

Statement of Heritage Impact

SHR 1044 Lismore Railway Underbridges

March 2024

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Executive Summary

This SOHI has been prepared to accompany an application under s60 of the Heritage Act 1977 to demolish the State Heritage Register listed (SHR) Terania Street underbridge, part of the non-operational Lismore Railway underbridges, with consideration under s63 of the Act. (Attachments 1a and 1b).

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life endangering public safety risks.

s63 (2) and (3) of the Heritage Act 1977 include considerations for an application to enable demolition of the whole of a building or work if:

*It is of the opinion that the building or work **constitutes a danger to the users or occupiers of that building or work, the public or a section of the public.** {s63(3)(a)}*

SOHI assessment of danger to the public under s63(3)(a)

The SOHI concludes that underbridges at Terania Street constitute a **danger to the public and users for the following reasons:**

- i. **The Terania Street underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.**
- ii. **The Terania Street underbridge has low height clearances and narrow lane widths that are life-endangering with escalating safety risks to the public and users of the road.**
- iii. **The Terania Street underbridge impedes disaster management egress and recovery, which is a life-endangering safety risk to the public and users of the Terania Street Evacuation Route.**

Terania Street underbridge condition in 2024

Consultant heritage bridge engineers, Focus Bridge Engineering (FBE), in their Strategic Options report for the non-operational Lismore railway underbridges (July 2023), (Attachment 2) assessed the Terania Street underbridge as being in **predominantly poor condition**, noting that the assessment **does not account for {future} vehicular accidents that would damage the piers and cause local and global structural instability.**¹ This report **recommends demolition as the preferred option**².

FBE also prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**³, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.*

¹ *Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report*, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B, Appendix B - Condition Assessment

² FBE Options Assessment, 2023, page 15

³ *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0)*, prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

In January and February 2024 following two further vehicle accidents at the Terania Street underbridge, consultant engineers SMEC were engaged to provide updated reports on **structural soundness following impact of vehicle strike**. (Attachments 4 and 5) These reports focus on public safety risks to road users and **recommend demolition of the spans over the existing road lanes**.⁴

SHR statement of significance

The SHR listing has the following statement of significance for the Lismore Railway underbridges:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

SHR listing, end of life condition and maintenance

Prior to listing on the SHR in 1999, and in recognition that the Terania Street underbridge was at end of its functional life, in 1995 the State Rail Authority NSW prepared design plans for a replacement concrete bridge at this location. (Attachment 6)

The 'end of life' condition of the underbridge was not taken into account at the time of listing and is not recognised in the gazetted SHR listing. Had a full and proper assessment been completed at that time, the compromised structural integrity of the bridge would have been recognised. If such an assessment had been undertaken, it would have been clear that the structure was not capable of long term maintenance and repair, and incapable of reasonable or economic use.

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

Options assessment

Extent Heritage (2016) (Attachment 7); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade).

⁴ SMEC Structural reports following vehicle strike #1 19 January 2024 and #2 7 February 2024

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁵ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

Proposed heritage impact

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in poor condition and at end of life causing critical life-endangering public safety risks, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified above, demolition is the only feasible option now open to TfNSW.

Proposed mitigation measures

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life-endangering public safety risks.

Mitigation measures are set out in section 5 to support this application.

⁵ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

Statement of Heritage Impact (SOHI)

Lismore Railway Underbridges

Relevant listings: State Heritage Register #01044; Lismore City Council LEP 2012 (A7, A8, A13 and A10); UGLRL s170 Register 2022 (Lismore, Leycester Creek Underbridge AKA Coleman's Bridge and Lismore, Leycester Creek Underbridge Approaches).

Address: Terania Street, Alexandra Parade, Union Street, Leycester Creek.

Statement of heritage impact for:

Removal of underbridge spans at Terania Street, Lismore.

Prepared by:

This SOHI has been prepared by TfNSW Miriam Stacy, Heritage Specialist and Felicity Barry, Senior Environmental Officer, (Heritage) who have worked with the TfNSW bridge project management team during the development of this document.

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Prepared for:

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Date: 8 March 2024

Issue: Version 1.0

1.0 The heritage item

1.1 Site Description

The following site description is taken from the State Heritage Register listing⁶ for the Lismore railway underbridges. Figure 1.1 includes a location plan with the location and names of the underbridges within Lismore City.

1.1.1 Description

STRUCTURES underbridges - steel, 3 span truss between Lismore and North Lismore 836.8km, 1894
viaducts - 3 sets of timber viaducts over flood plain, 837.1 to 837.7km, 1x12,1x16, 1x17 spans, 1894.

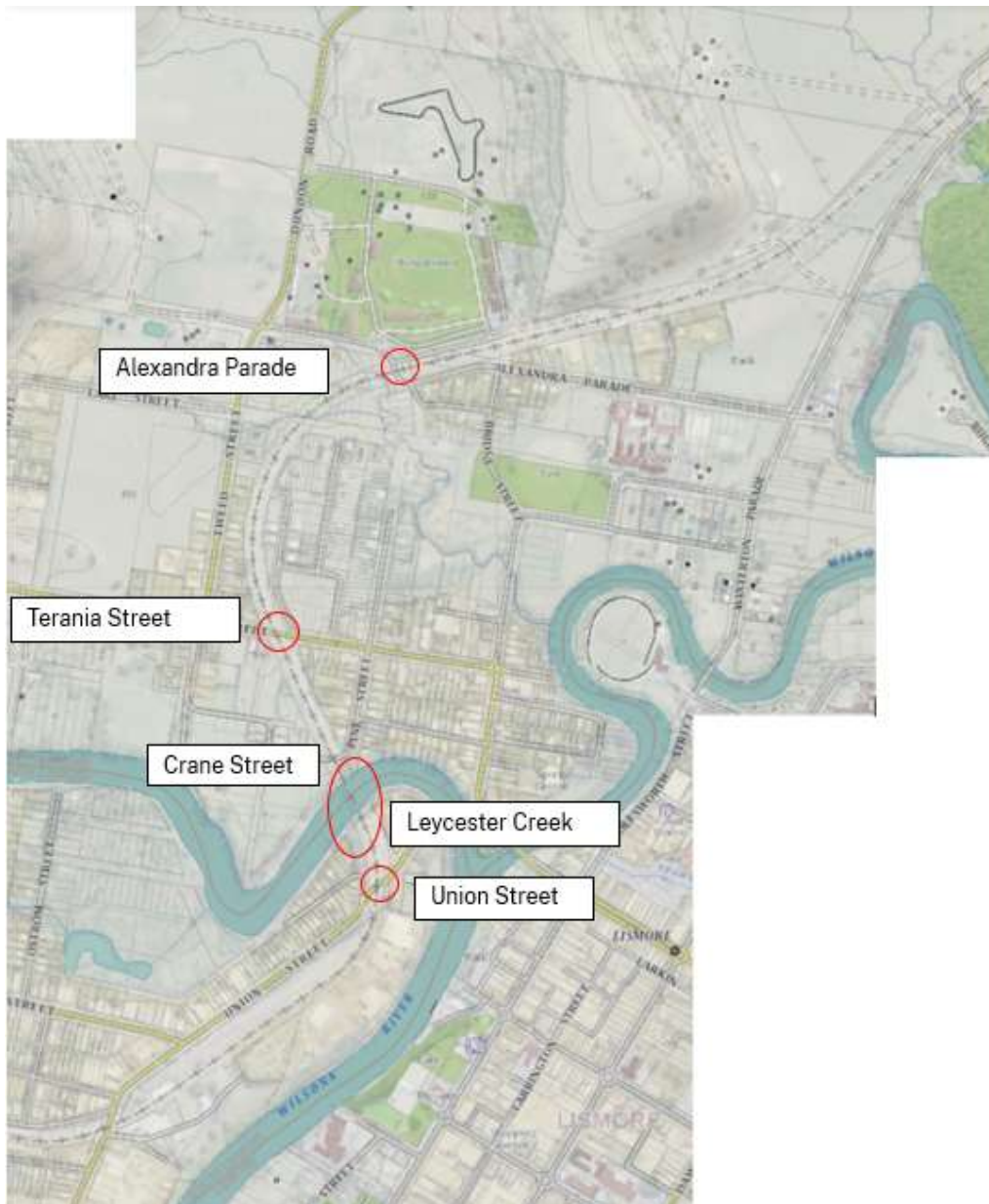


Figure 1.1 Location Plan (Topographic map) of Lismore and North Lismore showing the locations of the Lismore railway underbridges. Source: NSW Sixmaps, accessed February 2024.

⁶ [HMS -ViewItem \(nsw.gov.au\)](https://www.nsw.gov.au) accessed February 2024

1.1.2 Heritage Item

The Lismore railway underbridges State Heritage Register listing includes four bridges (Alexandra Parade, Terania Street, Leycester Creek including Crane Street, and Union Street) that were built as part of the Casino to Murwillumbah rail Line. The listing includes three timber girder bridges, a steel pratt truss crossing Leycester Creek. The listing includes but does not discuss two plate web girder bridges in its curtilage. These plate web girder bridges are connected to the timber viaduct at Union Street and at Crane Street connected to the Leycester Creek steel Underbridge.

1.1.3 Use

The Lismore railway underbridges have not been in use since the cessation of the Casino to Murwillumbah Line operations in 2004.

1.1.4 Condition

In 2020, Bill Phippen, heritage structural engineer and timber truss and girder bridge specialist (retired) notes in the Preface to his book:

... while none of the {timber} railway bridges are in service and the few survivors of an already small number are in such a poor state of repair that public safety may require their demolition, if nature does not intervene first by rot or flood.⁷

Terania Street underbridge condition in 2024

Consultant heritage bridge engineers, Focus Bridge Engineering (FBE), in their Strategic Options report for the Lismore railway underbridges (July 2023), (Attachment 2) assessed the Terania Street underbridge as being in **predominantly poor condition**, noting that the assessment **does not account for {future} vehicular accidents that would damage the piers and cause local and global structural instability.**⁸ This report **recommends demolition as the preferred option**⁹.

FBE also prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**¹⁰, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.*

In January and February 2024 following two further vehicle accidents at the Terania Street underbridge, consultant engineers SMEC were engaged to provide updated reports on **structural soundness following impact of vehicle strike**. (Attachments 4 and 5) These reports focus on public safety risks to road users and **recommend demolition of the spans over the existing road lanes.**¹¹

Following further vehicle strike in February 2024, further mitigation works are being considered (March 2024) to reduce traffic speed to 20km/hour by the introduction of chicanes and rumble tracks as traffic calming devices, to reduce, but not eliminate the risk of further vehicle strike resulting in potential bridge collapse.

⁷ *The Timber Truss Railway Bridges of New South Wales*, self-published by Bill Phippen, 2020, preface, page 7.

⁸ *Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report*, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B, Appendix B - Condition Assessment

⁹ FBE Strategic Options report, 2023, page 15

¹⁰ *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002* (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

¹¹ *SMEC report on structural soundness following impact of vehicle strike #1 – 19 January 2024 and SMEC #2 – 7 February 2024*

FBE have assessed the condition of elements of the Terania Street underbridge as percentages of the overall structure, as set out in the table below. **FBE conclude that 50% of the structure is in a predominantly poor condition, in large part owing to rotting, split, termite infestation and damaged timber members. These members are typically transoms, trestle piles, trestle branches, corbels and girders. Connections and bracing elements are typically loose and for the transoms non-functional.**¹²

Table B-7 Terania Street Underbridge estimated condition summary (Source: FBE)

Bridge Element Grouping	Condition as percentage of total amount of element				Failure Risk and Types		
	As-built	Good	Fair	Poor	Element	Risk	Failure Type
Superstructure	0	15	28	57	Girder	Med. - High	Flexure – Midspan
					Girder	Medium	Shear – Support
					Transom Ties	High High	Flexure Section Loss
Substructure	0	12	37	51	Corbel	Med – High	Flexure – Ends
					Corbel	Medium	Shear – At Support
					Trestle	Med. - High	Splitting/ Crushing
Foundations	0	39	40	20	Pile	Low	Crushing
Overall Condition	0	17	33	50			

The superstructure is in a predominantly poor condition and has a high risk of transoms falling off along with bolted connections. The main girders are also a medium to high risk of failure primarily owing to rotting and termite infestation. The substructure has more detrimental global risks to the underbridge due to the poor condition of the trestle piers, corbels and headstocks. The piles are typically split or splitting with many having rotten or are infested with termites. The assessment does not account for vehicular accidents that would damage piers and cause local and global structure instability. The foundations are typically seen and estimated to be in a good to fair condition.

Figure 1.2 Condition Assessment for Terania Street underbridge, FBE Strategic Options 2023, page 15

¹² Condition Assessment for Terania Street underbridge, FBE Strategic Options 2023, page 15



Figure B-13 Terania Street – Evidence of global rotation of Pier 6 together with failed pile (Source: FBE)



Figure B-15 Terania Street – Splitting & weathering of piles at Pier 11 (Source: FBE)



Figure B-14 Terania Street – Rotten and damaged east corbel at Pier 6 (Source: FBE)



Figure B-16 Terania Street – Loose connections & weathered beams (Source: FBE)



Figure B-17 Terania Street – View over looking south (Source: FBE)

Figure 1.3 Photographs showing typical condition of the Terania Street underbridge (July 2023. Source FBE, Lismore railway underbridges Strategic Options.

Two further recorded vehicle strikes occurred in early 2024 to the Terania Street underbridge. The following additional structural assessments were provided by SMEC, consultant engineers to TfNSW.

SMEC report on structural soundness following impact of vehicle strike #1 – 19 January 2024

It should be noted that the SMEC report prepared for TfNSW, is focused on affected spans and *managing public safety* risks arising from potential bridge failure on road traffic passing under the Terania St underbridge, while FBE have focused on the structural soundness of the whole underbridge.

Impact loading was not checked but it is highly unlikely that the bridge can resist the impact load case specified in ASS100.2. SMEC note that this is not a change and it is also unlikely that the bridge could resist this loading before it was damaged.

Recommendations

Given the poor condition of the bridge and the damage sustained from repeated truck impacts, SMEC recommends that the spans over the road be demolished as a matter of urgency.

SMEC report on structural soundness following impact of vehicle strike #2 – 7 February 2024

Once again, it should be noted that the SMEC report been prepared for TfNSW is focused on affected spans and *managing public safety* risks arising from potential bridge failure on road traffic passing under the Terania St underbridge, while FBE have focused on the structural soundness of the whole underbridge.

Based on the inspection, the key concerns identified were:

1. As before the bridge is stable when just standing, but a large impact would likely cause progressive collapse of the structure. The stability of the piers is the main concern. While they are protected by barriers, if the superstructure is hit by a large enough impact, a pier may fail. Once one pier fails, progressive collapse of the bridge is likely. The magnitude of such an impact is difficult to stipulate without undertaking some analysis.
2. The corbel mentioned in item 2 above has minimal restraint and therefore if it or the girder it supports are hit with sufficient force, the corbel could fall out, causing the middle beams to also fall. This obviously presents a risk to any vehicles passing underneath (if the road were reopened).
3. There remains a risk that the bridge could be hit again.

Recommendations

Given the regularity that this bridge is hit and the poor condition, it is our view that the spans of the bridge over the road should be removed. However, the stability of the bridge as a whole would need to be determined through a demolition assessment as it may be necessary to demolish the entire structure if individual spans are removed due to global stability issues.

The SMEC reports note and recommend:

- **The key concern is that a large impact would likely cause progressive collapse of the structure.**
- **Given the poor condition of the bridge and the damage sustained from repeated truck impacts, SMEC recommends that the spans over the road be demolished as a matter of urgency*.**

*However, it should be noted that SMEC were only engaged to assess and report on road traffic affected spans and not the entire length of the Terania Street underbridge.

1.1.5 Setting

The setting for the Lismore railway underbridges falls largely within the urban town settlement (Union Street) and also on the town fringes into open flood plains/farming lands near Terania Street and Alexandra Parade, adjacent to the Lismore showgrounds entry.

The setting for the underbridges has been disrupted due to major flooding in Lismore in 2021 and 2022, where repeated flooding which has left water damaged houses unsuitable for occupation, and in some instances either abandoned, demolished or relocated as part of the NSW Government buy back program, the NSW Government Resilient Homes Program.

In 2023 and 2024, the setting for the Lismore railway underbridges continues to change radically. Existing housing is either being retained and raised above flood levels, demolished or relocated away from flood prone low lying areas near the viaducts, to higher flood free land identified within Lismore, generally outside the setting and viewshed of the Lismore railway underbridges.

1.1.6 State heritage items located in the vicinity

A search of the State Heritage Inventory (see below) shows there are five SHR listings in Lismore, refer to table below. This includes the Lismore Railway Station group in Union Street, Coleman's road bridge over Leycester Creek which are within the vicinity, but not in the viewshed of the Lismore railway underbridges.

It is also worth noting the SHR listing for the High Conservation Value Old Growth forest, which is now protected as a state heritage item, and would in the past, have supplied readily available old growth hardwood timbers for the construction and maintenance of the railway underbridges at Lismore and across NSW.

Item Name ▲	Location	Local Government Area	Type	SHR ID
📍 Coleman's Bridge over Leycester Creek	Main Road 544 LISMORE NSW 2480	Lismore	Built	01463
📍 High Conservation Value Old Growth forest	Upper North East Region COFFS HARBOUR NSW 2450	Coffs Harbour	Landscape	01487
📍 Lismore Railway Station group	North Coast railway LISMORE NSW 2480	Lismore	Complex / Group	01180
📍 Lismore railway underbridges	North Coast railway LISMORE NSW 2480	Lismore	Built	01044
📍 Tullahoma	562 Ballina Road GOONELLABAH NSW 2480	Lismore	Built	00051

Table 1 State Heritage Register listings for Lismore LGA Source: State Heritage Inventory

1.1.7 Heritage Listings

Table 2 includes heritage listings for the Lismore railway underbridges.

Table 2 Heritage Listings			
Heritage listing	Name	Listing Date	Bridges included
State Heritage Register (SHR #1044)	Lismore Railway Underbridges	April 1999	Alexandra Parade Terania Street Leycester Creek/Crane St Union Street

Local Environmental Plan (Lismore LEP 2012)	North Lismore Railway Viaducts (A7); (A8); (A13)	2012	Alexandra Parade Terania Street (also included in 2000 LEP)
	Railway Bridge (A10)		Union Street Leycester Creek
S170 Heritage and Conservation Register (UGLRL)	Lismore, Leycester Creek Underbridge Approaches (A8; 1044)	13.06.2022	Terania Street Leycester Creek Union Street Alexandra Parade

1.1.8 Site and its context

Terania Street underbridge (12 spans), the site subject to this application, is circled in yellow on the SHR map below. It is located in Lismore forms part of the SHR listed Lismore railway underbridges.

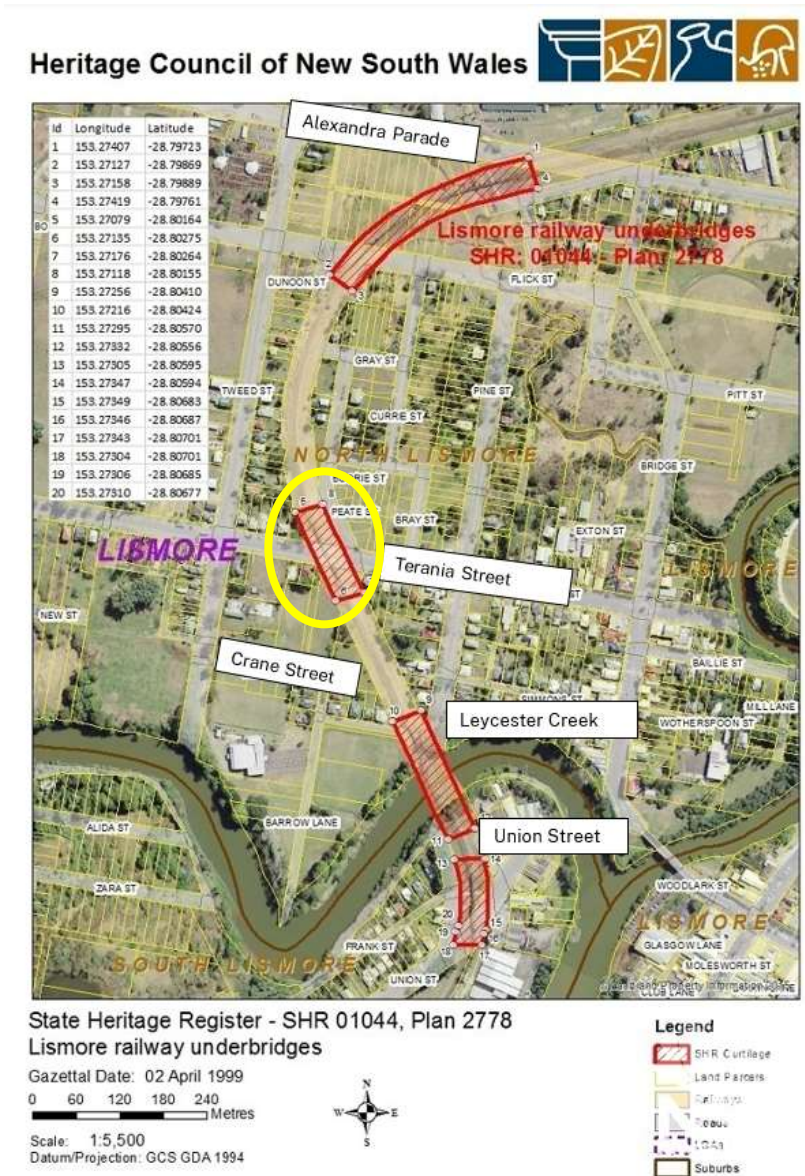


Figure 1.4 SHR boundary listing plan for Lismore railway underbridges. Terania Street underbridge is circled in yellow. Source: State Heritage Inventory, accessed February 2024

1.1.9 Topography

Lismore is located in the Northern Rivers Region of NSW and an estimated population of 44,276 in 2022¹³. Lismore is situated on the flood plains at the junction of Leycester Creek and Wilsons River. The town is surrounded by hilly topography forming a basin and catchment of these two water systems. During times of heavy rain, the basin fills up as the movement of water is contained resulting in major town flooding.

Although no other major environmental hazards generally affect the area, Lismore is renowned for frequent floods. Factors such as building in flood prone areas and the increasingly severity of weather events (intensity and frequency) have exacerbated flooding in the Lismore area.

The Lismore CBD, East, South and North Lismore, as defined as the extent of probable maximum flood (PMF¹⁴) has a long history of documented flood events¹⁵. A flood levee (10.7m in height) was installed in the Lismore CBD in 2005, and this was topped by the 2017 and subsequent floods.

The 2022 flood event reached an unprecedented 14.4 metres (47 ft). Prior to this the worst floods were in 1954 and 1974, when waters rose to a height of 12.1 metres (40 ft), with a number of others recorded as exceeding the stated height of the levee wall protection.¹⁶

The Casino Murwillumbah rail line crosses the flood plain via a series of railway bridges which are now known as the Lismore railway underbridges. The Real Levels for the Lismore Railway Underbridges vary from 11-13m AHD (or above sea level), refer to the figure below.

The Terania Street railway underbridge was topped out by flood waters, causing obstructions to the SES and disaster risk management emergency egress, rescues and recovery along Terania Street, which is a nominated Evacuation Route.

¹³ Lismore Council (.idcommunity demographic resources) based on ABS data, accessed February 2024, [Population and dwellings | Lismore City | Community profile \(id.com.au\)](#)

¹⁴ Engeny Water Management, Draft Lismore Floodplain Risk Management Study, report prepared for Rous County Council dated 2021, [Lismore Floodplain Risk Management Study - Report - Datasets - NSW Flood Data Portal](#)

¹⁵ [Why can floods in Northern Rivers towns like Lismore and Byron Bay come in clusters? - ABC News](#), Margaret Cook for ABC News, 31 March 2022, accessed February 2024

¹⁶ [Lismore, New South Wales - Wikipedia](#) that references [Flood information Lismore City Council \(nsw.gov.au\)](#), accessed February 2024

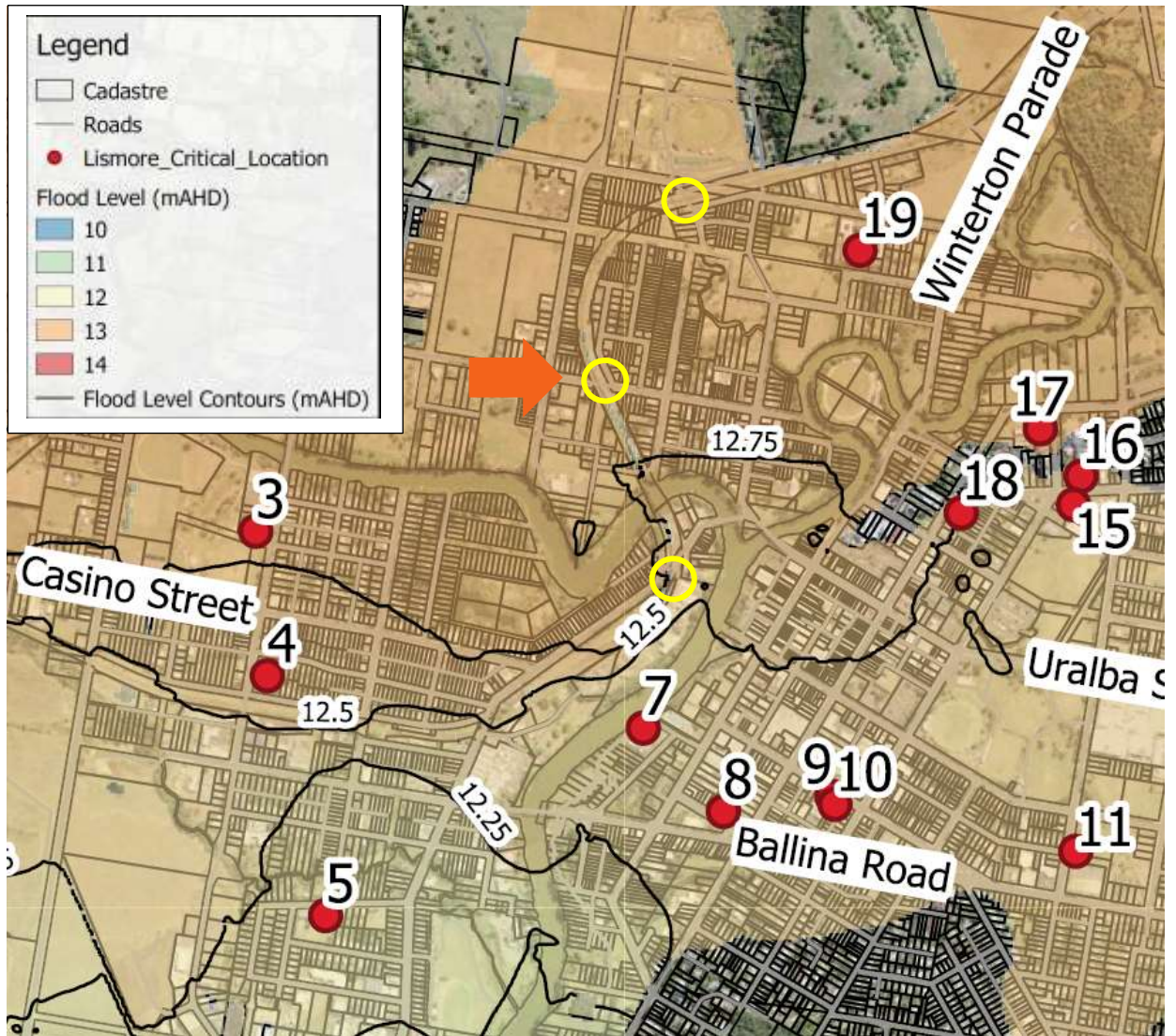


Figure 1.5 Part of the Vulnerable Land Uses and Infrastructure showing the Real Levels in Australian Height Datum of the Lismore Area. [0m AHD is sea level]. Source: *Final Lismore Floodplain Risk Management Study*, prepared by Engeny Water Management dated 2021

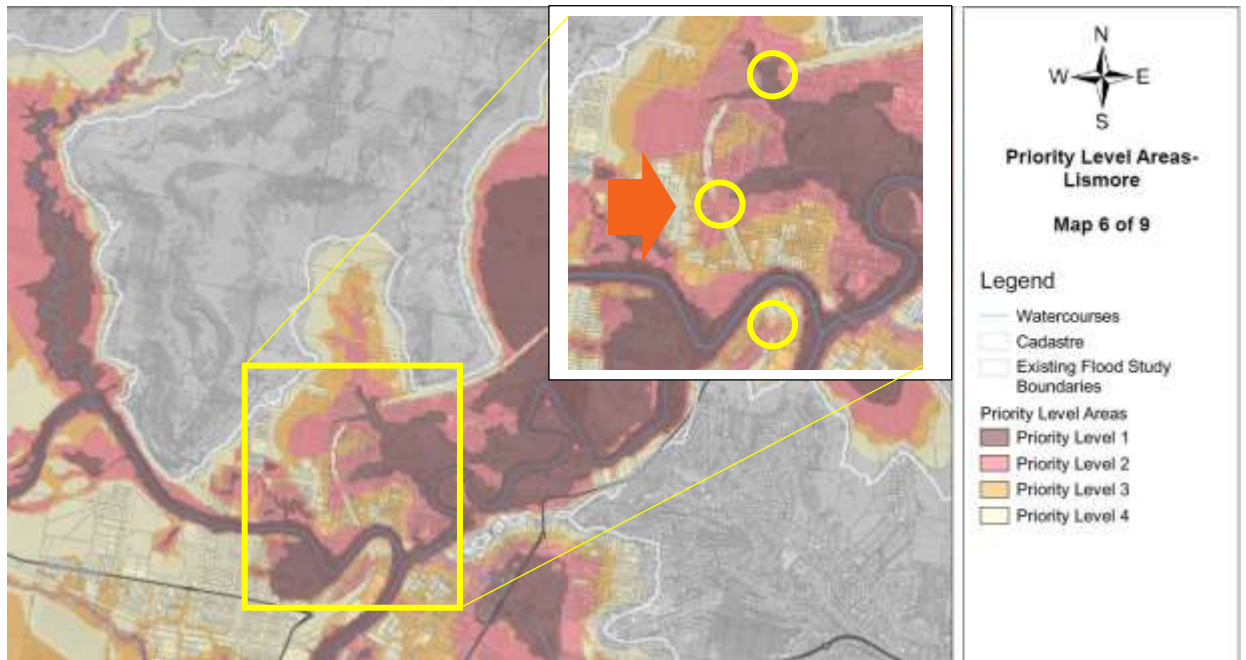


Figure 1.6 The map shows each of the Lismore Railway underbridges (circled yellow) are located in Priority Level Areas 1 and 2 where the Resilient Homes Program applies. Source: NSW Government Flood Hazard Information, Refer to Lismore Map 6 of 9 showing Priority areas, [Flood Hazard Information | NSW Government](#), accessed February 2024

In 2022, responding to severe impacts from major flood events repeatedly affecting the residents of Lismore, the NSW Government established the Lismore Flood Recovery Planning Package which includes a buy back program for property in Priority areas.¹⁷

1.1.10 Character and sustainable use of resources

The railway line through Lismore is characterised as a series of raised embankments forming the permanent way, combined with a series of underbridges over the low lying open flood plain and creeks. The rail line was surveyed and engineered to provide a stable and elevated level path of travel for the train tracks and train operations.

Originally built in the 1890s, the Lismore underbridges were constructed using timber girder beams supported on a series of closely spaced timber trestle piers in old growth hardwood timbers. Timber beam or timber girder construction is a simple bridge type that relies on a single support point, distributing load along its length as an integrated system. The span length is limited by the carrying capacity of the shorter girder beams and does not have the load carrying advantages of a sophisticated trussed beam system.

*The earlier timber truss bridges, designed between the 1850s and the 1880s, made use of vast forests of large, strong and durable NSW hardwoods. ... once the comparative strength and durability of these hardwoods became known around the world, so much timber was exported that these earlier types of timber truss bridges could no longer be built. Bridges designed in the 1890s and 1900s still made use of the future management options and opportunities strength and durability of the local hardwoods, but timber sizes were limited to these smaller and shorter sections still readily available.*¹⁸

¹⁷ [Lismore Flood Recovery Planning Package | Planning \(nsw.gov.au\)](#), NSW Government, Resilient Homes Program, accessed February 2024

¹⁸ *The Timber Truss Bridge Book*, Lenore Coltheart and Amie Nicholas, (Sydney: Roads and Maritime Services), 2019, 32

The Lismore railway underbridges were maintained during their operational use, with old growth hardwood timber, at a time when these timbers were readily accessible and cost effective.

Today, Forests NSW manages the two million hectares of state forests sustainability to balance timber production, recreational activities and the conservation of wildlife. The large section, old growth, native hardwood timber used in bridge construction is very difficult to obtain from these sustainably managed state forests, due to the rarity of trees of the correct species of sufficient height and age. Moreover, even when suitable logs exist, they are often cut into small marketable lengths for buildings, rather than set aside for use in timber bridges.¹⁹

In 2024, Transport considers using sustainably sourced materials as a key component of its responsible management of Transport assets.²⁰

Future Transport Strategy 4.4 Use more sustainable materials: ... *As we plan the future of transport in NSW, we must take factors such as the role transport, climate change, population and economic shifts, shocks and stresses into account. In doing so, we will create successful places and make our transport network and communities resilient. To reduce the impact of climate change and improve the liveability of communities, we will transition to net zero emissions and seek to minimise the environmental impact of transport with actions for decarbonisation and sustainable infrastructure design.*



Figure 1.7 1890s image showing clear felling of local timbers at Lismore, in the immediate vicinity of timber bridge construction that was underway. Source: *Construction of the Lismore – Tweed Railway Line, c1890s* sourced from the Richmond Rivers Historical Society, Folder Transport – Railways, image 52 as cited in Extent Heritage, 2017, *Lismore Underbridges (UBN62837A & UBN62837C) Interim Statement of Heritage Impact FINAL*, prepared for John Holland Rail Pty Ltd, p26

¹⁹ Coltheart and Nicholas, *The Timber Truss Bridge Book*, 2019, page 99

²⁰ [Future Transport Strategy \(nsw.gov.au\)](https://www.nsw.gov.au), Transport for NSW, P4.4: *Use more sustainable materials*, pages 78,80-81, NSW Government, 2022, accessed February 2024

SOHI assessment of sustainable outcomes

Partial retention, rebuilding or reconstruction are not viable options and do not address public safety risks and are not good or sustainable conservation outcomes.

These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

1.1.11 The proposed works area – Terania Street

The proposed works area for the Terania Street underbridge is shown on the following aerial photographs and street views in January 2024. Also refer to the attached works documentation. (Attachments 1a and 1b)



Figure 1.8 showing Terania Street underbridge looking west. Source TfNSW January 2024



Figure 1.9 Aerial view of Terania Street underbridge. Source Aerial imagery, Six maps, September 2012

1.2 Site summary history

1.2.1 Documented history

The Casino to Murwillumbah Line on which Lismore is located, was built progressively over several stages. The first railway constructed to service the northern rivers of NSW was built to main line standards extending from Murwillumbah to Byron Bay and then onto Lismore in 1894, moving goods to the port at Byron Bay. The rail line between Lismore and Casino was completed in 1903 to form a continuous connection from Casino to Murwillumbah.

Built in the constrained financial and social times of the 1890s, early 1900s and World War 1 through to the 1920s, many of the railway station buildings and bridges were constructed in readily available and affordable hardwood timbers.

Track formation for this line required the construction of major bridges over substantial rivers, along with tunnels through mountainous regions in the north east corner of NSW. There are numerous extant timber bridges on the Casino Murwillumbah line over valleys and smaller river tributaries and catchments.

The completion of the North Coast Line from Casino through to Kyogle and onto Brisbane, downgraded the Casino to Murwillumbah to branch line status. The Casino to Murwillumbah Line continued for just over 100 years, ceasing operations in 2004 and was replaced with coach based services.²¹ To date, the line has not been formally closed in Lismore.

The railway line runs through the city of Lismore dividing the town north south. The line crosses over the Leycester Creek and adjoining Crane Street, Terania Street (a regional classified road connection to the towns of Kyogle and Nimbin), Alexandra Pde (access to the Lismore showground) and Union Street (a regional classified road connection to Bruxner Highway into South Lismore over Leycester Creek to Bridge Street and Lismore CBD).

1.2.2 Chronological development and previous physical changes

During the operation of the Casino to Murwillumbah Line to ensure the structural capacity, the underbridges were regularly maintained and repaired using replacement timber members.

Since cessation of operations in 2004, bridge management has focused on regular inspection and monitoring regimes. Recent works have addressed public safety and traffic safety requirements. Works include safety fencing to prevent unauthorised access, line markings and traffic signage alerting traffic height limits, and warning signage alerting public safety risks.

Known previous works to the Lismore railway underbridges are included in Table 3 below. (Note: No works are included in this application for Alexandra Pde, Union St, Crane St or Leycester Creek underbridges (shaded dark grey)).

²¹ [Murwillumbah Branch \(nswrail.net\)](https://www.nswrail.net), accessed May 2023 and February 2024.

Table 3 Chronological development and previous physical changes – Lismore railway underbridges

Underbridge	Type of bridge	Construction date	Modification date	Number of Spans	Number of Trestles or Piers
Terania Street	Timber girder	1894	<p>1994-1995 Proposed but not executed demolition and replacement with concrete bridge</p> <p>2019-2020 (Barrier fencing to underbridges on rail corridor)</p> <p>Oct 2023 (Stabilisation propping to piers 6,7; concrete barriers piers 4,5,6)</p> <p>Jan 2024 (Emergency works to girder beams between spans 6 and 7 and at corbels)</p>	12	13 timber trestles

1.3 Physical Analysis

The application is seeking to demolish the underbridge located at Terania Street, from abutment to abutment.

In January and February 2024, two vehicle strikes at Terania St resulted in road closure (February to March 2024) due to structural engineering concerns about the stability of the underbridges. TfNSW must consider recommendations for the future management of these failing assets and actively manage public safety risks for road and pedestrian users. Road closures are also majorly affecting local business operations.

The timber girder bridge design has low height clearance and narrow lane widths between piers that impedes road users, and disaster risk management egress and recovery posing life-endangering public safety risks.

1.3.1 Asset Condition

Terania Street underbridge condition in 2024 is discussed in section 1.1.4 Condition

Consultant heritage bridge engineers, Focus Bridge Engineering (FBE), in their Strategic Options report for the Lismore railway underbridges (July 2023), (Attachment 2) assessed the Terania Street underbridge as being in **predominantly poor condition**, noting that the assessment **does not account for {future} vehicular accidents that would damage the piers and cause local and global structural instability.**²² This report **recommends demolition as the preferred option**²³.

FBE also prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**²⁴, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category*

²² *Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report*, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B, Appendix B - Condition Assessment

²³ FBE Strategic Options report, 2023, page 15

²⁴ *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0)*, prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.

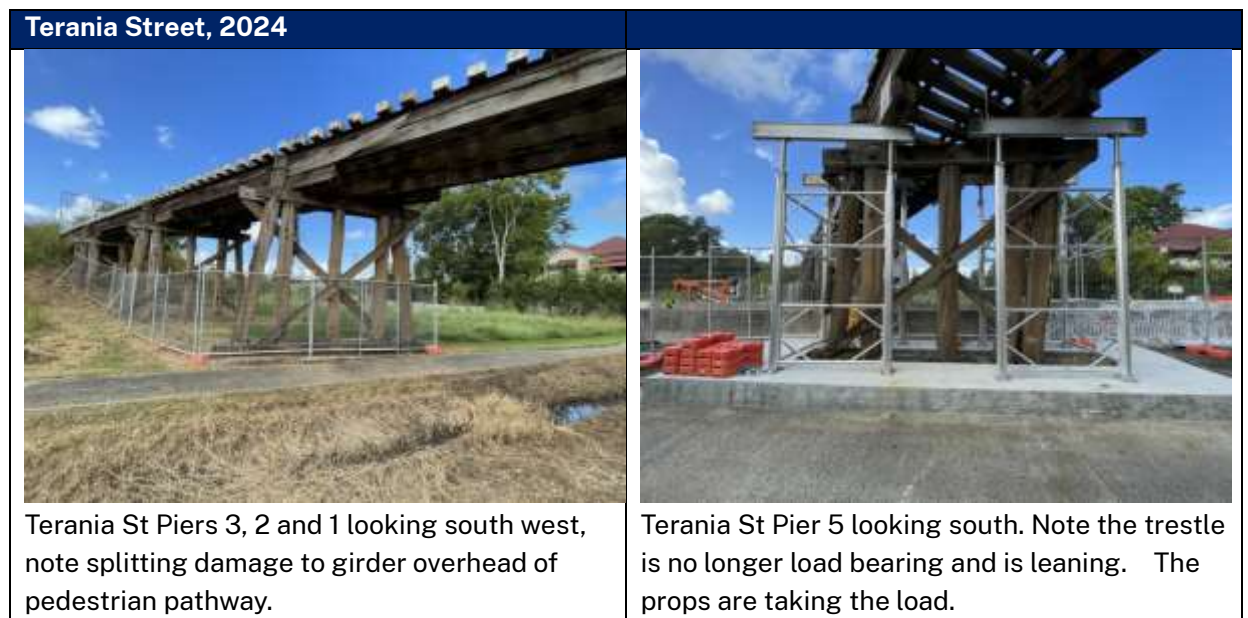
FBE have assessed the condition of elements of the Terania Street underbridge as percentages of the overall structure, as set out in the table below. **FBE conclude that 50% of the structure is in a predominantly poor condition, in large part owing to rotting, split, termite infestation and damaged timber members. These members are typically transoms, trestle piles, trestle branches, corbels and girders. Connections and bracing elements are typically loose and for the transoms non-functional.**²⁵

In January and February 2024 following two further vehicle accidents at the Terania Street underbridge, consultant engineers SMEC were engaged to provide updated reports on **structural soundness following impact of vehicle strike**. (Attachments 4 and 5) These reports focus on public safety risks to road users and **recommend demolition of the spans over the existing road lanes.**²⁶

Following further vehicle strike in February 2024, further mitigation works are being considered (March 2024) to reduce traffic speed to 20km/hour by the introduction of chicanes and rumble tracks as traffic calming devices, to reduce, but not eliminate the risk of further vehicle strike resulting in potential bridge collapse.

Life endangering public safety risks arising from further vehicle strike can only be eliminated by road closure or bridge demolition. Lismore City Council has advised TfNSW that road closure is unacceptable and have requested the non-operational rail bridges be demolished. (refer to Attachments 9 and 10)

Select photographs are included below, with more detailed images included in the *BridgeDoctors Level 2 Condition Assessments* dated September 2023 for Terania Street underbridge.



²⁵ Condition Assessment for Terania Street underbridge, FBE Strategic Options 2023, page 15

²⁶ SMEC report on structural soundness following impact of vehicle strike #1 – 19 January 2024 and SMEC #2 – 7 February 2024



Figure 1.10 Terania Street underbridge showing condition. Source Bridgedoctors September 2023

1.3.2 Impact on the Lismore road network and business operations

The Casino Murwillumbah Rail Line runs northerly from Lismore through to North Lismore and imposes height restrictions to traffic running east-west in North Lismore. This means that road closure due to rail underbridge impacts the Lismore road network by diverting all vehicles, including trucks and buses, onto alternative roads that have low clearance and lane width restrictions due to overhead rail underbridges and trestle supports. The road closures and low height clearances are having major impacts on operations of local businesses and truck movements.

Road safety hazards/risks for the Lismore railway underbridges have been identified in the *Road Safety Audit for the Lismore Rail Viaducts, November 2022 (Ardill Payne & Partners for Lismore City Council)*. (Refer below and Attachment 8)

Transport for NSW is required under section 163 of the Roads Act 1993 to keep a record of all classified roads. Terania Street is identified as regional classified main roads, and funding is provided by TfNSW to Lismore City Council for their management.

1.3.3 Risk assessment and public safety

Two risk assessments have been prepared to assess the public safety risks of the Lismore railway underbridges:

- *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0)* prepared by Focus Bridge Engineering, heritage engineering consultants to UGLRL in October 2023.
- *Road Safety Audit for the Lismore rail Viaducts* prepared by Ardill Payne and Partners for Lismore City Council, November 2023.

The Focus Bridge Engineering Risk Assessment recommends the demolition of the underbridge at Terania Street. The Executive Summary²⁷ states:

²⁷ Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'b' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.

The FBE Risk Assessment table²⁸ for Terania Street recommends:

Underbridge	SFAIRP Control	Comment
Terania Street	Entire demolition	Due to the nature and number of 'very high' and 'high' risks, immediate action is required. Implementation of a road closure/detour would mitigate risk in interim until demolition takes place

Table 4 FBE Risk Assessment, 2023. Page iii

The Road Safety Audit assessed road safety priorities for the Lismore Railway underbridges, assigning levels of risk against the likely severity of the impact to Austroads standards. High, Medium and Low road safety risks were identified for the Terania Street underbridge.

When the RSA was prepared all roads in Lismore were open (November 2022). The Road Safety Audit Findings²⁹ identified safety risks/hazards: what is potentially dangerous about the road or what could lead to crashes occurring or injury resulting.

In 2024, since completion of the RSA risk assessment, the risks have increased due to further vehicle strikes to the Terania Street underbridge.

RSA Terania Street underbridge recommendations:

High and medium risks of:

- **Vehicle collision with other vehicles or with viaduct pylons** requires road edge clearances, outer lane delineation, **narrow road widths**; delineation and protection of safety barrier ends; lane merging priorities.

Low risk of:

- Vehicle strike due to **minimal vertical clearance**. Warning and high vehicle detour routes must be in place to reduce collision with the viaduct.

In 2022 the RSA assessed the minimal vertical clearance at Terania St as a low risk leading to crashes occurring or injury resulting. However multiple vehicle strikes due to low height clearances are likely to increase this risk classification and treatment approach.

(Note: In order to reopen the road after two vehicle strikes, TfNSW are intending to introduce traffic calming devices to reduce vehicle speed to 20km/hour as an interim measure pending a decision on bridge removal. (March 2024)

Noting the RSA recommended Treatment Approach below³⁰:

²⁸ Lismore Railway Bridges Risk Assessment, FBE, 2023, page iii.

²⁹ Lismore Railway Road Safety Audit, Ardill Payne & Partners, 2022, pages 15 to 23.

³⁰ Lismore Railway Road Safety Audit, page 16 to 18.

Level of Risk	Treatment Approach
Negligible	No action required.
Low	Should be corrected or the risk reduced if the treatment cost is low.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not high.
High	Should be corrected or the risk significantly reduced, even if the treatment cost is high.
Extreme	Must be corrected regardless of cost

Low height clearance and increased road safety risks

The rail underbridges are well below the minimum standard for overheight vehicle clearance of 4.6m³¹. All bridges under 4.6m require warning signage for OSOM (over size and over mass vehicles) to alert road users to the safety risks.

The underbridge at Terania Street is signposted with the following low height clearance restrictions:³²

- Terania Street 3.8m and 4.0m as the underbridge is sloping the lanes height restrictions vary

The low clearance under the rail underbridges requires OSOM vehicles to obtain permits to travel on these affected roads, or to detour to other regional roads that can accommodate their height. Terania Street is a regional roads that connects Lismore to Kyogle and Nimbin.

Narrow lane width and increased road safety risks

The sealed road width of 4.6 metres has approximately 2.1 metre wide lanes which is less than the 3.5 metre minimum width required by Austroads.³³

The width of the road lanes passing under the underbridge is limited by the span width and placement of the supporting upright piers. The lane widths are further reduced by the inclusion of safety barriers installed to prevent vehicle strike (Terania St). The narrow road widths are identified as a road safety risk in the Road Safety Audit at the Terania Street underbridge.³⁴

Traffic strike at the underbridges

The Lismore railway underbridges have a history of traffic strikes and accidents at Terania Street are summarised in the table below and updated from TfNSW data, February 2024³⁵.

³¹ Road Safety Audit for Lismore Rail Viaducts, prepared by Ardill Payne & Partners for Lismore City Council, November 2022, page 17.

³² Height restrictions as signposted on the underbridges, and Road Safety Audit for Lismore Rail Viaducts, prepared by Ardill Payne & Partners for Lismore City Council, November 2022

³³ Lismore Railway Viaducts Underbridges Stage 2: Strategic Options Report, Rev B, 2023 Focus Bridge Engineering Consulting, for UGLRL, Appendix C Table C-5, page 27.

³⁴ Road widths noted for the underbridges, and Road Safety Audit for Lismore Rail Viaducts, prepared by Ardill Payne & Partners for Lismore City Council, November 2022

³⁵ Lismore Railway Viaducts Underbridges Stage 2: Strategic Options Report, Rev B, 2023 Focus Bridge Engineering Consulting, for UGLRL, Appendix C Table C-5.

Table 5 Traffic strike at Terania Street underbrige

Accident Characteristics	Terania Street	Works to underbridge resulting from accidents
Recent Accidents between 2017-2021	1 accident	Severe damage to underbridge pier. Low clearance and safety signage
Severity	severe	
Accidents between 2000-2021	unknown	
Accidents 2022 - 2023	1 accident	
Accidents 2024	2 accidents	emergency works to stabilise timber girder/beam

Lismore City Local Flood Emergency Plan and evacuation routes

The Lismore City Local Flood Emergency Plan³⁶ identifies Terania St as a Regional classified main roads which is nominated by the NSW State Emergency Services as Evacuation Route for South Lismore. The route is used to assist community evacuation, rescue and recovery, and other response situations as necessary.

³⁶ *Lismore City Local Flood Emergency Plan*, Vol 3, Annexure G, page 69, endorsed August 2023, accessed February 2024

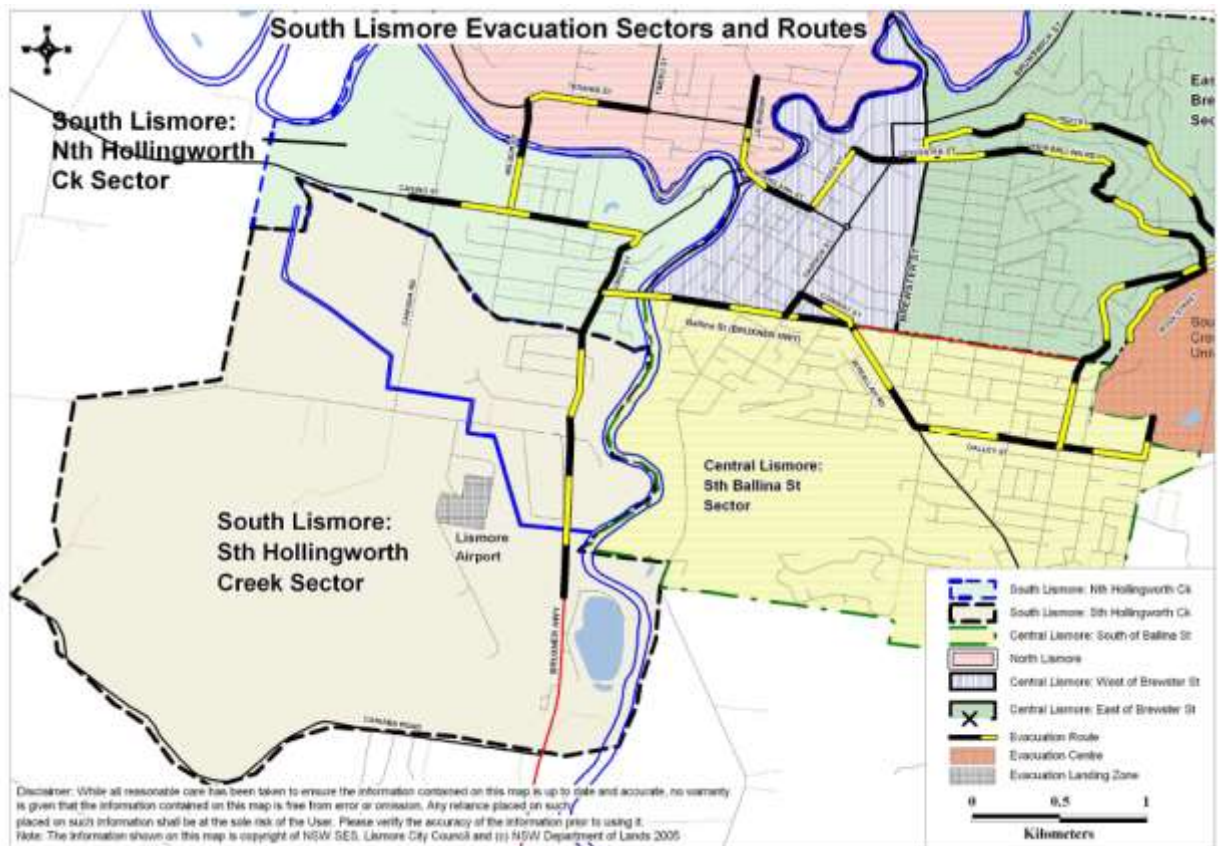


Figure 1.11 The Lismore City Local Flood Emergency Plan identifies Terania Street as Evacuation Routes for South Lismore, 2006 map included in the updated 2023 report. Source Lismore City Local Flood Emergency Plan August 2023.

Lismore City Council support for removal of underbridges

The Lismore City Council's (LCC) letter to TfNSW dated 27 October 2023, supports the demolition of Terania St underbridge as a matter of urgency. LCC also support the removal of the underbridges at Union St and Alexandra Pde due to safety concerns and impact on local businesses. (Refer to Attachment 9)

A further letter from LCC to TfNSW dated 15 February 2024, formally requests TfNSW to remove the railway bridge at Terania St, and to seek legal advice as to the fastest way to remove the underbridge, should TfNSW refuse to do so. (Refer to Attachment 10)

2.0 Significance Assessment

2.1 Statement of Significance

State Heritage Register listing statement of significance

The SHR listing has the following statement of significance for the Lismore Railway underbridges:

The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894.

The SHR listing boundary map is included in Section 1.1 Site and Context.

Heritage and Conservation Management Strategy statement of significance

The *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail in 2016, provides the following statement of significance for the Lismore railway underbridges.

<p>Lismore City Underbridges</p> <ul style="list-style-type: none"> - Terania St - Union St - Alexandra Parade - Winterton Parade 	<p>Lismore</p>	<p>Timber Girder – transom top</p>	<p>The Lismore bridges and viaducts are a fine set of bridges all in one location demonstrating the problems of building railways in this flood prone area dating from 1894. (SHR).</p> <p>The Leycester Creek Underbridge Approaches (Union Street underbridge and approaches) at Lismore provide an intact and durable example of late 19th Century railway bridge technology and a solution to the problem of building the railway line across a river and large flood plain close to a populated area. The timber approach viaducts and plate web girders date back to the inception of the Murwillumbah Line (originally the Lismore to Murwillumbah Railway), providing an example of the use of different materials for bridge construction in the 1890s and the introduction of technically sophisticated methods for the time. (s170)</p>
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Table 6 *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail, 2016, page 41.

2.2 Significance of the proposed work area

The Lismore railway underbridges are included in the SHR listing as part of the state significant heritage listing.

- There is no grading of significance for individual bridge elements in the SHR listing Description, or Statement of significance, nor in the *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail, 2016.
- Extent’s Strategy broadly identifies the relative lesser heritage significance of the timber girder bridges, compared with steel and masonry bridges; that the timber bridges were never expected to be retained in the long term; and that future management must acknowledge these inherent limitations in the bridge materials.
- The statement of significance and written description do not consider the visual setting of the Lismore railway underbridges or ‘end of life’ condition at time of listing.

3.0 Proposed Works

3.1 The proposal

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life endangering public safety risks.

The Scope of Works for Terania Street underbridge is summarised as:

- demolition and removal of all timber elements and rail tracks for the Terania St underbridge from abutment to abutment.
- Demolition and removal of all on-ground concrete piles in pre-disturbed areas.
- All works are inside the curtilage of the SHR item.
- There is no change of use proposed.
- At completion of works, the site will be made good and all existing road lanes repaved with bitumen.
- A recycling and reuse plan will be developed as part of the demolition documentation. This will only include suitable salvageable timbers. These will be marked before removal from the bridge and appropriate care taken during demolition.

Refer to Attachments 1a and 1b for the full set of works documentation.

Title	Author	Date
Terania Street Underbridge, Lismore Scope of Works	TfNSW	March 2024
Terania Street Underbridge, Works Plan and Elevation	TfNSW	March 2024

3.2 Background

3.2.1 Prelodgement consultation

- Transport for NSW approached Heritage NSW in September 2023 to request a meeting with Heritage NSW to discuss concerns with failing timber underbridges in Lismore and urgency for resolution due to proposals for imminent road closure at Terania St underbridge, with discussions between UGLRL and Lismore City Council.
- On 19 September 2023 an online meeting was held with Heritage NSW Executive Director Sam Kidman and A/Executive Director Sam Knight and TfNSW and HNSW officers. HNSW provided initial advice on documentation requirements for a 60 application for the Lismore rail underbridges.
- In October 2023, Heritage NSW invited TfNSW to present to the Heritage Council at the November meeting as part of the prelodgement discussion for the proposed works scope.
- TfNSW presented to the 1 November 2023 Heritage Council meeting on priority heritage timber rail bridges focusing on Lismore railway bridges. This was a prelodgement meeting

to discuss the proposed works scope. At this time TfNSW indicated that the scope of works had yet to be fully assessed and determined.

- Following the 1 November 2023 Heritage Council meeting, the Heritage Council noted the following Resolutions in its meeting minutes for the Lismore railway underbridges.
- In February 2024, due to two vehicle strikes causing further structural damage to Terania St (Jan and Feb 2024), TfNSW has determined that the escalating safety concerns requires an urgent and immediate s60 application for works to manage the public safety risks with an application to be lodged in March 2024.

Item 3.2 Six Timber Truss Bridges – pre lodgement consultation – Lismore Railway Underbridges section 60 application

Resolution 2023-37

The Heritage Council of NSW resolves to:

1. **Note** Transport for NSW's presentation and the safety concerns raised in relation to the Lismore Railway Underbridges.
2. **Express** an ongoing concern about the underfunding of the maintenance of their s.170 and SHR listed rail heritage assets.
3. **Seek assurance** from Transport for NSW that the cost required to adequately maintain all of its SHR listed heritage assets will be included in their Rail Heritage Strategy.
4. **Establish** a Working Group with representatives from the Heritage Council of NSW, Approvals Committee, Technical Advisory Panel and Heritage NSW, to consult with Transport for NSW during project scope development for Lismore and other identified bridges.
5. **Advise** Transport for NSW to prepare a scope of works for the total listed asset to enable a holistic understanding of impacts. The work scope should be prepared with the advice of a heritage engineer and in consultation with a project-specific Working Group.
6. **Advise** Transport for NSW that section 60 application for works should be accompanied by:
 - a. Independent heritage engineering advice
 - b. An options assessment and with clear, evidence-based justification for the preferred option. The analysis should include consideration of options for retention
 - c. Complete works documentation
 - d. Revised SHR curtilage recommendations relating to the proposal
 - e. Statement of Heritage Impact.
7. **Note** that the Heritage Council of NSW will be the determining authority of any section 60 applications for this work program, given the potential for substantial heritage impacts resulting in material affect and cumulative impacts across timber truss railway bridges in NSW.
8. **Provide** further comment by letter to Transport for NSW on the proposed long-term management strategy of bridge span removal for all four Lismore bridges.

Moved by Colleen Morris and seconded by Vanessa Holtham

Table 7 Item 3.2 Resolutions from the 1 November 2023 Heritage Council meeting. Source HNSW online

3.2.3 Consideration of alternatives

Extent Heritage (2016); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge, included in 4.1.7 *Options Assessment*.

SOHI preferred option is for full demolition.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes and the rebuilding of this non-operational rail structure to retain heritage significance would require the extensive use of old growth hardwood timber which is currently not available in the volumes required.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade) will bypass the timber underbridges.

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.³⁷ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

³⁷ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

4.0 Heritage Impact Assessment

4.1 Matters for consideration

The proposed scope of works set out in Section 3.1 and Attachments 1a and 1b is for the demolition and the removal of the SHR listed Lismore railway underbridge at Terania Street.

4.1.1 Fabric and spatial arrangements

Road traffic in the 19th century when the bridges were first built, could be accommodated by the design and construction of the underbridges. However, modern day transport needs can no longer be met by these earlier and now defunct bridge design standards.

The timber girder design and construction of the underbridges has low height clearance and narrow lane widths between piers that impedes road users, and disaster risk management egress and recovery and poses life-endangering public safety risks.

SOHI assessment

The proposed scope of works and resulting adverse impact to fabric and spatial arrangements of the Lismore railway underbridges must be supported for the reasons discussed in sections 1, 2, 3 and 4 of the SOHI.

TfNSW has considered mitigation measures and these are set out in section 5.

4.1.2 Setting, views and vistas

The Lismore railway underbridges are set in a flood plain and are low lying single storey horizontal and open structures that are not highly visible or dominant in their settings. The views and vistas to the Terania Street underbridge are generally restricted to close ups and middle distance views.

The following image demonstrates the limited nature of the views and vistas of this structure in its immediate setting, which is a combination of residential and rural environments. Its removal will have a minimal impact on its setting.



Figure 4.1 Photo of Terania Street underbridge taken at Tweed Street corner, showing a low lying single storey horizontal structure that is not highly visible along the street from any distance. (facing east). Source TfNSW February 2024

SOHI assessment of visual impact

The Extent Strategy assessment argues that any heritage value in the landscape for its visual impact is as an identifiable timber structure common throughout regional and rural NSW.

However, the SOHI has argued that the lack of visibility of the Terania Street underbridge from any distance is lost in its streetscape and rural setting, meaning the impact of its removal to the listed values is acceptable.

4.1.3 Current and future use

The existing timber railway underbridges are located on the non-operational Casino to Murwillumbah Line that ceased operations in 2004. Rail operations have been replaced with bus services and there is no plan to reopen the railway line.

The existing timber rail underbridge at Terania Street cannot not be retained insitu, maintained and repaired, or reused, and unable to carry live rail loads as it is structurally unsound.³⁸

Future community use

The current condition of the underbridge precludes upgrade and future community use.

The rail trail proposal for Lismore, in the same way as the recently completed Northern Rivers Rail Trail (Murwillumbah to Crabbes Creek, March 2023), is considering constructing an on ground trail path at the Terania Street underbridge or other underbridge location. The rail trail at present is only a proposal and has no formal NSW Government support.³⁹

Lismore City Council have confirmed *that the business case for Lismore to Crabbes Creek Rail Trail has been developed, submitted, and approved, with funding being sourced, with one section already submitted and waiting to hear on funding. The Casino to Bentley section construction is well underway and approximately 90% completed, with the Bentley to Lismore section being commenced in January 2024 and having 4km of trail installed to date and due to be completed by the end of 2024.*⁴⁰

³⁸ Bridgedoctors P/L Level 2 assessments for Alexandra Pde, Terania St and Union St, prepared September 2023.

³⁹ TfNSW Regional and Outer Metropolitan advice February 2024.

⁴⁰ Lismore City Council Business for Rail Trail, October 2023. LCC email confirmation provided to TfNSW on 26 February 2024.

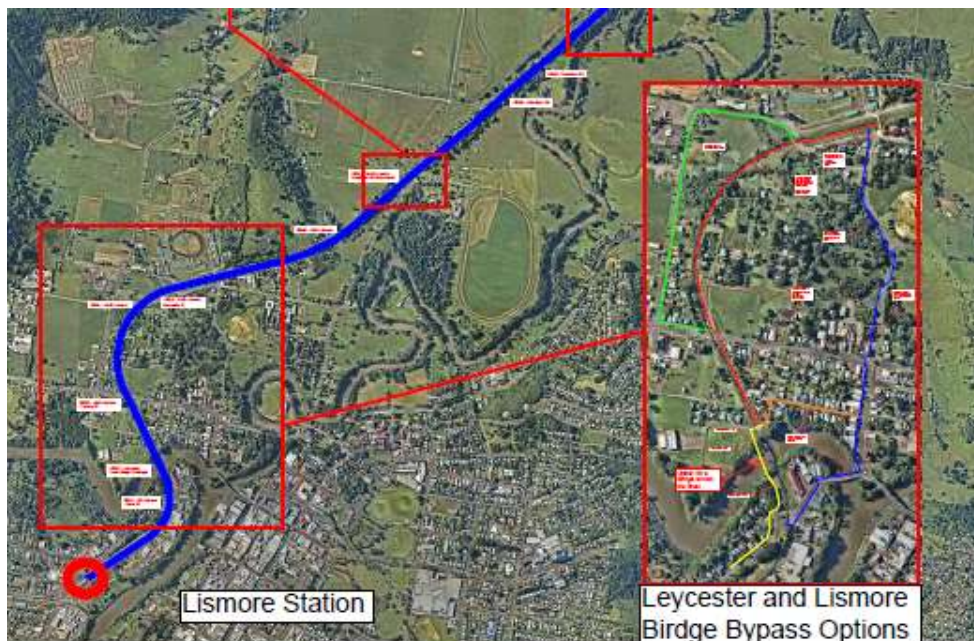


Figure 4.2 Lismore City Council Business Case, October 2023 shows options for the rail trail through Lismore. Source: LCC

There is also a competing proposal from the Northern Rivers Rail Ltd group to re-introduce rail services from Lismore to Yelgun. The group has been granted a license to undertake survey work to allow them to develop a feasibility study. Even so, any reintroduction of train usage would be unable to use the existing timber underbridge at Terania Street and should this proposal proceed, a replacement bridge will be required to upgrade the line to comply with current safety and design standards.⁴¹

SOHI assessment of future use

The Lismore City Council business case for the rail trail notes that the Lismore underbridge at Terania St will be bypassed, and as shown on the plan provided above., Figure 4.2.⁴²

There is a feasibility study in progress to re-introduce rail services, however the Terania Street underbridge will need to be demolished and replaced to comply with current rail safety and design standards.

There is no agreed future use for the non-operational Terania Street underbridge or timber underbridges at other locations in Lismore.

4.1.4 SHR listing, end of life condition and maintenance

The asset condition is considered in section 1.1.4 and 1.3.1.

SHR listing, end of life condition and maintenance

Prior to listing on the SHR in 1999, and in recognition that the Terania Street underbridge was at end of its functional life, in 1995 the State Rail Authority NSW prepared design plans for a replacement concrete bridge at this location. (Attachment 6)

The ‘end of life’ condition of the underbridge was not taken into account at the time of listing and is not recognised in the gazetted SHR listing. Had a full and proper assessment been completed at that time, the compromised structural integrity of the bridge would have been recognised. If such

⁴¹ TfNSW Regional and Outer Metropolitan advice February 2024.

⁴² Lismore City Council Business for Rail Trail, October 2023. LCC email confirmation provided to TfNSW on 26 February 2024.

an assessment had been undertaken, it would have been clear that the structure was not capable of long term maintenance and repair, and incapable of reasonable or economic use.

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

Risk Assessment

FBE prepared a Risk Assessment for the Lismore railway underbridges (October 2023), (Attachment 3) which **recommends the demolition of the Terania Street underbridge**⁴³, stating: *All five (5) of the Lismore railway underbridges were found to have category 'A' (very High) and/or category 'B' (High) risks to public safety. As a result, each structure should be given immediate priority as required by TfNSW standard T MU MD 20002 ST.*

Options Assessment

Extent Heritage (2016) (Attachment 7); Focus Bridge Engineering (2023) (Attachment 2); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

⁴³ Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standard TMU MD 20002 (Rev 0), prepared by Focus Bridge Engineering for UGLRL, October 2023, Page iii.

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade).

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁴⁴ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

4.1.5 Demolition

<i>If demolition is proposed, why is it necessary?</i>	The Terania Street underbridge constitute a danger to road users, the public or a section of the public. Refer to discussion below under SOHI assessment of danger to the public i, ii, iii and SOHI assessment of demolition.
<i>Have options for retention and adaptive reuse been explored? If yes, set out why these options have been discarded</i>	Refer to the detailed table under <i>Options Analysis</i> below including adaptative reuse of the underbridge.
<i>Has technical advice for demolition been obtained?</i>	Refer to discussion below under The underbridge is at end of life, not structurally sound and are a safety risk to the public and users of the roads.
<i>Identify and include advice about how significant elements, if removed by the proposal, will be salvaged and reused.</i>	This is addressed through a mitigation measure included in the scope of works set out in section 5.

Why is demolition proposed?

As set out in section 3.1, *Proposed works*, the proposal seeks to demolish the Terania Street underbridge which forms part of the Lismore railway underbridges.

S63 (2) and (3) of the Heritage Act 1977 makes allowances for approval of an application to enable demolition of the whole of a building or work if:

s63(3)(a) It is of the opinion of that the building or work **constitutes a danger to the users or occupiers of that building or work, the public or a section of the public.**

SOHI assessment of danger to the public

- i. The Terania Street underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.**

FBE have provided technical heritage engineering advice in two reports for the Lismore railway underbridges being the Strategic Options Assessment (Attachment 2) and Risk Assessment (Attachment 3). These reports clearly set out the poor condition and reasoning to support

⁴⁴ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

demolition as the only feasible option for TfNSW to manage the life-endangering public safety risks and potential for local and global bridge collapse.

In 2024 SMEC engineers have supported this position, following two further vehicle strikes to Terania Street underbridge.

SOHI assessment of danger to the public

- ii. **The Terania Street underbridge has low height clearances and narrow lane widths that are life-endangering and escalating safety risks to the public and users of the road.**

FBE have provided technical heritage engineering advice in two reports for the Lismore railway underbridges being the Strategic Options Assessment (Attachment 2) and Risk Assessment (Attachment 3). These reports clearly set out the constraints on the underbridges and impacts on the road network and reasoning to support demolition as the only feasible option for TfNSW to manage the life-endangering public safety risks and potential for local and global bridge collapse.

Evidence of frequent vehicle strikes are well documented and increasing due to existing height restrictions on the bridges (all below 4.6m see section 1.3 *Low clearance and increased road safety risks*). This is further exacerbated by lane width limitations (also discussed in Section 1.3 *Narrow lane width and increased road safety risks*).

If the bridge was to be removed and replaced (like for like reconstruction or with new materials), the existing low height clearance would continue to pose life endangering public safety risks.

SOHI assessment of danger to the public

- iii. **The Terania Street underbridge impedes disaster management egress and recovery, which is a life-endangering safety risk to the public and users of the Terania Street Evacuation Route.**

FBE have provided technical heritage engineering advice in two reports for the Lismore railway underbridges being the Strategic Options Assessment (Attachment 2) and Risk Assessment (Attachment 3). These reports clearly set out the constraints on the underbridges and impacts on disaster management egress and recovery and reasoning to support demolition as the only feasible option for TfNSW to manage the life-endangering public safety risks and potential for local and global bridge collapse.

The Lismore railway underbridges are situated within a flood plain. The *Lismore Local Flood Emergency Plan* identifies Terania Street as a classified regional main road and is nominated as a flood evacuation route in Lismore (section 1.3).

The Terania Street bridge is a danger to the public during flood events as it may cause an obstruction and may be hit while submerged and impact disaster egress, rescue and recovery efforts.

The underbridge blocks the transportation of oversized houses as part of the Resilient Homes Program.

Lismore City Council has written to Transport for NSW in 2023 advising the bridge presents an impediment to disaster responses⁴⁵. (Attachments 9 and 10)

SOHI assessment of demolition

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in poor condition and at end of life causing critical life-endangering public safety risks, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified above, demolition is the only feasible option now open to TfNSW.

However as demonstrated by this SOHI, the **demolition of the Terania Street underbridge is essential to address the existing danger to users and the public safety risks** arising from the current end of life condition of the underbridge.

- It is not possible to **partially retain** the underbridges due to poor condition and global stability of the underbridge.
- As addressed in i, ii, and iii above, **partial retention or reconstruction** will not resolve the residual danger and public safety risks.

4.1.6 Disaster Risk Mitigation

<p>Are the proposed works designed to minimise or mitigate the risks of natural heritage disasters to the heritage item?</p>	<p>As discussed under 4.1.5 <i>Demolition</i>, the proposed works are designed to facilitate disaster management egress and recovery. The Terania Street underbridge is assessed as a life-endangering safety risk to the public especially during floods, which Lismore is renown for. Lismore resilience and disaster risk management continues to make state headline news in 2024 following major flood disasters in 2021 and 2022.</p>
<p>Will the proposed works impact on the significance of the heritage item? If yes, how have the impacts of the proposed works been minimised?</p>	<p>The proposal will have a major adverse impact to the significance of the Lismore railway underbridges. Mitigation measures included in the scope of works set out in section 5.</p>

4.1.7 Options assessment

Extent Heritage (2016); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge. Refer to 4.1.10 for the Extent Heritage options assessment prepared as part of the *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* for John Holland Rail.

⁴⁵ Email from Andy Parks Strategic Planning Coordinator Lismore City Council to UGLRL, 7 March 2023.

FBE Strategic Options Assessment Recommendation

The Lismore Railway Viaduct Underbridges stage 2: Strategic Options Report, prepared by Focus Bridge Engineering for UGL Regional Linx, July 2023, Rev B sets out an options assessment for the Terania Street underbridge.

The options assessment consider seven options against six constraints and provides an overall assessment, as shown below.⁴⁶

Table 8-1 Terania Street Underbridge options assessment (Source: FBE0)

	Flooding impacts	Road network restrictions	Bridge clearances	Public safety	Heritage Impacts	Feasibility	Overall	Comment
Option 1 – Raising spans	●	●	●	●	●	●	●	Not recommended
Option 2 – Partial demolition	●	●	●	●	●	●	●	Possible
Option 3 – Entire demolition	●	●	●	●	●	●	●	Preferred
Option 4 – Alternative route	●	●	●	●	●	●	●	Not recommended
Option 5 – Rehabilitation	●	●	●	●	●	●	●	Not recommended
Option 6 – Reconstruction	●	●	●	●	●	●	●	Not recommended
Option 7 – Do nothing	●	●	●	●	●	●	●	Not acceptable

Key: ● Poor, ● Average, ● Good, see Section 5.3 for detailed assessment criteria

Figure 4.3 Terania Street Underbridge options assessment, FBE Options Report

The FBE Strategic Options Assessment for Terania Street underbridge recommends:

Entire demolition of the Terania Street underbridge is the preferred option. However, this has a significant negative heritage outcome, but it would satisfy all the other project and site constraints by removing the {road} network restrictions, removing the limited height and width clearances and would eliminate all safety and flood evacuation and rescue concerns.

Partial demolition would not fully resolve the ongoing maintenance and safety concerns for the remaining spans including flood evacuation and rescue risks and is therefore not recommended,⁴⁷ and is not a good heritage outcome.

⁴⁶ FBE Strategic Options report, 2023, Page 27

⁴⁷ FBE Strategic Options Report, 2023, Page 33

Options assessment prepared by TfNSW heritage specialists as part of the SOHI

The Options assessment set out in Table 8 has been prepared by the TfNSW heritage specialists, who have been working closely with the TfNSW bridge project team.

Table 8		
Option description	Analysis of the proposal	Impact to Listed values
Adaptive reuse	<p>The reuse of the Lismore Railway underbridges for railway purposes (inc. tourist group reinstatement) would require several factors including:</p> <ul style="list-style-type: none"> - Rail Infrastructure Manager (RIM) status. - Compliance with rail safety standards and technical structural engineering requirements to meet <i>National Rail Safety Law 2012</i>, Australian codes and standards. <p>The three underbridges are located on a non-operational rail line and not used for rail traffic in 24 years. To comply with these requirements and standards, the bridges and permanent way associated with the rail line would require removal and reconstruction.</p> <p>The Lismore City Council business case for the Rail Trail (2023) does not propose the reuse of the Lismore Railway underbridges, instead it is bypassing the three underbridges at Alexandra Pde, Terania and Union Streets.</p>	<p>The proposed rail trail will bypass the three timber underbridges and they are not proposing to adaptively reuse the existing structures.</p> <p>Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under <i>National Rail Safety Law 2012</i>.</p> <p>This is not a viable option. There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).</p>
Traffic management measures	<p>This will guide traffic and pedestrians in using the bridge and is one avenue to support management of the bridges, but its focus is on how motorists/pedestrians interact with the bridges.</p>	<p>Traffic management measures have been implemented to lower the risks for the Lismore railway underbridges.</p> <p>This is not a long term management option as it will not resolve the deteriorating fabric condition and bridge</p>

	<p>This option will not resolve the deteriorating fabric condition and bridge construction including low height clearance, narrow lane width and disaster management egress and recovery issues.</p>	<p>construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues.</p> <p>Traffic management measures are an interim measures and will have no impact on the management of the bridge. Their impact to the listed values is assessed as little/no and they are reversible.</p> <p>Traffic management is an interim measure and not a viable long term management option for Terania Street underbridge.</p>
<p>Road closure and rerouting the road</p>	<p>As at March 2024, one lane at Alexandra Parade and all Terania Street lanes are closed due to concerns about the condition of the bridges. This is causing traffic congestion, impacting on local businesses, and community disquiet, as one closure diverts users to another crossing under the viaduct in Lismore.</p> <p>The option will mean traffic is moved under the remaining Lismore railway underbridges due to the flow on effect of traffic movement, it may result in additional vehicle strikes to the remaining underbridges due to low height clearance and narrow lane width issues at all bridges.</p> <p>Terania and Union streets are both classified as regional main roads, their closure for extended periods is not acceptable to the community. Road closure responds to immediate public safety concerns by the relevant road manager and is not a long term option.</p> <p>This option will not resolve the deteriorating fabric condition and bridge construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues.</p>	<p>This is not a long term management option as it will not resolve the deteriorating fabric condition and bridge construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues.</p> <p>This measure will not impact the item's listed values.</p> <p>Road closure and rerouting the road is not a long term management option for Terania Street underbridge</p>

	<p>Lismore Council has requested the bridge at Terania Street is removed rather than the road be closed. [ref to Council meeting records and article 15 Feb 2024]. Lismore Council requested in October 2023 that all of the Lismore bridges be removed including Alexandra Pde and Union St underbridges.</p>	
<p>Additional propping</p>	<p>Propping will not address the fabric issues and the underlying structural condition of the bridge including its inability to carry its own dead weight or live loads.</p> <p>Additional propping may further reduce the height clearance of the structures and further reduce already narrow lane widths, exacerbating these problems increasing public safety risks.</p> <p>This is an interim management measure while propping is safely able to be undertaken (for workers).</p>	<p>This is not a long term management option.</p> <p>This option will not resolve the deteriorating fabric condition and bridge construction resulting in low height clearance, narrow lane width and disaster management egress and recovery issues.</p> <p>Propping will have a minor visual impact on the listed values, depending on how it is undertaken. It can be reversed.</p> <p>Additional propping is not a long term management option for Terania Street underbridge.</p>
<p>Maintenance and repair</p>	<p>The engineering condition data and analysis for Alexandra Pde, Terania St and Union St indicates the timber structures have reached end of life with Terania Street at the point of global failure. The existing fabric cannot be repaired and maintained.</p> <p>This option will not resolve the global failure issues due to the integrated/interconnected construction and stability of the underbridges that are at end of life.</p> <p>Maintenance and repair will not resolve low height clearances, narrow lane widths or disaster management egress and recovery issues at these structures, or address the public safety risks.</p>	<p>This option will not resolve the deteriorated condition and global failure of fabric and bridge design and construction with low height clearances, narrow lane widths and disaster management egress and recovery issues or address the public safety risks.</p> <p>Maintenance and repair is not a viable short or longer term management option for Terania Street underbridge.</p>
<p>Replacement of spans</p>	<p>The engineering condition data and analysis for Alexandra Pde, Terania St and Union St indicates the timber structures have reached end of life.</p> <p>Individual span replacement will not resolve the global failure of fabric due to end of life of the materials.</p>	<p>This option will not resolve the deteriorated condition and global failure of fabric and bridge design and construction with low height clearances, narrow lane widths and disaster</p>

	<p>This option will not resolve the global failure of fabric issues due to the integrated/interconnected construction and stability of the underbridges that are at end of life.</p> <p>Span replacement will not resolve low height clearances, narrow lane widths or disaster management egress and recovery issues at these structures, or address the public safety risks.</p>	<p>management egress and recovery issues or address the public safety risks.</p> <p>The span replacement option with like for like materials (timber) will not resolve the above issues and is not a viable option.</p> <p>Although this offers a sympathetic heritage solution, it is not an achievable option for the underbridges.</p> <p>Span replacement is not an option for the Terania Street underbridge.</p>
<p>Reconstruction of each bridge in like for like (old growth hardwood timber)</p>	<p>Reconstruction of each of the bridges in a like for like form (old growth hardwood timber) will not resolve the ongoing low height clearance, narrow lane width safety issues or disaster management egress and recovery issues which will remain at each of these structures.</p> <p>Reconstruction must consider the economic viability and use for a new structure including ongoing maintenance and repair as a non-operational NSW government asset. Reconstruction of these underbridges in timber has an estimated life of 40 years before replacement.</p> <p>Reconstruction of a new bridge on a non-operational rail line is not financially responsible, feasible or viable.</p> <p>Reconstruction using old growth hard wood timbers is contrary to sustainable development practice set out in TfNSW's Guiding Strategy 'Future Transport' and is not supported by TfNSW.</p> <p>There is no sustainable source of timbers available in the large quantities necessary to rebuild these structures. Reconstruction in old growth</p>	<p>Reconstruction would not resolve the ongoing low height clearance, narrow lane width and disaster management egress and recovery issues or address the public safety risks which remain at each of these structures.</p> <p>This option does not consider the non-operational status of the underbridges.</p> <p>Reconstruction with like for like materials (timber) will not resolve the above issues, including maintenance and recurrent replacement of materials, and is not a viable option.</p> <p>Although this offers a sympathetic heritage solution, it is not an achievable option for the underbridges.</p> <p>Reconstruction is not supported for the Terania Street underbridge.</p>

	<p>hardwood timbers is not a desirable or sustainable management outcome for scarce and finite resources.</p> <p>Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁴⁸ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks for non-operational rail.</p>	
<p>Reconstruction in new materials (not timber)</p>	<p>Reconstruction of each of the bridges in new materials (form and fabric) would require a new design.</p> <p>The new designs will continue to obstruct the clear movement along Evacuation routes necessary for disaster management egress and recovery issues which will remain at each of these structures.</p> <p>Reconstruction must consider the economic viability and use for a new structure including ongoing maintenance and repair as a non-operational NSW government asset.</p> <p>Reconstruction of a new bridge on a non-operational rail line is not financially responsible, feasible or viable.</p>	<p>Reconstruction will not resolve the disaster management egress and recover issues or address the public safety risks which remain at each of these structures.</p> <p>This option does not consider the non-operational status of the underbridges.</p> <p>Reconstruction with new materials and design will not resolve the above issues and is not a viable option.</p> <p>Although this offers a sympathetic heritage solution, as it would demonstrate new designs for the suite of bridges responding to historic and current flooding issues, it is not an achievable option for the underbridges.</p> <p>Reconstruction is not supported for the Terania Street underbridge.</p>
<p>Raise the existing underbridges superstructure</p>	<p>This option will not resolve the existing known engineering condition for each of the bridges and global failure of fabric.</p>	<p>This option will not resolve the existing fabric condition issues and global failure of fabric.</p>

⁴⁸ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

	<p>Physically and visually, raising the existing underbridges would disconnect the structures from the permanent way (the Casino Murwillumbah rail line) and would require major regrading of the permanent way to accommodate the new structures.</p> <p>These works must consider the economic viability and use for a new structure including ongoing maintenance and repair as a NSW government non-operational asset.</p> <p>This option will continue to obstruct the clear movement along Evacuation routes identifies in the disaster management plan for egress, rescue and recover, or address the public safety risks which will remain with each structure.</p>	<p>Structurally, it is not clear that it would be possible to attach new connections to the existing structures, unless the fabric condition issues are first resolved. This will first require reconstruction of the underbridges.</p> <p>Raising the superstructure does not support the listed values of the Lismore railway underbridges or the interpretation of how the 19th century railway and bridge construction responded to the floodplain.</p> <p>Raising the superstructure of the underbridges is not supported for the Terania Street underbridge.</p>
<p>Partial span removal (only select spans)</p>	<p>Removing individual spans at each of the underbridges immediately over the road/pedestrian walkways will resolve the immediate road height constraints and safety concerns from fabric issues over these specific locations.</p> <p>Technical engineering advice states that the nature of bridge construction relies on interconnected stability across spans for the full length of each bridge. Removal of individual spans affects stability of the whole structure.</p> <p>Technical advice in February 2024 following bridge strikes raises concerns about global failure of the bridges. Several of the trestles are non-load bearing and supported by propping. Removal of spans will require considerable stabilising works to secure the remaining spans that are already at end of life, and this may not be achievable given the deteriorating condition of the remaining timbers.</p> <p>Partial span removal may prolong the end of life condition of the underbridges for a short time. However, partial span removal is death by a</p>	<p>Partial span removal will not resolve the ongoing end of life condition for the whole underbridges. It will not address lane width constraints or issues linked to disaster management and recovery as there would still be material at end of life to cause safety issues with traffic and during major floods.</p> <p>Partial span removal will be a negative and cumulative impact to the heritage listed values of the bridges.</p> <p>Partial span removal does not support the listed values of the Lismore railway underbridges or the interpretation of how the 19th century railway and bridge construction responded to the floodplain.</p> <p>Partial span removal is not supported for the Terania Street underbridge.</p>

	<p>thousand cuts and its only a matter of a short time to when the remaining spans will require removal, or will fall down due to rot or flood.</p> <p>Partial span removal will not resolve the end of life condition for the whole underbridges. It will not address lane width constraints or issues. This option will continue to obstruct the clear movement along Evacuation routes identifies in the disaster management plan for egress, rescue and recover, or address the public safety risks which will remain with each structure.</p> <p>It will not address disaster management egress and recovery as the remaining bridge elements will continue to cause safety issues with traffic and obstructions during floods.</p>	
<p>Full span removal up to abutments</p>	<p>This proposal will resolve the ongoing end of life global failure of fabric, and existing dangers to the users and public safety risks of the low height clearance, narrow lane widths for road users.</p> <p>It will remove the bridge obstructions and enable clear movement along Evacuation routes necessary for disaster management egress and recovery issues which currently exist at each of these structures.</p> <p>These works consider the economic viability and use of the existing structures and eliminate costs and management associated with ongoing maintenance and repair as a NSW government non-operational asset.</p>	<p>Full span removal is the preferred option as it addresses the ongoing global failure of fabric, the low height clearance, narrow lane widths and disaster management egress, rescue and recovery and eliminates the ongoing danger to life and public safety risks.</p> <p>Measures to mitigate this impact are proposed and appropriate to ensure an accurate record, provide interpretation of the underbridges in the setting of the Casino Murwillumbah rail line within Lismore and respond to recovery/salvage of structural fabric.</p> <p>Full span removal at the three underbridges will materially and negatively affect the listed values which form a collection of bridges in the statement of significance.</p> <p>Full span removal to abutments for Terania Street underbridge is supported.</p>

In summary the SOHI supports the demolition of the Terania Street underbridge.

Extent Heritage (2016); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessments for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁴⁹ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

4.1.8 Curtilage

The SHR curtilage includes four separate sections of bridges (at Alexandra Parade, Terania Street, Union Street and at Leycester Creek connecting to Crane Street).

The proposed removal of the Terania Street underbridge would not in itself change the curtilage.

SOHI assessment of curtilage impacts

Transport will consider lodging a future application under Part 3A of the *Heritage Act, 1977* to amend and reflect the changes to the SHR listing and listing boundary, or to consider delisting of the SHR item.

Under s38 of the *Heritage Act*, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister is of the opinion that "...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated".

4.1.9 Cumulative impacts

No major change has occurred to these structures since listing, however as noted in 1.1.4 and 1.3.1 Asset Condition the underbridge is in poor condition and at end of life and at risk of local and global failure.

Previous works undertaken to the underbridges are set out above in Section 1.2 *Chronological development and previous physical changes*. This table outlines Exempt works for fencing; propping and traffic management have taken place at the Lismore railway underbridges.

⁴⁹ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

The proposed works will remove the Terania Street underbridge from the SHR listing for the Lismore railway underbridges. The works will have a major adverse impact on the heritage item.

SOHI assessment of cumulative impacts

The previous Exempt works present a little to no adverse impact to the significance and listed values of the Lismore railway underbridges as a whole.

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in **poor condition and at end of life causing critical life-endangering public safety risks**, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, **given the problems identified above**, demolition is the only feasible option now open to TfNSW.

4.1.10 The Conservation Management Strategy

Extent Heritage prepared the *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* for John Holland Rail in 2016.

The Strategy reviews the rail heritage timber assets on the CRN and sets out a discussion of significance, future use and management options and conclusions.

The Strategy discusses the heritage significance of the Lismore railway underbridges and the relative heritage significance of timber underbridges, and questions future management options:⁵⁰

What we can reason from our analysis is that the timber underbridges are an important part of the history of the regional railway network. They are important relics, evidence of times of political and financial uncertainty, as well as of ingenuity and resourcefulness over financial and logistical challenges. A truth that is also clear from our historical analysis is that the timber bridges, while forming part of evocative and sometimes iconic landscapes, were never built for that intention. The use of timber instead of steel or masonry is evidence of the relatively lesser and inferior status of these structures when built. The lines were not important enough to warrant more permanent and expensive structures. The material itself, being more susceptible to weathering, was never expected to stand the test of time, the result being that many structures have since been demolished or replaced. For many of the existing underbridges, much of the material has been repaired, replaced or reinforced, leaving the amount of original fabric questionable.

The challenge therefore in understanding the significance of these items is finding the balance between their historic, social and technological values and their current and ongoing management options.

⁵⁰ *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy* prepared by Extent Heritage for John Holland Rail, 2016, pages 43 and 59.

Many timber girder bridges were built and many are extant. Apart from particular adaptations for their railway use, there is little difference between timber girder bridges built for railways or for roads (or as wharfage) and this type of bridge is of comparatively low technical significance. Any heritage value lies primarily in their visual impact as identifiable timber structures common throughout regional and rural NSW.

Consequently, it is important to note that, in general terms, timber railway bridges are of lesser heritage significance overall than the metal bridges built for the NSW railways and are considerably less significant than some examples of the timber truss road bridges of NSW. T

Strategy review of significance of timber girder rail bridges (including Lismore railway underbridges)

The SOHI supports the Strategy assessment of the relative lesser heritage significance of the timber girder bridges compared with steel and masonry bridges and that these timber bridges were never expected to be retained in the long term. Future management must acknowledge these inherent limitations in the bridge materials.

The Strategy puts forward a ‘Catalogue of Conservation Options’ with 11 Conservation Treatments *which might be considered for conservation planning*.⁵¹ The Strategy provides a high level guideline of heritage listed underbridge assets but does not provide strict policies for the conservation management of the heritage assets.

The Strategy sets out the following ‘conservation treatments’ that could be applied for the Lismore railway underbridges.

Conservation Treatment 4 – Remediating public risk

The Strategy notes *for some sections of the [Lismore] viaducts that are over the roadways and pose a higher potential for public risk, you could consider the application of temporary or permanent engineering options to mitigate risk where feasible and appropriate to the risk profile and other variables*.⁵²

The SOHI assessment does not support the implementation of this option.

TfNSW (and John Holland Rail and UGLRL) have completed temporary engineering options to mitigate public risk.

Structural engineering condition assessments and risk assessments prepared for the underbridges in 2023 and 2024 and associated escalating public safety risks due to overall poor bridge condition and low height clearances do not support the implementation of this option as a long term option. (refer to section 1.3 Physical Analysis).

Conservation Treatment 7 – Partial retention

The Strategy notes that *sections of the bridges over the roadways pose a higher potential for public risk could be removed*.⁵³

The SOHI assessment does not support the implementation of this option.

Structural engineering condition assessments and risk assessments prepared for the underbridges in 2023 and 2024 and associated escalating public safety risks due to overall poor

⁵¹ CRN Timber Underbridges CMS, Extent, 2016, page 54.

⁵² CRN Timber Underbridges CMS, Extent, 2016, Page 55

⁵³ CRN Timber Underbridges CMS, Extent, 2016, Page 56

bridge condition and low height clearances do not support the implementation of this option (refer to section 1.3 Physical Analysis).

Conservation Treatment 8 – Interpretation

The Strategy notes that *bridges at these locations {Lismore} have a high public profile and interface with interpretation can be most effective, thereby justifying the expense of this treatment and promoting conservation and public outcomes.*⁵⁴

The SOHI assessment supports the implementation of this option.

Refer to section 5 mitigation measures.

Conservation Treatment 9 – Reinstate Railway Line to carry trains for railway and tourist groups.

The Strategy notes that *the associated costs in the short-term and continuing maintenance would be significant in most cases.*⁵⁵

The SOHI assessment does not support the implementation of this option.

Any proposed reinstatement of the railway to carry trains for railway and tourist groups will require Rail Infrastructure Manager (RIM) status. The line will need to comply with current rail safety standards and technical structural engineering requirements (2024). The underbridges dating from 1894 and last used in 2004, due to end of life condition would need to be demolished and rebuilt to meet the *National Rail Safety Law 2012* and relevant Australian codes and standards.

As the Strategy states, associated costs for start-up, operations and ongoing maintenance of the line and infrastructure assets including underbridges, would be significant and this may preclude the implementation of this option by a community organisation.

Conservation Treatment 10 – Adaptive community use

The Strategy notes that *bridges in these locations {Lismore} have a high public profile and interface where interpretation can be most effective.*⁵⁶

The SOHI assessment does not support the implementation of adaptive community reuse option.

Lismore City Council business case (October 2023) for a rail trail is proposing to bypass the underbridges at Terania Street, Alexandra Pde and Union Street.

Conservation Treatment 11 – Removal from Asset Register

The Strategy notes that *removal from the asset register, through de-listing, transfer of ownership, gifting or demolition can be a conservation outcome in some instance. ... This treatment may be considered for bridges where they are no longer financially viable to maintain, a particularly pertinent option criterion when considering inoperable assets.*⁵⁷

The SOHI assessment supports this option for Removal from Asset Register.

⁵⁴ CRN Timber Underbridges CMS, Extent, 2016 Page 56

⁵⁵ CRN Timber Underbridges CMS, Extent, 2016 Page 56

⁵⁶ CRN Timber Underbridges CMS, Extent, 2016 Page 56

⁵⁷ CRN Timber Underbridges CMS, Extent, 2016 page 57

As noted above, the end of life condition of these underbridges and associated escalating public safety risks, support this option as a viable and practical management option for the Lismore underbridges.

Strategy conclusions

The Strategy Conclusions state *consequently, the better conservation treatments for the management of the 21 timber bridges {that includes Lismore} would be short-immediate management as a ruin, partial removal, and potential delisting and demolition.*⁵⁸

The SOHI assessment supports the Strategy recommendations for delisting and demolition and this option is able to be implemented by TfNSW.

The SOHI assessment does not support partial removal due to the overall condition assessments and risks assessments as included in Section 1.3 Physical Analysis and Section 4.0 Heritage Impact Assessment.

The SOHI assessment does not support the management of underbridges as a ‘ruin’, for non-operational heritage timber bridges {at Lismore} as this is not feasible or achievable given the poor condition. Managing as a ruin or partial removal does not address the critical public safety risks and escalating risks associated with the overall condition of the ‘end of life’ underbridges. These approaches cannot be supported as viable and achievable by TfNSW for the Lismore railway underbridges.

4.1.11 Other heritage items in the vicinity

There are no heritage items in the immediate vicinity of the Terania Street underbridge.

⁵⁸ CRN Timber Underbridges CMS, Extent, 2016 Page 60

5.0 Summary and Recommendations

5.1 Assessment of heritage impact

The current SHR listing specifically states that the set of bridges at Lismore demonstrates a 19th century solution to resolving railway construction in a flood plain. However, 130 years later in the 21st century this non-operational rail structure is in poor condition and at end of life causing critical life-endangering public safety risks, which on balance, must take precedence over retention or rebuilding of the bridge.

The SOHI assessment is that the proposal to demolish the underbridge at Terania Street will have a major adverse impact on this heritage item. However, given the problems identified above, demolition is the only feasible option now open to TfNSW.

The SOHI has assessed the demolition of the Terania Street underbridge as part of the Lismore railway underbridges, considering s63 of the Heritage Act.

s63 (2) and (3) of the Heritage Act 1977 include considerations for an application to enable demolition of the whole of a building or work if:

*It is of the opinion that the building or work **constitutes a danger to the users or occupiers of that building or work, the public or a section of the public.** {s63(3)(a)}*

SOHI assessment of danger to the public under s63(3)(a)

The SOHI concludes that the Terania Street underbridge constitutes a **danger to the public and users for the following reasons:**

- i. The underbridge is at end of life, not structurally sound and is a safety risk to the public and users of the road.**
- ii. The underbridge has low height clearance and narrow lane widths that are life-endangering with escalating safety risks to the public and users of the road.**
- iii. The underbridge impedes disaster management egress and recovery, which is a life-endangering safety risk to the public and users of the Terania Street Evacuation Route.**

SHR listing, end of life condition and maintenance

Prior to listing on the SHR in 1999, and in recognition that the Terania Street underbridge was at end of its functional life, in 1995 the State Rail Authority NSW prepared design plans for a replacement concrete bridge at this location. (Attachment 6)

The 'end of life' condition of the underbridge was not taken into account at the time of listing and is not recognised in the gazetted SHR listing. Had a full and proper assessment been completed at that time, the compromised structural integrity of the bridge would have been recognised. If such an assessment had been undertaken, it would have been clear that the structure was not capable of long term maintenance and repair, and incapable of reasonable or economic use.

The 'end of life' condition and ensuing management obligations imposed on the asset owner to maintain non-operational rail infrastructure to Heritage Act s118 minimum maintenance standards, is not considered to be either realistic or achievable, either then or now.

Under s38 of the Heritage Act, the Minister may, after considering the recommendation of the Heritage Council on the matter, removal of an item from the State Heritage Register if the Minister

is of the opinion that “...the long-term conservation of the item is not necessary and that either or both of the following apply to the item (i) the listing renders the item incapable of reasonable or economic use, (ii) the listing causes undue financial hardship to the owner of the item or the land on which the item is situated”.

Options assessment

Extent Heritage (2016) (Attachment 7); Focus Bridge Engineering (2023); and TfNSW heritage team (2024) have prepared detailed options assessment for the Terania Street underbridge.

All three assessments recommend full demolition of the Terania Street underbridge.

All three assessments recognise that partial retention, rebuilding or reconstruction are not viable options as they do not address public safety risks. These options are not good or sustainable conservation outcomes as the rebuilding of this non-operational rail structure to retain heritage significance, would require the extensive use of old growth hardwood timber which is currently not available in the volumes required, and for future ongoing maintenance.

There is no viable adaptive reuse proposal for the existing Terania Street underbridge (or Union Street or Alexandra Parade).

The rail trail at Lismore will bypass the Lismore railway underbridges at Terania Street (and Union Street and Alexandra Parade).

Any reuse of the line as an operating rail line, will require demolition and rebuild of new structures to meet current public safety concerns, along with current safety and design standards and statutory obligations set out under *National Rail Safety Law 2012*.

Previous cost option analysis in 2018 provided to TfNSW by John Holland Rail estimate a like for like rebuild of a timber bridge to be in the order of \$25M.⁵⁹ However, this is not a preferred option as it not feasible or viable for non-operational rail infrastructure, and will not resolve current public safety risks.

5.2 Mitigation measures

This application for Terania Street underbridge has been brought forward due to the public and community concerns and ongoing road network impacts arising from the closure of Terania Street. It should be noted that timber girder underbridges at Terania Street together with Alexandra Parade and Union Street are all in similar poor and end of life condition with life endangering public safety risks.

The following mitigation measures are proposed in support of the application:

- An archival photographic recording of each of the Lismore railway underbridges in accordance with *Heritage NSW Guidelines for Photographic Recording of Heritage Items using Film or Digital Capture*, 2006⁶⁰ (in preparation)
- A photogrammetric record of the Lismore Railway underbridges that will be made available to Heritage NSW. (in preparation)

⁵⁹ Cost estimate provided in Manilla Viaduct Future Options Study Final Report, December 2018.

⁶⁰ <http://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Heritage/photographic-recording-of-heritage-items-using-film-or-digital-capture.pdf>, accessed February 2024

- Interpretation of the Lismore Railway underbridges as part of the Casino to Murwillumbah Line.
- Salvage of suitable timbers removed from the underbridges for the purpose of recycling and reuse, ensuring treatment and management of potential contaminants that may exist on or within the bridge timbers and provide certification that all timbers satisfy the requirements for reuse in accordance with TfNSW requirements.

6.0 Attachments

Attachment 1a Scope of Works and 1b Work Plans and elevations

Attachment 2 2023 (July, Rev B), Focus Bridge Engineering Lismore Railway Viaducts Underbridge stage 2: Strategic Options Report for UGL Regional Linx

Attachment 3 2023 (Oct, Rev 0) Focus Bridge Engineering *Lismore Railway Viaduct Underbridges Risk Assessment to TfNSW Standards TMU MD 20002 ST.*

Attachment 4 2024 (Jan) SMEC Condition Assessment Terania St post impact #1 19 January 2024

Attachment 5 2024 (Feb) SMEC Condition Assessment Terania St post impact #2 7 February 2024

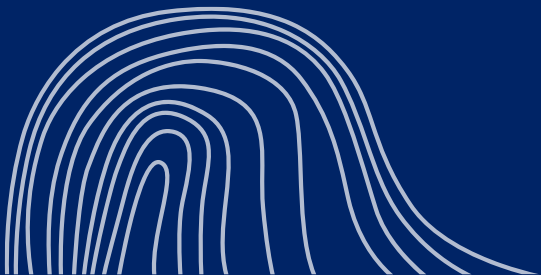
Attachment 6 State Rail Authority Plans for Terania Street renewal general arrangement 1995

Attachment 7 2016 Extent Heritage *Country Regional Network Timber Underbridges Heritage and Conservation Management Strategy*

Attachment 8 2022 (Nov) Lismore Council Road Safety Audit, Ardill Payne

Attachment 9 2023 (Oct) Letter Lismore Council to TfNSW seeking removal of all the Lismore underbridges

Attachment 10 2024 (Feb) Letter Lismore Council to TfNSW seeking immediate removal of Terania St bridge



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