12/11/2018	View of Gee Gee approach bridge from Gee Gee Bridge	Facing NE
A002	12/11/2018	View of Gee Gee approach bridge	Facing NE
A003	12/11/2018	Gee Gee approach bridge signage	Facing NE
A004	12/11/2018	View of Gee Gee approach bridge	Facing SW
A005	12/11/2018	View of northern span	Facing SW
A006	12/11/2018	View along western side of approach bridge	Facing E
A007	12/11/2018	View second span and stringers	Facing SW
A008	12/11/2018	View southern abutment	Facing SW
A009	12/11/2018	General view bridge surface from north eastern approach	Facing SW
A010	12/11/2018	View of approach to Gee Gee approach bridge from Gee Gee bridge	Facing SW
A011	12/11/2018	View of guard rails and bridge surface	Facing SW
A012	12/11/2018	General view of northern approach to approach bridge	Facing NE
A013	12/11/2018	View of span showing carved date	Facing SW
A014	12/11/2018	West side of approach bridge	Facing E
A015	12/11/2018	Southern abutment	Facing SE
A016	12/11/2018	View of second span on southern side	Facing SW
A017	12/11/2018	View of first span on southern side	Facing SW

Scales (if used): 20 cm increments

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GEE GEE
APPROACH BRIDGE


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Gee Gee Bridge over the Wakool River, NSW

ARCHIVAL PHOTOGRAPHY DIGITAL IMAGE CATALOGUE SHEET No.3 – DETAILS FROM TRANSPORT FOR NSW

PROJECT NAME	Gee Gee Bridge over the Wakool River Archival Recording		
CAMERA INFO	For Images 001 - 004	Apple IPhone 8	
	For Images 015 – 018	OLYMPUS OM-D E-M5 Mark II	
	For Images 019 - 022	Olympus SP-510 UZ	
PHOTOGRAPHERS	Sam Millie and	Dave Stratton	RMS

IMAGE FILE NO.	DATE	DESCRIPTION	ORIENTATION
001	06.03.2019	Steel Co Ltd England upstream top chord splice plate - steel mill mark 1	Facing SE
002	06.03.2019	Detail - Steel Co Ltd England upstream top chord splice plate - steel mill mark 1	Facing E
003	06.03.2019	Detail - Steel Co Ltd England upstream top chord splice plate - steel mill mark 1, upside down embossed letters	Facing E
004	06.03.2019	Detail - Steel Co Ltd England upstream top chord splice plate - steel mill mark 1, upside down embossed letters	Facing E
005	12.02.2019	Detail - 'BHP Co Ltd' bottom chord steel mill mark - standing Swan Hill end downstream	Facing E
006	12.02.2019	Detail - timber pier with extra pile support - standing Swan Hill end downstream	Facing E
007	12.02.2019	Detail - bottom chord tension rod washer plates - standing Swan Hill end downstream	Facing E
008	12.02.2019	Detail - bottom chord riveted splice connection - standing Swan Hill end downstream	Facing E
009	12.02.2019	Detail - bottom chord - standing Swan Hill end downstream	Facing E
010	12.02.2019	Detail – white painted timber cross girder replaced 2-04 Feb 2004 - standing Swan Hill end downstream	Facing E
011	12.02.2019	Detail - truss pier corbels includes dates of 2008 - standing Swan Hill end downstream	Facing E
012	12.02.2019	Detail - bottom chord wind bracing connection & splice plate- standing Swan Hill end downstream	Facing E
013	12.02.2019	Detail - timber ordinance handrail post connections - standing Swan Hill end downstream	Facing S
014	12.02.2019	Detail - rocker bearing-truss principal shoe-bottom chord pin - standing Swan Hill end downstream	Facing S
015	12.02.2019	Detail - rocker bearing - standing Swan Hill end downstream	Facing E
016	12.02.2019	Detail - Swan Hill Abutment headstock - standing downstream looking upstream	Facing W
017	12.02.2019	Detail - Swan Hill Abutment timber piles - standing downstream looking upstream	Facing W
018	12.02.2019	Detail - Dare truss bottom chord pier support - standing Swan Hill end downstream	Facing E
019	06.05.2010	Detail - Gee Gee Bridge 2010 - top chord truss anchor block	
020	06.05.2010	Detail - Gee Gee Bridge 2010 - top chord truss principal anchor block	
021	06.05.2010	Detail - Gee Gee Bridge 2010 - top chord tension rod washer plates & nuts without flashing	
022	06.05.2010	Detail - Gee Gee Bridge 2010 - top chord truss anchor block keyways	

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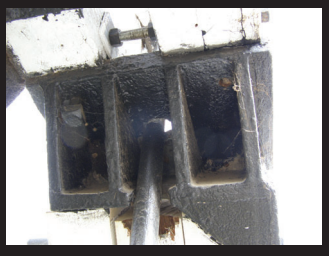

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STEEL Co LTD ENGLAND


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12/08