Transport
for NSW

St Albans Bridge Rehabilitation Works, St Albans

Review of Environmental Factors

March 2024



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Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the St Albans Bridge Rehabilitation Works is proposed.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.



Approval and authorisation

Title	St Albans Bridge Rehabilitation Works
Accepted on behalf of Transport for NSW by:	Alfred Fernandez
Signed	
Date:	07/03/24

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Executive summary

The proposal

Transport for NSW (Transport) proposes to carry out works on St Albans Bridge (the proposal). The bridge carries Wollombi Road over the Macdonald River at St Albans New South Wales (NSW), 2775.

The proposal involves three main packages of works:

- Rehabilitation works on Pier 4 of the bridge
- Flood recovery works at Pier 4 of the bridge
- Transport Asset Management Protection (TAMP) works on St Albans bridge

The key features of these works are summarised as follows:

Pier rehabilitation works

The pier rehabilitation works would involve strengthening the Pier 4 columns with additional steel casing and replacing the existing deteriorated steel bracing.

Flood recovery works

The proposed flood recovery works involve the removal of trees and other vegetation from the river which has backed up around Pier 4, along with the clearance of sand and silt around the base of Pier 4 to allow for inspection and cleaning of steel and timber works.

TAMP works

An opportunity has arisen to carry out TAMP works at the same time as the rehabilitation and flood recovery works. These works comprise resealing the surface of the bridge deck, installing cover plates over exposed gaps in the bridge, replacing deteriorated laminates throughout the bridge deck, restressing all bridge spans and reinstatement of 2m^2 of sandstone block along the Webbs Creek side abutment.

To support construction works, temporary ancillary facilities including a site compound, storage area, site amenities and site office will be located on land adjacent to the bridge. A temporary stockpile area will also be established adjacent to the car park area to the northwest of the site.

Construction is expected to start Q1 2024 and would take up to 22 weeks to complete. The proposal would include up to 10 nightshifts for out of hours works during construction.

During nighttime works and for two dayshifts, the proposal would require temporary closure of the bridge. During bridge closures, detours will be put in place via Settlers Road and St Albans Road to provide access to properties to the north and south of the bridge respectively.

Need for the proposal

The proposal is needed to address corrosion on Pier 4 of St Albans Bridge, replace damaged components within the bridge deck and improve safety for pedestrians and horse riders. The proposal would contribute to the safety and longevity of the bridge while reducing ongoing long-term maintenance requirements to the bridge piers. The proposal is consistent with Transport's commitment under the New South Wales (NSW) Timber Truss Road Bridges Overarching Conservation Management Plan (Roads and Maritime Services, 2018) to carry out appropriate ongoing repair and maintenance.

Proposal objectives

The objectives of the proposal include:

- Improve the safety and longevity of the bridge
- Improve the condition rating of the bridge from poor to good
- Reduce long term ongoing maintenance

- Minimise impacts on heritage values.

Options considered

Given the heritage significance of the bridge and noting that it has been identified for retention, bridge replacement or bypass were not considered as viable options.

Pier 4 rehabilitation works

Four options were considered for the Pier 4 rehabilitation works:

- Option 1 – Do nothing
- Option 2 – Strengthen the pier columns with carbon fibre wrapping
- Option 3 – Strengthen the pier columns with additional steel casing
- Option 4 – Like for like full replacement of Pier 4 structure

Option 3 (steel casing) was selected as the preferred option due to its lower heritage impacts and long design life.

Flood Recovery works

Three options were considered for the flood recovery works:

- Option 1 – Do nothing
- Option 2 – Relocate dead trees down stream
- Option 3 – Remove the dead trees from site, woodchip trees and dispose of trees at a separate facility offsite

Option 2 was selected as the preferred option due to its low potential environmental and safety risk and cost efficiency.

TAMP works

Three options were considered for the TAMP works:

- Option 1 – Do nothing
- Option 2 – Reseal bridge deck, cover the bridge joint with steel plates, replace the damaged laminate boards and restress all bridge spans
- Option 3 – Remove and replace entire asphalt layer of bridge and replace entire bridge deck around the damaged areas

Option 2 was selected as the preferred option due to its lower heritage impacts and long design life.

Statutory and planning framework

The proposal is for road infrastructure facilities and is being carried out by or on behalf of a public authority (TfNSW) and can therefore be assessed under Division 5.1 of the *E*nvironmental *P*lanning *& A*ssessment *Act 1979 (NSW)*. Development consent from council is not required.

No impacts are anticipated on matters of national environmental significance (MNES) and Commonwealth land and therefore a referral to Australian Government Department of Agriculture, Water and the Environment under the *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*is not required.

St Albans Bridge over the Macdonald River is listed on the State Heritage Register (SHR) (SHR # 01480). The assessment of heritage impacts found that the proposal would have moderate direct and minor visual impacts on the heritage significance of the bridge. Therefore, despite the aim of the work being to ensure the structural stability of the bridge approval under Section 57/60 of the *Heritage Act 1977* is required.

Community and stakeholder consultation

The proposal would be relatively short term and would have minimal community impacts. Accordingly, no specific community engagement activities have been carried out during the preparation of the REF. Targeted pre-work notification of nearby residents and businesses is proposed.

Consultation with Hawkesbury City Council, NSW Department of Primary Industries (DPI), Heritage NSW, NSW National Parks and Wildlife Services (NPWS), NSW Rural Fire Service (RFS) and NSW State Emergency Service has occurred in relation to the proposal.

Environmental impacts

Detailed technical investigations have been carried out to identify, assess, manage and minimise the proposal's potential impacts. The following outlines the proposal's main impacts on the environment and surrounding community. The safeguards and mitigation measures identified in this REF would help minimise the expected adverse impacts.

The main environmental impacts of the proposal are:

Traffic and access

The proposal would require temporary closures of St Albans Bridge for up to 10 nightshifts and for up to two daytime shifts to complete works to the deck. These closures would impact travel times and connectivity for some properties to St Albans. However, alternate access to St Albans from Wisemans Ferry is provided via Settlers Road, with less than 5 minutes in additional travel time. Notifications and appropriate traffic control measures would be put in place to address road detours and minimise impacts of traffic, access and parking.

Non-aboriginal heritage

Despite resulting in a positive outcome for the structural integrity of the bridge, the proposal would result in a moderate direct impact to the State listed St Albans Bridge over Macdonald River (SHR # 01480). This is largely due to the removal / replacement of some heritage fabric and the use an epoxy filler between the proposed steel casing and the existing Pier 4 columns that would be difficult to remove in the future without damaging the original wrought iron columns. Indirect visual impacts were assessed as minor.

The proposal would occur within the curtilage of the St Albans Conservation Area, which includes the St Albans Bridge and surrounding landscape. Overall, the proposal would result in negligible direct and indirect visual impacts to the heritage significance of the St Albans Conservation Area (LEP # C2), as works would be localised to the area of the St Albans Bridge and the scope of works is minimal.

In relation to other heritage items, the proposal would be localised to the St Albans Bridge and would not be noticeable or visually intrusive to other nearby heritage items. The proposal would result in a neutral visual impact to the views and setting of nearby heritage items.

Biodiversity

The proposal would result in minor impacts to native vegetation. To provide access to the riverbed, there is an existing path from behind the St Albans Rural Fire Station that leads to the banks of the river. This path may require widening which can be achieved by pruning branches and mowing the mixed exotic and native groundcovers. No mature trees would be removed.

A Threatened Ecological Community (TEC) of Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, was recorded within the area investigated. However, the extent of vegetation clearance/disturbance would not have a significant effect on the TEC.

No threatened aquatic species are considered likely to occur in the area of works within the Macdonald River and its margins. Impacts to aquatic biodiversity are expected to be minimal and temporary during the proposed works.

No flora or fauna species listed, or currently being considered for listing, under the EPBC and/or BC Acts were recorded during site survey. Despite this, the assessment has considered the potential that microbat species may occur in association with the existing structure. Following an assessment of significance in accordance with the *Biodiversity Conservation Act 2016* (BC Act) the BAR concluded that the proposal would not have a significant impact on microbats or their habitat/s and a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required.

Noise and vibration

The noisiest activities (such as abrasive blasting) could be audible at most residences in St Albans. This is largely a function of the low background noise levels and the noise levels generated by this activity. A smaller number of residences would be affected by higher levels of noise (moderately or highly intrusive) noise from this activity. A smaller number of residences would also be affected by operation of the compound.

Up to 10 nightshifts are proposed to complete TAMP works to the deck of the bridge, which could result moderately and highly intrusive levels of noise for some receivers in St Albans. Safeguards and mitigation measures have been proposed to address construction noise impacts.

Hydrology and water quality

Potential water quality impacts would mainly relate to disturbance of riverbed sediments due to excavation around the base of Pier 4.

There is also potential to impact on water quality through the release of materials and particles during the removal of the existing protective coating around Pier 4 and overspray during painting works. Specific controls have been developed to ensure the work site is fully contained to prevent airborne contaminants during abrasive blasting from entering the water, and to ensure that water borne contaminants are collected and appropriately disposed of to a licenced facility.

There is a risk of flooding during the construction period. A flood event could inundate the worksite including materials, equipment and encapsulated areas. As this could lead to water quality impacts, safeguards have been included covering the monitoring of weather conditions and rapid demobilisation from site.

Air Quality

The primary air quality risk for the proposal is the lead-containing particles emission from the abrasive blasting activity for the paint removal work. Lead is a toxic heavy metal, and exposure to lead can pose health risks when inhaled. Airborne lead particles also have the potential for long – distance transport, potentially affect areas beyond the immediate project site, including waterway (i.e. river). Mitigation measures, including encapsulation system, • High-Efficiency Particulate Air (HEPA) Filtration, air quality monitoring and emergency response plan, are recommended by this REF and need to be considered in the development of CEMP and EWMS.

Potential air quality impacts also include air emissions from construction vehicles, plant and machinery as well as dust and particulate emissions associated with earthworks, excavation and vegetation clearing. Safeguards and mitigation measures have been proposed to address air quality impacts.

Waste Management

The proposal would generate waste streams, including spoil, hazardous waste such as chemicals, paints, oils and lead based materials, and solid waste materials, including vegetation clippings, timber, steel waste and laminate decking materials.

During the construction of cofferdam, approximately 270 cubic metres of sand would be excavated from the river bed. If the excavated sand is placed on the river bed or near the waterway, there is a chance that the deposited sand would be washed into the waterway. On the other hand, introducing large amounts of sand on the existing river bed would also affect it stability. The excavated sand is to be temporarily stockpiled at the proposed compound site before transporting offsite.

The abrasive blasting and paint and lead removal works are anticipated to generate up to eight tonnes of hazardous lead abrasive waste. If not properly managed, lead-containing debris and paint chips could pose risks of lead exposure to workers and contribute to waterway contamination. When the lead abrasive waste temporarily stores at the compound site, the leak from the container could be result in contaminated land and affect the plant, animals and community. Disposal of hazardous waste must adhere to regulations at the licensed facility.

Safeguards and mitigation measures have been proposed to address potential waste impacts.

Other issues

The proposal would have a number of other potential impacts primarily during construction, including visual amenity and socioeconomic impacts. Measures have been proposed to avoid, minimise or mitigate these impacts.

Justification and conclusion

The proposed rehabilitation, flood recovery and TAMP works on St Albans Bridge is subject to assessment under Division 5.1 of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*. The Review of Environmental Factors (REF) has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the *Biodiversity Conservation Act 2016 (*BC Act), wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some potential heritage, construction noise, transport and access, biodiversity and water quality impacts. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would help reduced congestion and improve local connectivity at the subject location. On balance the proposal is considered justified, and the following conclusions are made.

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1. Introduction

This chapter introduces the proposal and provides context for the environmental assessment. In introducing the proposal, the objectives and project development history are detailed and the purpose of the report provided.

1.1 Proposal identification

Transport proposes to carry out works on St Albans Bridge at St Albans (the proposal). The bridge is located in St Albans in NSW and carries Wollombi Road over the MacDonald River at coordinates -33.29374731328786, 150.9725032463824.

The proposal involves three main packages of works:

- Rehabilitation works on Pier 4 of the bridge
- Flood recovery works at Pier 4 of the bridge
- TAMP works on St Albans bridge

These three packages are considered in turn as follows:

Pier rehabilitation works

The pier rehabilitation works would involve strengthening the Pier 4 columns with additional steel casing, and repainting of the exposed wrought iron columns of Pier 4.

Flood recovery works

The proposed flood recovery works involve the removal of existing fallen trees and the clearance of sediment and silt from around the base of Pier 4. The fallen trees would be relocated downstream from the site.

TAMP works

TAMP works will be undertaken at a later stage to the rehabilitation and flood recovery works. These works comprise:

- Resealing five hundred square metres of the surface of the bridge deck
- Installing about 20 metres of steel cover plate over exposed gaps in four bridge joints
- Destressing and replacing deteriorated laminates throughout the bridge deck
- Restressing all bridge spans

In addition, the following miscellaneous works would also be carried out:

- Clearing a track to access the southern Webbs Creek Side abutment and reinstating about two square metres of the sandstone block on the northern abutment

To facilitate access to Pier 4 for the works, temporary placement of a gabion mattress of up to 500 millimetre is proposed to provide an access track from the bank of the river to Pier 4. This gabion mattress will be provided as part of the access path for the proposal, as shown in Figure 3-11 and Figure 3-12. This gabion mattress will be removed upon project completion.

St Albans Bridge is a State Heritage Register (SHR) listed DeBurgh timber truss bridge located in the suburb of St Albans and within the Hawkesbury City Council local government area.

The location of the proposal is shown in Figure 1-1 and an overview of the proposal is provided in Figure 1-2. Chapter 3 describes the proposal in more detail.



Figure 1-1: Location of the proposal

Source: ERM 2021



Figure 1-2: The TAMP works location, including the position of Pier 4, proposed site compound and access

Source: ERM 2021

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by SNC-Lavalin on behalf of Transport for NSW (Transport).

For the purposes of these works, Transport is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act).

The purpose of the REF is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of Section 171 of the Environmental Planning and Assessment Regulation 2021, the factors in *Guidelines for Division 5.1 Assessments,* (DPE 2022), *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport examine and take into account, to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of this REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval sought from the Minister for Planning under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and if offsets are required and able to be secured.

The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

This chapter describes the need for the proposal in terms of its strategic setting and operational need. It identifies the various options considered and the selection of the preferred option for the proposal.

2.1 Strategic need for the proposal

The proposal is consistent with key strategic plans and policy documents as outlined in the following sections.

2.1.1 Timber Truss Bridge Conservation Strategy Submissions Report and Revised Conservation Strategy

The Timber Truss Bridge Conservation Strategy Submissions Report and Revised Conservation Strategy (Roads and Maritime Services, 2012) (revised Strategy) outlines how the then Roads and Maritime Services undertook public consultation on its draft Strategy for conservation of timber truss road bridges in NSW, how submissions from stakeholders and the public were analysed, and presents the revised Strategy which reflects its response to those submissions.

The revised Strategy commits to continue to promote the heritage significance of its timber truss bridges and use the opportunities arising from the replacement of some bridges to improve its knowledge of their conservation, engineering and future management. The revised Strategy also includes specific assessment, interpretation, sustainability and reporting initiatives.

The revised Strategy identifies St Albans Bridge for retention. Table 2-1 reviews the proposal against relevant policies within the revised Strategy.

Table 2-1: Assessment of the proposal against policies within the Timber Truss Bridge Conservation Strategy Submissions Report and Revised Conservation Strategy

Policy	Discussion
Further develop heritage-sympathetic conservation technology and techniques for timber truss bridges, in conjunction with the Heritage Council and key stakeholders.	The proposed design for the St Albans Bridge works utilises innovative technologies and techniques to offer heritage-sympathetic conservation strategies. The proposal attempts to minimise impact to original fabric through encapsulating rather than replacing the significant fabric of Pier 4. Collaboration with Heritage NSW and key stakeholders as part of the consultation procedures of the proposal has assisted in the decision-making process for the chosen design.
Complete current maintenance of St Albans Bridge	The proposed works to Pier 4 would ensure that aspects of the required maintenance of St Albans Bridge would be completed. Further work is required to maintain the subsurface cast iron piles of Pier 4.
Bridges identified as traditional construction which will be retained should utilise traditional bridge carpentry skills during restoration works	The proposed works would not constitute traditional bridge carpentry skills as the timber components of the bridge are not included in the scope of works. The timber components have been restored within the last ten years and are in good condition.
Prepare conservation management documentation for each of the five types of timber trusses in Roads and Maritime Services' portfolio for endorsement by the NSW Heritage Council.	A Conservation Management Plan (CMP) for De Burgh truss bridges or for St Albans Bridge has not yet been prepared. The NSW Timber Truss Road Bridges Overarching Conservation Management Plan (Roads and Maritime Services, 2018) commits to preparing bridge specific conservation management plans for all retained timber truss bridges (including St Albans).
Implement interpretation works at bridge sites and develop publications and heritage	Interpretation has not been considered as part of the proposal. The NSW Timber Truss Road Bridges Overarching Conservation Management Plan (Roads and Maritime Services, 2018) commits to the preparation of a heritage interpretation strategy for timber truss bridges.

2.1.2 NSW Timber Truss Road Bridges Overarching Conservation Management Plan

The NSW Timber Truss Road Bridges Overarching Conservation Management Plan (Roads and Maritime Services, 2018) (CMP) provides a methodology to address the collective conservation and management of the timber truss bridge population identified in the Timber Truss Bridge Conservation Strategy Submissions Report and Revised Conservation Strategy.

The CMP commits to managing and conserving a representative sample of timber truss bridges that reflects the diversity of the original bridge population. St Albans Bridge is identified for retention in the CMP. Relevant polices from the plan are reviewed in Table 2-2.

Table 2-2: Review of Conservation Management Plan policies

No	Policy summary	Comment
1	Retention of cultural significance of the timber truss bridge population: • TfNSW will conserve a representative population that reflects the diversity of timber truss bridges as part of the operational road network • Cultural significance of these bridges will be protected or enhanced • Conservation will be in accordance with the principles of the Burra Charter • All current and future owners, managers and consent authorities will be advised and jointly responsible for conservation • Conservation will be done in collaboration with relevant experts.	The proposal would contribute to the longevity of the bridge. The proposal would be subject to a Section 60 approval requirement under the *Heritage Act 1977*.
2	Adoption, implementation and review of the overarching CMP: • The overarching CMP was endorsed by the Heritage Council of NSW on 20/2/2018 and has been adopted by TfNSW • TfNSW will resource implementation of this CMP • TfNSW will train relevant staff in the use of this CMP • TfNSW will make this CMP available to the public • TfNSW will review this CMP every five years and submit to the Heritage Council for endorsement.	Future action for Transport.
3	Prepare bridge specific CMPs • TfNSW will prepare bridge specific CMPs • SHR listings for bridges to be retained will be updated to reflect new information.	Future action for Transport.
4	Conservation of a representative timber truss bridge population • TfNSW will review the list of bridges to be retained and those to be demolished, in keeping with the Strategy • The updated list will be submitted for endorsement by the Heritage Council of NSW.	St Albans Bridge is identified for retention.
5	Listings • Bridges to be retained will be nominated for SHR listing if they are not already listed on the SHR • Applications for delisting will be submitted for bridges to be replaced with Statement of Heritage Impact (SOHI) • Any bridges owned by local Councils, acquired by TfNSW for conservation will be added to the TfNSW S170 and nominated to the SHR where relevant.	St Albans Bridge is already listed on the SHR.

No	Policy summary	Comment
6	Use of bridges • TfNSW will engage with communities about use • Timber truss bridges to be retained will be used for vehicular traffic or other identified requirements • Unacceptable uses will not be supported • TfNSW will arrange for removal and relocation of utilities from timber truss bridges where possible.	No change to the current bridge use is proposed. The proposal is limited to rehabilitation, flood recovery and TAMP works and does not provide an opportunity for utilities relocation.
7	Maintenance and repair • Appropriate ongoing repair and maintenance will be carried out • Suitable high-quality timber will be sourced to enable conservation work • TfNSW will conduct relevant training and ensure skills transfer • TfNSW will prepare an Incident Response Plan for each bridge to be retained • Timber elements will be replaced before unacceptable deterioration occurs.	The proposal represents necessary works to ensure the safety and longevity of the bridge and is therefore consistent with this policy. The proposal involves the replacement of steel bracing elements of the bridge and replacing of deteriorated deck laminates before unacceptable deterioration occurs. The steel around the base of Pier 4 will be cleaned as part of ongoing maintenance of the structure.
8	New work • Elements will be conserved in accordance with their level of significance • New works and adaptations may be required to ensure continued operability • Excellence in design and quality in construction will be provided • TfNSW will explore and develop the use of new means by with the bridges may continue to fulfil their required functions • Approvals will be undertaken in accordance with relevant processes.	The proposed design for the St Albans Bridge works utilises innovative technologies and techniques in order to offer heritage-sympathetic conservation strategies. The proposal attempts to minimise impact to original fabric through encapsulating rather than replacing the significant fabric of Pier 4. The replacing of deteriorated laminates, installation of cover plates and resurfacing of the deck will ensure the continued operability of St Albans bridge. The proposal is subject to a Section 60 approval requirement under the *Heritage Act 1977*.
9	Interpretation • Cultural significance of these bridge will be effectively communicated • Interpretation of the timber truss bridges will be based on the NSW State historical themes • TfNSW will develop a heritage interpretation strategy to apply to both bridges and site and materials from bridges that have been replaced • Interpretation will conform to relevant guidelines • TfNSW will commission a comprehensive publication on the heritage significance of the timber truss bridges of NSW. • Following completion of the work, interpretation signs would be erected in the vicinity of the bridge in accordance with the *Timber Truss Bridges Heritage Interpretation Strategy,* 2021.	Future action for Transport.
10	Protection and enhancement of visual setting • Development in the vicinity is to be carefully managed not to have an unacceptable visual impact	Visual impacts of the proposal on heritage values have been assessed as negligible to minor. Refer to Section 6.2.4.

No	Policy summary	Comment
	• Signage in the vicinity should be minimised • Vegetation in the vicinity of the bridges should be kept to a minimum • Relevant planning and statutory controls must be adhered to	
11	Archival recording • Records will be managed to ensure permanent retention as State records • Photographic archival recording before, during and after any works • A complete archival recording will be undertaken of all extant bridges • Full documentation of methods and materials used during any works • Representative sample retained as a moveable heritage collection • Information used to assist effective heritage interpretation of population	Future / ongoing action for Transport.
12	Sustainability • TfNSW will implement a recycling policy, timber procurement policy and a skills development program for timber bridge conservation	Future / ongoing action for Transport.
13	Archaeology • Relevant Aboriginal stakeholders will be consulted about any proposed impact • The TfNSW Cultural Heritage Guidelines and the archaeological provisions of the *Heritage Act 1977* will be adhered to • The TfNSW Unexpected Heritage Items Procedure will be followed to manage any unexpected finds during works	The proposal is being carried out consistent with the provisions of Transport's Procedure for Aboriginal Cultural Heritage Consultation and Investigation.
14	Reporting • Reporting to the Heritage Council will be undertaken in accordance with the Timber Truss Bridge Strategy	A neutral impact on non-Aboriginal archaeological 'relics' or works has been identified. Refer to Section 6.2.4.

2.2 Limitations of existing infrastructure

Limitations of existing infrastructure at the proposal site include:

- Corrosion and partial burial by river sediment of the bottom of the Pier 4 steel columns, bracings and tie beam including the lacings
- Ponding of water around the pier columns which is further worsening Pier 4 corrosion.
- Backing up of vegetation around Pier 4, resulting in flood risk
- Load limit of 15 tonnes (due to capacity restrictions of truss steel diagonal tension rods).
- Gaps in four bridge joints resulting in safety risk to pedestrians and horse riders

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Improve the safety and longevity of the bridge
- Improve the Transport condition rating of the bridge from 'poor' to 'good'
- Reduce ongoing maintenance requirements
- Minimise impacts on heritage values.

The condition rating will be determined by a bridge inspection after the works are complete.

2.3.2 Development criteria

The development criteria for the proposal include:

- Minimising adverse environmental impacts (including heritage impacts)
- Satisfying the technical and procedural requirements of Transport and other stakeholders
- Optimising the design to minimise constructability issues
- Minimising community impacts, including construction-related traffic disruption

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

The methodology for the selection of the preferred option involved the development of options to address the identified need and the evaluation of those options (pros and cons) with reference to the following four criteria:

- Safety
- Environment
- Heritage
- Community.

2.4.2 Identified options

Pier 4 rehabilitation works

Four options were considered for the Pier 4 rehabilitation works as described in the following sections. Given the heritage significance of the bridge and noting that it has been identified for retention, bridge replacement or bypass were not considered as viable options.

Option 1 – Do nothing

The 'do nothing' option involves continuing with routine maintenance and repair of bridge elements, but excludes major rehabilitation works to address corrosion on Pier 4.

Option 2 - Strengthen the pier columns with carbon fibre wrapping

The pier columns would be strengthened with carbon fibre wrapping and deteriorated bracing at the bottom of the pier replaced. The columns and pile foundation would be strengthened with pressure grouting, and, all exposed existing steel elements would be repainted. The main activity is grinding and blast cleaning the deteriorated and corroded column surface to prepare for the carbon fibre wrapping. The carbon fibre wrapping strengthens the corroded column and provides additional bending, tensile and shear capacity to the existing columns.

Option 3 – Strengthen the pier columns with additional steel casing (the proposal)

The pier columns would be strengthened with additional steel casing and deteriorated bracing at the bottom of the pier would be replaced. The columns and pile foundation would be strengthened with pressure grouting, and all exposed existing steel elements would be repainted. The additional steel casing would be placed on top of the existing wrought iron column including the existing rivets and the gap would be filled with non-corrosive glue material. Connections to the new bracing members would be to the new steel casing.

Option 4 – Like for like full replacement of Pier 4 structure

This option involves the like-for-like replacement of the Pier 4 structure with new materials.

TAMP works

Option 1 – Do nothing

The 'do nothing' option involves continuing with routine maintenance, but excludes major upgrade works to address the poor condition and structural integrity issues of the bridge.

Option 2 – Reseal bridge deck, cover the bridge joint with steel cover plates, replace the damaged laminate boards and restress all bridges

Option 3 – Remove and replaced entire asphalt layer of bridge and replace entire bridge deck around the damaged areas

Flood recovery works (Dead tree removal)

Option 1 – Do nothing

Under the 'do nothing' option, the fallen trees located around the base of the bridge would not be removed.

Option 2 – Relocate dead trees downstream (the proposal)

This option would involve relocating the dead trees away from the bridge further downstream.

Option 3 – Remove the dead trees from site and dispose of at a separate facility offsite

This option would involve removal of the dead trees from site, chipping the trees and disposing of the trees at an appropriate facility offsite.

2.4.3 Analysis of options

Pier rehabilitation works

Four options were considered for the pier rehabilitation works.

Option 1, the 'do nothing' option to retain Pier 4 in its current state has been considered and rejected due to high risk of failure of Pier 4 and the bridge. This option does not satisfy any of the proposal objectives.

Option 2 (carbon fibre wrapping) would meet the objectives of improving the safety and longevity of the bridge, improving the condition rating of the bridge and reducing the ongoing maintenance requirements of the bridge, as it would strengthen the pier columns, replace deteriorated elements and enhance the structural integrity of the bridge. However, Option 2 does not achieve the objective of minimising impacts on heritage values, as the colours and materials would be inconsistent with the heritage character of the bridge.

Option 3 (steel casing) meets all of the proposal objectives, as it would strengthen the pier columns, replace deteriorated elements and enhance the structural integrity of the bridge. Further, the materials and finishes for Option 3 would be consistent with the existing materials, finishes and heritage character of the bridge.

While Option 4 (like for like replacement) also meets all of the proposal objectives, this option has major cost implications and constructability issues. This is due to the superstructure needing to be temporarily supported while the existing Pier 4 elements including bracing, columns above and below the ground, and columns down to founding level, are removed and replaced. The superstructure is currently supported directly on the existing columns and would need to be supported on temporary supports some 10 to 12 metres above existing ground level with consideration to design wind and flood loading during the construction period.

These four options are analysed in Table 2-3.

Table 2-3: Evaluation of Options for Pier Rehabilitation Works

		Option 1	Option 2	Option 3	Option 4
		Do nothing	Strengthen the pier columns with carbon fibre wrapping	Strengthen the pier columns with additional casing	Like for like full replacement of Pier 4 structure
Proposal objectives	Improve the safety and longevity of the bridge	☒ **Objective not met** This option would not meet the proposal objective. The bridge would not be rehabilitated, and the safety and structural risk of the bridge would remain.	☑ **Objective met** The pier columns would be strengthened with carbon fibre wrapping and deteriorated elements of the bridge would be replaced.	☑ **Objective met** The pier columns would be strengthened with additional steel casing, and deteriorated elements of the bridge would be replaced.	☑ **Objective met** The entire structure of Pier 4 would be replaced with new 'like for like' elements.
	Improve the condition rating of the bridge from poor to good	☒ **Objective not met** This option would not meet the proposal objective. The bridge would remain in poor condition.	☑ **Objective met** The pier columns would be strengthened with carbon fibre wrapping and deteriorated elements of the bridge would be replaced. These works would strengthen the corroded bridge columns and provide additional capacity to the columns. replaced	☑ **Objective met** The pier columns would be strengthened with carbon fibre wrapping and deteriorated elements of the bridge would be replaced. These works would strengthen the corroded bridge columns and provide additional capacity to the columns. replaced.	☑ **Objective met** This would involve replacement of the entire Pier 4 structure with like for like materials.
	Reduce ongoing maintenance requirements	☒ **Objective not met** This option would not meet the proposal objective. The pier would not be rehabilitated, and the need for ongoing maintenance requirements would remain.	☑ **Objective met** This option would enhance the structural integrity and replace deteriorated elements of Pier 4 with new elements to reinforce the columns and pile foundations.	☑ **Objective met** This option would enhance the structural integrity and replace deteriorated elements of Pier 4 with new elements to reinforce the columns and pile foundations.	☑ **Objective met** This would involve replacement of the entire Pier 4 structure with like for like materials.
	Minimise impacts on heritage values	☒ **Objective not met** This option would not meet the proposal objective. The risk of further damage and corrosion to the bridge would remain, which would adversely impact the heritage fabric of the bridge.	☒ **Objective not met** This option would not meet the objective. The colour and materials finishes would be in substantial contrast to, and inconsistent with, the existing	☑ **Objective met** There would be a very minor visual impact on the heritage character of the bridge associated with the new materials. However, the rehabilitation work and new materials would enhance the	☑ **Objective met** This would involve like for like replacement of Pier 4 with new materials, which would all be consistent with the heritage character of the bridge.

			heritage character of the bridge.	structural integrity of the bridge, the active use of the bridge would remain and, the full length of the existing wrought iron columns would be retained and encased rather than replaced. In addition, all new materials will be consistent with the existing materials and finishes of the bridge.	
Development Criteria	Minimising adverse environmental impacts (including heritage impacts)	☒ **Criterion met** This option would not cause any short-term environmental impacts as no works would be proposed. However, increased risk of bridge failure would remain, posing a safety risk to road users.	☒ **Criterion not met** The environmental impacts associated with the construction of this option would be temporary and minor and could be mitigated and addressed with appropriate safeguards. However, this option would result in significant adverse heritage impacts, as the materials and finishes would be significantly out of character with the heritage fabric of the bridge.	☑ **Criterion met** The environmental impacts associated with the construction of this option would be temporary and minor and could be mitigated and addressed with appropriate safeguards. The heritage impacts of this option would also be minimal, as the new materials and finishes would be like for like where possible and would be sympathetic to the heritage fabric of the bridge.	☑ **Criterion not met** The construction of this option could result in more substantial environmental impacts than the other options, as it would involve greater disturbance of the riverbed, require the removal of Pier 4, and require additional structures / works to support the bridge for the pier replacement works. While this option involves like for like replacement of the entire pier with new materials that are sympathetic to the heritage character of the bridge, there is the potential that the bridge could be further damaged during these works.
	Satisfying the technical and procedural requirements of Transport and other stakeholders	☒ **Criterion not met** This option would not satisfy the technical and procedural requirements, as the safety risk of the bridge would remain unchanged, and the bridge would remain in poor condition.	☒ **Criterion not met** This option does not meet the objective, as it would pose an unacceptable environmental risk and would result in an adverse heritage outcome. Therefore, it does not meet TfNSW's	☑ **Criterion met** This option would be undertaken in accordance with the relevant technical and procedural requirements of TfNSW and other stakeholders. This option would result in an outcome that	☒ **Criterion not met** This option poses an unacceptable constructability risk and would therefore not satisfy TfNSW's technical requirements.

			technical requirements.	satisfies TfNSW's technical requirements.	
	Optimising the design to minimise constructability issues	☒ **Criterion met** This option would not cause any short-term community issues as no works would be proposed.	☒ **Criterion not met** While this option would enhance the structural integrity and replace deteriorated elements of the pier, it would result in a significant adverse heritage impact to the heritage character of the area, as the proposed materials and finishes would be in stark contrast to the existing heritage fabric of the bridge.	☒ **Criterion met** This option has been designed to minimise constructability issues while also minimizing environmental and heritage impacts on the locality.	☒ **Criterion not met** This option does not meet the objective, as it poses significant constructability issues. While this option involves like for like replacement of entire pier, the superstructure of the bridge would need to be supported entirely during the construction works, which would require the installation of temporary support columns up to 12m high.
	Minimising community impacts, including construction related traffic disruption	☒ **Criterion met** This option would not cause any short-term community issues as no works would be proposed. However, potential bridge failure would still pose a safety risk to road users.	☒ **Criterion met** The proposal would generally be designed to minimise community impacts, including traffic related impacts, and these impacts would be minor and temporary in nature. The proposal would incorporate appropriate safeguards to manage any community impacts during construction (approximately 18 weeks).	☒ **Criterion met** The proposal would generally be designed to minimise community impacts, including traffic related impacts, and these impacts would be minor and temporary in nature. The proposal would incorporate appropriate safeguards to manage any community impacts during construction (approximately 18 weeks)	☒ **Criterion not met** This option would result in more substantial community impacts than the other options, as it would likely require more machinery, plant and construction traffic than the other options, would likely have a longer construction period than the other options and would likely require closure of the bridge for the duration of the works.

TAMP works

Three options were considered for the TAMP works.

Option 1, the 'do nothing' option to retain the bridge in its current state has been considered and rejected, as it does not meet any of the proposal objectives. The bridge would remain in a poor condition and continue to pose a safety risk, deteriorate further through lack of maintenance and potentially impact the longevity and heritage values of the bridge.

Option 2 would involve resealing the bridge deck, covering the bridge joint with steel cover plates, replacing the damaged laminate boards and restressing all bridge spans. This option would satisfy all of the proposal objectives, as it would reduce

the safety risk of the bridge, improve the structural integrity and condition rating of the bridge, improve the bridge decking and achieve an outcome that is sympathetic to the heritage character of the bridge.

Option 3 would involve removing the entire asphalt layer of the bridge to replace it with new asphalt and replacing the entire bridge deck around the damaged areas. This option would satisfy the proposal objectives to improve the safety and longevity of the bridge, improve the condition rating of the bridge, and reduce the ongoing maintenance requirements of the bridge. However, this option does **not** satisfy the objective to minimise impacts on heritage values, as it poses the risk of damaging the bridge deck and adversely impacting the heritage values of the bridge.

These three options are analysed in Table 2-4.

Table 2-4: Evaluation of options for TAMP works

		Option 1	Option 2	Option 3
		Do nothing	Resealing the bridge deck, covering the bridge joint with steel cover plates, replacing the damaged laminate boards and restressing all spans	Remove entire asphalt layer to replace with new asphalt and replace the entire bridge deck around the damaged areas
Proposal objectives	Improve the safety and longevity of the bridge	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The bridge would not be rehabilitated, and the safety and structural risk of the bridge would remain.	☑ **Objective <u>met</u>** This option would reduce the safety risk of the bridge and would improve the condition rating of the bridge from 'poor' to 'good'.	☑ **Objective <u>met</u>** This option would reduce the safety risk of the bridge and would improve the condition rating of the bridge from 'poor' to 'good'
	Improve the condition rating of the bridge from 'poor' to 'good'	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The bridge would remain in 'poor' condition.	☑ **Objective <u>met</u>** This option would enhance the structural integrity and condition rating of the bridge from 'poor' to 'good'.	☑ **Objective <u>met</u>** This option would enhance the structural integrity and condition rating of the bridge from 'poor' to 'good'.
	Reduce ongoing maintenance requirements	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The bridge would not be rehabilitated, and the risk of ongoing maintenance requirements would remain.	☑ **Objective <u>met</u>** This option would enhance the structural integrity and functionality of the bridge and reduce the need for ongoing maintenance requirements.	☑ **Objective <u>met</u>** This option would enhance the structural integrity and functionality of the bridge and reduce the need for ongoing maintenance requirements.
	Minimise impacts on heritage values	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The risk of further damage and corrosion to the bridge would remain, which could adversely impact the heritage fabric of the bridge.	☒ **Objective <u>met</u>** This option would enhance the structural integrity and functionality of the bridge and utilize materials, colours and finishes that are sympathetic to the original heritage fabric of the bridge.	☒ **Objective <u>not met</u>** This option could result in significant adverse heritage impacts to the bridge, as it could result in damage to the bridge deck.

Development Criteria	Minimising adverse environmental impacts (including heritage impacts)	☒ **Criterion met** This option would not cause any short-term environmental impacts as no works would be proposed. However, increased risk of bridge failure would remain, posing a safety risk to road users.	☒ **Criterion met** The environmental impacts associated with the construction of this option would be temporary and minor and could be mitigated and addressed with appropriate safeguards. This option would retain as much of the original fabric of the bridge as far as practicable. This option would also utilize colours, materials and finishes that are sympathetic to the original heritage fabric of the bridge.	☒ **Criterion not met** The environmental impacts associated with the construction of this option would be temporary and minor and could be mitigated and addressed with appropriate safeguards. However, this option could result in significant adverse heritage impacts to the bridge, as it could result in damage to the bridge deck.
	Satisfying the technical and procedural requirements of Transport and other stakeholders	☒ **Criterion not met** This option would not satisfy the technical and procedural requirements, as the safety risk of the bridge would remain unchanged, and the bridge would remain in poor condition.	☑ **Criterion met** This option would be undertaken in accordance with the relevant technical and procedural requirements of TfNSW and other stakeholders. This option would result in an outcome that satisfies TfNSW's technical requirements.	☒ **Criterion not met** This option does not meet the objective, as it could result in an adverse heritage outcome. Therefore, it does not meet TfNSW's technical requirements.
	Optimising the design to minimise constructability issues	☒ **Criterion met** This option would not cause any short-term constructability issues as no works would be proposed.	☒ **Criterion met** This option has been designed to ensure maximum constructability while also minimizing environmental and heritage impacts on the locality.	☒ **Criterion not met** While this option would enhance the structural integrity and replace deteriorated elements of the bridge, there is potential that this option could result in damage to the bridge deck, which could result in a significant adverse impact to the heritage values of the bridge.
	Minimising community impacts, including construction related traffic disruption	☒ **Criterion met** This option would not cause any short-term community issues as no works would be proposed. However, potential bridge failure would still pose a safety risk to road users.	☒ **Criterion met** The proposal would generally be designed to minimise community impacts, including traffic related impacts. The proposal would incorporate appropriate safeguards to manage any potential	☒ **Criterion met** The proposal would generally be designed to minimise community impacts, including traffic related impacts. The proposal would incorporate appropriate safeguards to manage any potential impacts.

Flood recovery works (Dead tree removal)

Three options were considered for the dead tree removal associated with the flood recovery works.

Option 1, the 'do nothing' option to leave the dead trees against the bridge structure has been considered and rejected, as it does not meet the relevant proposal objectives of improving the safety and longevity, reducing the ongoing maintenance requirements and minimising impacts on heritage values of the bridge. Under this option, the tree would continue to hit against the bridge structure and could capture more debris in future floods, resulting in further damage to the bridge.

Option 2 would involve relocating the dead trees away from the bridge further downstream. This option would meet all of the relevant proposal objectives. It would improve the safety and longevity of the bridge, as it would minimise the risk of future damage to the bridge by removing dead trees and debris from the bridge; it would reduce ongoing maintenance requirements, as it would remove the trees causing potential damage to the bridge; and it would minimise impacts on heritage values by reducing the risk of future damage to the bridge.

This option would avoid disrupting any potential habitat the tree may be a part of, and the plant / machinery would be available onsite to relocate the tree, creating efficiency and minimal risks.

Option 3 would involve removal of the dead trees from site, chipping the trees and disposing of the trees at an appropriate facility offsite. While this option also satisfies the relevant proposal objectives for the same reasons as Option 2, Option 3 would require more labour and machinery and could potentially pose a HSEQ risk to workers. In addition, the removal of dead trees from the river under Option 3 could pose environmental implications for aquatic habitat and species.

These three options are analysed in Table 2-5 below.

Table 2-5: Evaluation of options for flood recovery works

		Option 1	Option 2	Option 3
		Do nothing	Relocate the dead trees downstream from bridge	Remove trees from site, woodchip tree and dispose of at an appropriate facility offsite
Proposal objectives	Improve the safety and longevity of the bridge	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The trees would remain in their current location and would continue to damage the bridge.	☑ **Objective <u>met</u>** This option would improve the safety risk of the bridge and minimise the risk of future damage to the bridge from the dead trees and debris from future floods.	☑ **Objective <u>met</u>** This option would improve the safety risk of the bridge and minimise the risk of future damage to the bridge from the dead trees and debris from future floods.
	Reduce ongoing maintenance requirements	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The trees would remain in their current location and could further damage the bridge, resulting in further maintenance requirements to the bridge.	☑ **Objective <u>met</u>** This option would reduce the need for ongoing maintenance to the bridge as it would remove the trees obstructing the river and causing potential damage to the bridge.	☑ **Objective <u>met</u>** This option would reduce the need for ongoing maintenance to the bridge as it would remove the tree obstructing the river and causing potential damage to the bridge.
	Minimise impacts on heritage values	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The risk of further damage to the bridge would remain, which could adversely impact the heritage fabric of the bridge.	☑ **Objective <u>met</u>** This option would minimise adverse impacts to the heritage values of the bridge by reducing the risk of further damage to the bridge.	☑ **Objective <u>met</u>** This option would minimise adverse impacts to the heritage values of the bridge by reducing the risk of further damage to the bridge.
Developm	Minimising adverse environmental impacts (including heritage impacts)	☒ **Objective <u>not met</u>** This option would not meet the proposal objective. The risk of	☑ **Objective <u>met</u>** This option would minimise adverse impacts to the heritage values of the	☒ **Objective <u>not met</u>** This option would minimise adverse impacts to the heritage values of the bridge by reducing

		further damage to the bridge would remain, which could adversely impact the heritage fabric of the bridge.	bridge by reducing the risk of further damage to the bridge.	the risk of further damage to the bridge. However, this option could potentially disturb aquatic habitat within the river and result in an adverse impact to aquatic species. This option also poses a potential safety risk to workers.
	Satisfying the technical and procedural requirements of Transport and other stakeholders.	☒ **Criterion not met** This option would not satisfy the technical and procedural requirements, as the safety and structural risk of the bridge would remain unchanged, and the bridge would remain in poor condition.	☑ **Criterion met** This option would be undertaken in accordance with the relevant technical and procedural requirements of TfNSW and other stakeholders. This option would result in an outcome that satisfies TfNSW's technical requirements.	☒ **Criterion not met** This option does not meet the objective, as it could potentially result in an adverse environmental outcome on aquatic habitat and aquatic species adjacent to the bridge.
	Optimising the design to minimise constructability issues	☒ **Criterion met** This option would not cause any short-term constructability issues as no works would be proposed.	☒ **Criterion met** This option has been designed to ensure maximum constructability while also minimizing environmental and heritage impacts on the locality.	☒ **Criterion e not met** This option has been designed to ensure maximum constructability while also minimizing environmental and heritage impacts on the locality.
	Minimising community impacts, including construction related traffic disruption	☒ **Criterion met** This option would not cause any short-term community issues as no works would be proposed. However, potential bridge failure would still pose a safety risk to road users.	☒ **Criterion met** The proposal would generally be designed to minimise community impacts, including traffic related impacts. The proposal would incorporate appropriate safeguards to manage any potential impacts.	☒ **Criterion met** The proposal would generally be designed to minimise community impacts, including traffic related impacts. The proposal would incorporate appropriate safeguards to manage any potential impacts.

2.5 Preferred options

Pier 4 rehabilitation works

Option 3 (steel casing) was selected as the preferred option due to its low heritage impacts, long design life and lower maintenance costs. This option was chosen as it best meets the proposal objectives.

TAMP works

Option 2 was selected as the preferred option due to its low heritage impacts, long design life and lower maintenance costs. This option was chosen as it best meets the proposal objectives.

Flood recovery works (dead tree removal)

Option 2 was selected as the preferred option due to its cost efficiency, low potential environmental risk and minimal safety risk for workers. This option was chosen as it best meets the proposal objectives.

The preferred options are the basis for the proposal, which is described in detail in Chapter 3.

3. Description of the proposal

This chapter describes the proposal and provides descriptions of existing conditions, the design parameters including major design features, the construction method and associated infrastructure and activities.

3.1 The proposal

Transport proposes to carry out works on St Albans Bridge. The proposal would involve three main packages of works:

- Rehabilitation works on Pier 4 of the bridge
- Flood recovery works at Pier 4 of the bridge
- TAMP works on St Albans bridge

These three packages of works are detailed as follows:

3.1.1 Pier 4 rehabilitation works

Key features of the rehabilitation works associated with Pier 4 include:

- Installation of temporary sheet piling to provide a cofferdam. Sheet piles would be installed around base of Pier 4 using an excavator with pile driving attachment (refer to Figure 3-12)
- Non-destructive excavation around the base of Pier 4 to a depth of about two metres to remove sediment / silt
- Abrasive blasting to remove loose / deteriorated paint and prime coat applied to Pier 4
- Removal of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Panel 1 of Pier 4 (including removal, cleaning and repainting of brace rivets of the upper column cleats) (refer to Figure 3-4)
- Removal and cleaning of bottom metal brackets (cleats) on both sides, and treatment with paint in exposed areas
- Surface washing of the wrought iron columns to remove loose particles only, to the level of the second horizontal brace
- Installation of split covers/seating straps at the base of the wrought iron columns and at the level of the second horizontal bracing on both sides (including gap filling)
- Like-for-like replacement of the bottom horizontal steel lattice bracing element and the bottom two steel diagonal/cross bracing elements, which would be attached to new bottom cleats and the restored upper cleats with bolt connectors
- Removal and replacement of the steel connection plates for the diagonal and horizontal steel bracing elements with modified steel plates to connect to the new steel casing, featuring faux riveting with dome bolts and dome nuts
- Installation of additional steel casing detailed with faux riveting using dome bolts and dome nuts around the base of the wrought iron columns, connected to the existing wrought iron column with steel bolts and a non-corrosive epoxy infill material
- Pressure grouting of the inside of the cast iron piles at the lower and upper level of Pier 4 to fill all voids and provide adequate structural strength, using grout nipples. Pressure grouting would also require two 20-millimetre diameter holes to be drilled through the iron capping (which would be repaired, sealed and waterproofed on completion of the grouting)
- Repainting to match the existing colour of the exposed wrought iron columns of Pier 4, the new steel casing and the replaced elements
- Partial backfilling of the excavation with rock fill and sand (reducing the height of the riverbed to minimise further impact to Pier 4 caused by flooding events and sediment deposits)

A typical cross section of the rehabiliation works is shown in Figure 3-1 and the elevations are shown in Figure 3-2. Details of the proposed cofferdam are shown in Figure 3-3, and details of the panels for Pier 4 are shown in Figure 3-4.

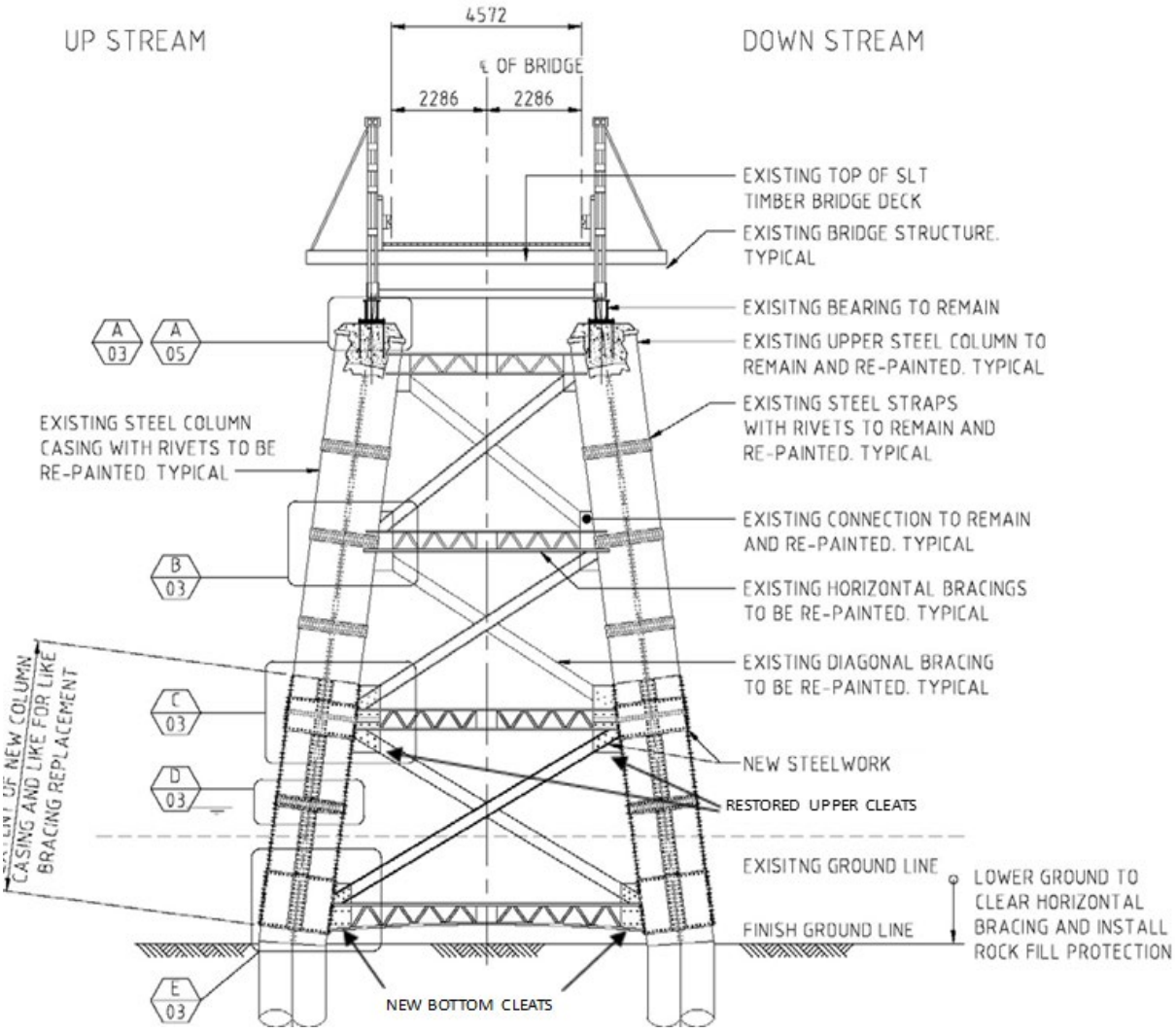


Figure 3-1: Typical Pier 4 cross section showing proposed works

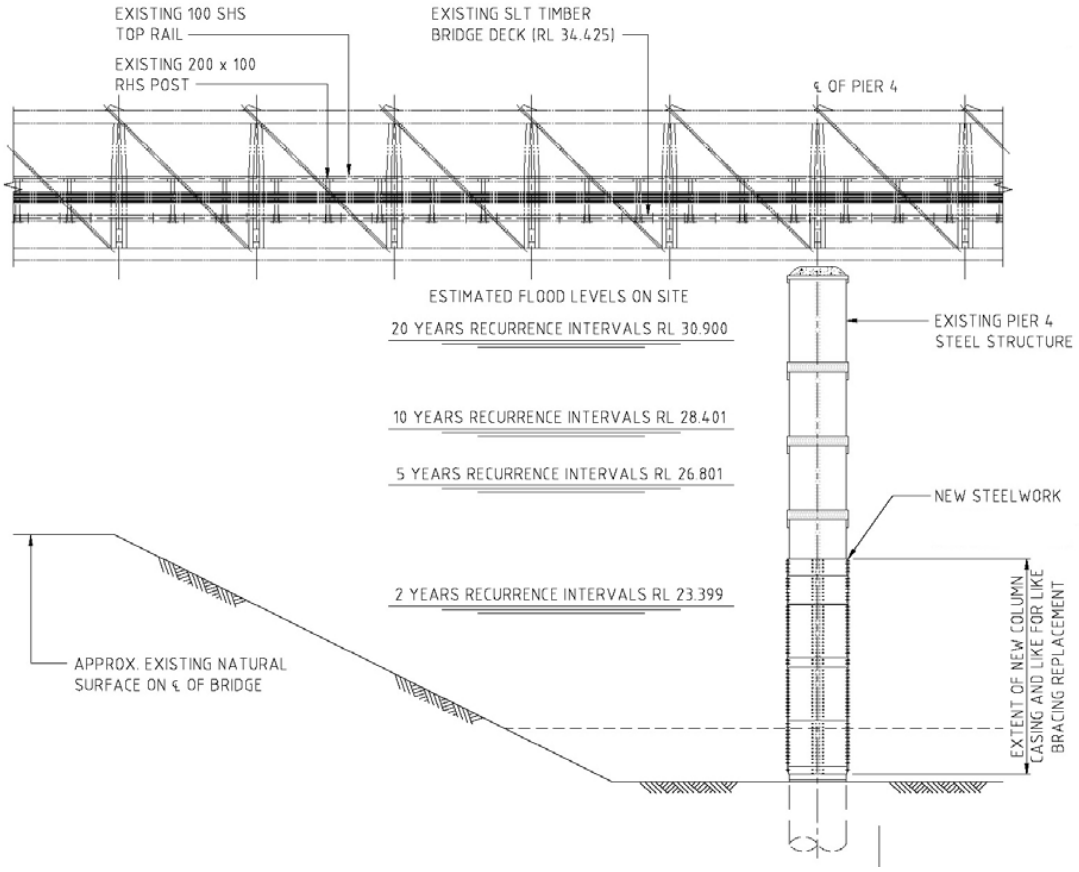


Figure 3-2: Pier 4 side view looking east showing proposed works

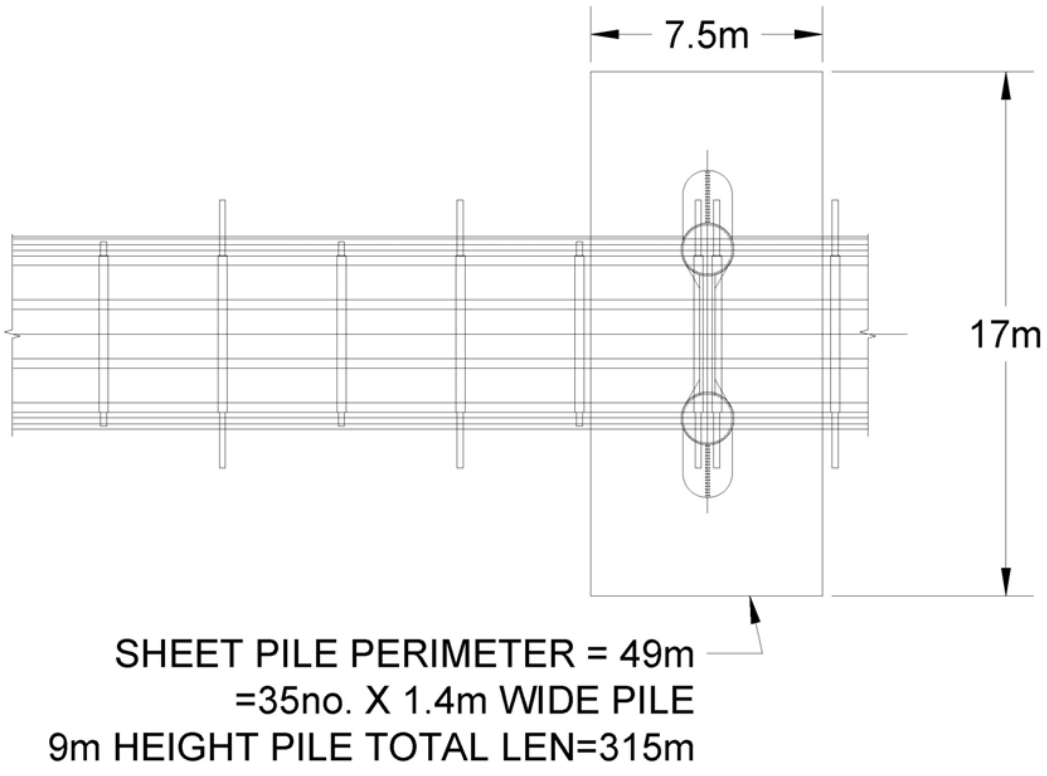


Figure 3-3: Pier 4 cofferdam size and orientation

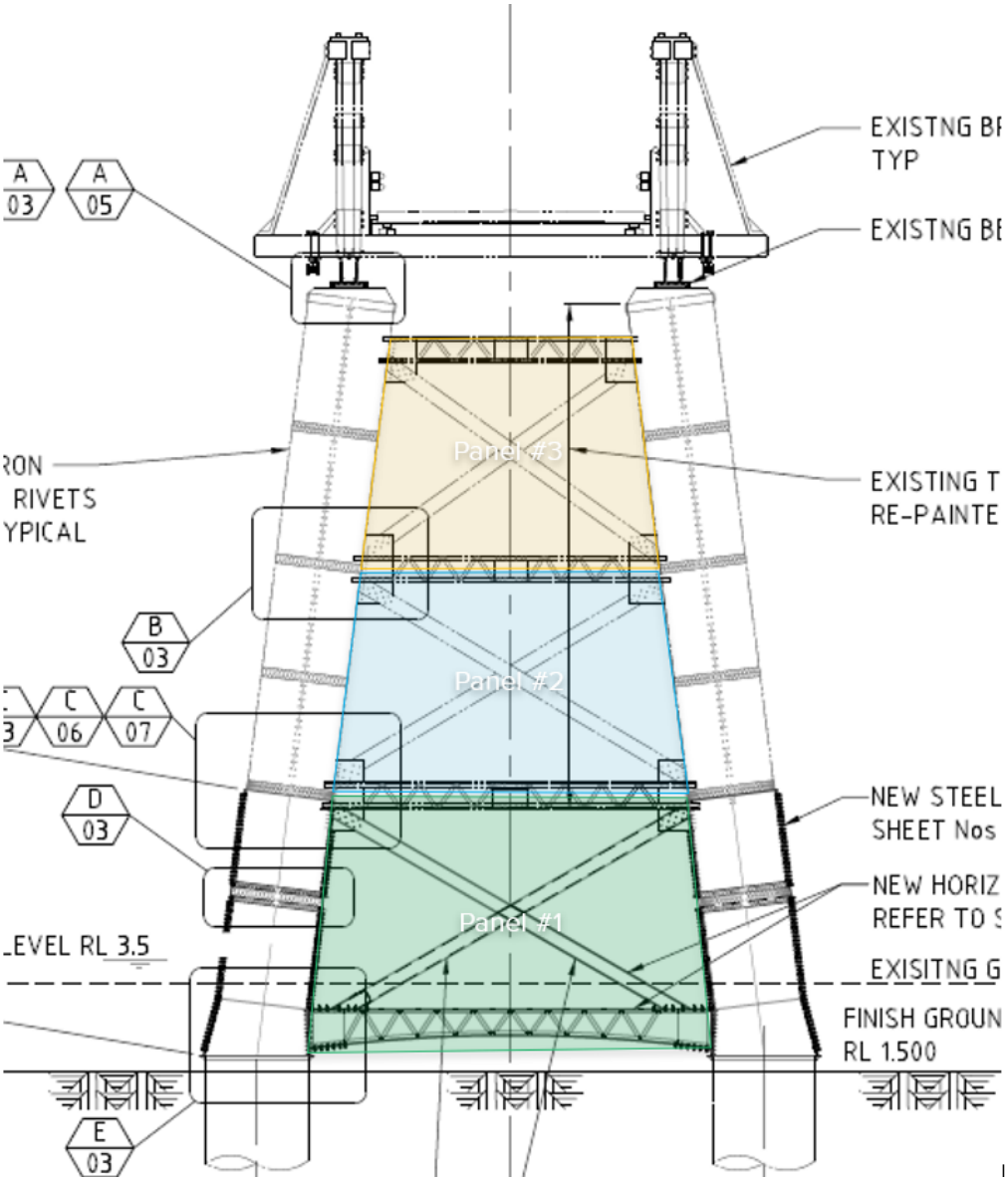


Figure 3-4: Pier 4 section with identification of panels

3.1.2 Flood recovery works

The proposed flood recovery works involve fallen tree removal and the clearance of sediment and silt from around the base of Pier 4. The fallen dead tree shown in Figure 3-5 would be relocated downstream from the site.

3.1.3 TAMP works

TAMP works will not occur concurrently with and will be undertaken at a later stage to the pier rehabilitation and flood recovery works. These works comprise:

- Resealing five hundred square metres of the surface of the bridge deck. The bridge deck to be resealed is shown in Figure 3-6
- Installing about 20 metres of cover plate over exposed gaps in bridge joints. A gap in the joint that requires covering is shown in Figure 3-7
- Destressing and replacing deteriorated laminates throughout the bridge deck. The laminates that require replacing are shown in Figure 3-8 and Figure 3-9
- Restressing all bridge spans
- Reinstate 2m^2 of sandstone block abutment, as shown in Figure 3-10



Figure 3-5: Fallen trees in River MacDonald to be removed from around base of Pier 4 and relocated downstream



Figure 3-6: Bridge deck surface to be resealed

Source: Gate 1 Document – 2023-PLZ-S8-142 B413 St Albans Bridge Over Macdonald River



Figure 3-7: Exposed gap in bridge joint which requires cover plate

Source: Gate 1 Document – 2023-PLZ-S8-142 B413 St Albans Bridge Over Macdonald River



Figure 3-8: Location of bridge deck laminates to be replaced

Source: Gate 1 Document – 2023-PLZ-S8-142 B413 St Albans Bridge Over Macdonald River

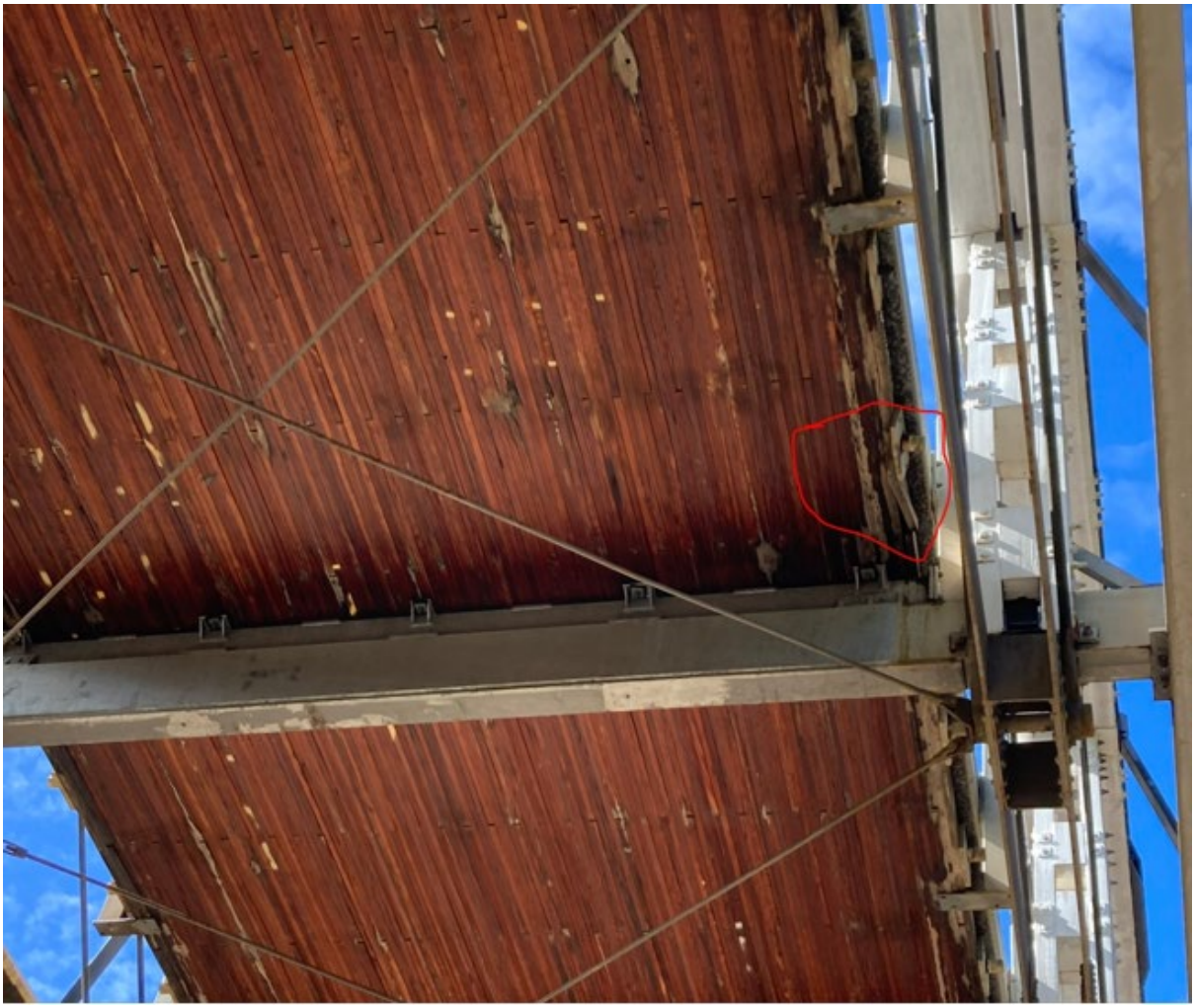


Figure 3-9: Location of bridge deck laminate to be replaced

Source: Gate 1 Document – 2023-PLZ-S8-142 B413 St Albans Bridge Over Macdonald River



Figure 3-10: Northern sandstone block abutment to be reinstated

3.1.4 Related works

Site Establishment Works

Site preparation works would involve the installation of fencing around the perimeter of the site and the installation of footings for the ancillary structures.

Access Track

To enable the necessary access to Pier 4 for the works, temporary placement of a up to 500-millimetre gabion mattress is proposed to form an access track from the bank of the river to Pier 4.

The current proposal does not require widening of the existing access track from the riverbank. The proposal would utilise the existing access track to enable construction machinery to access the riverbed around Pier 4. To minimise damage to the riverbank, and provide safe access for machinery, compacted gabion rock would provide a hardstand surface (gabion rock mattress) along the track, and bulka bags would be laid alongside the access track to retain the hardstand. One tree needs to be removed due to it poses safety hazard to the workers. Refer to Figure 3-11, Figure 3-12 and Figure 6-10 for details of the access track.

Site Compound, Site Amenities, Site Office and Stockpile Areas

To support construction works, temporary ancillary facilities, including a site compound, storage area, site amenities and site office, would be located on land adjacent to the bridge (including worker amenities and plant/equipment). This land is an existing hardstand area and would not require vegetation clearing or additional works to accommodate the ancillary facilities. The cabins and equipment would be brought onsite via truck and trailer.

A temporary stockpile area would also be established adjacent to the car park area to the northwest of the site. Ancillary facilities are detailed further in Section 3.4. These structures would be removed from site at the end of construction.

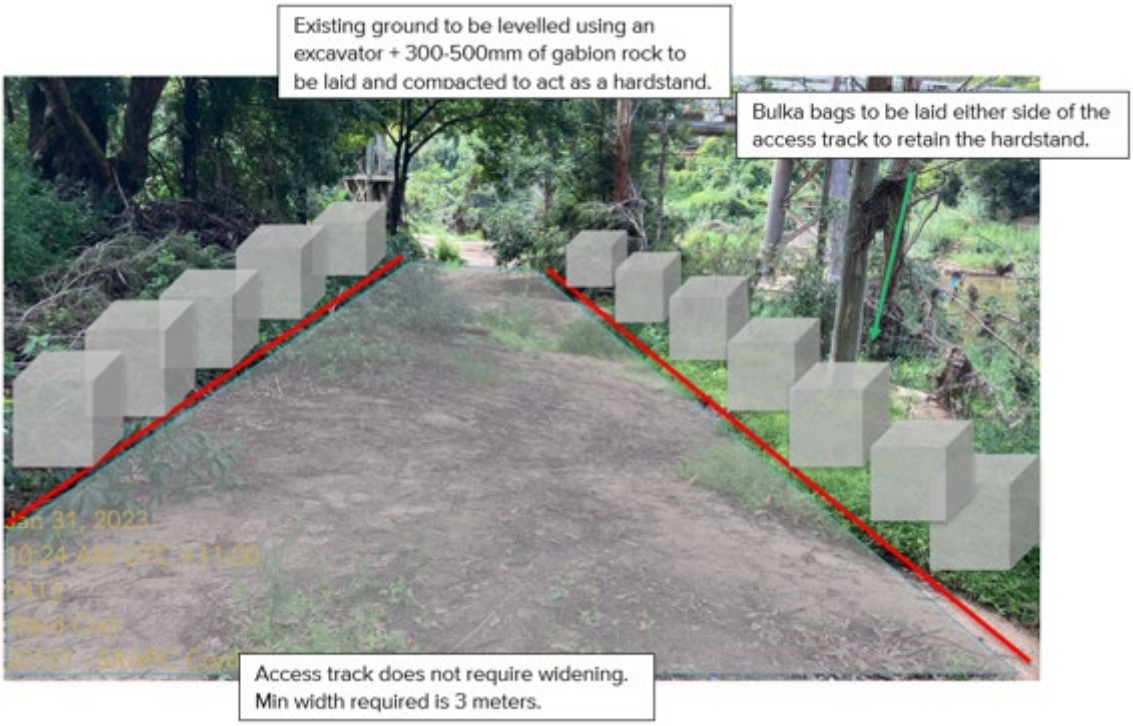


Figure 3-11: Proposed access track layout and associated works

3.2 Design

3.2.1 Design criteria

Design guides and policies used during the development of the proposal included:

- Australian Standard AS 5100-2017 Bridge design, Part 1: Scope and general principles
- Transport for NSW Bridge Technical Directions
- Austroads Guide to Road Design
- Transport for NSW Supplements to Austroads Guide to Road Design
- Transport for NSW Supplements to Australian Standards
- Transport for NSW Technical Specifications
- Transport for NSW Standard Drawings.

3.2.2 Engineering constraints

The proposal has several engineering related constraints:

- Requirement to maintain through traffic on St Albans Bridge during rehabilitation/construction
- Current 15 tonne load limit
- Need to avoid impacts on communications cabling on the bridge
- Water levels in the Macdonald River during construction

3.3 Construction activities

3.3.1 Work methodology

Initial works would include establishment of site compound and laydown area, the installation of environmental controls and the establishment of access to the piers and surrounding work areas.

The general sequence of works is identified in Table 3-1. The sequence is indicative and may need to be modified before the start of construction. Details of the construction methodologies and locations for the cofferdam and access track are provided in Figure 3-12, and details of the scaffolding encapsulating system are provided in Figure 3-13 and Figure 3-14.

Table 3-1: Proposed construction stages

Stage Activities	Details
Pier 4 rehabilitation works	
Deliver excavator to the site for sheet piling installation	The excavator float would go through Webbs Creek Ferry and arrive on St Albans Road. Unload the excavator from the float and tracked down to the embankment. The excavator is to track across the river in accordance with Environmental Work Method Statement (EWMS).
Install temporary sheet piling and cofferdam around Pier 4	Cofferdam to be approximately 17 x 7.5 metres, with sheet piles 9 metres long and top of sheet about 1 metre above cross brace intersection to allow for moderate river height increases. The cofferdam is to capture any sediment produced by the works and dewatering return water. Dewatering will be undertaken in accordance with the relevant requirements of DPI Fisheries.
Non-destructive excavation (using vacuum truck and similar plant) around the base of Pier 4 to a depth of about two metres to remove sediment / silt	Excavate / dredge around base of Pier 4 to enable access to concrete pad.
Pumping of water from within the cofferdam	Dewater by pump of pooled water, then by borehole(s)/vacuum, dewater to about 2m below horizontal brace and maintain dewatering at that level until completion of works associated with Stage 3 of construction.. The dewatering process would involve capturing the water in the sump within the cofferdam. All water within the cofferdam would be tested and treated (if required) before being pumped from the cofferdam. Pumped water would go through the geofabric channel and enter the rock check, which would be installed approximately ten metres away from the waterway. A EWMS would be prepared for pumping of water from site. Stage 3 includes the general cleaning of lower parts of the columns, the removal of temporary bracing and the installation of seating straps and casings for the columns. The proposal has incorporated appropriate safeguards for the management and treatment of water from the cofferdam, including safeguards recommended by DPI Fisheries, and these safeguards will be incorporated into the CEMP and EWMS.
Installation of scaffolding encapsulation system around Pier 4 for removal of paint and lead.	Temporary scaffolding to be erected around Pier 4 for paint and lead removal. The encapsulation system, which would provide full containment of the work areas and allow collection of all waste products including dust and wastewater, would cover areas of the columns to be painted and provide an air-tight seal. The walls and working platforms would be covered in an approved reinforced plastic sheeting. The encapsulation system would meet the relevant Australian standards and would not impede travel across the bridge.

Stage Activities	Details
Abrasive blasting to remove paint and prime coat applied to Pier 4 where required	Waste blast material containing lead-based paint and garnet blasting medium would be continuously removed from the containment area via pressurised dust extraction. It would be filtered into a large bin that is emptied into bulka bags and placed on pallets in sealed drums at the site compound prior to transportation to a licensed suitable disposal facility. From the point the lead paint is removed from the bridge until the point it is delivered to the disposal facility it would be in sealed containers and monitored through each step in the process (including the statutory requirement for tracking of hazardous waste).Once all paint has been removed, a prime coat of paint would be applied to Pier 4 as required. The proposal has incorporated appropriate safeguards for the management of the waste blast materials, including the storage and disposal of lead.
Excavate sand within cofferdam to 0.5 metres below horizontal brace.	Excavated river sands within cofferdam would be stockpiled at the proposed compound site, away from the waterway. The excavated sands would be beneficial reused for local council/residential projects, otherwise, it would be disposed of at appropriate facility. Maintain dewatering at 2 metre below horizontal brace. Place two layers of Bidum geo fabric and upper layer of 0.4 millimetre plastic industrial sheet on working platform to capture any scaling material.
Removal of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Panel 1 of Pier 4 (including removal, cleaning and repainting of brace rivets of the upper column cleats)	Upper column cleats; remove brace rivets and clean/repaint. Cleaning and repainting of the existing steel structure to be conducted within the cofferdam. Priming and build coat of the new steel to be done off site in the painters facility. Top coat to be applied to the new steel and existing steel (entire pier) after the new steel is connected. Bottom cleats both sides to be removed/cleaned back and pain treated in exposed areas. Maintain clean floor at all times. If 'overtopping' of river water into cofferdam is anticipated, clean floor by vacuum to ensure no deleterious materials remain.
Removal and cleaning of bottom cleats on both sides, and treatment with paint in exposed areas.	Bottom cleats to removed and cleaned and exposed areas to be painted.
Surface clean both iron columns to second horizontal brace and install first lift split covers both sides.	Complete cover installations including gap filling. Verify bracing and bolting dimensions, finish new bracing fabrication and paint.
Install (new) horizontal and cross braces.	Attach to new bottom cleats and restored upper cleats with bolt connectors.
Installation of split covers/seating straps at the base of the wrought iron columns and at the level of the second horizontal bracing on both sides (including gap filling)	Split cover alignment installed to suit existing site conditions and gap filler installed to manufacturer specifications and allowed to cure
Like-for-like replacement of the bottom horizontal steel lattice bracing element and the bottom two steel diagonal/cross bracing elements.	Horizontal steel lattice bracing and bottom bracing elements would be replaced with like-for-like bracing and would be attached to the bottom horizontal steel lattice bracing element and the bottom two steel diagonal/cross bracing elements, which would be attached to new bottom cleats and the restored upper cleats with bolt connectors.
Removal and replacement of the steel connection plates for the diagonal and horizontal steel bracing elements with modified steel plates to connect to the new	Steel connection plates for bracing would be removed and replaced with modified steel plates.

Stage Activities	Details
steel casing, featuring faux riveting with dome bolts and dome nuts.	
Install (new) horizontal and cross braces.	Attach to new bottom cleats and restored upper cleats with bolt connectors.
Pressure grout of the inside of the cast iron piles at the lower and upper level of Pier 4 to fill all voids and provide adequate structural strength, using grout nipples. Pressure grouting would also require two 20 millimetre diameter holes to be drilled through the iron capping of the piles (which would be repaired, sealed and waterproofed on completion).	Quantity and installation controls to be implemented including safeguards to minimise the risk of grout entering the river. Grouting material will be captured within the cofferdam, and all grouting equipment will be encapsulated and contained within a bunded area. Specific measures to minimise the risk of grout entering the river will be implemented under the Construction Environmental Management Plan (CEMP) and an Environment Work Method Statement (EWMS) for the Proposal
Surface preparation and repainting of the columns above the new steel casing	Following the first stage of removal steel surfaces would be cleaned using abrasive blast methods. A prime coat would be applied to all steel surfaces. Following the prime coat an intermediate build coat and topcoat layers of the coating system would be applied. The paint colour would match the existing. All layers would typically be sprayed with stripe coating of edges and joins applied with brush or roller.
Partial backfilling of excavation area	Partial backfilling of excavation area around Pier 4 with rock fill and sand to minimise further flooding and sedimentation impacts.
Remove grout nipples, clean, repair, paint as necessary, remove encapsulation and scaffold and floor coverings	Refill cofferdam area part with excavated sand and finalise with designed rock fill. Spread remainder of excavated sand to batter for scour protection.
Remove cofferdam	Cofferdam will be removed following completion of works.
Flood recovery works	
Remove vegetation from MacDonald River that has backed up against Pier 4.	Winch trees up access track along embankment, cut up, put through a chipper and then remove from site. Relocate fallen / dead trees downstream from site using excavator.
Clear sand / silt around base of Pier 4 to expose concrete pad	Clean all steel at base once exposed.
TAMP works	
Destressing and replacement of deteriorated laminates throughout bridge deck	Check entire span for tension. Undo tension of bridge deck. Remove deteriorated laminated pieces that are breaking at area of tension plates. Replace with new laminates in deck.
Reseal surface across bridge deck	Reseal five hundred metre squared of the surface of the bridge deck. Reinstate spray seal across deck including removing existing edge flashing around edges of deck and placement of new tack seal under flashing. Refastening to deck before new spray seal applied. Lay hot bitumen sealant over entire deck. Lay stone over bitumen sealant. Use roller for compaction.
Install steel cover plates	Install approximately twenty metres of steel cover plates over nominal gaps in four bridge joints.
Restress all bridge spans	Restress all bridge spans as required, including removal of all damaged laminate boards from the outer side of the deck and replacing these boards with new boards, ‘like for like’, ensuring they are treated and have the same appearance and qualities as the existing boards.

Stage Activities	Details
Reinstate 2m^2 of sandstone block abutment	Block layers to use existing stone where possible and to source similar sandstone blocks for any addition stone required.
Site Establishment Works	Install fencing around the perimeter of the site and install footings for ancillary structures.
Access Track	Remove one tree that pose safety hazard. Widen the existing track from the riverbank to enable construction machinery to access the riverbed around Pier 4.
Site Compound, Site Amenities, Site Office and Stockpile Area	Install / erect temporary facilities on land adjacent to the bridge. These facilities / structures would be brought onsite via truck and trailer and would be removed from site at the end of construction. A temporary stockpile area would be established adjacent to the northwest car park area.

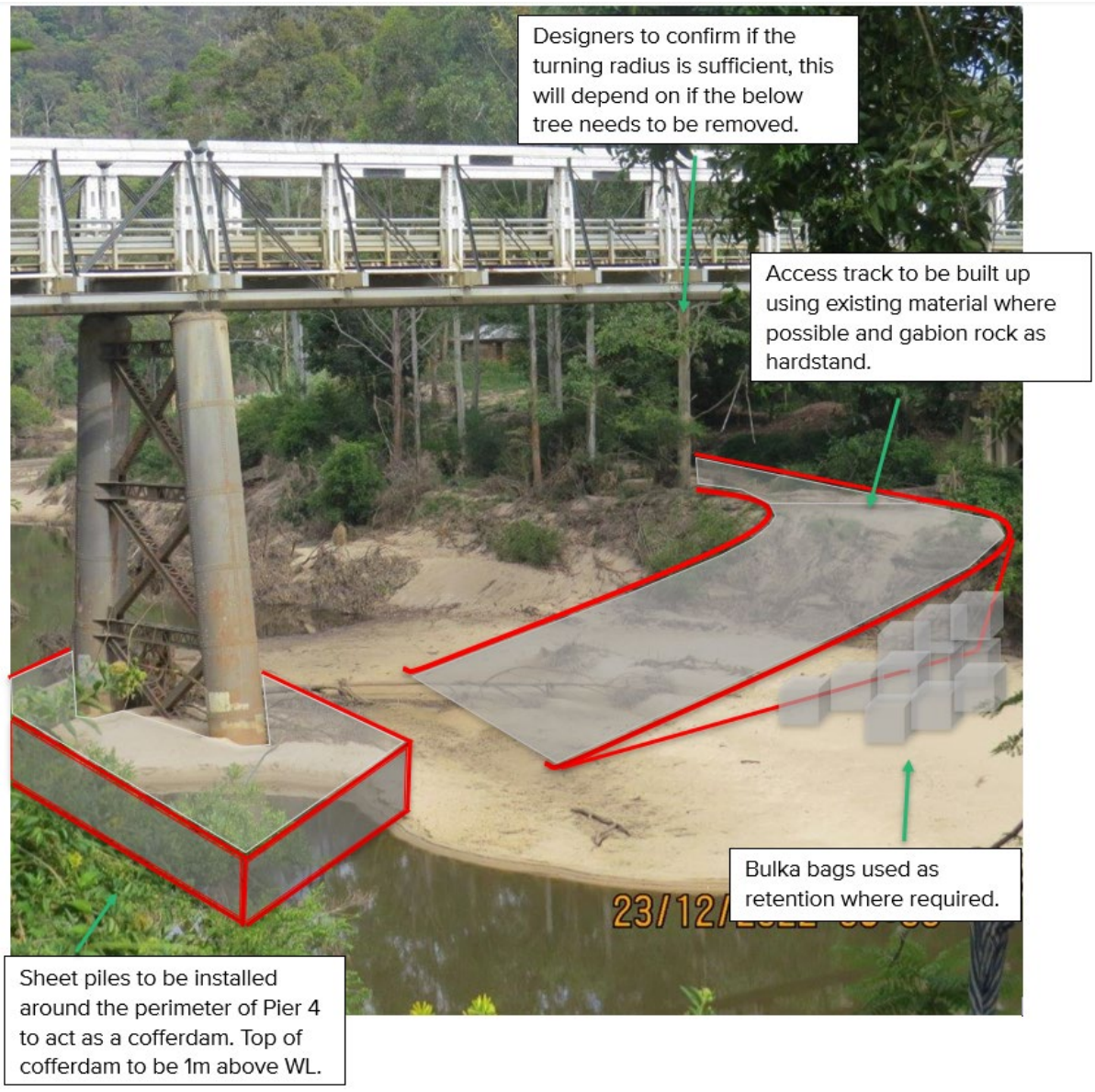


Figure 3-12: Access track and cofferdam location and layout (including location of proposed vegetation and tree removal)

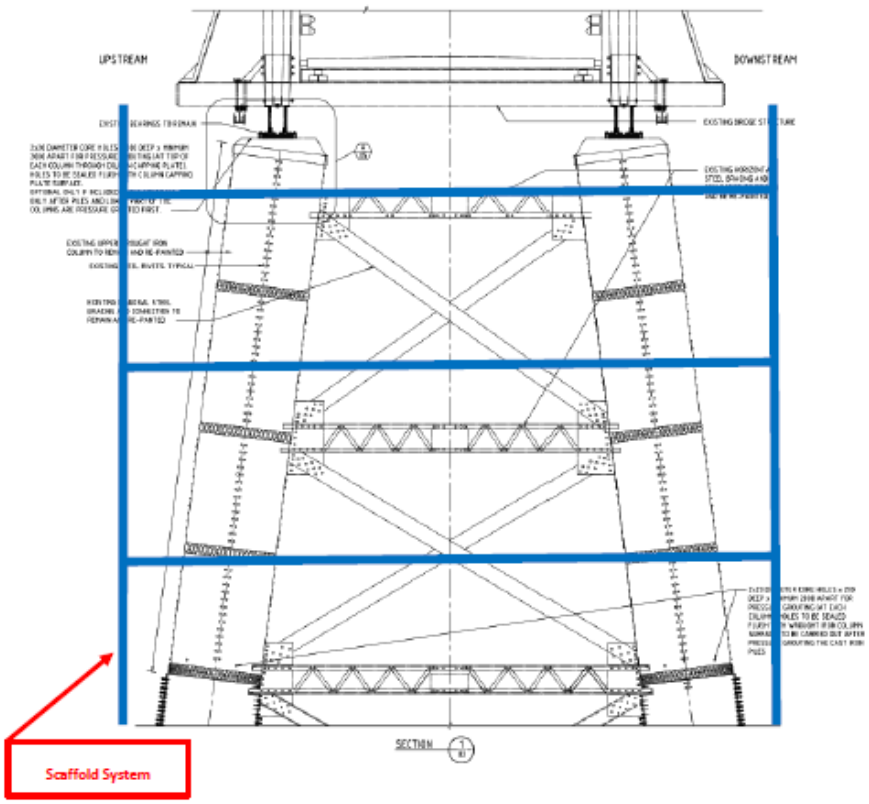


Figure 3-13: Scaffolding System

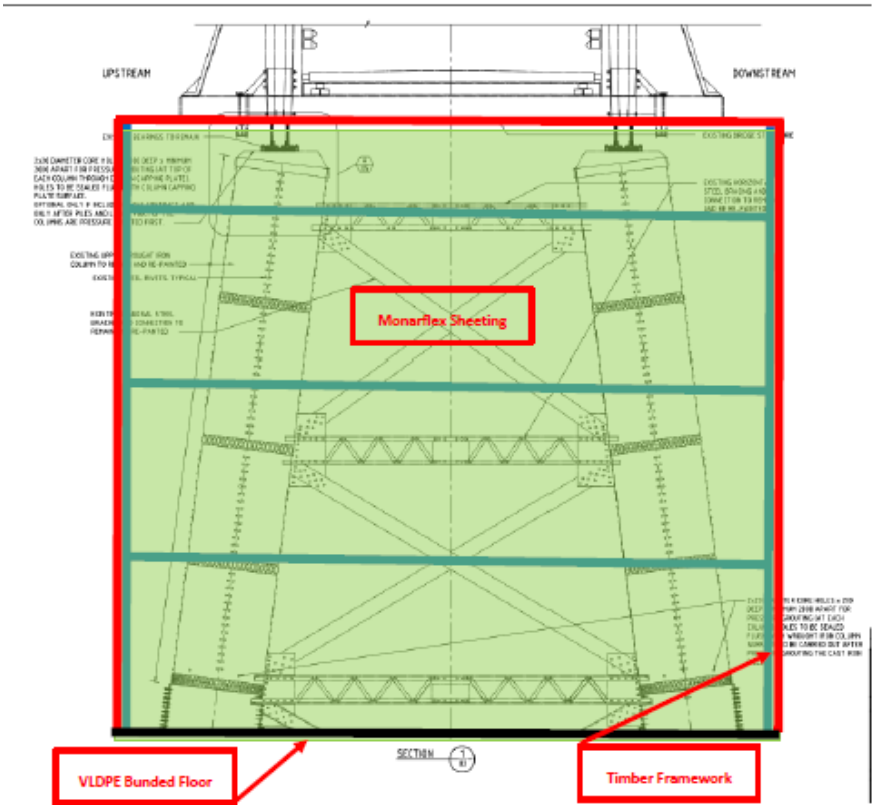


Figure 3-14: Preliminary Containment System Arrangement

3.3.2 Construction workforce

Construction of the proposal is expected to require an average of 6 workers on site per day. Workers would be distributed between the worksite and the site compound depending on the activities occurring and the time of day.

3.3.3 Construction hours and duration

Subject to approval, construction is anticipated to commence Q1 2024 and take about 22 weeks to complete, weather permitting.

Pier Rehabilitation and Flood Recovery Works

Construction works for the pier rehabilitation and flood recovery works would be carried out during standard construction hours, as detailed below:

- Monday to Friday: 7:00am to 5:30pm
- Saturday: 8:00am to 1:00pm
- Sunday: No work
- Public holidays: No work

TAMP Works

The TAMP works would not occur concurrently with the other works. The TAMP works would include up to 10 nightshifts for out of hours works. The out of hours work would occur from 8:00pm to 5:00am for each shift.

3.3.4 Plant and equipment

An indicative list of equipment expected to be used on site during construction of the proposal includes:

- One x Site Office / Lunchroom
- One x Bunded Chemical Storage Container
- One x Equipment Storage Container
- One x 10,000 cubic foot/minute (cfm) Dust Collector
- One x Decontamination Unit
- One x 5000 litre Water Storage Tank
- One x Two-three tonne Telehandler
- One x Compressor 200 cfm
- One x Compressor 850 cfm
- Two x 600-pound Blast Pots
- One x 20kVa Generator
- One x Port-a-loo
- Temporary Fencing
- Hand and Power Tools
- Elevated Work Platform (EWP)
- Under Bridge Inspection Unit (UBIU)
- Five tonne vibrating roller
- Eight tonne / 14 tonne Excavator
- Excavator mounted vibratory hammer (EMV)
- Hot melt bitumen boiler
- Eight tonne tipper

- Truck and dog
- Traffic control
- Portable boom gates
- One x cone truck
- One x variable message sign (VMS) utility vehicle

3.3.5 Earthworks

Earthworks would be minor and limited to excavation for the access track, cofferdam/sheet piling and excavation of sand and sediments around the base of Pier 4.

3.3.6 Source and quantity of materials

The proposal would require small quantities of prefabricated steel elements, metal fixings, laminates, paint and grout. The quantities of material required are listed in Table 3-2 and would not result in a regional or local supply shortage, and none are likely to be in short supply in the foreseeable future. Materials would be sourced from local commercial suppliers where available.

Non-renewable resources such as petroleum fuels would not be used in large quantities.

Table 3-2: Materials to be used

Item Reference	Description	Unit	Quantity
G1P5.1	Temporary bottom horizontal steel brace	tonne	0.906
G1P5.2	Temporary bottom steel cross brace(s)	tonne	1.275
G1P5.3	New steel casing – Segment 1	tonne	6.9
G1P5.4	Bolts M20 4.6/s (tack welded to Segment 1) and dome nuts	Item	700
G1P5.5	New bottom horizontal steel brace	tonne	0.8
G1P5.6	New bottom steel cross braces	tonne	1.4
G1P5.7	New steel casing – Segment 2	tonne	3.2
G1P5.8	Bolts M20 4.6/s (tack welded to Segment 2) and dome nuts	Item	410
G1P5.9	Steel vertical connection plates	tonne	9
G1P5.10	Steel horizontal connection plates	tonne	0.27
G1P5.11	Bottom steel support angle (tonnes) including bolts and nuts	tonne	0.07
G1P9	Infill material	m^3	1.64
G1P11	Pressure grouting	m^3	51
B220P1.2	Application of stripe, build and topcoats to existing steelwork (remaining columns and bracings)	m^2	205

3.3.7 Traffic management and access

The proposal is expected to generate on average up to one heavy and five light construction vehicle movements per day at the peak of construction activity for the pier rehabilitation works, mainly associated with:

- Movement of construction workers
- Delivery of construction materials
- Waste removal
- Delivery and removal of construction equipment and machinery
- Delivery and removal of site compound and ancillary facilities.

Access to the proposal footprint would be via the routes shown on Figure 1-2.

Traffic control measures, including detours, would be used to minimise the short-term traffic impacts during construction. These measures would be consistent with the Traffic Control at Works Sites Technical Manual (Transport for NSW, 2020) and addressed through a specific Traffic Management Plan (TMP).

It is estimated that bridge closures would be required for ten night shifts and two day shifts during the TAMP works. These closures would be addressed under applications for Road Occupancy Licences (ROLs). It is anticipated that ROLs would be required between 8:00pm and 5:00am for night shifts and 10:00am and 3:00pm for day shifts. Detours would be put in place during bridge closures to access properties to the north and south of the bridge via Settlers Road to Wisemans Ferry and Webbs Creek Ferry to St Albans Road respectively.

Traffic control measures outside of bridge closures would include escort vehicles and stop/slow set up. The impacts and mitigation measures for transport and access are addressed in Section 6.1.

3.4 Ancillary facilities

The proposal would require temporary facilities to support construction works, including a site compound, site amenities, site office and stockpile area adjacent to the northern approach of the bridge. The temporary facilities and equipment would be brought on site via truck and trailer and removed from site at the end of construction. The site would be accessed from Wollombi Road. No vegetation clearing would be required to accommodate the ancillary facilities.

A layout of the proposed ancillary facilities is provided in Figure 3-15.



Figure 3-15: Site layout plan, including ancillary facilities, storage, parking, and proposed access routes (in red)

3.5 Property acquisition

Property acquisition is not required for the proposal.

4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers the provisions of relevant state environmental planning policies, local environmental plans and other legislation.

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.109 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for road infrastructure facilities and is to be carried out by Transport, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW). Development consent from council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act) and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in chapter 5 of this REF.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Section 2.7 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity & Conservation)) states that an authority to clear vegetation under this policy is not required if it is a clearing authorised under s60(O) of the *Local Land Services Act 2013*. Section 60(O) provides an exemption for clearing under Part 5 of the EP&A Act, and therefore consent for the proposal is not required under the SEPP (Biodiversity & Conservation).

4.1.2 Local Environmental Plans

Hawkesbury Local Environment Plan 2012

The Hawkesbury Local Environment Plan 2012 (Hawkesbury LEP) identifies that the proposal is located within two land zones: E4 Environmental Living and RU5 Village.

Table 4-1 identifies the objectives for each of the affected land zones under the Hawkesbury LEP and considers the consistency of the proposal with those objectives. A zoning map is provided in Figure 4-1.

Table 4-1: Consistency with land zone objectives – Hawkesbury LEP

Zone	Objective	Comment
RU5 Village	• To provide for a range of land uses, services and facilities that are associated with a rural village • To maintain the rural character of the village and ensure buildings and works are designed to be in sympathy with the character of the village • To protect hilltops, ridge lines, river valleys, rural landscape and other local features of scenic significance	The proposal involves rehabilitation of part of an existing heritage bridge and would therefore help maintain the existing character of the area.

Zone	Objective	Comment
	• To ensure that development does not detract from the existing rural character or create unreasonable demands for the provision or extension of public amenities and services.	The proposal would not affect the realisation of the land zone objectives
C4 Environmental Living	• To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values. • To ensure that residential development does not have an adverse effect on those values. • To restrict development on land that is inappropriate for development because of its physical characteristics or bushfire risk. • To ensure that land uses are compatible with existing infrastructure, services and facilities and with the environmental capabilities of the land. • To encourage existing sustainable agricultural activities. • To ensure that development does not create or contribute to rural land use conflicts. • To promote the conservation and enhancement of local native vegetation, including the habitat of threatened species, populations and ecological communities by encouraging development to occur in areas already cleared of vegetation. • To ensure that development occurs in a way that does not have a significant adverse effect on water catchments, including surface and groundwater quality and flows, land surface conditions and important ecosystems such as waterways.	The proposal would not affect the realisation of the land zone objectives. Measures have been included as part of the proposal to address risks to water quality.



Figure 4-1: Project Zoning Map (Source: NSW Planning Portal (2023), Hawkesbury LEP (2023))

Development for the purposes of roads is permitted with development consent in the above zones. As noted previously the SEPP (Transport and Infrastructure) operates to remove these consent requirements.

4.2 Other relevant NSW legislation

4.2.1 Protection of the Environment Operations Act 1997

Part 3.2 of the *Protection of the Environment Operations Act 1997* (POEO Act) requires an environmental protection licence for scheduled development work and the carrying out of scheduled activities (as set out in Schedule 1 of the POEO Act), which includes road construction. The proposal does not trigger these requirements.

Section 148 of the POEO Act requires immediate notification of pollution incidents causing or threatening material harm to the environment to each relevant authority. An Incident Management Plan would be included in the environmental management documentation for the proposal, to be prepared prior to the start of construction.

4.2.2 Heritage Act 1977

The Heritage Act 1977 (Heritage Act) provides protection for items of state heritage significance that are listed on the State Heritage Register. Under Section 57(1) of the Heritage Act, the approval of the Heritage Council of NSW is generally required for development within a site included on the State Heritage Register, including works to the grounds or structures.

St Albans Bridge over the Macdonald River is listed on the State Heritage Register (SHR # 01480). The assessment of heritage impacts found that the proposal would have moderate direct and minor visual impacts on the heritage significance of the bridge. Therefore, approval under Section 60 of the Heritage Act is required.

An excavation permit is required to disturb or excavate any land knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. Relics are not expected to be affected by the proposal. Therefore, an excavation permit is unlikely to be required. Refer to Section 6.2 for further details.

4.2.3 National Parks and Wildlife Act 1974

The harming or desecrating of Aboriginal objects or places is an offence under Section 86 of the *National Parks and Wildlife Act 1979*. Under Section 90, an Aboriginal Heritage Impact Permit (AHIP) may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Aboriginal objects are not likely to be affected by the proposal. Refer to Section 6.8 for further details.

4.2.4 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) seeks to conserve biological diversity and promote ecologically sustainable development; to prevent extinction and promote recovery of threatened species, populations and ecological communities; and to protect areas of outstanding biodiversity value.

The BC Act provides a listing of threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes.

Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and endangered ecological communities listed under the BC Act or *Fisheries Management Act 1994*, are assessed using a five-part test. Where a significant impact is likely to occur, a Species Impact Statement or Biodiversity Development Assessment Report (BDAR) must be prepared.

An assessment of the potential impact on biodiversity is provided in Section 6.3.

4.2.5 Biosecurity Act 2015

Under the *Biosecurity Act 2015*, which came into effect on 1 July 2017 and repealed the *Noxious Weeds Act 1993*, 'all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable'.

The potential impacts and relevant safeguards are discussed further in Section 6.3. Appropriate biosecurity controls would be put in place for the proposed works to minimise the risk of weed transfer.

4.2.6 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

Section 199 of the FM Act provides that:

> *(1) A public authority (other than a local government authority) must, before it carries out or authorises the carrying out of dredging or reclamation work:*
>
> *a) give the Minister written notice of the proposed work, and*
>
> *b) consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).*

Section 219 of the FM Act includes a prohibition on the blocking of fish passage. A permit is required from Department of Primary Industries (DPI) if a proposal would permanently or temporarily block fish passage. The proposal would not block fish passage, and therefore a permit is not required.

However, as the proposal involves dredging and reclamation works undertaken on behalf of a public authority, notice of the proposal in accordance with Section 199 was provided to DPI on 1 November 2023. DPI provided a response on 4 February 2024 raising no objection to the proposal, subject to the implementation of appropriate safeguards. Further discussion of these consultation outcomes and safeguards are provided in Section 5.5 and Section 6.5 respectively.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and chapter 6 of the REF.

A referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of chapter 6 of the REF and Appendix A.

Findings – matters of national environmental significance

The assessment of the proposal's impact, on matters of national environmental significance and the environment of Commonwealth land, found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

4.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affective native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the Native Title Tribunal Native Title Vision website was undertaken on 28 April 2023, with no Native Title holders/claimants identified.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of road infrastructure facilities and is being carried out by or on behalf of a public authority. Under section 2.109 of SEPP (Transport and Infrastructure) the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

Transport is the determining authority for the proposal. This REF fulfils Transport's obligation under section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5. Consultation

This chapter discusses the consultation undertaken to date for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

The consultation strategy for the proposal involves several engagement tools which would be used to consult with the community and identified stakeholders. These include:

- Project notifications and project updates for nearby residents, businesses and stakeholders
- Letters, emails, social media posts and targeted correspondence.

5.2 Community involvement

The proposal would be relatively short term and would have minimal community impacts. Accordingly, no specific community engagement activities have been carried out during the preparation of the REF. Targeted pre-work notification of nearby residents and businesses is proposed, including notification for road closures associated with the TAMP works

As noted in Section 4.2.2, the proposal requires approval under Section 60 of the Heritage Act. The Heritage Council publishes notice of approval applications in State-wide and local media and invites the owners, occupiers, local council and any interested members of the public to make a submission.

5.3 Aboriginal community involvement

The proposal has been considered against the requirements of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011). This procedure is generally consistent with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (Department of Environment, Climate Change and Water, 2010). An outline of the procedure is presented in Table 5-1.

Table 5-1: Summary of Transport's Procedure for Aboriginal Cultural Heritage Consultation and Investigation

Stage	Description
Stage 1	Initial assessment by Transport.
Stage 2	Site survey and further assessment.
Stage 3	Formal consultation and preparation of a cultural heritage assessment report.
Stage 4	Implement environmental impact assessment recommendations.

A Stage 1 initial desktop assessment, including a search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 26 April 2023 for the proposal area. The search identified one site within the vicinity of the proposal. The AHIMS site is on elevated ground and located over 230 metres to the west of the proposal development footprint (refer to Section 6.6 for further assessment). Considering the distance and elevation of the AHIMS site from the proposal area, this site is unlikely to be impacted by the proposal. There is low potential for intact Aboriginal archaeological deposits within the proposal footprint and therefore no requirement to proceed to Stage 2 of the PACHCI.

5.4 SEPP (Transport and Infrastructure) consultation

The State Emergency Service (SES), the Office of Environment and Heritage within the Department of Climate Change, Energy, the Environment and Water (in respect of National Parks management) and Hawkesbury City Council have been consulted under SEPP (Transport and Infrastructure) about the proposal as per the requirements of sections 2.11, 2.12, 2.13

and 2.15 of SEPP (Transport and Infrastructure). Appendix B contains a SEPP (Transport and Infrastructure) consultation checklist that documents how SEPP (Transport and Infrastructure) consultation requirements have been considered.

Issues raised from this consultation are outlined in Table 5-2.

Table 5-2: Issues raised through SEPP (Transport and Infrastructure) consultation

Group	Issue raised	Response / where addressed in REF
State Emergency Service	• The correspondence was received on 04 August 2023, and SES advised that the proposal appears to have minimal risk to flood response operations. • The NSW SES requested that notification be provided where there are likely to be significant delays in the operation of the roads affected by the upgrades. • The SES asked if any improvements that Ventia Pty Ltd can make to reduce any flood risk will benefit the current and future community	• Comments and recommendations provided by SES have been addressed in the Water Safeguard section. • Ventia will notify SES at least seven days before the road closure with all relevant information. • Ventia proposes to donate the gabion rock to Hawkesbury Council for reuse on Council projects.
National Parks and Wildlife Service	• The NPWS confirmed that no impact on Yengo National Park as anticipated on 14 July 2023.	Noted.
Hawkesbury City Council	• In August, Hawkesbury City Council (HCC) will be commencing a Major Project on Settlers Road funded by TfNSW and Australian Government under DRFA - Disaster Recovery Funding Arrangements. This project will have a considerable impact on the local communities that will be diverting to Webbs Creek Ferry via St. Albans Bridge. Therefore, HCC does have a number of concerns regarding Ventia's proposed upcoming works at St Albans Bridge, including: - To see if it was possible to postpone the works on the St. Albans bridge until the works on Thomas James bridge are complete. - The possibility of removing the 15t weight limit from the St. Albans bridge if we were to carry out the pier rehabilitation works	The current condition of the St. Albans bridge is rated as "POOR," and the strengthening works on the bridge have actually been brought forward due to the condition rating. Because of this, Ventia is unable to postpone the works on the St. Albans bridge. TfNSW have clarified, "*Regarding 15t load limit, one of the main targets of the project is lifting the load limit subject to structural assessment outcomes.*" TfNSW community engagement team attended the community meetings to further clarify the proposal to the local community.

5.5 Government agency and stakeholder involvement

Other government agencies and stakeholders have been consulted about the proposal, including Heritage NSW and Department of Primary Industries (Fisheries).

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined stakeholders are outlined in Table 5-3.

Table 5-3: Issues raised through stakeholder consultation

Agency	Issue raised	Response / where addressed in REF
Heritage NSW	• State Heritage and Section 60 approval requirements	• Ventia to lodge S60 application with Heritage NSW by December 2023

Department of Primary Industries (Fisheries)	• Further information was requested on 27 July 2023. • DPI Fisheries have requested a Snag Management Plan and s199 consultation letter but have confirmed that a permit is not required.	• Ventia provided s199 consultation letter to DPI Fisheries on 3 November 2023. DPI Fisheries provided a response letter dated 4 February 2024 raising no objections to the proposal, subject to the implementation of appropriate safeguards. All safeguards recommended by DPI Fisheries will be implemented, as discussed in Section 6.5 below.
NSW Rural Fire Service (RFS)	• Access • Local council approval is required	• Noted

5.6 Ongoing or future consultation

If the proposal is approved, ongoing consultation activities would occur with the affected community including nearby landholders, businesses and road users during detail design and construction. Ongoing communications and notifications may include:

- Community/construction updates
- NSW live traffic updates and social media updates
- Web page updates
- Work notification letters (as required).

6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment, potentially impacted upon by the proposal, are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act.
- The factors specified in the Guideline for Division 5.1 assessments (DPE 2022) and as required under section 171 of the Environmental Planning and Assessment Regulation 2021 and the Roads and Related Facilities EIS Guideline (DUAP 1996). The factors specified in section 171 of the Environmental Planning and Assessment Regulations 2021 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Traffic and Access

6.1.1 Methodology

Assessment of the potential construction impacts on traffic and transport has been carried out using existing desktop information.

Consideration has been given to the impacts on St Albans Road and Wollombi Road, as well as detours on Settlers Road, and access to the proposed site compound, site amenities and stockpile area.

Operationally the impacts of the proposal have been assessed using the criteria of road safety.

6.1.2 Existing environment

The construction footprint for the proposal incorporates the existing St Albans Bridge and ancillary facilities which would be accessed from Wollombi Road. Wollombi Road is classified by Transport for NSW as a regional road, commencing at the southern end of St Albans Bridge, it crosses the Macdonald River and then links the township of St Albans to the upper Hawkesbury Region and further north to the Hunter Valley Region of NSW.

From the south, a 24-hour car ferry from Wisemans Ferry connects to St Albans Road and provides a connection between the northwest Sydney metropolitan region to Wollombi Road and the southern end of St Albans Bridge.

To the north of the St Albans Bridge, Wollombi Road is a two-lane, two-way sealed road with a 50 km/h speed limit. A 10 km/h speed limit is imposed on St Albans Bridge. To the south of the bridge, St Albans Road has a 50 km/h speed limit.

Current traffic volumes

The proposal is located on Wollombi Road and near the intersection of St Albans Road and Upper Macdonald Road. These are regional roads and a local road, in a rural area with low traffic volumes.

Pedestrian and cyclist access

There are no identified cycle lanes or footpaths on St Albans Bridge or Wollombi Road near the proposal site.

Public transport and ferry access

There are no public transport options near the proposal site. The closest bus stop is in Wisemans Ferry, approximately 20 km to the south of the proposal site.

The Webbs Creek ferry crosses the Hawkesbury River just south of the junction of the Macdonald River at the south-western edge of the Wisemans Ferry township. This ferry operates 24 hours a day, 7 days a week. This ferry crosses the Hawkesbury River and provides access to St Albans Road, which follows the true right bank of the Macdonald River and connects to Wollombi Road and the southern end of the St Albans Bridge. It is approximately a 23-minute drive from the Webbs Creek ferry terminal along St Albans Road to the proposal site.

The Wisemans ferry crosses the Hawkesbury River just east of the junction of the Macdonald River at the north-eastern edge of the Wisemans Ferry township. This ferry operates 24 hours a day, 7 days a week. This ferry crosses the Hawkesbury

River and provides access to Settlers Road. Settlers Road follows the true left bank of the Macdonald River and connects to the township of St Albans just to the north of the proposal site. It is approximately a 27-minute drive from the Wisemans Ferry terminal along Settlers Road to St Albans and the proposal site.

6.1.3 Potential impacts

Construction

Wollombi Road north of the St Albans Bridge, and St Albans Road to the south of St Albans Bridge will remain open throughout the duration of the construction period. However, the proposal will require temporary closures of St Albans Bridge for up to ten shifts during the night works and for up to two shifts during daytime hours (12 shifts total) for the TAMP works. During these closures, temporary detours around St Albans Bridge would be required. The detour/alternate route to provide access to and from St Albans to Wisemans Ferry is shown in Figure 6-1, and the additional travel time required from Wiseman's Ferry to provide access to Macdonald Valley Public School from the site is shown in Figure 6-2.

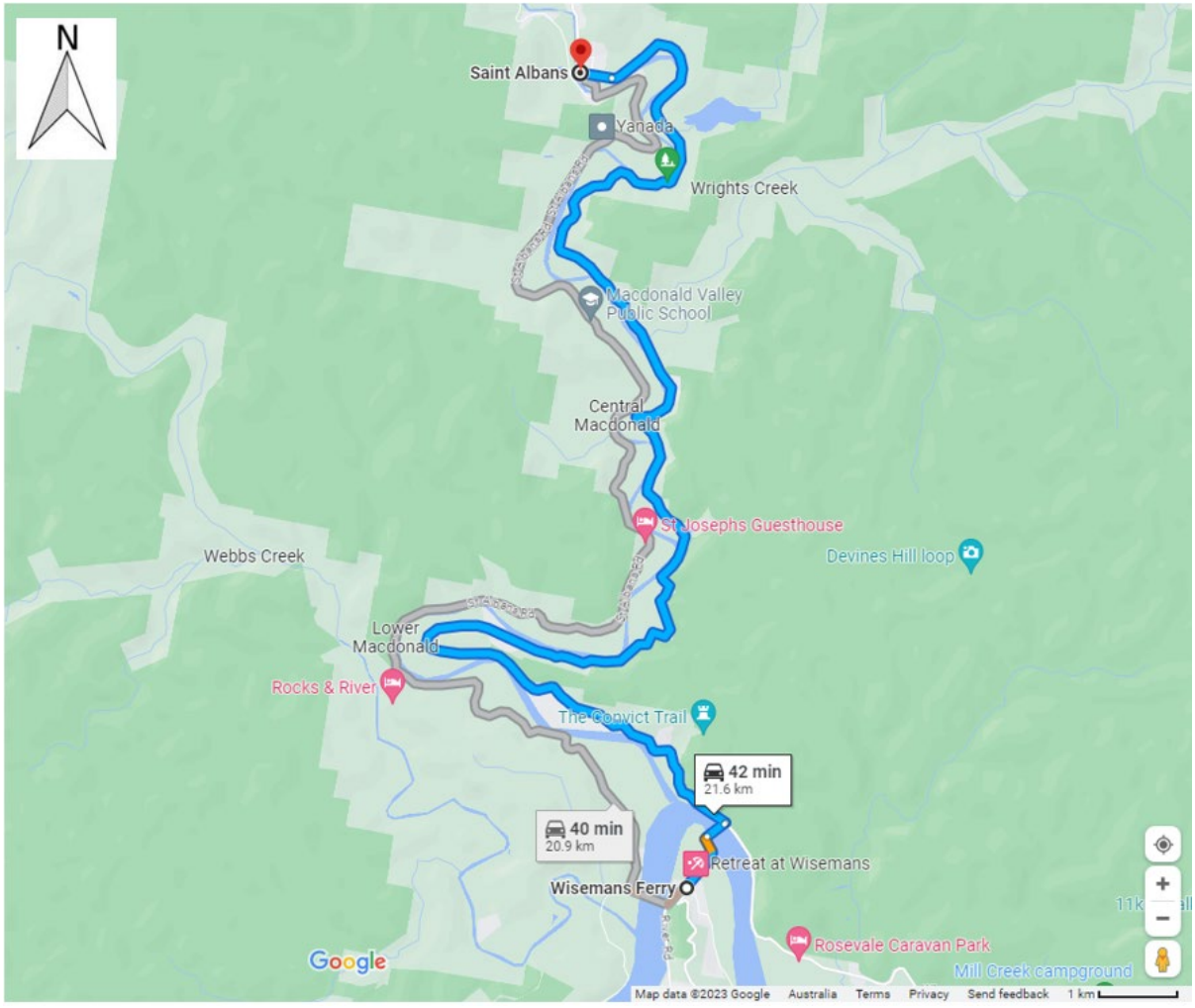


Figure 6-1: Comparison of ferry and vehicle travelling time from Wisemans Ferry to St Albans via St Albans Road versus the proposed road detour/alternate route via Settlers Road during closures of St Albans Bridge.

(Source: Google Maps 2023 – times shown include ferry crossings)

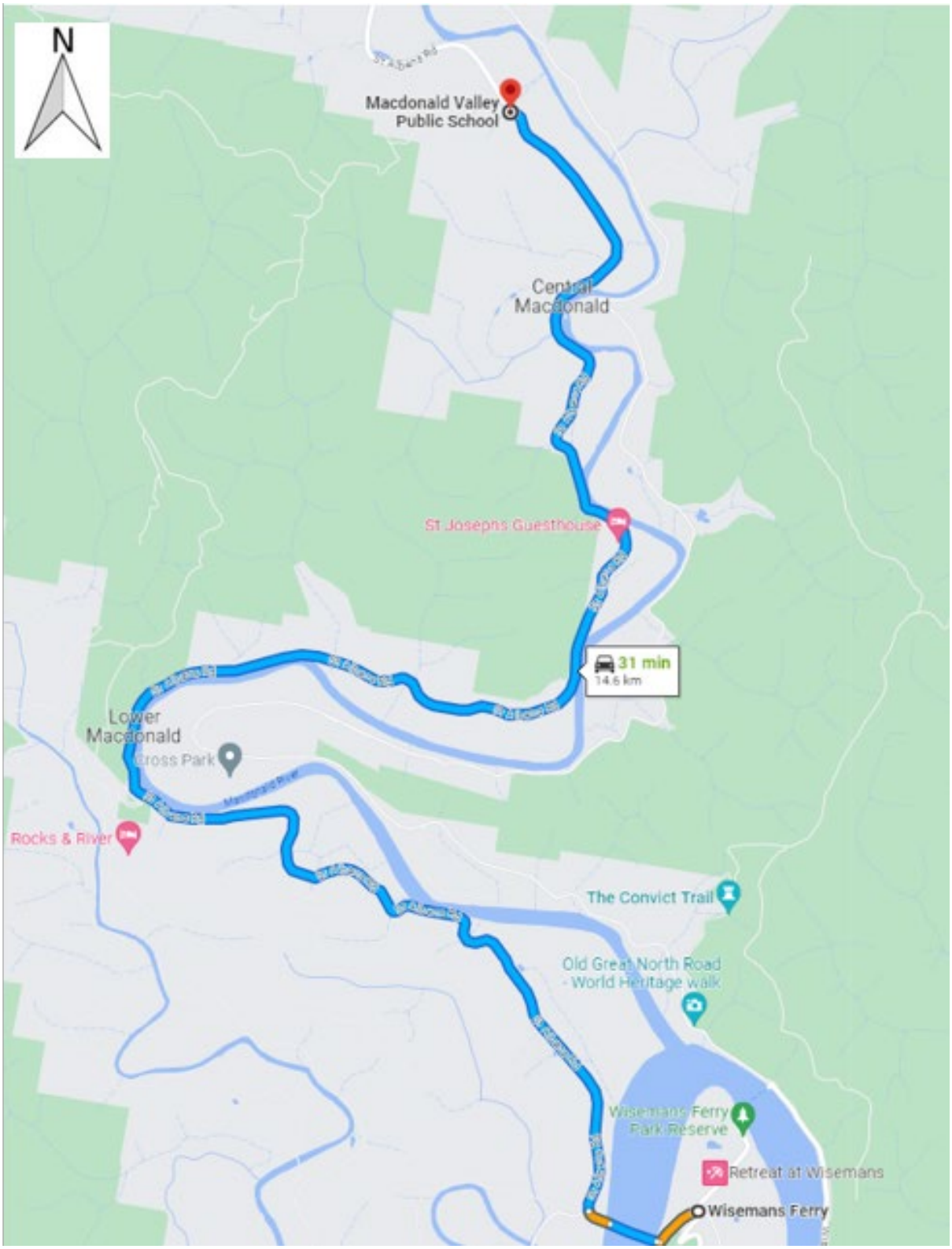


Figure 6-2: Additional travel / ferry time from site to Macdonald Valley Public School under diversion route

(Source: Google Maps 2023 – times shown include ferry crossings)

From St Albans in the north, temporary detours would be via the existing alternate route of Settlers Road and the Wisemans ferry over the Hawkesbury River to access the township of Wisemans Ferry in the south, and vice versa, and each leg of the detour would require driving a distance of 21.6 km and take about 42 minutes, compared to 20.9 km and about 40 minutes under the original route.

During the daytime bridge closures associated with the TAMP works, the diversion route from St Albans to Macdonald Valley Public School would require driving a distance of approximately 40 km, two ferry crossings, and a travel time of approximately 80 minutes each way, compared with a driving distance of approximately six kilometres, no ferry crossings, and a travel time of approximately ten minutes each way between St Albans and Macdonald Valley Public School in normal traffic conditions.

While the pier rehabilitation and flood recovery works would not require road closure, these works would require temporary traffic control measures for site access. Local traffic on St Albans Road and Wollombi Road may be temporarily impacted due to construction and delivery vehicles accessing the site. In addition, the speed limit along the stretch of road adjacent to the works and along St Albans Road would be temporarily reduced from 50 km/h to 40 km/h when road and lane closures are required during the construction period.

Construction traffic associated with the works would add additional vehicle movements to St Albans Road and Wollombi Road. Traffic movements would comprise transporting plant, machinery/equipment and materials to and from the site. Additional vehicle movements would also be associated with the transportation of construction workers to and from the work site, and the disposal of waste materials off-site. It is expected that up to one daily heavy vehicle movement and five light vehicle movements would occur during the peak construction period.

Light vehicles movements associated with the construction workforce travelling to and from the site would also add additional traffic to Wollombi Road, resulting in up to five daily light vehicle movements. An existing hardstand open parking area adjacent to the existing RFS Station to the northwest of the site and an existing gravel car park to the west of the side would be used for staff vehicle parking, as shown in Figure 3-15. These areas would need to be clearly demarcated, agreed with the RFS, and adopted into the Traffic Management Plan (TMP) and Construction Environmental Management Plan (CEMP) to ensure that emergency access to the Fire Station and facilities is not compromised and is maintained at all times.

While the proposal would result in only a minor increase in daily vehicle movements along the local road network, it would result in some temporary disruption to traffic flows and property access for local residents as a result of the bridge closures and temporary detours. During the construction works the connectivity of some properties along St Albans Road to the township of St Albans and further north would be affected, and access times for some emergency services, such as the St Albans RFS, to properties south of the bridge would be increased. Excluding these localised disruptions, the travel time comparison between the use of St Albans Road versus Settlers Road for travel from Wisemans Ferry to St Albans is insignificant (approximately 40 minutes versus 42 minutes). While there would be an increase in travel time for residents travelling to Macdonald Valley Public School and other businesses in the area (approximately 80 minutes versus ten minutes), these disruptions would be temporary and would occur for only two daytime shifts during the TAMP works.

The road closures and detours during night time works are unlikely to impact access to Macdonald Valley Public School and local businesses, and the proposal would implement appropriate safeguards to allow time to plan alternative travel during the two daytime closure periods.

There is the potential that the diversion route during the construction works would create more direct traffic to Wisemans Ferry and Webbs Creek ferry services, which could result in congestion for these services. However, both of these ferry services operate on demand (with up to approximately 15 minute waiting times), 24 hours a day, seven days a week (with the exception of the first Tuesday of every month for the Webbs Creek Ferry between 9:00 am and 11:00 am when it is closed for maintenance). Both ferries also have a 120-tonne capacity capable of accommodating up to 24 cars each trip. Considering the limited number of heavy and light daily vehicle movements associated with the proposed works, it is unlikely that the proposal would result in any significant disruptions to the Webbs Creek or the Wisemans ferry services or restrict access for local motorists reliant on these car ferry services.

In addition, the proposal would incorporate appropriate safeguards to minimise disruption of Wollombi Road and the local road network while construction works are underway. This would include the use of temporary signage, such as Variable Message boards, on Wollombi Road and St Albans Road near the proposal site, as well as the implementation of a Traffic Management Plan (TMP) for the proposal. Road users and local communities would also be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays as a result of construction activities associated with the proposal.

During the construction period, the proposal would maintain access to all private properties and local commercial businesses, and safe access for emergency vehicles would be provided at all times, including access for emergency vehicles to and from the RFS Station adjacent to the site.

Taking into consideration the location and short duration of the works, the limited number and timing of bridge closures, the usage of the road network, the numbers of vehicles and plant to be used during the works, and the traffic control

measures that would be implemented, the impacts on traffic and transport during construction are anticipated to be minor. Proposed safeguards to mitigate potential adverse impacts are outlined in Section 6.1.4.

Operation

Once the works are completed, the temporary speed restrictions would be removed, Wollombi Road and St Albans Bridge would be open in both directions and restored to speed limits of 50 km/h and 10 km/h on St Albans Bridge. There would be no impacts to traffic flow or access during operation. No other transport nodes, transport infrastructure or access would be impacted during operation.

The completion of the rehabilitation works is expected to meet current safety standards and improve the safety and stability of St Albans Bridge and therefore result in improved safety and efficiency for road users.

This proposal seeks to increase resilience to the impacts of future weather events, reducing the risk of damage to the bridge and road closures, and resulting in a positive long-term impact for road users utilising St Albans Bridge.

6.1.4 Safeguards and management measures

Table 6-1 Traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2022). The TMP will include: • Confirmation of haulage route and timing of bridge closures for TAMP works to minimise impact on businesses and Macdonald Valley Public School on St Albans Road • Measures to maintain access to local roads and properties • Measures to ensure that access for emergency services (e.g. RFS) is not compromised and maintained at all times. • Site specific traffic control measures (including signage and temporary speed reductions) to manage and regulate traffic movement • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms	Contractor	Detailed design/pre-construction	*QA Specification G10 – Traffic Management*

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and Transport	Set up of traffic control measures including: • Installation of signs to restrict access to the site and stockpile area • Temporary speed reduction past the proposal site of 40km/h • Temporary signage, including Variable Message boards, on Wollombi Road, either side of the proposal site	Contractor	Construction	
Traffic and transport	If the proposal is at any stage likely to cause substantial disruption to the use of St Albans Road or Wollombi Road by emergency vehicles, the NSW SES and emergency services will be notified.	Contractor	Construction	Additional measure
Traffic and Transport	Access to properties and local businesses will be maintained during construction.	Contractor	Construction	
Traffic and Transport	Construction staging and materials are to be managed to minimise number of deliveries/vehicles required on site.	Contractor	Construction	
Traffic and transport	Road users and local communities will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities. The affected community will be notified a minimum of seven days or five business days before any changed conditions that are likely to result in disruption.	Contractor	Pre-construction Construction	

6.2 Non-Aboriginal heritage

A Statement of Heritage Impact (SoHI) for the proposal was carried out by Artefact Heritage Services. The main findings of that assessment are summarised as follows, while the full report is included in Appendix D.

6.2.1 Methodology

The methodology used for the Statement of Heritage Impact is in accordance with the principles and definitions as set out in the guideline The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (Burra Charter) (Australia ICOMOS, 2013)).

If an item meets one of the seven heritage criteria (listed in Table 6-2), and retains the integrity of its key attributes, it can be considered to have heritage significance.

Table 6-2: NSW Heritage Assessment Criteria

Criteria	Description
A – Historical Significance	An item is important in the course or pattern of the local area's cultural or natural history.
B – Associative Significance	An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area's cultural or natural history.
C – Aesthetic or Technical Significance	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area.

D – Social Significance	An item has strong or special association with a particular community or cultural group in the local area for social, cultural or spiritual reasons.
E – Research Potential	An item has potential to yield information that will contribute to an understanding of the local area's cultural or natural history.
F – Rarity	An item possesses uncommon, rare or endangered aspects of the local area's cultural or natural history.
G - Representativeness	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments.

The significance of an item or potential archaeological site can then be assessed as being of local or State significance. The following definitions have been provided by the NSW Heritage Office:

- 'State heritage significance' – in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.
- 'Local heritage significance' – in relation to a place, building, work, relic, moveable objector precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

Impact on heritage items is assessed in relation to both direct physical impacts and indirect visual impacts.

Historical archaeological potential is defined as the potential of a study area/proposal site to contain historical archaeological relics, as classified under the Heritage Act 'Archaeological potential' refers to the likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or development. The physical remains within an area may vary in terms of intactness and/or survival integrity, for example due to (un)favourable environmental conditions or disturbance from subsequent development. The grading of archaeological potential in Appendix D has guided the assessment.

Table 6-3: Grades of archaeological potential

Grades	Description
High	Archaeological resource is known to exist and/or has strong potential for intactness/survival
Moderate	Reasonable potential for archaeological resource intactness/survival
Low	Limited potential for archaeological resource intactness/survival
Nil	No archaeological resource is anticipated

6.2.2 Historical context

The development of European settlements and industry in the Hawkesbury Region had increased throughout the early 1800s, resulting in populous towns around Windsor and Wisemans Ferry, however, the nearby Macdonald Valley remained isolated. Early tracks and roads were inadequate and, as such, early colonial census surveys were unlikely to have included scattered farming communities throughout the region. The first recorded European use of land in the Macdonald Valley and St Albans area was in 1803 by the Cross Brothers, who utilised the land for grazing.

By 1824, a public government Common, known as Wollambine or St Albans Common, was dedicated by Governor Brisbane, located on the eastern side of the Macdonald River and north of the current town of St Albans. It was accessed via the Wollombi Road and used by local landowners whose land could not sustain grazing or crops.

In 1833, the area was surveyed by Felton Matthew, demonstrating that several small farms had been established along the Macdonald River by a mixture of emancipists and free settlers, with 86 landowners living around the Wollambine Common area. The area was first called Macdonald, although by 1846 St Albans had developed as a separate town.

By the 1850s the population of the Macdonald Valley had decreased dramatically, as residents likely travelled to the gold fields. While the population remained small, a town had developed around key buildings including a school, post office, church and inn.

The first St Albans Bridge was a Bennett Truss Design, constructed in 1884. The first bridge was located downstream to the west of the current bridge and was destroyed during heavy flooding of the Macdonald River in 1889. Much of the riverbed was also heavily eroded and destroyed during the flooding, likely making it impossible to reconstruct the bridge in the same location. The second bridge (the subject of this proposal) was completed in 1903 as a DeBurgh construction. Pier 4 was constructed from tapered concrete-filled cast iron piles and wrought iron columns which were sunk into the bedrock and braced with steel lattice bracing.

Conservation and rehabilitation works have occurred on multiple occasions. The truss decking was replaced with Stress Laminated Timber in 1997-98. Additional upgrades in 2001 included the replacement of timber planking with Stress Laminated Timber, and timber cross girders were replaced with steel cross girders. Multiple girders and truss members have also been replaced at various stages over the course of the bridge's lifespan.

In 2005, timber subsurface piles were replaced with steel and/or concrete piles. Piers three (eastern side of bridge) and five (western side of bridge) were also replaced. In 2013, piers one and two, top cords and verticals were replaced. At this time, the stone abutment – Abutment A – was rehabilitated and much of the asphalt decking was resealed.

6.2.3 Existing environment

St Albans Bridge

St Albans Bridge was constructed as a De Burgh style timber truss bridge on an approximate north-south axis. The decking of the bridge comprises a sealed asphalt road surface laid over thin modern timber decking. The modern timber decking, supported with additional steel supports fixed to large cylindrical timber beams, is evident when viewed from below the bridge deck. The vertical timber trusses have been painted white and appear to be in good condition, with black-painted steel cross beams diagonally placed between each truss. Modern steel road barriers have been installed on either side of the bridge. The timber decking, timber beams, steel cross beams and vertical timber trusses appear to have been replaced with modern replicas. The original steel lattice horizontal chords are extant at the ends of the bridge and adjacent to Pier 4 but have been replaced with open steel chords along the rest of the bridge.

At the base of the St Albans truss bridge, an original stone abutment is present at the northern side of the bridge, functioning as a retaining wall. The southern side of the bridge is supported by the existing sandstone cliff face. Four truncated timber poles project from the surface of the water between Pier 4 and 5, but they do not appear in historical drawings and photographs. It is unclear as to when they were installed and if they relate to an earlier structure or redundant temporary structural support for the bridge.

The timber piers are modern replacements, installed during bridge rehabilitation works in 2013. Each of the timber piers are situated on concrete footings. Pier 4, constructed from concrete-filled cast iron piles and wrought iron columns with steel lattice bracing, is situated in the approximate centre of the bridge within the Macdonald River. The iron pier is original; however, small modern patches are evident and have been painted light blue. The above ground tapered columns of Pier 4 have been confirmed to have been constructed from wrought iron cylinders filled with a mix of sandstone and cementitious material, based on recent material analysis. The foundation of Pier 4 comprises two vertical concrete-filled cast iron piles sunk through the natural sand base of the river down to solid bedrock. Extensive rivets are evident in vertical and horizontal alignments around the iron pier, suggesting that the pier is constructed from multiple sheets of steel. Noticeable flaking of the paint and corrosion of steel is evident along the column shafts and bracing.

Selected photographs of bridge elements are provided in Figure 6-3 to Figure 6-6.



Figure 6-3: St Albans Bridge trusses and decking



Figure 6-4: Stone abutment on northern side of bridge



Figure 6-5: Unidentified timber piers on southern side of bridge



Figure 6-6: Wrought iron pier (Pier 4)

The statement of significance for St Albans Bridge associated with its State Heritage Register listing is provided as follows while the significance assessment is provided in Table 6-4:

> *Completed in 1902, St Albans Bridge is an early example of a DeBurgh timber truss road bridge. In 1998 it was in good condition.*
>
> *As a timber truss road bridge, it has many associational links with important historical events, trends, and people, including the expansion of the road network and economic activity throughout NSW, and Ernest DeBurgh, the designer of this type of truss.*
>
> *DeBurgh trusses were fourth in the five stage design evolution of NSW timber truss road bridges. Designed by Public Works engineer Ernest M. DeBurgh, the DeBurgh truss is an adaptation of the American Pratt truss design. The DeBurgh truss is the first to use significant amounts of steel and iron, and did so in spite of its high cost and the government's historical preference for timber.*
>
> *DeBurgh trusses were significant technical improvements over their predecessors. The St Albans bridge also has the largest DeBurgh truss spans remaining in NSW, which lends it further technical significance.*
>
> *In 1998 there were 10 surviving DeBurgh trusses in NSW of the 20 built, and 82 timber truss road bridges survive from the over 400 built.*
>
> *The St Albans bridge is a representative example of DeBurgh timber truss road bridges, and is assessed as being Nationally significant, primarily on the basis of its technical and historical significance.*

Table 6-4: Heritage significance assessment for the St Albans Bridge

Criteria	Description
A – Historical Significance	Through the bridge's association with the expansion of the NSW road network, its ability to demonstrate historically important concepts such as the gradual acceptance of NSW people of American design ideas, and its association with Ernest DeBurgh, it has historical significance.
C –Aesthetic Significance	The bridge exhibits the technical excellence of its design, as all of the structural detail is clearly visible. Also, visually attractive in its setting, and with ornate iron piers, the bridge has substantial aesthetic significance.
D – Social Significance	St Albans Bridge is highly valued by the local community. Situated near a popular pub and regular stop off area for tourists from nearby Sydney, the bridge is also valued by the many visitors to the area. Timber truss bridges are prominent to road travellers, and NSW has in the past been referred to as the "timber truss bridge state". Through this, the complete set of bridges gain some social significance, as they could be said to be held in reasonable esteem by many travellers in NSW.
E – Research Potential	The bridge has technical significance because it is a DeBurgh truss, is representative of a range of major technical developments that were made in timber truss design by the Public Works Department. The St Albans bridge has the largest DeBurgh truss spans constructed, giving it further technical significance.
F – Rarity	Rare in the Sydney region, and rare technical features.
G – Representativeness	Highly representative of DeBurgh trusses.

Other listed heritage items in the locality

Table 6-5 provides a summary of heritage listed items within and near the proposal footprint. Figure 6-7 shows the location of these items. Several of these heritage items are listed on multiple heritage registers with differing curtilages and these items have been grouped in

Table 6-5.



Figure 6-7: Heritage items within and near the proposal footprint

Table 6-5: Other heritage items within and near the proposal footprint

Item	Listing	Address	Significance	Proximity
St Albans Conservation Area	Hawkesbury LEP 2012 (LEP # C2)	-	Local	Within proposal footprint
Settlers Arm Inn	Hawkesbury LEP 2012 (LEP # I436)	1-5 Wharf Street, St Albans	Local	Proximity to proposal footprint: Approximately 85 metres Proximity to compound site: Approximately 85 metres
Gaol, Courthouse and Stables	Hawkesbury LEP 2012 (LEP # I440)	19 Upper MacDonald Road, St Albans	Local	Proximity to proposal footprint: Approximately 100 metres Proximity to compound site: Approximately 130 metres
Greater Blue Mountains	National Heritage List (NHL # 105999)	-	National	Proximity to proposal area: Approximately 120 metres Proximity to compound site: Approximately 150 metres
Greater Blue Mountains	World Heritage List (WHL # 917)	-	World	Proximity to proposal area: Approximately 120 metres Proximity to compound site: Approximately 150 metres

The St Albans Conservation Area (LEP # C2) has direct views of St Albans Bridge. The views from the approaches to the bridge along Wollombi Road from the north and St Albans Road and Upper Macdonald Road from the south are of high significance. These views of the bridge mostly comprise the timber truss and deck of the bridge. The uninterrupted views of the bridge from the banks are also of high significance, with views focusing on the central portion of the bridge, with particular views of the Pier 4 and the composite timber and steel truss superstructure. The rest of the piers are generally hidden from view by vegetation.

The views of St Albans Bridge from the locally listed Settlers Arm Inn (LEP # I436) are only partial due to the existing vegetation cover and the local fire department building, but the spatial relationship between the two is of high significance as physical and social landmarks within the town.

The views of St Albans Bridge from the locally listed Gaol, Courthouse and Stables (LEP # I440) were not able to be inspected due to private property access constraints. The Gaol, Courthouse and Stables were not visible from the bridge, but they are in close proximity to the bridge.

The Greater Blue Mountains, listed on the World Heritage List and National Heritage List (WHL # 917 and NHL # 105999), although only 120 metres from the St Albans Bridge at its closest point, has direct views of the bridge, but these were not able to be inspected. However, the views from the bridge to the Greater Blue Mountains were inspected and show a spatial relationship between the two items of high significance.



Figure 6-8: Settlers Arms Inn (LEP Item #436)



Figure 6-9: View of the Greater Blue Mountains from the northern end of St Albans Bridge (WHL #917)

Archaeology

The Statement of Heritage Impact identifies two phases of historical land use that assist consideration of archaeological potential of the proposal footprint. Table 6-6 describes these phases.

Table 6-6: Historical land use within the study area

Phase and dates	Land use activity
Phase 1: Early European Settlement (1788-1902)	Land use near the study area during Phase 1 is likely to have included early agricultural practices, road transportation, river transportation, and construction of dwellings and public house in the hamlet of St Albans. Most of these activities would have taken place outside the study area, with the main activities in the study area including use of the Macdonald River for transportation purposes and adjacent use of St Albans Road. Potential archaeological remains associated with these activities may include riverside dirt tracks and evidence of tree removal. However, the riverbank setting of the study area and effects of flooding and erosion mean that is unlikely any discernible archaeological evidence of these activities remains. The first St Albans truss bridge was located 80 metres west of the study area, meaning that archaeological remains of the earlier structure are not anticipated within the proposal footprint. There is no documentary evidence of previous fords at this location. Overall, there is nil archaeological potential associated with Phase 1. There are no predicted significant non- Aboriginal archaeological remains associated with Phase 1 within the proposal footprint.
Phase 2: Second St Albans Bridge (1902-present)	In 1903 the St Albans De Burgh timber truss bridge was completed. The construction of the bridge included the establishment of several timber piers and one metal pier into the riverbed and surrounding embankments, supported by stone abutments on either side of the river. Wollombi Road was altered from a straight alignment to a dog-legged alignment to meet the new bridge.

Phase and dates	Land use activity
	Following the initial construction of the second St Albans Bridge, several upgrades have seen former support structures removed and replaced with modern fabric. Archival information suggests that the location of Pier 4 has not changed, meaning that archaeological remains of former footings is not anticipated. The piers were excavated into clean river sand, and there is no evidence that fills (with the potential to contain artefactual resources) were introduced to the site. No works are proposed around the base of the timber piers, which have been replaced with modern fabric. Pier 4 has not been subject to any significant repair or construction works. It is not anticipated that the footings of any scaffolding or framework used in the erection of the pier would be present. Overall, there is nil archaeological potential associated with Phase 2. There are no predicted significant non-Aboriginal archaeological remains associated with Phase 2 within the Stage 2 study area.

6.2.4 Potential impacts

Direct Heritage Impacts

Pier 4 rehabilitation works

St Albans Bridge

Excavation works around the base of Pier 4, installation of temporary cofferdam sheeting and partial backfilling following completion of the works would be non-intrusive and would not result in direct impacts to the significant fabric of the bridge. The excavation works would therefore result in a **neutral** direct impact to the St Albans Bridge.

The direct impacts of the scaffolding and wall cover sheeting would depend on the detailed design, and further details would be required to assess the impact of these works. If the scaffolding is free-standing (for the encapsulation and painting process), is not fixed to Pier 4 or is fixed to Pier 4 in a way that does not penetrate or alter original fabric, the resultant direct impact would be **neutra**l. However, if fixing to Pier 4 is required for the scaffolding and wall cover sheeting through penetration of or direct connection to the steel or wrought iron elements, the works would result in **a negligible to minor** direct impact. The scaffolding and encapsulation works would therefore likely result in a **neutral to minor** direct impact to the St Albans Bridge.

The proposed surface cleaning, abrasive blast cleaning and painting works would involve the removal of flaked paint, surface rust and efflorescence on Pier 4 and the repainting of all elements of Pier 4 in the original colours as the existing fabric of the pier. These works would result in a **negligible direct** impact to the St Albans Bridge.

The injection of the grout at the base and the top of the wrought iron columns would result in localised direct impacts to the wrought iron columns. The grouting works would result in a **minor direct impact** to the St Albans Bridge.

The proposal would require the removal and replacement of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Pier 4 with like-for-like steel counterparts. The brace rivets of the upper column cleats would be removed, cleaned and repainted. The bottom cleats on both sides would be removed/cleaned back and treated with paint in the exposed areas. The proposal also involves the removal and replacement of the steel connection plates for the cross and horizontal steel bracing elements with modified steel plates to connect to the new steel casing. These works would be irreversible and would result in the removal of highly significant original fabric, of which little is left other than Pier 4. These works would result in an overall **moderate** direct impact to the St Albans Bridge.

The installation of the split covers/seating straps, the steel casing and injection of the non-corrosive epoxy infill material would result in the irreversible encasement of the bottom section of the wrought iron columns between the first and second horizontal columns. This method would ensure the retention of the original fabric of the wrought iron columns whilst providing structural stability. Despite the retention of the original wrought iron columns, this aspect of the proposal would result in a **moderate direct** impact.

Overall, despite resulting in a positive outcome for the structural integrity of the bridge, the proposed pier rehabilitation works would result in a **moderate** direct impact to the St Albans Bridge (SHR # 01480).

St Albans Heritage Conservation Area

The proposal would occur within the curtilage of the St Albans Conservation Area, which includes the St Albans Bridge and the surrounding landscape. The proposed excavation works, temporary works and rehabilitation works would result in a moderate direct impact to the bridge element of the St Albans Conservation Area. The works would also result in the excavation of deposited sediment along the course of the river within the St Albans Conservation Area. While the St Albans Bridge and the surrounding river course are contributing elements to the conservation area, the overall scope of works is minimal. Other significant elements of the conservation area would not be directly impacted.

Overall, the proposed works would result in a **negligible direct impact** to the heritage significance of the St Albans Conservation Area (LEP # C2).

Other Heritage Items

The proposed works would be localised to the area of St Albans Bridge and would not impinge on or adversely impact the heritage values of other nearby heritage items, including the Settlers Arm Inn (LEP#1436), the Gaol, Courthouse and Stables (LEP #1440) and the Greater Blue Mountains Area (WHL #917, NHL # 105999). The proposal would result in a **neutral heritage impact** on these surrounding or nearby heritage items.

Flood recovery works

The flood recovery works involve the removal of flood debris and sediment and the relocation of fallen trees from around the base of Pier 4 as well as the installation of a temporary access track to provide for machinery and vehicle access to Pier 4. These works would be non-intrusive and would not result in direct impacts to the significant original fabric of the bridge.

The flood recovery works would result in a **neutral** direct impact on the St Albans Bridge.

TAMP works

The proposed TAMP Works involve several actions to ensure the structural integrity and proper functioning of the St. Albans Bridge, including resurfacing the bridge decking with new asphalt, installing metal cover plates to close the gaps on the bridge deck, and replacing damaged laminates beneath the bridge. The installation of the cover plates would introduce a reversible addition to the bridge, while the resealing of the decking and replacement of damaged laminates would lead to a permanent direct impact on the bridge.

These TAMP Works are required for the maintenance and functionality of the St Albans Bridge and will result in a **minor** direct impact on the bridge.

Summary of Potential Direct Non-Aboriginal Heritage Impacts

Collectively, the scope of proposed works would result in a **moderate** impact to the St Albans Bridge, a **negligible** impact on St Albans Conservation Area, and a **neutral** impact to surrounding heritage items or heritage areas. Table 6-7 below provides a summary of the overall direct heritage impacts of the proposal.

Table 6-7: Summary of overall direct heritage impacts of the proposal on the bridge and heritage items in the area

Heritage Item	Overall impact
St Albans Bridge	Moderate
St Albans Conservation Area	Negligible
Greater Blue Mountains Area	Neutral
Settlers Arm Inn	Neutral
Gaol Courthouse and Stables	Neutral

Direct Visual Heritage Impacts

Pier 4 rehabilitation works

St Albans Bridge

The excavation works would result in a temporary disruption of views to the bridge from the riverbank. However, the works would also result in the reduction in the height of sediment around the wrought iron columns and enable the full exposure of the wrought iron columns at the base of Pier 4. These works would therefore result in a **temporary minor negative** visual impact and **positive minor permanent** visual impact to St Albans Bridge.

The scaffolding and sheeting works would likely result in a **temporary moderate visual heritage** impact and **neutral to negligible permanent visual heritage impact** to St Albans bridge, as these works would temporarily impact views to the bridge, but these structures would be removed at the completion of works.

The surface cleaning works would involve the removal of surface grime, rust and flaked paint from Pier 4, and would result in a **negligible visual impact**.

The repainting works would require the repainting of all elements of Pier 4 with colours sympathetic to the heritage fabric of St Albans Bridge. These works would result in a **minor visual heritage impact** to the heritage significance of St Albans Bridge.

The grout injection works on the wrought iron columns would result in 20mm holes at each location on each column. These holes would be located on the inside facing side of the columns to minimise visual impacts, and all removed sections of the columns would be reinstated and covered with protective paint coating. These works would result in a **negligible visual heritage impact.**

The removal and replacement of the steel lattice, cross braces and steel connection plates with like-for-like or with sympathetic elements would ensure that these works are compatible with the heritage character of the St Albans Bridge. These works would result in a **minor visual heritage impact** to the bridge.

The installation of the split covers/ seating straps, steel casing and injection of epoxy infill material would utilise elements that are visually sympathetic to the heritage fabric of the pier and pier columns. These works would result in a **minor visual** heritage i**mpact** to the bridge.

Flood recovery works

The flood recovery works involve the installation of a temporary access track to enable machinery and vehicle access to the river, as well as the removal of debris and the relocation of fallen trees from around the base of Pier 4.

These works would result in a **minor temporary visual impact** associated with the temporary tracks, associated materials and flood recovery activities. However, the removal of unsightly debris and the relocation of fallen trees from around the base of Pier 4 would result in a permanent **minor positive visual heritage impact** to the bridge.

The collective flood recovery works would therefore result in a permanent **minor positive visual heritage impact** to the bridge.

TAMP works

The proposed TAMP Works includes works to resurface the bridge decking with bitumen, install metal cover plates to close the gaps on the bridge deck, and replace damaged laminates beneath the bridge. The installation of the cover plates would introduce a reversible addition to the bridge, while the resealing of the decking and replacement of damaged laminates would lead to a permanent direct impact on the bridge.

However, these works will be sympathetic to the heritage fabric of the bridge and are required to maintain the functionality and structural integrity of the bridge.

The collective TAMP works would result in a **permanent minor visual heritage impact** to the setting and views of the State listed St Albans Bridge over Macdonald River (SHR # 01480).

St Albans Conservation Area

The proposal is located within the curtilage of the St Albans Conservation Area (LEP # C2), which includes the St Albans Bridge and the surrounding landscape. The works would be localised within the area of St Albans Bridge, and the overall scope of works would be minimal. Following completion of works, all scaffolding and sheeting would be removed from the bridge, and the area surrounding Pier 4 would be partially backfilled with rock scour infill and the area would be restored to its pre-existing condition, albeit with a reduced sediment height. In addition, all ancillary facilities and structures within the site, including site compound, site amenities and stockpile area, would be decommissioned and removed from site following completion of works.

Overall, the proposed works would result in a **negligible positive visual heritage impact** to the St Albans Conservation Area (LEP # C2).

Other Heritage Items

The proposed works would be localised to the St Albans Bridge and would not be visually intrusive to nearby heritage items, including the Settlers Arm Inn (LEP#1436), the Gaol, Courthouse and Stables (LEP #1440) and the Greater Blue Mountains Area (WHL #917, NHL # 105999). Buildings and vegetation currently provide a visual buffer and obscure views to the St Albans Bridge from these nearby heritage items. Therefore, the proposal would result in **neutral visual heritage impact** to the views and settings of these nearby heritage items.

Summary of Potential Direct Visual Non-Aboriginal Heritage Impacts

Table 6-8 provides a summary of the overall visual heritage impacts of the proposal on heritage items / heritage areas within the area.

Table 6-8: Summary of overall visual heritage impacts of the proposal on the bridge and heritage items in the area

Heritage Item	Overall impact
St Albans Bridge	Minor
St Albans Conservation Area	Negligible
Greater Blue Mountains Area	Neutral
Settlers Arm Inn	Neutral
Gaol Courthouse and Stables	Neutral

Archaeology

The preliminary archaeological assessment has not identified potential for significant non- Aboriginal archaeological remains within the proposal footprint. The land surrounding Pier 4 comprises recently deposited sediment from the river. Therefore, the proposal would not impact on any significant non-Aboriginal archaeological resources. The proposal would have a neutral impact on non-Aboriginal archaeological 'relics' or works.

Section 60 Application

The *NSW Heritage Act 1977* (Heritage Act) requires approval from Heritage NSW (S60 Approval) for development activities within or within the curtilage of State Heritage Register (SHR) listed items, where the development activities would impact these items.

St Albans Bridge is a SHR listed item, and the Heritage Impact Assessment has found that the proposal would have a moderate impact on the heritage significance of the St Albans Bridge. Therefore, a Section 60 application is required.

6.2.5 Safeguards and management measures

Table 6-9: Non-Aboriginal heritage safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non- Aboriginal heritage	A Heritage Management Plan incorporating the relevant recommendations and safeguards from the Statement of Heritage Impact prepared by Artefact and dated 1 August 2023 will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage and will include:	Contractor	Detailed design Pre-construction	Section 4.10 of *QA G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Site inductions which cover significant heritage fabric and protection requirements • Specific protection measures including fencing and maintenance of buffer areas • Tailored construction methods for works near significant heritage fabric (such as use of hand tools only). • A map identifying locations of items or sites (including curtilages) which are to be protected and those which are to be destroyed/impacted and no-go zones. • Identification of potential environmental risks/impacts due to the works/activities • Management measures to minimise the potential risk • Mitigation measures to avoid risk of harm and the interface with work activities on site. • Implementation of mitigation measures to protect identified heritage items or areas • Identify in toolbox talks where management of non-aboriginal heritage is required such as identification of no go zones and responsibilities under the Heritage Act 1977 and any obtained permits or exemptions. • A stop works procedure in the event of actual or suspected potential harm to a heritage feature/place. • Requirement to comply with Transport for NSW Standard Management Procedure - Unexpected Archaeological Finds, RMS 2012.			
Non-Aboriginal heritage	A S60 approval from Heritage NSW for the proposal will be required under the Heritage Act. The proposal must undertake appropriate heritage protections measures in accordance with the relevant requirements and recommendations of the S60 approval.	Contractor	Construction	Additional measure

6.3 Biodiversity

A Biodiversity Assessment for the proposal was carried out by Niche Environment and Heritage in 2021 for a similar scope of works to that of the proposal, however the works were not implemented at the time. In 2023, Lesryk Environmental were engaged to undertake an updated Biodiversity Assessment Report (BAR) for the proposal. The main findings of that assessment are summarised below while the full report is included in Appendix E.

6.3.1 Methodology

The methodology for the biodiversity assessment involved the following:

- Review of the draft BAR conducted by Niche Environment and Heritage in 2021
- Background research and search of relevant databases (including Bionet Atlas and Protect Matters Search Tool (PMST), Fisheries NSW Spatial Data Portal, NSW SEED map viewer) for a 10-kilometre radius around the proposal footprint and review of available spatial data including vegetation mapping
- Vegetation assessment including mapping, site surveys and classification
- Threatened species assessment addressing the likelihood of occurrence based on known records, presence or absence of important habitat features and professional judgement during targeted site surveys. The potential for the proposal to impact species was also assessed to eliminate those species from the list that, despite having some likelihood of occurring in the study area, would not be impacted by the small-scale localised works associated with the proposal. Species considered further in formal assessments of significance (BC Act, EPBC Act) were those in the 'Recorded' or 'High' categories where adverse impacts for the species could reasonably occur from the development.
- Review of 2021 targeted surveys for threatened microbats undertaken by Niche which included:
  - Diurnal search of the undercarriage of the bridge which involved inspecting the underside of the bridge with a handheld torch, searching for potential bat roosts (i.e. suitable holes, cracks, crevices), ammonia-like odours (urine), staining and guano (i.e. bat excrement)
  - Deployment of one songmeter (SM4) from 23 to 26 March 2020 (three detector nights) to record the calls of the bats
  - Dusk survey on two non-consecutive evenings involving observers being stationed below the bridge (with handheld torches and binoculars) to visually detect any microbats exiting the bridge for nightly foraging and further targeted on-site observations in 2023.
- Aquatic surveys including visual inspection and traverses of the Macdonald River in proximity to Pier 4 and a distance of 10 metres upstream and downstream.

6.3.2 Existing environment

Plant type communities

The vegetation within the study area for the Biodiversity Assessment was identified as containing Plant Community Types (PCT) of PCT 0 - Non-native vegetation, PCT 3605 – Hunter Range Ironbark Forest, and PCT 4057 – Sydney Creekflat Swam Mahogany Paperbark Forest.

The study area is comprised of a riverbank as well as an intermittently inundated (currently exposed) sand flats, both of which have been colonised by a variety of weeds and native species from the adjoining intact vegetation as well as those typical of disturbed bushland edges. A species recorded during the site survey are included in Appendix D of the BAR.

One BC Act listed Threatened Ecological Community (TEC) was identified within a component of the proposed works area (being in proximity to the required access track), this being the TEC known as 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'.

Groundwater dependent ecosystems (GDE)

Reference to the Groundwater Dependent Ecosystems Atlas (BoM 2023) identified high potential terrestrial GDE and moderate potential GDE within the proposal area. No aquatic or subterranean GDE were identified or analysed for the study area.

Threatened species

A review of the DCCEEW PMST and BioNet databases (DCCEEW 2023, DPE 2023a) identified 33 threatened flora species and 53 threatened fauna species, listed under the EPBC and/or BC Acts that have been previously recorded or are considered to have habitat within 10 km of the subject site.

No flora or fauna species listed, or currently being considered for listing, under the EPBC and/or BC Acts were recorded during site survey. Given the highly disturbed and modified character of the area investigated, no threatened flora species are expected to occur, particularly within the soil seed bank.

Considered and targeted searches were conducted, but no microbats were observed roosting in association within those portions of the bridge inspected. Despite this, with reference to Section 6.2.2 of the draft 2021 BAR (Niche 2021), as they have been previously recorded in the surrounding region, and as microbat habitat was observed in association with St Albans Bridge, it was considered appropriate to adopt a precautionary approach to the potential presence of the following cave-dependent microbats listed in Table 6-10 (all of which are listed as Vulnerable under the BC Act):

Table 6-10: Potential occurrence of threatened fauna

Scientific name	Common name	BC Act Status	Potential occurrence
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	High
Micronomus norfolkensis	Eastern Coastal Free- tailed Bat	Vulnerable	Recorded
Miniopterus australis	Little Bent-winged Bat	Vulnerable	Recorded
Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Recorded
Myotis macropus	Southern Myotis	Vulnerable	Recorded

Of the species listed in Table 6-10, the draft 2021 BAR (Niche 2021) concluded that Southern Myotis (*Myotis macropus*) is the only species that may potentially be roosting within or near the bridge based on the detection times of this species recorded through use of the Songmeter placed at the southern end of the bridge for the 2021 study.

Aquatic habitats

At the time of the site investigation undertaken on 23 May 2023, Macdonald River was an approximately 2-metre-wide flowing channel, with about 5-metre-tall earthen banks lined with Eucalypt woodland present within and beyond the limits of the proposed works. The river appeared to have low turbidity and minimal sedimentation, with high visibility. Several sedge grasses were present within Macdonald River and significant woody debris had accumulated around the base of Pier 4

Reference to the DPI Fisheries NSW Spatial Data Portal (DPI 2023b) indicates that the Macdonald River, where it intersects the proposal footprint is mapped as Key Fish Habitat.

No fish were observed in the river and the BAR considered it unlikely that any resident populations of native fish would be present due to the degraded nature of the habitat. No threatened fish species listed under the EPBC or FM Acts have mapped habitat within the study area (DPI 2023).

Areas of outstanding biodiversity value

No areas of outstanding biodiversity value identified by Part 3 of the NSW Biodiversity Conservation Regulation 2017 occur within or near the proposal footprint.

Wildlife connectivity corridors

The BAR confirms with reference to the NSW Government SEED Dataset mapping that the proposal site is not part of the Fauna Key Habitats or Fauna Corridors for North East NSW. The proposed works occur about 120 metres north of the fauna corridors for the North East that traverse part of Yengo National Park.

6.3.3 Potential impacts

Direct / construction impacts

Removal of native vegetation

The impacts to native vegetation would be minimal. There is an existing access track from behind the St Albans Rural Fire Station that leads to the banks of the river. The proposal will utilise this existing path and will not require widening of this access path.

However, the proposal would result in the disturbance and pruning of up to 0.375 ha of vegetation adjacent to the access track, including the removal of mixed exotic and native groundcover, the minor pruning of native and exotic tree branches, and the removal of one small tree to accommodate the turning radius of the access path to the riverbed. The tree to be removed has been identified as an Acaica Melanoxylon and is not hollow bearing.

A safeguard has been included requiring that tree removal and replacement be undertaken in accordance with the Tree and hollow replacement guidelines (Transport for NSW, 2022d).

Further details of the proposed vegetation and tree removal are provided in Figure 3-12 and Figure 6-10.

Removal of threatened fauna habitat

No threatened fauna species were recorded or considered likely to occur within those portions of the bridge surveyed.

No threatened fauna habitat would be removed as a result of the proposal. Trimming of native and exotic vegetation, and the removal of one mature tree would be required along the existing access track to accommodate the turning radius of the access path, but none of the trees that are to be pruned/trimmed or removed are considered to provide habitat (i.e. are hollow bearing) for native species.

The BAR considers the documented habitat requirements of the microbats listed in Table 6-10 and considers there is the potential that some could occupy St Albans Bridge. However, despite this, the BAR concludes that, considering the scope of works proposed and the components of the bridge at which the works would occur, the activities that would be conducted would not affect any habitat(s) (particularly roosting or breeding sites) that may be occupied by threatened microbats if they occur in association with the existing structure.

Despite no threatened species recorded or indicated as present within the proposal site, the BAR provided an assessment of significance (refer to Appendix E of the BAR) with reference to the criteria in Section 7.3 of the BC Act as a precautionary approach for the microbats listed in Table 6-10 above. Following the assessment of significance, the BAR concluded that the proposal would not have a significant impact on the microbats listed in Table 6-10 or their habitat/s. Therefore, the preparation of a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required.

Removal of threatened flora

The TEC of *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, was recorded within the area investigated. The BAR conducted assessments referring to the EPBC Act's Significant Impact Guidelines and Section 7.3 of the BC Act concluding the extent of vegetation clearance/disturbance would not have a significant effect on the TEC and therefore the preparation of an SIS is not considered necessary.

Aquatic impacts

The proposal is likely to result in changes to hydrology, turbidity and sedimentation as a result of riverbed sand and silt disturbance during construction of the cofferdam within the riverbed around the base of Pier 4. The extracted sediment and riverbed soil (excluding clean sands) would not be returned to the riverbed. This is not expected to have an adverse impact on the channel bottom of the Macdonald River or its hydrological flow.

The proposal would not have an adverse impact, particularly any that are long term, on aquatic habitats. Whilst the cofferdam would be located within the southern portion of the existing channel of Macdonald River, areas north of the dam would be available for the movement and dispersal requirements of aquatic species.

Beyond existing conditions, the works proposed would not result in any direct or indirect adverse impact on surface hydrology within the proposal area and is not expected to impact any drainage lines that occur beyond the limits of the work.

No threatened aquatic species are considered likely to occur. Impacts to aquatic biodiversity are expected to be minimal and temporary during the proposed works.

Injury and mortality

Injury and mortality of terrestrial and aquatic fauna is unlikely to occur during construction activities. Some sheltering fauna species (i.e., frogs and ground-traversing mammals) could be present and be subject to injury. Safeguards to minimise the impact of the proposed work on these animals if present (such as checking beneath vehicles/machinery/materials prior to their use) have been recommended.

Beyond current levels of impact due to the existing presence of Wollombi Road, St Albans Road, and the volume of traffic that typically uses this network, the operational phase of the proposal is not expected to significantly increase injury or mortality of fauna within the proposal area.

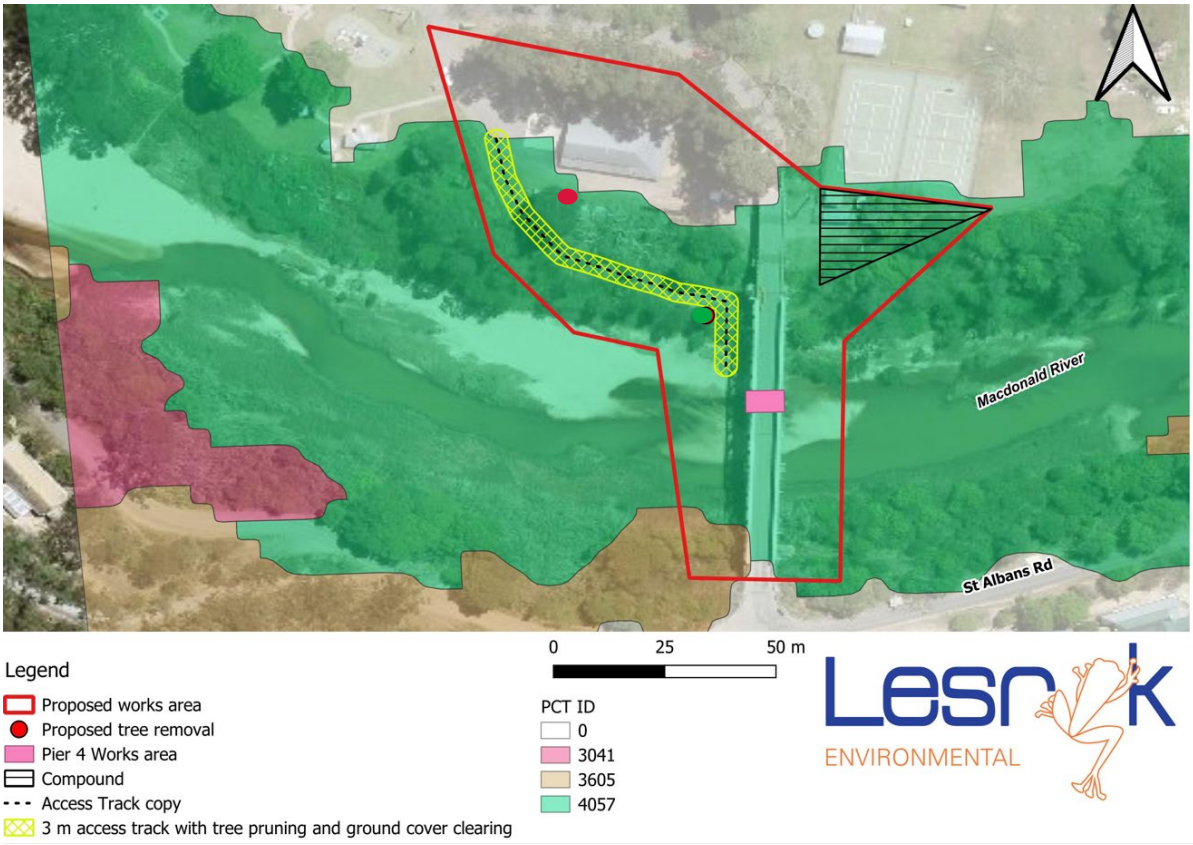


Figure 6-10: Aerial location of access track, works area, vegetation clearance area and tree to be removed

Indirect / operational impacts

Wildlife connectivity and habitat fragmentation

There would be no change to wildlife connectivity or increased habitat fragmentation as a result of the proposal.

Edge effects on adjacent native vegetation and habitat

The proposal would not create new edges or increase the length of edges to nearby native vegetation. No change to edge effects on adjacent native vegetation and habitat is therefore expected.

Invasion and spread of weeds

The proposal footprint and adjacent area is already affected by weeds and susceptible to further weed establishment during periods of high flows in the Macdonald River. It is unlikely that the proposal would result in an increase of weed invasion and spread, however it has potential to introduce new weeds into the riparian corridor. Safeguards have been proposed to minimise the risk of weed introductions during construction.

Invasion and spread of pests

It is unlikely that the proposal would result in an increase of pest species invasion and spread given its limited footprint and scope.

Invasion and spread of pathogens and disease

It is unlikely that the proposal would result in invasion and spread of pathogens and disease, however, there is some potential for new pathogens and disease to be introduced into the riparian corridor. Safeguards, such as disinfecting workers prior to any entry into adjoining bushland, have been proposed to minimise the risk of pathogen and disease introductions during construction.

Changes to hydrology

A cofferdam would be installed and remain in place for the duration of the proposed works to Pier 4, and the riverbed excavated around the bracings to a depth of two metres. This has the potential to cause temporary changes to hydrology and increase the turbidity of the water due to sand and silt disturbance.

However, the Macdonald River naturally experiences high turbidity during high flow events and this temporary increase in turbidity is likely to be consistent with natural variations. In addition, given the size of the Macdonald River, any changes in hydrology are negligible; particularly in terms of affecting native aquatic fauna.

Any changes to hydrology are expected to be temporary and minor in nature.

Noise, light and vibration

The proposal would increase noise and vibration for the duration of the works in the immediate area around the bridge. However, given the presence of the existing road corridor, it is considered that the proposal would result in only a minor impact to native fauna species.

Groundwater dependent ecosystems

The proposal is not likely to result in changes to water quantity, water quality, aquifer structure or land use to the extent that there may be impacts to groundwater dependent ecosystems.

Cumulative impacts

The proposal is unlikely to have any lasting cumulative impacts on the aquatic or terrestrial biodiversity of the area.

Table 6-11 provides a number of mitigation measures that aim to ensure that the proposed work carried out does not have an adverse impact on those environments that occur within or near to the proposal area.

6.3.4 Safeguards and management measures

Table 6-11: Biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Removal of native vegetation	Vegetation clearance limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Contractor	Pre-construction	Additional measure
Removal of native vegetation	Pre-clearing surveys will be conducted in accordance with *Guide 1: Pre-clearing process* (RTA 2011).	Contractor	Pre-construction	Additional measure
Removal of native vegetation	Vegetation removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (RTA 2011).	Contractor	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Clearing of native vegetation would be limited to the minimum required to successfully permit the proposal.			
Removal of native vegetation	Vegetation disturbance (including pruning/ trimming) adjacent to the existing access track is to be limited to the minimum necessary to permit the safe use of this track, and pruning / trimming must be less than 10% of the whole tree for each tree requiring pruning / trimming works	Contractor	Construction	Additional measure
Removal of native vegetation	Weed contaminated green waste will be bagged or covered and disposed of at a licensed landfill facility.	Contractor	Construction	Additional measure
Removal of native vegetation	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* (RTA 2011).	Contractor	Post-Construction	Additional measure
Tree removal and replacement	The *Tree and hollow replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2022d) are *to* be adhered to when providing replacement planting. Appropriate planting of replacement trees and hollows must be provided in accordance with these guidelines.	Contractor	Construction	TfNSW Tree and hollow replacement guidelines (TfNSW, 2022d)
Removal of threatened fauna habitat	Threatened fauna habitat (i.e. the existing timber trusses) will not be impacted.	Project Manager	Detailed Design	Additional measure
Removal of threatened fauna habitat	Fauna will be managed in accordance with *Guide 9: Fauna handling* (RTA 2011).	Contractor	Construction	Additional measure
Removal of threatened fauna habitat	Large woody debris will not be mulched or removed off-site but should be relocated locally and placed parallel to the river.	Contractor	Construction	Additional measure
Injury to fauna	Inspections for the presence of any sheltering fauna would be carried out beneath vehicles/machinery prior to use.	Contractor	Construction	Additional measure
Injury to fauna	Any sheltering native species would be collected and relocated locally by a licenced individual (nocturnal species to be released on dusk). If injured, native wildlife would be taken to a local veterinarian or wildlife carer for treatment. Once rehabilitated, these native animals must be released at their point of capture. Exotic injured wildlife would be taken to a local veterinarian and ethically treated.	Contractor	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
Invasion and spread of weeds	Weed species will be managed in accordance *with Guide 6: Weed management* (RTA 2011).	Contractor	Construction	Additional measure
Invasion and spread of weeds	In accordance with the NSW *Biosecurity Act 2015*, any Blackberry identified on site would be controlled (i.e. treated in accordance with approved weed management techniques such as hand removal or application of a suitable herbicide), thereby resulting in its suppression.	Contractor	Construction	Additional measure
Invasion and spread of pathogens and disease	Pathogens (e.g., *Phytophthora cinnamomi*) will be managed in accordance with *Guide 2: Exclusion zones* and *Guide 7: Pathogen management* (RTA 2011), including the following hygiene protocols: • If there is a need to enter the adjacent bushland, before accessing, and upon leaving, these portions of the work site, workers are to remove excess soil and mud and then spray boots, tools, gloves and small equipment with recommended disinfectant supplied by the contractor (70% Methylated spirits / 30% Water) until runoff is clear. Avoid unnecessary soil disturbance.	Contractor	Construction	Additional measure
Noise, light, dust and vibration	All plant/equipment to be used on site will be designed and operated to control the potential emission of smoky exhaust fumes into the atmosphere. All machinery/vehicles are to be operated within standard guidelines.	Contractor	Construction	Additional measure

6.3.5 Biodiversity offsets

With reference to Table 1 in Section 4.2 of the Guideline for Biodiversity Offsets (Roads and Maritime Services, 2016) it is noted that the proposal would not result in impacts to greater than one hectare of a threatened ecological community or habitat for threatened species which cannot withstand a loss. Offsets under the Guideline for Biodiversity Offsets are therefore not required.

However, as the proposal will result in the removal of one native mature tree, TfNSW has advised that the offsets and tree replacement requirements under TfNSW's *Tree and hollow replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2022d) would be applicable to the proposal, as the disturbed area will no longer be available for tree regeneration.

A safeguard has been included requiring the proposal to undertake appropriate replacement planting in accordance with the Tree and Hollow Replacement Guidelines.

The proposal will determine tree and hollow replacement requirements in accordance with the *Tree and hollow replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2022d) and supporting resources based on the final construction footprint.

6.4 Noise and vibration

6.4.1 Methodology

Construction noise and vibration has been assessed in accordance with the *Construction Noise and Vibration Guideline* (Roads and Maritime Services, 2016) (and the NSW Environmental Protection Agency's (EPA) *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009).

The assessment methodology for the noise assessment involved:

- Identifying and classifying sensitive receivers. Receivers were classified using a combination of recent aerial and ground photography, web-based information sources and cadastral data
- Adopting a suitable representative noise environment category from the Construction and Maintenance Noise Estimator Tool (Transport for NSW, 2017) (referred to as the Noise Tool). In this case the R0 category environment was adopted in recognition of the remote location and low traffic volumes.
- Establishing proposal specific construction noise management levels in accordance with the ICNG)
- Based on construction scenarios using the Noise Tool to produce predicted noise levels at different locations within the vicinity of the proposal and to identify any exceedance of construction noise management levels. The following calculations were conducted with a line of sight to the nearest sensitive receivers assumed:
  - Distance based calculation (noisiest plant) – abrasive blasting
  - Distance based calculation (scenario) – compound operation

  The complete Noise Tool outputs can be found in Appendix F.
- Assessing construction vibration to determine the potential for human comfort and structural damage construction vibration criteria to be exceeded
- Identification of feasible and reasonable environmental management measures.

6.4.2 Existing environment

The proposal is located at the southern end of St Albans, which is a small historic village, with the village and surrounding area having a population of approximately 161 people (ABS Census, 2021). The existing noise environment is categorised as rural,. The nearest receivers include a residence on the southern side of the Macdonald River (the occupation of which is unknown) at about 50 metres and the Settlers Arms Inn (which offers accommodation) at about 150 metres to the northwest. The location of sensitive receivers is shown in Figure 6-11 in section 6.4.4.

6.4.3 Criteria

Construction noise criteria

Noise management levels (NML) for the proposal have been established in accordance with the ICNG. The guideline prescribes noise management goals for receivers. As a guide, construction noise for residential receivers should not exceed the background noise levels by more than 10 dB(A) during standard daytime hours, and by more than 5 dB(A) for daytime out-of-hours-works (OOHW), evening, and night-time work. The level of 75 dB(A) is identified as the point above which there may be a strong community reaction to construction noise.

The project specific noise management levels selected for the proposal are as follows:

- Day (standard hours): 30 + 10 = 40 dB(A) LAeq 15 minutes
- Day (OOHW): 30 + 5 = 35 dB(A) LAeq 15 minutes
- Evening: 30 + 5 = 35 dB(A) LAeq 15 minutes
- Night: 30 + 5 = 35 dB(A) LAeq 15 minutes.

Construction traffic noise criteria

When construction related traffic moves onto the public road network, vehicle movements are regarded as additional road traffic and are assessed under the Road Noise Policy (RNP) (Department of Environment Climate Change and Water, 2011).

An initial screening test is applied to determine whether noise levels would increase by more than two dB due to construction traffic; this equates to around a 60% increase in number of vehicles on the road network.

An increase of two dB represents a minor impact that is considered barely perceptible to the average person. Where noise levels increase by more than two dB, further assessment is required using the criteria set out in the RNP.

Construction vibration criteria

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits is achieved, compliance would also be achieved for building damage.

The publication *Assessing Vibration: A Technical Guideline* (former Department of Environment and Conservation, 2006) provides acceptable values for continuous and impulsive vibration in the range 1-80Hz. Both preferred and maximum vibration limits are defined for various locations and are shown in Table 6-12 and Table 6-13.

Table 6-12: Preferred / Maximum Peak Particle Velocity (ppv) values for continuous vibration

Location	Assessment Period[1]	Preferred values (mm/s)	Maximum values (mm/s)
Critical areas[2]	Day or Night time	0.14	0.28
Receivers	Daytime Night time	0.28 0.20	0.56 0.40
Offices, schools, educational institutions and places of worship	Day or Night time	0.56	1.1
Workshops	Day or Night time	1.1	2.2

Table 6-13: Preferred / Maximum Peak Particle Velocity (ppv) values for impulsive vibration

Location	Assessment Period[1]	Preferred values (mm/s)	Maximum values (mm/s)
Critical areas[2]	Day or Night time	0.14	0.28
Receivers	Daytime Night time	8.6 2.8	17.0 5.6
Offices, schools, educational institutions and places of worship	Day or Night time	18.0	36.0
Workshops	Day or Night time	18.0	36.0

Structural damage to buildings

Currently there is no existing Australian Standard for assessment of structural building damage caused by vibration energy.

The German Standard *DIN 4150-3 Structural Vibration, Part 3: Effects of Vibration on Structures* identifies stringent vibration levels for building damage and includes a category specifically for heritage buildings. This standard recommends frequency dependent values for peak particle velocity (PPV) for different building categories, which are reproduced in Table 6-14. DIN 4150-3 is to be used to assess potential vibration impacts at heritage buildings, or other sensitive heritage structures identified for the proposal.

[1] Daytime is 7.00am-10.00pm and Night time is 10.00pm-7.00am.

[2] Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.

Table 6-14: DIN 4150-3 Vibration guidelines for structural damage assessment (mm/sec)

Type of structure	Guideline values for velocity			
	Vibration at the foundation at a frequency of			Vibration at the horizontal plane of the highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	
Commercial, industrial buildings and buildings of similar design and/or use	20	20-40	40-50	40
Dwellings and buildings of similar design and/or use	5	5-15	15-20	15
Structures sensitive to vibration and of great intrinsic value (e.g. heritage/buildings that are under a preservation order)	3	3-8	8-10	8

6.4.4 Potential impacts

Construction

Construction noise

The works are proposed to be primarily undertaken during standard hours (7am to 6pm Mondays to Fridays and 8am to 1pm Saturdays). All noisy works would be carried out during these standard hours. However, up to 10 nightshifts would be required, with OOHW to occur from 8:00pm to 5:00am for each nightshift. The ICNG (DECC, 2009) states that justification should be provided for works that are proposed to take place outside of standard working hours.

The nightworks would be required primarily to undertake the works to the bridge deck, during bridge closures, and to reduce daytime disruption to traffic. These works, including the replacement of the deteriorated deck laminates, resealing of the deck and replacement of steel cover plates, would exclude noisy works (e.g. saw cutting, jack hammering, breaking up concrete).

Operation of the compound site would include, but not be limited to deliveries of materials, mobilising and demobilising of construction plant and equipment, use of hand-held power tools, parking for workers, office and storage areas. The compound scenario was also applied to the assessment of noise at night, as the noisiest plant proposed to be used at night would be handheld power tools which have an affected distance less than that of the compound scenario. The compound noise scenario provides a “worst-case” assessment of affected distances for potential noise impacts at night.

The results of the construction noise assessment using the Noise Tool for residential receivers are provided in Table 6-15 for compound operation and abrasive blasting and shown in Figure 6-11.

Table 6-15: Construction Noise Tool assessment results

Works – Abrasive blasting				
	Affected Distance	**NML dB(A)**	**Predicted noise levels dB(A)**	**Recommended additional mitigation measures**
Standard hours	655m	40	40 - noticeable	-
	315m	40	50 - moderately intrusive	N
	150m	40	60 - highly intrusive	N
Works – Compound operation				
	Affected Distance	**NML dB(A)**	**Predicted noise levels dB(A)**	**Recommended additional mitigation measures**
Standard hours	250m	40	50 - moderately intrusive	N

	115m	40	60 - highly intrusive	N
Night	755m	35	35 - noticeable	N
	525m	35	40 - clearly audible	N, R2, DR
	250m	35	50 - moderately intrusive	N, PC, SN, R2, DR
	115m	35	60 highly intrusive	AA, N, PC, SN, R2, DR

The noise predictions and Figure 6-11 indicate that the proposed abrasive blasting could be audible at most residences in St Albans. This is largely a function of the low background noise levels and the noise levels generated by this activity. A small number of residences would be affected by moderately intrusive noise (14 receivers) and highly intrusive noise (3 receivers) from this activity. As these noisy works would be undertaken only during standard hours, recommended additional mitigation is in the form of advanced notification to receivers within the affected distance.

Figure 6-11 demonstrates that compound operations at night, which may include the use of hand-held power tools, would be clearly audible to many of the residences in St Albans. Seven receivers would be affected by moderately intrusive noise and three receivers by highly intrusive noise, with the potential for sleep disturbance for receivers within 85 metres of compound operations. As discussed, no noisy works are proposed at night and standard mitigations, including the use of non-tonal reversing beepers, well maintained plant and equipment, and pre-start and toolbox talks to reduce construction noise on site, would be adopted.

Additional mitigation measures that would be implemented include:

- Letterbox drop (N = notification) for receivers within a 755 m radius. Notifications would detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night-time period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification will be sent a minimum of seven calendar days prior to the start of works.
- Verification (V) – noise monitoring will be undertaken during major noise-generating activities, such as piling, and during night-time works to verify the noise model.
- Alternative accommodation (AA) – AA will be considered in line with the current TfNSW Alternative Accommodation policy.

Further details of the noise and vibration safeguards and management measures are provided in Table 6-16.

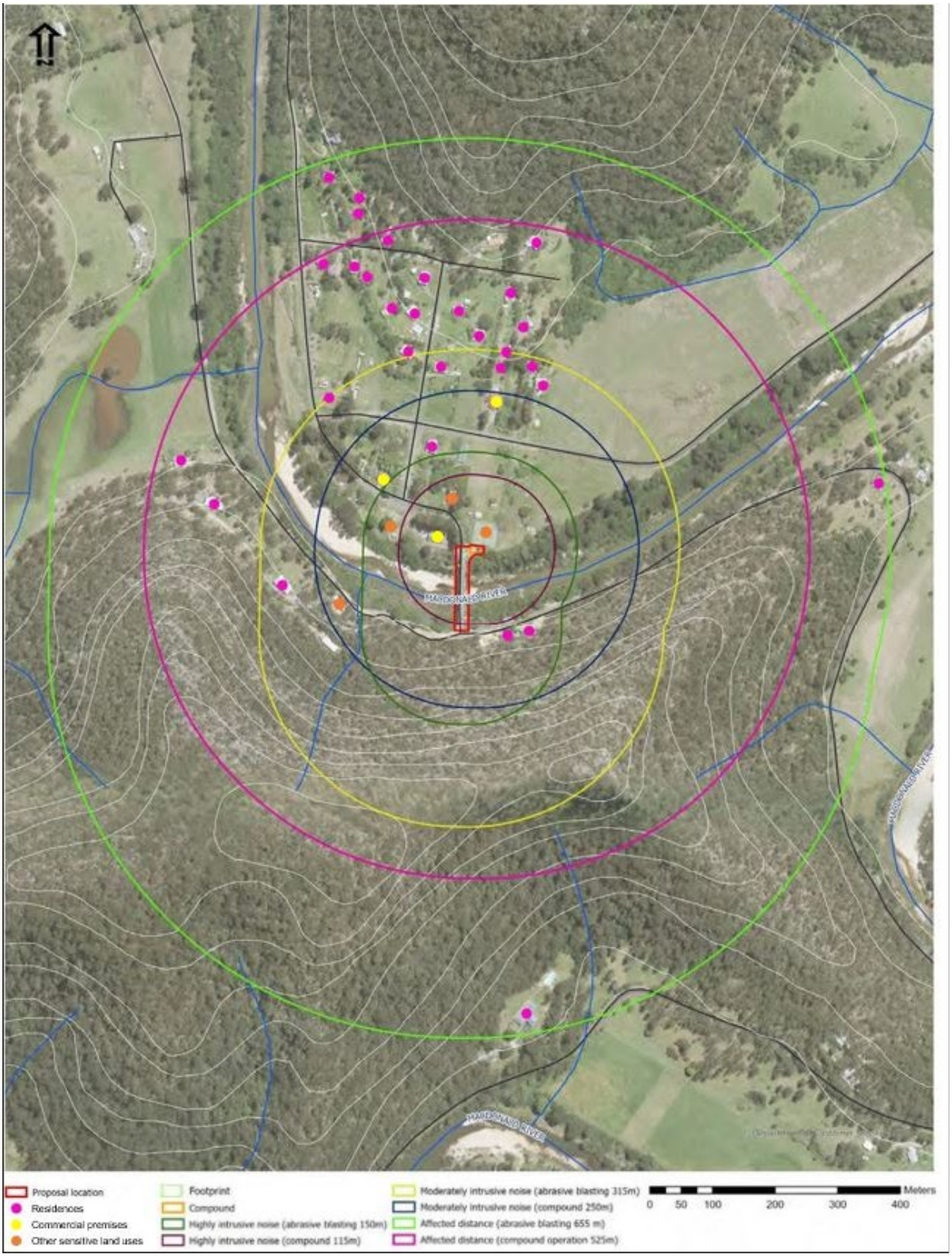


Figure 6-11: Extent of noise intrusion above noise management levels and the location of receivers impacted

Construction traffic noise

The proposal would generate one heavy vehicle and five light vehicle movements per day. These volumes would be small in the context of daily traffic (both through traffic and traffic generated from within St Albans) and are not anticipated to result in an increase in road traffic of approximately 60% that would generate an approximately two dB increase in noise. Therefore, no further assessment is considered to be required under the RNP.

The potential noise impacts as a result of construction traffic are expected to be minimal given the relatively small number of additional vehicles associated with the proposal, along with the limited number of noise sensitive receivers from the proposal.

Construction vibration

Construction plant would be selected to ensure minimum safe working distances set by the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) are complied with where possible, in relation to cosmetic damage, heritage structures and human response to vibration. If minimum safe working distances cannot be complied with, additional measures including the use of smaller plant and vibration monitoring would be implemented.

Operation

The proposal would not alter the operational road traffic noise.

6.4.5 Safeguards and management measures

Table 6-16: Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Construction noise and vibration	All sensitive receivers likely to be affected will be notified at least five working days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	Contractor	Pre-construction	Standard measure
Construction noise and vibration	Noise blankets will be used for noisy works such as concrete cutting.	Contractor	Construction	Construction Noise and Vibration Management
Construction noise and vibration	Noise works are not permitted after midnight.	Contractor	Construction	Construction Noise and Vibration Management

6.5 Soils, contamination and water

6.5.1 Methodology

Soils information was sourced from available reference material including soil landscape maps, salinity mapping and acid sulfate soil risk mapping. Emphasis was placed on identifying relevant limitations that would affect the construction or operation of the proposal.

Contamination was considered with reference to searches of the Environment Protection Authority contaminated land register and the list of notified contaminated sites.

Hydrology and flooding was assessed through a review of flood planning studies and maps.

6.5.2 Existing environment

Soils

Soil landscape mapping (accessed via eSpade) shows that the proposal site traverses the Wisemans Ferry and Watagan soil landscapes. Relevant characteristics of these soil landscapes are provided in Table 6-17.

Table 6-17: Soil landscapes

Soil landscape	Main limitations	Soil erodibility (topsoils)
Wisemans Ferry	High streambank erosion hazard, water erosion hazard, flood hazard, foundation hazard, groundwater pollution hazard, waterlogging (localised), permanently high water tables (localised), high run-on (localised); potential and actual acid sulfate soils (localised) and non- cohesive soils (localised).	Non concentrated flows – moderate Concentrated flows – high to very high Wind – low
Watagan	Mass movement hazard, rockfall hazard, steep slopes, extreme soil erosion hazard and high foundation hazard; localised high run-on, rock outcrop, non-cohesive soils, seasonal waterlogging and shallow soils.	Non concentrated flows – high Concentrated flows – very high Wind – low

Salinity

Salinity is the accumulation of salts in soil and water to levels that impact on people and the environment. Salinity occurs where salt in the landscape is mobilised and redistributed closer to the soil surface and/or into waterways by rising groundwater. Rising groundwater is commonly caused by removal of deep-rooted vegetation such as trees and perennial pasture. It is also caused by changes in soil permeability and structure which restrict groundwater movement. Compaction and cut / fill works can be contributors.

A search of the NSW eSPADE Soil and Land Information mapping database was conducted on 14 February 2024. The search identified that land within the site is located within the Wisemans Ferry Variant A soil landscape.

Salinity is not an identified landscape limitation within the Wisemans Ferry Variant A soil landscape.

Acid sulfate soils

Acid sulfate soils include those where the sulfides in the soils have been exposed to air and acid is being generated (actual acid sulfate soil) and those which may form actual acid sulfate soil when drained or exposed to oxidisation processes (i.e. the exposure of iron sulfate minerals such as pyrite to oxygen). Acid sulfate soil occurs predominantly on coastal lowlands, with elevations generally below five metres.

Acid sulfate soil risk mapping under the Hawkesbury Local Environmental Plan 2012 (LEP) identifies the site and area surrounding the proposal footprint as Class 5 Acid Sulfate Soil Land (Sheet ASS_011). Class 5 land is the lowest risk categorisation for acid sulfate soils. It is unlikely that the proposal would encounter acid sulfate soils.

However, the proposal has incorporated a safeguard for the management of acid sulfate soils should they be encountered during site works.

Contamination

A search (24 April 2023) of the NSW Environment Protection Authority contaminated land record of notices for the Hawkesbury local government area returned twelve notices relating to six sites. None of the recorded sites are near the proposed investigations.

A search of the List of NSW contaminated sites notified to EPA (as at 11 April 2023) did not identify any notified sites near the proposed investigations.

The site is beneath a bridge with some lead paint coatings. There is therefore some potential for lead residue to be in sediments beneath the bridge. This would be addressed through the waste classification process.

Water quality

The proposal would occur primarily on the bed of the Macdonald River, which is part of the broader Hawkesbury-Nepean catchment.

The Macdonald River naturally experiences high turbidity during high flow events. The quality of the water entering the river near the proposal footprint would be largely a function of the contaminants on roads and activities on adjacent areas discharged overland and via minor watercourses to the river. Common pollutants expected include gross pollutants (litter and debris), sediment and suspended solids, toxic organics, nutrients, heavy metals and hydrocarbons.

Hydrology and flooding

The Project is located within an identified flood zone under Hawkesbury City Council's Flood Planning Maps, as shown in Figure 6-12.

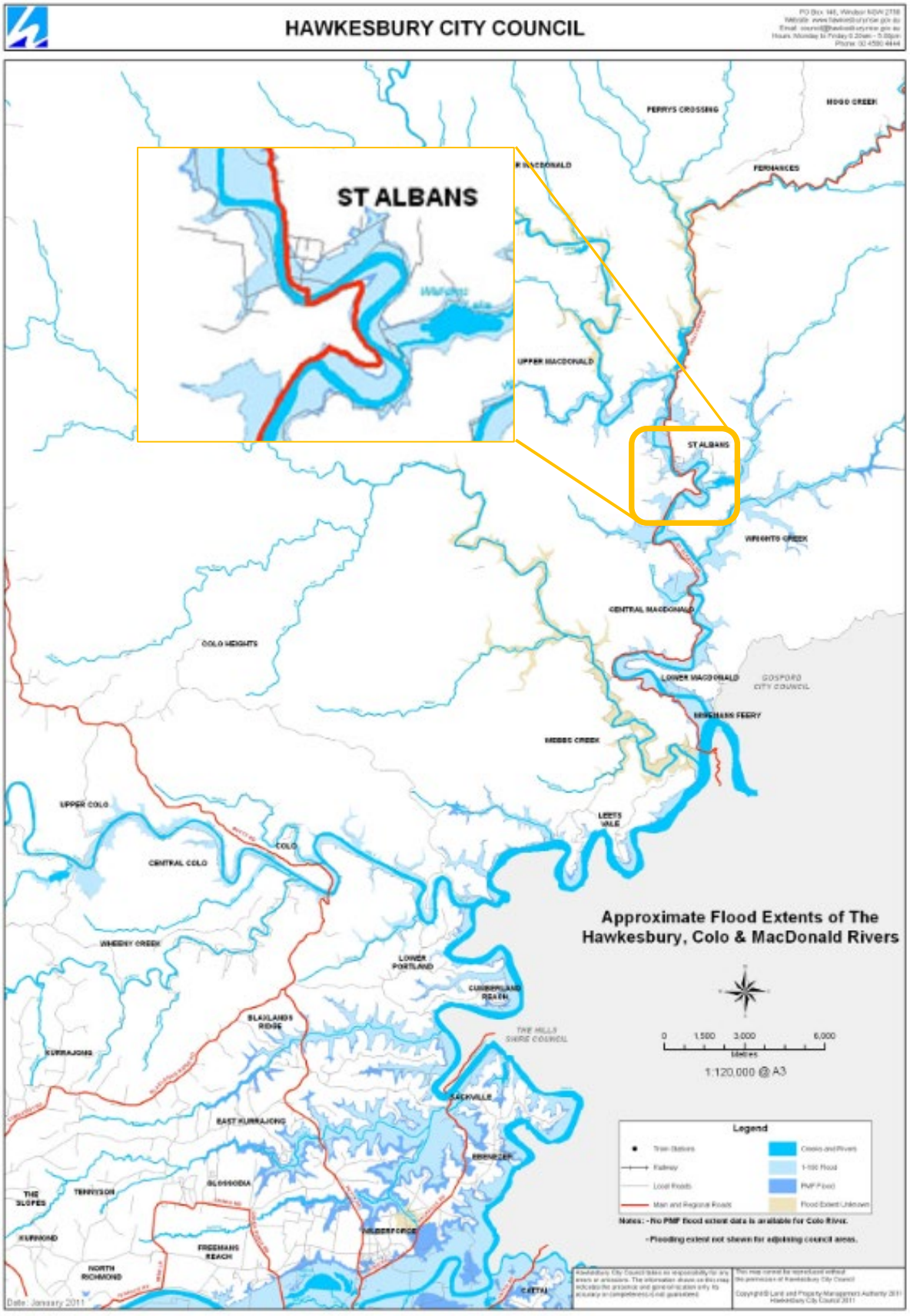


Figure 6-12: Extract from flood mapping for the proposal area

Source: Hawkesbury City Council

The Macdonald River is a tributary of the Hawkesbury River and drains a catchment area of about 1,845 square kilometres.

Flooding along the Macdonald River valley is mainly due to runoff generated in the upper reaches and from local catchments, while the lower reaches can also be affected by backwater from the Hawkesbury River when flood events coincide (Webb, McKeown and Associates, 2004).

There have been significant changes to the characteristics of the Macdonald River over the last 150 years with changes in the channel geometry resulting from the deposition of sand. There is also evidence that the typical channel width has substantially increased (Webb, McKeown and Associates, 2004).

Flood levels of 14.65 metres, 11.25 metres and 8.75 metres were recorded at St Albans in 1949, 1978 and 1990 respectively. The 100-year Annual Recurrence Interval (ARI) flood at St Albans has a level of 14.6 metres Australian Height Data (AHD) with a flow rate of 3,190 cubic metres per second.

6.5.3 Potential impacts

Construction

The key elements / aspects and risks associated with each works package that could potentially impact water quality, result in the potential exposure or disturbance of acid sulfate soils, and / or potentially result in water and soil contamination are considered below.

Pier 4 rehabilitation works

- Installation of sheet piling to provide a cofferdam
- Excavation around the base of Pier 4 to remove sediment / silt
- Abrasive blasting / paint removal
- Surface washing of wrought iron columns
- Pressure grouting
- Repainting
- Installation of rock mattress and backfilling of excavation area
- Stockpiling
- Potential fuel / oil spills associated with construction machinery
- Potential leakage of contaminated water from cofferdam
- Potential contamination from loose grout and associated debris
- Potential contamination from lead paint and hazardous materials

Flood recovery works

- Silt / sediment clearance from around the base of Pier 4
- Disturbance of silt / sediment associated with relocation of fallen dead tree downstream from site
- Potential fuel / oil spills associated with construction machinery

TAMP works

- Disturbance of riverbed associated with scaffolding system to accommodate TAMP works along underside of bridge
- Potential fuel / oil spills associated with construction machinery

Site establishment, ancillary facilities and access path

- Potential fuel / oil spills associated with construction machinery
- Stockpiling
- Disturbance of riverbed and potential site runoff associated with vegetation clearing and tree removal to accommodate access path

There are several components of the pier rehabilitation works that could result in adverse water quality impacts and / or soil contamination. The disturbance of soil and sediments around the bases of the piers due to the excavation works in the riverbed could result in increased sedimentation and turbidity within the Macdonald River. In addition, the abrasive blasting, paint removal, pressure grouting and repainting works could potentially result in contaminants and hazardous materials entering the river and / or contaminating the soil, including chemicals (e.g. fuel, oil, paint), construction materials (e.g. grout) and contaminants (e.g. lead paint material).

The backfilling around the excavated area for the pier rehabilitation works could also result in increased turbidity levels and sediment loads in the Macdonald River, while the pumping of water from the cofferdam could result in untreated contaminated water entering the river.

The flood recovery and TAMP works would also require excavation within, and potential disturbance of the riverbed, which could also result in adverse water quality impacts to the Macdonald River through increased turbidity and sedimentation.

The ground disturbance and vegetation removal associated with the site establishment works to create the access path adjacent to the Macdonald River could also result in sedimentation and runoff into the river.

The stockpiling of materials and use of construction machinery adjacent to the waterway for all aspects of the proposal could also result in potential hazardous materials and contaminants contaminating the soils and entering the Macdonald River through oil spills, fuel leakages/ spills and/or the spillage of other chemicals.

Considering that the proposal area is identified as Class 5 acid sulfate soil land, it is unlikely that the proposal, including disturbance / excavation around the riverbed, would result in the exposure or disturbance of acid sulfate soils.

The proposal has incorporated appropriate safeguards to manage any potential water quality and soil impacts associated with the development, including safeguards recommended by DPI Fisheries, appropriate erosion and sediment control measures to prevent sediments from travelling downstream, and measures for the management of acid sulfate soils in the unlikely event that the proposal works result in the disturbance or exposure of acid sulfate soils.

Specific controls have also been developed to ensure the work site is fully contained and that both airborne and water borne contaminants from the abrasive blasting and construction activities are managed, collected and appropriately disposed of at a licenced facility.

It is noted that non-corrosive epoxy infill material being considered for use between the existing surface of Pier 4 (lower section) and the new steel casing is classified as non-hazardous against the acute aquatic hazard category but has been classified as a Category Chronic 3 Hazard (9.1C New Zealand) (substances that are harmful in the aquatic environment, but not classified as ecotoxic) for the long-term aquatic hazard category. The product has however been approved for use on Transport's bridge assets and it is noted that it would remain enclosed within the steel casing and would not be directly exposed to potentially degrading agents such as UV light.

Potential flood impacts during construction

Given the proposal's location within an identified Flood Planning Area, there is the potential that heavy rainfall and flooding events could adversely impact the proposal and surrounding area during construction. Heavy rainfall and flooding events could result in the following potential impacts on the proposal:

- Potential construction delays
- Potential site inundation
- Potential damage to plant, materials and stockpiles
- Potential erosion of disturbed areas
- Potential safety risk to construction personnel and community

The proposal would incorporate appropriate safeguards to manage the risk associated with flooding during construction, including the implementation of a Flood Management Plan (FMP). The FMP would be implemented as part of the CEMP for the Project. These safeguards are detailed in Table 6-18.

Operation

The proposal would not result in an increase to impermeable surfaces and would not introduce any new discharge points on the bridge. No operational water quality impacts are expected.

There would be no net increase in the filling of riverbed and no introduction of potential obstructions to floodwaters. Therefore, no changes to flood behaviour are expected.

6.5.4 Safeguards and management measures

Table 6-18: Soils, contamination and water safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	Mitigation measures will be undertaken in accordance with the recommended safeguards detailed in the S199 Letter from DPI Fisheries dated 4 February 2024(C23/384). These measures will be detailed in an EWMS.	Contractor	Construction	Additional measure
Soil and water	A site-specific Erosion and Sediment Control Plan will be prepared and implemented in accordance with the Managing Urban Stormwater: Soils and Construction, Volume 1 and 2 (Landcom, 2004). De-watering procedure to be developed and included in the site-specific Erosion and Sediment Control Plan.	Contractor	Detailed design Pre-construction	Section 2.1 of *QA G38 Soil and Water Management*
Soil and Water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request	Contractor	Construction	Additional measure
Soil and water	All soil stockpiles are to be managed in accordance with the TfNSW Stockpile Management Guideline.	Contractor	Construction	Section 2.2 of QA *G38 Soil and Water Management*
Soil and water	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction	Additional measure
Soil and water	The CEMP should detail measures to neutralise acid sulfate soils if required, including through the addition of lime.	Contractor	Construction	Additional measure
Soil and water	Acid sulfate soils should be managed in accordance with RTA Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze (RTA, 2005)	Contractor	Construction	Additional measure
Soil and water	A progressive erosion and sediment control plan is to be prepared for the works.	Contractor	Construction	Additional measure
Water quality impacts associated with paint repair	Wastewater associated with washing will be contained, captured, transferred to sealed collection tanks and then disposed of consistent with its waste classification. The	Contractor	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	containment must be capable of containing all water that may enter the containment, such as rainwater or water from jet washing and contaminated liquid waste.			
Water quality	There is to be no release of dirty water into drainage lines and/or waterways.	Contractor	Construction	Additional measure
Water quality	Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.	Contractor	Construction	Additional measure
Water quality	Water quality control measures are to be used to minimise any materials or contaminants (eg. concrete, grout, sediment, lead based paint, fuel etc) entering drain inlets or waterways. These measures should be implemented as part of the CEMP and an EWMS for the Project.	Contractor	Construction	Additional measure
Spills	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.	Contractor	Construction	Additional measure
Spills	All fuels, chemicals and liquids when not in use will be stored in an impervious bunded area within the site compound. If required, refuelling of plant and equipment, and storage of any hazardous materials will occur within a double-bunded area.	Contractor	Construction	Additional measure
Spills	Minimal paint will be kept at the work site to minimise the consequences associated with a spill. Bunding large enough to contain 120 per cent of the materials volume will be in place at all times.	Contractor	Construction	Additional measure
Spills	A site-specific emergency spill plan will be developed and include spill management measures in accordance with the Transport for NSW Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design Pre-construction	Section 4.3 of *QA G36 Environment Protection*
Contamination	If contaminated areas are encountered during construction,	Contractor	Detailed design Construction	Section 4.2 of *QA G36*

Impact	Environmental safeguards	Responsibility	Timing	Reference
	appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport's Environment Manager and/or EPA.			*Environment Protection*
Flooding	During site works, check the Bureau of Meteorology website prior to start of the workday for any Severe Weather or Thunderstorm warnings, and consider closing the worksite prior to the start of the working day if there is a risk of heavy rainfall.	Contractor	Construction	Additional measure
Flooding	If a flood event is predicted or NSW SES issue a warning for St Albans using the Australian Warning System, Hazard Watch: • All moveable equipment must be temporarily relocated outside of the flood zone • Follow the guidance to ensure workers on site are relocated prior to any adverse flooding • Where practicable, additional supports, such as concrete barriers, will be brought to site for items unable to be relocated.	Contractor	Construction	Additional measure
Flooding	A Flood Management Plan (FMP) will be implemented as part of the CEMP for the project. The FMP will include appropriate measures such as: • Identify flood levels and minimise equipment storage and stockpiling within flood area • Include flood risk arras within site induction material • Remove construction equipment from flood risk or overland flow areas if rainfall in excess of the action level (10mm in any 24hr period) is approaching and at the completion of each day's work activity • Divert stormwater runoff around disturbed areas of the site where practical to prevent contamination with runoff from the disturbed areas. • Remove all equipment, temporary structures, embankments, haul barriers and	Contractor	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
	working pads as soon as feasible. • Flood monitoring and monitoring of rainfall to be undertaken, with onsite weather data supplied with daily weather conditions and forecasts from the Bureau of Meteorology website (http://www.bom.gov.au) • When 10mm (or greater) of rainfall is forecast over a 24-hour period (or less), sediment and erosion controls will be inspected and prepared • When 40mm (or greater) of rainfall is forecast over a 24-hour period (or less) it is considered a major flood event. Site Supervisors are to monitor flooding conditions and overland flows, and initiate flood evacuations from the site as required.			

6.6 Air Quality

6.6.1 Methodology

A desk-based assessment has been undertaken to establish the potential impacts of the proposed works on air quality. The assessment has taken into consideration local air quality information and the likelihood of emissions to air during construction and operation.

The existing environment has been determined following a review of the National Pollutant Inventory (NPI), Office of Environment and Heritage (OEH) Air Quality Index and the Bureau of Meteorology climate change data (BoM, 2023). No air quality monitoring has been carried out specifically for this proposal.

6.6.2 Criteria

Air quality criteria are used to assess the potential for ambient air quality to give rise to adverse health or nuisance effects. Emissions from construction equipment and vehicles using the highway have the potential to impact on local amenity. The most likely emissions produced from motor vehicles are:

- Oxides of nitrogen (NOx).
- Carbon monoxide (CO).
- Particulate matter (PM_{10}).

Of particular relevance to the proposed construction activities of the proposal are criteria for particulate matter. Particulate emissions (mainly dust) from construction have the potential to affect amenity and, in extreme cases, health. There are various classifications of particulate matter, with the OEH providing assessment criteria for:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter less than or equal to ten microns (PM_{10}).
- Deposited dust

The NSW Environment Protection Authority (EPA) has set air quality assessment criteria as part of the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2016). Table 6-19 summarises the criteria that are relevant to the proposal.

Table 6-19 EPA assessment criteria for relevant air pollutants

Pollutant	Averaging time	Criterion
Carbon monoxide (CO)	Maximum 1-hour average	30 mg/m^3
	Maximum 8-hour average	10 mg/m^3
Nitrogen dioxide (NO_2)	Maximum 1-hour average	246 µg/m^3
	Annual average	62 µg/m^3
Particulate matter (as PM_{10})	Maximum 24-hour average	50 µg/m^3
	Annual average	25 µg/m^3
Total suspended particulates (TSP)	Annual average	90 µg/m^3
Dust deposition	Annual average (maximum increase)	2 g/m^2/month
	Annual average (maximum total)	4 g/m^2/month

µg/m^3 = micrograms per cubic metre

6.6.3 Existing environment

No air quality monitoring was carried out specifically for this proposal, The nearest OEH operated air quality monitoring station is at Wyong, about 28 km east of the proposal area.

The Wyong monitoring station records ozone (O_3), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and PM_{10} (found in dust and smoke). Data collected in 2023 showed there were no days when the criteria for O_3, SO_2 or NO_2 were exceeded (NSW Government). Concentrations of PM_{10} in the vicinity of the proposal would be lower than at Wyong, as it has a lower population density.

The National Pollution Inventory (NPI) contains data on substances which have been identified by the Department of Environment and Energy as having potential effects on human health and the environment. A review of the NPI database identified no facilities within ten kilometres of the proposal. The nearest facility identified on the NPI is Camilleri Stockfeeds, 4777 Old Northern Road, Maroota, NSW, located approximately 30 km south of the proposal.

The proposal is in an area characterised by bushland and rural lands, with a small increase in settlement density in the township of St Albans. Existing sources of air pollution near the proposal area would include exhaust emissions from domestic light vehicles on St Albans Road and Wollombi Road, which would contribute to the local ambient air quality.

The closest sensitive air quality receptors to the proposed works are an existing residence at 1962 St Albans Road, located approximately 50m to the southeast of the proposal, and Settlers Arm Inn, located approximately 85m to the northwest of the proposal footprint. There are also an additional 23 residences located within a 500m radius of the development footprint, with the majority located to the north of the proposal area within St Albans village.

6.6.4 Potential impacts

Construction

Potential activities that could result in air quality impacts during construction would include:

- gaseous emissions from construction plant and machinery and construction vehicle movements
- potential fumes from application of new paint and overspray
- potential dust generation and airborne particulate emissions from abrasive blasting, pressure grouting and protective coating removal, including emissions of lead contaminated dust
- potential dust generation and airborne particulate emissions from vegetation clearing, topsoil stripping, earthworks excavation and site preparation works
- potential dust generation and airborne particulate emissions resulting from the handling and transfer of site stockpiles, soils and materials, backfilling activities within the riverbed, and wind erosion of soils and materials
- potential dust generation from construction vehicles travelling along unsealed areas

Exhaust emissions and fumes have the potential to impact air quality, and dust and particulate emissions can result in human health and amenity impacts at nearby sensitive receivers as well as safety impacts for road users, such as reduced road visibility.

The magnitude of dust generation and airborne particulate emissions would depend on the amount of works involved at a particular location, the duration and types of activities being carried out, the size of exposed areas, and the local meteorology at the time of the works, including windspeed and direction. However, the proposal is in an area with coarse sand, the characteristics of coarse sand generally make it less prone to becoming airborne compared to finer particles. The dust generation issue is considered as minor for the proposal.

Lead paint removal work could have air quality impacts, primarily due to the potential release of lead dust and fumes into the air. Lead is a toxic heavy metal, and exposure to lead can pose health risks when inhaled. The potential impacts associated with lead paint removal include:

- **Lead particles generation (lead-containing dust)**

  The process of removing lead paint could generate lead-containing dust particles. Considering the proposal is located in the rural area and sensitive receivers is located distantly, the primary receivers for the lead particles dust would be the field workers. The workers should be provided with appropriate respiratory protection, such as respirators to minimise the inhalation of lead-containing dust.

- **Airborne lead transport**

  In a rural setting with potentially lower background pollution, airborne lead particles have the potential for long – distance transport. Depending on wind direction and intensity, lead dust and fumes would disperse differently, potentially affect areas beyond the immediate project site, including waterway (i.e. river).

The following mitigation measures are recommended by this REF and need to be considered in the development of CEMP and EWMS:

- **Encapsulation system**

  Use containment measures such as plastic sheeting ad barries to isolate the work area and minimise the spread of lead-containing dust to surrounding environment.

- **High-Efficiency Particulate Air (HEPA) Filtration**

  Employ HEPA filtration system to capture fine particles, including lead-containing dust from the air.

- **Air Quality Monitoring**

  Air quality monitoring, including the locations of samplers, will be undertaken in accordance with *AS/NZS 4361.1:2017 Guide to hazardous paint management Part 1 Lead and other hazardous metallic pigments in industrial applications.* Air quality monitoring is not only to be conducted at the proposal working area, but also at strategic points beyond the immediate area to assess the potential reach of airborne lead particles. This applies to the live monitoring as well.

- **Emergency Response Plan**

  Develop protocols in the emergency response plan, specifically addressing unexpected release of airborne lead, which includes reporting/escalation process, stop work authority and rapid response measures to mitigate any air quality deterioration.

Whilst construction activities could result in air / exhaust emissions as well as dust generation and airborne particulate emissions within the vicinity of the proposal, the proposal would incorporate appropriate safeguards to manage potential air quality impacts during construction, including encapsulation around the pier for the abrasive blasting, paint and lead removal, restrictions on work activites and use of equipment during strong winds, and use of water carts for dust suppression on access tracks and in compound areas.

With the implementation of the appropriate safeguards and taking into consideration the temporary nature, duration of the works and distance of the sensitive receivers from the works, the potential impacts are anticipated to be minor. The safeguards are detailed in Table 6-20 below.

Operation

During operation, air quality impacts are not anticipated to differ from the existing situation. Therefore, there are no anticipated air quality impacts associated with the operation of the proposal.

6.6.5 Safeguards and management measures

Table 6-20 Air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	A CEMP will be prepared which will include measures, to minimise air quality impacts, such as: • Identification of potential risks/impacts due to work/activities as dust generating activities. • Plan and carry out all construction activities to avoid where practicable or minimise the generation of dust and vehicle/plant emissions. • Management measures to minimise risk of dust generation including the use of water carts for dust suppression. • A process for altering management measures as required and reprogramming	Contractor	Pre-construction Construction	Section 4.4 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
	construction activities if the safeguards and management measures do not adequately restrict dust generation.			
Air quality	Measures would be implemented to address the risk of emissions of lead contaminated dust in accordance with AS4361.1-1995 and Transport for NSW QA Specification B223 Management of lead, chromium and asbestos in bridge maintenance painting.	Contractor	Pre-construction	Additional measure
Air quality	Containment areas are to be established using plastic sheeting (or similar) to allow: • Fully sealed work areas with a resealable or overlapping entryway • Natural ventilation • Negative air pressure • Exhaust filtration The specific means for containment of paint dust / flakes would be dependent on the location, expected wind loads and form of access and would be informed by the risk assessment carried out in accordance with AS/NZS 4361.1:2017.	Contractor	Construction	Additional measure
Air quality	Waste particles settling within the containment area would be removed on a regular basis. If excessive dust is expected, dust extraction and filtering equipment would be employed.	Contractor	Construction	Additional measure
Air quality	Adequate facilities will be made available within the containment area for decontamination of work tools and personal protective equipment.	Contractor	Construction	Additional measure
Air quality	Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction	Additional measure
Air quality	Works must cease when unexpected release of airborne lead is identified.	Contractor	Construction	Additional measure
Air quality	Paints containing fast drying solvents will be used to minimise the impact of air sprayed paint emissions.	Contractor	Construction	Additional measure

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	Air quality monitoring will be undertaken in accordance with AS/NZS 4361.1:2017 Guide to hazardous paint management Part 1 Lead and other hazardous metallic pigments in industrial applications	Contractor	Construction	Additional measure
Air quality	Measures (including covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction	Additional safeguard
Air quality	Visual monitoring is to be undertaken to minimise or prevent air pollution and dust. When excessive emission occurs, including excessive levels of visible dust, work will cease immediately. Appropriate mitigation measures will be discussed and implemented before recommencing work.	Contractor	Construction	Section 4.4 of QA G36 Environment Protection
Dust emissions	Vehicles and vessels transporting waste or other materials that may produce dust are to be covered during transportation to and from the site and stockpile area.	Contractor	Construction	Section 4.4 of QA G36 Environment Protection
Dust emissions	Activities within the proposal site and stockpile site that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10) (RMS, 2011).	Contractor	Construction	Additional safeguard
Dust emissions	Stockpile materials within the laydown area and stockpile site will be covered or stabilised.	Contractor	Construction	Section 4.4 of QA G36 Environment Protection

6.7 Waste Management

6.7.1 Potential Impacts

Construction

Project activities during construction are anticipated to generate the following waste streams:

- **Spoil (including sand):** This would be generated as a result of the earthworks and access track

  During the construction of cofferdam, approximately 270 cubic metres of sand would be excavated from the river bed. If the excavated sand is placed on the river bed or near the waterway, there is a chance that the deposited sand would be washed into the waterway. On the other hand, introducing large amounts of sand on the existing river bed would also affect it stability. In accordance with the DPI Fisheries consultation outcome, any material removed from the waterway that is to be temporarily deposited or stockpiled on land to be located away from the waterway and be contained by appropriate erosion and sediment control devices. The excavated sand is to be temporarily stockpiled at the proposed compound site before transporting offsite.

  Road base materials (i.e. DGS and DGB) are required to construct the temporary access track. A test result/VENM certificate is to be provided prior to importing materials to the site. After the completion of the proposal, the access track needs to be demobilised and all the materials need to be transporting offsite.

A waste classification report is to be developed. This REF recommends seeking an opportunity to beneficial reusing the spoil for the local council's or residential projects. A hold point needs to be raised and released by Transport for NSW. Otherwise, the waste is to be disposed of at the appropriate waste facility.

- **Hazardous waste (e.g. chemicals, paints (including lead paint materials and lead particulates))** This waste stream would be generated as a result of the compound operations and structural remediation works, including pressure grouting and abrasive blasting. The abrasive blasting and paint and lead removal works are anticipated to generate up to eight tonnes of hazardous lead abrasive waste.

  If not properly managed, lead-containing debris and paint chips could pose risks of lead exposure to workers and contribute to waterway contamination. When the lead abrasive waste temporarily store at the compound site, the leak from the container could be result in contaminated land and affect the plant, animals and community (RFS and tennis court are adjacent to the hazardous waste storage area). Disposal of hazardous waste must adhere to regulations at the licensed facility.
- **Timber and vegetation (e.g. cleared vegetation and clippings, green waste and tree branches):** This would be generated as a result of the vegetation removal works
- **Replaced steel bracing elements:** This would be generated as a result of the rehabilitation works
- **Replaced laminates from the bridge deck:** This would be generated as a result of the TAMP works
- **Liquid waste**: This would be generated as a result of dewatering / discharge from cofferdam.

  Water to be tested prior to dewatering. If Total Suspended Solids (TSS) is higher than the river water, dewatering is not to occur, water need to be treated before discharge.
- **General garbage:** This waste stream would likely be generated throughout construction for all aspects of the proposal works

If not appropriately managed, project waste streams could potentially result in adverse environmental, amenity and human health impacts, particularly waste streams from lead based contaminants.

The proposal would incorporate appropriate safeguards to manage all waste streams generated by the project activities, including safeguards for the handling and disposal of contaminated and lead waste. These safeguards are detailed in Table 6-21 below.

Operation

Operation of the proposal is not anticipated to result in any additional waste streams or associated impacts.

6.7.2 Safeguards and management measures

Table 6-21: Waste safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	Management, storage and disposal of lead waste will be undertaken in accordance with AS4361.1 1995 and TfNSW Specification B223 Management of lead, chromium and asbestos in bridge maintenance, including the following measures: • Lead waste would be collected and placed in lined bags and then stored in a secured area offsite prior to transport to a facility that can legally accept hazardous waste. • Wastewater from paint removal and surface preparation activities would be contained, captured and transferred to sealed containers prior to disposal.	Contractor	Construction	Additional measure

Waste	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance will be followed by resource recovery (including reuse of materials reprocessing and recycling and energy recovery • Disposal will be undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act 2001)	Contractor	Construction	Additional measure
Waste	Waste material (including excavated sand from cofferdam) is to be temporarily stockpiled at the compound site, keeping away from the waterway. Waste material is not be left on site once the works have been completed.	Contractor	Construction	Additional measure
Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	Additional measure

6.8 Other impacts

6.8.1 Existing environment and potential impacts

Table 6-22: Other potential impacts

Environmental factor	Existing environment	Potential impacts
Socio-economic	St Albans is a small township with limited social infrastructure. St Albans Bridge provides and important link between the township and northern Sydney.	The proposal would result in the following general amenity impacts that have been assessed in other sections of this report. These impacts include: • Increase in noise due to operation of plant and equipment (refer to Section 6.4) • Increase (minor) in construction traffic due to the delivery of plant, materials and construction personnel (refer to above) • Visual impacts due to construction work (refer to Section 0 and below). There may also be positive effects from the proposal, including: • increased patronage during the construction phase for local businesses • ensure the longevity of the bridge which is important for connectivity. The proposal would not affect any social infrastructure within the town of St Albans.
Landscape character and visual impacts	St Albans is a picturesque and historic setting with high visual sensitivity. The dominant visual features are the Macdonald River, St Albans Bridge and the surrounding bushland.	Visual impacts from a non-Aboriginal heritage perspective are discussed in Section 6.2. In the context of landscape character and viewpoints, the visual change due to the proposal would be minor during construction (due to the presence of plant and equipment) and negligible following the completion of works.
Aboriginal heritage	An AHIMS search was conducted on 26 April 2023 and returned one record within the vicinity of the proposal	There is low potential for intact Aboriginal archaeological deposits to be present within the proposal footprint and therefore no requirement to proceed to Stage 2 of the PACHCI. The AHIMS site identified within the vicinity of the proposal is on elevated ground about 230 metres to the west and is unlikely to be affected by the proposal.
Climate change and greenhouse gases	The Australian climate is likely to experience a greater frequency and severity of extreme weather events due to climate change. Increased average temperatures and reduced annual rainfall are also expected (Intergovernmental Panel on Climate Change, 2013).	The following construction activities would result in the release of greenhouse gas emissions: • Fossil fuel combustion relations to use of plant, equipment and vehicles • Electricity use • Embedded emissions from manufacture and delivery of materials Given the scope and duration of the proposal, the impact of the emissions would be minor in nature. No climate change adaption requirements have been identified for the proposal.

Environmental factor	Existing environment	Potential impacts
Hazards and risk	Existing hazards and risks are associated with operation the road network and include the risk of crashes. The lead content in the existing protective coating on Pier 4 may pose a hazard to human health and the environment. Given the extent and sensitivity of the waterway, the release the release of fuels, chemical and/or other toxic materials from either vehicle crashes or malfunctions is another potential risk.	Hazards and risks associated with the construction of the proposal would potentially include: • Spills or leakages of contaminants such as fuels, chemicals and hazardous substances entering the Macdonald River • Release of lead-based particulates into the river during surface preparation works • The use and storage of hazardous materials • The use of heavy machinery • Unexpected excavation of contaminated land • Sparks and/or hot works causing fire, particularly during dry, hot periods • Unauthorised access to the construction work site. Construction hazards and risks are manageable through the application of standard mitigation measures, which would be developed by the construction contractor prior to construction. No operational hazards / risks have been identified.

6.8.2 Safeguards and management measures

Table 6-23: Other impacts Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic	Any complaints received during the undertaking of the works are to be recorded on a complaint register and addressed within a reasonable time.	Contractor	Construction	Additional measure
Landscape character and visual amenity	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	Additional measure
Aboriginal heritage	If Aboriginal heritage items are uncovered during the works, all works must cease in the vicinity of the find and the Transport for NSW Aboriginal cultural heritage advisor and the Environment Manager contacted immediately. The steps in the Standard Management Procedure: Unexpected Heritage Items (Transport for NSW, 2022) must be followed.	Contractor	Construction	Section 4.9 of *QA G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Reference
General	An Environmental Work Method Statement (EWMS) will be prepared and submitted for review and endorsement of the TfNSW Senior Manager Environment and Sustainability prior to commencement of the activity.	Contractor	Pre-construction / detailed design	Additional measure

6.9 Cumulative impacts

6.9.1 Study area

A cumulative impact occurs when two or more projects are carried out concurrently and near to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was carried out in isolation.

The study area for the consideration of cumulative impacts was the broader region around the proposal footprint, extending south to Wisemans Ferry.

6.9.2 Other projects and developments

A search of the Department of Planning, Industry and Environment's Major Projects Register was carried out on 26 April 2023 for the Hawkesbury local government area, with no major projects likely to interact with the proposal identified.

Council landslip works to Thomas Jane Bridge on Settlers Road are scheduled for completion by the end of 2023. These works are located over 10 km from the Proposal and will result in the closure of Thomas Jane Bridge and the redirection of traffic from Settlers Road. Construction for the Proposal is scheduled to commence in Q1 2024 and is unlikely to occur concurrently with the Council landslip works. Potential impacts.

Considering the minor and localised nature and the scheduling of construction works for the proposal, potential cumulative impacts associated with other projects are considered unlikely.

To minimise potential cumulative traffic impacts, including potential impacts associated with the Council landslip works, the proposed TAMP works requiring closure of St Alban's Bridge and associated detour route would not be scheduled until the landslip works that may impact Settlers Road are complete.

The Proposal has incorporated appropriate safeguards to address potential cumulative impacts, as detailed in Table 6-24 below. Safeguards and management measures

Table 6-24: Cumulative safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored. Where potential cumulative impacts are identified, the scheduling of works will be coordinated with interacting projects to minimise potential impacts. This will include: • Scheduling the TAMP works after the Council landslip works to Thomas Jane Bridge are complete • Scheduling works to allow suitable respite periods for construction noise • Scheduling of works to minimise consecutive construction noise impacts, where feasible • Coordinating lane closures and pedestrian/cyclist diversions to minimise the overall number of occasions where disruption occurs.	Transport for NSW Project Manager	Construction	Additional measure

7. Environmental management

This chapter describes how the proposal would be managed to reduce potential environmental impacts during detailed design, construction and operation. A framework for managing potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are listed.

7.1 Environmental management plans (or system)

Safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) would be prepared to describe the safeguards and management measures identified. The CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The CEMP would be prepared prior to construction of the proposal and must be reviewed and certified by the Transport for NSW Environment and Sustainability Officer, Greater Sydney, prior to the commencement of any on-site works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with the specifications set out in the [adjust as necessary: *QA Specification G36 - Environmental Protection (Management System)*, *QA Specification G38 - Soil and Water Management (Soil and Water Plan)*, *QA Specification G40 - Clearing and Grubbing, QA Specification G10 - Traffic Management*.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF would be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • Increase awareness of construction timeframes and impacts • Details of how the project will implement the identified safeguards outlined in the REF • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the activity. The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / Transport project manager	Pre-construction / detailed design	
GEN2	General - notification	All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor Transport project manager	Pre-construction	
GEN3	General - environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular 'toolbox' style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk.	Contractor Transport project manager	Pre- construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN4	General – environmental awareness	An Environmental Work Method Statement (EWMS) will be prepared and submitted for review and endorsement of the TfNSW Senior Manager Environment and Sustainability prior to commencement of the activity.	Contractor	Pre-construction / detailed design	
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the *Traffic Control at Work Sites Technical Manual* (Transport for NSW, 2022). The TMP will include: • Confirmation of haulage route and timing of bridge closures for TAMP works to minimise impact on businesses and school along St Albans Road • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage and temporary speed reductions) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic Monitoring, review and amendment mechanisms	Contractor	Detailed design/pre-construction	*QA Specification G10 – Traffic Management*
TT2	Traffic and Transport	Set up of traffic control measures including: • Installation of signs to restrict access to the site and stockpile area • Temporary speed reduction past the proposal site of 40km/h Temporary signage, including Variable Message boards, on Wollombi Road, either side of the proposal site	Contractor	Construction	
TT3	Traffic and Transport	Access to properties and local businesses will be maintained during construction.	Contractor	Construction	
TT4	Traffic and Transport	Construction staging and materials are to be managed to minimise number of deliveries/vehicles required on site.	Contractor	Construction	
TT5	Traffic and transport	Road users and local communities will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities. The affected community will be notified a minimum of seven days or five business days before any changed conditions that are likely to result in disruption.	Contractor	Pre-construction Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT6	Traffic and transport	During construction, traffic will be managed in accordance with Traffic control at work sites – Technical Manual (Roads and Maritime Services, 2018) and Australian Standard 1742.3 Manual of uniform control devices. This will include preparing and implementing a traffic control plan.	Contractor	Construction	Standard measure
TT7	Traffic and transport	If the proposal is at any stage likely to cause substantial disruption to the use of St Albans Road or Wollombi Road by emergency vehicles, the NSW SES and emergency services will be notified.	Contractor	Construction	Additional measure
NAH1	Non- Aboriginal heritage	A Heritage Management Plan incorporating the relevant recommendations and safeguards from the Statement of Heritage Impact prepared by Artefact and dated 1 August 2023 will be prepared and implemented as part of the CEMP /EWMS. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage and will include: • Site inductions which cover significant heritage fabric and protection requirements • Specific protection measures including fencing and maintenance of buffer areas • Tailored construction methods for works near significant heritage fabric (such as use of hand tools only) • A map identifying locations of items or sites (including curtilages) which are to be protected and those which are to be destroyed/impacted and no-go zones. • Identification of potential environmental risks/impacts due to the works/activities • Management measures to minimise the potential risk • Mitigation measures to avoid risk of harm and the interface with work activities on site. • Implementation of mitigation measures to protect identified heritage items or areas • Identify in toolbox talks where management of non-aboriginal heritage is required such as identification of no go zones and responsibilities under the Heritage Act 1977 and any obtained permits or exemptions. • A stop works procedure in the event of actual or suspected potential harm to a heritage feature/place. • Requirement to comply with Transport for NSW Standard Management Procedure -Unexpected Archaeological Finds, RMS 2012.	Contractor	Detailed design Pre-construction	Section 4.10 of *QA G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NAH2	Non-Aboriginal heritage	A S60 approval from Heritage NSW for the proposal will be required under the Heritage Act. The proposal must undertake appropriate heritage protections measures in accordance with the relevant requirements and recommendations of the S60 approval.	Contractor	Construction	Additional measure
BIO1	Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Project Manager	Detailed Design	Additional measure
BIO2	Removal of native vegetation	Vegetation clearance limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Contractor	Pre-construction	Additional measure
BIO3	Removal of native vegetation	Pre-clearing surveys will be conducted in accordance with *Guide 1: Pre-clearing process* (RTA 2011).	Contractor	Pre-construction	Additional measure
BIO4	Removal of native vegetation	Vegetation removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (RTA 2011). • Clearing of native vegetation would be limited to the minimum required to successfully permit the proposal.	Contractor	Construction	Additional measure
BIO5	Removal of native vegetation	Vegetation disturbance (including pruning/ trimming) adjacent to the existing access track is to be limited to the minimum necessary to permit the safe use of this track, and pruning / trimming must be less than 10% of the whole tree for each tree requiring pruning / trimming works	Contractor	Construction	Additional measure
BIO6	Removal of native vegetation	Weed contaminated green waste will be bagged or covered and disposed of appropriately at a licensed landfill facility.	Contractor	Construction	Additional measure
BIO7	Removal of native vegetation	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* (RTA 2011).	Contractor	Post-Construction	Additional measure
BIO8	Tree removal and replacement	The *Tree and hollow replacement guidelines EMF-BD-GD-0129* (Transport for NSW, 2022d) must be adhered to for replacement planting. Appropriate biodiversity offsets and the planting of replacement trees and hollows must be provided in accordance with these guidelines.	Contractor	Construction	Additional measure
BIO9	Removal of threatened fauna habitat	Threatened fauna habitat (i.e. the existing timber trusses) will not be affected.	Project Manager	Detailed Design	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO10	Removal of threatened fauna habitat	Fauna will be managed in accordance with Guide 9: Fauna handling (RTA 2011).	Contractor	Construction	Additional measure
BIO11	Removal of threatened fauna habitat	Large woody debris should not be mulched or removed off-site but should be relocated locally and placed parallel to the river banks.	Contractor	Construction	Additional measure
BIO12	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Project Manager	Detailed Design	Additional measure
BIO13	Fragmentation of habitat corridors	Connectivity measures will be considered/implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011) or equivalent updated NSW Guidelines.	Contractor	Construction	Additional measure
BIO14	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance *with Guide 2: Exclusion zones* (RTA 2011).	Contractor	Construction	Additional measure
BIO15	Injury to fauna	Fauna will be managed in accordance with *Guide 9: Fauna* handling (RTA 2011).	Contractor	Construction	Additional measure
BIO16	Injury to fauna	Inspections for the presence of any sheltering fauna would be carried out beneath vehicles/machinery prior to use.	Contractor	Construction	Additional measure
BIO17	Injury to fauna	Any sheltering native species would be collected and relocated locally by a licenced individual (nocturnal species to be released on dusk). If injured, native wildlife would be taken to a local veterinarian or wildlife carer for treatment. Once rehabilitated, these native animals must be released at their point of capture. Exotic injured wildlife would be taken to a local veterinarian and ethically treated.	Contractor	Construction	Additional measure
BIO18	Invasion and spread of weeds	Weed species will be managed in accordance *with Guide 6: Weed management* (RTA 2011).	Contractor	Construction	Additional measure
BIO19	Invasion and spread of weeds	In accordance with the NSW *Biosecurity Act 2015*, any Blackberry identified on site would be controlled (i.e. treated in accordance with approved weed management techniques such as hand removal or application of a suitable herbicide), thereby resulting in its suppression.	Contractor	Construction	Additional measure
BIO20	Invasion and spread of weeds	All vehicles/machinery would enter the site via stabilised areas to prevent the introduction and spread of weed seeds and/or pathogens.	Contractor	Construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BIO21	Invasion and spread of pathogens and disease	Pathogens (e.g. *Phytophthora cinnamomi*) will be managed in accordance with *Guide 2: Exclusion zones* and *Guide 7: Pathogen management* (RTA 2011), including the following hygiene protocols: • If there is a need to enter the adjacent bushland, before accessing, and upon leaving, these portions of the work site, workers are to remove excess soil and mud and then spray boots, tools, gloves and small equipment with recommended disinfectant supplied by the contractor (70% Methylated spirits / 30% Water) until runoff is clear. Avoid unnecessary soil disturbance.	Contractor	Construction	Additional measure
BIO22	Noise, light, dust and vibration	All plant/equipment to be used on site will be designed and operated to control the potential emission of smoky exhaust fumes into the atmosphere. All machinery/vehicles are to be operated within standard guidelines.	Contractor	Construction	Additional measure
NV1	Construction noise and vibration	The standard mitigation measures identified in Appendix B of the Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016a) will be implemented as relevant.	Contractor	Construction	Additional measure
NV2	Construction noise and vibration	All sensitive receivers likely to be affected will be notified at least five working days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	Contractor	Pre- construction	Standard measure
NV3	Construction noise and vibration	Noise blankets will be used for noisy works such as concrete cutting.	Contractor	Construction	Construction Noise and Vibration Management
NV4	Construction noise and vibration	Noise works are not permitted after midnight.	Contractor	Construction	Construction Noise and Vibration Management
SW1	Soil and water	A site-specific Erosion and Sediment Control Plan will be prepared and implemented in accordance with the Managing Urban Stormwater: Soils and Construction, Volume 1 and 2 (Landcom, 2004).	Contractor	Detailed design Pre-construction	Section 2.1 of *QA G38 Soil and Water Management*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW2	Soil and water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request	Contractor	Construction	Additional measure
SW3	Soil and water	All soil stockpiles are to be managed in accordance with the RMS Stockpile Management Guideline.	Contractor	Construction	Additional measure
SW4	Soil and water	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Contractor	Construction	Additional measure
SW5	Soil and water	A progressive erosion and sediment control plan is to be prepared for the works.	Contractor	Construction	Additional measure
SW6	Soil and water	The CEMP should detail measures to neutralise acid sulfate soils if required, including through the addition of lime.	Contractor	Construction	Additional measure
SW7	Soil and water	Acid sulfate soils should be managed in accordance with RTA Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze (RTA, 2005)	Contractor	Construction	Additional measure
SW8	Water quality impacts associated with paint repair	Removal of all materials identified as being coated with paint containing lead (or other hazardous metallic pigments) will occur in accordance with guidance as set out in AS/NZS 4361.1:2017 Guide to hazardous paint management Part 1 Lead and other hazardous metallic pigments in industrial applications and Transport for NSW QA Specification B223- Management of lead, chromium and asbestos in bridge maintenance painting.	Contractor	Construction	Additional measure
SW9	Water quality impacts associated with paint repair	Wastewater associated with washing will be contained, captured, transferred to sealed collection tanks and then disposed of consistent with its waste classification. The containment must be capable of containing all water that may enter the containment, such as rainwater or water from jet washing and contaminated liquid waste.	Contractor	Construction	Additional measure
SW10	Water quality	Mitigation measures will be undertaken in accordance with the recommended safeguards detailed in the S199 Letter from DPI Fisheries dated 4 February 2024(C23/384). These measures will be detailed in the EWMS.	Contractor	Construction	Additional measure
SW10	Water quality	There is to be no release of dirty water into drainage lines and/or waterways.	Contractor	Construction	Additional measure
SW11	Water quality	Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.	Contractor	Construction	Additional measure
SW12	Water quality	Water quality control measures are to be used to prevent any materials (eg. concrete, grout, sediment etc) entering drain inlets or waterways.	Contractor	Construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW13	Water quality	Water quality control measures are to be used to prevent any materials or contaminants (e.g. concrete, grout, sediment, lead based paint, fuel etc) entering drain inlets or waterways. These measures should be implemented as part of the CEMP and EWMS for the Project.	Contractor	Construction	Additional measure
SW14	Spills	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.	Contractor	Construction	Additional measure
SW15	Spills	All fuels, chemicals and liquids when not in use will be stored in an impervious bunded area within the site compound. If required, refuelling of plant and equipment, and storage of any hazardous materials will occur within a double-bunded area.	Contractor	Construction	Additional measure
SW16	Spills	Minimal paint will be kept at the work site to minimise the consequences associated with a spill. Bunding large enough to contain 120 per cent of the materials volume will be in place at all times.	Contractor	Construction	Additional measure
SW17	Spills	A site-specific emergency spill plan will be developed and include spill management measures in accordance with the Transport for NSW Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design Pre-construction	Section 4.3 of *QA G36 Environment Protection*
SW18	Contamination	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.	Contractor	Detailed design Pre-construction	Section 4.3 of *QA G36 Environment Protection*
SW19	Flooding	Consider the impact of flooding on the infrastructure from overland and mainstream flooding up to and including the PMF.	Contractor	Detailed design Pre-construction	Additional measure
SW20	Flooding	Pursue site design and stormwater management that minimises any risk to the community.	Contractor	Detailed design Pre-construction	Additional measure
SW21	Flooding	Ensure workers and people using the bridge during and after the upgrades are aware of the flood risk, for example by using signage.	Contractor	Construction	Additional measure
SW22	Flooding	During site works, check the Bureau of Meteorology website prior to start of the workday for any Severe Weather or Thunderstorm warnings, and consider closing the worksite prior to the start of the working day if there is a risk of heavy rainfall.	Contractor	Construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW23	Flooding	If NSW SES issue a warning for St Albans using the Australian Warning System, Hazard Watch, follow the guidance to ensure workers on site and equipment is relocated prior to any adverse flooding.	Contractor	Construction	Additional measure
SW24	Flooding	A Flood Management Plan (FMP) will be implemented as part of the CEMP for the project. The FMP will include appropriate measures such as: • Identify flood levels and minimise equipment storage and stockpiling within flood area • Include flood risk arras within site induction material • Remove construction equipment from flood risk or overland flow areas if rainfall in excess of the action level (10mm in any 24hr period) is approaching and at the completion of each day's work activity • Divert stormwater runoff around disturbed areas of the site where practical to prevent contamination with runoff from the disturbed areas. • Remove all equipment, temporary structures, embankments, haul barriers and working pads as soon as feasible. • Flood monitoring and monitoring of rainfall to be undertaken, with onsite weather data supplied with daily weather conditions and forecasts from the Bureau of Meteorology website (http://www.bom.gov.au). • When 10mm (or greater) of rainfall is forecast over a 24-hour period (or less), sediment and erosion controls will be inspected and prepared • When 40mm (or greater) of rainfall is forecast over a 24-hour period (or less) it is considered a major flood event. Site Supervisors are to monitor flooding conditions and overland flows, and initiate flood evacuations from	Contractor	Construction	Additional measure
AQ1	Air quality	A CEMP will be prepared which will include measures to minimise air quality impacts, such as: • Identification of potential risks/impacts due to work/activities as dust generating activities. • Plan and carry out all construction activities to avoid where practicable or minimise the generation of dust and vehicle/plant emissions. • Management measures to minimise risk of dust generation including the use of water carts for dust suppression. • A process for altering management measures as required and reprogramming construction activities if the safeguards and management measures do not adequately restrict dust generation.	Contractor	Pre-construction Construction	Section 4.4 of QA G36 Environment Protection
AQ2	Air quality	Measures would be implemented to address the risk of emissions of lead contaminated dust in accordance with AS4361.1-1995 and Transport for NSW	Contractor	Pre- construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		QA Specification B223 Management of lead, chromium and asbestos in bridge maintenance painting.			
AQ3	Air quality	Containment areas are to be established using plastic sheeting (or similar) to allow: • Fully sealed work areas with a resealable or overlapping entryway • Natural ventilation • Negative air pressure • Exhaust filtration The specific means for containment of paint dust / flakes would be dependent on the location, expected wind loads and form of access and would be informed by the risk assessment carried out in accordance with AS/NZS 4361.1:2017.	Contractor	Construction	Additional measure
AQ4	Air quality	Waste particles settling within the containment area would be removed on a regular basis. If excessive dust is expected, dust extraction and filtering equipment would be employed.	Contractor	Construction	Additional measure
AQ5	Air quality	Adequate facilities will be made available within the containment area for decontamination of work tools and personal protective equipment.	Contractor	Construction	Additional measure
AQ6	Air quality	Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction	Additional measure
AQ7	Air quality	Works must cease when unexpected release of airborne lead is identified.	Contractor	Construction	Additional measure
AQ8	Air quality	Paints containing fast drying solvents will be used to minimise the impact of air sprayed paint emissions	Contractor	Construction	Additional measure
AQ9	Air quality	Air quality monitoring will be undertaken in accordance with AS/NZS 4361.1:2017 Guide to hazardous paint management Part 1 Lead and other hazardous metallic pigments in industrial applications	Contractor	Construction	Additional measure
AQ10	Air quality.	Measures (including covering exposed areas) are to be used to minimise or prevent air pollution and dust.	Contractor	Construction	Additional safeguard
AQ11	Air quality	Visual monitoring is to be undertaken to minimise or prevent air pollution and dust. When excessive emission occurs, including excessive levels of visible dust, work will cease immediately. Appropriate mitigation measures will be discussed and implemented before recommencing work.	Contractor	Construction	Section 4.4 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ12	Air quality	Vehicles and vessels transporting waste or other materials that may produce dust are to be covered during transportation to and from the site and stockpile area.	Contractor	Construction	Section 4.4 of QA G36 Environment Protection
AQ13	Dust emissions	Activities within the proposal site and stockpile site that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10) (RMS, 2011).	Contractor	Construction	Additional safeguard
AQ14	Dust emissions	Stockpile materials within the laydown area and stockpile site will be covered or stabilised.	Contractor	Construction	Section 4.4 of QA G36 Environment Protection
LCV1	Landscape character and visual amenity	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	Additional measure
AH1	Aboriginal heritage	If Aboriginal heritage items are uncovered during the works, all works must cease in the vicinity of the find and the Transport for NSW Aboriginal cultural heritage advisor and the Environment Manager contacted immediately. The steps in the Standard Management Procedure: Unexpected Heritage Items (Transport for NSW, 2022) must be followed.	Contractor	Construction	Section 4.9 of *QA G36 Environmental Protection*
WM1	Waste	Management, storage and disposal of lead waste will be undertaken in accordance with AS4361.1 1995 and TfNSW Specification B223 Management of lead, chromium and asbestos in bridge maintenance, including the following measures: • Lead waste would be collected and placed in lined bags and then stored in a secured area offsite prior to transport to a facility that can legally accept hazardous waste. • Wastewater from paint removal and surface preparation activities would be contained, captured and transferred to sealed containers prior to disposal.	Contractor	Detailed design Construction	Additional measure
WM2	Waste	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance will be followed by resource recovery (including reuse of materials reprocessing and recycling and energy recovery • Disposal will be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*)	Contractor	Detailed design Construction	Additional measure

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
WM3	Waste	Waste material (including excavated sand from cofferdam) is to be temporarily stockpiled at the compound site, keeping away from the waterway. Waste material is not be left on site once the works have been completed.	Contractor	Construction	Additional measure
WM4	Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Contractor	Construction	Additional measure
HR1	Hazards and risks	A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to: • Details of hazards and risks associated with the activity (including consideration of bushfire and flooding) • Measures to be implemented during construction to minimise these risks • Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • A monitoring program to assess performance in managing the identified risks • Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. • The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice and EPA publications.	Contractor	Construction	Additional measure
CI1	Cumulative impacts	Current and upcoming projects with the potential to interact with the proposal will be monitored. Where potential cumulative impacts are identified, the scheduling of works will be coordinated with interacting projects to minimise potential impacts. This will include: • Scheduling works to allow suitable respite periods for construction noise • Scheduling of works to minimise consecutive construction noise impacts, where feasible • Coordinating lane closures and pedestrian/cyclist diversions to minimise the overall number of occasions where disruption occurs.	Transport for NSW Project Manager	Construction	Additional measure

7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
Roads Act 1993 (section 138)	Road occupancy licence for temporary road closures and if short term lane closures are needed.	Prior to start of the activity.
Heritage Act 1977	Approval under Section 60 of the Heritage Act.	Prior to determination of the proposal under Part 5 (Division 5.1) of the EP&A Act.

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

The proposal is needed to address corrosion on Pier 4 of St Albans Bridge (including columns, bracing and tie beam), to improve the strength and load capacity of the bridge, replace deteriorated components within the bridge deck and improve safety for pedestrians,horse riders and vehicles. The proposal would contribute to the safety and longevity of the bridge while reducing ongoing long-term maintenance requirements.

The proposal is consistent with Transport's commitment under the NSW Timber Truss Road Bridges Overarching Conservation Management Plan (Roads and Maritime Services, 2018) to carry out appropriate ongoing repair and maintenance.

While there would be some environmental impacts as a consequence of the proposal including heritage impacts, construction noise, and potential water impacts, they have been avoided or minimised wherever possible through the site-specific safeguards summarised in Section 7.2.

8.1.1 Social factors

The proposal would result in some short-term negative social impacts including an increase in construction traffic due to delivery of plant, machinery and construction personnel, some temporary road closures and detours, an increase in noise due to operating plant and machinery, and visual impacts associated with the construction works.

However, the proposal would help ensure the longevity of the bridge which is important for connectivity. The proposal would not affect any social infrastructure within the town of St Albans.

A 'do nothing' approach was not considered appropriate as it does not address the identified need and does not meet the proposal's objectives.

8.1.2 Biophysical factors

The proposal is not likely to significantly impact threatened species or ecological communities or their habitats within the meaning of the BC Act. Therefore a Statement of Significance or BDAR is not required.

The Proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the EPBC Act. Therefore, a Commonwealth referral under the provisions of the EPBC Act is not required.

8.1.3 Economic Factors

The proposal would continue to support the orderly economic use and development of land by maintaining an important transport link.

Residents and businesses may experience temporary amenity impacts during construction of the proposal due to associated noise, traffic movements, work activities and presence of construction plant and equipment.

However, there may also be positive effects for local businesses from increased patronage during the construction phase.

8.1.4 Public interest

There would be benefits to the community in terms of retention of the bridge in working condition over the short and longer term. The benefits of the proposal are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal.

8.2 Objects of the EP&A Act

Table 8-1: Objects of the Environmental Planning and Assessment Act 1979

Instrument	Requirement
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would improve the reliability of the transport network and minimise impact on the natural environment and resources. It is therefore consistent with this objective.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The principles of ecological sustainable development are considered in Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	The proposal would continue to support the orderly economic use and development of land by maintaining an important transport link.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposal would have some potential impacts on native animals (primarily bats that may be roosting in / near the bridge). Impacts have been assessed as not significant and measures have been proposed to minimise impacts.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Impacts on non-Aboriginal and Aboriginal heritage have been assessed as part of this REF (Section 0and Section 6.8respectively). Safeguards and mitigation measures have been proposed to address impacts.
1.3(g) To promote good design and amenity of the built environment.	The proposal balances heritage / visual impacts with the need to implement a long-term solution to the current deterioration of Pier 4 and the laminates of the bridge deck.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the project.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Feedback from several stakeholders has been considered in the development and assessment of the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation carried out to date and proposed ongoing consultation is outlined in Chapter 5.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during route options development (refer to Chapter 2). The precautionary principle has guided the assessment of environmental impacts for this REF and the development of mitigation measures.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

The impacts of the proposal have been identified as primarily short term and manageable. There would be benefits to the community in terms of retention of the bridge in working condition over the short and longer term.

Conservation of biological diversity and ecological integrity

The twin principles of biodiversity conservation and ecological integrity have been a consideration during the design and assessment process with a view to identifying, avoiding, minimising and mitigating impacts.

The proposal is not expected to have significant biodiversity impacts.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things.

While it is often difficult to place a reliable monetary value on the residual, environmental and social effects of the proposal, the value placed on environmental resources within and around the St Albans Bridge is evident in the extent of environmental investigations, planning and design of impact mitigation measures to prevent adverse environmental impacts.

8.3 Conclusion

The proposed works at St Albans Bridge is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats, and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal, as described in the REF, best meets the project objectives but would still result in some potential heritage, construction noise, traffic and access, biodiversity and water quality impacts. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would contribute to the saftey and longevity of the bridge, whilst reducing ongoing long-term maintenance and ensuring local connectivity. On balance the proposal is considered justified and the following conclusions are made. Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared nor approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.3.1 Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance nor the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999 (*Commonwealth). A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

This review of environmental factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Name:	Alistair Smith
Position:	Head of Environental Services
Company name:	AtkinsRéalis
Date:	22 February 2024

I certify that I have reviewed and endorsed the contents of this REF and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading. I accept it on behalf of Transport for NSW.

Name:	Alfred Fernandez 
Position:	Project Manager
Transport region/program:	SRAPC – Parklands Special Projects
Date:	07/03/24

10. EP&A Regulation publication requirement

Table 10-1: EP&A Regulation publication requirement

Requirement	Yes/No
Does this REF need to be published under section 171(4) of the EP&A Regulation?	Yes

11. References

Australia ICOMOS. (2013). *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance.* Australia ICOMOS

Department of Environment and Climate Change. (2009). *Interim Construction Noise Guideline.* Sydney: former DECC.

Department of Environment and Conservation. (2006). Assessing Vibration: A Technical Guideline . Sydney: Department of Environment and Conservation.

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12. Terms and acronyms used in this REF

Table 12-1: Terms and acronyms used in this REF

Term / Acronym	Description
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ARI	Annual Recurrence Interval
BC Act	*Biodiversity Conservation Act 2016 (NSW)*
BAR	Biodiversity Assessment Report
BDAR	Biodiversity Development Assessment Report
CEMP	Construction Environmental Management Plan
CMP	Conservation Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPE	Former NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
DPI	Department of Primary Industries
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
FM Act	Fisheries Management Act 1994
Heritage Act	*Heritage Act 1977 (NSW)*
HRMP	Hazard and Risk Management Plan
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
NML	Noise management Level
NPW Act	National Parks and Wildlife Act 1974 (NSW)
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PCT	Plant Community Type
PPV	Peak particle velocity
POEO Act	Protection of the Environment Operations Act 1997 (NSW)
RDP	Rapid Data Plots

Term / Acronym	Description
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Services, now Transport for NSW
RNP	*Road Noise Policy 2011*
RFS	Rural Fire Service
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure). A type of planning instrument made under Part 3 of the EP&A Act.
SES	State Emergency Service
SHR	State Heritage Register
SOHI	Statement of Heritage Impacts
TfNSW	Transport for New South Wales
TMP	Traffic Management Plan
WHL	World Heritage List
WMP	Waste Management Plan
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the Roads and Related Facilities EIS Guideline (DUAP 1996) as detailed in the REF, the following factors, listed in section 171 of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor		Impact
a	Any environmental impact on a community? The proposal would have impacts during construction (heritage, noise, water quality, biodiversity) but would retain an important transport and heritage asset over the longer term.	Short-term negative Long-term positive
b	Any transformation of a locality? The proposal would not transform the locality, as works would be limited in scope, extent and duration.	Nil
c	Any environmental impact on the ecosystems of the locality? The proposal would have some potential impacts native animals and plants, ecological communities and their habitats. Impacts have been assessed as not significant.	Negative
d	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would result in a minor and temporary reduction in aesthetic value of the locality for road users and nearby residents. Safeguards have been proposed to address identified potential impacts.	Short-term negative
e	Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? While resulting in a positive outcome for the structural integrity of the State Heritage Register listed St Albans Bridge, the proposal would have moderate direct impacts on heritage fabric. Refer to Section 6.1.	Long-term negative impact on heritage fabric Long-term positive impact on structural integrity and retention of State Heritage item.
f	Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? There would be some impact on habitat for native species. These species would not be solely reliant on the areas of affected habitat and measures have been proposed to minimise impacts.	Short-term negative
g	Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would not endanger animals, plants or other forms of life.	Nil
h	Any long-term effects on the environment? The proposal would have long-term impacts on heritage values but would also contribute to the structural integrity of St Albans Bridge over the longer term.	Long-term positive and negative
i	Any degradation of the quality of the environment? Disturbance of river bed sediments during excavation works and release of materials during the removal of existing protective coatings could result in water quality impacts during construction. The proposal would result in a loss of a small amount of riparian and aquatic habitat. Visual amenity of nearby sensitive receivers may be temporarily impacted by the presence of signage and construction machinery during the construction stage.	Short-term negative

Factor		Impact
	All impacts are temporary during the construction period. Controls have been proposed to address these issues. No long-term degradation to the environment is anticipated.	
j	Any risk to the safety of the environment? The proposal would involve minimal risk to the safety of the environment due to the limited scope of works and the implementation of appropriate work health and safety measures (which address removal of lead paint).	Short-term negative
k	Any reduction in the range of beneficial uses of the environment? The proposal would not reduce the range of beneficial uses of the environment.	Nil
l	Any pollution of the environment? The proposal has the potential to result in minor pollution associated with the disturbance of riverbed sediments. Safeguards have been proposed to address this issue.	Short-term negative
m	Any environmental problems associated with the disposal of waste? Waste generated during construction would be removed from the site and disposed of legally. No environmental problems are anticipated for the disposal of waste.	Nil
n	Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposal would not increase demand for resources, which are, or are likely to become, in short supply.	Nil
o	Any cumulative environmental effect with other existing or likely future activities? The minor nature of the proposal and potential impacts mean that cumulative effects are unlikely.	Nil
p	Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal would not influence coastal processes and/or coastal hazards.	Nil
q	Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1, The proposal aligns with state level strategic plans including the Timber Truss Bridge Conservation Strategy Submissions Report and Revised Conservation Strategy and NSW Timber Truss Road Bridges Overarching Conservation Management Plan, as detailed in Section 2.1.	Long-term positive
r	Other relevant environmental factors. The proposal would not impact on any other environmental factors.	In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 6 of this assessment.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Department of Climate Change, Energy, the Environment and Water .

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor		Impact
a	Any impact on a World Heritage property? The proposal would not impact on any World Heritage properties. The closest World Heritage property to the proposal site is the Greater Blue Mountains World Heritage Area, located approximately 120 km south of the proposal site.	Nil
b	Any impact on a National Heritage place? The proposal would not impact on any National Heritage places. The closest National Heritage place to the proposal site is the Greater Blue Mountains World Heritage Area, located approximately 120 km south of the proposal site.	Nil
c	Any impact on a wetland of international importance? The proposal would not impact on any wetlands of international importance. The closest wetland of international importance to the proposal site is Towra Point Nature Reserve, which is approximately 80 km to the southeast.	Nil
d	Any impact on a listed threatened species or communities? The proposal would not impact on any threatened species or communities. Safeguards to manage impacts on threatened species are detailed in section 6.3.4.	Nil
e	Any impacts on listed migratory species? The proposal would not impact on any listed migratory species.	Nil
f	Any impact on a Commonwealth marine area? The proposal would not impact on any Commonwealth marine areas. No Commonwealth marine areas occur within ten kilometres of the proposal.	Nil
g	Does the proposal involve a nuclear action (including uranium mining)? The proposal does not involve a nuclear action.	Nil
h	Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposal would not impact on the environment of Commonwealth land.	Nil

Appendix B - Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.110
Bus Depots	Does the project propose a bus depot?	No		Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		Section 2.110

Development within the Coastal Zone

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		Section 2.14

Note: See interactive map at ***Planning Portal NSW spatial viewer - find a property***. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No		Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No		Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will	No		Section 2.10

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	this connection have a *substantial* impact on the capacity of any part of the system?			
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No		Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No		Section 2.10
Road & footpath excavation	Will the works involve more than *minor* or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No		Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No, St Albans Bridge is a State heritage item. Yes, the proposal is within the St Albans Heritage Conservation Area. The heritage assessment concludes that overall, the proposed works would result in a negligible direct impact to the heritage significance of the St Albans Conservation Area (LEP # C2)	Hawkesbury City Council	Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	Yes, however impacts are minor	Hawkesbury City Council	Section 2.12
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	Yes, however works are minor to bridge and for routine maintenance	State Emergency Services	Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	Yes Yengo National Park	Environment and Heritage Group, NSW DCCEEW (in respect of National Park management)	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment and Heritage Group, NSW DCCEEW	Section 2.15
Navigable waters	Do the works include a fixed or floating structure in or over navigable waters?	No	Transport for NSW - Maritime	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service (RFS) [Refer to the NSW RFS publication: *Planning for Bush Fire Protection (2006)*]	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map	No	Secretary of the Commonwealth Department of Defence	Section 2.15

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) Section
	referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.			
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	Section 2.15

Appendix C – Design drawings

MAIN ROAD No. 181
ST ALBANS ROAD

CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS

REHABILITATION OF PIER 4

EXISTING BRIDGE: 1902
BRIDGE No: B00413
REGISTRATION No OF PLANS: 0181 091 BC 0101
LISTED ON THE STATE HERITAGE REGISTER MAINTAINED BY THE NSW HERITAGE OFFICE
GENERAL FILE: 91.1428

REHABILITATION OF PIER 4: 2021
DESIGN FILE No. TBA

DESIGN CRITERIA AND LIMITATIONS:
DESIGN TO AS 5100-2017
ULTIMATE LIMIT STATE DESIGN, EXCEPT THAT:

DESIGN LIVE LOADING: ONE LANE, MAXIMUM 42.5t LEGAL LOADING
ST42.5 (6 AXLE SEMI-TRAILER) DLA=0.25
BRAKING FORCE = 188kN
MINIMUM LATERAL RESTRAINT FORCE = 200kN
TRAFFIC BARRIER DESIGN LOAD = BASIC PERFORMANCE LEVEL IN ACCORDANCE WITH BTD 2007/08 AND AS 5100
MAXIMUM ESTIMATED STREAM VELOCITY Vu = 3m/s
ESTIMATE FLOOD LEVELS AT SITE (AHD):
5 YEAR ARI FLOOD LEVEL RL 9.800
20 YEAR ARI FLOOD LEVEL RL 12.600
100 YEAR ARI FLOOD LEVEL RL 14.600
200 YEAR ARI FLOOD LEVEL RL 15.500
500 YEAR ARI FLOOD LEVEL RL 16.700
FLOOD LEVEL FOR TEMPORARY WORKS DESIGN (AHD):
5 YEARS ARI FLOOD LEVEL RL 9.800

FLOOD REPORT:
LOWER MACDONALD RIVER FLOOD STUDY, AUGUST 2004, WEBB, MCKEOWN & ASSOCIATES PTY LTD FOR HAWKESBURY CITY COUNCIL.
LATEST RIVER HEIGHTS FROM AUSTRALIAN BUREAU OF METEOROLOGY - 23 MARCH 2021.
EXISTING LEVEL SOURCES FROM DEPARTMENT OF FINANCE SERVICES AND INNOVATION.

REFERENCE DESIGN REPORTS
BRIDGE DESIGN REPORT: ST ALBANS BRIDGE - PIER 4
BY MU GROUP DATED JULY / 2021

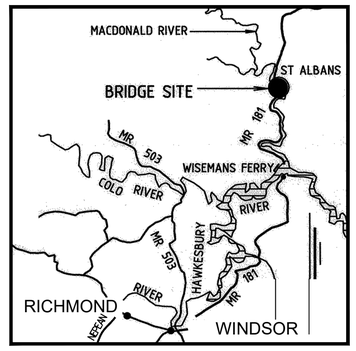
INDICATIVE CONSTRUCTION SEQUENCE
REFER TO SHEET No 16 FOR CONSTRUCTION STAGING

TfNSW QA SPECIFICATIONS:
B30 – EXCAVATION AND BACKFILL FOR BRIDGEWORKS
B80 – CONCRETE WORK FOR BRIDGES
B201 – STEELWORK FOR BRIDGES
B220 – PROTECTIVE TREATMENT OF BRIDGE STEELWORK
B223 – MANAGEMENT OF LEAD, CHROMIUM, AND ASBESTOS IN BRIDGE MAINTENANCE PAINTING
B240 – STEEL FASTENERS
M231 - PRESSURE GROUTING FOR SLAB JACKING / STABILISATION

SCHEDULE OF DRAWINGS

1. COVER SHEET
2. GENERAL ARRANGEMENT - SHEET A
3. GENERAL ARRANGEMENT - SHEET B
4. PAINTING AND PRESSURE GROUTING - SHEET A
5. PAINTING AND PRESSURE GROUTING - SHEET B
6. NEW CASING STEEL DETAILS - SHEET A
7. NEW CASING STEEL DETAILS - SHEET B
8. NEW CASING STEEL DETAILS - SHEET C
9. NEW CASING STEEL DETAILS - SHEET D
10. NEW CASING STEEL DETAILS - SHEET E
11. NEW CASING STEEL DETAILS - SHEET F
12. NEW BRACING STEEL DETAILS - SHEET A
13. NEW BRACING STEEL DETAILS - SHEET B
14. NEW BRACING STEEL DETAILS - SHEET C
15. MISCELLANEOS STEEL DETAILS
16. CONSTRUCTION STAGING
17. TEMPORARY BRACING

SURVEY LEVEL SOURCE:
DEPARTMENT OF FINANCE SERVICES AND INNOVATION (DFSI). SPATIAL SERVICES CATEGORY 1 LIDAR. ACCURACY OF 0.3m VERTICAL. EPSG 28356 AHD71 MGA ZONE 56.
DATA CAPTURE END DATE 2017-07-06



LOCALITY PLAN
THE BRIDGE SITE IS APPROXIMATELY 100 km BY ROAD FROM SYDNEY
NOT TO SCALE

ISSUE	DATE		PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S.	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY
BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4
COVER SHEET

MU GROUP TRANSPORT AND INFRASTRUCTURE
Level 4, 23/33 Mary Street,
Surry Hills NSW 2010
T 02 8095 6418
www.mugroup.com.au

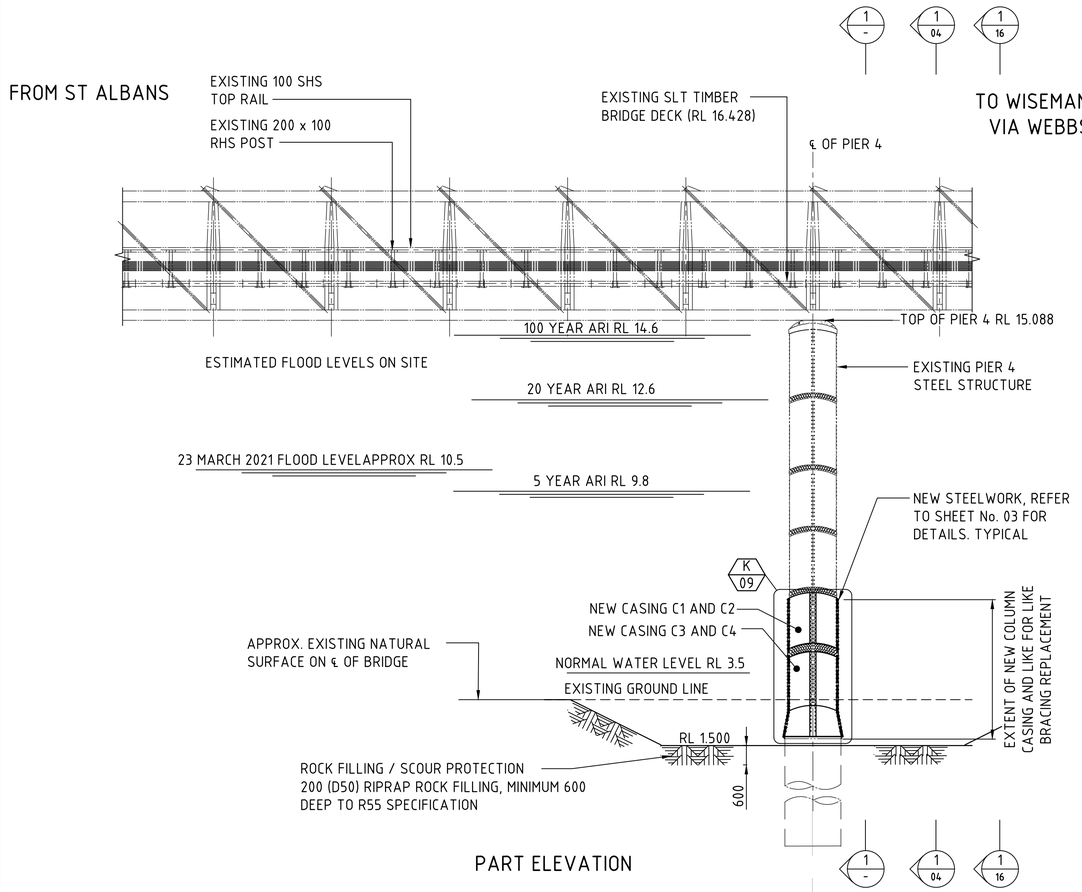
CLIENT SYDNEY REGION
NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

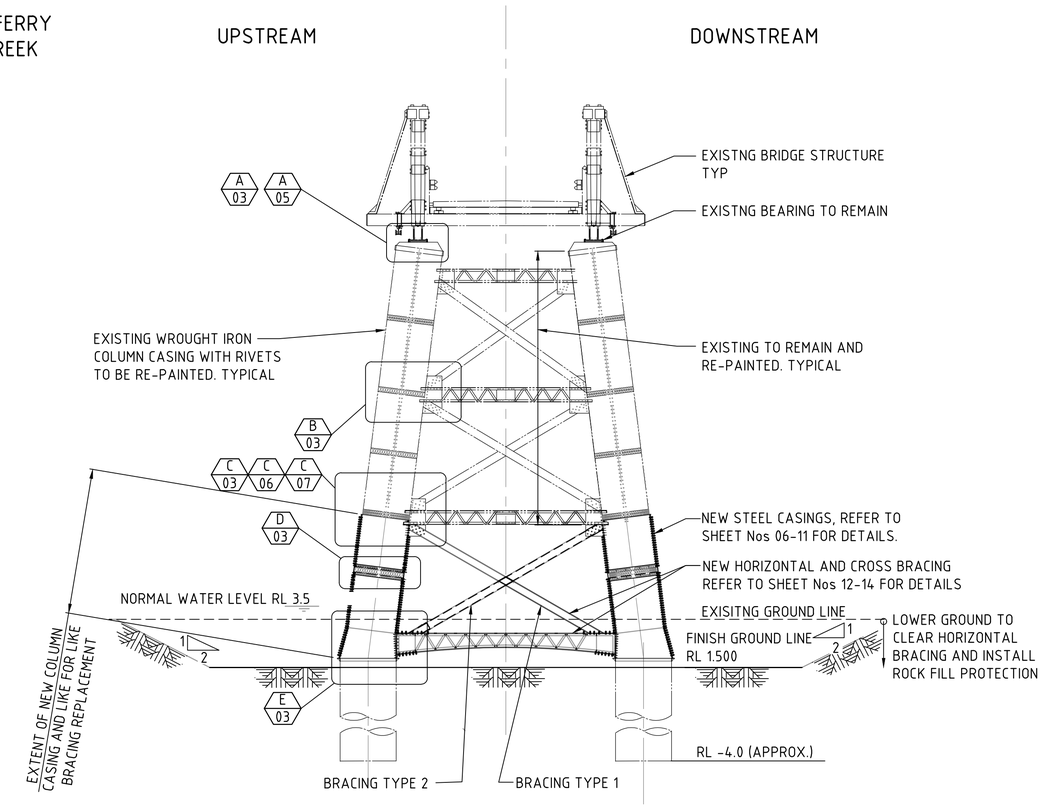
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BRIDGE No B00413
APPROVED DESIGN QA RECORDS
DIRECTOR
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 01 ISSUE 1
CAD No

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSE OF THE NOMINATED PROJECT

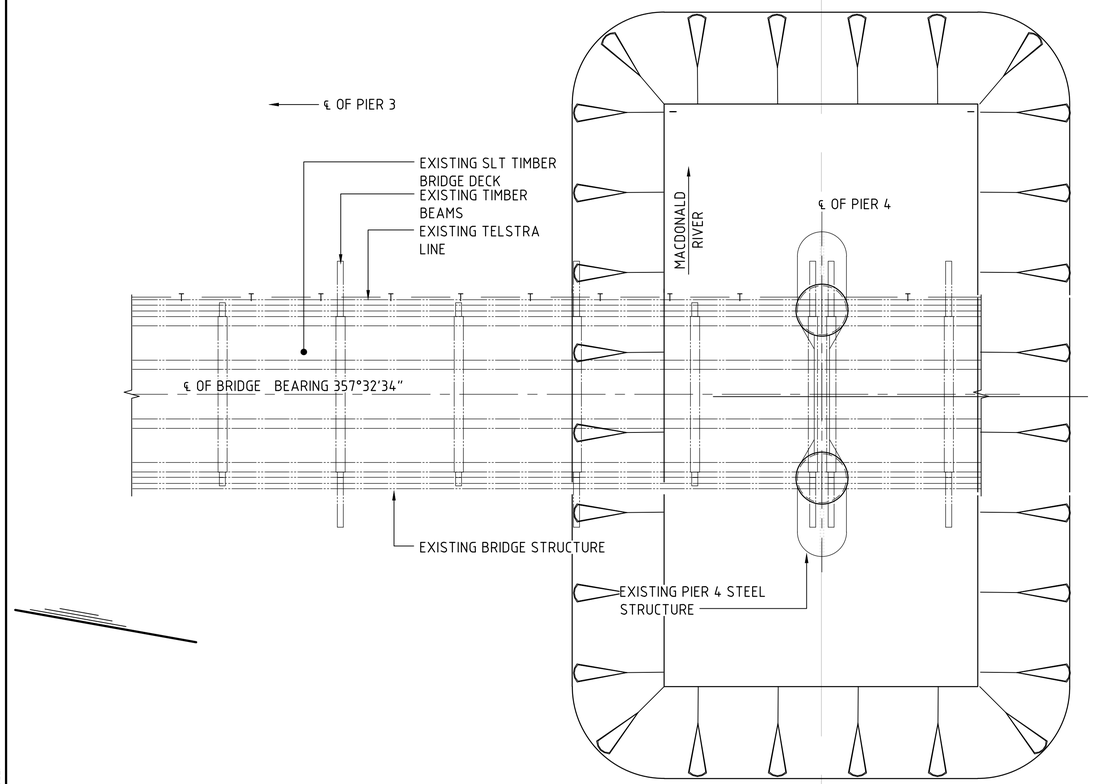
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PEN TABLE: ----



PART ELEVATION



SECTION 1 -



PART PLAN

GENERAL NOTES

SCALE 0 1000 2500 5000mm OR AS SHOWN

DIMENSIONS ARE IN MILLIMETRES, CHAINAGES, COORDINATES AND REDUCED LEVELS ARE IN METRES. REDUCED LEVELS ARE RELATED TO AHD.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

GENERAL ARRANGEMENT - SHEET A

MU GROUP TRANSPORT AND INFRASTRUCTURE
Level 4, 23/33 Mary Street, Surry Hills NSW 2010
T 02 8095 6418
www.mugroup.com.au
DM ROADS

CLIENT SYDNEY REGION — NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

APPROVED DESIGN QA RECORDS — DIRECTOR

DRAWING SET No DS2021/00195

BRIDGE No B00413

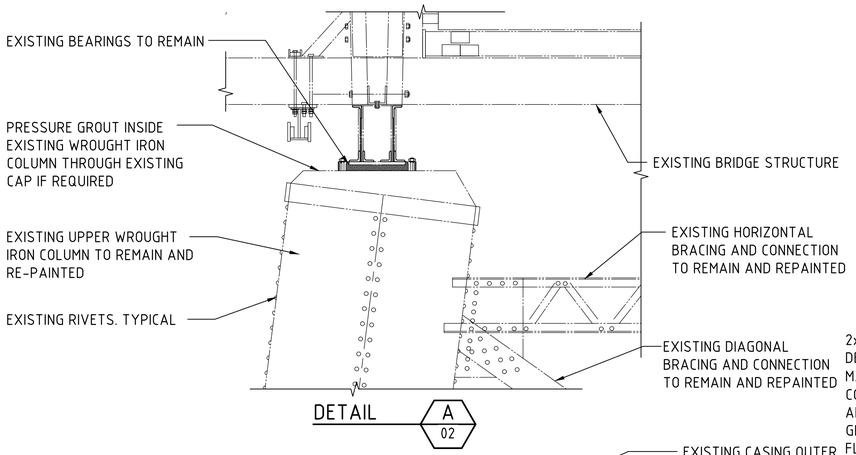
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SHEET No 02 ISSUE 1

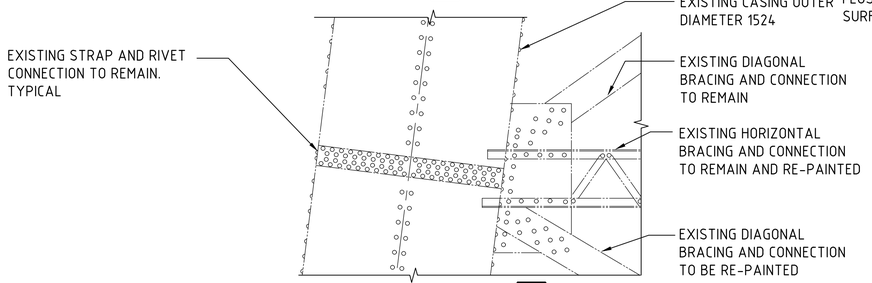
CAD No

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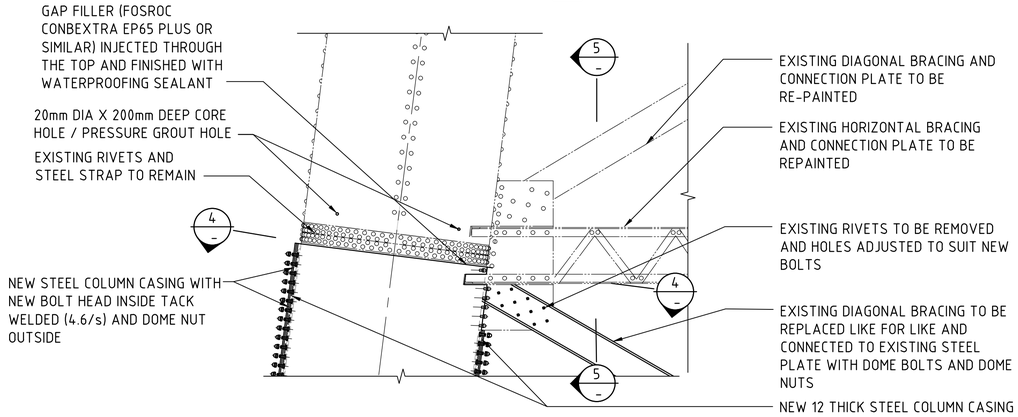
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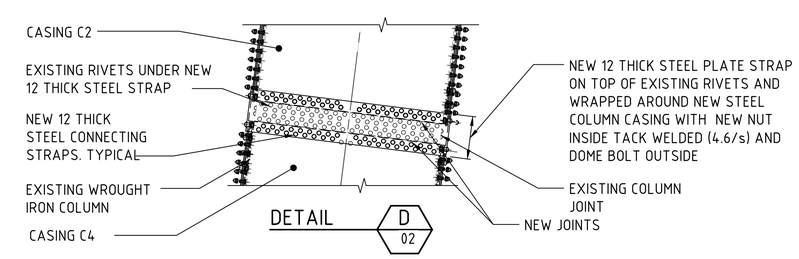
DETAIL A 02



DETAIL B 02

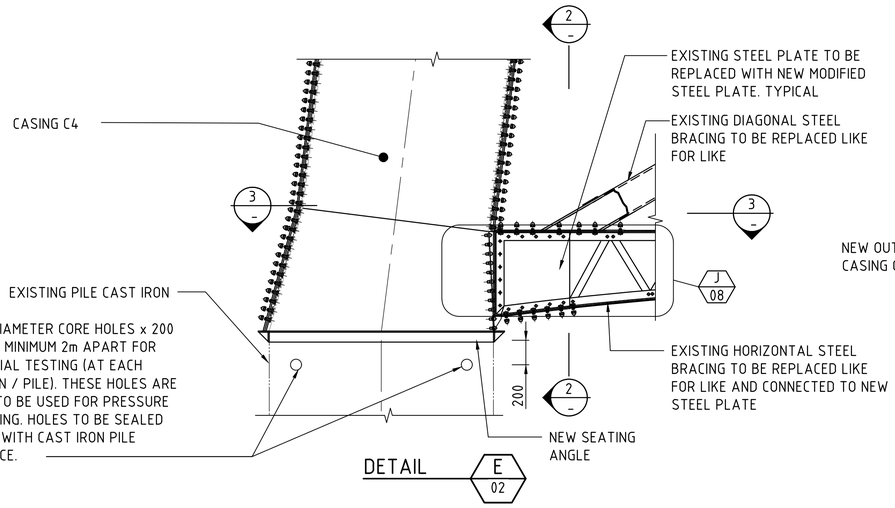


DETAIL C 02

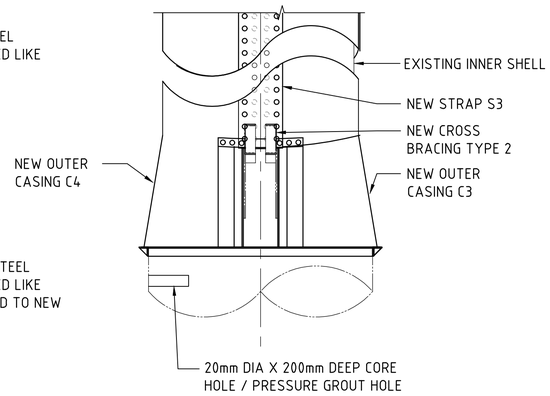


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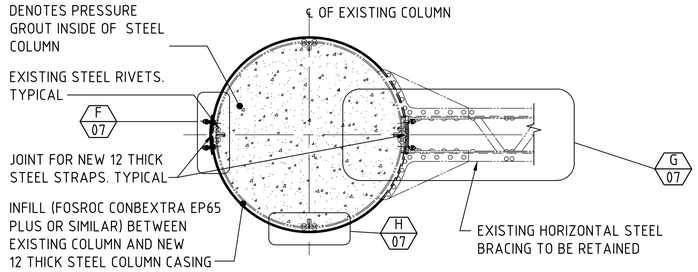
NOTE
FOR CASING, STRAP AND CONNECTING PLATE DETAILS REFER TO SHEET Nos. 06-11



DETAIL E 02

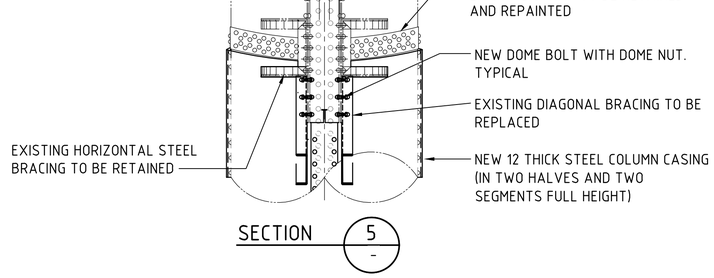


SECTION 2 –

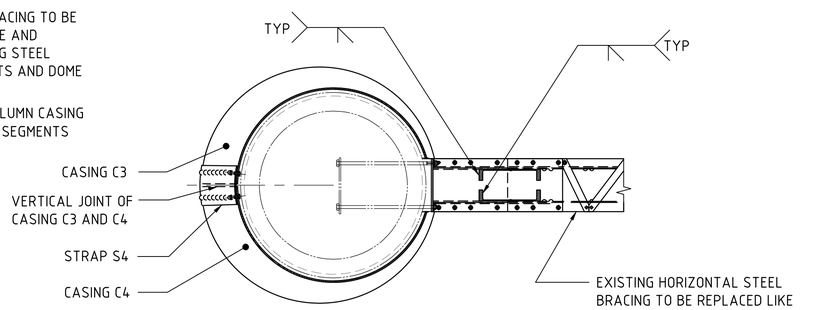


SECTION 4 –

NOTE:
DIAGONAL BRACING NOT SHOWN ON THIS SECTION FOR CLARITY



SECTION 5 –



SECTION 3 –

GENERAL NOTES

SCALE 0 250 500 1000mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET, REFER TO SHEET No 02

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

GENERAL ARRANGEMENT - SHEET B

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CLIENT SYDNEY REGION — NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

APPROVED DESIGN QA RECORDS

DIRECTOR

DRAWING SET No DS2021/00195

BRIDGE No B00413

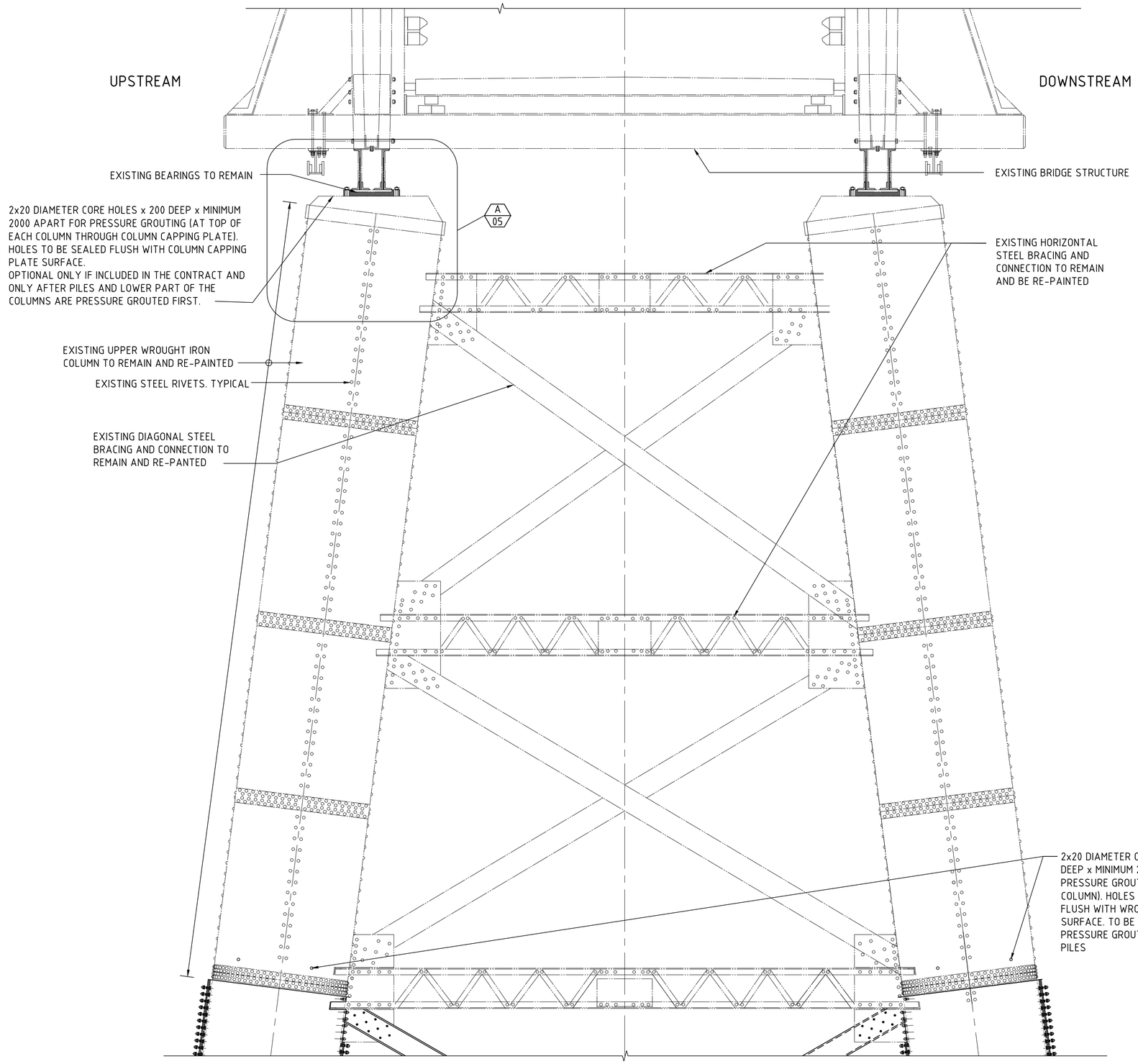
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SHEET No 03 ISSUE 1

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PLOTTED BY: MU PLOT STYLE: NONE
PEN TABLE: —



SECTION 1/02

GENERAL NOTES

SCALE 0 250 500 1000mm OR AS SHOWN

FOR PRESSURE GROUTING USE TfNSW SPECIFICATION ' M231 – PRESSURE GROUTING FOR SLAB JACKING / STBILISATIONS ' AS A GUIDE ONLY. THE CONSTRUCTION CONTRACTOR TO PROVIDE A PROPOSAL FOR APPROVAL BEFORE PROCEEDING WITH THE PRESSURE GROUTING.

PRESSURE GROUTING AT GROUND LEVEL AT THE CAST IRON PILE SECTION TO FILL ALL VOIDS DOWN TO ROCK FOUNDATION (APPROXIMATE DEPTH OF 6m).

PRESSURE GROUTING AT WROUGHT IRON COLUMN SECTION TO BE AS SHOWN IN THIS DRAWING. THE UPPER PART OF THE COLUMN AT THE COLUMN CAP IS OPTIONAL AND ONLY TO BE CARRIED OUT IF INCLUDED IN THE CONTRACT.

REPAINTNG OF THE RETAINED STEEL WORK MUST BE IN ACCORDANCE WITH B220 COATING SYSTEM SC11.

PAINTNG OF THE NEW STEEL WORK MUST BE IN ACCORDANCE WITH .B220 COATING SYSTEM SC7

RE-PAINTNG OF THE EXISTING STEEL BELOW NEW CASING WORK MUST BE IN ACCORDANCE WITH B220 COATING SYSTEM SC7.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4

PAINTING AND PRESSURE GROUTING - SHEET A

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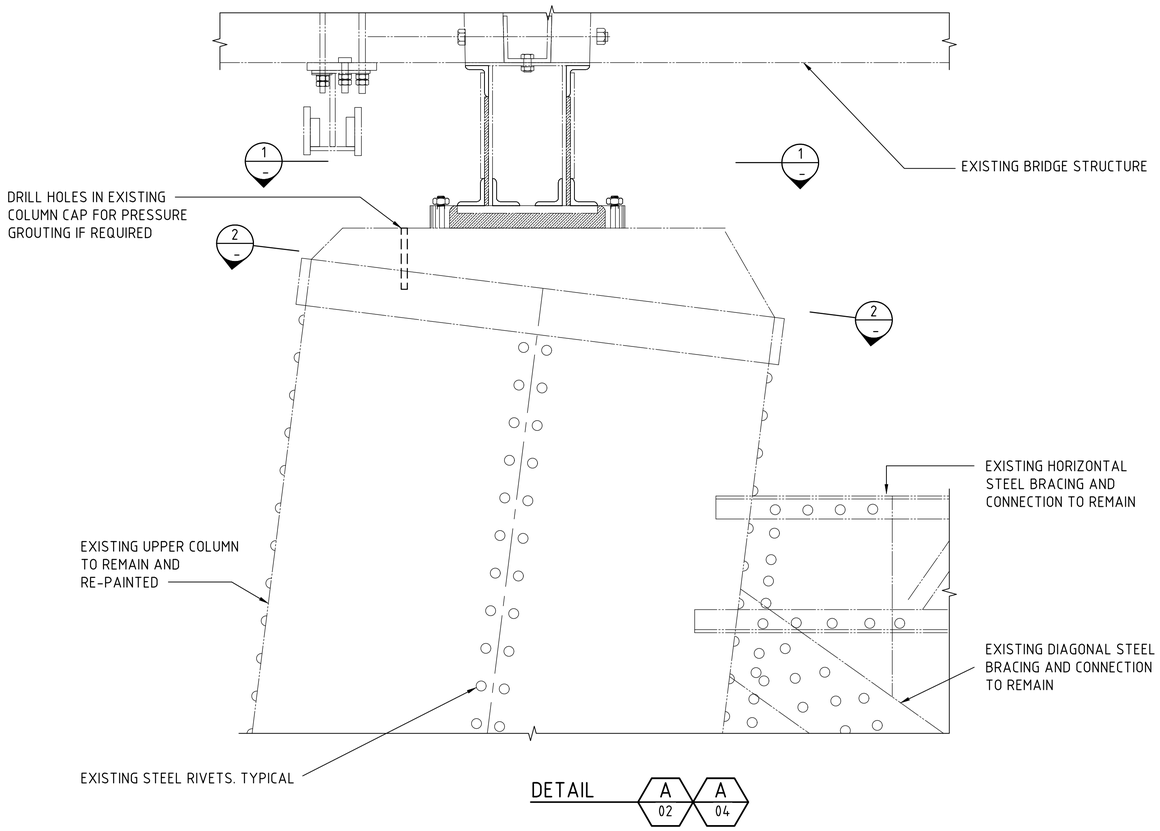
CLIENT SYDNEY REGION
NSW GOVERNMENT Transport for NSW

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DRAWING	G. KRISHNASAMY	P. KEOGH

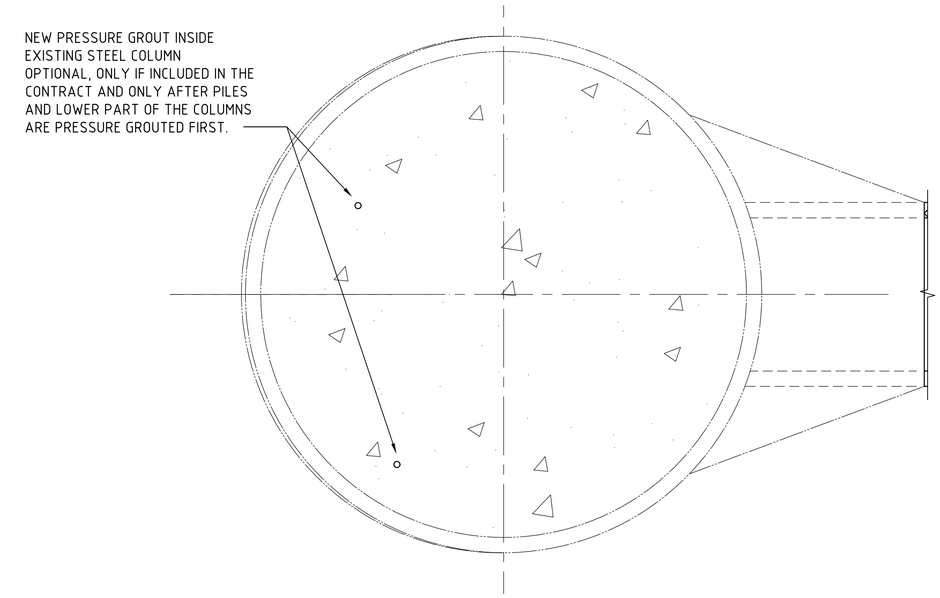
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BRIDGE No B00413
APPROVED DESIGN QA RECORDS
DIRECTOR
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 04 ISSUE 1
CAD No

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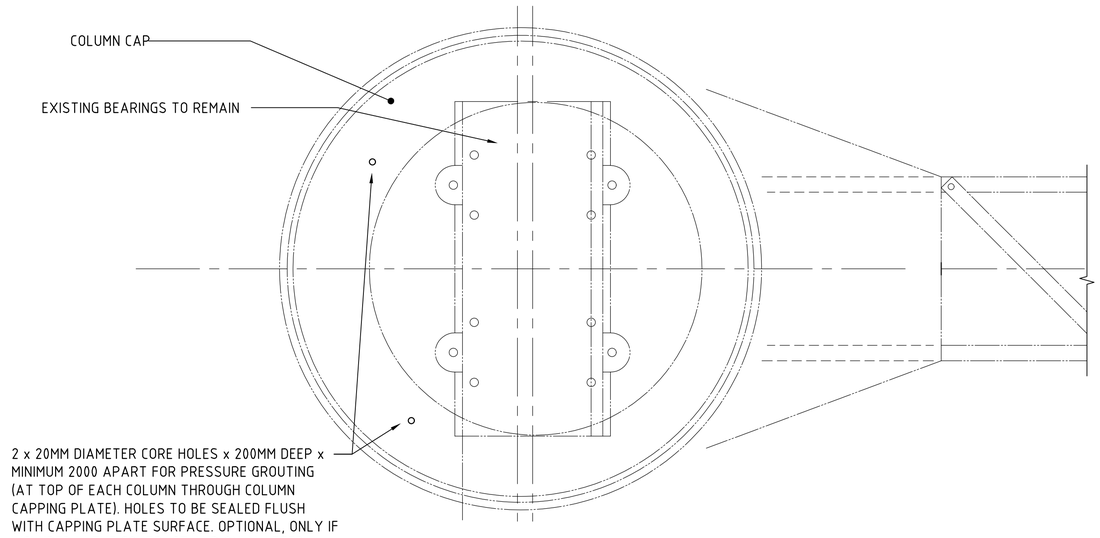
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PLOT DRIVER: NONE
PEN TABLE: ----



DETAIL A/02 A/04



SECTION 2/-



SECTION 1/-

PART PLAN

GENERAL NOTES

SCALE 0 100 250 500mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET, REFER TO SHEET No 04.

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1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

PAINTING AND PRESSURE GROUTING - SHEET B

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APPROVED DESIGN QA RECORDS

DIRECTOR

DRAWING SET No DS2021/00195

BRIDGE No B00413

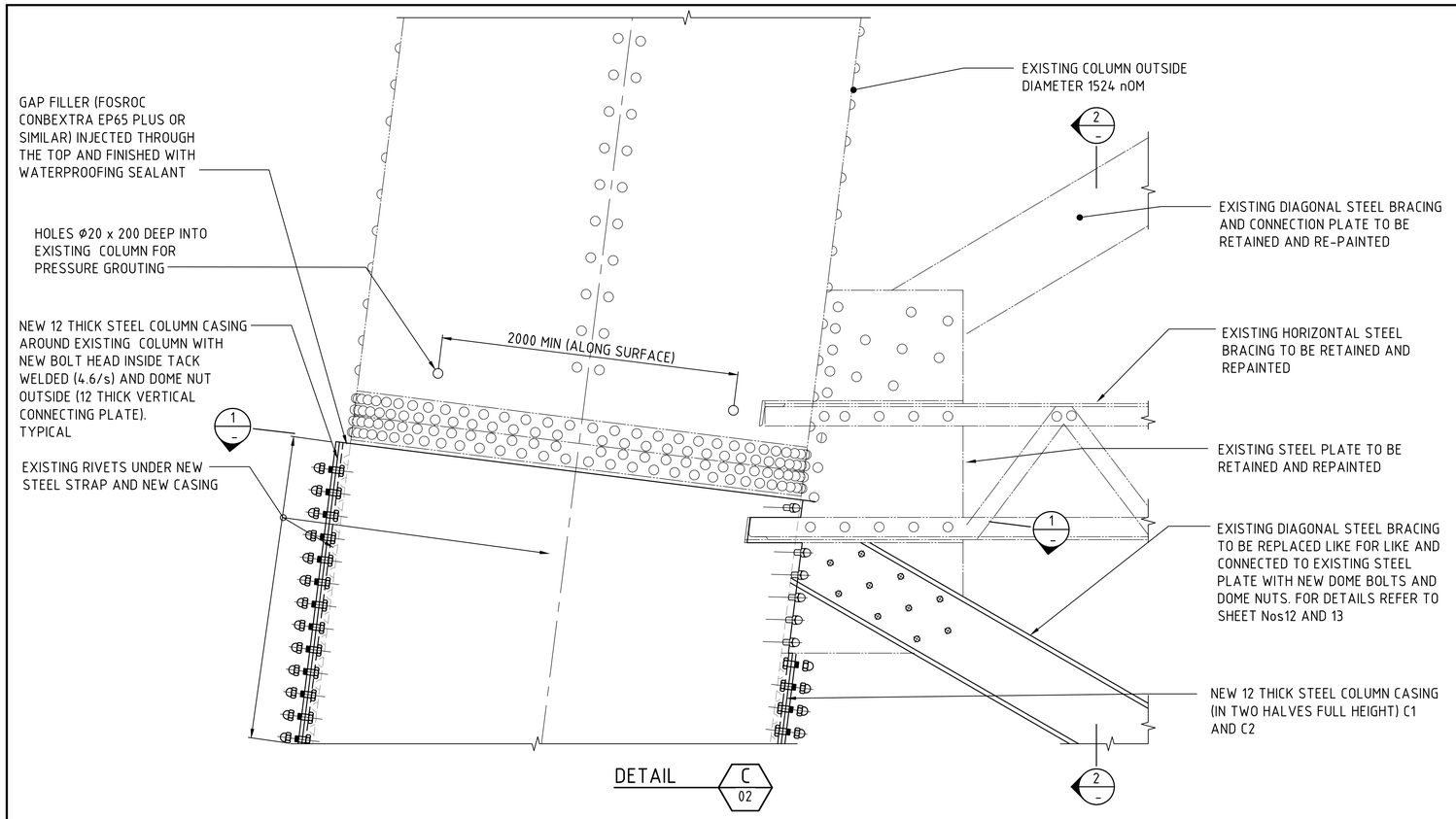
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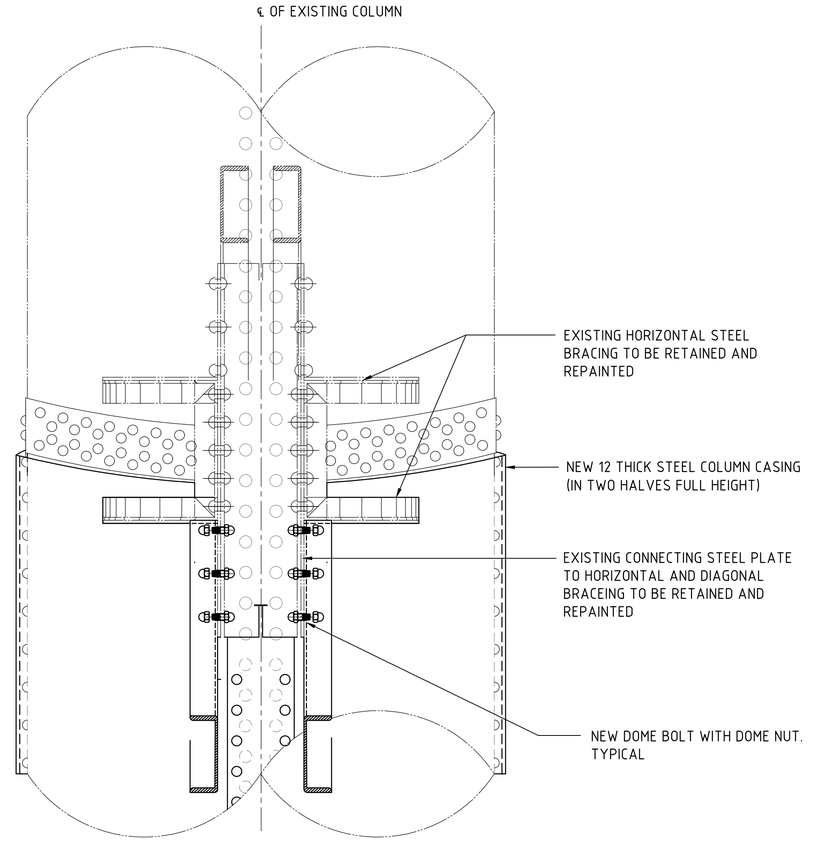
SHEET No 05 ISSUE 1

CAD No

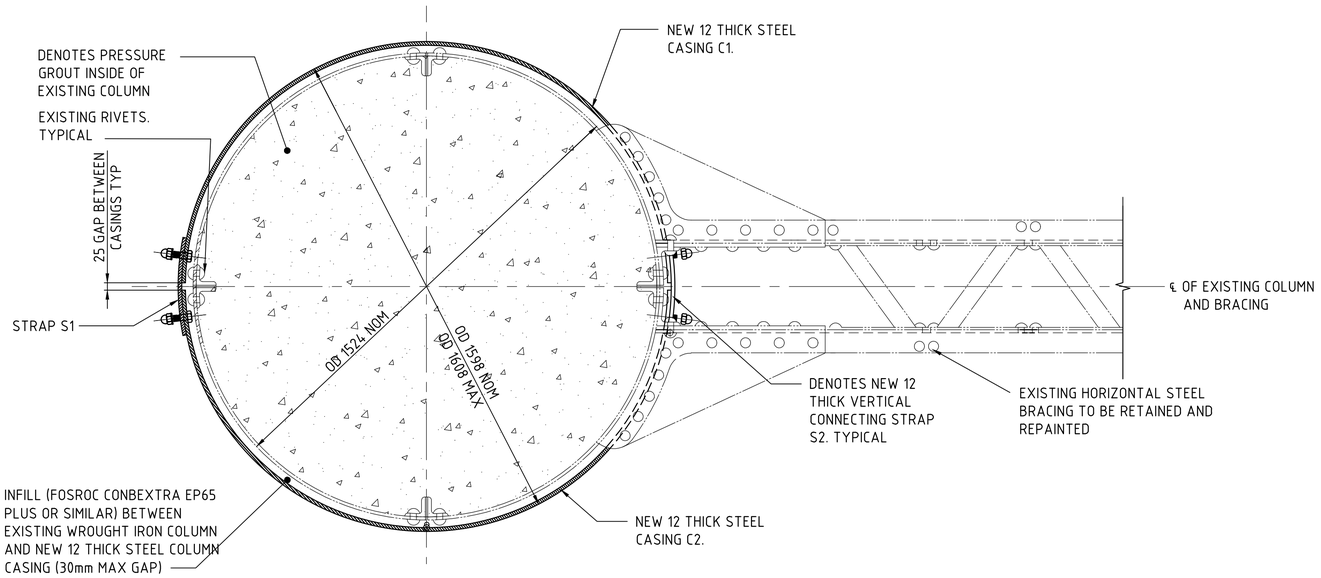
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PLOTTED BY: NONE
PEN TABLE: —





SECTION 2 -



SECTION 1 -

NOTE:
DIAGONAL BRACING NOT SHOWN ON THIS SECTION FOR CLARITY.
FOR DETAILS REFER TO SHEET Nos 12 AND 13

GENERAL NOTES

SCALE 0 100 250 500mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET, REFER TO SHEET No 09.
ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE NEW STEEL FABRICATION.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
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MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

NEW CASING STEEL DETAILS - SHEET A

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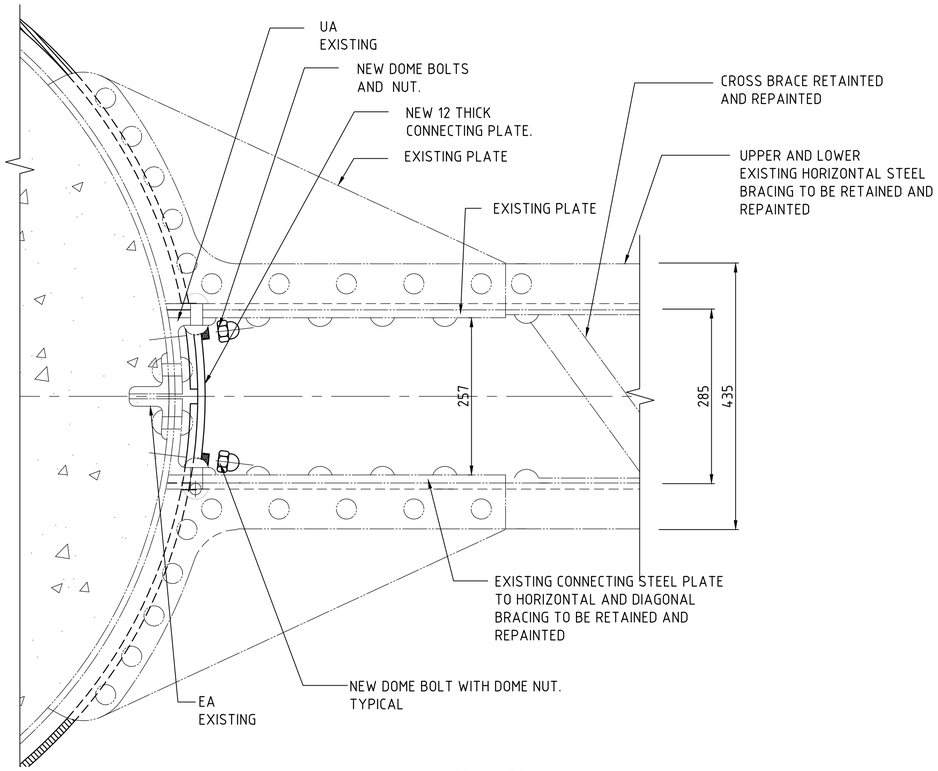
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	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD (Lindsay Dynan)
DRAWING	G. KRISHNASAMY	P. KEOGH

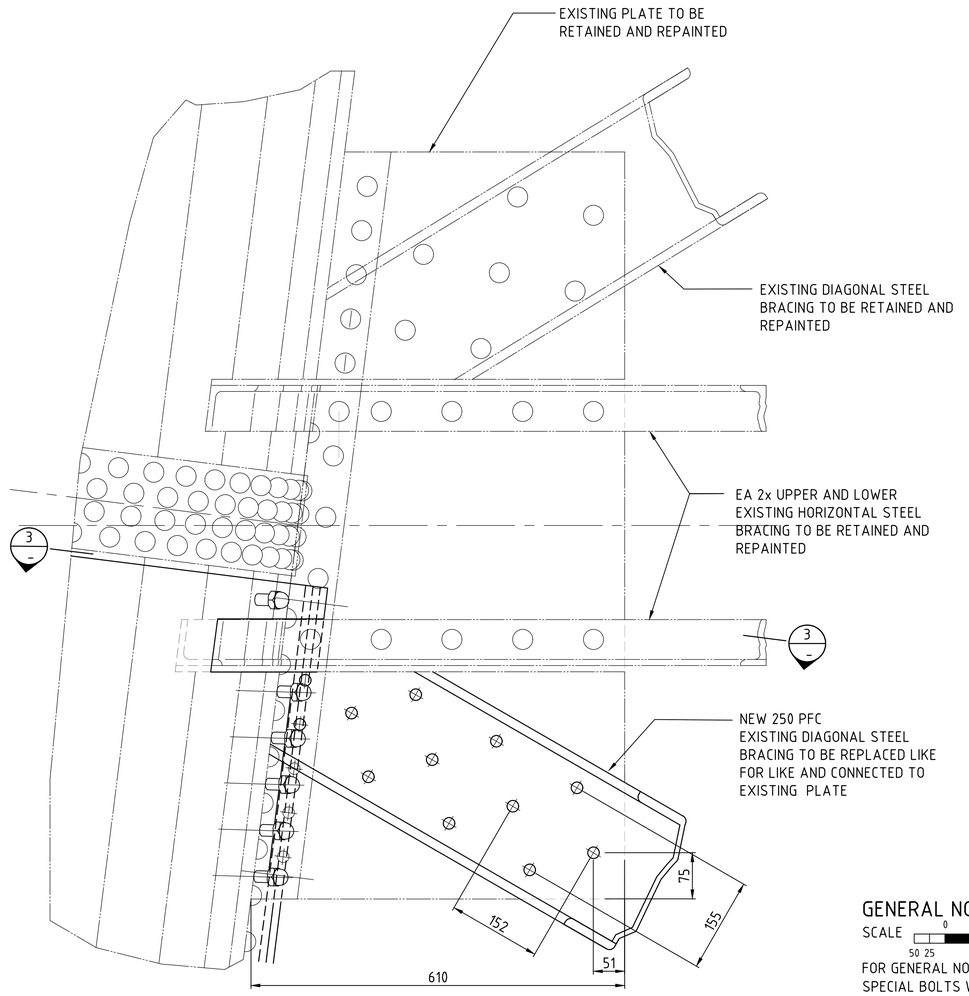
DRAWING SET No DS2021/00195
BRIDGE No B00413
APPROVED DESIGN QA RECORDS — DIRECTOR
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 06 ISSUE 1
CAD No

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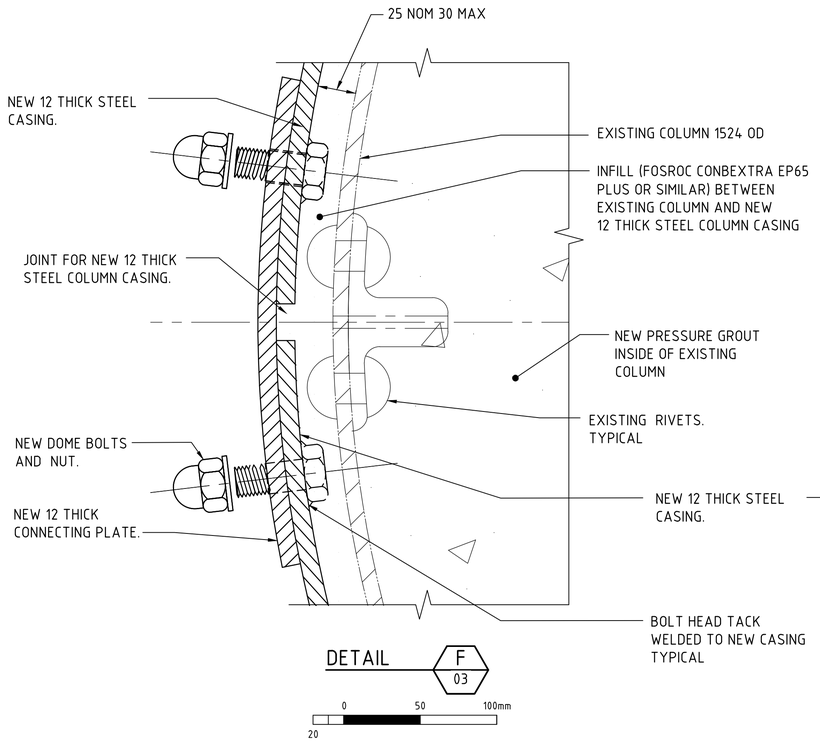


SECTION 3/- G/03



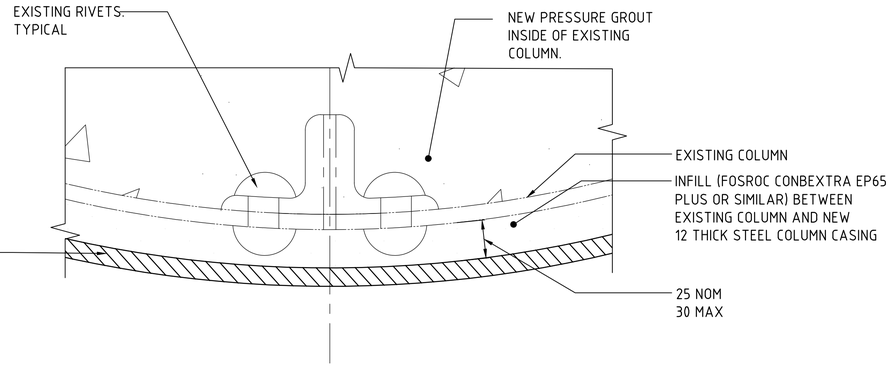
ELEVATION

DETAIL C/02



DETAIL F/03

0 50 100mm
20



DETAIL H/03

0 50 100mm
20

GENERAL NOTES

SCALE 0 100 200mm / 50 25 OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET,REFER TO SHEET No 09
SPECIAL BOLTS WITH HEAD OF BOLT INSIDE HIDDEN (OR WITH "DOME" HEAD IF EXPOSED). DOME NUT OUTSIDE EXPOSED TO MIMIC THE EXISTING RIVETS.
ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR ON SITE BEFORE NEW STEEL FABRICATION.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

NEW CASING STEEL DETAILS - SHEET B

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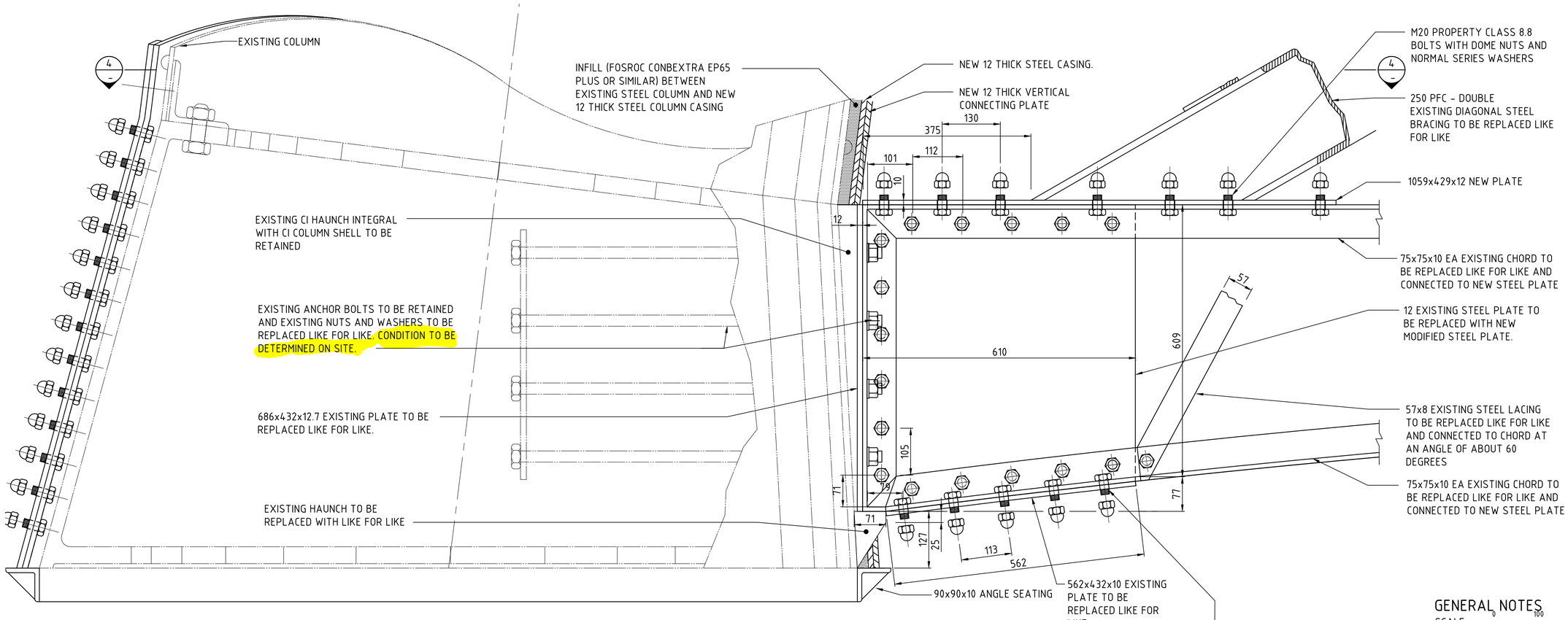
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DRAWING	G. KRISHNASAMY	P. KEOGH
APPROVED	DESIGN QA RECORDS	
	DIRECTOR	

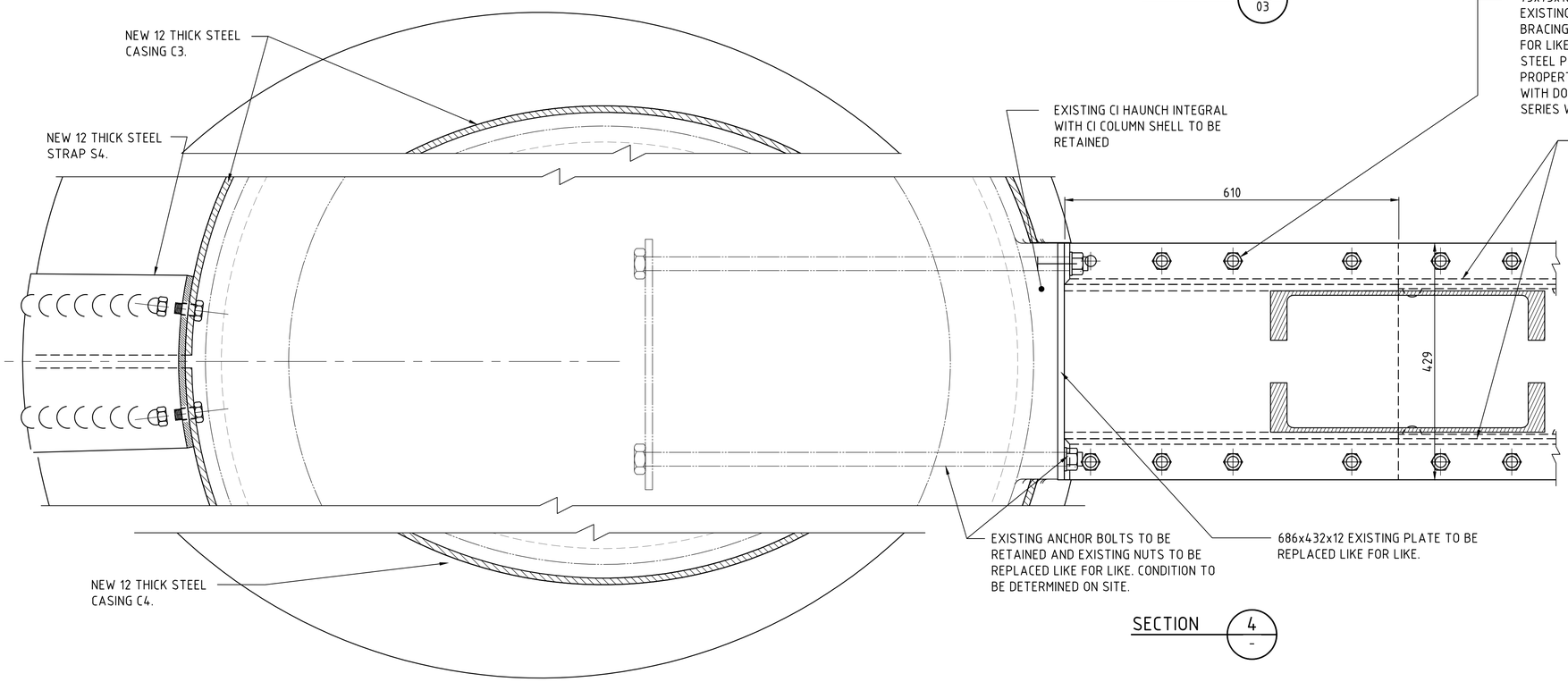
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BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 07 ISSUE 1
CAD No

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PLOTTED: C-0500.ctb
PLOTTER: NONE
PEN TABLE: ----



ELEVATION J 03



SECTION 4 -

GENERAL NOTES

SCALE 0 50 100 200mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET, REFER TO SHEET No 09

SPECIAL BOLTS WITH HEAD OF BOLT INSIDE HIDDEN (OR WITH "DOME" HEAD IF EXPOSED). DOME NUT OUTSIDE EXPOSED TO MIMIC THE EXISTING RIVETS.

ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR ON SITE BEFORE NEW STEEL FABRICATION.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

NEW CASING STEEL DETAILS - SHEET C

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DESIGN	C. SOOSAPILLA	Dr J MULLARD (Lindsay Dynan)
DRAWING	G. KRISHNASAMY	P. KEOGH

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DRAWING SET No DS2021/00195

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SHEET No 08 ISSUE 1

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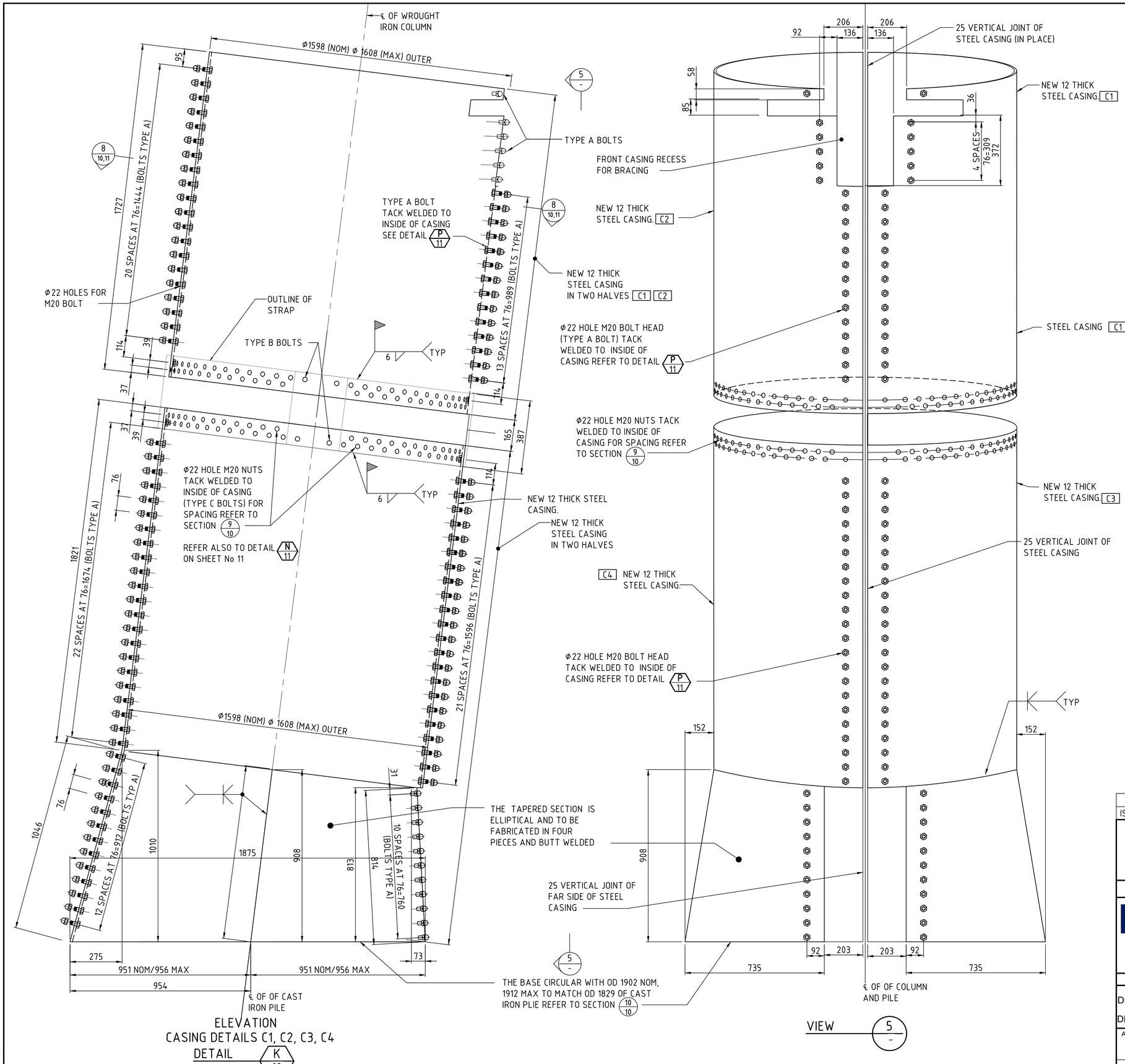


TABLE 1

BOLT TYPE	DIA	LENGTH	NUT TYPE	HEAD TYPE	No REQUIRED
TYPE A	M20	45	DOME	HEXAGON	444
TYPE B	M20	55	HEXAGON	DOME	16
TYPE C	M20	45	HEXAGON	DOME	212

GENERAL NOTES

SCALE 0 250 500mm 100 OR AS SHOWN

ALL PLATES ARE 350 GRADE TO AS 3678.

PAINTING OF NEW STEEL WORK MUST CONFORM TO B220 SYSTEM SC7
THE EXTENT OF WELD INSPECTION MUST CONFORM TO SPECIFICATION B201 UNLESS NOTED OTHERWISE.
THE CONSTRUCTION CATEGORY MUST BE CC3 IN CONFORMITY TO SPECIFICATION B201.
ALL STEEL FABRICATION AND WELDING MUST CONFORM TO SPECIFICATION B201, UNLESS SPECIFIED OTHERWISE.
THE WELD CATEGORY MUST BE SP CONFORMING TO AS/NZS 5100.6.
BOLTS MUST BE PROPERTY CLASS 4.6 TO AS 1111.1 EXCEPT WHERE SHOWN OTHERWISE.
NUTS MUST BE PROPERTY CLASS 05 EXCEPT WHERE SHOWN OTHERWISE.
HIGH STRENGTH STEEL BOLTS, NUTS AND WASHERS SHALL BE PROPERTY CLASS 8.8 CONFORMING TO AS/NZS1252.1
THE BOLTING CATEGORY FOR HIGH STRENGTH BOLTS SHALL BE 8.8/TB IN ACCORDANCE WITH AS 5100.6.
ONE NORMAL SERIES WASHER TO BE PROVIDED WITH ALL BOLT ASSEMBLIES.
DETAILS FOR ONE COLUMN ARE SHOWN, OTHER COLUMN IS SIMILAR BUT OPPOSITE HAND
ALL DIMENSIONS TO BE VERIFIED BY THE CONTRACTOR ON SITE BEFORE NEW STEEL FABRICATION.

IT IS STRONGLY RECOMMENDED THE USE OF A TEMPLATE TO ENSURE CORRECT LOCATION OF HOLES TO BE DRILLED,

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1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

NEW CASING STEEL DETAILS - SHEET D

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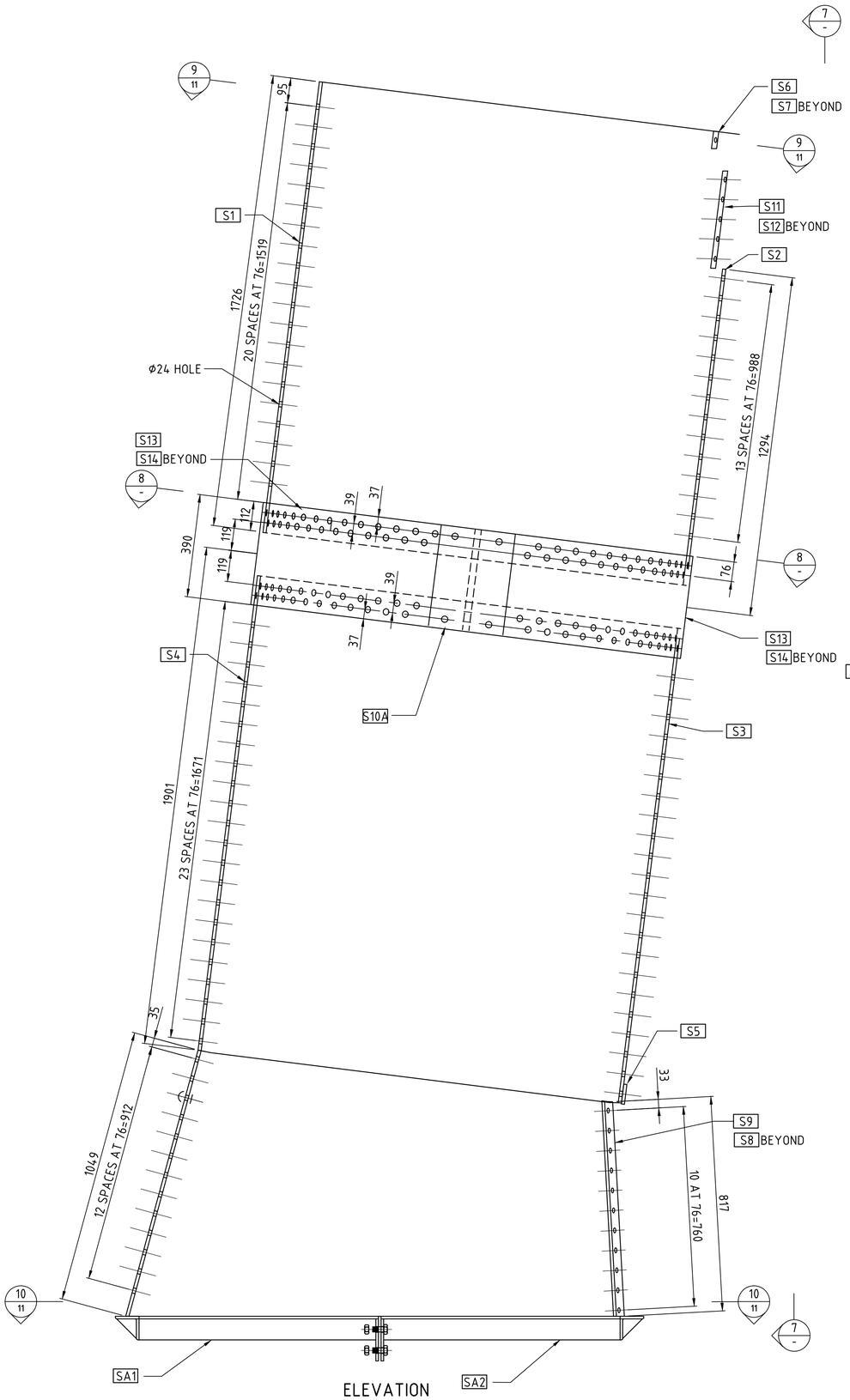
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DRAWING	G. KRISHNASAMY	P. KEOGH

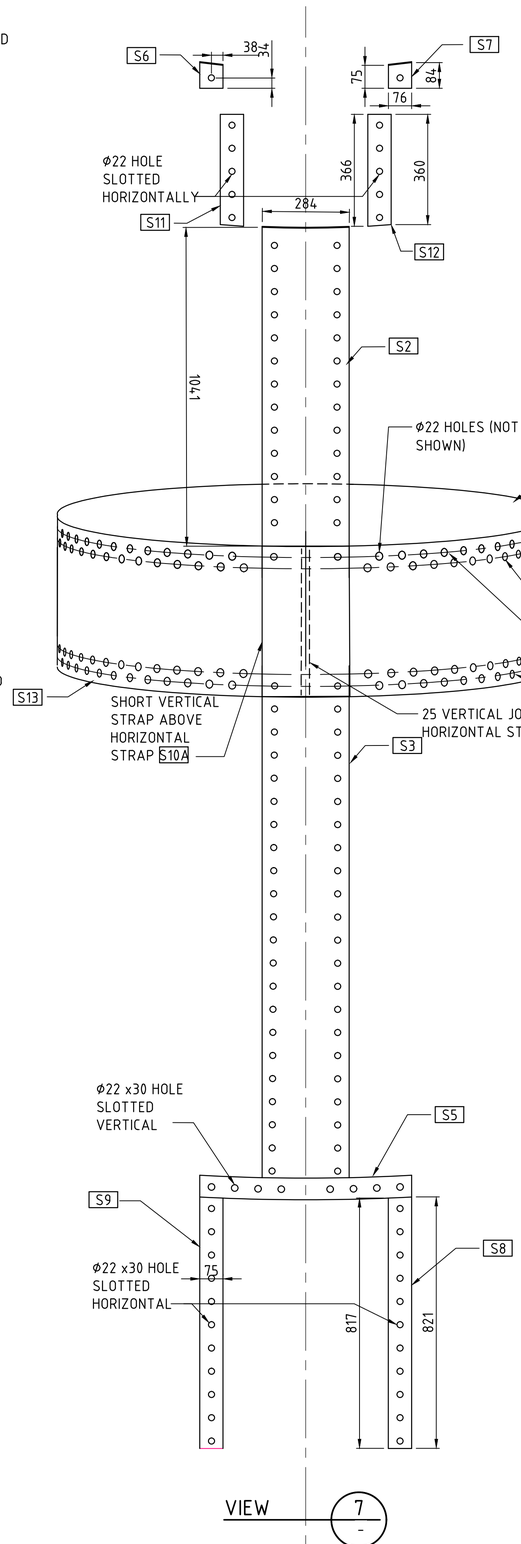
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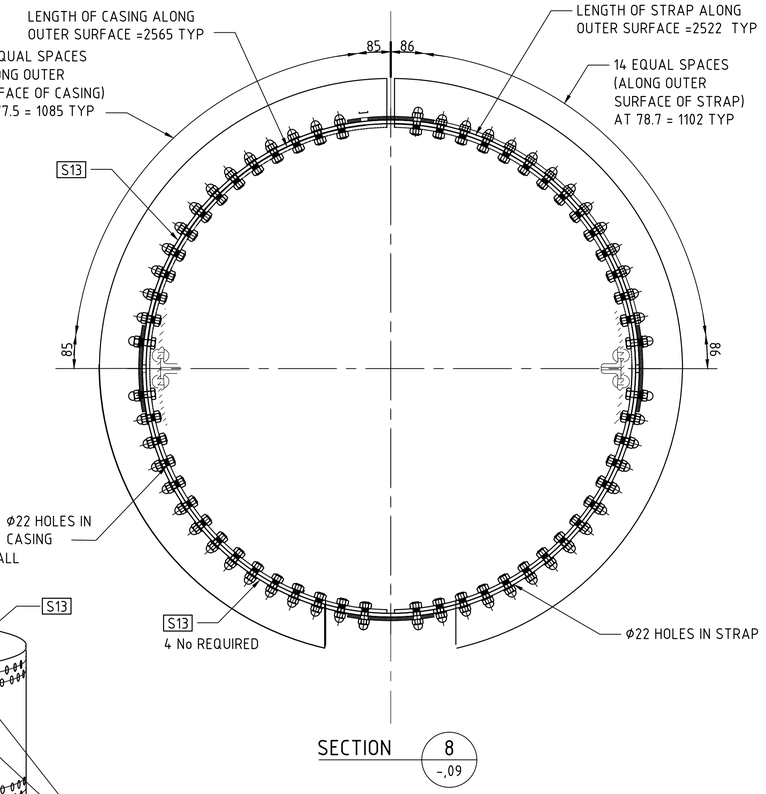
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PLOT DRIVER: NONE
PEN TABLE: ----







GENERAL NOTES

SCALE 0 100 250 500mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET REFER TO SHEET No 09.

CONNECTING PLATES (S1 to S4), STRAP (S5 TO S16), SA1 AND SA2 DETAILS

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4

NEW CASING STEEL DETAILS - SHEET E

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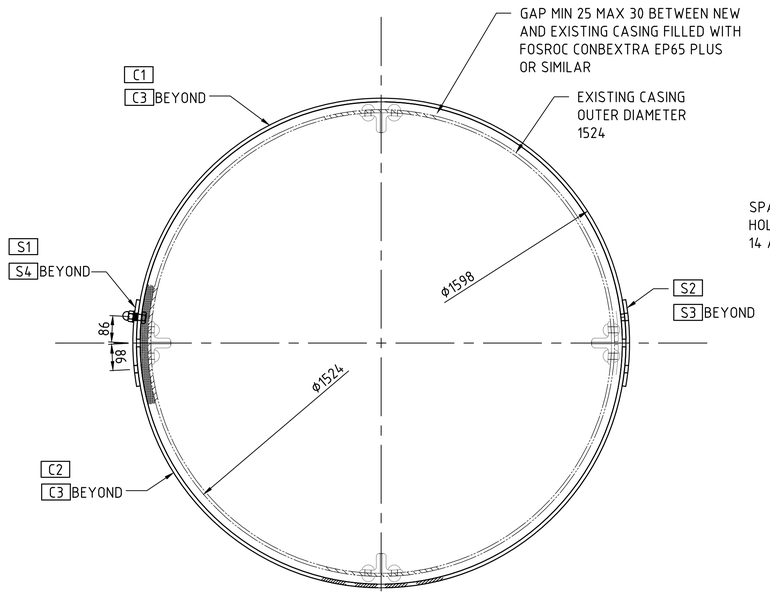
CLIENT SYDNEY REGION
NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH
APPROVED	DESIGN QA RECORDS	DIRECTOR

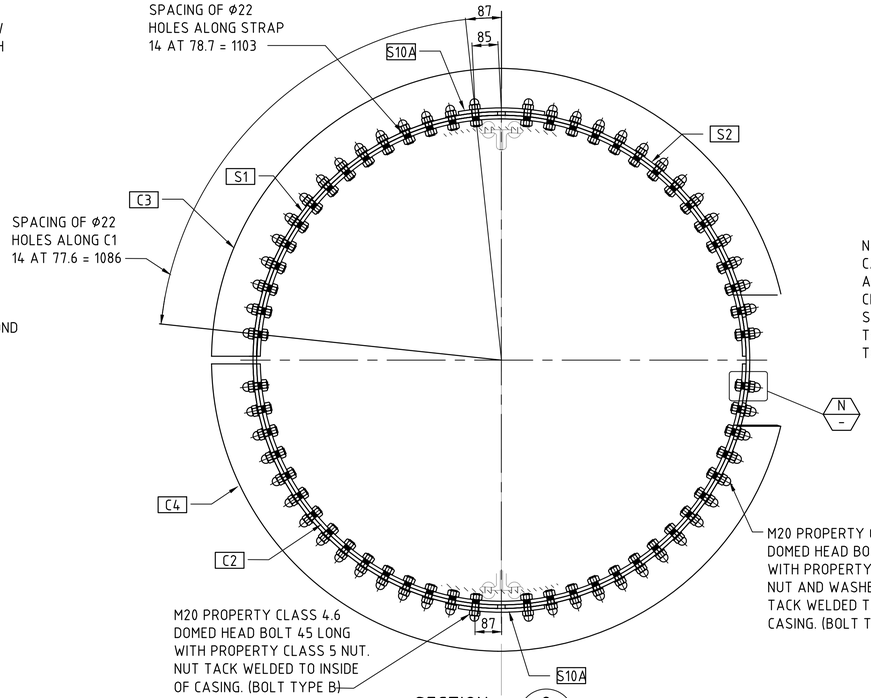
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BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 10 ISSUE 1
CAD No

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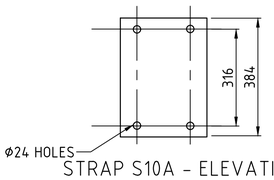
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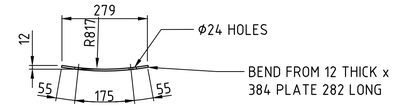
SECTION 8/10



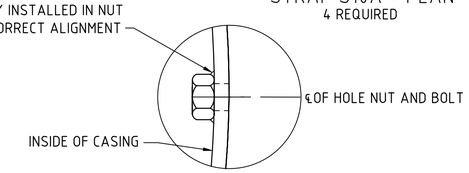
SECTION 9/10

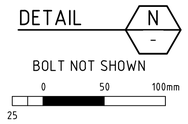


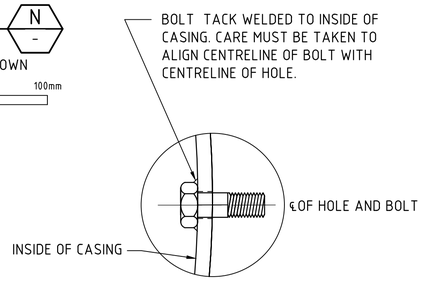
STRAP S10A - ELEVATION

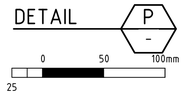


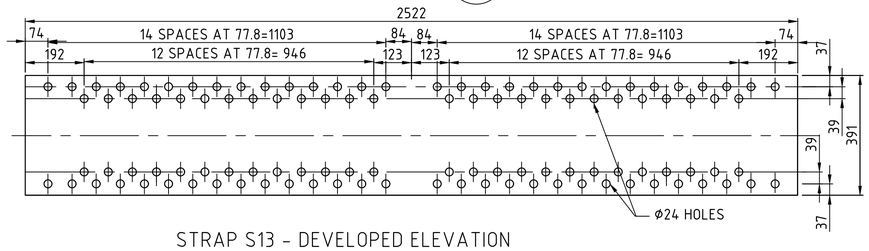
STRAP S10A - PLAN
4 REQUIRED



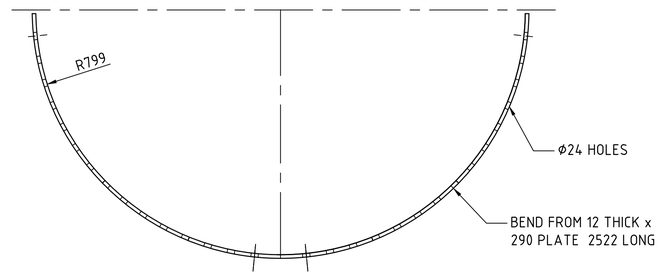






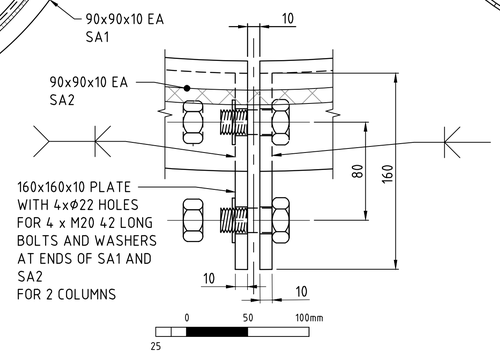


STRAP S13 - DEVELOPED ELEVATION



STRAP S13 - PLAN
4 REQUIRED

SECTION 10/10



SEATING DETAIL OF SA1 AND SA2

DETAIL M

GENERAL NOTES

SCALE 0 250 500mm (100) OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET REFER TO SHEET No 09.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

NEW CASING STEEL DETAILS - SHEET F

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T 02 8095 6418
www.mugroup.com.au
DM ROADS

CLIENT SYDNEY REGION — NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

DRAWING SET No DS2021/00195

BRIDGE No B00413

APPROVED DESIGN QA RECORDS — DIRECTOR

ISSUE STATUS: ISSUED FOR CONSTRUCTION

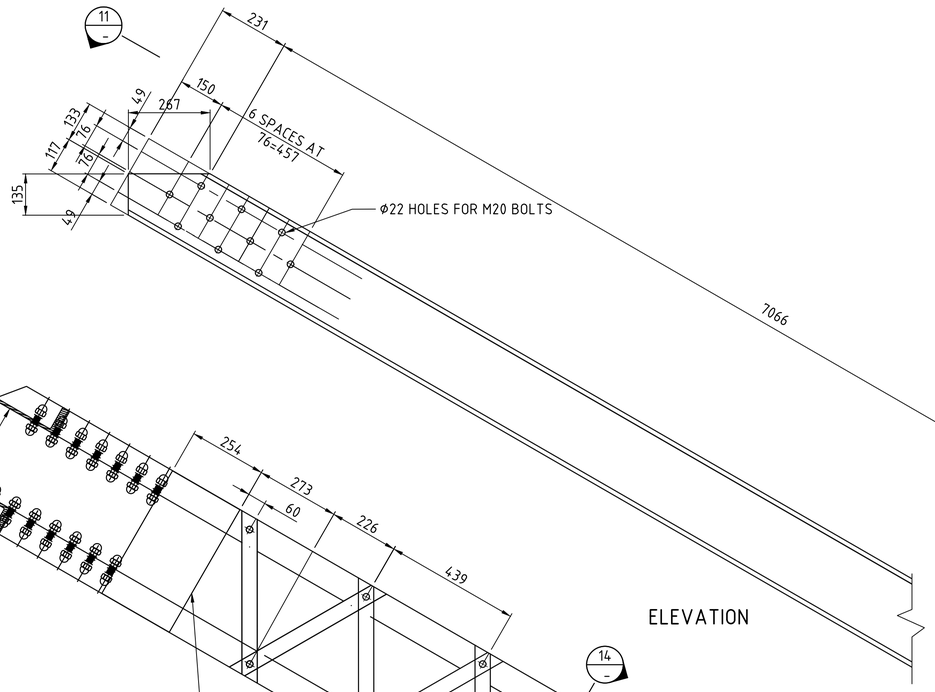
SHEET No 11 ISSUE 1

CAD No

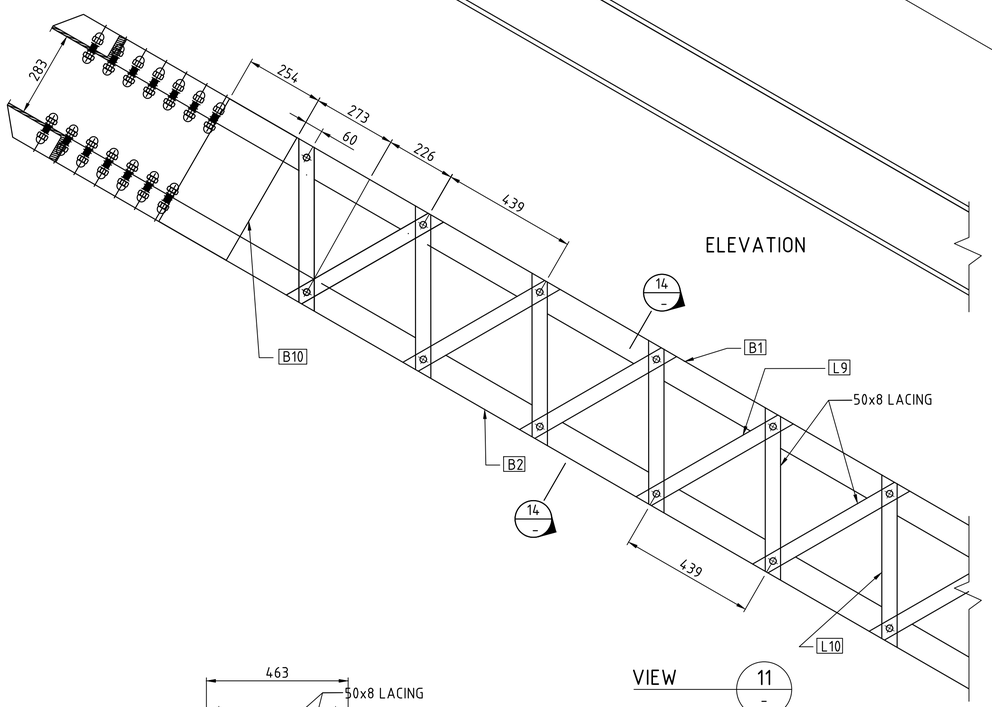
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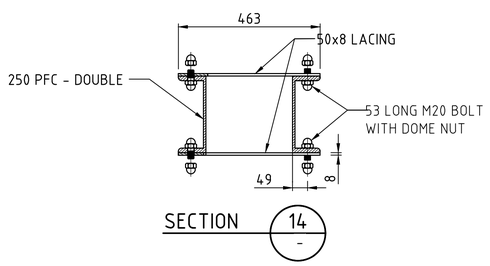
FOLLOWING THE COMPLETION OF THE FABRICATION, A TRIAL ASSEMBLY OF THE BRACE (TYP) MUST BE UNDERTAKEN ENSURING THE DIMENSIONS AND ALIGNMENT ARE CORRECT. POSSIBLY CONSIDER STAMPING UNIQUE NUMBERS ON THE PLATES TO ENSURE THE SAME ITEMS ARE ASSMBLED ON SITE AS WERE TRIAL ASSEMBLED IN THE WORKSHOP



ELEVATION

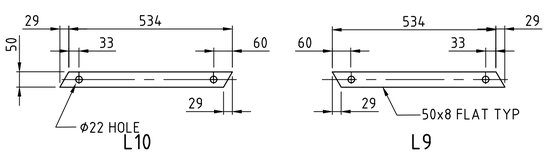


VIEW 11 –



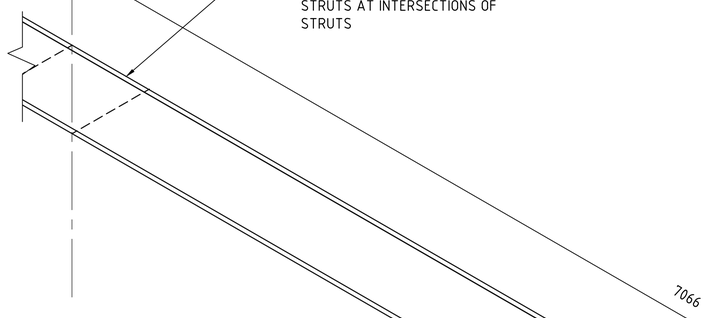
SECTION 14 –

NEW CROSS BRACING DETAILS TYPE 1

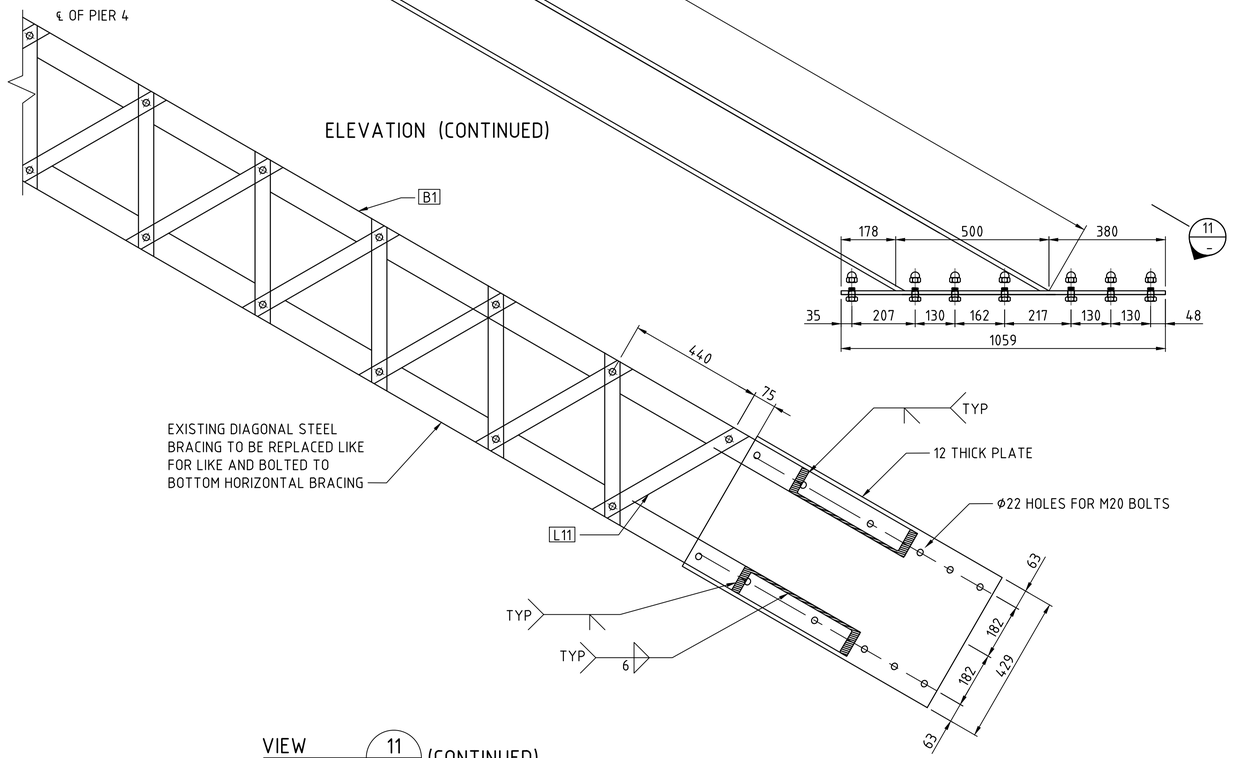


LACING DETAILS L9 AND L10

LACINGS TO BE SET AT AN ANGLE OF ABOUT 60 DEGREES. TO BE OMMITED ON OUTER STRUTS AT INTERSECTIONS OF STRUTS



ELEVATION (CONTINUED)



VIEW 11 – (CONTINUED)

GENERAL NOTES

SCALE 0 250 500mm OR AS SHOWN
100

ALL PLATES ARE 350 GRADE TO AS 3678.
UNLESS SPECIFIED OTHERWISE.
ALL NEW STEELWORK MUST BE PAINT IN ACCORDANCE WITH SYSTEM SC02
THE EXTENT OF WELD INSPECTION MUST CONFORM TO RMS
SPECIFICATION B201 UNLESS NOTED OTHERWISE.
THE CONSTRUCTION CATEGORY MUST BE CC3 IN CONFORMITY TO RMS
SPECIFICATION B201.
ALL STEEL FABRICATION AND WELDING MUST CONFORM TO RMS SPECIFICATION
WELDING SYMBOLS CONFORM TO AS 1101.3.
SPECIFICATION B201, UNLESS SPECIFIED OTHERWISE.
THE WELD CATEGORY MUST BE SP IN CONFORMITY TO RMS
DETAILED, IN CONFORMITY TO AS/NZS 5100.6.
BOLTS, NUTS AND WASHERS MUST BE PROTECTIVE TREATED IN CONFORMITY
TO SYSTEM HR AS SPECIFIED IN CLAUSES 1.5 AND 1.6 OF AS/NZS 1252.1.
STEEL SECTIONS MUST CONFORM TO AS/NZS 3679.1-300Lnn.
BOLTS MUST BE PROPERTY CLASS 4.6 TO AS 1111.1
NUTS MUST HAVE CHARACTERISTICS OF PROPERTY CLASS 05
PRIOR TO FABRICATION ALL DIMENSIONS MUST BE VERIFIED ON
SITE TO ENSURE COMPONENTS FIT SITE CONDITIONS

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4

NEW BRACING STEEL DETAILS - SHEET A

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CLIENT SYDNEY REGION
NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

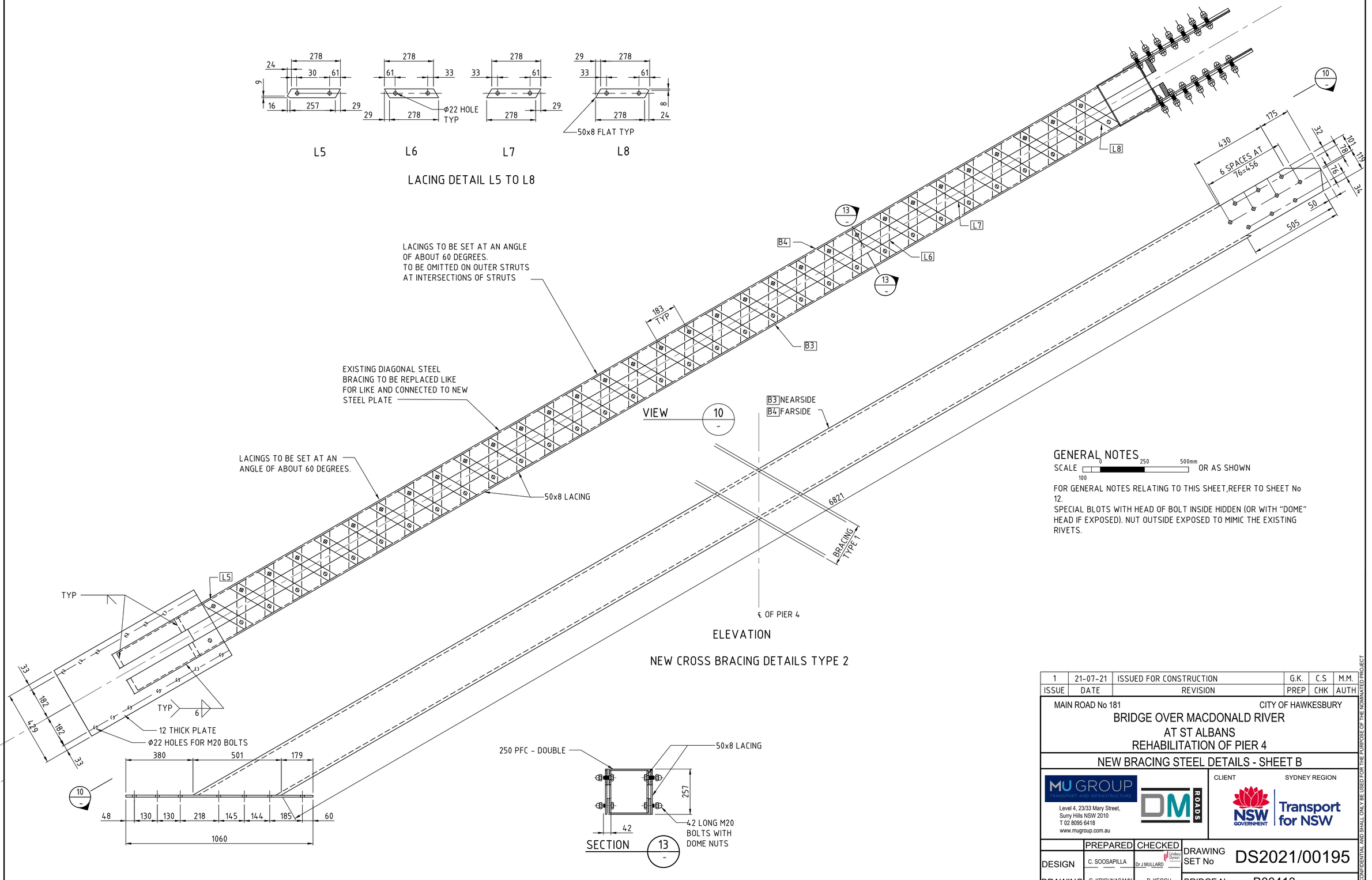
DRAWING SET No DS2021/00195
BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 12 ISSUE 1

APPROVED DESIGN QA RECORDS
DIRECTOR
CAD No

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PLOTTED BY: NONE
PEN TABLE: ----

LACING DETAIL L5 TO L8



ELEVATION

NEW CROSS BRACING DETAILS TYPE 2

GENERAL NOTES

SCALE 0 100 250 500mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET, REFER TO SHEET No 12.

SPECIAL BLOTS WITH HEAD OF BOLT INSIDE HIDDEN (OR WITH "DOME" HEAD IF EXPOSED). NUT OUTSIDE EXPOSED TO MIMIC THE EXISTING RIVETS.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4

NEW BRACING STEEL DETAILS - SHEET B

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CLIENT SYDNEY REGION — NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

APPROVED DESIGN QA RECORDS

DIRECTOR

DRAWING SET No DS2021/00195

BRIDGE No B00413

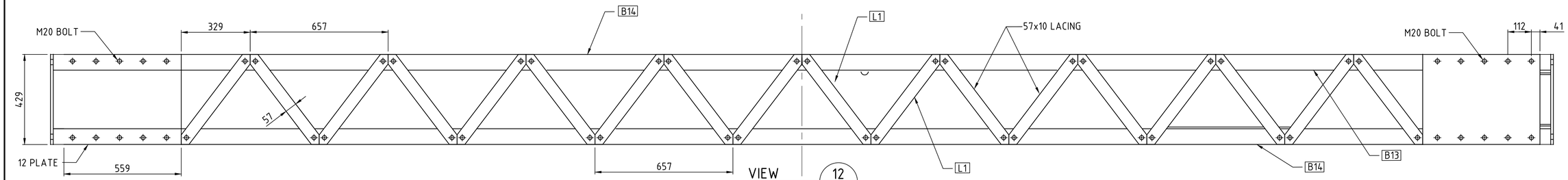
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SHEET No 13 ISSUE 1

CAD No

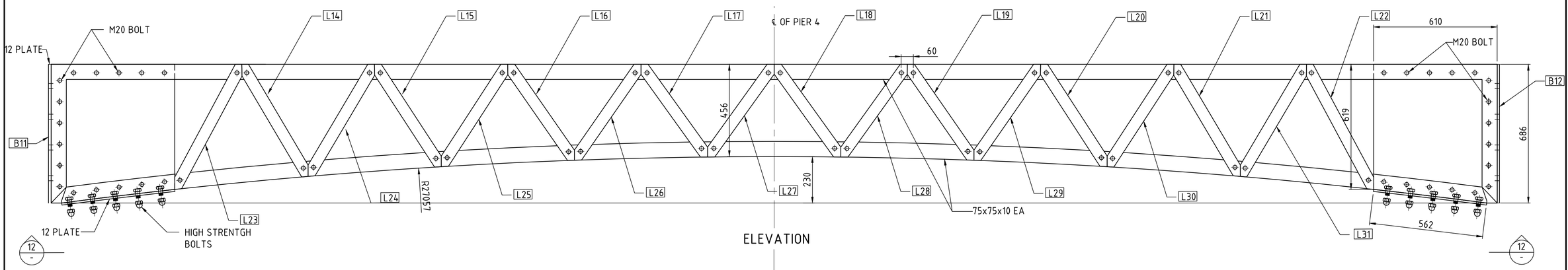
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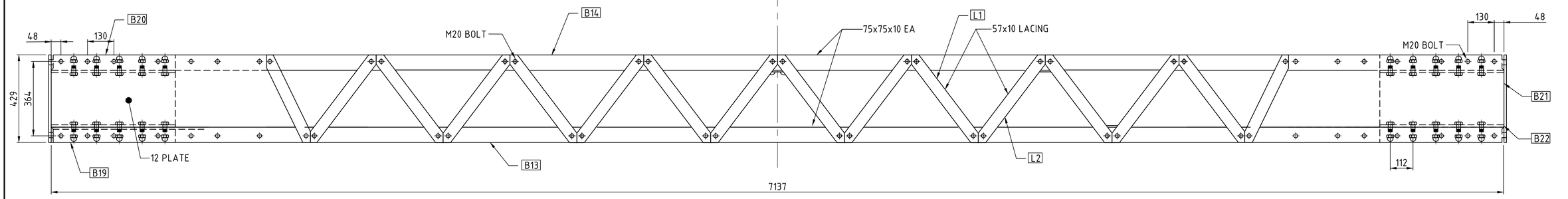


VIEW 12

FOR CLARITY ONLY BOOTTOM
ELEMENTS ARE SHOWN IN THIS VIEW

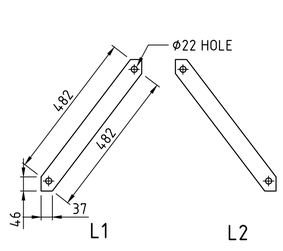


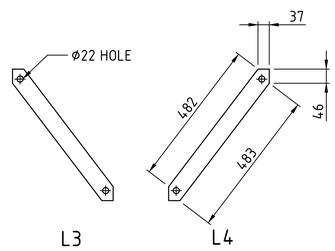
ELEVATION



PLAN

FOR CLARITY ONLY TOP ELEMENTS
ARE SHOWN IN THIS VIEW





GENERAL NOTES

SCALE 0 250 500mm OR AS SHOWN
100

FOR GENERAL NOTES RELATING TO THIS SHEET,REFER TO SHEET No 12
SPECIAL BLOTS WITH HEAD OF BOLT INSIDE HIDDEN (OR WITH "DOME" HEAD IF EXPOSED). NUT OUTSIDE EXPOSED TO MIMIC THE EXISTING RIVETS.
FOR DIMENSIONS OF L14 TO L31 REFER TO SHEET No 14

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

NEW BRACING STEEL DETAILS - SHEET C

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NSW GOVERNMENT Transport for NSW

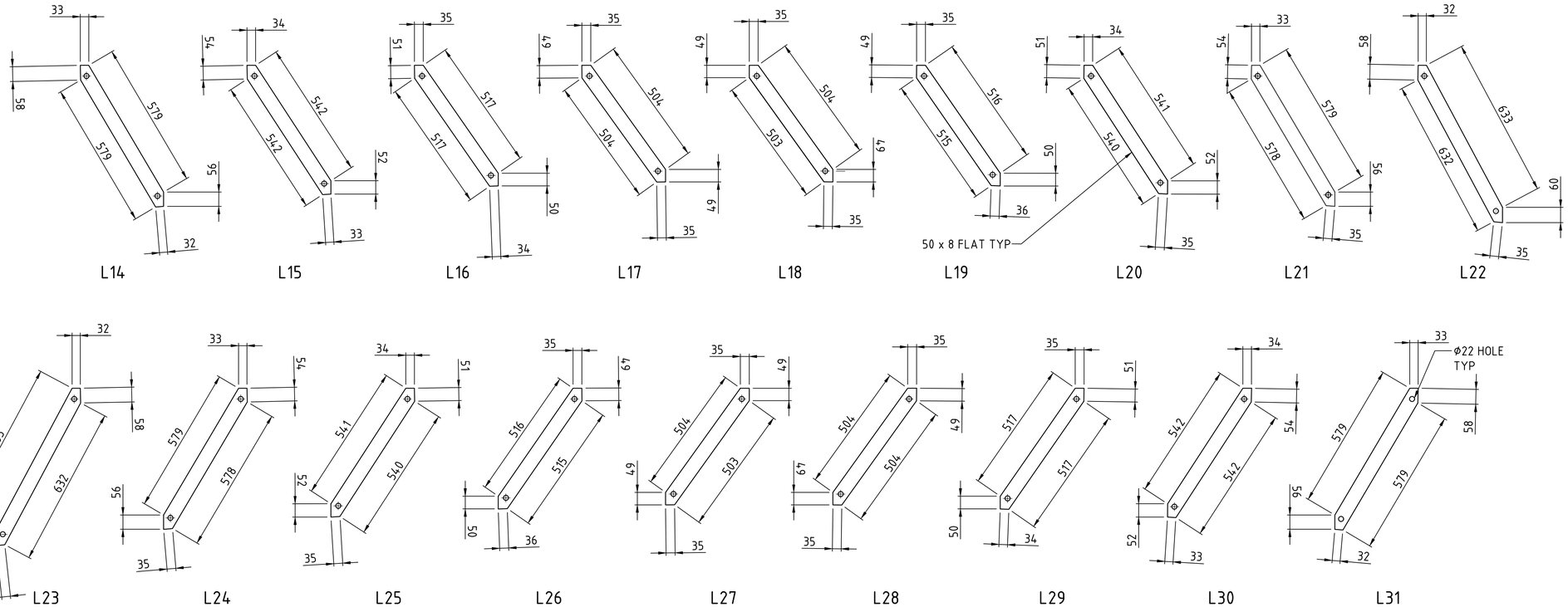
	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

APPROVED DESIGN QA RECORDS
DIRECTOR

DRAWING SET No DS2021/00195
BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 14 ISSUE 1
CAD No

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PLOT DRIVER: NONE
PEN TABLE: ----



LACING DETAILS L14 TO L31

HORIZONTAL BRACING BOLTS

MEMBER DESCRIPTION	MEMBER TOTAL THICKNESS mm	M20 DOME BOLT WITH DOME NUT Q.TY.	HOLE DIA. mm	BOLT LENGTH	SPACING TYPICAL mm
B11+B13/B14	24 8NO. x 1"BOLT		27.4		EXISTING
B12+B13/B14	24 8NO. x 1"BOLT		27.4		EXISTING
B13+B17	20	5	22	35	113
B13+B18	20	5	22	35	113
B13+L4	20	9	22	35	657
B13+L3	20	9	22	35	657
B13+B19	22	16	22	35	112
B13+B22	22	16	22	35	112
B13+L14 TO L31	20	36	22	35	
B13+B15	20	7	22	35	
B13+B16	20	7	22	35	
B13+L1	20	8	22	35	
B13+L2	20	8	22	35	
B14+B17	20	5	22	35	113
B14+B18	20	5	22	35	113
B14+L4	20	9	22	35	657
B14+L3	20	9	22	35	657
B14+B20	22	16	22	35	112
B14+B21	22	16	22	35	112
B14+L14 TO L31(UND)	20	36	22	35	
B14+B15	20	7	22	35	
B14+B16	20	7	22	35	
B14+L1	20	8	22	35	
B14+L2	20	8	22	35	
				35	

CROSS BRACING TYPE 1 - BOLTS

MEMBER DESCRIPTION	MEMBER TOTAL THICKNESS mm	BOLT LENGTH mm	M20 DOME BOLT WITH DOME NUT Q.TY.	HOLE DIA. mm	SPACING TYPICAL mm
B3+B5	23	35	4	22	73
B3+B7	23	35	4	22	73
B3+L6(L7)	31	45	20	22	302
B3+L6(L7)(BOTTOM)	31	45	20	22	302
B3+B6	23	35	3	22	73
B4+B5	23	35	4	22	73
B4+B7	23	35	4	22	73
B4+L6(L7)	31	45	20	22	302
B4+L6(L7)(BOTTOM)	31	45	20	22	302
B4+B6	23	35	3	22	73

CROSS BRACING TYPE 2 - BOLTS

MEMBER DESCRIPTION	MEMBER TOTAL THICKNESS mm	BOLT LENGTH mm	M20 DOME BOLT WITH DOME NUT Q.TY.	HOLE DIA. mm	SPACING TYPICAL mm
B1+B10	23	35	4	22	73
B1+B8	23	35	4	22	73
B1+L10+L11	31	45	9	22	533
B1+L9	23	35	2	22	533
B1+L10+L11 (UNDER)	31	45	9	22	533
B1+L9 (UNDER)	23	35	2	22	533
B1+EXISTING	20	35	10	22	107
B2+B10	23	35	4	22	73
B2+B8	23	35	4	22	73
B2+L10+L11	31	45	9	22	533
B2+L9	23	35	2	22	533
B2+L10+L11 (UNDER)	31	45	9	22	533
B2+L9 (UNDER)	23	35	2	22	533
B2+EXISTING	20	35	10	22	107

GENERAL NOTES

SCALE 0 50 25 100 200mm OR AS SHOWN

FOR GENERAL NOTES RELATING TO THIS SHEET,REFER TO SHEET No 13

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4

MISCELLANEOUS STEEL DETAILS

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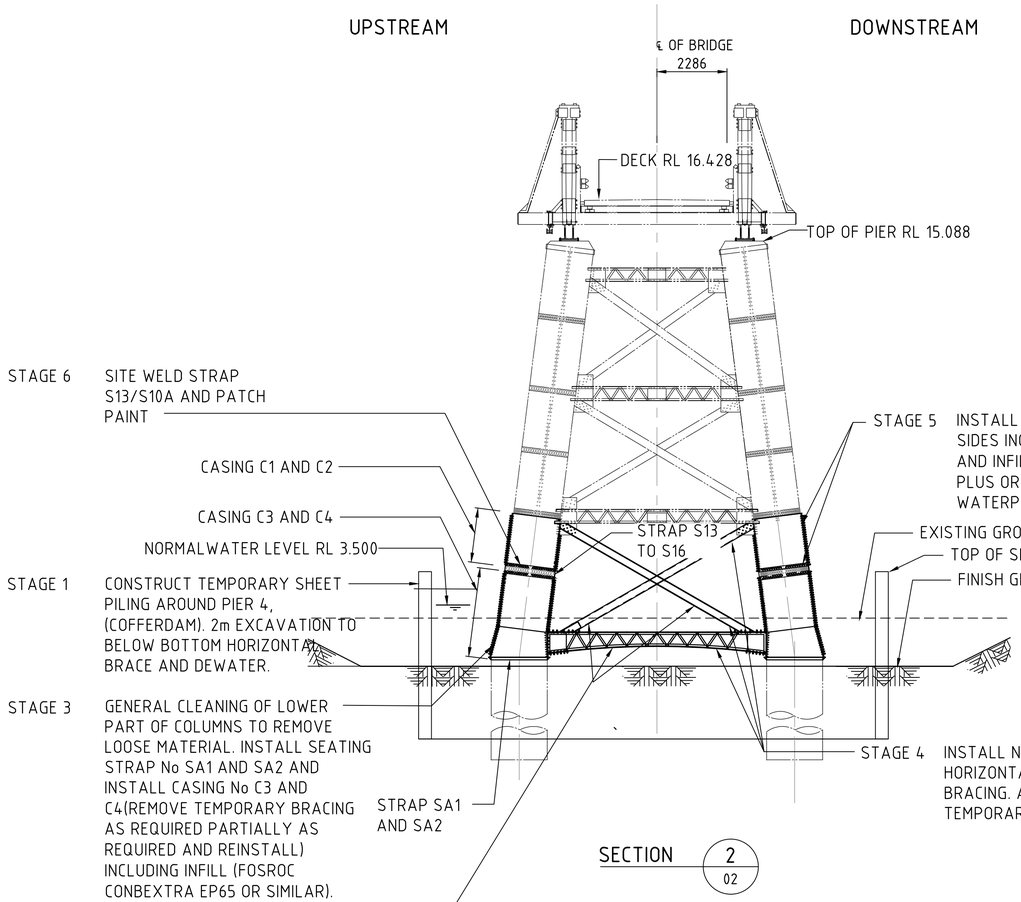
CLIENT SYDNEY REGION
NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

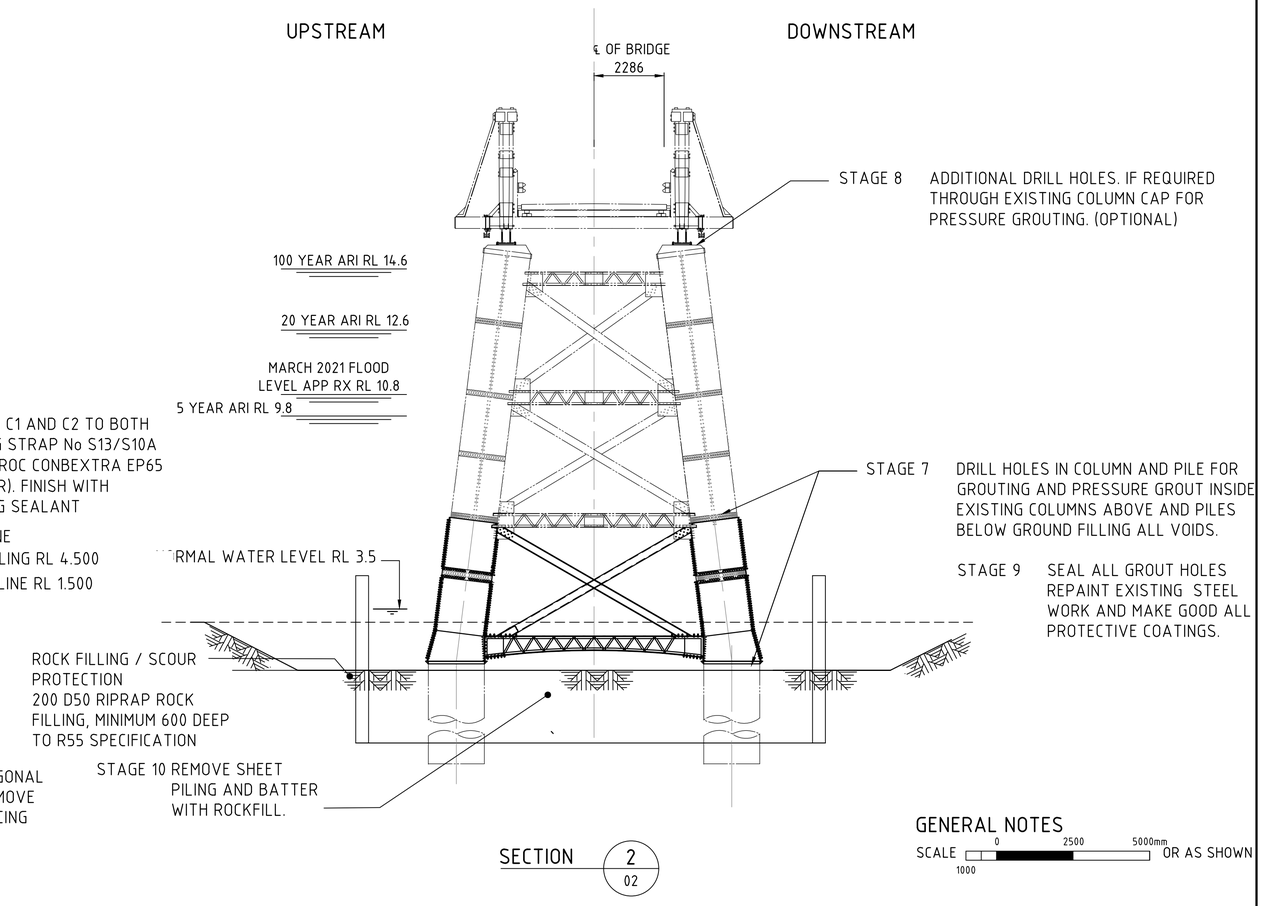
DRAWING SET No DS2021/00195
BRIDGE No B00413
APPROVED DESIGN QA RECORDS
DIRECTOR
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 15 ISSUE 1
CAD No

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FILE PATH: C:\BA\data\2021-05-26-dwg-REV 1+ISSUE-H2020_DS_BR_0015-MISCELLANEOUS STEEL DETAILS.dwg
PLOTTER: HP DesignJet T1700dr
PEN TABLE: ----



SECTION 2/02



SECTION 2/02

GENERAL NOTES

SCALE 0 1000 2500 5000mm OR AS SHOWN

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

CONSTRUCTION STAGING

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CLIENT SYDNEY REGION — NSW GOVERNMENT Transport for NSW

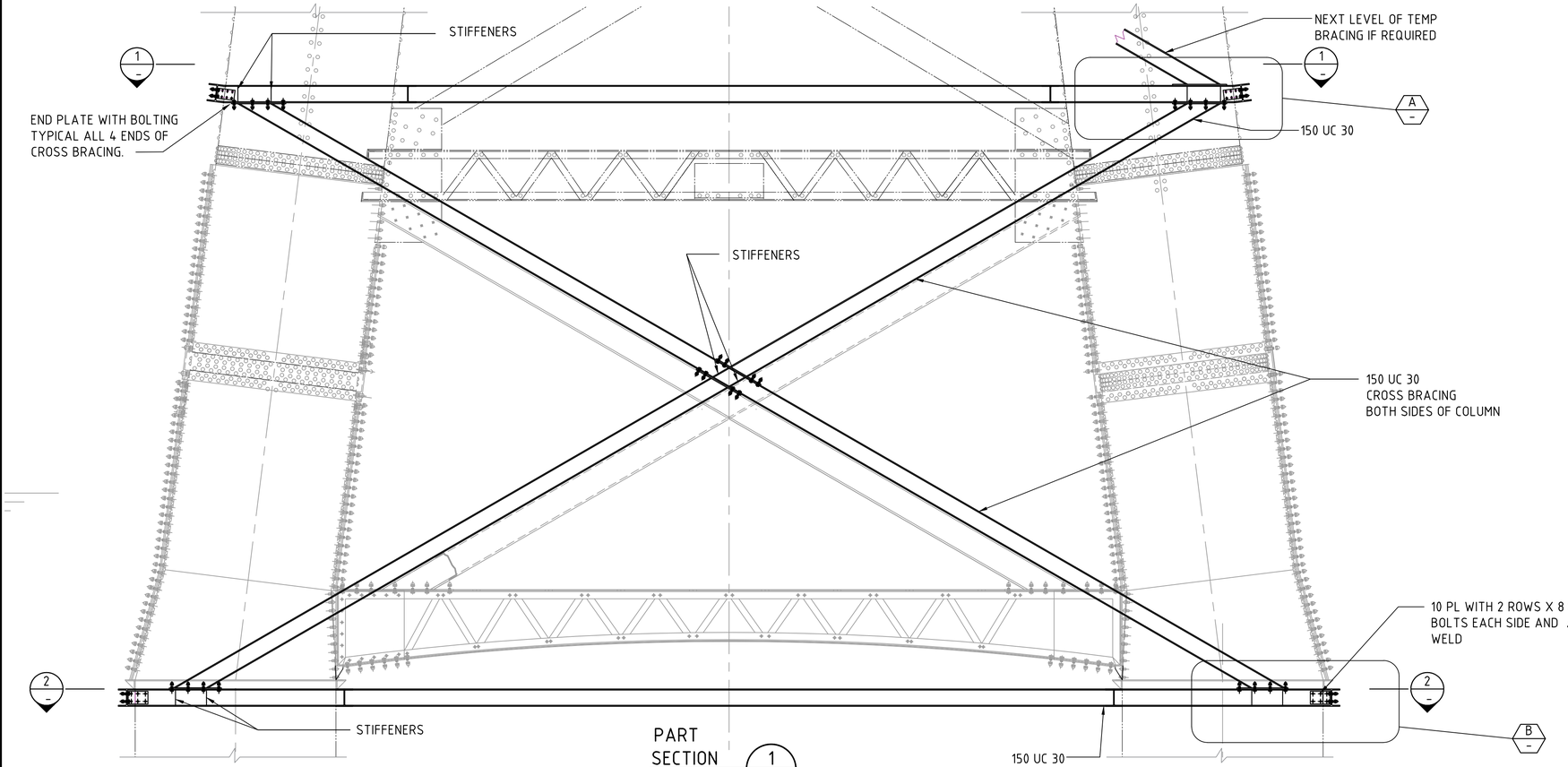
	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD
DRAWING	G. KRISHNASAMY	P. KEOGH

APPROVED DESIGN QA RECORDS
DIRECTOR

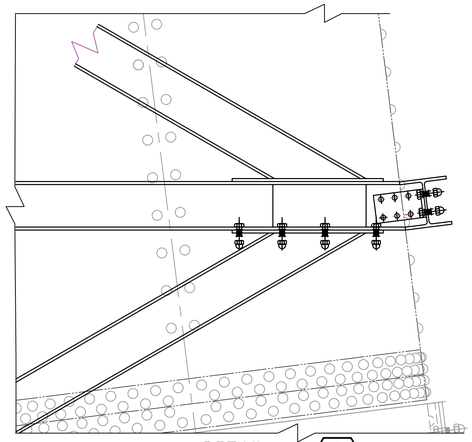
DRAWING SET No DS2021/00195
BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 16 ISSUE 1
CAD No

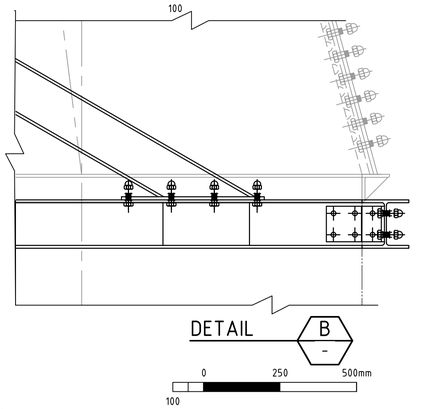
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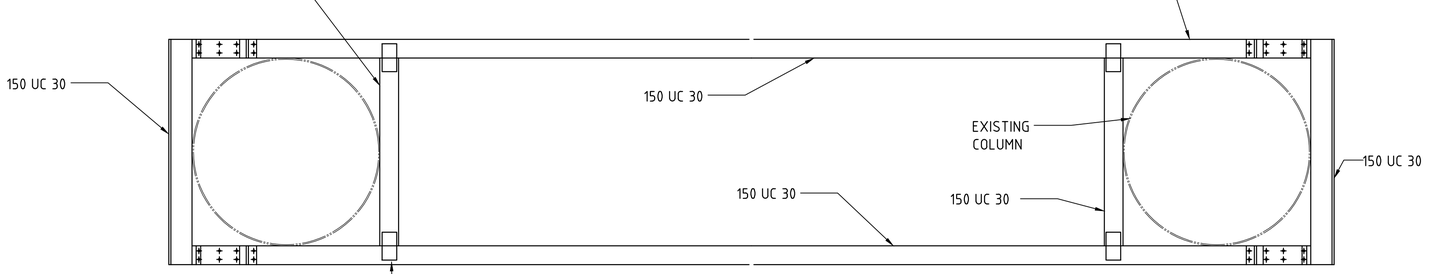
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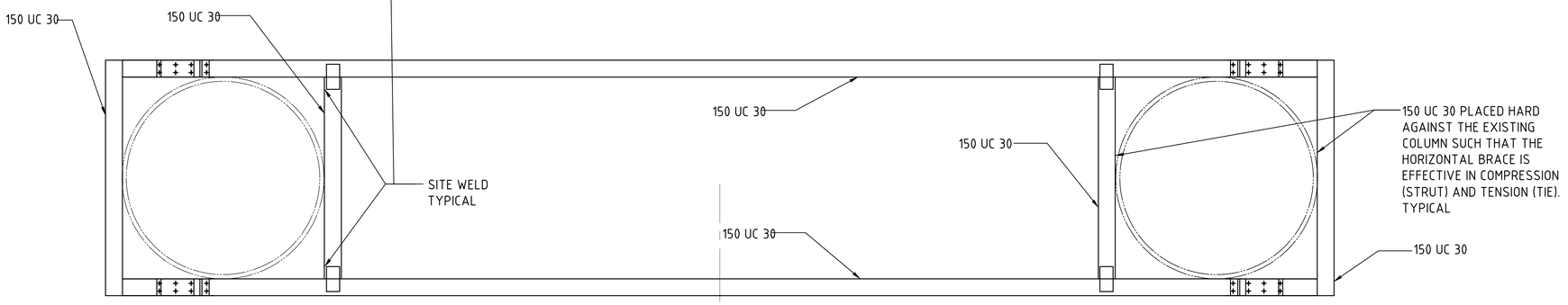
PART SECTION 1/02







VIEW 1/-



VIEW 2/-

GENERAL NOTES

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THE DESIGN, SUPPLY AND INSTALLATION OF TEMPORARY BRACING IS THE RESPONSIBILITY OF THE CONSTRUCTION CONTRACTOR.
TEMPORARY BRACING SHOWN IS INDICATIVE ONLY AND CAN BE ADJUSTED TO SUIT CONSTRUCTION CONTRACTOR'S INSTALLATION METHODOLOGY OF PERMANENT WORKS.
THE DESIGN MAXIMUM ULTIMATE COMPRESSION LOAD OR TENSION LOAD ON BRACING MEMBERS IS 120 KN.
THE DESIGN OF BRACING MEMBERS SHOULD CATER FOR SELF WEIGHT DEFLECTION AND ANY SITE TOLERANCE REQUIRED.
THE BOLTED TEMPORARY CROSS BRACING CAN BE REMOVED AND THEN REINSTALLED TO ALLOW FOR ACCESS WHEN INSTALLING PERMANENT WORKS.
FOR GENERAL NOTES RELATING TO THIS SHEET,REFER TO SHEET No 01.

ISSUE	DATE	REVISION	PREP	CHK	AUTH
1	21-07-21	ISSUED FOR CONSTRUCTION	G.K.	C.S	M.M.

MAIN ROAD No 181 — CITY OF HAWKESBURY

BRIDGE OVER MACDONALD RIVER AT ST ALBANS REHABILITATION OF PIER 4

TEMPORARY BRACING

MU GROUP TRANSPORT AND INFRASTRUCTURE
Level 4, 23/33 Mary Street,
Surry Hills NSW 2010
T 02 8095 6418
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DM ROADS

CLIENT SYDNEY REGION
NSW GOVERNMENT Transport for NSW

	PREPARED	CHECKED
DESIGN	C. SOOSAPILLA	Dr J MULLARD (Lindon Dynan)
DRAWING	G. KRISHNASAMY	P. KEOGH

APPROVED DESIGN QA RECORDS
DIRECTOR
CAD No

DRAWING SET No DS2021/00195
BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 17 ISSUE 1

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Appendix D – Statement of Heritage Impact

St Albans Bridge Conservation Works Stage 2 (revised)

Statement of Heritage Impact (revised)

Report to Ventia on behalf of Transport for NSW

June 2023

artefact

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Document history and status

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2	02/21	Hills Environmental			Draft V1
3	27/06/23	Josh Symons	Josh Symons	14/06/2023	Draft V2
4					

File name:	St Albans Bridge Rehabilitation Stage 2 SoHI (Revised)
Project name:	2023 St Albans Bridge Rehabilitation
Author:	Jordan Wilson-Aarsen (V2), Elanor Pitt (v1), Josh Symons (v1)
Project manager:	Bronwyn Hanna (v2) Josh Symons (V1)
Project number:	230795
Name of organisation:	Artefact Heritage
Document version:	Draft

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EXECUTIVE SUMMARY

St Albans Bridge is listed on the State Heritage Register (SHR) (#1480), and the proposed works are part of an ongoing maintenance program for heritage-listed timber truss bridges being undertaken by Transport for New South Wales (TfNSW).

In 2020 Artefact Heritage prepared a non-Aboriginal (historic) Statement of Heritage Impact (SoHI) for Stage 1 of the St Albans Bridge project for investigation works. The Stage 1 SoHI concluded that the works would have no / neutral heritage impacts and could proceed without the need for approvals or exemptions from the Heritage Council of NSW.

In 2021 Artefact prepared a non-Aboriginal (historic) Statement of Heritage Impact (SoHI) for Stage 2 of the project. The Draft Stage 2 SoHI identified significant fabric and archaeological potential which might be affected by the proposed conservation works, determined the level of heritage significance for each affected element, assessed potential impacts, recommended mitigation measures to reduce heritage impacts, and identified other statutory obligations with advice on how to manage them. Stage 2 works were not implemented at that time.

In 2023 Artefact has been engaged by Ventia on behalf of TfNSW to revise the 2021 Stage 2 SOHI in response to proposed changes to the planned work as stated in the Ward Civil B413 project plan. The updated scopes include: Under bridge access and track construction, removal of falling trees under the bridge water, pier rehabilitation, sheet piling/cofferdam installation, installation of cover plates over exposed gaps on bridge road deck, Pier 4 abrasive blasting and repainting, replacement of damaged laminates throughout decking and reinstatement of an approximate 2sqm of sandstone blocks on Webbs Creek Abutment (See Appendix 11.2 for Ward Civil Complete Scopes List).

Overview of findings

St Albans Bridge is heritage listed as follows:

- State Heritage Register (SHR#01480)
- TAHE s170 Register (#4300129)
- Hawksbury Council LEP 2012 (#I01480)
- Within the St Albans Conservation Area: Hawksbury LEP 2012 (#C2)

The bridge is in the vicinity of the following heritage listed places:

- Greater Blue Mountains Area, listed on the World Heritage List (WHL) (#917) and the National Heritage List (NHL) (#105999)
- Settlers Arm Inn, listed on the Hawksbury LEP 2012 (#I436)
- Goal, Courthouse and Stables, listed on the Hawksbury LEP 2012 (#440)

This revised analysis of heritage impacts arising from the Stage 2 works concludes they would result in a **moderate direct impact** to St Albans Bridge, resulting from making changes to the structural design of an original component, and **minor visual impacts** to the place. The proposed works would result in **no / negligible direct or visual impacts** to the St Albans Conservation Area and **to** nearby heritage items, including the Greater Blue Mountains Area, the Settlers Arm Inn, the Gaol, Courthouse and Stables. Within the study curtilage there is no evidence of archaeological potential.

Approval pathway

This assessment concludes that despite the aim of the project being to positively conserve the heritage significance of the bridge by ensuring its structural stability, the proposed works will have **moderate direct and minor visual impacts** on the heritage significance of the SHR listed St Albans Bridge over the Macdonald River (SHR # 01480). Therefore, a s60 application for approval by Heritage Council of NSW should be submitted to Heritage NSW for these works, accompanied by this SOHI.

Recommendations and mitigation measures

The following mitigation measures should be enacted to minimise heritage impacts during works:

- Where possible, core drilling into the pier columns should avoid rivets, joints and should be assigned on the internal faces of the pier where possible while ensuring structural safety
- Any and all removed bridge componentry should be reinstated to original located in pre-existing condition, with the exception of structurally faulty material unsafe for continued use. If unsafe for reattached, repairs should be made with suitable patching material and painted to match the existing appearance (the original materials should be labelled and stored in a safe environment)
- Suitable protective materials and barrier layers should be employed to ensure minimal risk lot the original bridge materials during the construction period
- Potential vibration impacts to significant fabric, including rivets, the columns and the diagonal brackets, should be assessed and monitored prior to and during works
- Paint analysis should be utilised to accurately match paint during Stage 2 repainting and data should be provided to the Transport for New South Wales heritage team to inform future repainting works. It is recommended that complete repainting of the pier with paint to match the original paint colour be undertaken as part of Stage 2. Modern paint that is not an accurate match in colour or chemical composition would result in additional intrusive impacts to the St Albans Bridge
- Any scaffolding or enclosures required for the works should be free-standing and should not be fixed to Pier 4 in order to minimise impact to significant fabric. Movable plant should be driven by suitably experienced and qualified operators in order to avoid accidental impacts to significant fabric
- Any further modifications to the works outside the scope of this assessment must be assessed in an addendum to this SoHI
- Prior to the commencement of works, a heritage induction should be prepared for all contractors to complete, which would identify significant fabric and methods to minimise disturbance of significant fabric. The induction should aim to ensure the minimisation of impact to significant fabric
- In the unlikely event of any archaeological finds, all works should cease immediately and a suitable heritage consultant and/or archaeologist should be contacted for advice

- Following the guidance of the RMS *Timber Truss Bridge Conservation Strategy*, the proposed methodologies for Stage 2 rehabilitation works should be discussed in consultation with Heritage NSW to finalise the creative heritage-sympathetic methodologies of rehabilitation for the St Albans Bridge
- The addition of aluminium cover plates bolted over the bridge-road gaps appears to be a predominantly cosmetic action and consideration should be taken for excluding this scope, unless in the case the cover plates offer protection from water or falling debris damage to the infrastructure below

1.0 INTRODUCTION

1.1 Project background

St Albans Bridge is listed on the State Heritage Register (SHR) (#1480), and the proposed works are part of an ongoing maintenance program for heritage-listed timber truss bridges being undertaken by Transport for New South Wales (TfNSW).

In 2020 Artefact Heritage prepared a non-Aboriginal (historic) Statement of Heritage Impact (SoHI) for Stage 1 of the St Albans Bridge project. The Stage 1 works involved the exposure of bracing, piling and geotechnical investigation, taking core samples and paint samples from the bridge. That SoHI concluded that the Stage 1 works would have **nil / neutral** heritage impacts and could proceed without the need for approvals or exemptions from the Heritage Council of NSW under the Standard Exemptions and Minimum Standard of Maintenance and Repair Guidelines.

In 2021 Artefact was engaged by Hill Environmental to prepare a Draft non-Aboriginal (historic) Statement of Heritage Impact (SoHI) for Stage 2 of the project. The Draft Stage 2 SoHI identified significant fabric and archaeological remains which could be affected by the proposed conservation works, determined the level of heritage significance for each affected element, assessed potential impacts to those elements, recommended mitigation measures to reduce heritage impacts, and identified other statutory obligations with advice on how to manage them. Stage 2 works were not implemented at that time.

In 2023 Artefact has been engaged by Ventia (subcontracting to Ward Civil on behalf of TfNSW) to revise the Draft Stage 2 SOHI in response to proposed changes to the planned works. Artefact's scope includes site inspection with explanation of revised works, review of the revised work scope for Stage 2, and updating the 2021 draft SoHI. All site photographs have been captured by Artefact Heritage Consultants unless otherwise stated in image captions.



Figure 1. The Study Area. Source: Artefact 2020

1.2 Study area

The Study Area for the assessment includes the St Albans Bridge, located on Wollombi Road over the Macdonald River, St Albans. The Study Area is located within the Hawkesbury Council local government area (LGA). The Study Area is illustrated in Figure 1.

1.3 Authorship

The first draft of this report was prepared in 2021 by Artefact's Elanor Pitt (Heritage Consultant) with input and review provided by Josh Symons (Principal). This revised version of that SOHI has been prepared by Jordan Wilson-Aarsen (Heritage Consultant and Bronwyn Hanna (Senior Associate), with input and review provided by Scott MacArthur (Principal).

1.4 Scope of Assessment

This SoHI assesses the built heritage impacts of the proposed Stage 2 Rehabilitation of St Albans Bridge on behalf of TfNSW as part of the B413 project being undertaken by Ward Civil with contractual services from Ventia and Artefact Heritage. The scope of works assessed here have been prepared by Ward Civil's Senior Project Engineer, Sean Burke.

2.0 LEGISLATIVE CONTEXT

2.1 Introduction

There are several items of State and Commonwealth legislation that are relevant to the current study. A summary of these Acts and the potential legislative implications follow.

2.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legislative framework for the protection and management of matters of national environmental significance, that is, flora, fauna, ecological communities and heritage places of national and international importance. Heritage items are protected through their inscription on the World Heritage List (WHL), NHL or the CHL.

2.2.1 World Heritage List and National Heritage List

The EPBC Act stipulates that a person who has proposed an action that will or is likely to have a significant impact on a World, National or Commonwealth Heritage site must refer the action to the Minister for the Environment (hereafter the Minister). The Minister would then determine if the action requires approval under the EPBC Act. If approval is required, an environmental assessment would need to be prepared. The Minister would approve or decline the action based on this assessment.

There is one item listed on the WHL in the vicinity of the Study Area:

- Greater Blue Mountains (WHL # 917), located approximately 120m south of the Study Area.

The NHL was established by the EPBC Act to protect places of significant natural or cultural heritage value at a national level. The EPBC Act requires NHL places to be managed in accordance with the National Heritage Management Principles. Under section 15B and 15C of the EPBC Act, a referral must be made to the Department of the Environment and Energy for actions that are likely to have a significant impact on NHL listed properties.

There is one item listed on the NHL in the vicinity the Study Area:

- Greater Blue Mountains (NHL # 105999), located approximately 120m south of the Study Area.

The curtilages for the NHL listing and the WHL listing are the same, and both listing surround the Study Area but do not include it. The nearest boundary of these listings to the Study Area is approximately 120 metres.

2.3 Heritage Act 1977

The NSW *Heritage Act 1977* (Heritage Act) provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items considered to be significant to the State are listed on the State Heritage Register (SHR) and cannot be demolished, altered, moved or damaged, or their significance altered without approval from the Heritage Council of NSW.

2.3.1 The State Heritage Register (SHR)

The SHR was established under Section 22 of the NSW *Heritage Act 1977* and is a list of places and objects of particular importance to the people of NSW, including archaeological sites. The SHR is administered by Heritage NSW, Department of Premier and Cabinet and includes a diverse range of over 1,500 places, in both private and public ownership.

To carry out activities within the curtilage of a place listed on the SHR, approval must be gained from the Heritage Council of NSW by submitting a Section 60 application. In some circumstances, under Section 57(2) of the *Heritage Act 1977*, a Section 60 permit may not be required if works are undertaken in accordance with the NSW Heritage's procedures for *Standard Exemptions* or in accordance with agency specific exemptions or site specific exemptions. Exemptions are generally applicable to works that are minor in nature and with neutral or negligible impacts on the heritage significance of the place.

St Albans Bridge is listed on the SHR:

- St. Albans Bridge over MacDonald River (SHR #1480).

2.3.2 Section 170 Registers

Under the NSW *Heritage Act 1977* all government agencies are required to identify, conserve and manage heritage items in their ownership or control. Section 170 requires all government agencies to maintain a S170 Heritage and Conservation Register that lists all heritage assets and an assessment of the significance of each asset. They must also ensure that all items inscribed on its list are maintained with due diligence in accordance with State Owned Management Principles approved by the Government on the advice of the NSW Heritage Council. These principles serve to protect and conserve the heritage significance of items and are based on NSW heritage legislation and guidelines.

St Albans Bridge is listed on the TAHE / TfNSW / Roads and Maritime Services s170 register:

- St Albans Bridge over MacDonald River (#5051384).

2.3.3 Hawkesbury Local Environmental Plan 2012

The Study Area falls within the Hawkesbury LGA and is administered under the Hawkesbury LEP 2012. The Hawkesbury LEP 2012 aims to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views; and to protect archaeological sites. The LEP stipulates development controls in relation to development proposed on or near heritage listed properties, archaeological sites, or Aboriginal places of heritage significance. The relevant DCP for the Study Area is the Hawkesbury DCP 2012.

The following heritage listed items on the Hawkesbury LEP 2012 are located within the Study Area:

- St Albans Bridge over MacDonald River (LEP # I01480)
- St Albans Conservation Area (LEP # C2)

The following heritage listed items on the Hawkesbury LEP 2012 are located in the vicinity of the Study Area:

- Settlers Arm Inn (LEP # I436), located 85m north of the Study Area

- Gaol, courthouse and stables (LEP # I440) located 100m west of the Study Area

2.4 Summary of heritage listings

Table 1 provides a summary of heritage listed items within and in proximity to the Study Area. Several heritage items in this assessment are listed on multiple heritage registers with differing curtilages and these items have been grouped in the table below.

The locations of these items and their curtilages are illustrated in

Table 1. Heritage listings near the Study Area

Heritage item	Listing	Address	Significance	Proximity to Study Area
St Albans Bridge over MacDonald River	State Heritage Register (#1480) TAHE s170 (#4300129) Hawkesbury LEP 2012 (#I01480)	Main Road 181, St. Albans,	State	Within
St Albans Conservation Area	Hawkesbury LEP 2012 (#C2)		Local	Within
Settlers Arm Inn	Hawkesbury LEP 2012 (#I436)	1-5 Wharf Street, St Albans	Local	85m
Gaol, Courthouse and Stables	Hawkesbury LEP 2012 (#I440)	19 Upper MacDonald Road, St Albans	Local	100m
Greater Blue Mountains	World Heritage List (#917) National Heritage List (#105999)		World National	120m

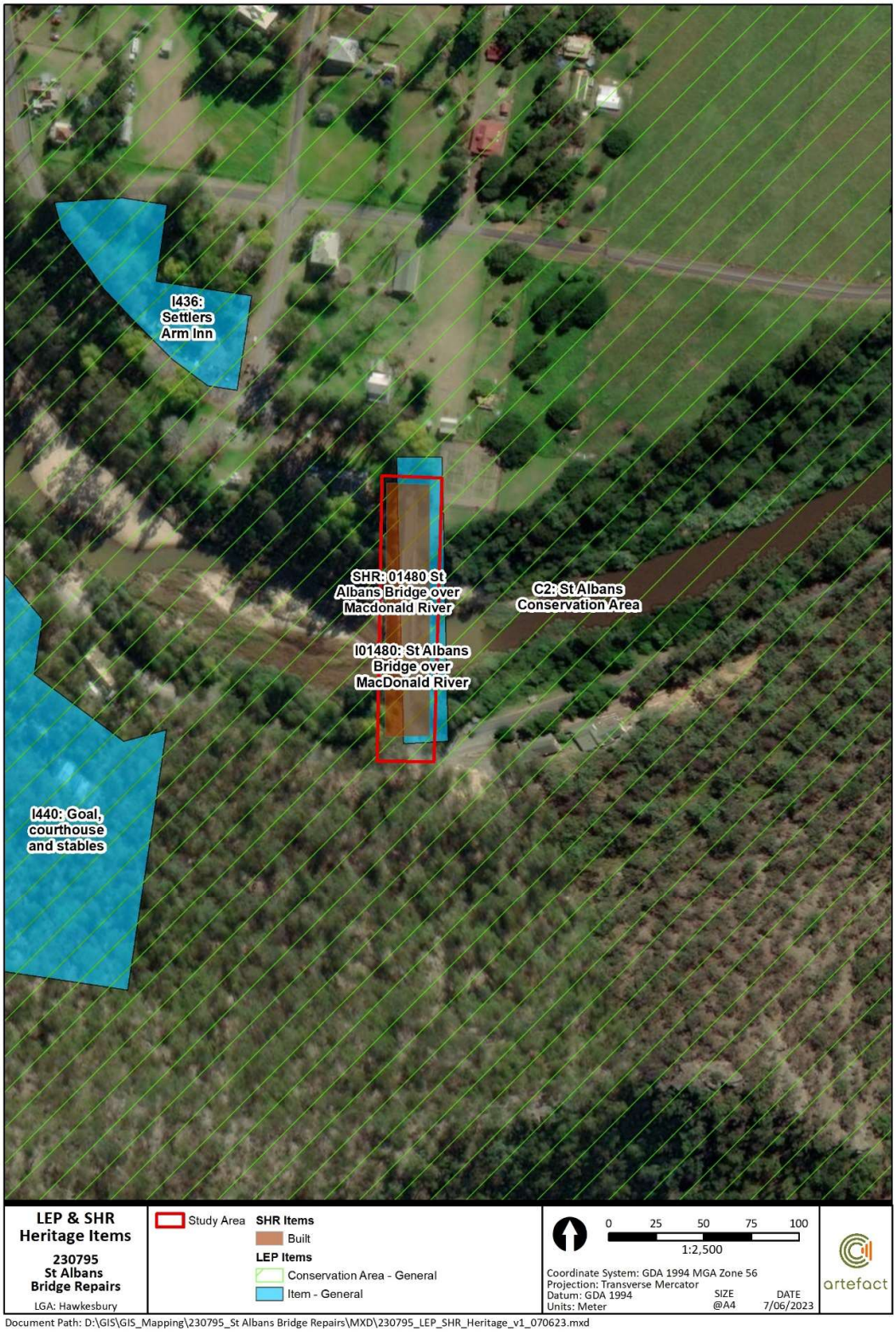


Figure 2. SHR and LEP heritage curtilages relative to the Study Area. (Source: Artefact 2020)

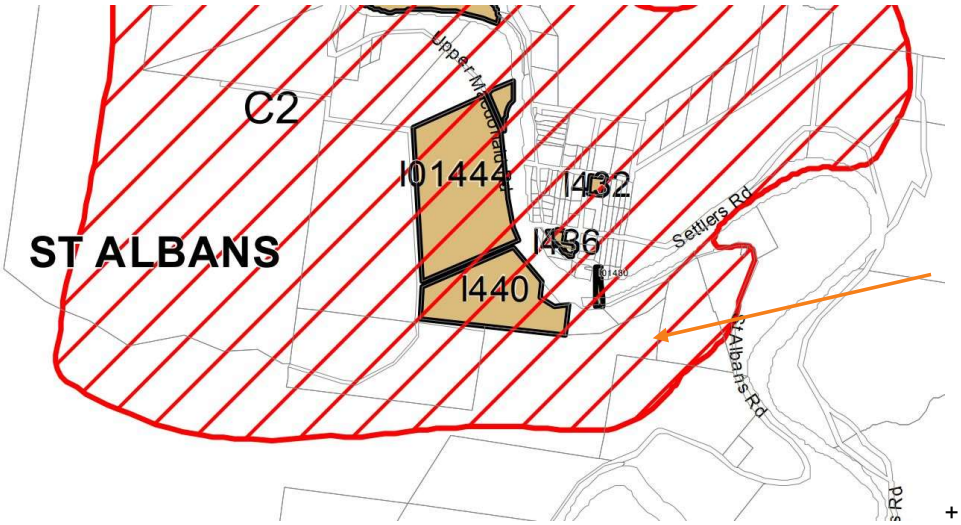


Figure 3. Hawkesbury LEP 2012 HER001 extract of heritage map showing St Albans Bridge (#I1480).

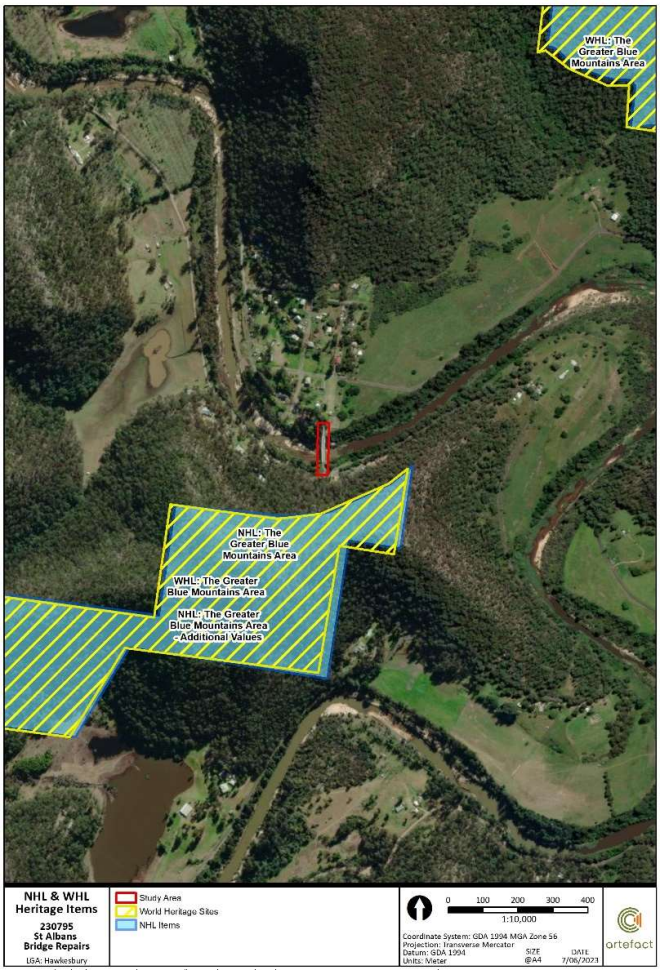


Figure 4. Extract of map of the World Heritage listed Greater Blue Mountains Area relative to the Study Area.

3.0 HISTORICAL BACKGROUND

3.1 Early European exploration and settlement

3.1.1 Early exploration in the Hawkesbury and MacDonald Valley regions

Following the early settlement of the European colony at Sydney Cove in 1788, additional naval explorations occurred with the aim of locating suitable agricultural land to supply food for the colony. The Cooks River, Georges River and Hawkesbury River were explored within the first years of British settlement. The Hawkesbury River was accessed through Broken Bay to the north of Sydney, winding west and eventually becoming the Nepean River, separating the Blue Mountains region from the greater Sydney Basin. Governor Phillip explored the Hawkesbury in 1789 in search of fertile land for agriculture. The area was determined to be suitable, and a small settlement known as Green Hills developed in the Hawkesbury Region from 1794, located to the south-west of St Albans, near Pitt Town and Windsor.[1] While Governor Phillip acknowledged the suitability and fertility of the region for agriculture, he was reluctant to encourage settlement in the region due to its distance from Sydney. By 1976, more than 1000-acres of land within the Hawkesbury region were in cultivation.[2] The settlement was prosperous and successful in crop harvesting, however, the frequent flooding of the Hawkesbury River which made the area so fertile also resulted in the loss of crops and regular destruction of farmland and buildings.

Following Lachlan Macquarie's appointment as Governor of New South Wales in 1810, the Hawkesbury region prospered. Macquarie had prioritised agriculture because of inconsistent food supplies, and he showed great interest in the development of the Hawkesbury region. He established five towns in the Hawkesbury Region which were referred to as the 'Macquarie Towns' – Castlereagh, Pitt Town, Windsor, Wilberforce, and Richmond.[3] To minimise impacts from flooding, Macquarie encouraged settlers to build on the higher grounds away from the floodplain.

From the early nineteenth century, the Hawkesbury River around the Green Hills area was crossed by a punt. The river provided a suitable transportation method for ships between Windsor and Sydney via Broken Bay. A shipbuilding industry developed in the western portion of the Hawkesbury near Wilberforce and Pitt Town. These ships sailed past Wisemans Ferry at the northernmost extent of the Hawkesbury, where a small town and river port developed in the early 1810s. By 1812, however, there were complaints regarding the state of agricultural produce, such as wheat, upon its arrival in Sydney following the long journey by boat.[4] Existing roads between Prospect and Windsor became increasingly popular for agricultural transport, as travel by road was shorter, less dangerous, and more reliable.[5] Following the development of the settlement at Newcastle and throughout the fertile Hunter Valley, plans were put in place for the construction of a road between Sydney and Newcastle.

An expedition led by William Parr, Ben Singleton and John Howe set out from the St Albans area around 1817, creating a track north from the Macdonald River which became known as the Bulga Road, and later, Putty Road. It extended west through Wollombi and Cessnock, following valleys and ridges, and eventually became an important route for transporting stock between Sydney and Newcastle.[6] The creation of this route encouraged increased migration into the Hawkesbury, Hunter Valley and Liverpool Plains. Settlement and development in the area increased in the 1820s and 1830s following the construction of the Great North Road through Wisemans Ferry, which passed

[1] St. Albans Bridge over MacDonald River', State Heritage Register listing entry, State Heritage Inventory, Heritage NSW website.
[2] Op. Cit.
[3] Op. Cit
[4] Proudfoot, H., 2017. *The Hawkesbury – A Thematic History*, p.10.
[5] Op. Cit.
[6] Op. Cit., p.11.

near St Albans on the way to the Hunter Valley. The Great North Road took over ten years to construct even with large gangs of convicts working at work.[7] The construction involved stonework buttresses, culverts, bridges and retaining walls of up to nine metres, resulting in an incredible feat of construction that is now World Heritage Listed.[8] At Wisemans Ferry, the two portions of the road either side of the Hawkesbury River were connected by the cable ferry that had been constructed by Solomon Wiseman in 1827.[9] Despite the effort of construction, the Great North Road was isolated and distant from reliable watercourses and existing settlements.[10] The route through St Albans was preferred by local settlers, resulting in the early growth of the town.[11]



Figure 5. River scene on the Hawkesbury River near Windsor, 1813. Engraving by Phillip Slaeger. Source: State Library of New South Wales



Figure 6. Great North Road pass above Wisemans Ferry by Conrad Martens, 1839. Source: National Gallery of Victoria

[7] NSW Government, 2019. 'Australian Convict Sites – Old Great North Road.' NSW Department of Planning, Industry and Environment webpage.
[8] Op. Cit.
[9] 'Cable Ferry Crossing, Wisemans Ferry', TAHE S170 listing entry, State Heritage Inventory, Heritage NSW website.
[10] NSW Government, 2019, Op. Cit.
[11] NGH Environmental 2013. *Rehabilitation of St Albans Bridge abutment A and decking on spans 1, 2, 3 and 6. St Albans NSW Statement of Heritage Impact*, p.7.

3.1.2 St Albans

The development of settlements and industry in the Hawkesbury Region had increased throughout the early nineteenth century, resulting in populous towns around Windsor and Wisemans Ferry, however, the nearby Macdonald Valley remained relatively isolated. Early tracks and roads were poor and early colonial surveys sometimes failed to include the scattered farming communities throughout the region.[12] The first recorded European use of land in the Macdonald Valley and St Albans area was in 1803 by the Cross Brothers, who utilised the land for grazing.[13]

By 1810, a track known as the Old Bullock Road had been developed by drovers who crossed the Macdonald River at flats. By 1814 the population in the MacDonald Valley was estimated at between 60 and 100 people.[14] By 1824, some Crown land known as Wollambine Common or St Albans Common was dedicated by Governor Brisbane, located on the eastern side of the Macdonald River and north of the current town of St Albans. It was accessed via the Wollombi Road and utilised by local landowners whose land could not sustain grazing or crops.[15] The common featured grassy verges on either side of the river which provided suitable and reliable feed for cattle.

Following the construction of the Great North Road through Wisemans Ferry farmers began to move their cattle by ferry down the Macdonald River to Wisemans Ferry, where they could then be transported to Windsor or Sydney.[16]

In 1833, the area was surveyed by Felton Matthew. This survey showed that several small farms had been established along the Macdonald River by a mixture of emancipists and free settlers, and there were 86 landowners living in the vicinity of the Wollambine Common.[17] The area was first called Macdonald, although by 1846 St Albans had developed its identify as a separate town. In the 1846 census St Albans was recorded as including four houses and 21 residents, while 1000 and 1200 people were recorded as living in the broader area of the valley.[18] The primary industry in the area was grazing and farming, although it does not appear to have been very prosperous. By the 1850s the population of the Macdonald Valley was decreasing dramatically when residents likely travelled to the gold fields.[19] While the population remained small, a town had developed around key buildings including a school, post office, church and inn.[20] Investigation in 1842 had determined that the dedication of the common had never been completed, and in 1853 the common was officially dedicated and placed under the control of trustees from the town.[21]

The area was well connected to Windsor and ultimately Sydney by the Macdonald River, which was deep enough to allow substantial trade boats to travel via St Albans. The characteristic flooding of the Hawkesbury River, which had encouraged settlers to build on higher land, became more frequent and devastating in the mid-nineteenth century. The Hawkesbury flooded fifteen times between 1857 and 1879,[22] resulting in the destruction of the riverbanks and the alteration of the streambed of the Macdonald River.[23] The former river routes were no longer viable for shipments, resulting in the increased importance of road connections throughout the Hawkesbury region and Macdonald Valley.

[12] NGH Environmental, 2013, Op. Cit., p.7.
[13] Proudfoot, 2017, Op. Cit., p.61.
[14] NGH Environmental 2013, Op. Cit., 7.
[15] Hawkesbury People and Places 2020, Op. Cit., p.61.
[16] NGH Environmental 2013, Op. Cit., 8.
[17] NGH Environmental 2013, Op. Cit., p.7; Proudfoot, H., 2017, Op. Cit., p.61.
[18] Op. Cit.
[19] Op. Cit.
[20] Proudfoot, 2017, Op. Cit., p.40.
[21] Hawkesbury People and Places 2020, Op. Cit.
[22] Proudfoot, 2017, op. Cit., p.17.
[23] NGH Environmental 2013, Op. Cit., p8.

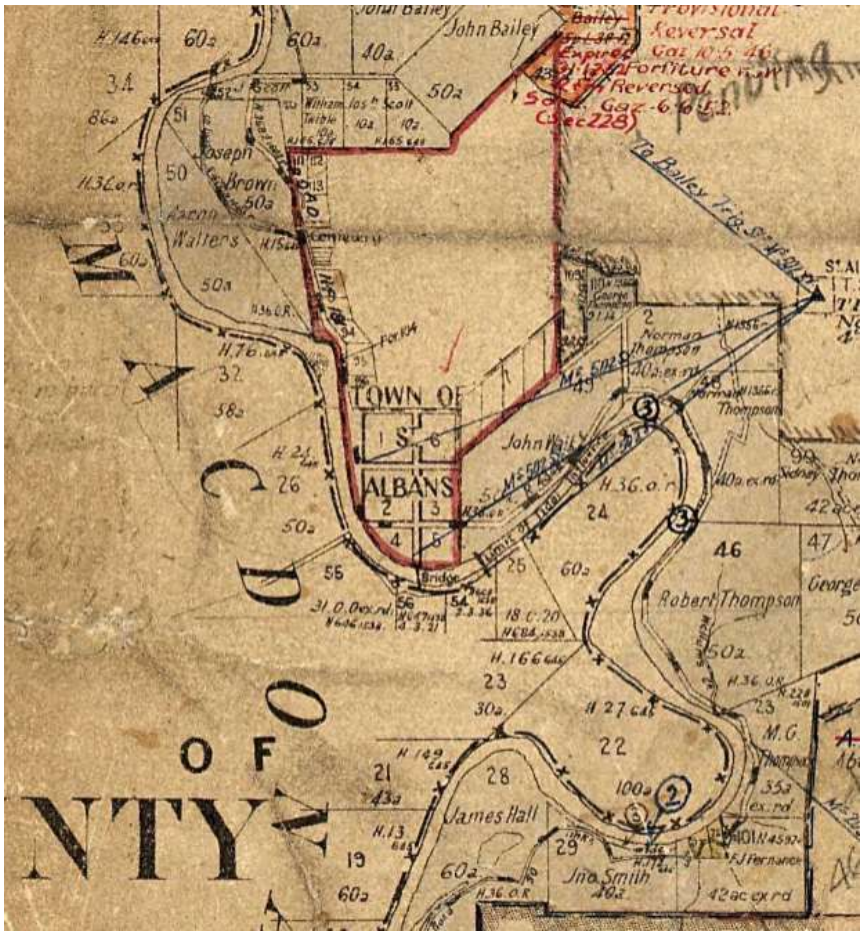


Figure 7. Parish of St Albans, County of Northumberland, n.d. Source: Historic Land Records Viewer

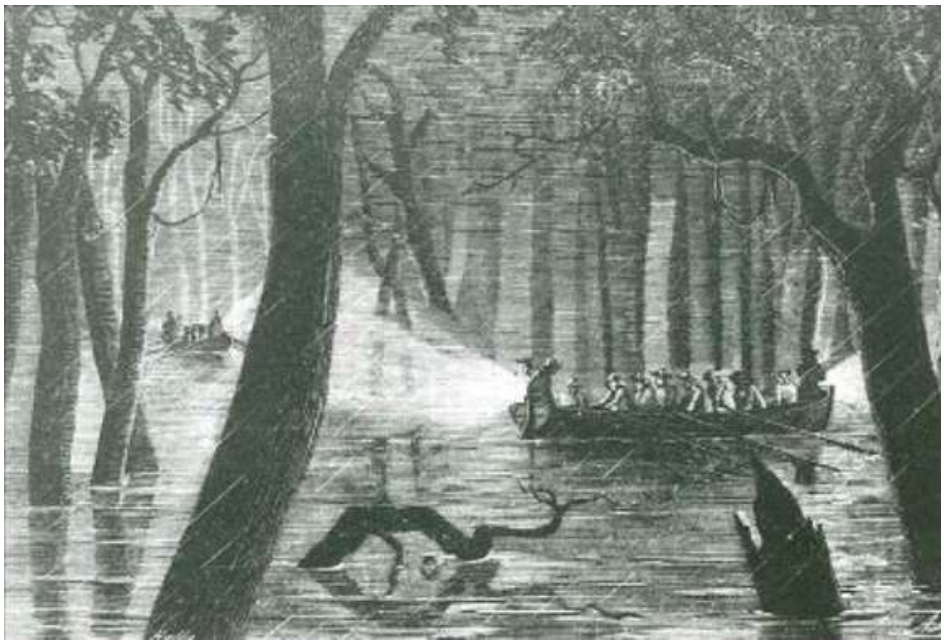


Figure 8. Engraving of the Floods on the Hawkesbury, 1867. Source: State Library of New South Wales, *Illustrated Sydney News*

3.2 Connecting the colony

3.2.1 Bridges within Greater NSW

Following the settlement of the colony in 1788, shipping along major rivers served as the primary method of transportation of people and produce.[24] Increased settlement away from Sydney and in various regions encouraged the configuring of a system of roads, unofficially initiated by locals transporting stock and produce.[25] The broader geography of the Sydney Basin and surrounds, with various major rivers, valleys and ranges, required creative transportation solutions, such as bridges and cable-ferries to cross watercourses where required. In the 1830s, the Great North Road was completed with at least two substantial timber beam bridges built across rivers, constructed on masonry piers,[26] including the Thomas James Bridge, which remains the oldest in-use bridge in Australia.[27]

Some of the earliest bridges in the colony were stone arch bridges constructed along the Western Road by the engineer David Lennox, such as at Prospect and Lapstone.[28] While many roads and bridges were constructed in conjunction with visionary colonial schemes for greater connection of settlements, many were motivated by the desperation of farmers and travellers for faster methods of transporting their produce to the markets in Sydney.[29] In the early nineteenth century the colonial timber-getting industry was prominent and, with extensive and seemingly endless supplies of bushland for logging, timber was utilised for infrastructure throughout much of the nineteenth century.[30] Timber bridges, and eventually timber truss bridges, became prominent throughout the colony.

3.2.2 Timber truss bridges

From the mid-nineteenth century to the early twentieth century, timber truss bridges became the preferred construction method of the NSW Public Works Department. They were relatively cheap, used mostly local materials when native timber resources were extensive and readily available. Stone or steel and iron bridges were expensive and required extensive manufacturing and mining or quarrying processes. Furthermore, steel was imported from England until the mid-20th century, greatly increasing the construction costs and timeframes.[31] The truss bridge type is comprised of several pieces of timber, primarily aligned in triangle shapes which function as joints.[32] Each piece of timber has a significant function in holding the bridge together, and carries either tension – a pulling force – or compression – a pushing force. As such, the successful construction of a truss bridge is reliant on an extensive knowledge of physics.[33] Truss bridges became popular on railway lines, however, secure funding for effective road bridges was less reliable.[34]

Timber truss road bridges were popular throughout the colony and were all designed and engineered by the NSW Department of Public Works. Each leading designer and engineer created small changes to the truss bridges, resulting in five distinct types of truss bridges within New South Wales.[35] The first

[24] Brassil, T., Coltheart, L., and Rex Glencross-Grant, 2012. 'Introduction' in Transport Roads & Maritime Services, *Timber Truss Bridge Conservation Strategy*.
[25] *Op. Cit.*
[26] *Op. Cit.*
[27] Wisemans Ferry Forgotten Valley Association, n.d. 'Thomas James Bridge.' *Wisemans.org.*
[28] Brassil et al., Op. Cit.
[29] *Op. Cit.*
[30] *Op. Cit.*
[31] NGH Environmental 2013, Op. Cit., p.8.
[32] *Op. Cit.*
[33] *Op. Cit.*
[34] *Op. Cit.*
[35] *Op. Cit.*

was the Bennett Truss, developed by Chief Engineer and Commissioner for Roads and Bridges William Bennett between 1858 and 1886. During this period, over 150 truss bridges were built throughout the state.[36] The second phase timber truss bridge was referred to as the McDonald Truss bridge, which was designed to cope with heavier maximum weights.[37] Approximately 90 were constructed throughout the state between 1886 and 1894.[38]

From 1894 to 1929, the Allan Truss bridge was a popular, frequently used design, constructed under the leadership of Percy Allan at the Department of Public Works.[39] Allan had worked under both Bennett and McDonald. His revised bridge design was largely driven by the scarcity of large timber resources to make trusses, and cuts to funds as a result of the economic depression of the 1890s.[40] The fourth version was the DeBurgh truss bridge, a rare style of truss bridge designed by Ernest DeBurgh between 1900 and 1905. Approximately 20 bridges were constructed, eight of which are still extant.[41] The final phase of the timber truss bridges was the Dare Truss, which became prominent between 1905 and 1936. The Dare Truss combined the positive attributes of the Allan and DeBurgh bridges, while mitigating their problems. The Allan Truss had a tendency for timber bottom chords to come loose, while the DeBurgh bridge's use of metal fabricated parts made it expensive to construct.[42]

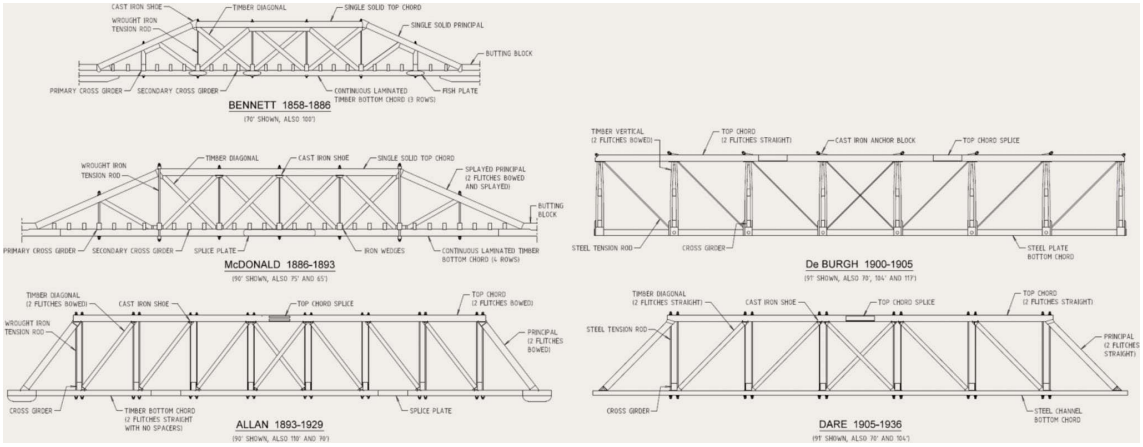


Figure 9. Typology of NSW Timber Truss Bridges, by Jack Pulczynski. Source: The Timber Truss Book[43]

3.2.3 St Albans Bridge

The first St Albans Bridge was a Bennett Truss Design, constructed in 1884.[44] The first bridge was located downstream to the west of the current bridge. Photographs show that the structure was built on extensive timber supports positioned on stone foundations in the riverbed. The timber barriers were relatively short in height and the deck was constructed using timber planks. Early parish maps show the first bridge located approximately in alignment with Wollombi Road. It was destroyed during

[36] Op. Cit.
[37] Op. Cit.
[38] Op. Cit.
[39] Op. Cit.
[40] Op. Cit.
[41] Op. Cit.
[42] Op. Cit.
[43] Pulczynski, J., 2012. 'The five types of NSW timber truss bridge.' In Transport Roads & Maritime Services, 2012. *Timber Truss Bridge Conservation Strategy.*
[44] Gojak, D., 2012. 'A Working Legacy' In Transport Roads & Maritime Services, 2012. *Timber Truss Bridge Conservation Strategy.*

heavy flooding of the Macdonald River in 1889.[45] Much of the riverbed was also heavily eroded and destroyed during the flooding,[46] making it difficult to reconstruct the bridge in the same location. It appears, however, that the old bridge was partially repaired or reused, as no plans were drawn up for the construction of a new bridge until 1901.[47] Alternatively, the river may have been able to be forded at the time. The second bridge was completed in 1903 as a DeBurgh construction.[48] A comparison of parish maps and site plans demonstrates that the new bridge was built approximately 50-70 metres east of the first bridge. The new bridge included exposed timber decking, two timber trusses and four beam spans costing £7,720.[49] The Department of Public Works described the bridge when constructed:

> *This bridge includes two composite truss spans, each of 117 feet [36 metres] centres of bearings. These are the longest composite truss spans yet constructed in the State without overhead bracing, and have proved satisfactory, the vibration under moving loads being very slight. The total length of the bridge is 370 feet [113 metres].*[50]

Pier 4 was constructed from tapered concrete-filled cast iron piles and wrought iron columns which were sunk into the bedrock and braced with steel lattice bracing. Pier 3 was also originally intended to be constructed in the same method as Pier 4, but the design was modified to be constructed from timber to match the rest of the piers due to failing to reach bedrock for the piles at a 60 foot depth.[51] Photographs over time show the iron pier situated in sand, on account of the shallow water level. The opening of the bridge attracted a large crowd and allowed greater connection between Wisemans Ferry and Wollombi in the north.[52]

Conservation and rehabilitation works to the bridge have been undertaken on multiple occasions. The truss decking was replaced with Stress Laminated Timber in 1997-98.[53] An upgrade in 2001 included the replacement of timber planking with Stress Laminated Timber, and timber cross girders were replaced with steel cross girders.[54] Multiple girders and truss members have also been replaced at various stages over the course of the bridge's lifespan.[55] In 2005, timber subsurface piles were replaced with steel and/or concrete piles. Piers three (eastern side of bridge) and five (western side of bridge) were also replaced.[56] In 2013, piers one and two, top cords and verticals were replaced.[57] At this time, the stone abutment – Abutment A – was rehabilitated and much of the asphalt decking was resealed.[58]

In 2000 the "St Albans Bridge over McDonald River" was added to the NSW State Heritage Register (SHR) as part of a group listing of historic road bridges by the NSW Government. In 2023 the St

[45] Op. Cit.
[46] NGH Environmental 2013, Op. Cit., p.9.
[47] NGH Environmental 2013, Op. Cit., p.9.
[48] Gojak, n.d., Op. Cit.; 'A Red-Letter Day at St. Albans'. (1903, July 3). Hawkesbury Herald (Windsor, NSW: 1902 - 1945), p. 5.
[49] NGH Environmental 2013, Op. Cit., p.9.
[50] Roads Department of Public Works 1903, p.58.
[51] NGH Environmental 2013, Op. Cit., p.10; 'New Bridge at St. Albans'. (1903, July 4). Windsor and Richmond Gazette (NSW: 1888 - 1961), p.1.
[52] Op. Cit.
[53] NGH Environmental 2013, Op. Cit., p.15.
[54] Op. Cit.
[55] MU Group, 2021, *St Albans Bridge – Pier 4 Over MacDonald River at Wollombi Road, St Albans: Concept Design Report.* Issue 3, January 2021.
[56] NGH Environmental 2013, Op. Cit., p.16.
[57] Op. Cit.
[58] Op. Cit., p.17.

Albans Bridge is in use by mainly local traffic as a road bridge, with a 15 tonne load limit restricting its use by heavy vehicles.

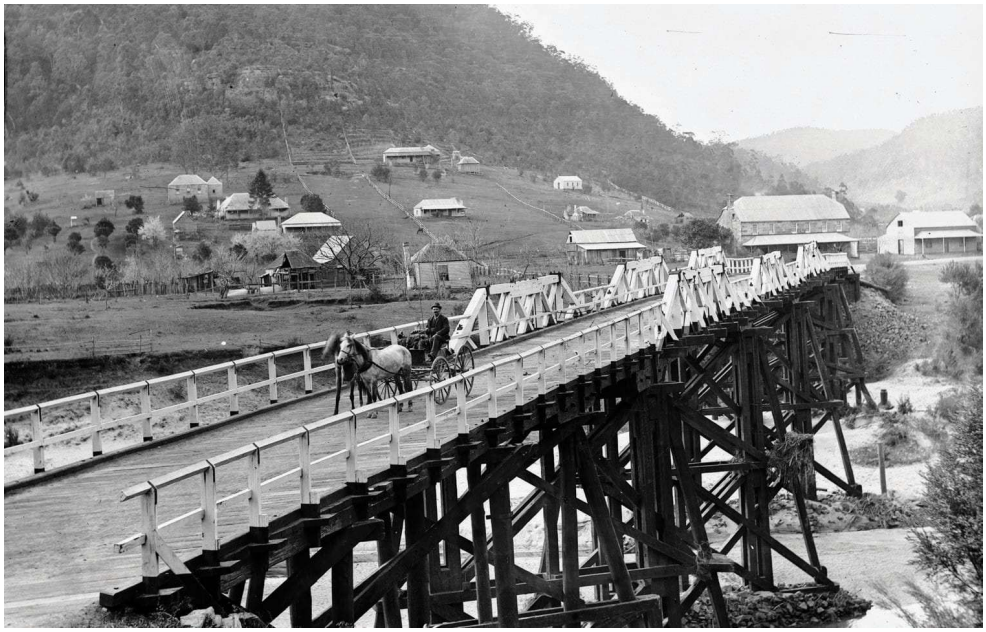


Figure 10. The 1884 Bennett Truss bridge at St Albans. Source: State Library of NSW

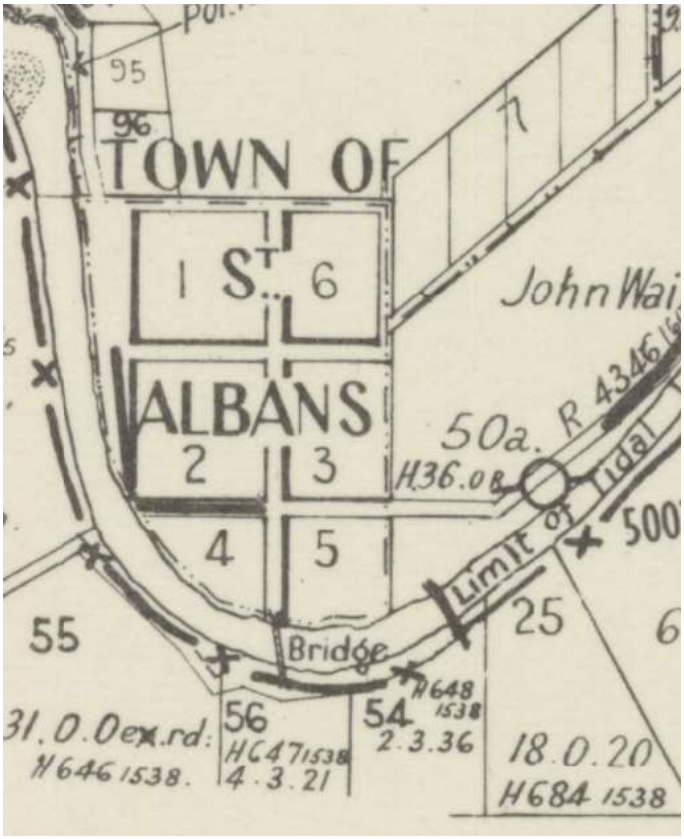


Figure 11. Location of original truss bridge at St Albans, note direct south alignment from road. Source: HLRV

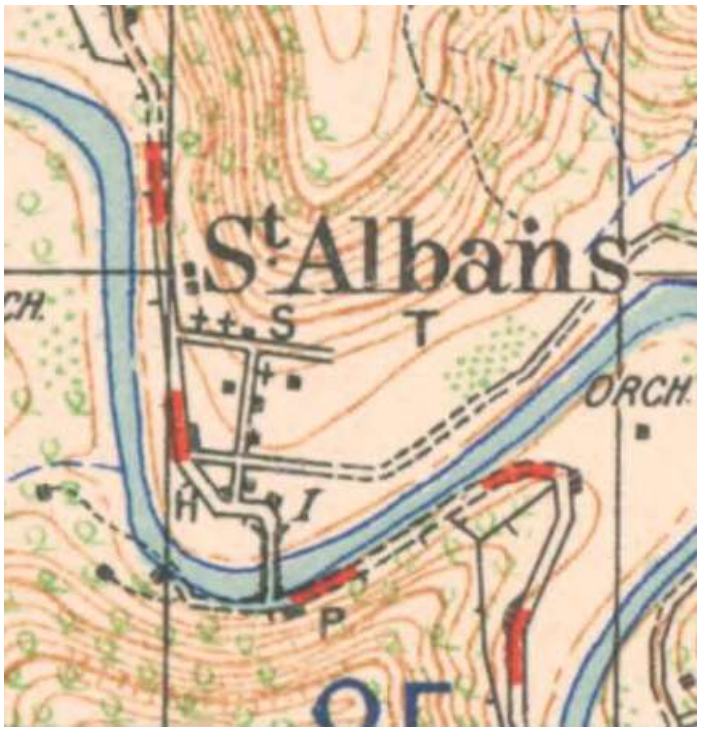


Figure 12. St Albans second bridge location, east of original bridge. Source: National Library of Australia

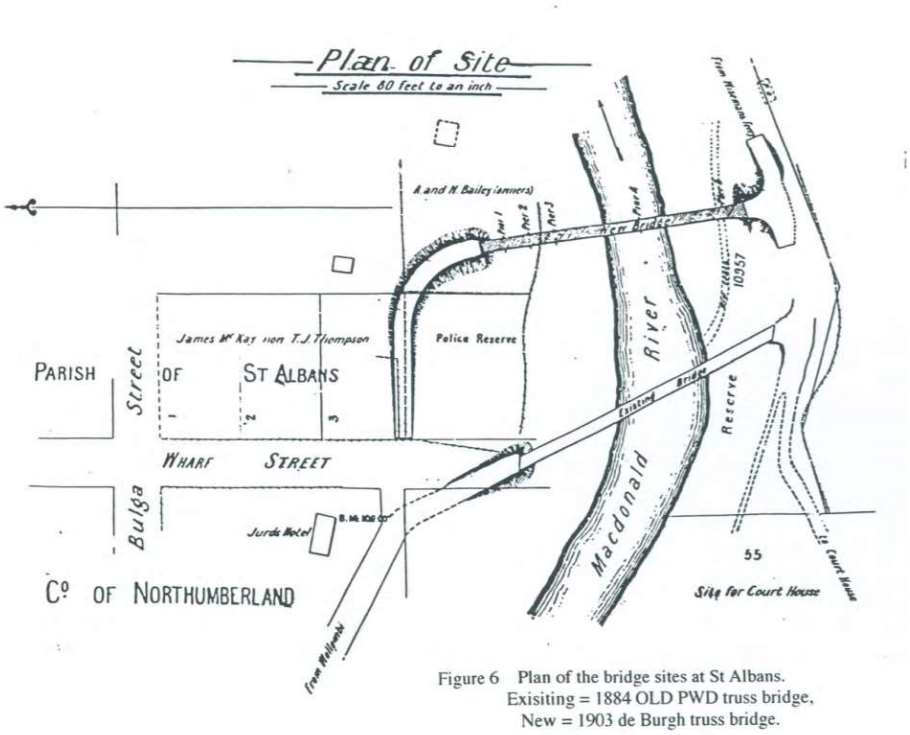


Figure 6 Plan of the bridge sites at St Albans.
Exisiting = 1884 OLD PWD truss bridge,
New = 1903 de Burgh truss bridge.

Figure 13. Plan for the construction of the 1903 and 1884 St Albans Bridge sites. Source: Department of Public Works cited in Fraser 2002

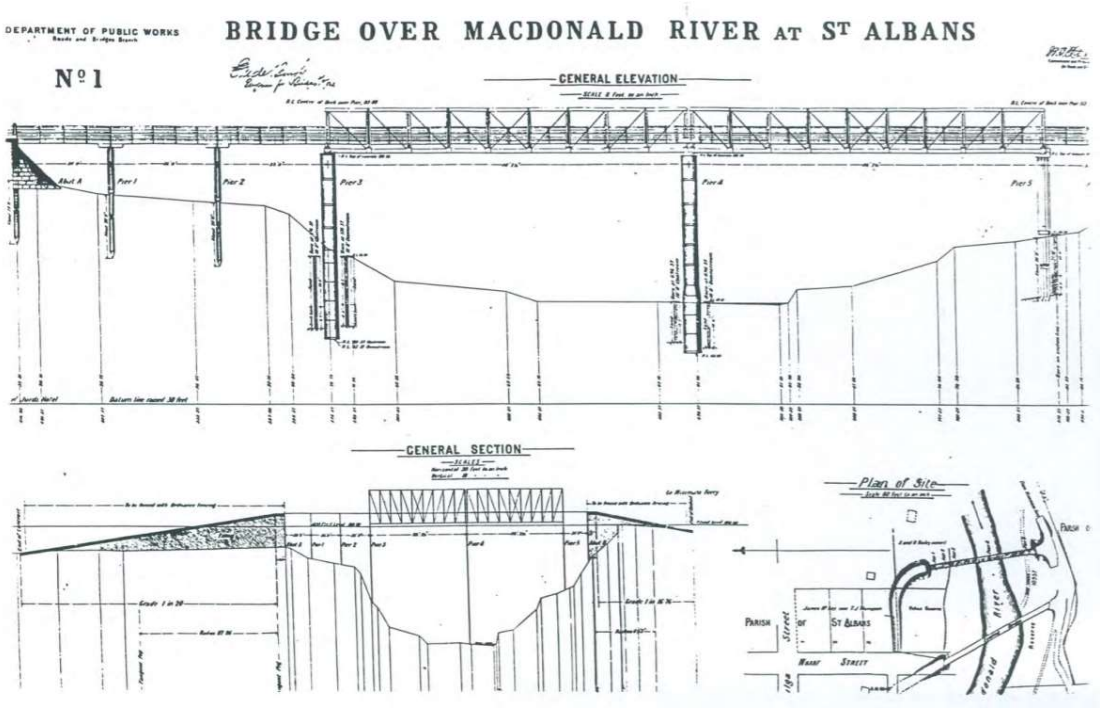


Figure 14. 1901 design drawings for the construction of St Albans Bridge, showing Pier 3 and Pier 4 as wrought iron piers. Source: Department of Public Works cited in Fraser 2002

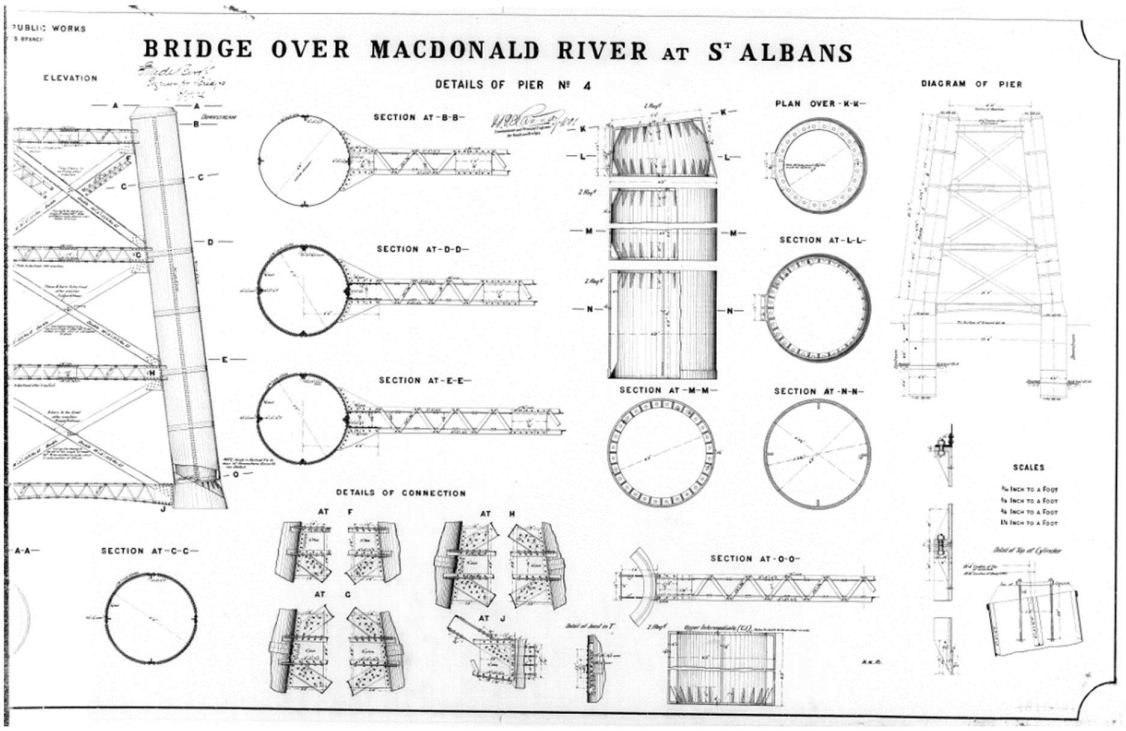


Figure 15. 1901 drawings for the construction of St Albans Bridge wrought iron pier, Pier 4. Source: Department of Public Works

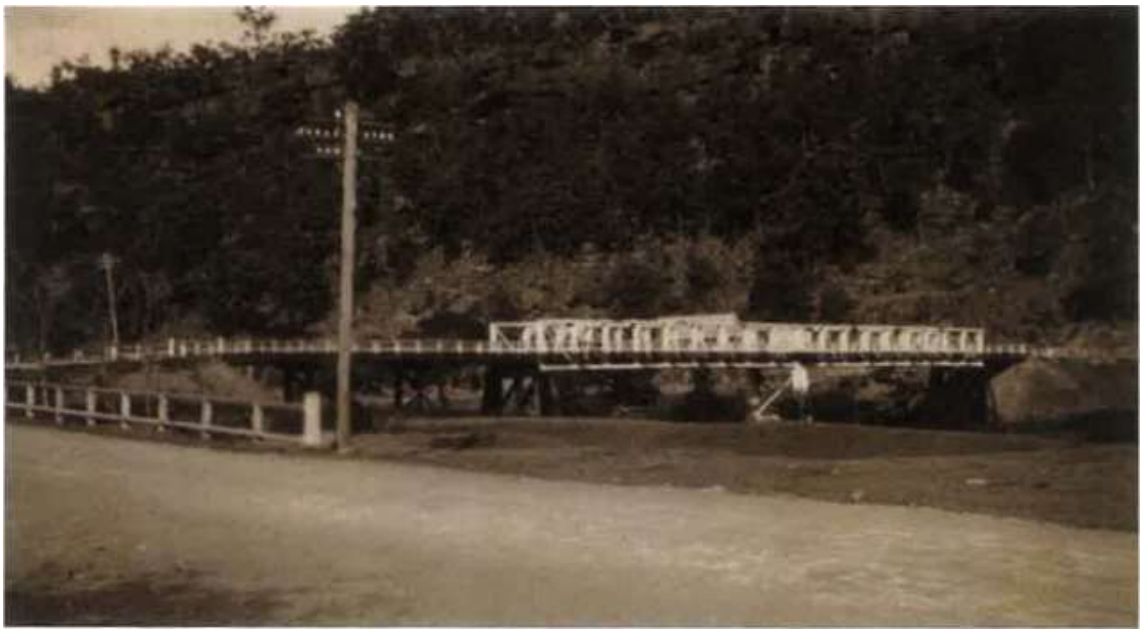


Figure 16. St Albans second truss bridge (the existing bridge), 1929. Source: State Archives of NSW[59]



Figure 17. St Albans second truss bridge, early 1930s. Source: Roads and Maritime Services Archives

[59] Watt, L.G., 1929. 'St Albans Bridge.' *State Archives and Records NSW.*



Figure 18. St Albans Bridge, 1932. Note the wrought and cast-iron pier 4 in the centre of the photograph. Source: Roads and Maritime Services Archives



Figure 20. St Albans Bridge, 1988. Source: Coalfields Local History Association[60]

[60] Sternbeck, P., 1988. 'St Albans Bridge, St Albans, NSW, April 1988.' Coalfields Local History Association on Flickr.



Figure 21. St Albans Bridge, 2017. Source: Houman Hatamian[61]

[61] Hatamian, H., 2017. 'The present St Albans Bridge in 2017, a de Burgh Truss completed in 1902 downstream of the 1884 bridge.'

4.0 PHYSICAL CONTEXT

4.1 Site Inspection

A site inspection was conducted on 23 May 2023 by Jordan Wilson-Aarsen and Bronwyn Hanna of Artefact Heritage. The aim of the site inspection was to examine the area of proposed works, assess the additional project scopes and identify heritage items and heritage significant fabric that may be affected by the project. The inspection was undertaken on foot, accompanied by Ventia representatives Lander Robinson and Nicola Booth, and Ward Civil representative, engineer Sean Burke.

4.1.1 Context

The St Albans Timber Truss Bridge is situated on the Macdonald River at St Albans, connecting Wollombi Road and St Albans Road. The timber truss bridge is located to the south-east of the Rural Fire Service building and the Settlers Arms Inn and to the north of private residences along St Albans Road. The town of St Albans is situated in the Macdonald River valley, with sandstone ridges on either side. The Macdonald River features sandy riverbanks and shallow water beneath the bridge, with significant plantings on the riverbanks, including several jacaranda trees and eucalyptus species.

The bridge was constructed as a De Burgh style timber truss bridge on an approximate north-south axis. The decking of the bridge comprises a sealed asphalt road surface laid over thin modern timber decking with a steel reinforced edge connecting both ends of the bridge with the conjoining road. The modern timber decking, supported with additional steel supports fixed to large cylindrical timber beams, is evident when viewed from below the bridge deck. The vertical timber trusses have been painted white and appear to be in good condition, with black-painted steel cross beams diagonally placed between each truss. Modern steel road barriers have been installed on either side of the bridge. The timber decking, timber beams, steel cross beams and vertical timber trusses appear to have been replaced with modern replicas. The steel lattice horizontal chords are extant at the ends of the bridge and adjacent to Pier 4, but have been replaced with open steel chords along the rest of the bridge.

At the base of the St Albans truss bridge, the original Webbs Creek Abutment is present at the northern side of the bridge, functioning as a retaining wall. The southern side of the bridge is supported by the existing sandstone cliff face. The vertical face appears to have been modified slightly, as a cobble-stone effect is present, however, major excavations do not appear to have taken place as the cliff face is largely consistent with the adjacent riverbed topography. Four truncated timber poles project from the surface of the water between Pier 4 and 5, but they do not appear in historical drawings and photographs. It is unclear as to when they were installed and if they relate to an earlier structure or redundant temporary structural support for the bridge.

The timber piers are modern replacements, installed during bridge rehabilitation works in 2005 and 2013. Each of the timber piers are situated on concrete footings. Pier 4, constructed from concrete-filled cast iron piles and wrought iron columns with steel lattice bracing, is situated in the approximate centre of the bridge within the Macdonald River. The iron pier is original; however, small modern patches are evident and have been painted light blue. It is unknown whether these patches are evidence of previous investigative works or repair works. The aboveground tapered columns of Pier 4 have been confirmed to have been constructed from wrought iron cylinders filled with a mix of sandstone and cementitious material, based on recent material analysis.[62] The foundation of Pier 4

[62] MU Group, 2021. *St Albans Bridge – Pier 4 Over MacDonald River at Wollombi Road, St Albans: Concept Design Report.* Issue 3, January 2021.

comprises two vertical concrete-filled cast iron piles sunk through the natural sand base of the river down to solid bedrock. Extensive rivets are evident in vertical and horizontal alignments around the iron pier, suggesting that the pier is constructed from multiple sheets of steel. Noticeable flaking of the paint and corrosion of steel is evident along the column shafts and bracing.



Figure 23. Wollombi Road, St Albans, 2020



Figure 24. Macdonald River plantings adjacent to the St Albans Bridge, 2020



Figure 25. Macdonald River, looking east, from the truss bridge, 2020



Figure 26. St Albans timber truss bridge, 2020



Figure 27. St Albans bridge trusses and decking, 2020



Figure 28. St Albans bridge decking, 2023



Figure 29. Timber decking from below with view of stringers (large wooden logs supporting timber deck), 2020



Figure 30. Timber decking from below, 2023



Figure 31. Vertical timber truss and steel crossbeams, 2020



Figure 32. Stone abutment on north side of truss bridge, 2020



Figure 33. Stone abutment on north side of truss bridge, 2023



Figure 34. Sandstone cliff on southern side of truss bridge with unidentified timber piers in the foreground, 2020



Figure 35. Timber pier structures in concrete bases, 2020



Figure 36. Wrought iron pier in Macdonald River, 2020



Figure 37. Wrought iron pier in Macdonald River, 2023



Figure 38. Wrought iron pier in Macdonald River, showing detail of paint and base, 2020



Figure 39. View of wrought iron pier from the decking, showing the steel latticed chords in situ adjacent to the pier, 2020



Figure 40. Example of the replaced chords along the bridge from the decking level, 2020



Figure 41. Exposed gap on bridge road decking level, Northern side , 2023



Figure 42. Exposed gap on bridge road decking level, Southern side, 2023

4.1.2 Views from nearby heritage items

The St Albans Conservation Area (LEP # C2) has direct views of the St Albans Bridge. The views from the approaches to the bridge along Wollombi Road from the north and St Albans Road and Upper Macdonald Road from the south are of high significance. These views of the bridge mostly comprise the timber truss and deck of the bridge. The uninterrupted views of the bridge from the banks are also of high significance, with views focusing on the central portion of the bridge, with particular views of the Pier 4 and the composite timber and steel truss superstructure. The rest of the piers are generally hidden from view by vegetation.

The views of St Albans Bridge from the locally listed Settlers Arm Inn (LEP # I436) are only partial due to the existing vegetation cover and the local fire department building, but the spatial relationship between the two is of high significance as physical and social landmarks within the town.

The Greater Blue Mountains, listed on the WHL and NHL (WHL # 917 and NHL # 105999), although only 120 metres from the St Albans Bridge at its closest point, has direct views of the bridge, but these were not able to be inspected. However, the views from the bridge to the Greater Blue Mountains were inspected. The views and spatial relationship between the two items are of high significance.



Figure 43. View of St Albans Bridge from Wollombi Road within the St Albans Conservation Area, view south, 2020



Figure 44. View of St Albans Bridge from St Albans Road within St Albans Conservation Area, view north, 2020



Figure 45. View of St Albans Bridge from St Upper Macdonald Road within St Albans Conservation Area, view north-east, 2020



Figure 46. View of St Albans Bridge from the St Albans Conservation Area along the bank running along Wollombi Road, view south-east, 2020



Figure 47. View of the northern section of St Albans Bridge from the St Albans Conservation Area to the north-east of the bridge, view south-west, 2020



Figure 48. View of the northern section of St Albans Bridge from the St Albans Conservation Area, view east, 2020



Figure 49. View of St Albans Bridge from the St Albans Conservation Area along the bank of the Macdonald River, view east, 2020



Figure 50. View of St Albans Bridge from the St Albans Conservation Area along the course of the Macdonald River, view west, 2020



Figure 51. View of St Albans Bridge from the St Albans Conservation Area along the course of the Macdonald River, view south-east, 2020



Figure 52. Settlers Arms Inn (LEP # I436), view north, 2020



Figure 53. View of St Albans Bridge from Settlers Arms Inn, view south-east, 2020



Figure 54. View towards Gaol, Courthouse and Stables (LEP # I440), view west, 2020



Figure 55. View of the Greater Blue Mountains from the northern end of St Albans Bridge, view south, 2020



Figure 56. View towards the Greater Blue Mountains from the southern end of St Albans Bridge, view south, 2020

5.0 SIGNIFICANCE ASSESSMENT

5.1 Methodology

Determining the significance of heritage items or a potential archaeological resource is undertaken by utilising a system of assessment centred on the *Burra Charter* (Australia ICOMOS 2013). The principles of the charter are relevant to the assessment, conservation and management of sites and relics. The assessment of heritage significance is outlined through legislation in the *Heritage Act* and implemented through the *NSW Heritage Manual*, the *Archaeological Assessment Guidelines* and *Assessing Significance for Historical Archaeological Sites and 'Relics'.*

If an item meets one of the seven heritage criteria and retains the integrity of its key attributes, it can be considered to have heritage significance. The significance of an item or potential archaeological site can then be assessed as being of local or State significance. If a potential archaeological resource does not reach the local or state significance threshold, then it is not classified as a relic under the *Heritage Act*.

5.2 St Albans Bridge over MacDonald River

The St Albans Bridge over the MacDonald River is listed on the State Heritage Register (SHR # I01480), Roads and Maritime Services s170 Register (SHI # 4300129), and the Hawkesbury LEP 2012 (LEP # I01480). The SHR significance assessment for the St Albans Bridge is included in Table 2. It should be noted that the SHR lists St Albans Bridge as "being Nationally significant" owing to its status as a piece of not only local history, but history significant to the representation of Australian bridge architectural design and construction of the early 20th century.

Table 2. Heritage significance assessment for the St Albans Bridge (SHR listing entry)[63]

Criteria	Discussion
A) Historical Significance	*Through the bridge's association with the expansion of the NSW road network, its ability to demonstrate historically important concepts such as the gradual acceptance of NSW people of American design ideas, and its association with Ernest DeBurgh, it has historical significance.*
C) Aesthetic Significance	*The bridge exhibits the technical excellence of its design, as all of the structural detail is clearly visible. Also visually attractive in its setting, and with ornate iron piers, the bridge has substantial aesthetic significance.*
D) Social Significance	*St Albans bridge is highly valued by the local community. Situated near a popular pub and regular stop off area for tourists from nearby Sydney, the bridge is also valued by the many visitors to the area. Timber truss bridges are prominent to road travellers, and NSW has in the past been referred to as the "timber truss bridge state". Through this, the complete set of bridges gain some social significance, as they could be said to be held in reasonable esteem by many travellers in NSW.*

[63] 'St. Albans Bridge over MacDonald River', State Heritage Register listing entry, State Heritage Inventory, Heritage NSW website.

E) Research Potential	*The bridge has technical significance because it is a DeBurgh truss, is representative of a range of major technical developments that were made in timber truss design by the Public Works Department. The St Albans bridge has the largest DeBurgh truss spans constructed, giving it further technical significance.*
F) Rarity	*Rare in the Sydney region, and rare technical features.*
G) Representativeness	*Highly representative of DeBurgh trusses.*

5.2.1 Statement of Significance

The State Heritage Register listing for the item features the following statement of significance:

> *Completed in 1902, St Albans Bridge is an early example of a DeBurgh timber truss road bridge. In 1998 it was in good condition.*
>
> *As a timber truss road bridge, it has many associational links with important historical events, trends, and people, including the expansion of the road network and economic activity throughout NSW, and Ernest DeBurgh, the designer of this type of truss.*
>
> *DeBurgh trusses were fourth in the five-stage design evolution of NSW timber truss road bridges. Designed by Public Works engineer Ernest M. DeBurgh, the DeBurgh truss is an adaptation of the American Pratt truss design. The DeBurgh truss is the first to use significant amounts of steel and iron and did so in spite of its high cost and the government's historical preference for timber.*
>
> *DeBurgh trusses were significant technical improvements over their predecessors. The St Albans bridge also has the largest DeBurgh truss spans, which lends it further technical significance.*
>
> *In 1998 there were 10 surviving DeBurgh trusses in NSW of the 20 built, and 82 timber truss road bridges survive from the over 400 built.*
>
> *The St Albans bridge is a representative example of DeBurgh timber truss road bridges, and is assessed as being Nationally significant, primarily on the basis of its technical and historical significance.*[64]

5.3 St Albans Bridge proximity to locally listed Goal, Courthouse and Stables

The views of St Albans Bridge from the locally listed Gaol, Courthouse and Stables (LEP # I440) were not inspected. The Gaol, Courthouse and Stable buildings were not visible from the bridge, but there is close physical proximity.

[64] State Heritage Register listing for 'St. Albans Bridge over MacDonald River.', State Heritage Inventory, Heritage NSW website.

5.4 St Albans Conservation Area

The St Albans Conservation Area is listed on the Hawkesbury LEP 2012 (LEP # C2). A significance assessment for the item is not available.

5.4.1 Statement of Significance

The LEP listing for the St Albans Conservation Area is associated with the following statement of significance:

> *Early 19th century rural settlements in narrow valleys backed by rugged vegetated hills. Historic routes – European (Old North Road), Aboriginal (Boree Track). St Albans Common, still functioning as was early last century and numerous stone buildings scattered throughout the valleys.*[65]

[65] Lester Tropman and Associates, Helen Proudfoot, and Meredith Walker, 1987. 'St Albans Conservation Area.' *Heritage Study of the Shire of Hawkesbury.*

6.0 PRELIMINARY ARCHAEOLOGICAL ASSESSMENT

This section discusses the Study Area's potential to contain non-Aboriginal (historical) archaeological resources. The potential for the survival of archaeological remains is significantly affected by activities which may have caused ground disturbance. This assessment is therefore based on consideration of current ground conditions, and analysis of the historical development of the Study Area.

'Archaeological potential' refers to the likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or redevelopment of that area. This is distinct from 'archaeological significance' and 'archaeological research potential'. These designations refer to the cultural value of potential archaeological remains and are the primary basis of the recommended management actions included in this document.

An overview of historical phases relevant to the Study Area, an assessment of archaeological potential relevant to that phase, and significance is outlined in Table 4.

Table 2. Preliminary archaeological assessment

Phase	Discussion
Phase 1: Early European Settlement (1788-1902)	Land use in the vicinity of the Study Area during Phase 1 is likely to have included early agricultural practices, road transportation, river transportation, and construction of dwellings and public house in the hamlet of St Albans. Most of these activities would have taken place outside the Study Area, with the main activities in the Study Area including use of the Macdonald River for transportation purposes and adjacent use of St Albans Road. Potential archaeological remains associated with these activities may include riverside dirt tracks and evidence of tree removal. However, the riverbank setting of the Study Area and effects of flooding and erosion mean that is unlikely any discernible archaeological evidence of these activities remains. The first St Albans truss bridge was located 80 metres west of the Study Area, meaning that archaeological remains of the earlier structure are not anticipated within the Study Area. There is no documentary evidence of previous fords at this location. Overall, there is **nil archaeological potential** associated with Phase 1. There are no predicted significant non-Aboriginal archaeological remains associated with Phase 1 within the Stage 2 Study Area.
Phase 2: Second St Albans Bridge (1902-present)	In 1903 the St Albans De Burgh timber truss bridge was completed. The construction of the bridge included the establishment of several timber piers and one metal pier into the riverbed and surrounding embankments, supported by stone abutments on either side of the river. Wollombi Road was altered from a straight alignment to a dog-legged alignment to meet the new bridge. Following the initial construction of the second St Albans Bridge, several upgrades have seen former support structures removed and replaced with modern fabric. Archival information suggests that the location of Pier 4 has not changed, meaning that archaeological remains of former footings is not anticipated. The piers were excavated into clean river sand, and there is no evidence

Phase	Discussion
	that fills (with the potential to contain artefactual resources) were introduced to the site. No Stage 2 works are proposed around the base of the timber piers, which have been replaced with modern fabric. Pier 4 has not been subject to any significant repair or construction works.[66] It is not anticipated that the footings of any scaffolding or framework used in the erection of the pier would be present. Overall, there is **nil archaeological potential** associated with Phase 2. There are no predicted significant non-Aboriginal archaeological remains associated with Phase 2 within the Stage 2 Study Area.

6.1 Summary

There is **nil potential** for significant non-Aboriginal archaeology to be present within the Study Area.

[66] Pers. Comm. TfNSW via Hills Environmental 28 May 2020.

7.0 THE PROPOSED WORKS

7.1 The proposed works

7.1.1 Works and methodology

The proposed works as stated in the Ward Civil B413 project plan outline the following scopes as approved by Ventia and Ward Civil: Under bridge access and track construction, removal and nearby relocation of falling trees under the bridge water, pier rehabilitation, sheet piling/cofferdam installation, installation of cover plates over exposed gaps on bridge road deck, pier 4 abrasive blasting and repainting, replacement of damaged laminates throughout decking and reinstatement of an approximate 2 sqm of sandstone blocks on Webbs Creek Abutment (See Appendix 11.2 for Ward Civil Complete Scopes List).

This option involves the following works as approved by Ventia and Ward Civil:

- Installation of temporary sheet piling to a minimum depth of 6 metres, a caisson measuring 18 metres by 8 metres in length, and floating river boom for silt capture. The top of the sheet piling would be one metre about the cross-brace intersection
- Pumping of water from within the caisson to lower the water level to one metre below the level of the bottom of the horizontal brace and maintenance of the water at that level
- Non-destructive digger (NDD) excavation around the base of Pier 4 to a depth of two metres to remove the sediment, or 0.5 below the bottom horizontal brace, to allow for works to occur and to confirm the condition of the subsurface cast iron piles of Pier 4. The trench would be partially backfilled with scour rock fill and sand and the cofferdam removed following completion of works. The height of the riverbed would be permanently reduced in order to minimise further impact to Pier 4 caused by flooding events and sedimental deposits.
- Stockpiling of sand at the northern side of the river and installation of two layers of geo fabric (Bidum) and an upper layer of 0.4mm plastic industrial sheet on the working platform to capture any material
- Construction of a surround scaffold and wall cover sheeting to a level above the upper cleat to enable encapsulation for environmental control
- Removal of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Panel 1 of Pier 4. The brace rivets of the upper column cleats would be removed, cleaned and repainted. The bottom cleats on both sides would be removed/cleaned back and treated with paint in exposed areas
- Surface cleaning of the wrought iron columns to remove loose particles only, to the level of the second horizontal brace
- Installation of split covers/seating straps at the base of the wrought iron columns and at the level of the second horizontal bracing on both sides. This would include complete cover installations including gap filling. The bracing and bolting dimensions would be verified at this point and the new bracing would be fabricated and painted
- De-stressing of the bridge, removal and replacement of damaged laminates and re-stressing

- Like-for-like replacement of the bottom horizontal steel lattice bracing element and the bottom two steel diagonal/cross bracing elements, which would be attached to new bottom cleats and restored upper cleats with bolt connectors
- Removal and replacement of the 12mm thick steel connection plates for the diagonal and horizontal steel bracing elements with modified steel plates to connect to the new steel casing, featuring faux riveting utilising dome bolts and dome nuts
- Installation of additional steel casing detailed with faux riveting utilising dome bolts and dome nuts around the base of the wrought iron columns, connected to the existing wrought iron column with steel bolts and a non-corrosive epoxy infill material, Fosroc Conbextra-EP65 Plus, between the steel and wrought iron. The epoxy would not be bonded to the wrought iron columns
- Pressure grouting of the inside of the cast iron piles to fill all voids and provide adequate structural strength, using grout nipples. The grout would consist of a mix of SL or GP cement, fly ash, admixtures, potable water and fine aggregate. This would require two 20mm diameter holes to be cored through the top of the cast iron piles. Pressure grouting may also be required at the top of the wrought iron columns, which would also require two 20mm diameter holes through the iron capping. The holes would be repaired and waterproofed
- Removal of grout nipples, cleaning and repairing works to original fabric. This would involve blast cleaning
- Repainting of the exposed wrought iron columns of Pier 4, the new steel casing and the replaced elements
- Removal of the encapsulation, scaffold and floor coverings, as well as the caisson and river boom.
- Construction and safety standards may require the planned locations of core drilling sites, scaffolding, methods of attachment and reinstalment of original material to be adaptable.

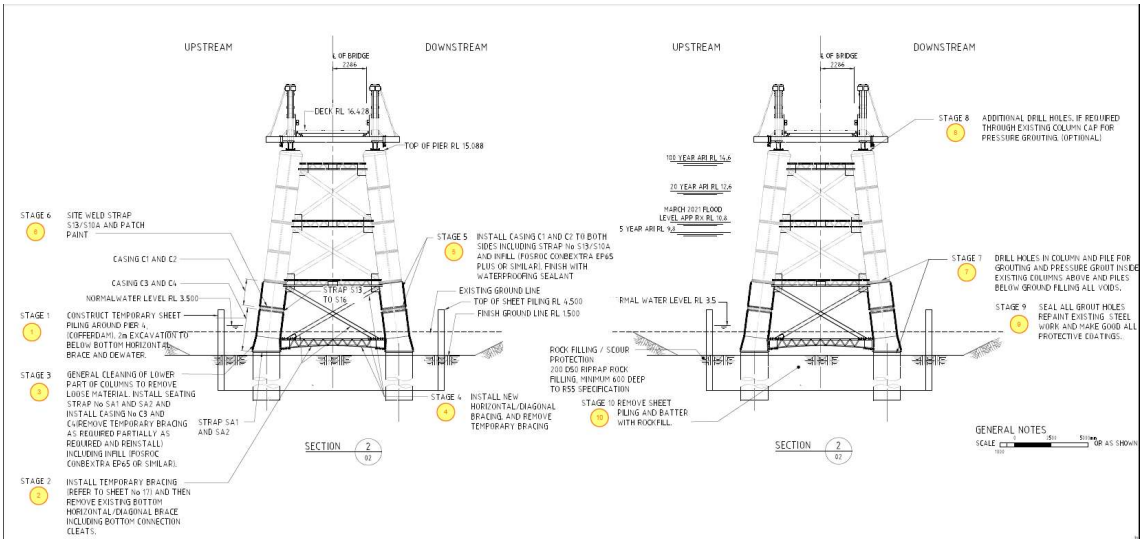


Figure 57. Pier Rehabilitation Design: Works to lower section of Pier

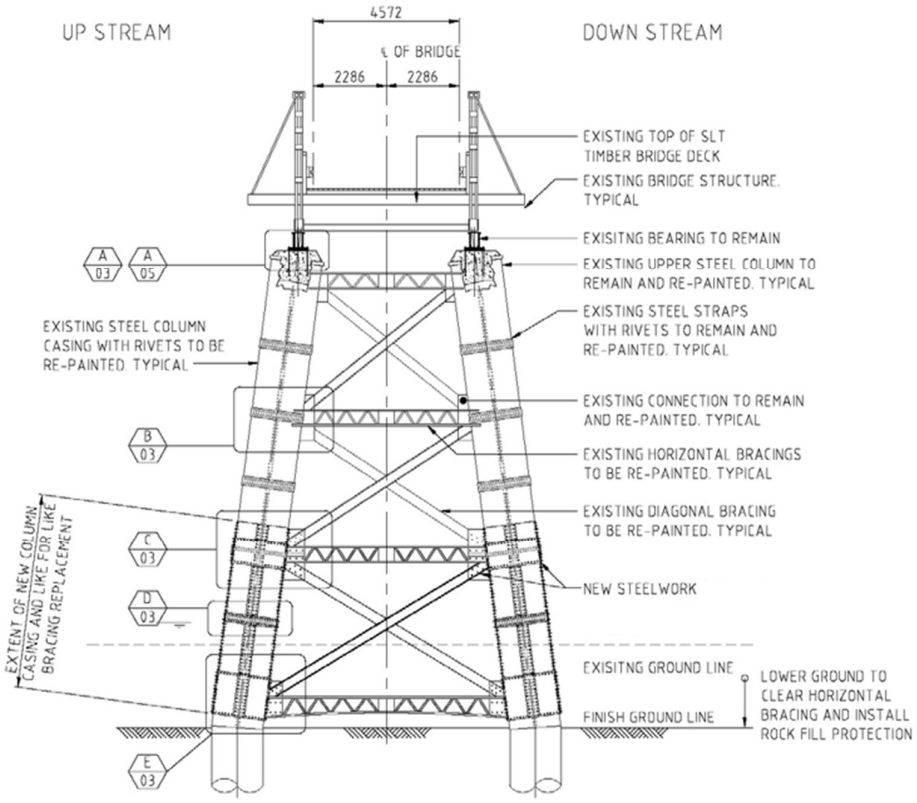


Figure 58. Pier Rehabilitation Design: Works to lower and upper sections of Pier

The design drawings for the proposed works were initially prepared by DM Roads and the MU Group and dated 27 July 2021 and are provided in the Appendix (Section 11.0) of this report. Further information on the designs are provided in the *Concept Design Report* prepared by MU Group in July 2021 and *St Albans Rehabilitation Works, St Albans Review of Environmental Factors* prepared by Transport for NSW in June 2023.[67] (Section 11).

7.1.2 Justification for works

Pier 4, constructed as part of the original bridge between 1901 and 1903, is one of the few remaining original components of St Albans Bridge. Since the initial construction of the second (current) St Albans Bridge, several iterations of conservation and rehabilitation have taken place to ensure the bridges safe and ongoing function.

Work records over the last 40 years document the change and material replacement that has occurred to the bridge:

- 1997-1998: Timber truss decking was replaced using Stress Laminated Timber (SLT)
- 2001: Timber planking was replaced with SLT along with the replacement of all timber cross girders with steel cross girders
- 2005: Below ground timber piles were replaced with steel and concrete piles, Pier 3 and Pier 5 replaced, replacement of top cords and verticals and allied works of the spans 4 and 5 trusses

[67] MU Group, 2021, Op. Cit.; Transport for NSW, 2023. *St Albans Bridge Rehabilitation Works, St Albans Review of Environmental Factors.* Draft 1.2, June 2023.

- 2013: Construction of new concrete abutment headstock on driven steel piles with new concrete tie beam behind original abutment, Cut down existing timber piles and cap walls to suit new work, Modify the exiting SLT deck on the spans one, two and three by adding new additional laminated timber of the same quality, Extend the span one deck by up to 1.5 metres to span the new abutment, Replace timber girders, Extend decking with new laminated timber, Replace the timber girders on spans 2 and 3 as required, Seal deck with bitumen, Removal of Pier 3 and Pier 5 temporary structures

Original bridge materials:

- Pier 4 (Figure 36, Figure 37, Figure 38 and Figure 51)
- Webbs Creek Abutment (Figure 32 and Figure 33)
- Wooden Stringers (Figure 29)

Pier 4 comprises cast iron piles and wrought iron columns filled with a mix of sandstone and cement and is braced with steel lattice bracing dating to 1903 and should be retained with as little intervention as possible to maintain significance as original materials of an early 20th century truss bridge. However, the bases of the wrought iron sections of the columns, including the steel bracings and the tie beams, have become significantly corroded due to their location at the water level of the Macdonald River and are currently partly buried by deposited sediment (Figure 59). Due to the current condition of Pier 4, the load limit of the bridge has been reduced to 15 tonnes. However, there are concerns that ultimate wind, flood and debris loading combined with this lateral loading capacity may impact the bridge's capacity or the structural failure of the bridge.[68]

Structural rehabilitation of the base of the pier is therefore required in order to ensure the structural integrity of the bridge and to extend the lifespan of the bridge. The works would ensure the serviceability of the bridge and the long-term retention of the bridge, resulting in an overall positive outcome for the bridge. If no rehabilitation work is performed, the bridge will continue to deteriorate and has a high risk of failure.[69]

[68] MU Group, 2021, op. Cit.
[69] Op. Cit.



Figure 59: Images of St Albans Bridge – Orange Arrow: Indicating replacement work 1997-1998, Green Arrows: Indicating replacement work 2001, Red Arrows: Indicating replacement work 2005, Yellow Arrows: Indicating replacement work 2013, Light Blue Arrows: Indicating early 20th century original material



Figure 60: Close up view of Pier 4 base showing corroded base of column and bracing. Source: MU Group[70]

[70] MU Group, 2021, Op. Cit.

8.0 HERITAGE IMPACT ASSESSMENT

8.1 Heritage Impact Assessment

8.1.1 St Albans Bridge over Macdonald River

8.1.1.1 Direct Impacts

The proposed Stage 2 works focus on the rehabilitation of Pier 4 as one of the few remaining elements of original fabric of the St Albans Bridge.

The proposed works would involve NDD excavation around the base of the Pier 4 columns to a depth of up to two metres or 0.5 metres below the bottom horizontal steel lattice brace. During these works a cofferdam sheeting would be installed to a minimum depth of six metres and would extend one metre above the height of the cross-brace intersection. A river boom would also be installed. These works would allow for the effective drainage of water, excavation around the base of the pier and for ensuring rising water levels do not impact the works. The excavated sand would be stockpiled at the northern side of the river and two layers of geo fabric (Bidum) and an upper layer of 0.4mm plastic industrial sheet would be installed on the working platform to capture any material. Following completion of works, the cofferdam and sheeting would be removed and the partially backfilled with sour rock fill and sand to reduce the height of the riverbed and the cofferdam sheeting would be removed. These works would be non-intrusive and would not result in direct impacts to the significant original fabric of the bridge. The excavation works would therefore result in a **neutral** direct impact to the St Albans Bridge.

The direct impact caused by the scaffolding and wall cover sheeting for the encapsulation of Pier 4 would depend on the detailed design. Further details would be required to accurately assess the impact of these works. If the scaffolding is free-standing, is not fixed to Pier 4 or is fixed to Pier 4 in a way that does not penetrate or alter original fabric, the resultant direct impact would be neutral. However, if fixing to Pier 4 is required for the scaffolding and wall cover sheeting through penetration of or direct connection to the steel or wrought iron elements, the works would result in a negligible to minor direct impact, depending on the nature and number of fixings. These works would therefore result in a **neutral to minor** direct impact to the St Albans Bridge.

The proposed surface cleaning would involve blast cleaning which would remove surface grime and any loose or flaked paint, surface rust or efflorescence on Pier 4. Historical paint layers would remain in situ under the new protective paintwork. The cleaning, localised repairs and repainting works would therefore result in a **negligible** direct impact to the significant fabric of the St Albans Bridge.

The injection of the grout at the base and the top of the wrought iron columns would require the making of two 20mm penetrations at each location on each column. This would therefore result in localised direct impacts to the original wrought iron columns. However, the injection of grout would aid in ensuring the structural stability of the columns through the filling of any gaps in the original cement and sandstone infill. The holes would be repaired and waterproofed, but the specifications for repair have not been provided at this stage of the design. It is recommended that the removed sections of iron are reinstated, and the gaps repaired with an easily removable waterproof sealant. Although the works would result in a minor direct impact to the bridge, the works are intended to ensure the continuation of the active use of the bridge. The works would result in a **minor** direct impact to the St Albans Bridge.

The works involve the removal and replacement of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Panel 1 of Pier 4 with like-for-like steel counterparts. The brace rivets of the upper column cleats would be removed, cleaned and repainted. The bottom cleats

on both sides would be removed/cleaned back and treated with paint in the exposed areas. The works would also involve the removal and replacement of the steel connection plates for the cross and horizontal steel bracing elements with modified steel plates to connect to the new steel casing. These works would be irreversible and would result in the removal of highly significant original fabric, of which little is left other than Pier 4. The works aims to minimise the removal of original fabric, with all elements that are in good condition being left in situ or conserved and reattached to the structure. The works are required in order to replace the badly corroded elements and to ensure the structural stability of the bridge, resulting in a positive outcome for the bridge. Such works would have a localised major direct impact on fabric of high significance but would result in an overall **moderate** direct impact to the St Albans Bridge.

The installation of the split covers/seating straps, the steel casing and injection of the non-corrosive epoxy infill material would result in the irreversible encasement of the bottom section of the wrought iron columns between the first and second horizontal columns. This method would ensure the retention of the original fabric of the wrought iron columns whilst providing structural stability. The method of connection to the wrought iron columns would minimise the removal of original fabric, as connection between the encasement and the iron columns would be restricted to the location of the straps. However, the injection of the epoxy infill material between the metal casing and the original columns would result in an irreversible addition to the columns due to the strength and hardness of the epoxy after it has cured. The works would therefore be difficult to remove in the future without damaging the original wrought iron columns, Despite the retention of the original wrought iron columns, the works would result in a **moderate** direct impact to the St Albans Bridge.

Overall, despite resulting in a positive outcome for the structural integrity of the bridge, the proposed works would result in a **moderate** direct impact to the St Albans Bridge.

8.1.1.2 Visual Impacts

The proposed Stage 2 works involve the temporary works including the installation of a cofferdam and river boom, the excavation of sand, stockpiling of sand to the north within the river area and the installation of geo fabric and plastic industrial sheeting. Following the completion of works, the temporary elements would be removed, and the cofferdam infilled with rock scour fill and the stockpiled sand, to a height lower than existing. The works would result in a temporary minor visual impact to the views of the bridge from the riverbank and along the course of the river, as well as the views down from the decking level. The views from the approaches to the bridge at road level would be little impacted. The reduction in the height of the surrounding sediment would result in a positive minor visual impact due to the exposure of the full length of the wrought iron columns, which are currently partially obscured by sediment. The works would therefore result in a **temporary minor negative** visual impact and permanent **positive minor** visual impact to the St Albans Bridge.

The visual impact caused by the scaffolding and wall cover sheeting for the encapsulation of Pier 4 would be dependent on the detailed design. These works are likely to result in a temporary moderate visual impact to the views of the bridge due to the encapsulation of the significant original fabric of Pier 4, which would not be visible during the works. The permanent visual impact of the scaffolding and wall cover sheeting would depend on the method of installation; if penetrations or direct fixings to the bridge are required, the resultant visual impact is likely to be negligible, while a free-standing scaffold would result in no permanent visual impact. The works would result in a **temporary moderate** visual impact and **neutral to negligible** permanent visual impact to the St Albans Bridge.

The proposed surface cleaning would involve blast cleaning and would remove surface grime and any loose or flaked paint, surface rust or efflorescence on Pier 4. The cleaning works would therefore result in a **negligible** visual impact to the significant fabric of the St Albans Bridge.

The proposed repairs and repainting of all elements of Pier 4, including the original wrought iron and steelwork and the new steelwork, would aid in minimising the visual impact of the works, as the works would allow for the bridge pier to present as one homogenous element when viewed from afar. The new steel casing and bracing would, however, be readily identifiable as new fabric on close inspection, particularly when viewed from along the riverbank. The repainting works would, however, remove the surface patina of corroded steelwork, which assists in demonstrating the historic nature of the bridge. The covering of the existing patina with homogenous paintwork would partially obscure the historic nature of the bridge but would also obscure past and proposed penetrations and poor-quality localised paintwork. The colour has not been identified in the proposed works documentation, but it is recommended for the paint to colour match the original colour of the pier based on the paint analysis conducted as part of the Stage 1 works. The repainting works would therefore result in an overall **minor** visual impact to the St Albans Bridge.

The injection of the grout at the base and the top of the wrought iron columns would require the removal of two 20mm holes at each location on each column. This would therefore result in localised visual impacts to the wrought iron columns. In order to minimise visual impact, the holes should be located on the inside-facing side of the columns. In order to further minimise visual impact, it is recommended that the removed sections of iron are reinstated, the gaps repaired with an easily removable waterproof sealant and a protective paint coating is applied to the full length of the columns. If these recommendations are followed, the works would result in a **negligible** visual impact to the St Albans Bridge.

The works involve the removal and replacement of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Panel 1 of Pier 4 with like-for-like steel counterparts utilising the same dimensions, lattice structures and detailing. This would also involve the replacement and reuse of the steel connection plates with new dome bolts. The visual impact of the works would be minimised through the use of dome bolts and nuts to imitate but not fully replicate the original riveting, as well as the like for like replacement of the bracing. This would ensure the sympathetic nature of the works whilst allowing the works to be visible as new work on close inspection. Such works would have an overall **minor** visual impact to the St Albans Bridge.

The installation of the split covers/seating straps, the steel casing and injection of the non-corrosive epoxy infill material would result in the encasement of the bottom section of the wrought iron columns between the first and second horizontal columns. The new casing would be detailed with dome and nut bolts to imitate but not fully replicate the original riveting of the wrought iron columns. The new bolts would also be located parallel to, but not on top of, the original rivets in order to ensure that the works are not mistaken for original fabric. The works would therefore be visually sympathetic to the design and detailing of the bridge without replicating heritage detail. The new steel casing would result in the bottom section of the columns being marginally wider than the rest of the columns, but this would likely only be noticeable on a close inspection. The works would therefore result in an overall temporary and permanent **minor** visual impact to the setting and views of the St Albans Bridge.

8.1.2 St Albans Conservation Area

8.1.2.1 Direct Impacts

The proposed works would occur within the curtilage of the St Albans Conservation Area, which includes the St Albans Bridge and the surrounding landscape. The proposed excavation works, temporary works and rehabilitation works would result in a **moderate** direct impact to the bridge element of the St Albans Conservation Area. The works would also result in the excavation of deposited sediment along the course of the river within the St Albans Conservation Area. While the St Albans Bridge and the surrounding river course are contributing elements to the conservation area,

the overall scope of works is minimal. Other significant elements of the conservation area would not be directly impacted by the proposed works.

Overall, the proposed works would result in a **negligible** direct impact to the heritage significance of the St Albans Conservation Area (LEP # C2).

8.1.2.2 Visual Impacts

The proposed works would occur within the curtilage of the St Albans Conservation Area but would be localised to the area of the St Albans Bridge. Following the completion of the works, the scaffolding and sheeting would be removed, the area surrounding Pier 4 would be partially backfilled with rock scour infill and the excavated sand, cofferdam sheeting removed, and that the area would be restored to its pre-existing condition, albeit with a reduced sediment height. The temporary works would result in temporary **minor** impact to the views and setting of the St Albans Conservation Area. These works would result in an overall **negligible** positive visual impact to the setting and views of the St Albans Bridge within the St Albans Conservation Area (LEP # C2).

The rehabilitation works, including cleaning, painting, the steel encasement, replacement of three steel bracing elements, grout installation works and epoxy application, to St Albans Bridge would result in an overall negligible visual impact to the setting and views of the St Albans Conservation Area in the vicinity of the bridge (LEP # C2).

The proposed works would result in **negligible** visual impacts to the St Albans Conservation Area (LEP # C2).

8.1.3 Other heritage items

The proposed works would be localised to the St Albans Bridge and would not be noticeable or visually intrusive to other nearby heritage items. The views to the bridge from nearby heritage items, including the Settlers Arm Inn (LEP # I436), the Gaol, Courthouse and Stables (LEP # I440) and Greater Blue Mountains World Heritage List (WHL # 917, NHL # 105999) are currently obscured by additional buildings and vegetation. Therefore, the proposed works would result in a **neutral** visual impact to the views and setting of nearby heritage items.

8.1.4 Archaeological impact

The preliminary archaeological assessment in Stage 1 did not identify potential for significant non-Aboriginal archaeological remains within the Study Area. The land surrounding Pier 4 comprises recently deposited sediment from the river. Potential Phase 2 deposits associated with construction rubbish pits would be located on land within the embankments, outside of the proposed area of impact. Therefore, the proposal would not impact on any significant non-Aboriginal archaeological resources. The proposal would have a **neutral** impact on non-Aboriginal archaeological 'relics' or works.

8.2 Assessment against relevant policies

In 2012 the Road and Maritime Services (now TfNSW) prepared the *Timber Truss Bridge Conservation Strategy*,[71] which provides objectives and policies for the conservation, replacement and retention or timber truss bridges throughout the state. The proposed works are addressed against the relevant policies in Table 3.

[71] Transport Roads & Maritime Services, 2012. *Timber Truss Bridge Conservation Strategy.*

Table 3. Assessment of the proposal against relevant conservation strategy policies

Policy	Discussion
Further develop heritage-sympathetic conservation technology and techniques for timber truss bridges, in conjunction with the Heritage Council and key stakeholders.	The proposed design for the rehabilitation of Pier 4 of St Albans Bridge utilises innovative technologies and techniques in order to offer heritage-sympathetic conservation strategies. The options attempt to minimise impact to original fabric through encapsulating rather than replacing the significant fabric of Pier 4. Collaboration with Heritage NSW and key stakeholders as part of the consultation procedures of the project has assisted in the decision-making process for the chosen design.
Complete current maintenance of St Albans Bridge	The proposed works to Pier 4 would ensure that aspects of the required maintenance of St Albans Bridge would be completed. Further work will be required to maintain the subsurface cast iron piles of Pier 4.
Bridges identified as traditional construction which will be retained should utilise traditional bridge carpentry skills during restoration works	The proposed works to Pier 4 would not constitute traditional bridge carpentry skills as the timber components of the bridge are not included in the scope of Stage 2 works. The timber components have been restored within the last ten years and are in good condition.
Prepare conservation management documentation for each of the five types of timber trusses in Roads and Maritime Services' portfolio for endorsement by the NSW Heritage Council.	A Conservation Management Plan for De Burgh truss bridges or for St Albans Bridge has not been prepared. Preparation of a Conservation Management Plan for St Albans Bridge should be considered as part of the finalisation of the design of the Stage 2 works.
Implement interpretation works at bridge sites and develop publications and heritage resources that are accessible to a broad audience.	Interpretation has not been considered as part of the Stage 2 works. Preparation of an interpretation strategy or interpretation plan for St Albans Bridge should be undertaken during the finalisation of the design for Stage 2 works.

8.2.1 Statement of Heritage Impact

A statement of heritage impact has been prepared according to NSW Heritage Office guidelines in Table 4 below.

Table 4. Preliminary Statement of Heritage Impact for the proposed conservation works

Development	Discussion
What aspects of the Proposal respect or enhance the heritage significance of the Study Area?	The Stage 2 works aim to structurally reinforce the bridge whilst minimising impact to significant fabric. The full length of the wrought iron columns would be retained and encased, rather than replaced. The works would ensure the retention of the structural integrity of the bridge, its active use as a road bridge and its identity as a notable landmark in the community. This would result in an overall positive outcome for the SHR listed St Albans Bridge over the Macdonald River. The lowering of the sediment surrounding the piers would result in a positive visual impact as the full length of the wrought iron columns of the bridge would be visible.
What aspects of the Proposal could have a detrimental impact on the heritage significance of the Study Area?	Despite the encapsulation of the bottom section of the wrought iron columns of Pier 4, rather than the replacement of these elements, the overall direct impact would be moderate due to the irreversibility of the works. The replacement of the diagonal steel braces and the horizontal steel lattice braces would result in a moderate direct impact to the bridge, as Pier 4 is one of the last remaining original elements of the bridge. The overall visual impact to the heritage-listed bridge would be minor due to the replacement of the diagonal steel braces and the horizontal steel lattice braces, as well as the encasement of the bottom section of the columns.
Have more sympathetic options been considered and discounted?	The options assessment for the proposed works included four options: 1) a 'do nothing' approach; 2) the application of carbon fibre wrapping and the replacement of the steel bracing; 3) the current proposal; and 4) and the full replacement of Pier 4. Although Option 1 would ensure the minimisation of impacts to the bridge, the option would result in a high risk of structural failure, and is therefore not a more sympathetic option. Option 2 would result in the application of carbon fibre wrapping to the bottom section of the bridge and the replacement of the bottom bracing members. This option would minimise direct impact to fabric but would result in a more major visual impact to the bridge if not painted in a sympathetic colour. Option 2 would require removal of all lead paintwork, which may exacerbate corrosion of the more corroded elements as well as requiring specialised enclosure and safety measures for workers while removing the paint. This option was therefore discounted. Option 4 was discounted due to the major direct impact to significant fabric and the high cost associated with the full replacement of the pier. Therefore, the most sympathetic and feasible option has been chosen for the works.

9.0 CONCLUSION

9.1 Conclusion

This Statement of Heritage Impact has found the following:

- The proposed works would occur within the heritage curtilage of the St Albans Bridge over the Macdonald River, listed on the SHR (SHR # 01480), the Roads and Maritime s170 (SHI # 4300129), and the Hawkesbury LEP 2012 (LEP # I10480)
- The proposed works would result in a moderate direct impact to the St Albans Bridge (SHR # 01480)
- The proposed works would result in a temporary and permanent minor visual impact to the St Albans Bridge (SHR # 01480)
- The proposed works would result in a negligible direct and visual impact to the St Albans Conservation Area (LEP # C2)
- The proposed works would result in a neutral visual impact to the views from the nearby heritage items, including the Settlers Arm Inn (LEP # I436), the Gaol, Courthouse and Stables (LEP # I440) and Greater Blue Mountains World Heritage List (WHL # 917, NHL # 105999)
- Significant archaeological remains have not been identified within the Study Area

9.2 Approvals

The proposed works will occur within the SHR curtilage of the St Albans Bridge over the Macdonald River (SHR # 01480).

Typically, to carry out activities within the curtilage of an item listed on the SHR, approval must be gained from Heritage NSW, Department of Premier and Cabinet (Heritage NSW) or delegate. In some circumstances, under Section 57 of the *Heritage Act*, a Section 60 (s60) permit may not be required if works are undertaken in accordance with the Standard Exemptions for items on the SHR or in accordance with agency specific exemptions. This includes works that have little to no impact on the heritage significance of the place. The approval pathway for standard works with a greater impact to heritage significance require the submission of a standard s60 works application to Heritage NSW. Works of a minor nature costing under $150,000 may be eligible for a s60 fast track application.

This assessment has found that the proposed works will have moderate direct and minor visual impacts on the heritage significance of the SHR listed St Albans Bridge over the Macdonald River (SHR # 01480). Therefore, despite the aim of the work to ensure the structural stability of the bridge, **this SoHI will need to be submitted with an s60 application for approval by Heritage NSW**.

9.3 Recommendations and mitigation measures

The following mitigation measures should be enacted to minimise heritage impacts during works:

- Where possible, coring for the injection of grout should be taken from the inner face of the pier columns and should be taken as close to the base as is deemed structurally safe. Coring should avoid rivets, joins, and the diagonal support structures. The size and number of the coring holes should be minimised. The removed sections of the columns should be reinstated

to their original location and restored to its pre-existing condition following completion of the grouting works. It is recommended that the gaps are repaired with an easily removable waterproof sealant. If it is not possible to restore the removed wrought iron fragment during works, the core sample location should be patched with a suitable non-corrosive putty that is discernibly modern fabric, which should then be sanded down to be flush with the column and painted to match the rest of the column

- The bolts used for connecting the new bracing to the pier columns should only be fixed to the new steel column casing and not the original wrought iron in order to minimise impact to original fabric
- In order to minimise direct impact, wrap the wrought iron columns with a suitable protective material prior to installation of the steel casing and the epoxy so that, when injected, the epoxy does not directly bond to the wrought iron. This will protect the wrought iron from the epoxy in order to allow for ease of removal and minimisation of damage to the wrought iron if the epoxy is required to be removed in the future
- In order to minimise direct impact, consider the replacement of the epoxy between the new steel casing and the wrought iron columns of Pier 4 with a material that can be easily removed in the future without causing damage to significant fabric. The material used should be reversible, in accordance with Article 15 of the *Burra Charter*. A design alternative would be to use blind bolts between the steel casing and wrought iron columns, as though they would require penetration of the wrought iron column, the impact to original fabric would be minimised to the location of the bolts
- Potential vibration impacts to significant fabric, including rivets, the columns and the diagonal brackets, should be assessed and monitored prior to and during works. Vibration monitors should be considered for use prior to and during works with temporary attachment using adhesives such as beeswax so as to not damage the original materials with unnecessary rivet or drill holes
- Particular caution should be taken to ensure that the removal of any fabric would not cause damage to the significant fabric to be retained. If possible, a toothless auger should be used for any required holes in original fabric in order to maintain smooth edges
- The removed wrought iron fragments from creating holes for grouting should be retained for reinstatement following completion of the grouting works. The fragments should be reinstated, and the gaps repaired with an easily removable waterproof sealant
- The faux rivet heads on the new steel casing should match the profile, size, spacing and location of the existing rivets in order to minimise visual impact. However, the new rivets and steel casing should be discernible as new on close inspection in accordance with Article 20.2 of the *Burra Charter*
- The original steel bracing elements to be replaced should be carefully removed by heritage tradespersons with experience in the conservation of historic wrought iron, cast iron and steel. The removal method should be undertaken by hand and should not damage the original fabric of the pier columns

- The original steel elements to be removed should be labelled, retained and stored in a secure, safe and dry location. The elements should alternatively be utilised for interpretation in the vicinity of the bridge
- Paint analysis should be utilised to accurately match paint during Stage 2 repainting and data should be provided to the Transport for New South Wales heritage team to inform future repainting works. It is recommended that complete repainting of the pier with paint to match the original paint colour be undertaken as part of Stage 2. Modern paint that is not an accurate match in colour or chemical composition would result in additional intrusive impacts to the St Albans Bridge
- Cofferdam/sheet piling should be installed at a suitable distance from the wrought iron pier and the four truncated timber poles within the watercourse. The angle should also be designed to avoid impacting significant original fabric of the steel pier. Excavation work should be limited to NDD and avoid use of hand tools to minimise potential of damaging significant fabric, notably the columns, bracing and piles of Pier 4
- Any scaffolding or enclosures required for the works should be free-standing and should not be fixed to Pier 4 in order to minimise impact to significant fabric. Movable plant should be driven by suitably experienced and qualified operators in order to avoid accidental impacts to significant fabric
- Any modifications to Stage 2 works outside the scope of this assessment must be assessed in an addendum to this SoHI
- Prior to the commencement of works, a heritage induction should be prepared for all contractors to complete, which would identify significant fabric and methods to minimise disturbance of significant fabric. The induction should aim to ensure the minimisation of impact to significant fabric
- No significant archaeological remains were identified during this assessment. As such, the works should proceed under the TfNSW Unexpected Finds Policy. All works should cease immediately if potential archaeological remains are located and a suitable heritage consultant and/or archaeologist should be contacted for advice
- Following the guidance of the RMS (now TfNSW) *Timber Truss Bridge Conservation Strategy*, the proposed methodologies for Stage 2 rehabilitation works should be discussed in consultation with Heritage NSW to finalise the creative heritage-sympathetic methodologies of rehabilitation for the St Albans Bridge
- The addition of aluminium cover plates bolted over the bridge-road gaps appears to be a predominantly cosmetic action and consideration should be taken for excluding this scope, unless in the case the cover plates offer protection from water or falling debris damage to the infrastructure below
- Detailed recording should be made of all works to the bridge to ensure the integrity and history of the bridge is maintained

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11.0 APPENDIX

11.1 Design drawings

The design drawings prepared by Transport NSW dated June 2023 for the rehabilitation of Pier 4 are provided below.

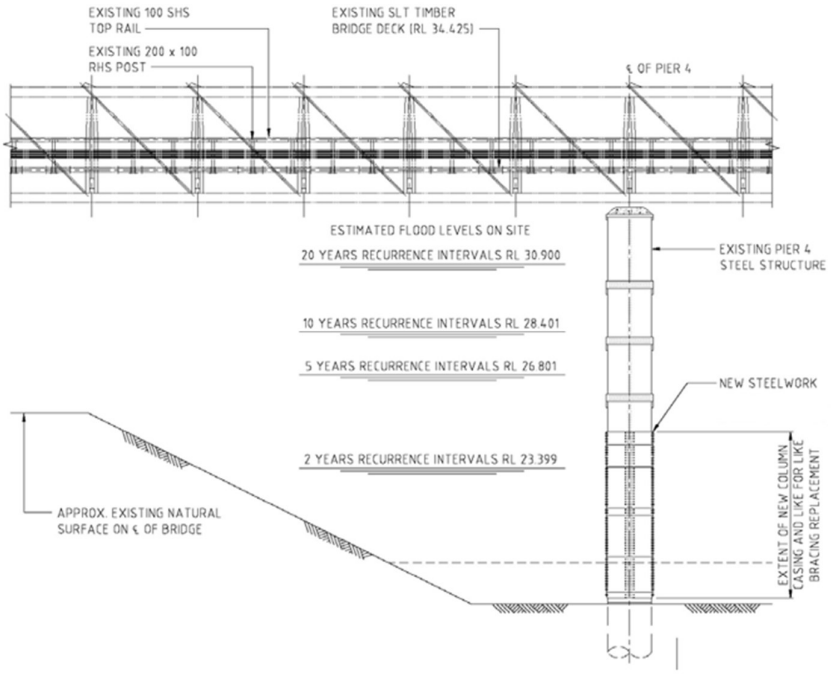


Figure 61: Pier 4 partial elevation showing proposed works. Source: Transport for NSW

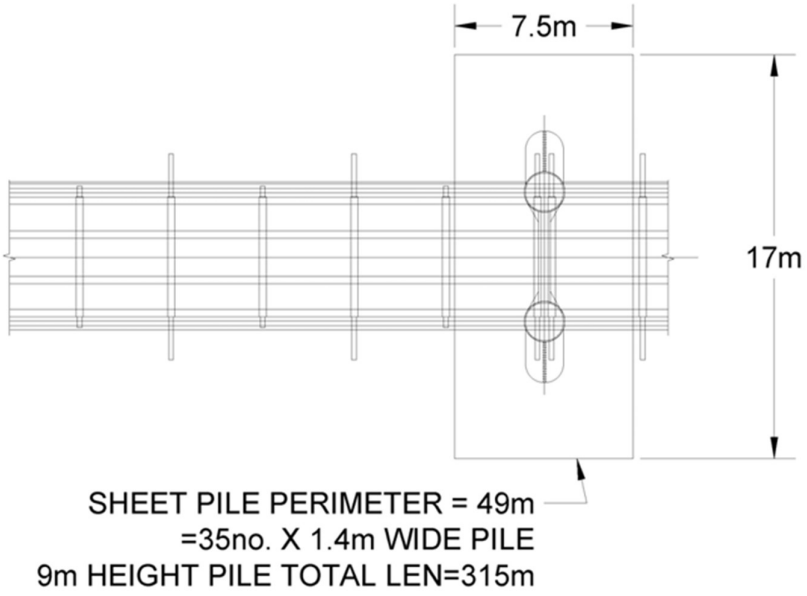


Figure 61: Pier 4 cofferdam size and orientation. Source: Transport for NSW

The design drawings prepared by DM Roads and the MU Group dated 21 July 2021 for the rehabilitation of Pier 4 are provided below.

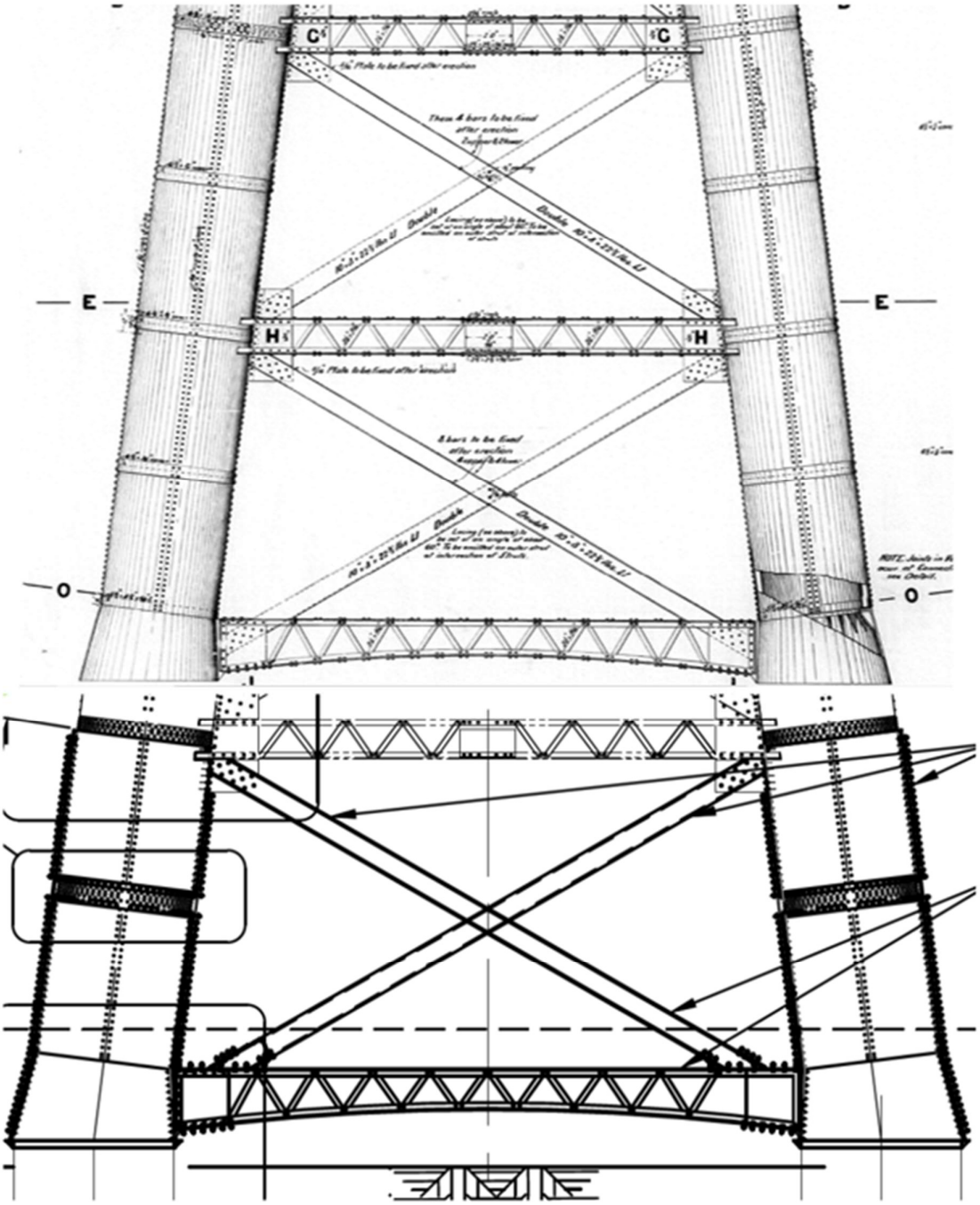


Figure 62: Typical Geometry of Existing Pier 4 at St Albans (Top), New Strengthening details of Pier 4 at St Albans. Source: MU Group

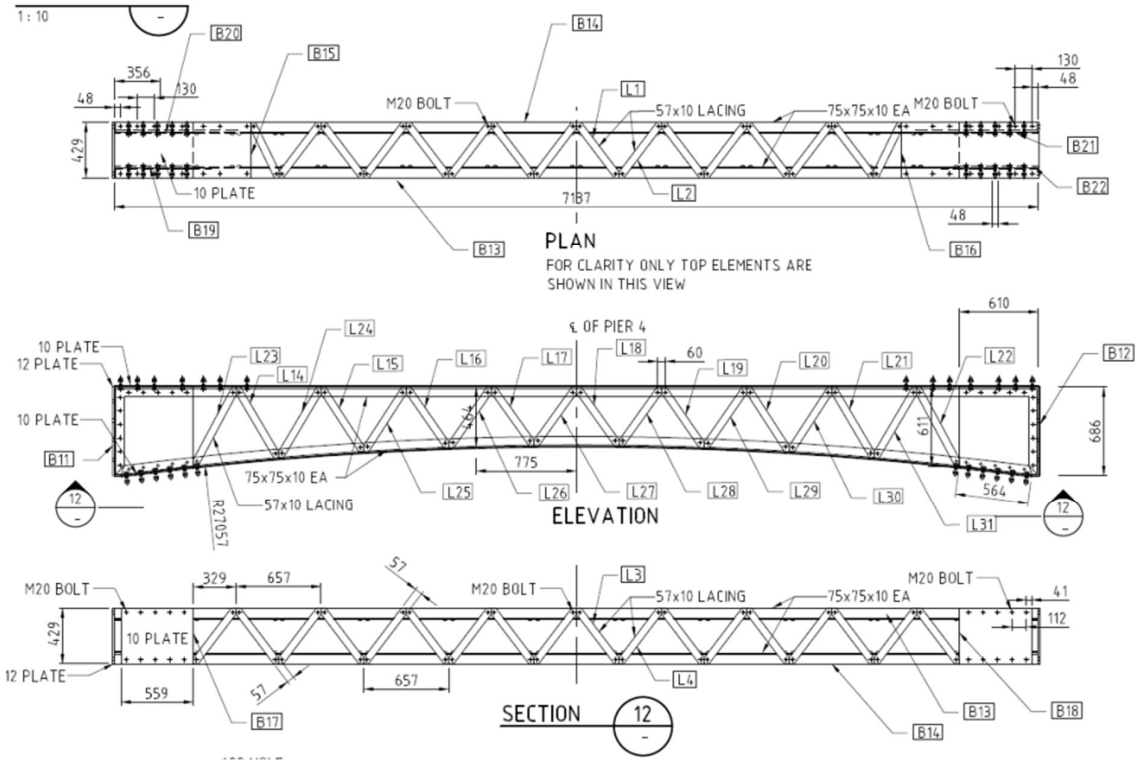


Figure 63: New Replacement Bottom Horizontal Arch Brace details. Source: MU Group

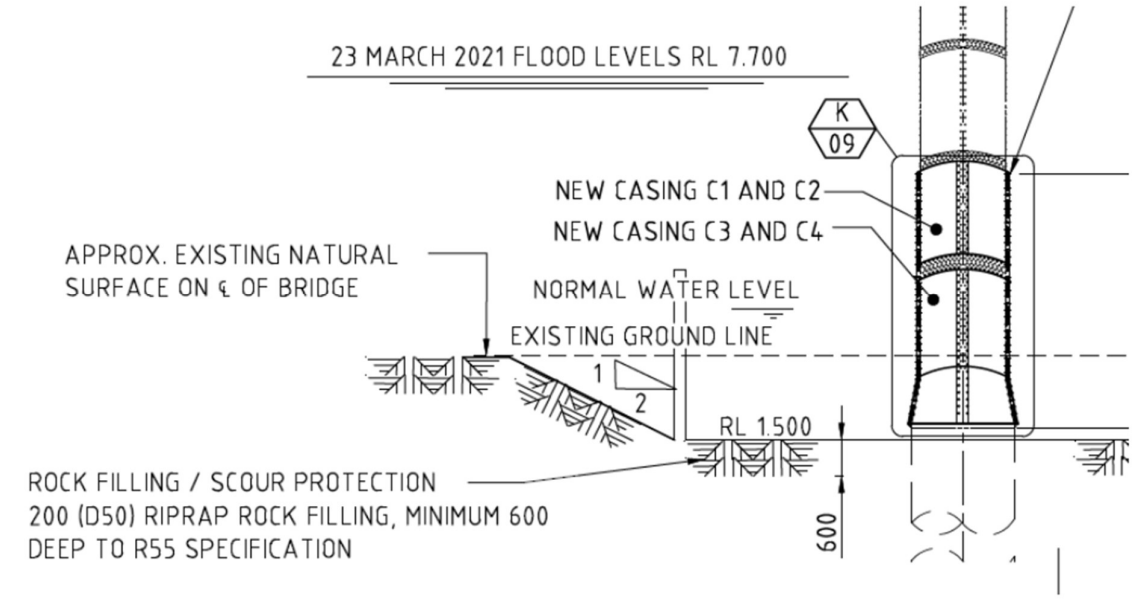


Figure 64: Lowering of existing ground confirmed by TfNSW. Source: MU Group

11.2 Ward Civil Complete Scopes List

- **Site Establishment – SP Works**
  - Footings installed for cabins
  - Fencing set up around the perimeter of the site
  - Cabins and equipment brought in via truck + trailer
- **Construction of Access track – SP Works**
  - Bridging structure installed over the water tank or ground widened around the water tank.
  - Excavator to reshape existing track
  - Existing material + new material used to reshape the track
  - Compacted and gabion rock to be laid over the surface of the track.
- **Removal/reposition of dead trees in the waterway**
  - Tree to be removed from waterway, chipped and disposed of correctly
  - Or, repositioned further downstream with assistance from an excavator
- **Installation of sheet piling/cofferdam – SP Works**
  - Sheet piles to be driving into the parameter of pier 4 using an excavator with the correct attachment
  - Water to be tested before getting pumped back into the waterway
  - Silt to be dug out using an excavator
  - Gabion rock to be laid as a hard standing
- **Install scaffold encapsulating system – SP Works**
  - Scaffolding system to be erected around the pier 4 for lead/paint removal purposes
- **Abrasive blast paint. – SP Works**
  - Entire pier 4 to get abrasive blasted and prime coat applied where required
- **Install temporary bracing – SP Works**
- **Install casing (C3+C4) – SP Works**
- **Install new bracing – SP Works**
- **Install casing (C1+C2) + infill – SP Works**
- **Weld strap + Patch paint – SP Works**
- **Drill holes + pressure grout, lower level – SP Works**
- **Drill holes + pressure grout, upper level – SP Works**
- **Seal all grout holes – SP Works**
- **Topcoat painted on Pier 4 – SP Works**
- **Remove scaffolding + sheet piles – SP Works**
- **Reinstate waterway**
  - Recycle existing material where possible otherwise remove added material from site.
- **Site demobilisation**
- **Replace laminate boards on the deck – TAMP Works**
  - Night works
  - Access from underneath via EWP
  - Access from on top via under bridge inspection unit
- **Reseal deck – TAMP Works**
  - Night works
  - Hot bitumen sealant to be sprayed on the deck and 10mm aggregate rolled on top.
- **Install cover plate – TAMP Works**
  - Night works
  - Aluminium plate to be bolted onto one side of the gap and the plate to cover the gap.
- **Reinstate 2m2 of sandstone block abutment – TAMP Works**
  - 2 block layers to use existing stone where possible and to source similar sandstone blocks for any addition stone required



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Appendix E – Biodiversity Assessment Report

Transport
for NSW

Biodiversity Assessment Report for REF

St Albans Bridge- Pier 4 rehabilitation over Macdonald River at St Albans

June 2023



NSW GOVERNMENT

transport.nsw.gov.au

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Executive summary

A Biodiversity Assessment has been conducted as Transport for NSW is proposing to undertake rehabilitation works at the St Albans Bridge site, this being a state heritage listed structure that spans the Macdonald River, St Albans, NSW. The bridge is a component of Wollombi Road and is located about 10 kilometres north of the NSW township of Wisemans Ferry. This Biodiversity Assessment has been carried out by Lesryk Environmental Pty Ltd to accompany the Minor Works Review of Environmental Factors being prepared for the proposal. This report assesses the biodiversity impact of the proposal to meet the requirements of the NSW *Environment Planning and Assessment Act 1979*.

To permit the undertaking of rehabilitation works, an estimated disturbance footprint of 0.825 ha is expected to be required, within which 0.375 ha of vegetation (this located along/adjacent to an existing access track) would be temporarily disturbed/pruned/compacted/trimmed. No large, extra-large or hollow-bearing trees are expected to be removed.

Within the area investigated, no threatened flora or fauna species (including microbats) listed, or currently being considered for listing, under the EPBC or BC Acts were recorded. Similarly, considering the quality and structure of the vegetation and habitat present, no threatened flora or fauna were considered likely to occur and/or rely on the proposed bridge work sites for any of their lifecycle requirements.

One endangered ecological community was recorded within, and close to, the proposed disturbance footprint (i.e. the existing access track), this being 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions', this listed as Endangered under the BC Act. Although the proposed bridge works will occur within a previously disturbed/modified footprint and only overhanging branch trimming/pruning will be undertaken, based on the adoption of the precautionary approach, the criteria provided under Section 7.3 of the BC Act have been referred to and drawn upon.

Though none were recorded or indicated, assessments that reference the criteria provided under Section 7.3 of the BC Act were also conducted on those microbats previously recorded at this site.

The assessments conducted on the threatened ecological community and microbats concluded that the proposal would not have a significant effect on these entities, or any areas of their habitat. As such, it is not considered that the preparation of a Species Impact Statement or Biodiversity Development Assessment Report (should Transport for NSW pursue that option) that further considers the impact of the proposal on these entities is required.

With reference to Chapter 4 of SEPP (Biodiversity and Conservation) 2021, the preparation of a Koala Plan of Management is not required.

Mitigation measures have been recommended in Section 6, to reduce any ecological impact as a result of the proposed work. Two primary measures include:

- Minimising impact through detailed design, and
- Adhering to TfNSW's *Biodiversity Guidelines* (RTA 2011).

In addition, the following key mitigation measures have been provided:

- Prepare an ESCP to minimise soil erosion and sediment transfer off-site
- Large woody debris around the pier to be collected and placed perpendicular to the river to provide habitat
- Limit vegetation removal to the minimum required to successfully permit the proposal
- If the proposal is amended to include any works on the timber trusses, top chord, top of the posts and abutments, further surveys are needed to be conducted targeting cave-associated microbats.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

The outcomes of the field survey did not identify any terrestrial or aquatic ecological constraints that would prevent the works proposed proceeding as planned.

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1. Introduction

1.1 Proposal background

Transport for NSW is proposing to undertake rehabilitation works at St Albans Bridge, this being a heritage listed wrought iron truss structure that spans the Macdonald River at St Albans (Figure 1-1). The bridge is a component of Wollombi Road and is located about 10 km north of the NSW township of Wisemans Ferry. A disturbance footprint of approximately 0.825 ha, inclusive of access and excavation requirements, is required for the proposed works.

The existing piers, including Pier 4, have significant corrosion and are partly buried by sediment from the riverbed with ponding of water around the pier columns further worsening the corrosion (MU Group 2023). With reference to the Niche Environment and Heritage Pty Ltd ('Niche') Review of Environmental Factors (REF) (Niche 2021), the objectives of the proposed remediation works are to:

- Improve the safety of the bridge.
- Reduce long term ongoing maintenance.
- Respect the heritage and characteristics of the 19th century design.

Lesryk Environmental Pty Ltd ('Lesryk') has been engaged to conduct the Biodiversity Assessment, this required to consider and assess all ecological matters affecting, or likely to affect, the environment as a result of the proposed remediation work. This Biodiversity Assessment Report (BAR) will contribute to the Review of Environmental Factors (REF) being prepared for the proposal, this produced in compliance with the requirements of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 The proposal

With reference to the REF the proposal broadly includes:

- Rehabilitation works on Pier 4 of the bridge:
    - Installation of sheet piling / cofferdam. Sheet piles will be installed around base of Pier 4 using an excavator
    - Non-destructive digger excavation around the base of Pier 4 to a depth of about two metres to remove sediment / silt
    - Pumping of water from within the cofferdam
    - Installation of scaffolding encapsulating system around Pier 4 for removal of paint and lead.
    - Abrasive blasting to remove paint and prime coat applied to Pier 4 where required
    - Removal of the existing deteriorated bottom horizontal steel lattice and two steel cross braces from Panel 1 of Pier 4 (including removal, cleaning and repainting of brace rivets of the upper column cleats)
    - Removal and cleaning of bottom cleats on both sides, and treatment with paint in exposed areas
    - Surface cleaning of the wrought iron columns to remove loose particles only, to the level of the second horizontal brace
    - Installation of split covers/seating straps at the base of the wrought iron columns and at the level of the second horizontal bracing on both sides (including gap filling)
    - Like-for-like replacement of the bottom horizontal steel lattice bracing element and the bottom two steel diagonal/cross bracing elements, which would be attached to new bottom cleats and the restored upper cleats with bolt connectors
    - Removal and replacement of the steel connection plates for the diagonal and horizontal steel bracing elements with modified steel plates to connect to the new steel casing, featuring faux riveting with dome bolts and dome nuts

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  - Installation of additional steel casing detailed with faux riveting using dome bolts and dome nuts around the base of the wrought iron columns, connected to the existing wrought iron column with steel bolts and a non-corrosive epoxy infill material
  - Pressure grouting of the inside of the cast iron piles at the lower and upper level of Pier 4 to fill all voids and provide adequate structural strength, using grout nipples. Pressure grouting would also require two 20 millimetre diameter holes to be drilled through the iron capping (which would be repaired, sealed and waterproofed on completion of the grouting)
  - Repainting of the exposed wrought iron columns of Pier 4, the new steel casing and the replaced elements
  - Removal of the encapsulation scaffolding and sheet piles
  - Partial backfilling of the excavation with rock fill and sand (reducing the height of the riverbed to minimise further impact to Pier 4 caused by flooding events and sediment deposits)
  - Removal of the cofferdam and river boom.
- Flood recovery works at Pier 4 of the bridge:
  - The proposed flood recovery works involve the removal of trees and vegetation and the clearance of sediment and silt from around the base of Pier 4. The vegetation will be removed from site, woodchipped and disposed of at an appropriate facility.
- Special project works on St Albans bridge:
  - Resealing five hundred square metres of the surface of the bridge deck. The bridge deck to be resealed.
  - Installing about 20 m of cover plate over exposed gaps in bridge joints. A gap in the joint that requires covering.
  - Destressing and replacing deteriorated laminates throughout the bridge deck. The laminates that require replacing.
  - Restressing all bridge spans
  - Reinstate 2 m^2 of sandstone block abutment.

For reference, extracts of the detailed design plans have been provided (Figures 1-2 and 1-3).

To permit the proposed bridge works, vegetation management is required, including vegetation trimming for vehicle access to Pier 4.

A temporary stockpile/ compound site would be located in a previously cleared/ disturbed area.

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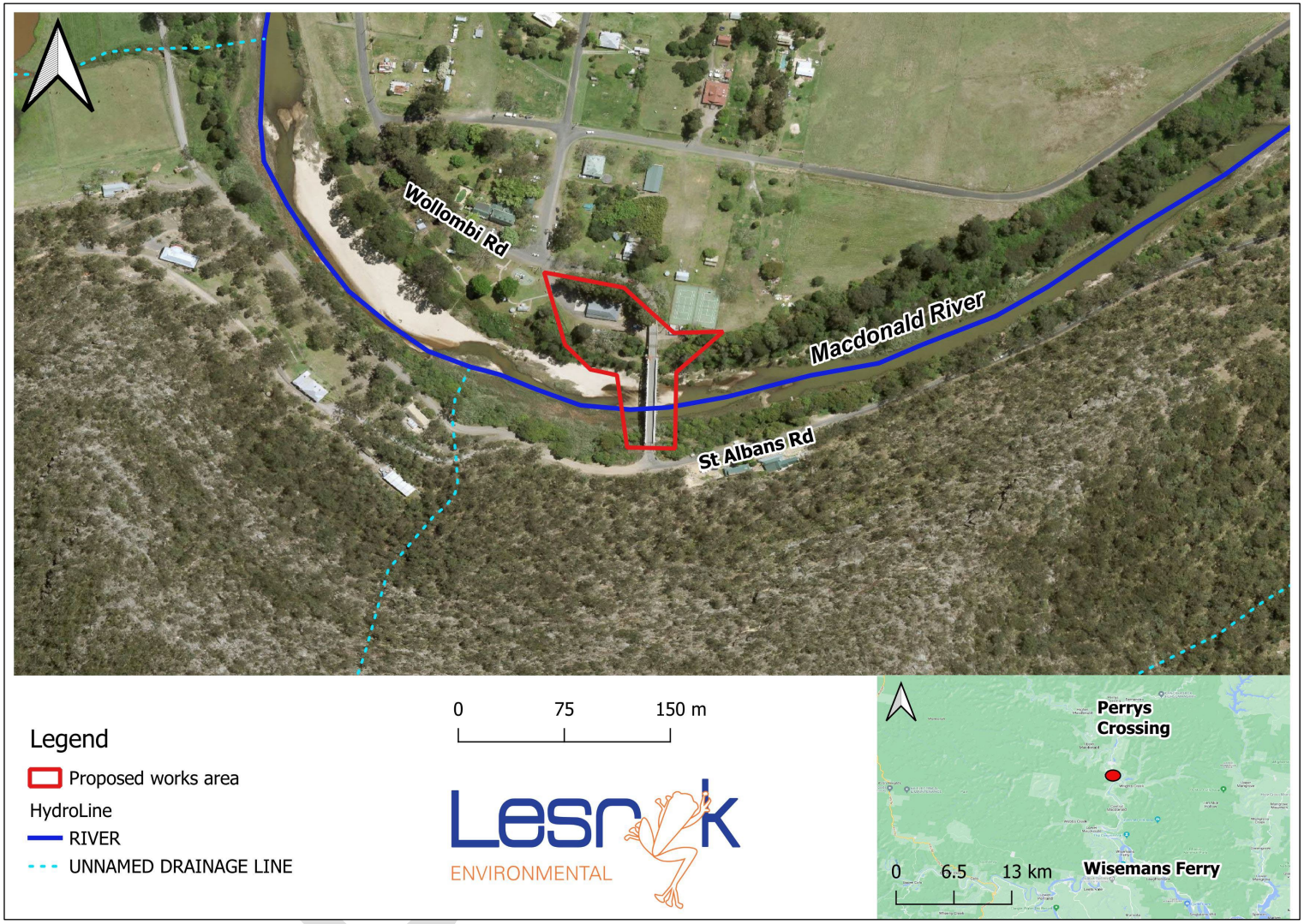


Figure 1-1 Proposal context

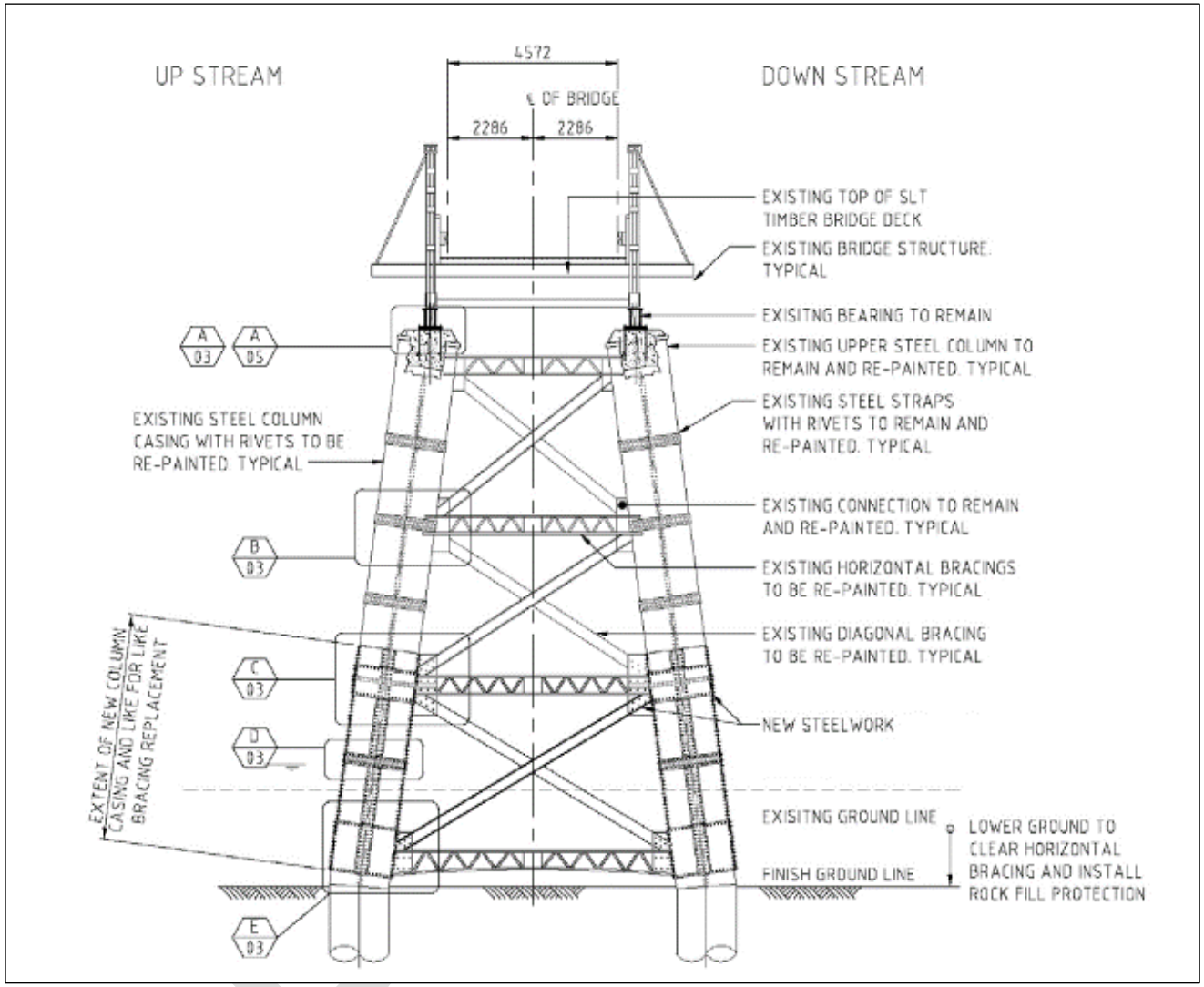


Figure 1-1 Detailed Engineering Plans (extract) for the proposed pier remediation works (TfNSW 2023)

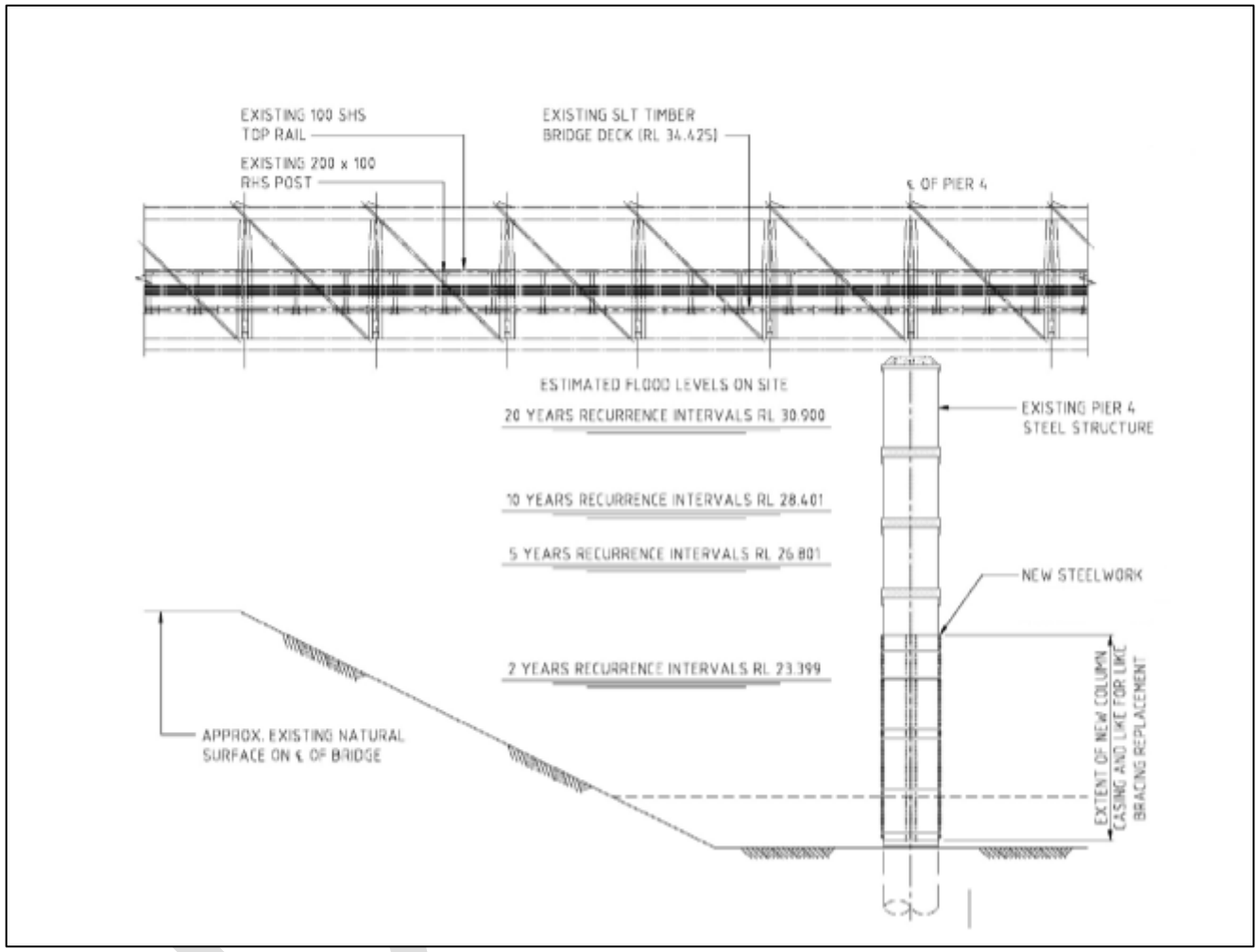


Figure 1-2 Detailed Engineering Plans (extract) for the proposed pier remediation works (TfNSW 2023)

The following machinery/equipment would be used during the course of the proposed work would include, but would not be limited to:

- 1 x Site Office/Lunchroom
- 1 x Bunded Chemical Storage Container
- 1 x Equipment Storage Container
- 1 x 10,00 cfm Dust Collector
- 1 x Decontamination Unit
- 1 x 20kVa Generator
- 1 x 5000 ltr Water Storage Tank
- Hand and Power Tools
- 1 x 5000ltr Water Storage Tank
- 1 x 2-3t Telehandler
- 1 x Compressor 200 cfm
- 1 x Compressor 850 cfm
- 2 x 600-pound Blast Pots
- Excavator mounted vibratory hammer (EMV)
- 5t vibrating roller
- 8t / 14t Excavator

Unless a specific aspect is referred to, the work would hereafter be referred to as 'the proposed work'.

Subject to approval, construction is anticipated to commence in September 2023 and take about 22 weeks to complete, weather permitting.

Construction work would largely be carried out during standard construction hours, as detailed below:

- Monday to Friday: 7am to 5:30pm
- Saturday: 8am to 1pm
- Sunday: No work
- Public holidays: No work

However, the proposal would include up to 10 nightshifts for out of hours works. The out of hours work would occur from 8:00pm to 5:00am for each shift.

Post-work, disturbed areas will be permitted too naturally regenerate.

1.2.1 Assessment areas

Based on a worst-case estimate, the proposal would require a work area (i.e. impact footprint in which 'disturbances would occur') that totals about 0.825 ha, this composed of:

- Disturbance/removal of 0.375 ha of exotic and native vegetation to achieve the objectives of the proposal
- The movement of personnel and vehicles/machinery, and
- A compound site that is about 600 m² in size.
    - The compound would be located within an existing compound site or a previously cleared/disturbed area

The operational footprint of the proposal would be less than this.

1.3 Legislative context

A REF is prepared to satisfy TfNSW duties under s.5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity" and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the proposal and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

Part 7 of the BC Act requires that a determination be made as to whether "the development or an activity is likely to significantly affect threatened species." In the case of a Part 5 development, this is assessed using the five-part test in Section 7.3 of the BC Act. Where threatened species, communities, or their habitats are likely to be significantly affected, a Species Impact Statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

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In September 2015, a "strategic assessment" approval was granted by the Federal Minister in accordance with the EPBC Act. The approval applies to TfNSW's road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, TfNSW road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities, and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy
- Do not require referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters, even if the activity is likely to have a significant impact
- Must use the BAM to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities, and migratory species.

To assist with this, assessments are required for all relevant biodiversity values in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

2. Methods

2.1 Personnel

Personnel involved in the assessment, and their qualifications, are identified in Table 2-1.

Table 2-1: Personnel

Name	Role	Qualifications
Mr Deryk Engel	Director and Senior Ecologist. Project management, , BAR write-up, review and quality assurance	B.Env.Sc. (Hons)
Mr Edward Langston	Botanist, site investigation, BAR write-up	Cert II Conservation and Land management
Ms Isabel Burcher	Field Ecologist, site investigation, contribution to BAR	B.Sc.
Mr Harry Engel	Senior Ecologist, site investigation, contribution to BAR	B.Mar.Sc.

An on-site inspection of the proposed work areas was carried out by Harry Engel on 23 May, and by Isabel Burcher and Edward Langston on 1 June, 2023. The weather conditions experienced during the site investigations was generally cool temperatures [~18°C], clear skies, light breezes and sunny conditions.

2.2 Background research

Prior to carrying out any fieldwork, known databases and any previous studies conducted in the region were consulted to identify the diversity of ecological communities, flora and fauna species known to be present, or potentially occurring, in the study region. The identification of those known or potentially occurring native species and communities within this portion of the Hawkesbury City Council LGA, particularly those listed under the Schedules to the EPBC, BC and/or FM Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants and animals, their vegetation associations and/or necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, either the most appropriate species-specific survey techniques may be selected [should their associated vegetation communities/habitat requirements be present] or a precautionary approach to their presence adopted.

The carrying out of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impact on, all known and likely native species, particularly any plants and animals that are of

regional, State and/or national conservation concern. This approach also avoids issues inherent with a one off 'snap-shot' study.

A list of all databases, date these were accessed, and the search area employed is provided in Table 2-2.

Other reports and documents referred to are provided within the bibliography section of this report.

All these databases and reports were reviewed and drawn upon where relevant. While reviewing these documents, particular attention was paid to identifying relevant ecological matters listed, or currently being considered for listing, under the Schedules of the EPBC, BC and/or FM Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the proposed works area.

Table 2-2: Database searches

Database/Information sources	Date accessed	Search area
Protected Matters Search Tool (PMST) (DCCEEW 2023a)	June 2023	10 km buffer on study area
Register of critical habitat (DCCEEW 2023e)	June 2023	N/A
BioNet Atlas (DPE 2023a)	June 2023	10 km buffer on study area
Areas of Outstanding Biodiversity Value register (DPE 2023b)	June 2023	N/A
NSW WeedWise Database (DPI 2023a)	June 2023	Hawkesbury City Council LGA
Fisheries NSW Spatial Data Portal (DPI 2023b)	June 2023	Hawkesbury - Nepean layer
NSW State Vegetation Type Map (DPE 2023c)	June 2023	Study area
BioNet Vegetation Classification database (NSW Government 2023c)	June 2023	N/A
Biodiversity Values Map and Threshold Tool (NSW Government 2023d)	June 2023	Study area
PlantNet (2023)	June 2023	N/A
SEED map viewer (NSW Government 2023e)	June 2023	Study area
Threatened Species website (OEH 2023)	June 2023	N/A
Groundwater Dependent Ecosystems Atlas (BoM 2023b)	June 2023	Study area
National Flying-fox monitoring viewer (DCCEEW 2023f)	June 2023	Study area

Field guides and standard texts used include:

- Brooker and Kleinig (1999) [used to identify eucalypts]
- Costermans (1992) [other vegetation]
- Cogger (2014) [reptiles and frogs]
- Anstis (2017) [frogs]
- Churchill (2008) [flying mammals]
- Simpson and Day (2010) [birds]
- Van Dyck and Strahan (2008) [non-flying mammals], and
- Triggs (1996) [identification of scats, tracks and markings]

Nomenclature follows that in these texts, or within the EPBC, BC and/or FM Acts. It is noted that the currently accepted scientific names for some of the threatened fauna species previously recorded in this locality are not consistent with the names used/provided under either the EPBC, BC and/or FM Acts. In these instances, nomenclature used within this report follows the current approved scientific conventions.

Where applicable, any TECs were classified and named according to the NSW Scientific Committee's Final and Preliminary Determinations [various dates].

The conservation significance of those ecological communities, plants and animals recorded is made with reference to:

- The EPBC, BC and/or FM Acts
- Vegetation mapping of the study region (State Government and DPE 2023c), and
- The BioNet Vegetation Classification database (NSW Government 2023c)

2.3 Vegetation assessment

2.3.1 Vegetation mapping

Vegetation of the locality has been mapped and described in the NSW State Vegetation Type Map (DPE 2023c). Mapping identifies the most likely Plant Community Type (PCT) to occur in the polygon. Refer to Section 3.1 for further details.

2.3.2 Vegetation survey and classification

The purpose of the vegetation survey was to confirm the dominant species with reference to the mapped PCTs, assess the condition of the vegetation, search for threatened species or their habitats and identify weeds.

Surveys were conducted by traversing the accessible portions of the require works areas and, as far as possible, identifying all plants present as well as documenting dominant species in each stratum.

The vegetation at the site was found to be highly modified within 5 m of the bridge structure from the road verge down to the river bank. Remnant trees and understory species were present along the river bank outside of the approximately 5 m disturbance zone around the bridge. The vegetation around Pier 4 contained a mix of juvenile exotic and native sedges and grasses sparsely spread out along the entirety of the sand bank.

No tree clearing works is required as part of the works proposed. As such, this assessment has been conducted with the understanding that no clearing of vegetation (defined in section 60C of the *Local Land Service Act 2013*) is needed and therefore no plot-based full floristic surveys were required.

2.4 Threatened species assessment

The purpose of the field investigations was to identify those vegetation communities, fauna habitats, plants and animals present within, and in close proximity to, the proposal area that are of State and/or national conservation significance as listed under the Schedules to the EPBC, BC and FM Acts.

While conducting the habitat assessments, efforts were made to identify features such as known vegetation associations, geological features, feed trees, mature trees with hollows, connectivity of fauna corridors, aquatic environments and other habitat features [e.g. the bridge and pier, as well as other cave substitutes] important to the lifecycle requirements of those threatened plants and animals previously recorded, or likely to occur, in the study region (as listed in Appendix B).

The survey methods employed during the field investigation were:

- The identification of those plants present, including within any areas affected by direct and indirect impacts
- The identification of the structure of those vegetation communities and fauna habitats present at, and close to, the proposed work areas
- The direct observation of those fauna species present within or near to the proposed work areas
- Diurnal call identifications of those fauna species present, with all calls being identified in the field
- The identification of any indirect evidence such as tracks, scats, scratching, and diggings that would suggest the presence of a particular fauna species
- Leaf litter and ground debris searches for sheltering reptiles and amphibians

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- Conduct targeted searches for those species of State and/or national conservation concern, as listed the EPBC and BC Acts, or their likely habitat areas, which were identified during the literature review stage of the project.

Accessible portions of the proposal area were traversed by foot.

2.4.1 Habitat suitability assessment

An assessment of available habitat for each threatened species or community identified in the database searches, and their likelihood of occurrence, is provided in Appendix B.

2.4.2 Targeted flora surveys

Given the highly modified/disturbed nature of the proposed work areas, and the habitat available within the study area, none of the flora species listed in Appendix B were considered to have a moderate to high likelihood of occurring. Therefore, no targeted flora surveys were undertaken.

2.4.3 Targeted fauna surveys

With reference to section 6.2.2 of the BAR, five threatened Yangochiroptera (hereafter referred to as microbats) have been recorded in proximity to the existing bridge (Niche 2021) (Table 2-3):

Table 2-3 Potential occurrence of threatened fauna (extract from Niche 2021)

Scientific name	Common name	BC Act status	Potential occurrence
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	High
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	High
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	Recorded
Miniopterus australis	Little Bent-winged Bat	Vulnerable	Recorded
Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Recorded
Myotis macropus	Southern Myotis	Vulnerable	Recorded
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable	Recorded

Of the species listed in Table 2-3, the Southern Myotis (*Myotis macropus*) is the only species that may potentially be roosting within or near the existing bridge based on the detection times of this species (Niche 2021). The other cave dependent bats (i.e. *Miniopterus* spp. and *Micronomus norfolkensis*) were detected at times that suggest they were only recorded during nightly foraging movements (Niche 2021).

Regarding Southern Myotis, the earliest pass after dusk for this species was 11:57 pm, a considerable amount of time (around five hours) after sunset, which indicates that the species may have travelled some distance before arriving in the study area. However, the latest pass of this species was 6:34 am, this being around dawn (sunrise being 7:01 am). This indicates that Southern Myotis could be roosting within, or close to, the existing bridge (REF 2021).

During the course of the site inspections conducted as part of this investigation, a consideration was given to the presence of cave-dependent microbats occupying those portions of St Albans Bridge at which works will occur. To assist with the surveying for this group of mammals, a hand-held torch was employed to inspect any cavities or sites that could be utilised by cave-dependent microbats.

Whilst portions of the existing bridge could be used by microbats, such as the timber trusses, top chord, top of the posts and abutments, it is noted that none of these features of the existing structure are to be disturbed.

It is acknowledged that vehicle movements across the existing bridge are permitted. As such, any individuals that are present under the decking planking or floor beams would be tolerant of vibration and noise. The works proposed to be undertaken

atop of the decking planking would not have an adverse impact on any potentially occurring roosting bats that are under the bridge itself.

Though considered and targeted, no microbats were observed in association with the existing bridge, particularly those portions where works are proposed to be undertaken. In addition, no evidence to suggest their presence, such as characteristic guano, stains or dead individuals was noted.

Based on the observations made during the diurnal investigations, the disturbed and modified nature of the area investigated (i.e. road corridor, existing access and bridge structure) and the identification of those habitats present, excluding the potential presence of the previously recorded microbats, it was considered that none of the remaining species listed in Appendix B had a moderate to high likelihood of occurring. Therefore, it was not considered necessary to employ any surveys for species credit fauna species.

2.5 Aquatic surveys and consideration

Macdonald River is the primary waterway present within the study area, this flowing in a south westerly direction for a distance of about 10 km before discharging into the Hawkesbury River.

Reference to the DPI Fisheries NSW Spatial Data Portal (DPI 2023b) indicates that the Macdonald River is mapped as Key Fish Habitat (Figure 2-1). Beyond the proposal limits, ephemeral drainage lines are present to the west where stormwater runoff is concentrated; these flowing into Macdonald River.

With reference to the Policy and Guidelines for Fish Habitat Conservation and Management (DPI 2013), and the Strahler Stream Order Classification System (DPI 2023d), Macdonald River is a 3rd order waterway. Macdonald River is considered to be Class 3 'Major fish habitat', this identified as:

> *Major fish habitat* - Major permanently or intermittently flowing waterway (e.g. river or major creek); habitat of a threatened fish species or 'critical habitat'.

As components of the proposed work would be conducted within, and in proximity to, Macdonald River, an aquatic study was broadly performed in accordance with the publication titled *Aquatic Ecology in Environmental Impact Assessment* (Lincoln-Smith 2003). This approach conforms to Section 3.3 General Requirements for Development (page 26) of DPI's 2013 publication titled *Policy and guidelines for fish habitat conservation and management*.

The investigation involved traversing, where safe to do so, the section of river that occurs in proximity to the Pier 4 works, and a distance of up to 10 m upstream and downstream of this; with notes taken on habitats present within the section of river being 'disturbed', the structure of its bank, its riparian communities, its course, and the presence of any snags or other features important to the lifecycle requirements of those aquatic species present, or considered likely to occur.

In addition, information referred to included:

- A literature search of any relevant previous aquatic studies
- Identification of known or expected aquatic species and their habitats, particularly those of conservation concern.

Based on a qualitative assessment of the water that was flowing along Macdonald River at the time of the field investigation, combined with a consideration of the alignment of the channel, the extent of exposed sand, the scope of work proposed near Pier 4 and the 'short-term' nature of the flood repair works [it is expected that, post-development, the site would generally reflect its pre-disturbance character], the undertaking of the activity will not erect any barriers to fish movement nor would it cause the isolation or fragmentation of any aquatic environments.

It was not considered that any surveys that targeted those aquatic species present, or considered likely to occur (i.e. netting, trapping or electric fishing), were necessary.

2.6 Limitations

By the completion of the field investigation a total of about 3.5 person hours of active searches had been accumulated. Given the disturbed nature, physical condition and size of the proposed work areas, this length of time is considered more than adequate when endeavouring to determine the diversity of native species present, their habitats and vegetation associations, and the conservation status of each of these.

During the field investigation, no adverse seasonal constraints were encountered.

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Not all animals and plants can be fully accounted for within any given proposal area. The presence of threatened species is not static; it changes across time, often in response to longer term natural forces that can, at any time, be dramatically influenced by human-made disturbances. To overcome this limitation:

- Database searches were conducted for threatened species and ecological communities known to occur within the region, and
- The precautionary principle was adopted where necessary (i.e. suitable habitat for those threatened species known to occur, or that have been previously recorded within the surrounding locality, was identified).

This report is based upon data acquired from the current investigation; however, it should be recognised that the data gathered is indicative of the environmental conditions of the site at the time the field work was conducted.

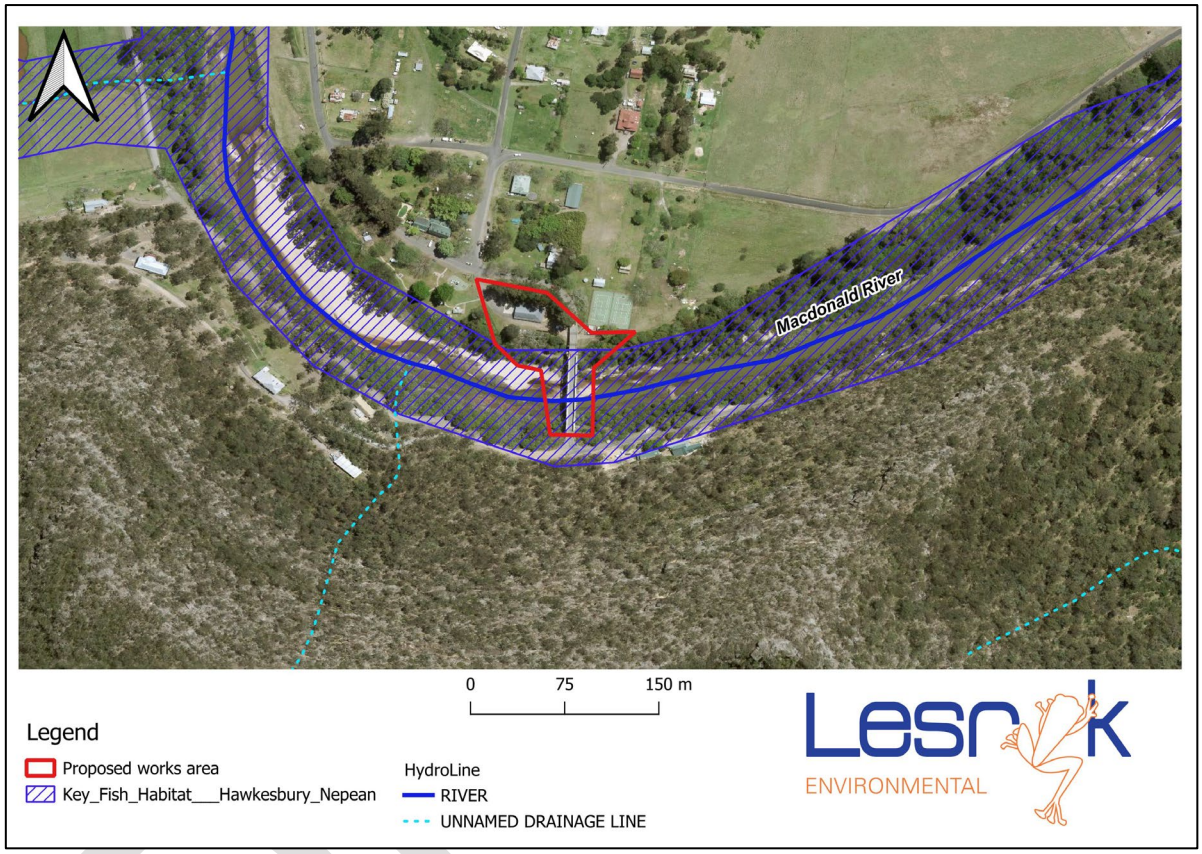


Figure 2-1 Key Fish Habitat in proximity to the proposal

3. Existing environment

For reference, a photographic record of the area investigated is provided in Appendix D.

The proposal area is located along and around St Albans Bridge, about 350 m south-east of the NSW township of St Albans, the bridge width being about 6 m. The bridge traverses Macdonald River, with a relatively steep decline of 12 m down to the river.

The road verge is earthen and/or comprises cleared areas composed of grasses and weeds; with sections of guardrails present along the majority of the investigated length. Vegetation is present on the river bank, with the area that occurs in close proximity to the bridge being dominated by invasive species.

Around the base of Pier 4 is an accumulation of woody debris with exotic and native grasses and sedges present along the sandbank within the riverbed.

Surrounding the area investigated is open forest characterised by a canopy of eucalypts to 25 m in height. The understorey is comprised of native trees (mostly Cheese Tree *Glochidion ferdinandi* var. *ferdinandi*) to 7 m, with a groundcover of grasses forbs and ferns. Leaf litter and ground debris is present.

The nearest conservation reserve, being Yengo National Park, occurs approximately 120 m south of the works.

The Macdonald River is the primary waterway present within the proposal area, with its tributaries, occurring to the north-west, within the upper reaches of the surrounding gullies and drain into this waterway. The river flows in a south-easterly direction to its confluence with the Hawkesbury River about 10 km to the north-east. Reference to the DPI Fisheries NSW Spatial Data Portal (DPI 2023b) indicates Macdonald River is mapped as Key Fish Habitat

Reference to the Biodiversity Values Map and Threshold Tool (BVMTT) (NSW Government 2023d) identified mapped Biodiversity Values (namely Macdonald River) within the proposal area. The proposed activities will not affect or compromise the ecological value of this waterway.

Reference to the Soil Landscape of the St Albans 1:100,000 Sheet report (McInnes S.K., 1997) and mapping (State Government and DPE 1992) indicates the proposal area is located within the following soil landscapes (Figure 3-1):

- Watagan – Colluvial
- Wisemans Ferry variant a – Alluvial.

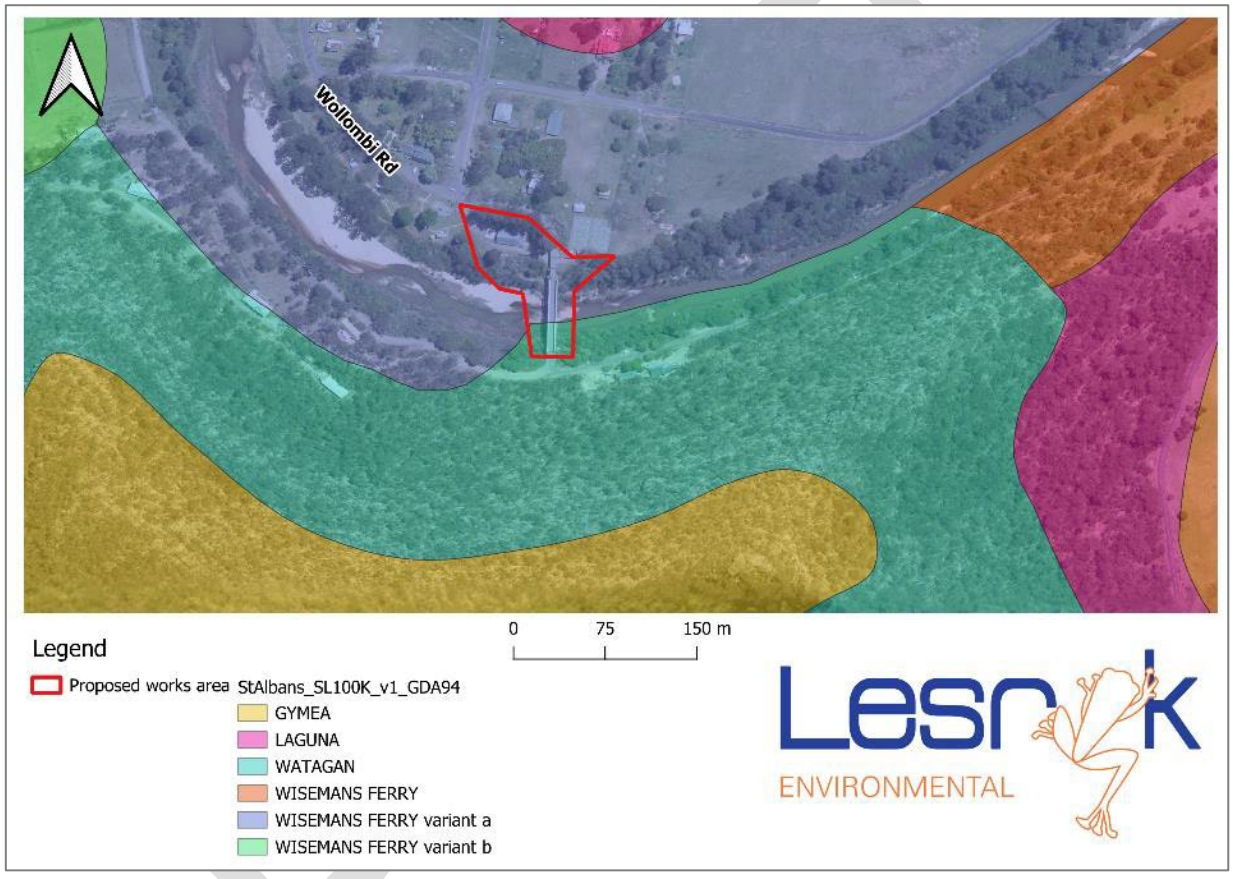


Figure 3-1 Soil Landscape

The geology of the Watagan Landscape is formed from the Narrabeen Group Sandstones with massive and cross-bedded lenticular beds of quartz-lithic sandstone, siltstone and claystone. Massive sandstone units typically form bold cliff exposures. The soils are very complex and includes very shallow to shallow (<50 cm) rapidly drained Lithosols/Siliceous Sands (Rudosols) and Earthy Sands (Tenosols) on coarse sandstone crests and sideslopes; moderately to very deep (50 - 200 cm), moderately well to imperfectly drained Yellow Podzolic Soils (McInnes 1997). The limitations of the Watagan landscape are mass movement hazard, rockfall hazard, steep slopes, extreme soil erosion hazard and high foundation hazard; localised high run-on, rock outcrop, non-cohesive soils, seasonal waterlogging and shallow soils.

The geology of the Wisemans Ferry (variant a) Landscape is narrow to moderately broad (<100–300 m), level to gently undulating floodplains, levee banks, backplains and backswamps adjacent to the Hawkesbury, Macdonald and Colo Rivers and their tributaries in the Hawkesbury Valleys. The soils are moderately deep to very deep (50–>150 cm), rapidly drained Alluvial

Soils (Tenosols and Rudosols) and well to rapidly drained Brown Earths (Tenosols) on levee banks (McInnes 1997). The limitations of the Wisemans Ferry variant a are high streambank erosion hazard, water erosion hazard, flood hazard, foundation hazard, groundwater pollution hazard, waterlogging (localised), permanently high water tables (localised), high run-on (localised); potential and actual acid sulfate soils (localised) and non-cohesive soils (localised) (McInnes 1997).

With regard to the NSW Environmental Protection Authority (EPA) Contaminated Land Record [search area The Hawkesbury City Council LGA] (EPA 2023), the proposed works area is not identified as contaminated land. Reference to the SEED map viewer (NSW Government 2023e) shows no acid sulfate soils occur within the study area.

For reference, Table 3-1 identifies attributes of the proposal area investigated.

Table 3-1: Site attributes

Site Attributes	
Estimated size (ha)	About 0.825 ha
ASL	13 m
Climate[1]	Mean summer high: 27.4 °C (January) Mean winter low: 5.9 °C (July) Average annual rainfall – 946.7 mm
Waterbody	Macdonald River
Critical habitat	No
IBRA Bioregion/Subregion	Sydney Basin / Yengo
Mitchell Landscape	• Yengo – Howes Range • Yengo – MacDonald Channel and Floodplain
Soil Landscape	• Watagan • Wisemans Ferry (variant a) (see Figure 3-1)
NPWS estate	Yengo National Park, (is present 120 m south of the proposal)

3.1 Plant community types and vegetation zones

Reference to the State Vegetation Type mapping (DPE 2023a) identifies the following PCTs occur within the study area (Figure 3-2):

- PCT 0 – Non-Native Vegetation
- PCT 3605 – Hunter Range Ironbark Forest
- PCT 4057 – Sydney Creekflat Swamp Mahogany-Paperbark Forest
    - This PCT is associated with the BC Act listed Endangered Ecological Community known as 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'.

It was found that the vegetation mapping was broadly accurate.

[1] Nullo Mountain AWS [062100] – This being the nearest operating weather station to the area investigated

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The study area is comprised of a creek bank as well as an intermittently inundated (currently exposed) sand flats, both of which have been colonised by a variety of weeds and native species from the adjoining intact vegetation as well as those typical of disturbed bushland edges. Common species recorded were the:

- exotics: Blackberry (*Rubus ulmifolius* [fruiticosus species aggregate]), Pigeon Grass (*Setaria sphacelata*), Turkey Rhubarb (*Acetosa sagittata*) and Farmers Friend (*Bidens pilosa*)
- natives: Cheese Tree, Fern-leaf Wattle (*Acacia filicifolia*), Bracken Fern (*Pteridium esculentum*), Tall Sedge (*Carex apressa*) and Bog Bulrush (*Schoenoplectus mucronatus*).

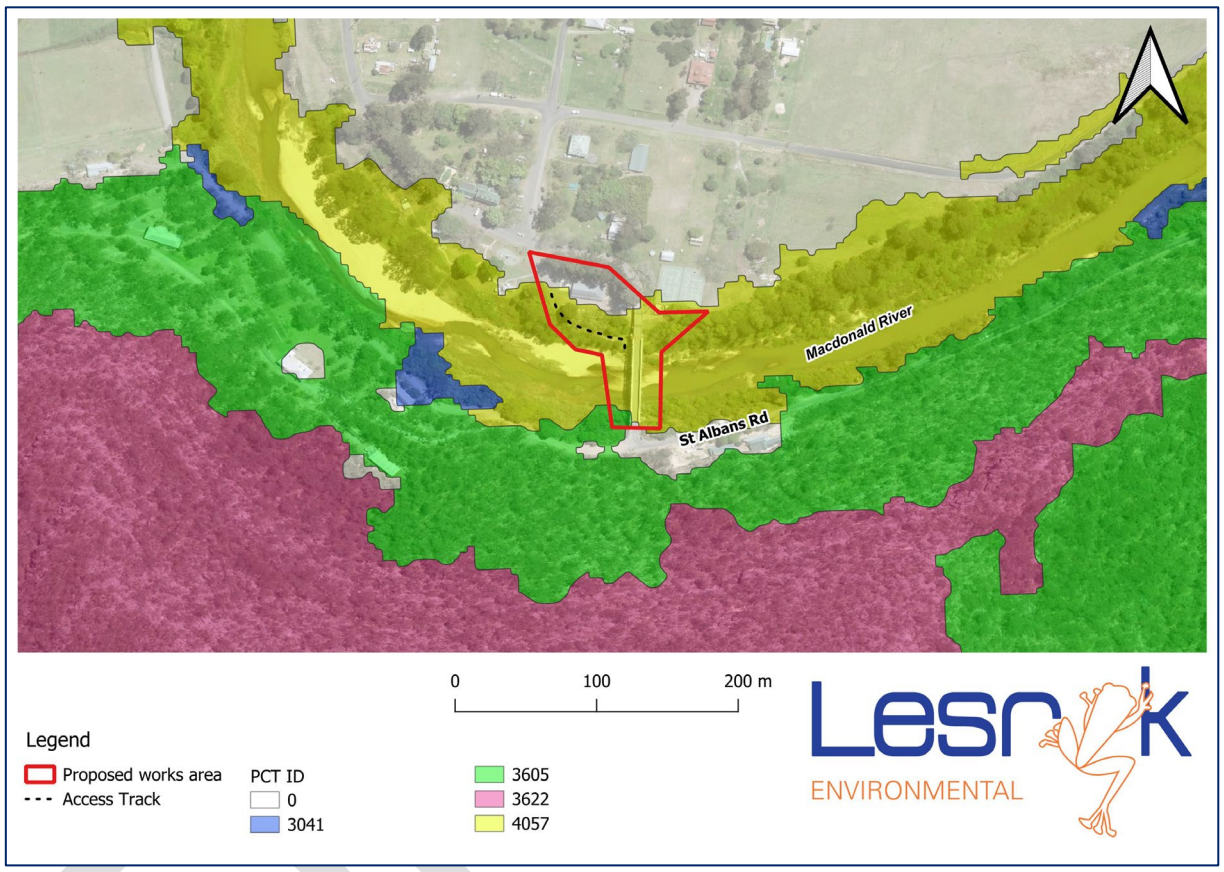


Figure 3-2 Plant community types

Surrounding the access paths allocated for the proposed works, the vegetation matches PCT 4057 – Sydney Creekflat Swamp Mahogany-Paperbark Forest. The canopy is comprised of Mountain Blue Gum (*Eucalyptus deanei*), Grey Gum (*Eucalyptus punctata*) and Rough-barked Apple (*Angophora floribunda*). The midstory is dominated by Cheese Trees with Bracken Fern the dominant groundcover.

3.2 Threatened ecological communities

One Endangered BC Act listed TEC was identified within a component of the proposed works area (being in proximity to the required access track), this being the Threatened Ecological Community known as '*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*'.

The access track, this existing and being in the order of 3.5 m wide by 150 m long, is present on the north bank of the river, this proposed to be used to gain access to Pier 4. To permit use of this track, it would be slashed, with overhanging/track vegetation trimmed/pruned. The alignment of the existing track will not be altered and there will not be any clearing of the adjacent native woodland. None of the limbs that are to be trimmed/pruned are hollow-bearing.

During the field survey, no large stick nests, typical of those of the large raptors, were observed within, or in proximity to, St Albans Bridge.

Based on the adoption of a precautionary approach, to consider the impact the works proposed to permit use of the access track may have on the Endangered Ecological Community, the criteria provided under Section 7.3 of the BC Act were referred to and drawn upon (Appendix D). Reference to these criteria concluded the extent of vegetation clearance/disturbance would not have a significant effect on the threatened ecological community or its habitat.

It is acknowledged that, post-work, the vegetation present adjacent to the required access track would be permitted to naturally regenerate, with no on-going track maintenance occurring.

3.3 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDE) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- Wetlands
- Red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation
- Ecosystems in streams fed by groundwater
- Limestone cave systems, and
- Hanging valleys and swamps.

Reference to the Groundwater Dependent Ecosystems Atlas (BoM 2023b) identified high potential terrestrial GDE and moderate potential GDE within the proposal area. No aquatic or subterranean GDE were identified or analysed for the study area (Figure 3-3).

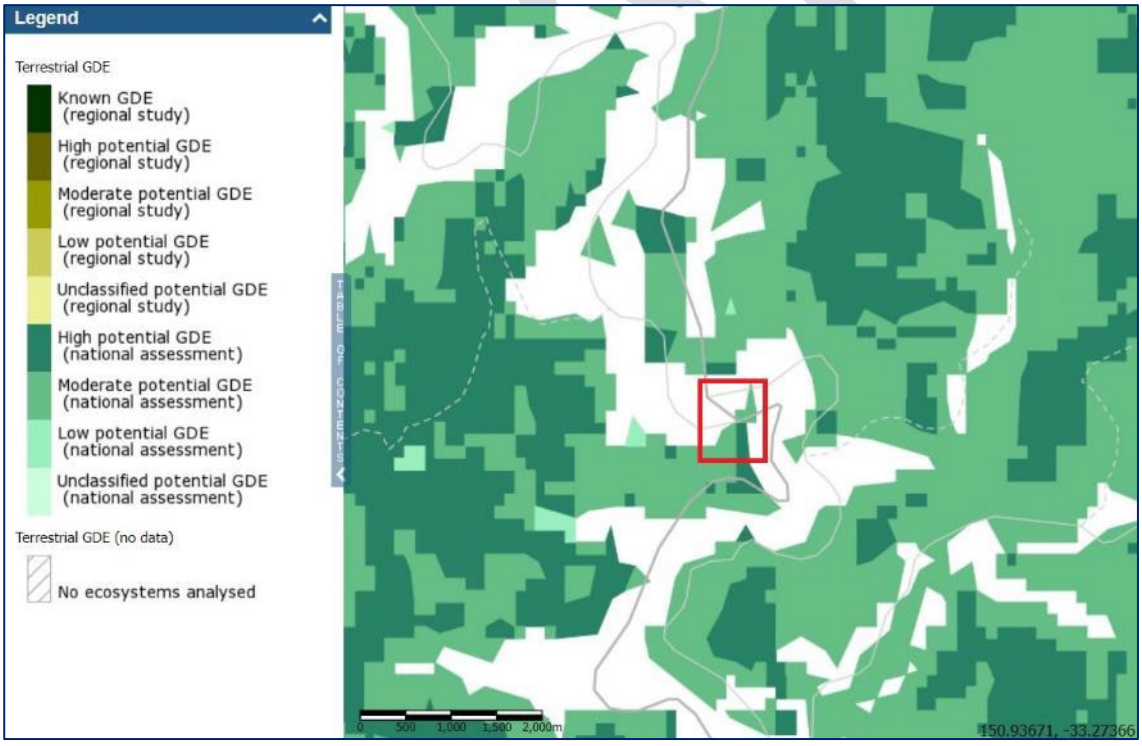


Figure 3-3 Groundwater dependent ecosystems (red box indicative of proposal area)

3.4 Threatened Species

Prior to conducting the field investigation, a review of the DCCEEW PMST and BioNet databases (DCCEEW 2023a, DPE 2023a) identified 33 threatened flora species and 53 threatened fauna species, listed under the EPBC and/or BC Acts that have been previously recorded or are considered to have habitat within 10 km of the subject site (Appendix B). Those species that have been previously recorded within 10 km of the study area as per the BioNet Atlas are presented in Figure 3-4 (note: the locations where some species were recorded overlap). Due to a lack of their necessary habitats within the area investigated, oceanic, estuarine, wetland and/or fish species were not considered.

By the completion of the investigation, one vegetation community, this being the BC Act listed '*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*'.

No flora or fauna species listed, or currently being considered for listing, under the EPBC and/or BC Acts were recorded.

Given the highly disturbed and modified character of the area investigated, no threatened flora species are expected to occur, particularly within the soil seed bank.

Though considered and targeted searches were conducted, no microbats were observed roosting in association within those portions of the bridge inspected. In addition, no signs (such as guano or characteristic staining) that would indicate the use of the bridge by microbats was obtained.

Whilst this is the case, with reference to Section 6.2.2 of the initial BAR (Niche 2021), as they have been previously recorded in the surrounding region, and as microbat habitat was observed in association with St Albans Bridge, it was considered appropriate to adopt a precautionary approach to the potential presence of the following cave-dependent microbats (all of which are listed as Vulnerable under the BC Act), the:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Little Bent-wing bat (*Miniopterus australis*)
- Large Bent-wing bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*).

Assessments referencing the criteria provided under Section 7.3 of the BC Act were conducted on these microbats; these concluding that the proposed bridge works will not have a significant impact on these species or their habitat/s (Appendix F). Therefore, the preparation of an SIS, or BDAR should Transport for NSW pursue that option, is not required.

With reference to Section 6.2.2 of the BAR (Niche 2021), the Southern Myotis (*Myotis macropus*) is the only species that may potentially be roosting within or near the bridge based on the detection times of this species. The other cave dependent bats (i.e. *Miniopterus* spp. and *Micronomus norfolkensis*) were detected at times that suggest they were recorded during their nightly foraging movements. Niche noted:

> *Regarding Southern Myotis, the earliest pass after dusk for this species was 11:57 pm, a considerable amount of time (around five hours) after sunset, which indicates that the species may have travelled some distance before arriving in the study area. However, the latest pass of this species was 6:34 am, this being around dawn (sunrise being 7:01 am). This indicates that Southern Myotis could be roosting near of the bridge (or could be due to survey limitations and earlier passes of Southern Myotis not being detected)* (Niche 2021, Page 16).

One of the species recorded during those surveys conducted (Niche 2021), the Yellow-bellied Sheathtail bat (*Saccolaimus flaviventris*), is listed as Vulnerable under the BC Act. This species has a specific habitat requirement that includes hollow-bearing trees. Within the proposal area, no occurrences of this habitat are present and therefore this species would not occur within, or close to, the proposed bridge works site.

During their surveys, Niche was made aware that populations of the following threatened species maybe present in this vicinity of St Albans Bridge: the Large-eared Pied Bat (*Chalinolobus dwyeri*) [Vulnerable – EPBC and BC Acts]. Though considered and surveyed for, this microbat was not recorded and Niche did not consider that it would be present as a locally viable population.

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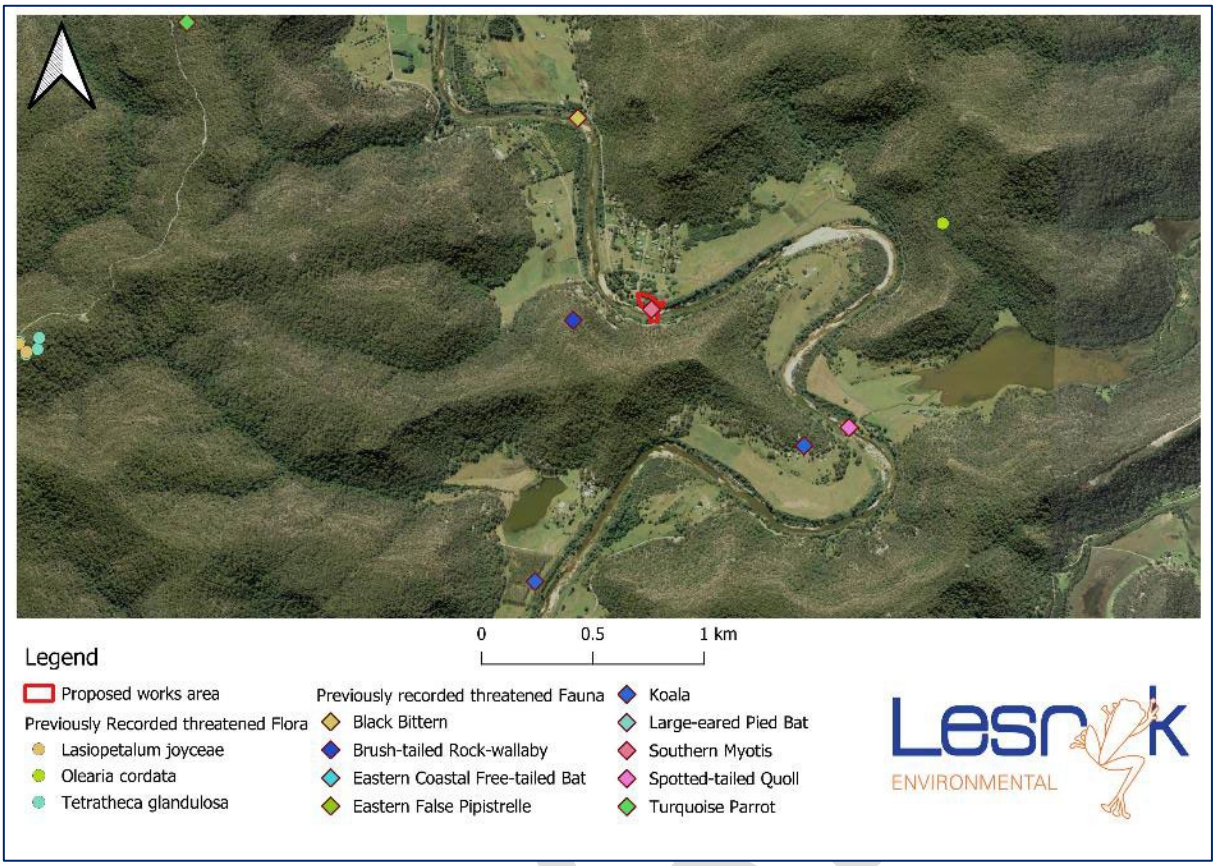


Figure 3-4 Previously recorded threatened species (within 10 km)

Given the open and cleared character of the fauna habitats present, few native species were recorded (Appendix D). The native species recorded, and the majority of those detected during the previous study (Niche 2021), are protected as defined by the BC Act, but considered to be common to abundant throughout the surrounding region. The species currently or previously recorded would not be solely reliant upon those habitats present within, or near to, the portions of St Albans Bridge where works will be conducted such that the removal or further disturbance of these would threaten the 'local' occurrence of these animals. The species recorded or previously detected are all expected to be present within both the proposal area and surrounding locality post-work.

In the case of fauna, numerous highly mobile threatened species with large territorial ranges (e.g. bats, birds) may traverse or occupy the study area on occasions. Only those that have a documented association with those habitat components that were identified within the study area would be considered for assessment under the EPBC and/or BC Acts.

3.5 Aquatic results

At the time of the investigation Macdonald River was a 2 m wide flowing channel, with about 5 m tall earthen banks lined with Eucalypt woodland present within and beyond the limits of the proposed works. The river appeared to have low turbidity and minimal sedimentation, with high visibility. Several sedge grasses were present within Macdonald River and significant woody debris had accumulated around the base of Pier 4.

The proposal is primarily terrestrial in nature, though a component will include the removal of the existing footings through use of a cofferdam and some bank work to permit the establishment of the bridge abutments. It is noted that these works will be temporary in nature, will not present any barriers to the movement patterns of aquatic species, will not fragment or isolate any aquatic habitats and would not affect any aquatic habitats such as gravel beds, reed beds or large woody debris.

It is acknowledged that the proposal would involve:

Dredging work —
a) any work that involves excavating water land
b) any work that involves moving material on water land or removing material from water land.

Reclamation work —
a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or
a) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or
b) draining water from water land for the purpose of its reclamation.

Based on an assessment of those aquatic habitats observed in Macdonald River, it is not considered that any threatened fish would be present as a resident population within the section of river investigated.

Of those Key Threatening Processes (KTP) listed under Schedule 6 of the FM Act, 'Degradation of native riparian vegetation along NSW water courses' is relevant to the proposal. This threatening process applies to all NSW waterways, not only those where listed threatened species are present. In proximity to St Albans Bridge, the native riparian vegetation present will not be significantly disturbed by the proposal. Given the condition of Macdonald River, within, and in proximity to, the area investigated, and as the existing road corridor is regularly maintained, the proposal would not significantly contribute to this KTP. Furthermore, the removal of the vegetation from the road corridor is not expected to cause the instability of the river's banks or further reduce the quality of the water.

Though considered and a period of about 15 minutes spent observing those pools present, no fish were observed. It is unlikely that any resident populations of native fish will be present due to the degraded nature of the habitat. No threatened fish species listed under the EPBC or FM Acts have mapped habitat within the study area (DPI 2023b), the closest being the habitat for the Macquarie Perch (*Macquaria australasica*) about 20 km south-west beyond the boundary of the proposal. Whilst the aquatic habitats present remain suitable for native fish, the scale of work proposed is not considered to have a significant impact on these species, their habitats or movement patterns. No major areas of aquatic habitat are to be removed, modified or disturbed. The proposal is not considered to result in any fish species, aquatic-associated animals or their populations becoming extinct in the locality.

No nationally important RAMSAR wetlands are identified within, or near to, the study area (DCCEEW 2023a). The area is not mapped as an NSW Marine Protected Area.

Reference to the Bureau of Meteorology GDE Atlas (Bureau of Meteorology 2023b) identified mapped areas of High and Moderate potential Terrestrial GDE within the study area (Figure 3-3; red box indicative of study area). Beyond the study area, no Aquatic GDE occurs within 10 km of the site.

To ensure that the works have a negligible impact on the Macdonald River, standard erosion and sediment control measures would be implemented and supervised by the engaged contractors. Sedimentation fencing/structures (e.g., sandbags) would be erected/installed where ground disturbance is predicted, prior to the commencement, and kept in place for the duration, of the proposed work. During the works, these would be inspected and maintained (e.g., sediment build up cleared) as required.

Given the measure above, there would not be any significant impacts on aquatic biodiversity as a result of the proposal.

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3.6 Areas of outstanding biodiversity value

The DCCEEW's Register of Critical Habitat (DCCEEW 2023e) and DPE's Area of Outstanding Biodiversity Value (AOBV) register (DPE 2023b) (in conjunction with Part 3 of the Biodiversity Conservation Regulation 2017) per listings provided under the EPBC and/or BC Acts, does not identify any gazetted areas of critical habitat or AOBV for any flora or fauna species or communities occurring within or near to the proposed work area.

3.7 Wildlife connectivity corridors

A relatively continuous vegetated corridor, encompassing several conservation reserves and protected lands, extends from [within the surrounding region] Yengo National Park (120 m south and 1.2 km north of the proposal) to Goulburn River National Park (about 118 km north-east of the proposal area). The connectivity of this corridor is important for the dispersal, movement, interbreeding and migratory needs of a number of native species.

Reference to SEED Dataset mapping notes that the proposed bridge works site is not part of the Fauna Key Habitats or Fauna Corridor for North East NSW (State Government of NSW and DPIE 2010a, 2010b) (Figure 3-5). The proposed works occur about 120 m north of the Fauna Corridors for the North East (Figure 3-5).

The key habitats map layer is a regional representation displaying the likelihood of occurrence of key habitats for fauna consolidated at the regional scale. Regional corridors are primary landscape connections between larger important areas of habitat; generally substantial in width (> 500 m) and provide not only for dispersal of individual species but act as habitat in their own right for a range of species, and should be at least twice the width of the average home range area of the animal species identified as potential users of the corridor (DEC 2004b).

The proposal is located within an existing disturbed/modified footprint, with exotic roadside vegetation in the vicinity; as such, it will not involve any significant vegetation removal (e.g., canopy connectivity) or significantly impact wildlife connectivity corridors. Given the modified nature of the study area, the proposal will not impact any existing wildlife corridors or the connectivity of vegetation present within and in proximity to the study area.

Numerous barriers to ground traversing fauna are present within the area surveyed, including the river and bridge itself. Beyond existing influences, the undertaking of the works will not affect any fauna movements, nor will they have an adverse cumulative impact when associated with the existing situation. The works will not further fragment or isolate any habitat area, nor present a barrier to fauna dispersal patterns.

Post-work, flying species, and those highly tolerant of traversing rural environments/infrastructure, would still be able to move across and through the proposed work areas.

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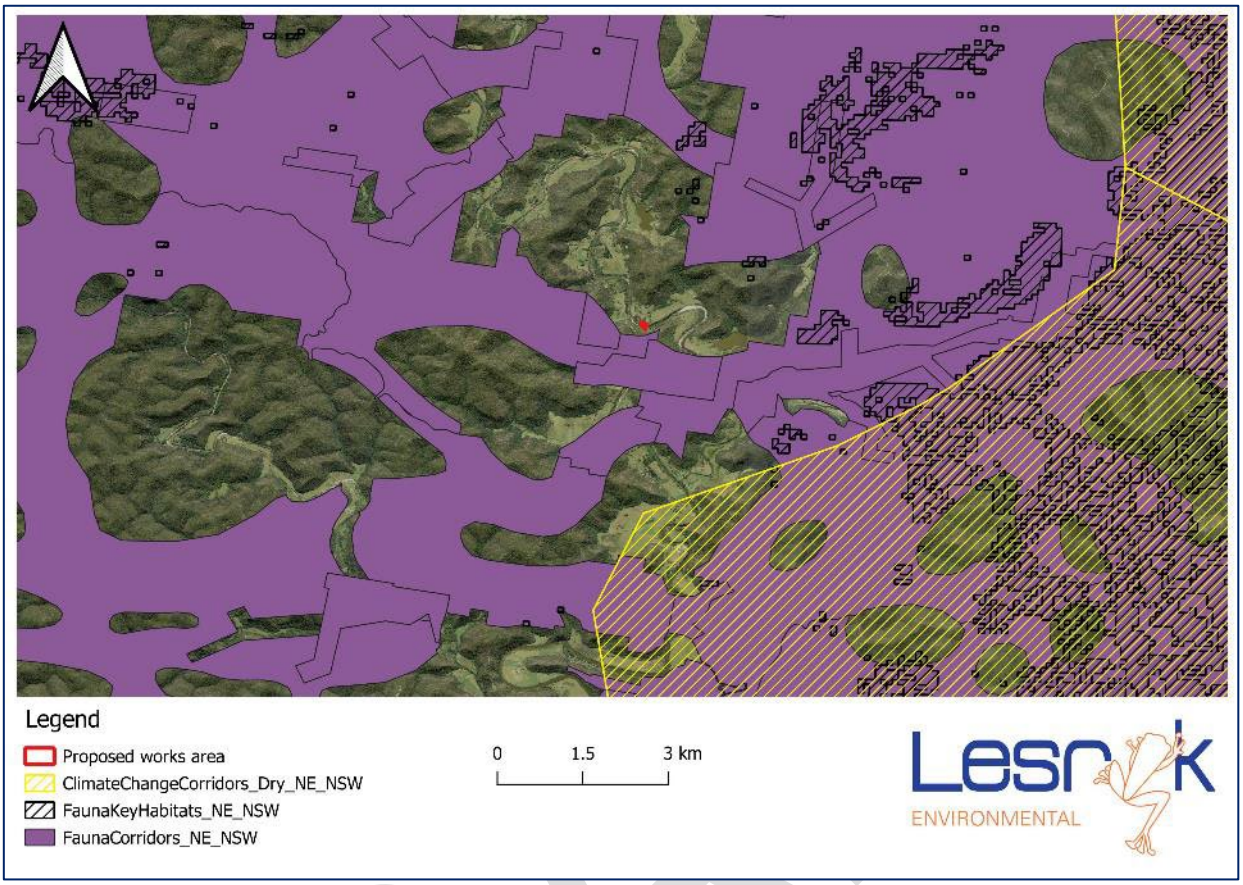


Figure 3-5 North-east Key Habitat and Corridors

3.8 SEPP (Biodiversity and Conservation) 2021

Chapter 4 - Koala Habitat Protection 2021

The Hawkesbury City Council LGA is identified under Schedule 2 - LGAs of the SEPP and is within the Central Coast Koala management area. This Policy seeks to encourage the proper conservation and management of areas that provide habitat for Koalas.

Chapter 4 'Koala habitat protection 2021' of the SEPP only applies to development applications assessed under Part 4 of EPA Act, not those considered under Part 5. That stated, it is TfNSW's practice to consider the SEPP criteria as part of the environmental assessment process.

No Koala Plan of Management exists for the locality. No evidence (i.e. sightings, calls, scats etc.) to suggest that the area investigated supported a resident Koala population were identified. Reference to the BioNet Atlas (DPE 2023a) identified a previous Koala record about 1 km south east of the proposal area – and most recent detection approximately 3 km south west (sighted in 2018).

In accordance with the following definitions provided under Chapter 4, Section 4.2 of the SEPP, the proposal area is not considered to constitute Core Koala habitat:

(a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

(b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

The carrying out of the proposed work would not require the preparation of a Plan of Management for the conservation and management of areas of Koala habitat

3.9 Matters of National Environmental Significance

No threatened species or Threatened Ecological Communities listed under the EPBC Act were recorded within, or near to, the proposed bridge works site. Similarly, none were considered likely to occur or rely upon the habitat to be temporarily disturbed for any of their necessary lifecycle requirements.

Reference to the PMST did not identify any wetlands of international importance, within, or near to, the proposal site.

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4. Avoidance and minimisation

The key principles of Transport's Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011), and the associated impact on the natural and social environment, is that Transport should aim to:

- Avoid and minimise the impact first
- Mitigate the impact where avoidance is not possible, and
- Offset where residual impact cannot be avoided.

4.1 Application of avoid and minimise principles

The proposal includes::

- Rehabilitation works on Pier 4 of the bridge
- Flood recovery works at Pier 4 of the bridge
- Special project works on top of the deck of St Albans Bridge itself.

While disturbance of about 0.825 ha of native and exotic vegetation is unavoidable in order to carry out the proposal, the amount and quality of bushland to be cleared/disturbed is considered to provide minimal habitat resources for those species recorded, or potentially occurring, given the extent of similar retained vegetation within the surrounding locality.

The proposed work would take place within, and adjacent to, the disturbance footprint of the existing access track, around the base of the existing Pier 4 and on the bride deck itself; as such, the potential to avoid wider impacts to biodiversity is high.

To permit the proposed work, trimming of vegetation will be undertaken.

No trees, particularly those that are hollow-bearing, will require removal.

Vegetation clearance would be limited to the minimum required to successfully complete the proposal; with the selection of equipment to be used also aimed at minimising clearance requirements. Vegetation clearance and work limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with Guide 2 of Transport's Biodiversity Guidelines (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees present and the areas marked as 'no-go zones', to avoid indirect impact.

To avoid the removal of additional vegetation, the temporary compound/stockpile site required to assist the proposal would be located within an existing cleared/disturbed site off the eastern shoulder of St Albans Bridge within the north-western extent of the proposed work areas and additional compound site within the northern extent of the proposal area.

The design process involved an assessment to consider suitable remediation options and select the most appropriate solution with regard to minimising impact on the ecological values of the subject site wherever possible.

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5. Impact assessment

Potential impacts as a result of conducting the activity include the disturbance/removal of up to 0.825 ha of native and exotic vegetation, including the trimming of the vegetation that occurs alongside of the existing access tracks. None of the trees that are to be pruned/trimmed are considered to provide habitat (i.e. are hollow-bearing) for native species.

No threatened species were recorded. Similarly, no threatened flora or fauna species were considered to have a moderate to high likelihood of occurrence in the proposed work areas.

Potential impact include temporary noise and/or vibration levels, erosion, injury and/or mortality to fauna, edge effects, weed proliferation and introduction of pathogens.

No significant adverse impact is expected during the operational phase of the proposal.

Mitigation measures have been provided in Section 6 of this report.

5.1 Construction direct impacts

5.1.1 Removal of native vegetation

By the completion of the field survey a number of native and exotic plants had been recorded within the area investigated (Appendix D). It is noted that Appendix D is not intended to be a comprehensive list of all species present within the area investigated, and only represents those plants that were recorded whilst conducting searches for:

- those native species and ecological communities of State and/or national conservation concern that are known, or expected to occur, in the locality, and
- weeds of significance that would require treatment (refer to Section 5.2.4).

Based on a worst-case estimate it is expected that 0.825 ha of native and exotic vegetation would be temporarily disturbed/affected to permit the proposal (Table 5-1). Post-bridge work, the vegetation that would be affected would be permitted to naturally regenerate.

Table 5-1: Removal of native vegetation and/or PCT type

Veg. zone	Plant community type (PCT)	Broad condition class	TEC	Area to be impacted (ha or m^2)
Proposal Area	PCT 0 – Unclassified vegetation	Low	N/A	0.45 ha
Proposal Area	PCT 4057 – Sydney Creekflat Swamp Mahogany-Paperbark Forest	Moderate	Yes	0.375 ha

Relevant to the proposal's impact on vegetation, the following Key Threatening Process (KTP) is applicable:

- Clearing of native vegetation – Schedule 4, BC Act.

Given the extent of similar resources within the study area and beyond, and provided recommended mitigation measures are adopted, trimming of native vegetation within the 0.825 ha disturbance footprint of native and exotic vegetation within the proposal area, it is not considered to significantly contribute to, or increase the impact of the KTP.

Clearing within the proposal area would be carried out in accordance with Guide 4 of the Biodiversity Guidelines (RTA 2011) to minimise disturbance to surrounding flora and fauna habitats.

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5.1.2 Removal of threatened fauna habitat

No threatened fauna species listed under the EPBC or BC Acts were recorded or considered likely to occur within those portions of the bridge surveyed.

With reference to section 6.2.2 of the initial BAR prepared by Niche, five cave-dependent threatened microbats have been recorded in proximity to the existing bridge (Niche 2021). Considering the documented habitat requirements of these microbats, there is the potential that some could occupy St Albans Bridge. Whilst this is the case, considering the scope of works proposed and the components of the bridge at which the works will occur, the activities that would be conducted would not affect any habitat(s) (particularly roosting or breeding sites) that may be occupied by threatened microbats if they occur in association with the existing structure.

Assessments referencing the criteria provided under Section 7.3 of the BC Act were conducted on the five cave-dependent threatened microbats previously recorded; these concluding that the proposed bridge works will not have a significant impact on these species or their habitat/s (Appendix F). Therefore, the preparation of an SIS or BDAR is not required.

No further threatened fauna habitat (including aquatic environments) important to the local occurrence of threatened species previously recorded within the surrounding region was observed within the area investigated.

Removal of habitat within the proposal area would be carried out in accordance with Guide 4 of the Biodiversity Guidelines (RTA 2011).

5.1.3 Removal of threatened flora

One threatened vegetation community listed under the BC Act was recorded within the area investigated;, this being the '*Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*'. as such, the conducting of assessments referring to the EPBC Act's Significant Impact Guidelines and Section 7.3 of the BC Act was conducted concluding the expected impacts associated with the proposal on the Swamp Sclerophyll Forest are not considered to be significant and therefore the preparation of an SIS is not considered necessary.

5.1.4 Aquatic impacts

Works undertaken around Pier 4 will require the temporary establishment of a coffer dam. Use of this will not have an adverse impact, particularly any that are long term, on aquatic habitats. Use of the coffer dam will not require the clearing of any aquatic vegetation, gravel runs, submerged aquatic habitats or large woody debris, similarly the use of this will not fragment or isolate any aquatic environments.

Whilst the coffer dam will be located within the southern portion of the existing channel of Macdonald River, areas north of the dam will be available for the movement and dispersal requirements of aquatic species.

Beyond existing conditions, the works proposed would not result in any direct or indirect adverse impact on surface hydrology within the proposal area and is not expected to impact any of those drainage lines that occur beyond the limits of the work.

No land identified by SEPP Resilience and Hazards 2021 (i.e. coastal wetlands) occurs within, or near to, the study area.

No aquaculture, commercial or recreational fishing occurs within, or near to, the study area.

5.1.5 Injury and mortality

Vegetation trimming to permit the proposal would involve the disturbance of a mix of native and exotic vegetation, inclusive of groundcover vegetation, shrubs and ground debris. Given the proposal would be conducted within a previously disturbed environment (due to use of the existing access trail, bridge deck and sand banks), there is minimal expectation that sheltering animals would be injured during the course of the proposed activity.

During the construction phase of the proposal some rural adaptable, sheltering fauna species (i.e. frogs and ground-traversing mammals) could be present and be subject to injury. Mitigation measures to minimise the impact of the proposed work on these animals, if present (such as checking beneath vehicles/machinery prior to their use) have been provided to address this matter (Section 6).

Beyond current levels of impact due to the existing presence of Wollombi Road, St Albans Road, and the volume of traffic that typically uses this network, the operational phase of the proposal is not expected to significantly increase injury or mortality of

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fauna within the proposal area. The proposal is not expected to increase vehicle strikes on those fauna species recorded or potentially occurring. The proposal would not have an adverse impact on the long-term viability of these species or their local populations.

5.1.6 Groundwater dependent ecosystems

High potential terrestrial GDE and moderate potential terrestrial GDE have been identified within the proposal area (BoM 2023b).

In reference to the DPI (Office of Water)'s *Risk assessment guidelines for groundwater dependent ecosystems* (Serov *et al.* 2012), the proposed bridge works would not have any direct or indirect impact on a water source or aquifer structure, it would not involve groundwater extraction, and, with the adoption of mitigation measures, would not contribute to the off-site movement of sediment.

5.2 Indirect and operational impacts

5.2.1 Edge effects on adjacent native vegetation and habitat

Weeds are readily spread (and are spreading) by existing dispersal factors such as wind, birds, water and the movement of vehicles along the road. Clearing and opening up of new vegetation edges can facilitate the recruitment of these species and provide opportunities for the establishment of other weed species. These weeds are often able to out-compete native flora and fauna species and reduce the habitat values of these areas. While this is the case, edge effects beyond those that are currently occurring adjacent to St Albans Bridge and the existing access track are not expected to be exacerbated due to the carrying out of the proposed activity.

5.2.2 Wildlife connectivity and habitat fragmentation

The proposed works, including the temporary disturbance/pruning/trimming of 0.375 ha of vegetation along/adjacent to the required access track, would not isolate or further fragment any habitat areas. Beyond the current situation, the proposed works will not erect any additional barriers to the movement and dispersal patterns of flying species (i.e. birds, bats), gliding arboreal mammals, ground traversing species that may be currently negotiating Wollombi Road and St Albans bridge. Similar resources retained within the proposal area, and the surrounding lands, permit the opportunity for dispersal of species.

5.2.3 Injury and mortality

The potential for fauna injury and mortality impact, beyond that identified during the construction phase of the proposal (Section 5.1.5) or currently occurring at this location, would not increase during the operational phase of the proposal.

5.2.4 Invasion and spread of weeds

Under the *Biosecurity Act 2015*, 'all plants are regulated with a general biosecurity duty to prevent, eliminate or minimize any biosecurity risk they may pose'. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimized, so far as is reasonably practicable.'

Of those introduced plants recorded, Lantana (*Lantana camara*), Fireweed (*Senecio madagascariensis*) and Blackberry are listed:

- Under Schedule 3 of the NSW Biosecurity Regulation 2017
- As a WoNS (Weeds Australia 2023)[2], and
- As a Priority weed for the Hunter Local Land Services Region (DPI 2023a).

The relevant Regional Recommended Measure for Lantana, Fireweed and Blackberry under the Biosecurity Regulation is "Land managers should mitigate spread of the plant from their land." Therefore, control of these weeds prior to the commencement of the bridge works is recommended.

[2] The list of WoNS is part of a combined State and Commonwealth initiative to combat invasive species.

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As part of the ongoing maintenance of the road corridor, regular monitoring of these weeds is recommended.

5.2.5 Invasion and spread of pests

Beyond the existing diversity of exotic species and pests recorded and predicted to occur, the proposed bridge works will not have an adverse cumulative impact. The works will not benefit any exotic pests at the expense of native species.

Exotic plants and animals currently occupy, and occur in proximity to, the proposed work areas.

5.2.6 Invasion and spread of pathogens and disease

Should there be a need for workers to enter the adjacent bushland, there is a risk that the proposal would introduce, spread or exacerbate the plant diseases caused by *Phytophthora cinnamomi* and Myrtle Rust (*Puccinia psidii*). These diseases are most likely introduced or spread through the importation or movement of soil, water and landscaping materials, either directly or through incidental attachment to machinery.

'Infection of native plants by *Phytophthora cinnamomi*' and 'Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)', are listed KTP's under the BC and EPBC Acts, respectively. 'Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' is listed as a KTP under the BC Act and the disease is covered by the EPBC Act listing of 'Novel biota and their impact on biodiversity' as a KTP.

Although there was no obvious evidence for the presence of *Phytophthora cinnamomi* or Myrtle Rust in the vegetation of the proposal area or adjacent to it, recommendations to disinfect workers prior to any entry into adjacent bushland (should this be required) have been presented in Section 6.

5.2.7 Changes to hydrology

The proposed work would not result in any direct or indirect adverse impact on surface hydrology within the area investigated.

5.2.8 Noise, light, dust and vibration

During construction, activities associated with the proposal may cause additional noise and vibration; however, given the presence of the existing road corridor, it is not considered that the proposal would result in adverse changes to existing levels of noise, vibration and/or light from this existing source such that there would be a significant impact to native fauna species.

The proposed work impact is considered to be temporary and short-term. The Draft Construction Noise Guideline (EPA 2020) would be referenced, as would compliance of all vehicles and machinery with industry noise guidelines.

5.3 Cumulative impacts

The works proposed will not have an adverse cumulative impact when associated with other activities being conducted in the local area.

The works proposed will be temporary in nature, with an existing track and the bridge pier/deck being 'affected'.

Based on a worst-case estimate, the cumulative impact of the proposal would require the temporary disturbance/pruning/trimming of up to 0.825 ha of native and exotic vegetation, this including the trimming/pruning of several trees that occur adjacent to the existing access track. No large, extra-large trees, hollow-bearing trees or limbs would require removal.

Through the proposed rehabilitation work conducted within the proposed works area of St Albans Bridge, the cumulative

The proposal is not considered to contribute to an adverse cumulative ecological impact in a local and regional context; nor is it considered to further contribute to the decline of any threatened species, populations or ecological communities within the locality.

5.4 Assessments of significance

One threatened ecological community was recorded within, and close to, the proposed disturbance footprint (i.e. the existing access track), this being 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, this listed as Endangered under the BC Act. Although the proposed bridge works will occur within a previously disturbed/modified footprint and no vegetation clearing is being undertaken, based on the adoption of the

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precautionary approach, the criteria provided under Section 7.3 of the BC Act have been referred to and drawn upon (Appendix E). Reference to these criteria concluded the extent of vegetation clearance/disturbance wouldn't have a significant effect on the threatened ecological community or its habitat.

Reference to Section 6.2.2 of the BAR prepared for the proposal (Niche 2021) notes that the following cave-dependent microbats (all of which are listed as Vulnerable under the BC Act) have been recorded near the existing bridge site, the:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Little Bent-wing bat (*Miniopterus australis*)
- Large Bent-wing bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*).

Of these, Niche identified that the Southern Myotis is the only species that may potentially be roosting within or near to St Albans Bridge.

Though considered and targeted searches were conducted, no microbats were observed in association within those portions of the bridge inspected. In addition, no signs (such as guano or characteristic staining) that would indicate the use of the bridge by microbats was obtained.

Whilst not recorded or indicated, as it has been previously recorded at this site, based on the adoption of a precautionary approach, assessments referencing the criteria provided under Section 7.3 of the BC Act were conducted on these microbats (Appendix F).

The assessments conducted on the TEC and microbats concluded that the proposal would not have a significant effect on these entities, or any areas of their habitat. As such, it is not considered that the preparation of a SIS or BDAR that further considers the impact of the proposal on these entities is required.

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6. Mitigation

Table 6-1 provides a number of mitigation measures that aim to ensure that the proposed work carried out does not have an adverse impact on those environments that occur within or near to the proposal area.

Where applicable, safeguards are made with reference to Transport's *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).

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Table 6-1: Mitigation measures

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B01	General	An Erosion Sediment Control Plan (ESCP) would be prepared for the proposal and would be in line with the publication *Managing Urban Stormwater: Soils & Construction Guidelines* (Landcom 2004).	Detailed design	Effective	No	Project Manager/ Contractor
B02		A Construction Environmental Management Plan (CEMP) would be prepared for the proposal.	Prior to construction	Effective	No	Project Manager/ Contractor
B03		All temporary stockpiles to be managed in accordance with TfNSW's Stockpile Site Management Guidelines (EMS-TG-10	Prior/during construction	Effective	No	Project Manager/ Contractor
B04		The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) if threatened ecological communities and threatened fauna or flora not assessed in this biodiversity assessment, are identified in the proposal site.	During construction	Proven	No	Environment manager
B05		Spill kits commensurate with the type and quantity of hazardous material used must be available on-site.	During construction	Effective	No	Project Manager
B06	Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Detailed design	Effective	There would be a residual impact from the loss of 0.375 ha of native/exotic vegetation.	Project Manager/ Botanist
B07		Vegetation clearance limits would be identified both on site maps/plans and on-site through the erection of temporary exclusion fencing, bunting or similar in accordance with *Guide 2: Exclusion Zones* (RTA 2011). Fencing etc. would be established at the outer limits of the drip line of any retained trees and the areas marked as 'no-go zones' to avoid direct impact.	Prior to construction	Effective	No	Botanist/ Project Manager/ Contractor
B08		Pre-clearing surveys will be conducted in accordance with *Guide 1: Pre-clearing process* (RTA 2011).	Prior to construction	Effective	No	Ecologist
B09		Vegetation removal will be conducted in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* (RTA 2011).	During construction	Effective	No	Contractor

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ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
		Clearing of native vegetation would be limited to the minimum required to successfully permit the proposal.				
B10		Vegetation disturbance (including pruning/trimming) adjacent to the existing access track is to be limited to the minimum necessary to permit the safe use of this track.	During construction	Effective	No	Contractor
B11		Weed contaminated green waste will be disposed of appropriately at a licensed landfill facility.	During/post construction	Effective	No	Contractor
B12		Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* (RTA 2011).	Post-construction	Proven	No	Contractor
B13		No trees are to be removed during the proposed works.	Pre/post-construction	Effective	See B06.	Project Manager/ Environment Manager
B14	Removal of threatened fauna habitat	Threatened fauna habitat (i.e. the existing timber trusses) will not be affected.	Detailed design	Effective	No	Ecologist/ Project Manager
B15		Fauna will be managed in accordance with Guide 9: Fauna handling (RTA 2011).	During construction	Effective	No	Ecologist/licensed wildlife carer
B16		Large woody debris should not be mulched or removed off-site but should be relocated locally and placed parallel to the river banks.	During construction	Effective	No	Project Manager/Contractor/Environmental manager
B17	Removal of threatened flora	The unexpected species find procedure is to be followed (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	No	Environment Manager
B18	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Detailed design	Effective	No	Project Manager
B19		The coffer dam should not isolate or fragment any aquatic environments and should not present a barrier to the moment of aquatic species.	During construction	Proven	No	Project Manager/Contractor/Environmental manager

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ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B20	Fragmentation of identified habitat corridors	Connectivity measures will be considered/implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011) or equivalent updated NSW Guidelines.	Detailed design, during construction and post construction	Effective	No	Project Manager/ Ecologist
B21	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance *with Guide 2: Exclusion zones* (RTA 2011).	Prior to/during construction	Effective	No	Ecologist/ Project Manager
B22	Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna* handling (RTA 2011).	During construction	Effective	No	Ecologist or licensed wildlife carer
B23		Inspections for the presence of any sheltering fauna would be carried out beneath vehicles/machinery prior to use.	During construction	Effective	No	Contractor
B24		Any sheltering native species would be collected and relocated locally by a licenced individual (nocturnal species to be released on dusk). If injured, native wildlife would be taken to a local veterinarian or wildlife carer for treatment. Once rehabilitated, these native animals must be released at their point of capture. Exotic injured wildlife would be taken to a local veterinarian and ethically treated.	During construction	Effective	No	Ecologist or licensed wildlife carer
B25	Invasion and spread of weeds	Weed species will be managed in accordance *with Guide 6: Weed management* (RTA 2011).	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B26		In accordance with the NSW *Biosecurity Act 2015*, any Blackberry identified on site would be controlled (i.e. treated in accordance with approved weed management techniques such as hand removal or application of a suitable herbicide), thereby resulting in its suppression.	Prior/during construction	Effective	No	Botanist or similarly qualified personnel
B27		All vehicles/machinery would enter the site via stabilised areas to prevent the introduction and spread of weed seeds and/or pathogens.	During construction	Effective	No	Contractor

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ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B28	Invasion and spread of pathogens and disease	Pathogens (e.g. *Phytophthora cinnamomi*) will be managed in accordance with *Guide 2: Exclusion zones* and *Guide 7: Pathogen management* (RTA 2011), including the following hygiene protocols: • If there is a need to enter the adjacent bushland, before accessing, and upon leaving, these portions of the work site, workers are to remove excess soil and mud and then spray boots, tools, gloves and small equipment with recommended disinfectant supplied by the contractor (70% Methylated spirits / 30% Water) until runoff is clear. • Avoid unnecessary soil disturbance.	During construction	Effective	No	Contractor/ Project Manager
B29	Noise, light, dust and vibration	Potential dust impact generated from activities (e.g. mulching) would be monitored (i.e. to ensure it is not reducing traffic visibility). If dust impact is more than manageable, work will stop and the work method reviewed.	During construction	Effective	No	Contractor
B30		All plant/equipment to be used on site will be designed and operated to control the potential emission of smoky exhaust fumes into the atmosphere. All machinery/vehicles are to be operated within standard guidelines.	During construction	Effective	No	Contractor

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7. Offsets and other measures

7.1 Thresholds

The proposed works would not trigger thresholds set out by the No Net Loss Guidelines (TfNSW 2022a) listed in Table 7-1 (refer to Section 7.2 of this report).

Table 7-1: Offset thresholds (TfNSW No Net Loss Guidelines)

Impact	Threshold	Triggered
Works involving clearing of a CEEC	Where there is any clearing of an CEEC in 'moderate to good' condition	No
Works involving clearing of an EEC	Where clearing of a EEC ≥ 2 ha in 'moderate to good' condition	No
Works involving clearing of VEC	Where clearing of VEC ≥ 5 ha in 'moderate to good' condition	No
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥ 1 ha in 'moderate to good' condition	No
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥10 or where clearing of habitat is ≥ 1 ha	No
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat	No
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the *Tree and Hollow Replacement Guideline.*	Any clearing of hollows and/or trees ≥5cm DBH	No

Table 7-2: Assessment of vegetation impacts against thresholds

Veg. zone	Plant community type (PCT)	Condition	TEC	Impact area (ha or m²)[1]	Threshold triggered?
Proposal Area	PCT 0 - Unclassified vegetation	Low	N/A	0.45 ha	No
	PCT 4057 – Sydney Creekflat Swamp Mahogany-Paperbark Forest	Moderate	Associated with the BC Act Endangered Ecological Community listed as 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'	0.375 ha	No

7.2 Biodiversity offset strategy/tree and hollow replacement plan

The proposed work will not require the removal of any trees.

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8. Conclusion

To permit the undertaking of rehabilitation works at the existing St Albans Bridge site, an estimated disturbance footprint of 0.825 ha is expected, within which 0.375 ha of vegetation would be temporarily disturbed/pruned/compacted/trimmed.

Within the area investigated, no threatened flora or fauna species listed, or currently being considered for listing, under the EPBC or BC Acts were recorded. Similarly, considering the quality and structure of the vegetation and habitat present, no threatened flora or fauna were considered likely to occur and/or rely on the proposed bridge work sites for any of their lifecycle requirements.

One threatened ecological community was recorded within, and close to, the proposed disturbance footprint (i.e. the existing access track), this being 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, this listed as Endangered under the BC Act. Although the proposed bridge works will occur within a previously disturbed/modified footprint and no vegetation clearing is being undertaken, based on the adoption of the precautionary approach, the criteria provided under Section 7.3 of the BC Act have been referred to and drawn upon (Appendix E).

Assessments that reference the criteria provided under Section 7.3 of the BC Act were conducted on those microbats previously recorded at this site (Appendix E). It is noted that, though considered and surveyed for, no microbats were observed in association within those portions of the bridge inspected. In addition, no signs (such as guano or characteristic staining) that would indicate the use of the bridge by microbats was obtained.

The assessments conducted on the threatened ecological community and microbats concluded that the proposal would not have a significant effect on these entities, or any areas of their habitat. As such, it is not considered that the preparation of a SIS or BDAR (should Transport for NSW pursue that option) that further considers the impact of the proposal on these entities is required.

With reference to Chapter 4 of SEPP (Biodiversity and Conservation) 2021, the preparation of a Koala Plan of Management is not required.

Mitigation measures have been recommended in Section 6, to reduce any ecological impact as a result of the proposed work. Two primary measures include:

- Minimising impact through detailed design, and
- Adhering to TfNSW's *Biodiversity Guidelines* (RTA 2011).

In addition, the following key mitigation measures have been provided:

- Prepare an ESCP to minimise soil erosion and sediment transfer off-site
- Large woody debris around the pier to be collected and placed perpendicular to the river to provide habitat
- Limit vegetation removal to the minimum required to successfully permit the proposal
- If the proposal is amended to include any works on the timber trusses, top chord, top of the posts and abutments, further surveys are needed to be conducted targeting cave-associated microbats.

With adherence to those recommendations provided in this report, no ecological constraints to the proposal proceeding as planned were identified or considered likely to occur.

The adoption of the mitigation measures provided would ensure that the proposal is carried out in an ecologically sustainable manner.

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9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (State Government of NSW and DPIE 2020c).
BioNet Atlas	The DPE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish.
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW.
Construction footprint	The area to be directly impacted by the proposal during construction activities. See also definition for subject land.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation). This includes impacts from activities related to the construction or operational phase of the proposal (State Government of NSW and DPIE 2020c).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (State Government of NSW and DPIE 2020c).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (State Government of NSW and DPIE 2020c).
Landscape assessment area	The area which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land or 500 m along each side of the centre line of a linear-shaped proposal.
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and

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	contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year.
Matter of national environmental significance	A MNES is any of the nine defined components protected by a provision of Part 3 of the EPBC Act.
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary, a) trees (including any sapling or shrub or any scrub) b) understorey plants c) groundcover (being any type of herbaceous vegetation) d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (State Government of NSW and DPIE 2020c).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Patch size	An area of native vegetation that: • occurs on the development site or biodiversity stewardship site • includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (State Government of NSW and DPIE 2020c).
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (State Government of NSW and DPIE 2020c). This is analogous with the definition of 'candidate species'.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (DPE 2023a).
Study area	The area directly affected by the proposal (subject land or construction footprint) and any additional areas likely to be affected by the proposal, either directly or indirectly.

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Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject land (i.e., the area of land in the 1500 m buffer zone around the subject land or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area (State Government of NSW and DPIE 2020c). See also definition for construction footprint.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (State Government of NSW and DPIE 2020c). Part of the BioNet database.
Tree	As per Australian Standard 4970-2009 a tree is considered to be a long-lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks (or as defined by the determining authority).
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (State Government of NSW and DPIE 2020c).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (State Government of NSW and DPIE 2020c).
Water land	Water land is land submerged by water – a) whether permanently or intermittently b) whether forming an artificial or natural body of water.

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10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EP&A Act	*Environment Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
KFH	Key Fish Habitat
KTP	Key Threatening Process
LGA	Local Government Area
mm/cm/m/m2/km/ha	Millimetres, centimetres, metres, square metres, kilometres, hectares
MNES	Matters of national environmental significance
NSW	New South Wales
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
TfNSW	Transport for NSW
VIS	Vegetation Information System
WoNS	Weeds of National Significance

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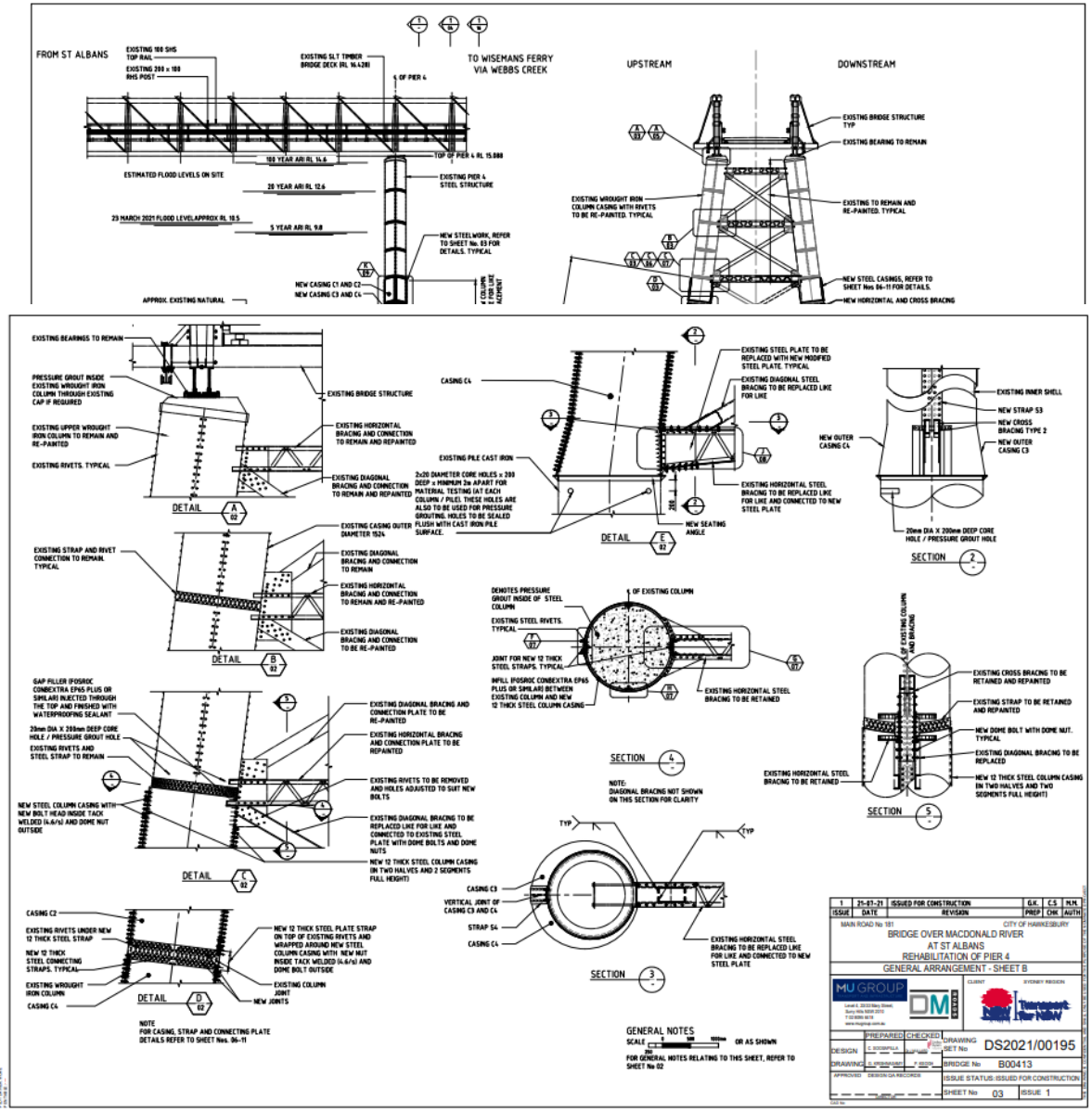
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Appendix A: Detailed Engineering Design Plans


FROM ST ALBANS
TO WISEMANS FERRY VIA WEBBS CREEK
UPSTREAM
DOWNSTREAM
EXISTING 100 SHS TOP RAIL
EXISTING 200 x 100 RHS POST
EXISTING SLT TIMBER BRIDGE DECK (RL 16.428)
℄ OF PIER 4
100 YEAR ARI RL 14.6
TOP OF PIER 4 RL 15.888
ESTIMATED FLOOD LEVELS ON SITE
20 YEAR ARI RL 12.6
EXISTING PIER 4 STEEL STRUCTURE
23 MARCH 2021 FLOOD LEVEL(APPROX RL 10.5
5 YEAR ARI RL 9.8
NEW STEELWORK, REFER TO SHEET No. 03 FOR DETAILS. TYPICAL
NEW CASING C1 AND C2
NEW CASING C3 AND C4
APPROX. EXISTING NATURAL
EXISTING BRIDGE STRUCTURE TYP
EXISTING BEARING TO REMAIN
EXISTING WROUGHT IRON COLUMN CASING WITH RIVETS TO BE RE-PAINTED. TYPICAL
EXISTING TO REMAIN AND RE-PAINTED. TYPICAL
NEW STEEL CASINGS, REFER TO SHEET Nos 06-11 FOR DETAILS.
NEW HORIZONTAL AND CROSS BRACING
EXISTING BEARINGS TO REMAIN
PRESSURE GROUT INSIDE EXISTING WROUGHT IRON COLUMN THROUGH EXISTING CAP IF REQUIRED
EXISTING BRIDGE STRUCTURE
EXISTING UPPER WROUGHT IRON COLUMN TO REMAIN AND RE-PAINTED
EXISTING HORIZONTAL BRACING AND CONNECTION TO REMAIN AND REPAINTED
EXISTING RIVETS. TYPICAL
EXISTING DIAGONAL BRACING AND CONNECTION TO REMAIN AND REPAINTED
DETAIL A 02
CASING C4
EXISTING STEEL PLATE TO BE REPLACED WITH NEW MODIFIED STEEL PLATE. TYPICAL
EXISTING DIAGONAL STEEL BRACING TO BE REPLACED LIKE FOR LIKE
EXISTING PILE CAST IRON
2x20 DIAMETER CORE HOLES x 200 DEEP x MINIMUM 2m APART FOR MATERIAL TESTING (AT EACH COLUMN / PILE. THESE HOLES ARE ALSO TO BE USED FOR PRESSURE GROUTING. HOLES TO BE SEALED FLUSH WITH CAST IRON PILE SURFACE.
EXISTING HORIZONTAL STEEL BRACING TO BE REPLACED LIKE FOR LIKE AND CONNECTED TO NEW STEEL PLATE
NEW SEATING ANGLE
DETAIL E 02
EXISTING INNER SHELL
NEW STRAP S3
NEW CROSS BRACING TYPE 2
NEW OUTER CASING C3
NEW OUTER CASING C4
20mm DIA X 200mm DEEP CORE HOLE / PRESSURE GROUT HOLE
SECTION 2
EXISTING STRAP AND RIVET CONNECTION TO REMAIN. TYPICAL
EXISTING CASING OUTER DIAMETER 1524
EXISTING DIAGONAL BRACING AND CONNECTION TO REMAIN
EXISTING HORIZONTAL BRACING AND CONNECTION TO REMAIN AND RE-PAINTED
EXISTING DIAGONAL BRACING AND CONNECTION TO BE RE-PAINTED
DETAIL B 02
DENOTES PRESSURE GROUT INSIDE OF STEEL COLUMN
EXISTING STEEL RIVETS. TYPICAL
JOINT FOR NEW 12 THICK STEEL STRAPS. TYPICAL
INFILL (FOSROC CONBEXTRA EP65 PLUS OR SIMILAR) BETWEEN EXISTING COLUMN AND NEW 12 THICK STEEL COLUMN CASING
℄ OF EXISTING COLUMN
EXISTING HORIZONTAL STEEL BRACING TO BE RETAINED
SECTION 4
NOTE: DIAGONAL BRACING NOT SHOWN ON THIS SECTION FOR CLARITY
GAP FILLER (FOSROC CONBEXTRA EP65 PLUS OR SIMILAR) INJECTED THROUGH THE TOP AND FINISHED WITH WATERPROOFING SEALANT
20mm DIA X 200mm DEEP CORE HOLE / PRESSURE GROUT HOLE
EXISTING RIVETS AND STEEL STRAP TO REMAIN
NEW STEEL COLUMN CASING WITH NEW BOLT HEAD INSIDE TACK WELDED (6.6/s) AND DOME NUT OUTSIDE
EXISTING DIAGONAL BRACING AND CONNECTION PLATE TO BE RE-PAINTED
EXISTING HORIZONTAL BRACING AND CONNECTION PLATE TO BE REPAINTED
EXISTING RIVETS TO BE REMOVED AND HOLES ADJUSTED TO SUIT NEW BOLTS
EXISTING DIAGONAL BRACING TO BE REPLACED LIKE FOR LIKE AND CONNECTED TO EXISTING STEEL PLATE WITH DOME BOLTS AND DOME NUTS
NEW 12 THICK STEEL COLUMN CASING (IN TWO HALVES AND 2 SEGMENTS FULL HEIGHT)
DETAIL C 02
EXISTING CROSS BRACING TO BE RETAINED AND REPAINTED
EXISTING STRAP TO BE RETAINED AND REPAINTED
NEW DOME BOLT WITH DOME NUT. TYPICAL
EXISTING DIAGONAL BRACING TO BE REPLACED
NEW 12 THICK STEEL COLUMN CASING (IN TWO HALVES AND TWO SEGMENTS FULL HEIGHT)
EXISTING HORIZONTAL STEEL BRACING TO BE RETAINED
SECTION 5
TYP
CASING C3
VERTICAL JOINT OF CASING C3 AND C4
STRAP S4
CASING C4
EXISTING HORIZONTAL STEEL BRACING TO BE REPLACED LIKE FOR LIKE AND CONNECTED TO NEW STEEL PLATE
SECTION 3
CASING C2
EXISTING RIVETS UNDER NEW 12 THICK STEEL STRAP
NEW 12 THICK STEEL PLATE STRAP ON TOP OF EXISTING RIVETS AND WRAPPED AROUND NEW STEEL COLUMN CASING WITH NEW NUT INSIDE TACK WELDED (6.6/s) AND DOME BOLT OUTSIDE
NEW 12 THICK STEEL CONNECTING STRAPS. TYPICAL
EXISTING WROUGHT IRON COLUMN
CASING C4
EXISTING COLUMN JOINT
NEW JOINTS
DETAIL D 02
NOTE
FOR CASING, STRAP AND CONNECTING PLATE DETAILS REFER TO SHEET Nos. 06-11
GENERAL NOTES
SCALE
OR AS SHOWN
FOR GENERAL NOTES RELATING TO THIS SHEET, REFER TO SHEET No 02
1 25-07-21 ISSUED FOR CONSTRUCTION G.K. C.S. M.M.
ISSUE DATE REVISION PREP CHK AUTH
MAIN ROAD No 181
CITY OF HAWKESBURY
BRIDGE OVER MACDONALD RIVER
AT ST ALBANS
REHABILITATION OF PIER 4
GENERAL ARRANGEMENT - SHEET B
MU GROUP
DM CONSULTING
CLIENT
SYDNEY REGION
PREPARED
CHECKED
DESIGN
DRAWING
APPROVED
DESIGN QA RECORDS
DRAWING SET No DS2021/00195
BRIDGE No B00413
ISSUE STATUS: ISSUED FOR CONSTRUCTION
SHEET No 03
ISSUE 1

Appendix B: Habitat suitability assessment

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey or has been recorded within the past five years (known from a reputable source).
High	A species is considered highly likely to occur in the study area if: • There are previous credible records on BioNet within the study area from the last 10 years and suitable habitat is present. • The species is highly mobile, is dependent on identified suitable habitat within the study area (i.e., for breeding or important lifecycle periods such as winter flowering resources) and has been recorded recently (within five years) on BioNet in the locality. This also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	A species is considered moderately likely to occur in the study area if: • Any suitable habitat (e.g., foraging) is present in the study area, the species is highly mobile and has been recorded in the locality in the last 10 years on BioNet. The species may be unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area. • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has been recorded in the locality in the last 10 years on BioNet. • For flora species that are associated with PCTs in the study area (see TBDC) or have been recorded in the locality in the last 10 years on BioNet – the associated PCT/habitat present in the study area is not degraded and the species was not targeted by surveys in accordance with the BAM and relevant survey guidelines. In addition, for flora species known to occur in disturbed areas (e.g., orchids), records from any time within the locality may warrant inclusion in this category.
Low	A species is considered to have a low likelihood of occurring in the study area if: • For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet. • The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet. • For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.
Unlikely	Suitable habitat for the species is absent from the study area.

Key

V – vulnerable E – endangered CE – critically endangered M – migratory

Note: Species underlined are those which only the EPBC PMST predicted as having habitat in the search area. All other species have been recorded within 10 km of the study area.
Note: As these habitats are not present, no pelagic, estuarine, wetland or fish species have been included in the following table.
Given that the proposed work is not located within the Commonwealth marine area, this being from 3 to 200 nautical miles from the coast, no species listed as marine under the EPBC Act have been considered; nor has the marine status of any species been acknowledged.

* - habitat requirements were generally extracted from DCCEW (2023d), DPE (2023a), Harden (1992-2002), Frith (2007), Churchill (2008), Cogger (2014) and Van Dyck and Strahan (2008) with other references used being identified in the bibliography.

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
PLANTS						
Bynoe's Wattle *Acacia bynoeana*	V	E	Known to Occur within the region	Occurs in heath or dry sclerophyll forest on sandy soils.	PMST	Low No Suitable Habitat.
Allocasuarina glareicola	E	E	Not within known habitat range	Primarily restricted to the Richmond district, with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland.	PMST	Low No Suitable Habitat and outside known habitat range.
Ancistrachne maidenii		V	Known to Occur	Restricted to northern Sydney, around St Albans - Mt White - Maroota - Berowra areas and to the Shannon Creek area south-west of Grafton. Grows in dry sclerophyll forest on sandstone-derived soils. Habitat requirements appear to be specific, with populations occurring in distinct bands in areas associated with a transitional geology between Hawkesbury and Watagan soil landscapes.	33	Low Associated with PCT 4057 and 3605; no records or habitat present within the proposal area; targeted but not observed during site investigation
Asterolasia elegans	E	E	Known to occur within the region	Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	56	Low - Unlikely No Suitable Habitat within the study area.

[3] Actual numbers from DPE 2023a
[4] For the site to support, and be important for the lifecycle requirements of, a locally viable population of this species.

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
Leafless Tongue Orchid *Cryptostylis hunteriana*	V	V	Not within known or predicted geographic range	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland.	PMST	Low No Suitable Habitat and outside geological range.
White-flowered Waxplant *Cynanchum elegans*	E	E	Known to occur within the region	Usually occurs on the edge of dry rainforest vegetation but also in littoral rainforest, coastal scrub and aligned open forest and woodland.	PMST	Low No Suitable Habitat within the study area.
Darwinia biflora	V	V	Known to occur within the region	Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	PMST	Low No Suitable Habitat within the study area.
Slaty Red Gum *Eucalyptus glaucina*	V	V	Known to occur within the region	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	PMST	Low Associated with PCT 3605; no suitable habitat; targeted but not observed during site investigation.
Eucalyptus sp. Cattai (Gregson s.n., 28 Aug 1954)	CE	CE	Known to occur within the region	Occurs in The Hills Local Government Area, with known populations occurring within the area bounded by Kellyville - Maraylya - Glenorie. Occurs as a rare emergent tree in scrub, heath and low woodland on sandy soils, usually as isolated individuals or occasionally in small clustered groups. The sites at which it occurs are generally flat and on ridge tops.	PMST	Low No Suitable Habitat.
Euphrasia arguta	CE	CE	Not known to occur or likely to occur within the region	*Euphrasia arguta* was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, *Euphrasia arguta* has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'.	PMST	Low No Suitable Habitat and outside geological range.

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
Bauer's Midge Orchid *Genoplesium baueri*	E	E	Not known to occur or likely to occur within the region	Grows in dry sclerophyll forest and moss gardens over sandstone.	PMST	Low No Suitable Habitat and outside geographic range.
Wingless Raspwort *Haloragis exalata* subsp. *exalata*	V	V	Known to occur within the region	Appears to require protected and shaded damp situations in riparian habitats.	PMST	Low Suitable Habitat present; targeted but not observed during field investigation.
Kunzea rupestris	V	V	Known to occur within the region	Grows in shallow depressions on large flat sandstone rock outcrops. Characteristically found in short to tall shrubland or heathland.	PMST	Low No Suitable Habitat present within the study area.
Lasiopetalum joyceae	V	V	Known to occur within the region	Has a restricted range occurring on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. Seventeen of these are reserved. Grows in heath on sandstone.	14	Low No Suitable Habitat present within study area.
Leucopogon fletcheri subsp. *fletcheri*		E	Known to occur within the region	Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs.	2	Low No Suitable Habitat present within the study area.
Deane's Melaleuca *Melaleuca deanei*	V	V	Known to occur within the region	Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas. Occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone.	4	Low No Suitable Habitat within the study area.
Micromyrtus blakelyi	V	V	Known to occur within the region	Typically occurs within heathlands in shallow sandy soil in cracks and depressions of sandstone rock platforms.	2	Low No Suitable Habitat present within the study area.
Olearia cordata	V	V	Known to occur within the region	Populations are typically small and scattered. Grows in dry open sclerophyll forest and open shrubland, on sandstone ridges.	10	Low Associated with PCT 3605; no suitable habitat present within the study area; targeted but not observed during site investigation.
Tall Knotweed *Persicaria elatior*	V	V	Known to occur within the region	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	PMST	Low Suitable Habitat; not associated with PCTs present within the study area and no known records within 10 km of the study area; targeted

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
						but not observed during field investigation.
Hairy Geenbung *Persoonia hirsuta*	E	E	Known to occur within the region	Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	16	Low Associated with PCT 3605; no suitable habitat present within the study area; targeted but not observed during site investigation.
Pimelea curviflora var. curviflora	V	V	Known to occur within the region	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	PMST	Low No Suitable Habitat present within the study area.
Rufous Pomaderris *Pomaderris brunnea*	V	E	Known to occur within the area	Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	PMST	Low Suitable Habitat; not associated with PCTs present within the study area and no known records within 10 km of the study area; target but not observed during field investigation
Singleton Mint Bush *Prostanthera cineolifera*	V	V	Known to occur within the region	Grows in open woodlands on exposed sandstone ridges. Restricted to only a few localities near Scone, Cessnock and St Albans.	1	Low Associated with PCT 3605; targeted but not observed during site investigation.
Illawarra Greenhood *Pterostylis gibbosa*	E	E	Known to occur within the region	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. Near Nowra, the species grows in an open forest of Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*.	PMST	Low No Suitable Habitat present within the study area.
Eastern Underground Orchid *Rhizanthella slateri*	E	V	Known to occur within the region	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	PMST	Low No records of the species previously recorded within 10km; no suitable habitat present within the study area.
Scrub Turpentine *Rhodamnia rubescens*	CE	CE	Known to occur within the region	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	PMST	Low Associated with PCT 4057; targeted but not observed during site investigation

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
Native Guava *Rhodomyrtus psidioides*	CE	CE	Known to occur within the region	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines.	PMST	Low No Suitable Habitat present within the study area.
Heath Wrinklewort *Rutidosis heterogama*	V	V	Known to occur within the region	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	PMST	Low Associated with PCT 3605; no previous records of occurrence within 10k of the study area; targeted but not observed during site investigation.
Magenta Lilly Pilly *Syzygium paniculatum*	V	E	Known to occur within the region	Found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	PMST	Low No Suitable Habitat present in the study area.
Tetratheca glandulosa		V	Known to occur within the region	Restricted to the following LGAs: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches.	156	Low No Suitable Habitat present in the study area.
Austral Toadflax *Thesium australe*	V	V	Not within geographic range of known and likely occurrence	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast.	PMST	Low No Suitable Habitat present in the study area and outside geographic range.
Velleia perfoliata	V	V	Known to occur within the region	Only known from the Hawkesbury district and upper Hunter Valley. Found in shallow depressions on Hawkesbury sandstone shelves, on rocky hill sides, under cliffs or on rocky/sandy soils along tracks and trails. Occurs on fairly shallow soils of sandy loam texture. Often found growing on moss and lichen mats formed on rock.	PMST	Low Associated with PCT 3605; no previous record of species within 10km of study area; targeted but not observed during site investigation.

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
Zieria involucrata	V	E	Known to occur within the region	Occurs primarily on Hawkesbury sandstone. Also occurs on Narrabeen Group sandstone and on Quaternary alluvium. Found primarily in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest, although some populations extend upslope into drier vegetation.	146	Low Associated with PCT 4057 and 3605; habitat highly disturbed within the study area of which they would likely occupy; targeted but not observed during site investigation
MAMMALS						
Spotted-tailed Quoll *Dasyurus maculatus*	E	V	Known to occur within the region	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	6	Low no suitable habitat
Long-nosed Potoroo *Potorous tridactylus*	V	V	Outside of geographic range	Inhabits coastal heath and dry and wet sclerophyll forests with dense cover which provides diurnal sheltering sites and protection from predators, while foraging in adjacent, open areas.	PMST	Low no suitable habitat
Koala *Phascolarctos cinereus*	E	E	Known to occur within the region	Open eucalypt forest and woodland, containing a variety of 'preferred' food tree species.	38	Low no suitable habitat
Parma Wallaby *Macropus parma*	V	V	Outside of geographic range	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	PMST	Low no suitable habitat
Brush-tailed Rock-wallaby *Petrogale penicillata*	V	E	Known to occur within the region	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	11	Low no suitable habitat
Yellow-bellied Glider *Petaurus australis*		V	Known to occur within the region	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	12	Low no suitable habitat
Southern Greater Glider *Petauroides volans*	E	E	Known to occur within the region	Largely restricted to eucalypt forests and woodlands, utilising tree hollows.	3	Low no suitable habitat
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	Known to occur within the region	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	2	Low no suitable habitat
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	Known to occur within the region	Cave-roosting bat that forages in timbered woodland and dry sclerophyll forest.	8	Previously recorded at site, could occupy components of existing bridge. The scope of

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
						work proposed would not remove any areas the bats could be occupying (eg. Headstocks) no assessment required
Eastern False Pipistrelle *Falsistrellus tasmaniensis*		V	Known to occur within the region	Prefers moist habitats, with trees taller than 20 m. Generally, roosts in hollow-bearing trees (eucalypts), but has also been found under loose bark on trees or in buildings.	1	Previously recorded at site, could occupy components of existing bridge. The scope of work proposed would not remove any areas the bats could be occupying (eg. Headstocks) no assessment required
Southern Myotis *Myotis macropus*		V	Known to occur within the region	Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	3	Previously recorded at site, could occupy components of existing bridge. The scope of work proposed would not remove any areas the bats could be occupying (eg. Headstocks) no assessment required
Greater Broad-nosed Bat *Scoteanax rueppellii*		V	Known to occur within the region	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Usually roosts in tree hollows but also in buildings.	2	No suitable habitat
Large Bent-winged Bat *Miniopterus orianae oceanensis*		V	Known to occur within the region	Generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day.	2	Previously recorded at site, could occupy components of existing bridge. The scope of work proposed would not remove any areas the bats could be occupying (eg. Headstocks) no assessment required
Eastern Coastal Free-tailed Bat *Mormopterus norfolkensis*		V	Known to occur within the region	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	2	Previously recorded at site, could occupy components of existing bridge. The scope of work proposed would not remove any areas the bats

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
						could be occupying (eg. Headstocks) no assessment required
New Holland Mouse *Pseudomys novaehollandiae*	V		Outside of geographic range	Open heathland, open woodland with a heathland understorey and vegetated sand dunes.	PMST	Low no suitable habitat
BIRDS						
Australasian Bittern *Botaurus poiciloptilus*	E	E	Outside of geographic range	Occupies shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of *Typha* sp., *Juncus* sp. and *Phragmites* sp. Nests on platforms of reeds and rushes, usually built over water in dense cover.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle
Black Bittern *Ixobrychus flavicollis*		V	Known to occur within the region	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	4	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Eastern Curlew *Numenius madagascariensis*	CE, M, Ma		Outside of geographic range	Found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Curlew Sandpiper *Calidris ferruginea*	CE, M, Ma	E	Outside of geographic range	Generally, occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
White-throated Needletail *Hirundapus caudacutus*	V, M, Ma		Outside of geographic range	Almost exclusively aerial. Takes insects on wing over a range of habitat types. Recorded most often above wooded areas, including open forest and rainforest.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Bush Stone-curlew *Burhinus grallarius*		E	Known to occur within the region	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Eastern Osprey *Pandion cristatus*	M, Ma	V	Known to occur within the region	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands.	3	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Red Goshawk *Erythrotriorchis radiatus*	E	CE	Outside of geographic range	Very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
White-bellied Sea-eagle *Haliaeetus leucogaster*	Ma	V	Known to occur within the region	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia.	7	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
						cycle; no assessment necessary
Little Eagle *Hieraaetus morphnoides*		V	Known to occur within the region	Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Grey Falcon *Falco hypoleucos*	V	V	Outside of geographic range	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Australian Painted Snipe *Rostratula australis*	E, Ma	E	Outside of geographic range	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Gang-gang Cockatoo *Callocephalon fimbriatum*		V	Known to occur within the region	Prefers tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests during summer, these being at higher altitudes. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, or in dry forest in coastal areas.	13	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Glossy Black-cockatoo *Calyptorhynchus lathami*		V	Known to occur within the region	Inhabits eucalypt woodland and feeds almost exclusively on Casuarina fruits.	43	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
South-eastern Glossy Black-Cockatoo subsp. *Calyptorhynchus lathami lathami (V – EPBC Act)*						is not dependent on habitat present to support its life cycle; no assessment necessary
Little Lorikeet *Glossopsitta pusilla*		V	Known to occur within the region	Forages primarily in the open Eucalypt forest and woodland canopies, particularly along water courses; occasionally in Angophoras, Melaleucas and other tree species, also riparian habitats are used.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Turquoise Parrot *Neophema pulchella*		V	Known to occur within the region	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Swift Parrot *Lathamus discolor*	CE, Ma	E	Known to occur within the region	Eucalypt forests. When over-wintering on the mainland, this species is dependent on winter-flowering eucalypt species.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Powerful Owl *Ninox strenua*		V	Known to occur within the region	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.	3	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Sooty Owl *Tyto tenebricosa*		V	Known to occur within the region	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	2	The species may visit/utilise the habitat present but similar habitat exists outside

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
						of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Masked Owl *Tyto novaehollandiae*		V	Known to occur within the region	Lives in dry eucalypt forests and woodlands from sea level to 1100 m.	2	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Eastern Grass Owl *Tyto longimembris*		V	Known to occur within the region	Found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	2	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Brown Treecreeper (eastern subsp) *Climacteris picumnus victoriae*	V	V	Outside of geographic range	The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus* which then occupies the remaining parts of the state. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Pilotbird *Pycnoptilus floccosus*	V		Outside of geographic range	Found in wet forested areas and heathland in eastern Victoria and south-eastern New South	PMST	The species may visit/utilise the habitat present but

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
				Wales. Forages on the ground, turning over leaf litter using strong legs.		similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Regent Honeyeater *Anthochaera phrygia*	CE	CE	Known to occur within the region	Inhabits dry open forest and woodland. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	17	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Painted Honeyeater *Grantiella picta*	V	V	Known to occur within the region	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Varied Sittella *Daphoenositta chrysoptera*		V	Known to occur within the region	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland.	3	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Dusky Woodswallow *Artamus cyanopterus cyanopterus*		V	Known to occur within the region	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.	2	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
Flame Robin *Petroica phoenicea*		V	Known to occur within the region	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys.	2	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Hooded Robin (south-eastern) *Melanodryas cucullata cucullata*	E	V	Outside of geographic range	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Diamond Firetail *Stagonopleura guttata*		V	Outside of geographic range	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
REPTILES						
Rosenberg's Goanna *Varanus rosenbergi*		V	Known to occur within the region	Found in heath, open forest and woodland.	7	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Broad-headed Snake *Hoplocephalus bungaroides*	V	E	Known to occur within the region	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
						cycle; no assessment necessary
AMPHIBIANS						
Giant Burrowing Frog *Heleioporus australiacus*	V	V	Known to occur within the region	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	3	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Red-crowned Toadlet *Pseudophryne australis*		V	Known to occur within the region	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	18	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Green and Golden Bell Frog *Litoria aurea*	V	E	Known to occur within the region	Inhabits a variety of environments, including disturbed sites, ephemeral ponds, wetlands, marshes, dams and stream-sides, particularly those that contain one or more of the following aquatic plants: bullrush (Typha spp.), spikerush (*Eleocharis* spp.), *Juncus kraussii, Schoenoplectus littoralis* and *Sporobolus virginicus.*	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
Stuttering Frog *Mixophyes balbus*	V	E	Outside of geographic range	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	PMST	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary

Common Name	Status		Habitat constraints and/or geographic limitations	Primary habitat requirements	No. of records[3]	Likelihood of Occurrence[4]
	EPBC Act	BC Act				
Giant Barred Frog *Mixophyes iteratus*	E	E	Known to occur within the region	Found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation.	1	The species may visit/utilise the habitat present but similar habitat exists outside of the study area, the species is not dependent on habitat present to support its life cycle; no assessment necessary
INVERTEBRATES						
Dural Land Snail *Pommerhelix duralensis*	E	E	Known to occur within the region	The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark.	2	No suitable habitat
FISH						
Black Rockcod *Epinephelus daemelii*	V	V	Outside of geographic range	Large, reef-dwelling species which is found in warm temperate and subtropical parts of the south-western Pacific.	PMST	No suitable habitat
Macquarie Perch *Macquaria australasica*	E	E	Outside of geographic range	Endemic to the southern tributaries of the Murray-Darling River System, and is also found in the Hawkesbury-Nepean and Shoalhaven River systems in the eastern drainage in New South Wales. Prefers clear water and deep, rocky holes with lots of cover.	PMST	No suitable habitat
Australian Grayling *Prototroctes maraena*	V	E	Outside of geographic range	Spawning occurs in the lower freshwater reaches of rivers. Larvae drift/disperse into marine waters before migrating back into freshwaters; individuals then remain within freshwater habitats for the remainder of their lives. During freshwater phase of the life-cycle, inhabit both large rivers and smaller streams, and in relatively undisturbed/highly disturbed catchments.	PMST	No suitable habitat

Appendix C: Photographic record





Characteristics of Pier 4 at St Albans Bridge including vegetation and snags present around the footings. At this location, vegetation present would be removed to remediate the area and install stabilisation infrastructure.



Characteristics of access track to Pier 4, this present within the western portion of the proposal site. Works will include trimming to permit vehicle access to Pier 4.

	Character of riverbank vegetation within the proposal area. Photograph taken facing east.
 	Character of St Albans Bridge and surrounding vegetation.

	Character of riverbank vegetation that occurs adjacent to the existing access track. Photograph taken facing south west.

Appendix D: Species recorded

Flora

Key

#- Weeds of Nation Significance (WONS)

* - introduced species

FAMILY	Scientific Name	Common Name
	FILICOPSIDA - FERNS	
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair Fern
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
	MAGNOLIOPSIDA – FLOWERING PLANTS	
MAGNOLIIDAE - DICOTYLEDONS		
Altingiaceae	*Liquidambar styraciflua**	Sweetgum
Apocynaceae	*Araujia sericifera**	Moth vine
Asteraceae	*Bidens pilosa* *	Farmers Friend
	# Senecio madagascariensis *	Fireweed
	Sigesbeckia orientalis	Indian Weed
	Tagetes minuta *	Stinking Roger
Bignoniaceae	*Jacaranda mimosifolia* *	Jacaranda
Commelinaceae	*Tradescantia fluminensis* *	Wandering Jew
Euphorbiaceae	*Glochidion ferdinandi* var. *ferdinandi*	Cheese Tree
Fabaceae: Mimosoideae	*Acacia filicifolia*	Fern-leaf Wattle
	Acacia implexa	Hickory Wattle
Meliaceae	*Melia azedarach*	White Cedar
Moraceae	*Ficus coronata*	Sandpiper Fig
Myrtaceae	*Callistemon viminalis*	Weeping Bottlebrush
	Eucalyptus deanei	Mountain Blue Gum
	Eucalyptus punctata	Grey Gum
	Eucalyptus tereticornis	Forest Red Gum
Oleaceae	*Ligustrum lucidum* *	Large-leaved Privett
	Ligustrum sinense *	Small-leaved Privett
Plantaginaceae	*Plantago lanceolata* *	Lamb's Tongue
Polygonaceae	*Acetosa sagittata* *	Turkey Rhubarb
	Persicaria decipiens	Knotweed
Rosaceae	*# Rubus fruticosus* agg. spp. *	Blackberry

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FAMILY	Scientific Name	Common Name
Solanaceae	*Cestrum parqui* *	Green Cestrum
	Solanum mauritianum *	Wild Tobacco Tree
	Solanum nigrum *	Blackberry Nightshade
Verbenaceae	*# Lantana camara* *	Lantana
Violaceae	*Viola hederacea*	Ivy-leaved Violet
LILIIDAE - MONOCOTYLEDONS		
Cyperaceae	*Carex appressa*	Tall Sedge
	Cyperus gracilis	Slender Flatsedge
	Cyperus tetraphyllus	
	Isolepis inundata	
	Schoenoplectus mucronatus	Bog Bulrush
Juncaceae	*Juncus continuus*	
	*Juncus acutus**	Spiky Rush
	Juncus usitatus	Common Rush
Lomandraceae	*Lomandra longifolia*	Mat Rush
Poaceae	*Cynodon dactylon**	Couch
	Entolasia stricta	Wiry Panic
	Isachne globosa *	Swamp Millet
	Panicum effusum	Hairy Panic
	Poa affinis	
	Setaria gracilis *	Pigeon Grass
Typhaceae	*Typha orientalis*	Cumbungi

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Fauna

EPBC Act	BC Act	Common Name	Scientific Name
BIRDS			
			Psittacidae
		Rainbow Lorikeet	*Trichoglossus haematodus*
			Alcedinidae
		Azure Kingfisher	*Ceyx azureus*
			Maluridae
		Superb Fairy-wren	*Malurus cyaneus*
			Acanthizidae
		Brown Thornbill	*Acanthiza pusilla*
			Rhipiduridae
		Grey Fantail	*Rhipidura albiscapa*
		Willie Wagtail	*Rhipidura leucophrys*
			Petroicidae
		Eastern Yellow Robin	*Eopsaltria australis*

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Appendix E: Assessments of Significance

Though considered and targeted, no threatened species were recorded or indicated as being present within the areas surveyed.

One threatened ecological community was recorded within, and close to, the proposed disturbance footprint (i.e. the existing access track), this being 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, this listed as Endangered under the BC Act.

Reference to Section 6.2.2 of the BAR prepared for the proposal (Niche 2021) notes that the following cave-dependent microbats (all of which are listed as Vulnerable under the BC Act) have been recorded near the existing bridge site, the:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Little Bent-wing bat (*Miniopterus australis*)
- Large Bent-wing bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*).

As these microbats have been previously recorded a precautionary approach to their presence has been adopted.

The potential impact associated with the proposed bridge works on the threatened ecological community and previously recorded microbats, is considered with reference to the assessment criteria provided under Section 7.3 of the BC Act (these commonly referred to as the 5-part test). These criteria are designed to determine whether there is likely to be a significant effect on these threatened species, or their habitats, and consequently whether a SIS [or BDAR if Transport pursues that option] is required.

In line with the guidelines provided by DPE (then DECC) on the Assessment of Significance (DECC 2007), due to the similarity of their habitat requirements (i.e. all are cave-dependent species), the threatened microbats have been grouped together as opposed to individual assessments being conducted on each animal.

2.1 Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Swamp Sclerophyll Forest is an endangered ecological community not a threatened species.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The proposal will result in the removal/disturbance of a maximum of 0.375 ha of degraded Swamp Sclerophyll Forest. It is not considered likely that this removal will place the local occurrence of this TEC at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The proposal is not considered to adversely modify the composition of the Swamp Sclerophyll Forest that is to remain beyond the limits of the subject site such that its local occurrence would be placed at risk of extinction. Beyond trimming of some canopy and shrub/ground cover vegetation to permit access; removal will be undertaken around the base of Pier 4 which is disturbed by current river processes.

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(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposal will result in the removal/disturbance of a maximum of 0.375 ha of degraded Swamp Sclerophyll Forest.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The Swamp Sclerophyll Forest present within the subject site is already fragmented due to previous and current land use practices. The proposed rehabilitation is not expected to result in the further fragmentation or isolation of this EEC.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat present within the subject site is not considered important for the long-term survival of the Swamp Sclerophyll Forest in this portion of the Hawkesbury City Council LGA.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No declared areas of outstanding biodiversity value would be directly or indirectly affected by the proposal. The subject site is not listed as a declared area of outstanding biodiversity value under Part 3 of the Biodiversity Conservation Regulation 2017.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Currently 35 KTP for mainland NSW are listed under Schedule 3 of the BC Act. Of these, the 'clearing of native vegetation' would be applicable to the proposal. While it is acknowledged that the proposal would result in the removal/disturbance of a maximum of 0.375 ha of degraded Swamp Sclerophyll Forest, it is not considered that these actions would significantly contribute to a KTP such that the local or regional presence of this TEC would be compromised.

Expected impact on the Swamp Sclerophyll Forest

Given the scope of works proposed, no significant areas of Swamp Sclerophyll Forest habitat would be removed or affected by the proposed work. The expected impacts associated with the proposal on the Swamp Sclerophyll Forest are not considered to be significant and therefore the preparation of an SIS is not considered necessary.

2.2 Cave-dependent microchiropterans

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

No microbats were observed occupying, or indicated as having been previously present, within those portions of the existing bridge where works will occur.

Though not recorded during the current investigation, Niche as part of an initial inspection of this site, recorded the Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle, Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis. As cave-dependent microbats are known to occupy timber bridges (authors field notes), St Albans Bridge is considered suitable habitat for these species.

The bridge rehabilitation work will include a combination of 'impacts' such as vibration generated by the movement of machinery and an increase of noise under the bridge (due to presence of personnel talking, use of equipment). These impacts are considered minimal, are of a short duration and will not have a cumulative adverse impact when associated with existing traffic movements etc.

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The actions proposed will not have an adverse effect on the lifecycle of cave-dependent microbats such that a viable local population of these species is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
- *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable to a threatened species.

(c) in relation to the habitat of a threatened species, population or ecological community:

- *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*

No habitat used by these species will be removed or indirectly disturbed. The work proposed is restricted to piers, riverbank and road surface of St Albans Bridge; however, the work may cause a temporary short-term disturbance (due to noise, vibration and so forth) to the roosting patterns of any individuals present.

- *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity*

No habitat will be isolated or fragmented due to the carrying out of the proposed bridge works.

- *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality*

The 'cave' habitats associated with St Albans Bridge is not considered important to the local occurrence of cave-dependent microbats.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

No declared AOBV will be directly or indirectly affected by the proposal. The subject site is not listed as a declared AOBV under Part 3 of the Biodiversity Conservation Regulation 2017.

(e) whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process

Currently 35 KTP for mainland NSW are listed under Schedule 4 of the BC Act, none of which are relevant to the scope of work proposed.

Conclusion

The carrying out of the proposed bridge works will not remove, modify or fragment any habitats critical to the lifecycle requirements of the Eastern Coastal Free-tailed Bat, Eastern False Pipistrelle, Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis. While the proposal may result in a temporary low-key disturbance (i.e. noise, vibration) to the roosting patterns of any cave-dependent microbats present, the proposed activities are not considered to have a significant impact on these species or their habitat. As such, the preparation of a SIS is not required.

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Appendix F – Construction Noise Calculations

Transport for NSW

Distanced Based Assessment (Noisiest Plant)

Please pick from drop-down list in orange cells

Noise area category		R0
RBL or L_{A90} Background level (dB(A))	Day	30
	Evening	30
	Night	30
$L_{Aeq(15minute)}$ Noise Mangement Level (dB(A))	Day	40
	Day (OOHW)	35
	Evening	35
	Night	35
Noisiest plant		Abrasive Blasting
Is there line of sight to receiver?		Yes

Steps for Assessment:

1. Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
2. Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
3. Select the noisiest plant. If not found in drop-down list, refer to 'Source List' and select a representative plant with equivalent sound power level.
4. Is there line of sight to receiver? Select the appropriate scenario from the drop down list .

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sightoiaw to receiver' drop-down list. Solid barriers can be in the form of road cutting, timber lapped and capped fence, shipping container, site office, etc. Substantial solid barriers are barriers greater than 5 metres in height or multiple rows of houses or a sound barrier specifically designed to mitigate construction noise. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

5. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period . Consider background LA90 noise measurements to check assumption in Step #2 if:

(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or

(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.

Note that consideration need to be given to the construction staging plan when determining impact duration.

7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver.
8. Where night works are involved, identify sleep disturbance affected distance.
9. Document the outcomes of these steps.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project basis. Please contact a Roads and Maritime noise speciliast for more information)

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver

			$L_{Aeq(15minute)}$ noise level above background (L_{A90})											$L_{Aeq(15minute)}$ 75 dB(A) or greater (Highly affected)			Sleep disutrbance L_{Amax} 65 dB(A)
			5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)					
			Noticeable			Clearly audible			Moderately intrusive			Highly intrusive					
		Affected distance (m)	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Affected distance (m)
Undeveloped green fields, rural areas with isolated dwellings	Day	655							N	315	50	N	150	60	N, PC, RO	35	75	
	Day (OOHW)	940				N, R1, DR	655	40	N, R1, DR	315	50	N, R1, DR, PC, SN	150	60	N, PC, RO	35	75	
	Evening	940				N, R1, DR	655	40	N, R1, DR	315	50	N, R1, DR, PC, SN	150	60	N, PC, RO	35	75	
	Night	940	N	940	35	N, R2, DR	655	40	N, PC, SN, R2, DR	315	50	AA, N, PC, SN, R2, DR	150	60	N, PC, RO	35	75	140
	Highly Affected	35													N, PC, RO	35	75	
Developed settlements (urban and suburban)	Day	870							N	390	50	N	170	60	N, PC, RO	40	75	
	Day (OOHW)	1265				N, R1, DR	870	40	N, R1, DR	390	50	N, R1, DR, PC, SN	170	60	N, PC, RO	40	75	
	Evening	1265				N, R1, DR	870	40	N, R1, DR	390	50	N, R1, DR, PC, SN	170	60	N, PC, RO	40	75	
	Night	1265	N	1265	35	N, R2, DR	870	40	N, PC, SN, R2, DR	390	50	AA, N, PC, SN, R2, DR	170	60	N, PC, RO	40	75	155
	Highly Affected	40													N, PC, RO	40	75	
Propagation across a valley / over water	Day	1215							N	530	50	N	210	60	N, PC, RO	45	75	
	Day (OOHW)	1770				N, R1, DR	1215	40	N, R1, DR	530	50	N, R1, DR, PC, SN	210	60	N, PC, RO	45	75	
	Evening	1770				N, R1, DR	1215	40	N, R1, DR	530	50	N, R1, DR, PC, SN	210	60	N, PC, RO	45	75	
	Night	1770	N	1770	35	N, R2, DR	1215	40	N, PC, SN, R2, DR	530	50	AA, N, PC, SN, R2, DR	210	60	N, PC, RO	45	75	190
	Highly Affected	45													N, PC, RO	45	75	

Non-residential receiver
Undeveloped green fields, rural areas with isolated dwellings

		Standard hours		$L_{Aeq(15minute)}$ noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)		
				<10 dB(A)			10 to 20 dB(A)					
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	215				N	105	65	N, PC, RO	35	75
Hospital wards and operating theatres	Day	65	105							N, PC, RO	35	75
Place of worship	Day	55	215				N	105	65	N, PC, RO	35	75
Active recreation	Day	65	105							N, PC, RO	35	75
Passive recreation	Day	60	150				N	60	70	N, PC, RO	35	75
Industrial premise	Day	75	35							N, PC, RO	35	75
Offices, retail outlets	Day	70	60							N, PC, RO	35	75

		OOHW		$L_{Aeq(15minute)}$ noise level above NML											
				< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	105				N, R1, DR	60	70	N, R1, DR	20	80	N, R1, DR, PC, SN	6	90
	Night	65	105	N	105	65	N, R2, NR	60	70	N, PC, SN, R2, DR	20	80	AA, N, PC, SN, R2, DR	6	90
Place of worship	Evening	55	215				N, R1, DR	150	60	N, R1, DR	60	70	N, R1, DR, PC, SN	20	80
	Night	55	215	N	215	55	N, R2, NR	150	60	N, PC, SN, R2, DR	60	70	AA, N, PC, SN, R2, DR	20	80
Active recreation	Evening	65	105				N, R1, DR	60	70	N, R1, DR	20	80	N, R1, DR, PC, SN	6	90
Passive recreation	Evening	60	150				N, R1, DR	105	65	N, R1, DR	35	75	N, R1, DR, PC, SN	11	85
Industrial premise	Evening	75	35				N, R1, DR	20	80	N, R1, DR	6	90	N, R1, DR, PC, SN	2	100
	Night	75	35	N	35	75	N, R2, NR	20	80	N, PC, SN, R2, DR	6	90	AA, N, PC, SN, R2, DR	2	100
Offices, retail outlets	Evening	70	60				N, R1, DR	35	75	N, R1, DR	11	85	N, R1, DR, PC, SN	4	95
	Night	70	60	N	60	70	N, R2, NR	35	75	N, PC, SN, R2, DR	11	85	AA, N, PC, SN, R2, DR	4	95

Non-residential receiver
Developed settlements (urban and suburban)

		Standard hours		$L_{Aeq(15minute)}$ noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)		
				<10 dB(A)			10 to 20 dB(A)					
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	260				N	110	65	N, PC, RO	40	75
Hospital wards and operating theatres	Day	65	110							N, PC, RO	40	75
Place of worship	Day	55	260				N	110	65	N, PC, RO	40	75
Active recreation	Day	65	110							N, PC, RO	40	75
Passive recreation	Day	60	170				N	70	70	N, PC, RO	40	75
Industrial premise	Day	75	40							N, PC, RO	40	75
Offices, retail outlets	Day	70	70							N, PC, RO	40	75

				$L_{Aeq(15minute)}$ noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	110				N, R1, DR	70	70	N, R1, DR	22	80	N, R1, DR, PC, SN	7	90
	Night	65	110	N	110	65	N, R2, NR	70	70	N, PC, SN, R2, DR	22	80	AA, N, PC, SN, R2, DR	7	90
Place of worship	Evening	55	260				N, R1, DR	170	60	N, R1, DR	70	70	N, R1, DR, PC, SN	22	80
	Night	55	260	N	260	55	N, R2, NR	170	60	N, PC, SN, R2, DR	70	70	AA, N, PC, SN, R2, DR	22	80
Active recreation	Evening	65	110				N, R1, DR	70	70	N, R1, DR	22	80	N, R1, DR, PC, SN	7	90
Passive recreation	Evening	60	170				N, R1, DR	110	65	N, R1, DR	40	75	N, R1, DR, PC, SN	13	85
Industrial premise	Evening	75	40				N, R1, DR	22	80	N, R1, DR	7	90	N, R1, DR, PC, SN	2	100
	Night	75	40	N	40	75	N, R2, NR	22	80	N, PC, SN, R2, DR	7	90	AA, N, PC, SN, R2, DR	2	100
Offices, retail outlets	Evening	70	70				N, R1, DR	40	75	N, R1, DR	13	85	N, R1, DR, PC, SN	4	95
	Night	70	70	N	70	70	N, R2, NR	40	75	N, PC, SN, R2, DR	13	85	AA, N, PC, SN, R2, DR	4	95

Non-residential receiver
Propagation across a valley / over water

				$L_{Aeq(15minute)}$ noise level above NML					LAeq(15minute) 75 dB(A) or greater (Highly affected)		
	Standard hours			<10 dB(A)			10 to 20 dB(A)				
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	340				N	130	65	N, PC, RO	45	75
Hospital wards and operating theatres	Day	65	130							N, PC, RO	45	75
Place of worship	Day	55	340				N	130	65	N, PC, RO	45	75
Active recreation	Day	65	130							N, PC, RO	45	75
Passive recreation	Day	60	210				N	80	70	N, PC, RO	45	75
Industrial premise	Day	75	45							N, PC, RO	45	75
Offices, retail outlets	Day	70	80							N, PC, RO	45	75

				$L_{Aeq(15minute)}$ noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	130				N, R1, DR	80	70	N, R1, DR	30	80	N, R1, DR, PC, SN	7	90
	Night	65	130	N	130	65	N, R2, NR	80	70	N, PC, SN, R2, DR	30	80	AA, N, PC, SN, R2, DR	7	90
Place of worship	Evening	55	340				N, R1, DR	210	60	N, R1, DR	80	70	N, R1, DR, PC, SN	30	80
	Night	55	340	N	340	55	N, R2, NR	210	60	N, PC, SN, R2, DR	80	70	AA, N, PC, SN, R2, DR	30	80
Active recreation	Evening	65	130				N, R1, DR	80	70	N, R1, DR	30	80	N, R1, DR, PC, SN	7	90
Passive recreation	Evening	60	210				N, R1, DR	130	65	N, R1, DR	45	75	N, R1, DR, PC, SN	15	85
Industrial premise	Evening	75	45				N, R1, DR	30	80	N, R1, DR	7	90	N, R1, DR, PC, SN	2	100
	Night	75	45	N	45	75	N, R2, NR	30	80	N, PC, SN, R2, DR	7	90	AA, N, PC, SN, R2, DR	2	100
Offices, retail outlets	Evening	70	80				N, R1, DR	45	75	N, R1, DR	15	85	N, R1, DR, PC, SN	4	95
	Night	70	80	N	80	70	N, R2, NR	45	75	N, PC, SN, R2, DR	15	85	AA, N, PC, SN, R2, DR	4	95

Transport for NSW

Distanced Based Assessment (Construction Scenario)

Please pick from drop-down list in orange cells

Noise area category		R0
RBL or L_{A90} Background level (dB(A))	**Day**	30
	Evening	30
	Night	30
$L_{Aeq(15minute)}$ Noise Mangement Level (dB(A))	**Day**	40
	Day (OOHW)	35
	Evening	35
	Night	35
Scenario		Compound operation
Is there line of sight to receiver?		Yes

Steps for Screening Assessment:

1. Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
2. Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
3. Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.
4. Is there line of sight to receiver? Select the appropriate scenario from the drop down list .

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

6. Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period . Consider background noise measurements to check assumption in Step #2 if:

(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or

(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.

Note that consideration need to be given to the construction staging plan when determining impact duration.

7. Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver
8. Where night works are involved, identify sleep disturbance affected distance.
9. Document the outcomes of these steps.

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver

			$L_{Aeq(15minute)}$ noise level above background (L_{A90})												$L_{Aeq(15minute)}$ 75 dB(A) or greater (Highly affected)			Sleep disutrbance L_{Amax} 65 dB(A)
			5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)						
			Noticeable			Clearly audible			Moderately intrusive			Highly intrusive						
		Affected distance (m)	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Affected distance (m)
Undeveloped green fields, rural areas with isolated dwellings	**Day**	525							N	250	50	N	115	60	N, PC, RO	20	75	
	Day (OOHW)	755				N, R1, DR	525	40	N, R1, DR	250	50	N, R1, DR, PC, SN	115	60	N, PC, RO	20	75	
	Evening	755				N, R1, DR	525	40	N, R1, DR	250	50	N, R1, DR, PC, SN	115	60	N, PC, RO	20	75	
	Night	755	N	755	35	N, R2, DR	525	40	N, PC, SN, R2, DR	250	50	AA, N, PC, SN, R2, DR	115	60	N, PC, RO	20	75	85
	Highly Affected	20													N, PC, RO	20	75	
Developed settlements (urban and suburban)	**Day**	685							N	305	50	N	130	60	N, PC, RO	25	75	
	Day (OOHW)	1010				N, R1, DR	685	40	N, R1, DR	305	50	N, R1, DR, PC, SN	130	60	N, PC, RO	20	75	
	Evening	1010				N, R1, DR	685	40	N, R1, DR	305	50	N, R1, DR, PC, SN	130	60	N, PC, RO	25	75	
	Night	1010	N	1010	35	N, R2, DR	685	40	N, PC, SN, R2, DR	305	50	AA, N, PC, SN, R2, DR	130	60	N, PC, RO	25	75	95
	Highly Affected	25													N, PC, RO	25	75	
Propagation across a valley / over water	**Day**	955							N	405	50	N	155	60	N, PC, RO	25	75	
	Day (OOHW)	1415				N, R1, DR	955	40	N, R1, DR	405	50	N, R1, DR, PC, SN	155	60	N, PC, RO	25	75	
	Evening	1415				N, R1, DR	955	40	N, R1, DR	405	50	N, R1, DR, PC, SN	155	60	N, PC, RO	25	75	
	Night	1415	N	1415	35	N, R2, DR	955	40	N, PC, SN, R2, DR	405	50	AA, N, PC, SN, R2, DR	155	60	N, PC, RO	25	75	110
	Highly Affected	25													N, PC, RO	25	75	

Non-residential receiver
Undeveloped green fields, rural areas with isolated dwellings

				$L_{Aeq(15minute)}$ noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)		
		Standard hours		<10 dB(A)			10 to 20 dB(A)					
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	**Day**	55	170				N	65	65	N, PC, RO	20	75
Hospital wards and operating theatres	**Day**	65	65							N, PC, RO	20	75
Place of worship	**Day**	55	170				N	65	65	N, PC, RO	20	75
Active recreation	**Day**	65	65							N, PC, RO	20	75
Passive recreation	**Day**	60	115				N	35	70	N, PC, RO	20	75
Industrial premise	**Day**	75	20							N, PC, RO	20	75
Offices, retail outlets	**Day**	70	35							N, PC, RO	20	75

				$L_{Aeq(15minute)}$ noise level above NML										
		OOHW		< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	**Evening**	65	65				N, R1, DR	35	70	N, R1, DR	11	80	N, R1, DR, PC, SN	4	90
	Night	65	65	N	65	65	N, R2, NR	35	70	N, PC, SN, R2, DR	11	80	AA, N, PC, SN, R2, DR	4	90
Place of worship	**Evening**	55	170				N, R1, DR	115	60	N, R1, DR	35	70	N, R1, DR, PC, SN	11	80
	Night	55	170	N	170	55	N, R2, NR	115	60	N, PC, SN, R2, DR	35	70	AA, N, PC, SN, R2, DR	11	80
Active recreation	**Evening**	65	65				N, R1, DR	35	70	N, R1, DR	11	80	N, R1, DR, PC, SN	4	90
Passive recreation	**Evening**	60	115				N, R1, DR	65	65	N, R1, DR	20	75	N, R1, DR, PC, SN	6	85
Industrial premise	**Evening**	75	20				N, R1, DR	11	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
	Night	75	20	N	20	75	N, R2, NR	11	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets	**Evening**	70	35				N, R1, DR	20	75	N, R1, DR	6	85	N, R1, DR, PC, SN	2	95
	Night	70	35	N	35	70	N, R2, NR	20	75	N, PC, SN, R2, DR	6	85	AA, N, PC, SN, R2, DR	2	95

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Non-residential receiver
Developed settlements (urban and suburban)

				$L_{Aeq(15minute)}$ noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)		
		Standard hours		<10 dB(A)			10 to 20 dB(A)					
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	**Day**	55	200				N	75	65	N, PC, RO	25	75
Hospital wards and operating theatres	**Day**	65	75							N, PC, RO	25	75
Place of worship	**Day**	55	200				N	75	65	N, PC, RO	25	75
Active recreation	**Day**	65	75							N, PC, RO	25	75
Passive recreation	**Day**	60	130				N	40	70	N, PC, RO	25	75
Industrial premise	**Day**	75	25							N, PC, RO	25	75
Offices, retail outlets	**Day**	70	40							N, PC, RO	25	75

		$L_{Aeq(15minute)}$ noise level above NML			
OOHW		< 5 dB(A)	5 to 15 dB(A)	15 to 25 dB(A)	> 25 dB(A)

	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	75				N, R1, DR	40	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
	Night	65	75	N	75	65	N, R2, NR	40	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90
Place of worship	Evening	55	200				N, R1, DR	130	60	N, R1, DR	40	70	N, R1, DR, PC, SN	14	80
	Night	55	200	N	200	55	N, R2, NR	130	60	N, PC, SN, R2, DR	40	70	AA, N, PC, SN, R2, DR	14	80
Active recreation	Evening	65	75				N, R1, DR	40	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
Passive recreation	Evening	60	130				N, R1, DR	75	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85
Industrial premise	Evening	75	25				N, R1, DR	14	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
	Night	75	25	N	25	75	N, R2, NR	14	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets	Evening	70	40				N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95
	Night	70	40	N	40	70	N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95

Non-residential receiver
Propagation across a valley / over water

				$L_{Aeq(15minute)}$ noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)		
	Standard hours			<10 dB(A)			10 to 20 dB(A)					
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	250				N	75	65	N, PC, RO	25	75
Hospital wards and operating theatres	Day	65	90							N, PC, RO	25	75
Place of worship	Day	55	250				N	75	65	N, PC, RO	25	75
Active recreation	Day	65	90							N, PC, RO	25	75
Passive recreation	Day	60	155				N	40	70	N, PC, RO	25	75
Industrial premise	Day	75	25							N, PC, RO	25	75
Offices, retail outlets	Day	70	50							N, PC, RO	25	75

				$L_{Aeq(15minute)}$ noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	90				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
	Night	65	90	N	90	65	N, R2, NR	50	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90
Place of worship	Evening	55	250				N, R1, DR	155	60	N, R1, DR	40	70	N, R1, DR, PC, SN	14	80
	Night	55	250	N	250	55	N, R2, NR	155	60	N, PC, SN, R2, DR	40	70	AA, N, PC, SN, R2, DR	14	80
Active recreation	Evening	65	90				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
Passive recreation	Evening	60	155				N, R1, DR	90	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85
Industrial premise	Evening	75	25				N, R1, DR	15	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
	Night	75	25	N	25	75	N, R2, NR	15	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets	Evening	70	50				N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95
	Night	70	50	N	50	70	N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95

Appendix G – Consultation with DPI Fisheries

Department of Primary Industries
Department of Regional NSW

C23/384
2 February 2024

Karoline Sheng
Ventia Pty Limited
16 Lidco Street, Arndell Park, NSW 2148

Re: s.199 FM Act notification – St Albans bridge pier 4 rehabilitation works and reinstation of sandstone block abutment –MacDonald River, St Albans

Dear Karoline,

Thank you for your referral dated 01 November 2023 regarding the above stated matter. This notification complies with s.199(1)(a) of the *Fisheries Management Act* (FM Act) concerning the proposed dredging and reclamation activities.

DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, DPI Fisheries ensures that developments comply with the requirements of the FM Act (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Fish Habitat Conservation and Management (2013)*. DPI Fisheries is also responsible for ensuring the sustainable management of commercial, recreational and Aboriginal cultural fishing, aquaculture, marine parks and aquatic reserves in NSW.

DPI Fisheries has reviewed these works in light of those provisions and has no objections to the proposed works provided that they occur as described in the REF (Draft no:1.1, Date: 14 November 2023) for these works.

DPI Fisheries recommends that the following general environmental mitigation measures be implemented during construction:

1. Erosion and sediment mitigation devices are to be erected in a manner consistent with current Best Management Practice (i.e. Managing Urban Stormwater: Soils and Construction 4th Edition Landcom, 2004) to prevent entry of sediment into the waterway prior to any earthworks being undertaken. These are to be maintained in good working order for the duration of the works and subsequently until the site has been stabilised and the risk of erosion and sediment movement from the site is minimal;
2. There is to be no complete blockage of fish passage during the works. Environmental protection measures or coffer dams are to be erected so that fish passage is maintained in the waterway. These measures are to be removed from the site once the site has been stabilised and the risk of sediment movement is minimal;

3. Any material removed from the waterway that is to be temporarily deposited or stockpiled on land is to be located well away from the waterway and to be contained by appropriate erosion and sediment control devices;
4. On completion of the works all disturbed soil is to be levelled, smoothed and sown with a mixture of sterile/native grass seeds to encourage rapid revegetation and planted out with native endemic riparian vegetation;
5. Machinery is not to enter or work from the waterway unless in accordance with the proposed works;
6. Only clean rock (no fines) is to be used during these works;
7. Prior to use at the site and/or entry into the waterway, machinery is to be appropriately cleaned degreased and serviced. Spill kits are to be available on site at all times during the works;
8. Works are to be undertaken during low flows in the waterway;
9. Should any dewatering be required, then:
    a. pumps used in waterways are to be screened with mesh of no greater than 6 mm in diameter;
    b. pumps and screens must be of a suitable capacity and size, and pump velocities slow enough, to allow fish to escape during the dewatering process;
    c. the dewatering system must be designed to treat water to the ambient water quality upstream in the waterway;
    d. discharge points for the dewatering, abrasive blasting, surface washing and or pump around systems must be designed to prevent erosion, scour or visible turbid plumes;
    e. daily checks of the sediment levels in the dewatering sediment dams are to be conducted to ensure adequate storage capacity;
    f. dewatering operations must ensure retention of spoil for a long enough period to allow mobilised sediments to settle out;
    g. a visual inspection of the waterway is to be conducted at all times during dewatering operations to ensure that no visible plumes are generated within the waterway from dewatering operations;
    h. sediment levels in water being returned to the waterway must be equal of less than that in ambient water upstream of the worksite;
    i. dewatering of temporary in-stream structures requires notification to NSW DPI seven days prior to any dewatering activities commencing in order to organise any fish rescue activities. If required, a separate s.37 permit will be obtained from NSW DPI to relocate fish.
    j. daily checks of the sediment levels in the dewatering sediment dams are to be conducted to ensure adequate storage capacity;
    k. dewatering operations must ensure retention of spoil for a long enough period to allow mobilised sediments to settle out; and
    l. a visual inspection of the waterway is to be conducted at all times during dewatering operations to ensure that no visible plumes are generated within the waterway from dewatering operations.
10. Any cofferdams required for the works must be designed to result in minimal impact to the stream bed and banks and be completely removed from the waterway on completion of works. In particular:
    a. Geotextile fabric is to be used to isolate the natural bed of the waterway from any material used to create a coffer dam within the bed of the waterway; and
    b. Any material used to construct a cofferdam within the waterway must be free from fines, e.g., clean rock or washed sand contained within sandbags. Unconsolidated mobile material, such as earthen bunds, are not permitted.

11. Procedures to ensure adherence to ANZECC water quality guidelines are to be detailed in the CEMP.
12. DPI Fisheries (1800 043 536) and the Environment Protection Authority (EPA) (131 555) are to be notified immediately if any fish kills occur in the vicinity of the works. In this situation, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed.

For any further information , please contact me at karthika.krishnapillai@dpi.nsw.gov.au.

Sincerely

Karthika

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DPI Fisheries

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