Roads & Maritime

BARHAM-KOONDROOK BRIDGE – TRUSS AND VICTORIAN APPROACH SPAN RESTORATION

Review of environmental factors

February 2016

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Executive summary

The proposal

Roads and Maritime Services propose to restore part of Barham-Koondrook Bridge, located on the NSW Victorian border over the Murray River. Some parts of the bridge have already been restored under earlier stages of work. It is now proposed to carry out stages three, four and five of the restoration. The key features of the proposal include:

- Replacing pier four timber piles and timber pier with concrete piles, concrete pile caps and timber pier, similar to what has been completed on the NSW side
- Constructing a new concrete Victorian abutment, abutment B, about three metres behind the existing timber abutment. This would provide a spill through abutment
- Replacing the Victorian timber approach span, also known as span five, with a steel and concrete composite deck structure
- Replace timber traffic barriers with steel traffic barriers on all spans except for the lift span
- Reconstructing the approach roads to suit new abutment location and height
- Installing scour protection of the Victorian river bank both upstream and downstream of the existing bridge
- Replacing the two De Burgh timber truss spans over the river, being spans two and four. Timber elements would be replaced like for like. Cast iron tension rods would be replaced with steel tension rods with a bigger diameter
- Replacing timber decking and sheeting with a stress laminated timber deck. The deck would be surfaced with asphalt or spray seal
- Replacing corroded webbing in both the iron pylons under the lift span
- Upgrading and replacing the removable mechanical components of the lift span, including the sheaves and shafts
- Removing existing lead paint by grit blasting and repainting of lift span towers. This would be done either where it stands with scaffolding and containment to prevent lead exposure to the environment or off-site by a qualified and authorised subcontractor
- Constructing a temporary bridge upstream of the existing bridge as shown in Figure 3-3. The temporary bridge is proposed to be about one metre away from the bridge on the NSW bank and about 18 metres from the bridge on the Victorian bank. It would be open for use by vehicles, cyclists and pedestrians
- Carrying out any required landscaping and tree planting
- Building a pedestrian boardwalk underneath the bridge on the NSW side of the river in consultation with Wakool Shire Council
- Restoring parks and reserves near the Barham-Koondrook bridge in consultation with Wakool and Gannawarra councils.

Need for the proposal

The Barham-Koondrook bridge is in poor structural condition. The restoration work is needed so that the bridge can continue to meet current heavy vehicle loads and volumes. The work would also allow for traffic volume growth into the future. If the bridge is not restored, load limits would need to be imposed on the bridge which would restrict accessibility across the river.

Proposal objectives

The objectives of the proposal include:

- Maintain the heritage values of the bridge
- Improve safety to road users and pedestrians by providing a structurally sound bridge
- Minimise environmental impact
- Minimise impact on the community
- Design for low maintenance
- Meet the growing needs of the local and travelling community into the future.

Options considered

Three options were considered to ensure a structurally sound crossing of the Murray River between Barham and Koondrook. These options include:

- Demolish the bridge and construct a new bridge
- Restore the bridge
- Maintain the bridge.

Demolishing the bridge to build a new one in its place would ensure minimal maintenance costs for a long time. However, the existing bridge is listed on the state heritage register, and its demolition would not meet the project objective of maintaining the heritage values of the bridge.

Maintaining the bridge does not meet the project objectives to improve safety, to design for low maintenance and to meet the growing needs of the local and travelling community. It would also result in ongoing disruption to the communities of Barham and Koondrook.

Option two to restore the existing bridge best meets the project objectives and is the preferred option for work on the bridge.

Seven options were considered for the provision for temporary crossing over the river while the bridge work is being carried out. These options include:

1. Temporary bridge - Cobwell Street (via Murray Parade)
2. Temporary bridge - Cobwell Street (via Vine and Dalton Streets)
3. Temporary bridge – Thule Street (next to bridge)
4. Temporary bridge – Wakool Street (via Murray Parade)
5. Ferry – Noorong Street (via Murray Parade)
6. Temporary bridge – Punt Road (via Teague Street)
7. No temporary crossing.

The preferred temporary crossing option is option 3 in Thule Street next to the existing bridge. This option would involve less road work and intersection upgrades and traffic would generally follow the same route through the two towns. This would have the following benefits:

- Traffic and the business trade generated by travellers wouldn't be diverted away from the main street of Barham
- Access to the main street of Barham would remain the same
- Significant detours to the temporary bridge would not be needed. This means that normally quiet residential streets would not experience an increase in traffic volumes and noise
- Pedestrian access across the river would remain similar to the existing situation. This would maintain convenient access for pedestrians, cyclists and mobility scooters.

Statutory and planning framework

NSW

Clause 94 of the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) 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.

The work proposed in NSW, carried out by Roads and Maritime, can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from council is not required.

This review of environmental factors fulfils the requirements of Section 111 of the EP&A Act and has been prepared in accordance with clause 228 of the Environmental Planning and Assessment Regulation 2000. It has also considered the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Victoria

Under clause 52.17 of the Gannawarra Planning Scheme, a planning permit is needed to remove or lop native vegetation along the Victorian river bank of the proposal area. Under Clause 62.01, a planning permit is not needed to use land for the purpose of a road. That means that the use of land in Gannawarra Shire for a road does not need a planning permit.

Approval to carry out the work in a road reserve is needed from VicRoads.

Community and stakeholder consultation

Roads and Maritime have carried out consultation with the community through community meetings, a website page, media releases, an information stand and public surveys. The issues raised and preferences of the community have been taken into account as much as possible when designing the work. Roads and Maritime have also held meetings with key businesses and river users.

Local Aboriginal parties, including the Moama Local Aboriginal Land Council, Barapa Barapa Nation Aboriginal Corporation and the Wamba Wamba Wadi Wadi Barapa Barapa First Nations Aboriginal Corporation have been consulted in the preparation of the Aboriginal cultural heritage assessments. These parties also participated in site inspections of areas where the proposal would be carried out.

Government agencies and key stakeholders in both NSW and Victoria were consulted in the preparation of this REF. Roads and Maritime would continue to consult with the community and stakeholders during detailed design and construction of the proposal.

Environmental impact

The proposal would have the following beneficial outcomes:

- Ensure the structural integrity of the bridge to maintain the current load limit
- Protect and conserve the heritage values of the state listed heritage item
- Maintain economic benefit generated by the bridge as a tourist landmark

The proposal would have the following main adverse impacts:

- Removal of about 0.2 hectares of native vegetation
- Increased risk of erosion and scour until disturbed soils can be stabilised with scour protection or vegetation
- Degradation of river water quality during piling and riverbed work
- Potential impact on water ecology
- Increased risk of pollution of the environment from spills and lead paint
- Construction noise
- Inconvenience from traffic delays and bridge closures
- Restrictions for some wide loads while the temporary bridge is in operation
- Change to the visual amenity of the area from removal of trees and the placement of the temporary bridge
- Generation of dust during earthwork

Impact has been avoided or managed to an extent through selection of the preferred option and development of the concept design.

Safeguards and management measures have been identified to address, manage and minimise the potential adverse environmental impact from the proposal.

Justification and conclusion

The preferred option best meets the proposal objectives and would satisfy key government strategies and plans.

The potential environmental impact from the proposal has been avoided or reduced during options assessment and development of the concept design. Although adverse impact on the environment is likely, the impact would mostly be short-term during construction. Safeguards and management measures detailed in this REF would further minimise and manage the expected impact.

The proposal would deliver a structurally sound bridge while maintaining the heritage values of the state listed heritage item. The long term benefits of the proposal are considered to outweigh the likely environmental impact. On balance the proposal is considered justified.

The environmental impact of the proposal is not likely to be significant. An environmental impact statement and approval from the Minister for Planning is not needed. The proposal is unlikely to significantly affect threatened species, populations or ecological communities or their habitats and therefore a species impact statement is not required. The proposal is also unlikely to significantly affect Commonwealth land or have a significant impact on any matters of national environmental significance. A referral to the Federal Minister for the Environment is not considered necessary.

Display of the review of environmental factors

This review of environmental factors is on display for comment between Monday 29 February and Friday 18 March 2016. You can access the documents in the following ways:

Internet

The documents will be available as pdf files on the Roads and Maritime website at http://www.rms.nsw.gov.au/projects/south-western/barham-bridge/.

Display

The review documents can be viewed at:

Wakool Shire Council, 15 Murray Street, Barham, Monday to Friday 9.00am to 5.00pm.

Gannawarra Shire Council, Patchell Plaza, 47 Victoria Street, Kerang, Monday to Friday 10am to 4pm

Barham Bakery, 8 Mellool Street, Monday to Friday 6am to 5pm, Saturdays and Sundays 6am to 2pm

Barham Riverside Café, 22 Murray Street, Monday to Saturday, 7am to 8pm

Purchase

The review documents are available for purchase in hard copy ($25.00) or CD/USB ($10.00) by contacting the Bridge Works Manager, Sam Millie, on (02) 6938 1114.

How can I make a submission?

To make a submission on the proposal, go online to http://www.rms.nsw.gov.au/projects/south-western/barham-bridge or please send your written comments to:

Roads and Maritime Services Bridge Works Manager:
Sam Millie
Roads and Maritime Services
PO Box 484, Wagga Wagga NSW 2650
T (02) 6938 1114
Wagga.Wagga.Regional.Office@rms.nsw.gov.au

Submissions must be received by 5pm Friday 18 March 2016.

Privacy information

All information included in submissions is collected for the sole purpose of assisting in the assessment of this proposal. The information may be used during the environmental impact assessment process by relevant Roads and Maritime Services staff and its contractors.

Where the respondent indicates at the time of supply of information that their submission should be kept confidential, Roads and Maritime Services will attempt to keep it confidential. However there may be legislative or legal justification for the release of the information, for example under the *Government Information (Public Access) Act 2009* or under subpoena or statutory instrument.

The supply of this information is voluntary. Each respondent has free access at all times to the information provided by that respondent but not to any identifying information provided by other respondents if a respondent has indicated that the representation should be kept confidential.

Any respondent may make a correction to the information that they have provided by writing to the same address the submission was sent.

The information will be held by the Roads and Maritime Services, address of relevant Roads and Maritime Services office.

What happens next?

Following the submissions period, Roads and Maritime Services will collect submissions. Acknowledgement letters will be sent to each respondent. The details of submission authors will be retained and authors will be subsequently advised when project information is released.

After consideration of community comments Roads and Maritime Services will determine whether the proposal should proceed as proposed, or whether any alterations to the proposal are necessary. The community will be kept informed about this Roads and Maritime Services determination.

If the proposal goes ahead, Roads and Maritime Services proceeds with final design and tenders are called for construction of the project.

If you have any queries, please contact the Roads and Maritime Services project manager on (02) 6938 1114.

Contents

1 Introduction

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) propose to restore part of Barham-Koondrook Bridge. Barham-Koondrook Bridge is a De Burgh Timber Truss bridge with a steel lift span over the Murray River. The bridge connects the towns of Barham in NSW and Koondrook in Victoria and is an important link for the communities on each side of the Murray River. Figure 1-1 shows the location of the proposal.

Some parts of the bridge have already been restored under earlier stages of the work. Stages one and two included preliminary lift span repairs, the replacement of the NSW abutment and approach span and the replacement of pier one. This work was completed in 2013 and 2014.

Roads and Maritime now proposes to carry out stages three, four and five of the restoration. These stages include the replacement of the Victorian abutment and approach span, replacement of two timber truss spans, and painting and mechanical upgrade of the lift span. A temporary bridge would be constructed to maintain vehicular and pedestrian access over the river while the restoration work is being performed. The proposal is expected to start construction in April 2016 and is expected to finish by January 2018.

The proposed restoration work would ensure the Barham-Koondrook Bridge can continue to operate as a bridge without load weight restrictions.

The key features of the proposal are listed below with a detailed description provided in Section 1.

- Replacing the timber piles on pier four with new concrete piles and a concrete pile cap
- Replacing the timber on pier four
- Constructing a new concrete abutment on the Victorian side of the bridge, Abutment B, about three metres behind the existing timber abutment
- Replacing the timber approach span on the Victorian side of the bridge, also known as span five, with a steel and concrete composite deck structure
- Replacing timber traffic barriers with steel traffic barriers on all spans except for the lift span
- Reconstructing the approach roads to suit the new abutment location
- Installing scour protection along the river bank on the Victorian side of the river, both upstream and downstream of the existing bridge
- Replacing the two De Burgh timber truss spans over the river, also known as spans two and four
- Replacing timber decking and sheeting with a stress laminated timber deck. The deck would be surfaced with asphalt or spray seal
- Replacing corroded webbing in both the iron pylons under the lift span
- Upgrading and replacing the removable mechanical components of the lift span, including the sheaves and shafts
- Removing existing lead paint by grit blasting and repainting of lift span towers
- Constructing and operating a temporary bridge upstream of the existing bridge for use during the work. The temporary bridge is proposed to be about one metre away from the existing bridge on the NSW bank and about 18 metres from the

existing bridge on the Victorian bank. It would be open for use by vehicles, cyclists and pedestrians

- Carrying out any required landscaping and tree planting
- Building a pedestrian boardwalk underneath the bridge on the NSW side of the river in consultation with Wakool Shire Council
- Restoring parks and reserves near the Barham-Koondrook bridge in consultation with Wakool and Gannawarra Councils.

The proposal is located in both the New South Wales town of Barham and the Victorian town of Koondrook. The state border between New South Wales and Victoria is located on the Victorian side of the river where the riverine plain meets the edge of the river channel (top of bank on the Victorian side). The work carried out in New South Wales under the Environmental Planning and Assessment Act 1979 includes:

- Refurbishment of timber bridge trusses
- Replacement of timber bridge deck
- Replacement of Victorian approach span
- Repainting of bridge lift span and tower
- Piers for temporary bridge
- Abutment for temporary bridge
- Road work for temporary crossing

Work carried out in Victoria under the Planning and Environment Act 1987 includes:

- New Victorian abutment for bridge
- Abutment for temporary bridge
- Road work for temporary bridge

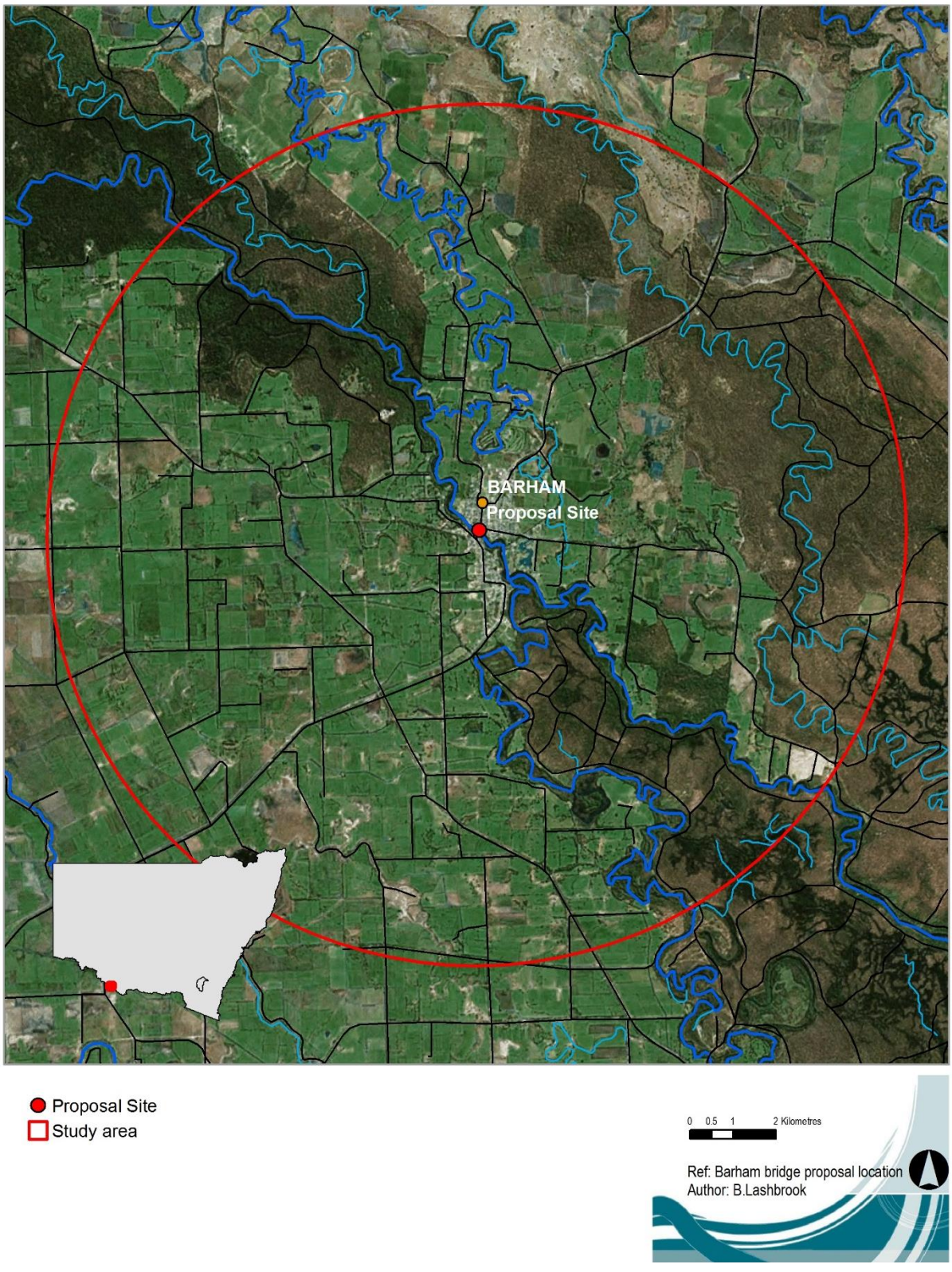

Figure 1-1 Proposal location

I.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by NGH Environmental on behalf of Roads and Maritime Services South West Region. For the purposes of this work, Roads and Maritime Services is the proponent and the determining authority under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

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

The description of the proposed work and associated environmental impact have been undertaken in context of clause 228 of the NSW *Environmental Planning and Assessment Regulation 2000*, the NSW *Threatened Species Conservation Act 1995* (TSC Act), the NSW *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of:

- Section 111 of the EP&A Act, which Roads and Maritime Services examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by carrying out the work
- The strategic assessment approval granted by the Federal Government under the EPBC Act in September 2015, with respect to the impacts of Roads and Maritime activities on nationally listed threatened species, ecological communities and migratory species.

This document also aims to identify and address Victorian statutory requirements for the proposed work. The Planning and Environment Act 1987 establishes the framework for planning the use, development and protection of land in Victoria. The Act provides for a single instrument of planning control for each municipality, which in this case is the Gannawarra Planning Scheme.

The findings of the 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 to be sought from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- 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 whether offsets are required and able to be secured
- The potential for the proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment 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

2.1 Strategic need for the proposal

Barham-Koondrook Bridge is a De Burgh Timber Truss bridge with a steel lift span over the Murray River. Bridge construction commenced in 1903 and the bridge was opened in 1905. The bridge connects the towns of Barham in NSW and Koondrook in Victoria and is an important link for communities on each side of the Murray River. As the towns are not large there is considerable commuting across the bridge for services that are not duplicated in both towns. The bridge is also a vital link for shared emergency response for both states.

Around 4029 vehicles use the bridge each day with around 10.5 per cent of these being heavy vehicles. The nearest alternative bridge crossing of the Murray River is located around 24 kilometres away at Gonn Crossing, Murrabit, requiring a road detour of around 57 kilometres.

Inspections carried out on 22 September 2014, 8 June 2012 and 23 September 2010 have shown the Barham-Koondrook bridge is in poor structural condition. These inspections have noted some of the timber components have deteriorated and have lost structural strength. The restoration work is needed so that the bridge can continue to meet current heavy vehicle loads and volumes. The work would also allow for traffic volume growth into the future. If the bridge is not restored load limits would need to be imposed on the bridge which would restrict accessibility across the river. The proposed work would also minimise ongoing routine maintenance and the need to source replacement timber into the future.

The proposal would change the fabric of some components of the bridge to increase strength and minimise maintenance. The reduction in maintenance would result in less disruptions to the community in the future with most components expected to last 25 years.

2.1.1 Relevant plans and strategies

NSW 2021: A Plan to Make NSW Number One

NSW 2021: A Plan to Make NSW Number One (Department of Premier and Cabinet, 2011) is a 10 year plan that provides goals and targets to rebuild the economy, provide quality services, renovate infrastructure, restore government accountability, and strengthen the local environment and communities. It is the NSW Government's strategic plan, setting priorities for action and guiding resource allocation.

The proposal is considered to be consistent with *NSW 2021: A Plan to Make NSW Number One* as it would be an investment in critical infrastructure, meeting the growing needs of the local and travelling community into the future.

NSW Long Term Transport Master Plan

The NSW Long Term Transport Master Plan (LTTMP) (Transport for NSW, 2012) sets the direction for transport planning for the next 20 years, providing a framework for transport policy and investment decisions that respond to key transport challenges.

The proposal is consistent with the following objectives of the plan:

- *Support regional development* – by improving accessibility to jobs, services and people, improving freight connections to markets and providing better links between clusters of business activity
- *Improve safety and security* – by placing a high priority on addressing the causes and risks of transport accidents and security incidents.

The transport master plan identifies that regional centres and small and medium towns contribute to the vitality and character of NSW. Often attractive and amenable to walking and cycling, these centres and towns also function as important service and employment nodes for the surrounding area. This proposal recognises the important role the Barham-Koondrook Bridge plays in the community by restoring the bridge to retain its heritage value, while still providing an important connection of services between Barham and Koondrook.

NSW Freight and Ports Strategy

The *NSW Freight and Ports Strategy* provides a framework for industry, all levels of government and stakeholders to guide investment and other decisions to enhance freight logistics in NSW (Transport for NSW, 2013).

The proposal supports the following actions from the strategy:

- *Developing and maintaining capacity for freight on the road network.* The proposal would maintain current vehicle loads and volumes, as well as the meet the growing needs of the local and travelling community into the future
- *Develop and maintain projects to support network capacity.* The proposal would enable continued heavy vehicle use of the bridge.

Timber Truss Road Bridges: A strategic approach to conservation

The focus of the *Timber Truss Road Bridges: A strategic approach to conservation* (Roads and Traffic Authority 2011) is determining a set of bridges requiring long-term conservation in order to meet the evolving operational needs of NSW's road network while providing an appropriate representation of NSW's bridge heritage. This report identified the Barham-Koondrook Bridge as requiring replacement based on the poor condition and the narrow width of the bridge.

However, after public consultation, the strategy was revised in the *Timber Truss Bridge Conservation Strategy Submission Report and Revised Conservation Strategy*. The revised strategy recommended keeping the Barham-Koondrook Bridge given the large number of submissions in support of its retention.

The proposal involves restoring the bridge so that it may be used safely in the long-term.

2.2 Existing road and infrastructure

Barham-Koondrook Bridge is a timber truss, steel lift span bridge across the Murray River between Barham in NSW and Koondrook in Victoria. It is used by local traffic as well as through traffic from regional NSW and Victoria.

Barham Koondrook Bridge

Barham-Koondrook Bridge is about eight metres wide with a single vehicular traffic lane and a pedestrian footpath along the eastern, or upstream, side. The bridge comprises three main spans including one lift span, supported on wrought iron piers. There is a single approach span at each end supported on timber trestle piers. The lift span of the bridge is steel lattice in construction, is 17.8 metres in length, and narrows to about five metres with no dedicated footpath (Figure 2-1).

The two other main spans are 31.7 metres in length and are De Burgh timber trusses. The truss uses a steel bottom chord and supports steel cross girders and steel longitudinal stringers. The main bridge piers are twin wrought iron columns protected within concrete cofferdams. Except for the centre lift span, the timber deck has been segregated for pedestrian use with a kerb and handrail.

The existing NSW abutment (Abutment A) was built in 2013 and replaced successive timber abutments built from 1958 onwards. The abutment on the Victorian side of the river (Abutment B) has very low clearance and comprises two timber piles and two steel piles. The major cause of deterioration in abutment timbers is termite infestation.

The entire bridge, excluding the walkway, is decked with longitudinal sheeting supported on transverse timber decking, as shown in Figure 2-2.

Figure 2-1 Photo of the Barham-Koondrook Bridge

Figure 2-2 Photo of the lift span of the Barham-Koondrook Bridge

Thule Street, the approach road in Barham is a two lane road with an additional lane for parking on both sides of the road. The road is bitumen sealed with kerb and guttering. Grigg Road, the approach road in Koondrook is a two lane road without kerb and guttering. The shoulders of the road are unsealed with swale drains for stormwater drainage.

2.3 Proposal objectives

The objectives of the proposal are to:

- Maintain the heritage values of the bridge
- Improve safety to road users and pedestrians by providing a structurally sound bridge
- Minimise environmental impact
- Minimise impact on the community
- Design for low maintenance
- Meet the growing needs of the local and travelling community into the future.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

Roads and Maritime has been restoring the historic lift span bridge since April 2012. The work has included mechanical repairs to the lift span and replacing the NSW abutment and approach span.

Roads and Maritime is currently planning the next stages of work. Three options were identified for the proposal, including:

- Demolish the existing bridge
- Restore the existing bridge
- Base case – maintain elements of the bridge as required.

Each option was analysed taking into consideration how well each option met the proposal objectives and a preferred option selected.

2.4.2 Identified bridge work options

Option One: Demolish bridge and construct new bridge

This option involves demolishing the existing bridge and constructing a new bridge in its place.

Option Two: Restore bridge

This option involves the restoration of the Barham-Koondrook Bridge. This option would involve work needed to ensure structural soundness of the bridge, including:

- Replacement of the Victorian bridge abutment and approach span
- Replacement of pier four (pier on Victorian side)
- Replacement of the two timber truss spans over the river
- Painting and mechanical upgrade of the lift span.

Option Three: Base case – Maintain elements of the bridge as required

This option involves replacing timber elements that are in poor condition on an as needed basis. This option would initially involve installing a temporary truss to support the Victorian truss span as it is currently in poor condition. Work would be carried out under traffic. Ongoing replacement of timber elements would be required as other parts of the bridge continue to deteriorate.

2.4.3 Analysis of bridge work options

Table 2-1 provides a summary of whether each bridge work option meets the objectives of the proposal. A more detailed analysis is provided after the table.

Table 2-1 Performance of bridge work options against the proposal objectives

Project Objective	Option One New bridge	Option Two Restore bridge	Option Three Maintain bridge
Maintain the heritage values of the bridge	Does not meet proposal objective	Meets proposal objective	Meets proposal objective
Improve safety to road users and pedestrians	Meets proposal objective	Meets proposal objective	Partly meets proposal objective
Minimise environmental impact	Does not meet proposal objective	Partly meets proposal objective	Meets proposal objective
Minimise impact on the community	Partly meets proposal objective	Partly meets proposal objective	Does not meet proposal objective
Design for low maintenance	Meets proposal objective	Meets proposal objective	Does not meet proposal objective
Meet the growing needs of the local and travelling community into the future	Meets proposal objective	Meets proposal objective	Does not meet proposal objective

Option one would meet the objectives to improve safety, ensure low maintenance and meet future needs. It would not meet the objective of maintaining the heritage values of the bridge, and it would have an impact on the environment and the community. The Barham-Koondrook bridge is one of the oldest lift span bridges on the Murray River. It is listed on the NSW State Heritage Register and has been retained as part of the *Timber Truss Bridge Conservation Strategy*. The proposal objective to maintain the heritage values of the bridge would therefore not be achieved by demolishing the bridge. The option was therefore discounted.

Option two, to restore the existing bridge, would also have an impact on the environment and the community. This option would meet all other objectives by maintaining the heritage values of the bridge and be designed for low maintenance, but it falls short of allowing for future needs for Barham and Koondrook. Overall, option two best meets the project objectives and was selected as the preferred option.

Option three to continue with maintenance based upon element condition would have the least impact to the environment and would also maintain the heritage values of the bridge by leaving the bridge as it is. This option however does not meet the objective to design for low maintenance, nor does it improve safety. This option would result in ongoing and severe disruptions to the local community through ongoing maintenance work under traffic. Accessibility would be limited in the short term as temporary supports would reduce the width of the bridge. This option was therefore discounted.

2.4.4 Feedback from community consultation on the options

Feedback received during consultation about the bridge work options identified significant concerns about bridge closures. The feedback showed a strong preference for Roads and Maritime to provide a temporary crossing solution for the next stage of the work. A temporary crossing would have several benefits including:

- Maintain unimpeded traffic flow between Barham and Koondrook
- Reduce the time of construction from about two years to about 12 months.

The preferred option was therefore refined to provide a temporary access over the river while the bridge work is carried out.

2.4.5 Identified temporary crossing options

Six temporary crossing options were investigated, as well as an option without a temporary crossing. The options included suggestions made by the community during consultation discussed in section 2.4.4.

- Option 1: Temporary bridge – Cobwell Street (via Murray Parade)
- Option 2: Temporary bridge – Cobwell Street (via Vine and Dalton Streets)
- Option 3: Temporary bridge – Thule Street (next to bridge)
- Option 4: Temporary bridge – Wakool Street (via Murray Parade)
- Option 5: Ferry – Noorong Street (via Murray Parade)
- Option 6: Temporary bridge – Punt Road (via Teague Street)
- Option 7: No temporary crossing.

The methodology for selecting the preferred option involved the following steps:

- On-site assessment looked at the quality of possible detour routes, habitat values of trees along the river, the location of infrastructure and services that would be impacted and may need relocation, the ability for heavy vehicles to turn at the intersection, the number of houses that would be affected by increased traffic noise and the impact from vehicle headlights
- Suitable options were then assessed against the objectives of the proposal.

The temporary bridge options are discussed below and shown in Figure 2-3. Common features across all bridges are that the temporary bridge provides access for light vehicles, heavy vehicles, school buses and emergency vehicles. There would be some limitations for wide loads as the temporary bridge would be narrower than the existing bridge. There would be waterway restrictions for high vessels as the temporary bridge would not have a moveable lift span.

Option 1: Temporary bridge – Cobwell Street (via Murray Parade)

Option 1 would involve the construction of a temporary bridge between Cobwell Street in Barham and Murray Parade in Koondrook. This temporary bridge option would be almost at right angles to Murray Parade.

Traffic would be detoured along Wakool and Cobwell Streets in Barham and Murray Parade in Koondrook.

Option 2: Temporary bridge – Cobwell Street (via Vine and Dalton Streets)

Option 2 would involve the construction of a temporary bridge between Cobwell Street near the Barham & District Services Memorial Bowling Club to the intersection of Vine Street and Murray Parade in Koondrook. This temporary bridge option would be at a skewed angle across the river.

Traffic would be detoured along Gonn and Cobwell Streets in Barham and Vine, Burnett and Dalton Streets in Koondrook.

Option 3: Temporary bridge – Thule Street (next to bridge)

Option 3 would involve the construction of a temporary bridge along the eastern side of the existing Barham-Koondrook bridge. Only minor traffic diversions from Thule Street and Grigg Road would be needed.

Option 4: Temporary bridge – Wakool Street (via Murray Parade)

Option 4 would involve the construction of a temporary bridge just north of the Barham & District Services Memorial Bowling Club to Murray Parade in Koondrook.

Traffic would be detoured along Wakool Street in Barham and Murray Parade in Koondrook.

Option 5: Ferry – Noorong Street (via Murray Parade)

Option 5 would involve the use of a ferry to transfer vehicles and pedestrians across the river between Noorong Street near the Barham Caravan and Tourist Park and Murray Parade in Koondrook.

Traffic would be detoured along Noorong Street in Barham and Murray Parade in Koondrook.

Option 6: Temporary bridge – Punt Road (via Teague Street)

Option 6 would involve the construction of a temporary bridge at the end of Punt Road in Barham.

Traffic would be detoured along Gonn Street and Punt Road in Barham. On the Victorian side a new detour road would need to be built past the Koondrook Primary School with traffic diverted along Teague Street onto Grigg Road.

Option 7: No temporary crossing

Option 7 would involve not providing a temporary crossing of the river while the bridge restoration work is being carried out. Traffic control would be implemented to allow the bridge to be used by vehicles and pedestrians while work is being carried out. Without the temporary crossing, it would take about two years to complete the restoration work on the bridges compared to 12 months.

This option would include night work to avoid some bridge closures and delays that would have an impact on businesses. There would also be about 15 days of bridge closures over a period of about two years. Each closure would vary between about eight hours to five days.

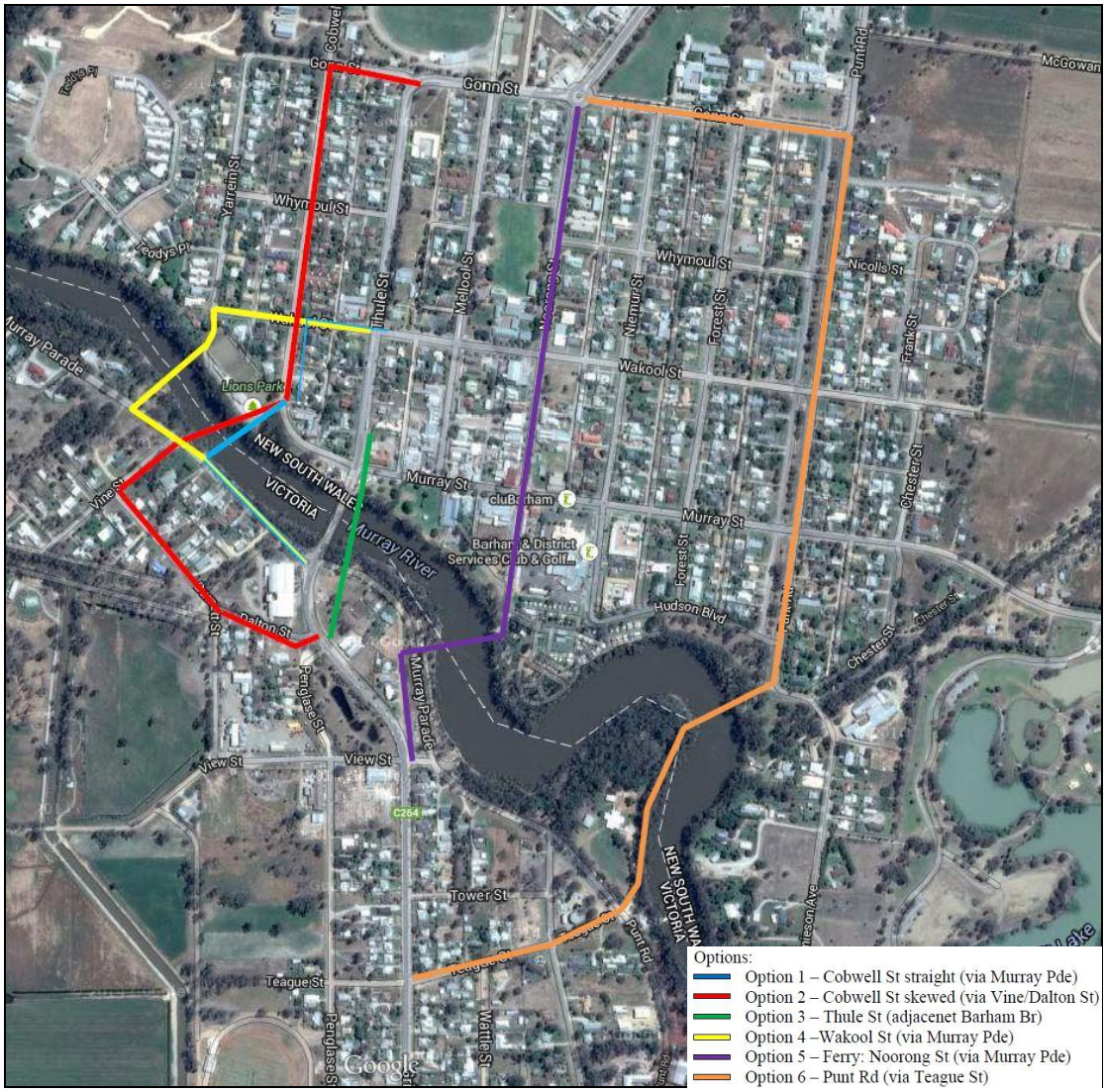

Figure 2-3 Temporary bridge crossing options.

2.4.6 Analysis of temporary crossing options

Table 2-2 provides a summary of the expected impacts of each option. A more detailed analysis is provided after the table.

Table 2-2 Analysis of the impact of temporary crossing options

Impact	Option 1 Cobwell via Murray	Option 2 Cobwell via Vine	Option 3 Next to Bridge	Option 4 Wakool St	Option 5 Noorong St Ferry	Option 6 Punt Rd	Option 7 No Crossing
Impact on businesses	Detour away from business centre	Detour away from business centre	Access to business centre maintained	Detour away from business centre	Detour away from business centre	Detour away from business centre	Queuing traffic would block access to business centre
Impact on residents along detour route	More noise Headlights Queueing traffic	More noise Headlights Queueing traffic	Minor detour for vehicles	More noise Headlights Queueing traffic	More noise Headlights Queueing traffic	More noise Headlights Queueing traffic	No detour Least noise impacts No headlights Queueing traffic and delays from bridge work
Impact on water traffic	No access past bridge for tall river traffic	No access past bridge for tall river traffic	No access past bridge for tall river traffic	No access past bridge for tall river traffic	Access for tall river traffic could be arranged	No access past bridge for tall river traffic	Access for tall river traffic could be arranged
Impact on bridge users	Long detour for pedestrians	Long detour for pedestrians	Minor detour for pedestrians	Long detour for pedestrians	Would not have the capacity for vehicle and pedestrian volumes	Long detour for pedestrians	Delays for pedestrians and vehicles over a longer construction period
Impact on wide load traffic	60 km detour for four months	60 km detour for four months	60 km detour for four months	60 km detour for four months	Dependent on width of ferry	60 km detour for four months	60 km detour for twenty-four months
Impact on	Clearing of about 0.3ha of	Clearing of about 0.4ha of	Clearing of about 0.2ha of	Clearing of about 0.5ha of	Clearing of about 0.3ha of	Clearing of about 1.3ha of	No tree removal

environment	trees	trees	trees	trees	trees Limited construction work in the river	trees	
Utilities and infrastructure	Relocation of electricity lines and poles for work on existing bridge	Possible sewer and stormwater relocation Road realignments and intersection upgrades	Relocation of electricity lines and poles Two new intersections Short section of new road	Relocation of pump station Detour road and intersection construction	Relocation of electricity lines and poles for work on existing bridge	About 340m of new road	Relocation of electricity lines and poles for work on existing bridge

Table 2-2 Legend

Colour	**Rating Meaning**
Red	Moderate to high impact
Yellow	Moderate impact
Green	Minimal impact

Option 1: Temporary bridge - Cobwell Street (via Murray Parade)

The detour route for this temporary bridge option includes sharp corners that would not allow heavy vehicles to turn safely. New intersections and road realignments would need to be constructed for this option.

The traffic detour route for this option would divert traffic along normally quiet residential streets. This would have an impact on residents from vehicle headlights, traffic noise and queueing traffic at the temporary bridge.

The detour would also divert travellers away from the business centre in Barham. This would affect the trade of the businesses for up to 12 months.

Pedestrian access would be provided over the temporary bridge, however the bridge would not be in a convenient location for pedestrians. Footpaths would also need to be constructed to ensure good access to the bridge.

Tall river traffic would not be able to pass while the temporary bridge is in place as the temporary bridge would not have a lift span.

About 0.3 hectares of native vegetation would need to be removed from the river banks. Many of these trees have hollows which provide potential habitat for threatened species.

This option was discounted as it is not considered to be the best option given the impact on residents, businesses and the environment.

Option 2: Temporary bridge – Cobwell Street (via Vine and Dalton Streets)

This option would involve heavy vehicles navigating narrow corners along the detour route on normally quiet residential streets. This would have an impact on residents from vehicle headlights, traffic noise and queueing traffic at the temporary bridge.

The detour would also divert travellers away from the business centre in Barham. This would affect the trade of the businesses for up to 12 months.

Pedestrian access would be provided over the temporary bridge, however the bridge would not be in a convenient location for pedestrians. Footpaths would also need to be constructed to ensure good access to the bridge.

A water pump station on the Victorian river bank would need to be relocated, which would affect the timeframe and cost of the project.

Tall river traffic would not be able to pass while the temporary bridge is in place as the temporary bridge would not have a lift span.

Wide loads, such as agricultural machinery, would need to cross the river at Gonn while the temporary bridge is in place. This would be a detour of about 60 kilometres.

About 0.4 hectares of native vegetation would need to be removed from the river banks. Many of these trees have hollows which provide potential habitat for threatened species.

This option was discounted as it is not considered to be the best option given the impact on residents, businesses and the environment as well as the need to relocate a water pump station.

Option 3: Temporary bridge – Thule Street (next to bridge)

As the traffic route for this option would remain the same there would be no impact to existing traffic conditions and no additional impact on residents from traffic noise or

headlights. There would be minimal change in the impact from queueing traffic at the temporary bridge.

The temporary bridge would be in the best position for pedestrians with minimal change to the pedestrian traffic route.

Tall river traffic would not be able to pass while the temporary bridge is in place as the temporary bridge would not have a lift span.

Wide loads, such as agricultural machinery, would need to cross the river at Gonn while the temporary bridge is in place. This would be a detour of about 60 kilometres.

About 0.2 hectares of native vegetation would need to be removed along the Victorian river bank. Some of these trees have hollows which provide habitat for threatened species.

This option provides substantial benefits to bridge users, businesses and residents.

Option 4: Temporary bridge – Wakool Street (via Murray Parade)

The detour route for this temporary bridge option includes sharp corners that would not allow heavy vehicles to turn safely. New intersections and road realignments would need to be constructed for this option.

The traffic detour route for this option would divert traffic along normally quiet residential streets. This would have an impact on residents from vehicle headlights, traffic noise and queueing traffic at the temporary bridge.

The detour would also divert travellers away from the business centre in Barham. This would affect business trade for about 12 months. While the temporary bridge is in place the access to the Bowling Club at Barham would need to change for safety reasons. This may be an inconvenience to patrons of the club.

Pedestrian access would be provided over the temporary bridge, however the bridge would not be in a convenient location for pedestrians. Footpaths would also need to be constructed to ensure good access to the bridge.

Wide loads, such as agricultural machinery, would need to cross the river at Gonn while the temporary bridge is in place. This would be a detour of about 60 kilometres.

Tall river traffic would not be able to pass while the temporary bridge is in place as the temporary bridge would not have a lift span.

About 0.5 hectares of native vegetation would need to be removed from the river banks. Many of these trees have hollows which provide habitat for threatened species.

This option was discounted as it is not considered to be the best option given the impact on residents, businesses and the environment.

Option 5: Ferry – Noorong Street (via Murray Parade)

Option 5 is not suitable as a ferry would be unable to meet vehicle capacity during peak times. A ferry for pedestrian use would also be unable to meet capacity and would require significant work on the river banks to provide for the elderly, wheelchairs and mobility scooter use.

The traffic detour route for this option would divert traffic along normally quiet residential streets. This would have an impact on residents from vehicle headlights, traffic noise and queueing traffic at the temporary bridge.

The detour would also divert travellers away from the business centre in Barham. This would affect the business trade for about 12 months.

Passage for tall river traffic may be able to be arranged provided the lift span on the existing bridge is still operational at that time.

About 0.3 hectares of native vegetation would need to be removed from the river banks.

This option was discounted as it is not considered to be the best option given the impact on residents, businesses and the environment.

Option 6: Temporary bridge – Punt Road (via Teague Street)

This option would divert traffic through Koondrook Primary School land. A new road would need to be built from the river to Teague Street, which could be as close as four metres to school buildings. This would impact the school from traffic noise and queueing traffic near the school.

The traffic detour route for this option would divert traffic along normally quiet residential streets. This would have an impact on residents from vehicle headlights, traffic noise and queueing traffic at the temporary bridge.

The detour would also divert travellers away from the business centre in Barham. This would affect the business trade for about 12 months.

Pedestrian access would be provided over the temporary bridge, however the bridge would not be in a convenient location for pedestrians. Footpaths would also need to be constructed to ensure good access to the bridge.

Wide loads, such as agricultural machinery, would need to cross the river at Gonn while the temporary bridge is in place. This would be a detour of about 60 kilometres.

Tall river traffic would not be able to pass while the temporary bridge is in place as the temporary bridge would not have a lift span.

About 1.3 hectares of native vegetation would need to be removed from the river banks.

This option was discounted given the impact on the Koondrook Primary School, residents, businesses and the environment.

Option 7: No temporary crossing

If a temporary crossing is not provided, the existing bridge would remain open to traffic while the restoration work is being carried out. This would mean traffic control measures 24 hours a day for about two years. Traffic delays would be experienced daily during this time and the bridge would need to be closed for about 15 days over the two years of restoration work. The closures would range from eight hours to five days. This option would also involve night work to avoid some night closures that may affect local businesses. A detour of around 60 kilometres would be required during closures which would add about 40 minutes to motorist's journey times.

This option would have the least impact on the environment and the residents of Barham and Koondrook would not experience increased traffic noise or headlight impact.

Passage for tall river traffic may be able to be arranged provided the lift span is still operational at that time.

This option is not the preferred option compared to the benefits of providing a temporary crossing, reducing the construction period and therefore reducing the disruption to the community through traffic delays and bridge closures.

2.4.7 Preferred option

The preferred option is to restore Barham-Koondrook Bridge as it best meets the proposal objectives to maintain the heritage values of the bridge and improve safety to road users and pedestrians.

The provision of a temporary crossing was investigated. Roads and Maritime has determined that Temporary Bridge Option 3 is the preferred option as it would allow the community to carry on with business as usual, minimising economic impact and keeping the connection between Barham and Koondrook. This option is considered the best option given:

- Traffic and the business trade generated by travellers wouldn't be diverted away from the main street of Barham
- Access to the main street of Barham would remain the same
- Significant detours to the temporary bridge would not be needed. This means that normally quiet residential streets would not experience an increase in traffic volumes and noise
- Pedestrian access across the river would remain similar to the existing situation. This would maintain convenient access for pedestrians, cyclists and mobility scooters.

While the temporary bridge crossing would impact tall river traffic and wide loads, overall, Option 3 best meets the project objectives.

3 Description of the proposal

3.1 The proposal

Roads and Maritime propose to complete the restoration of Barham-Koondrook Bridge by undertaking stages three, four, and five of the proposal. A plan showing pier and span numbers is shown in Figure 3-1. Key features of the proposal include:

- Replacing the timber piles on pier four with concrete piles and a concrete pile cap
- Replacing the timber trestle elements on pier four with new timber
- Constructing a new concrete abutment on the Victorian side of the bridge, about three metres behind the existing timber abutment
- Replacing the timber approach span on the Victorian side of the bridge, also known as span five, with a steel and concrete structure
- Replacing the timber traffic barriers with steel traffic barriers on all spans except for the lift span
- Reconstructing the approach roads to suit new abutment location
- Installing scour protection on the Victorian river bank for about 30 metres upstream and downstream of the existing bridge
- Replacing the two De Burgh timber truss spans over the river, spans two and four. Timber elements would be replaced with timber. Cast iron tension rods would be replaced with steel tension rods
- Replacing timber decking and sheeting with a stress laminated timber deck. The deck would be surfaced with asphalt or spray seal
- Replacing corroded webbing in both the iron pylons under the lift span
- Upgrading and replacing the removable mechanical components of the lift span
- Removing existing lead paint and repainting the lift span towers
- Constructing a temporary bridge upstream of the existing bridge as shown in Figure 3-3. The temporary bridge is proposed to be about one metre away from the bridge on the NSW bank and about 18 metres from the bridge on the Victorian bank. It would be open for use by vehicles, cyclists and pedestrians
- Carrying out any required landscaping and tree planting
- Building a pedestrian boardwalk underneath the bridge on the NSW side of the river in consultation with Wakool Shire Council
- Restoring parks and reserves near the Barham-Koondrook Bridge in consultation with Wakool and Gannawarra Councils.

The proposal would also involve compound and stockpile areas, ancillary work and utility relocation that would be required to construct the project. These are discussed in Section 3.3. If pads for locating and operating cranes are required these would be located within the proposed area assessed for construction compound shown in Figure 3-4.

All metal components and existing materials would be investigated for reuse in the restoration where possible. Concept design plans are provided in Appendix B. The concept design would be further refined during the detailed design phase of the proposal.

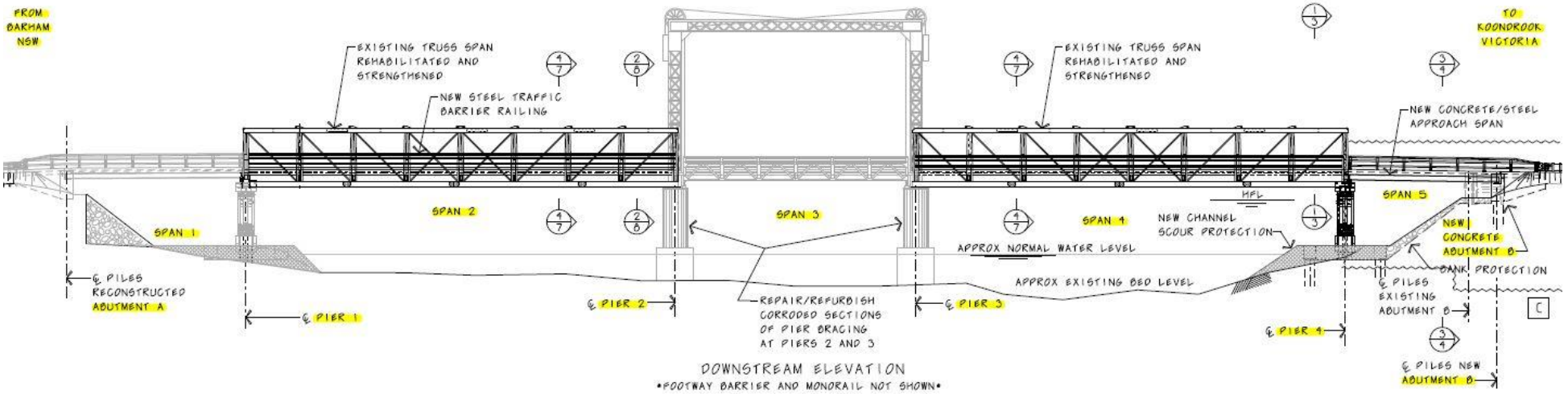

Figure 3-1 Plan of Barham-Koondrook bridge showing span and pier numbers

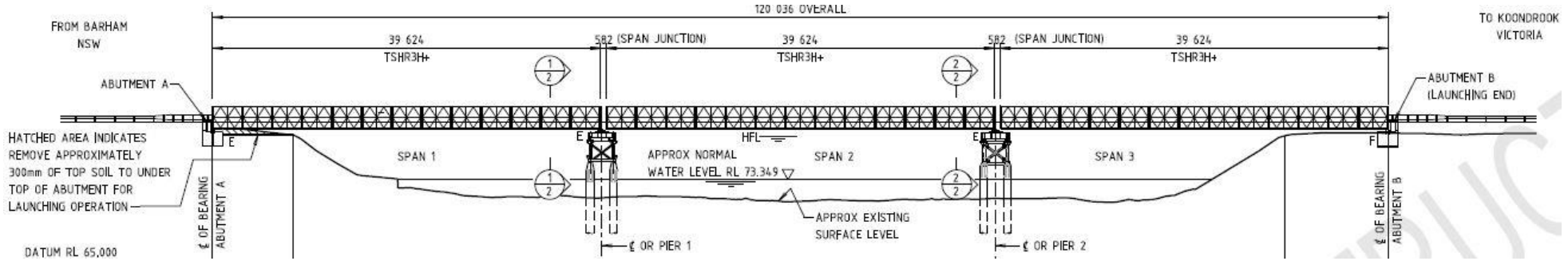

Figure 3-2 Plan of Proposed Temporary Bridge

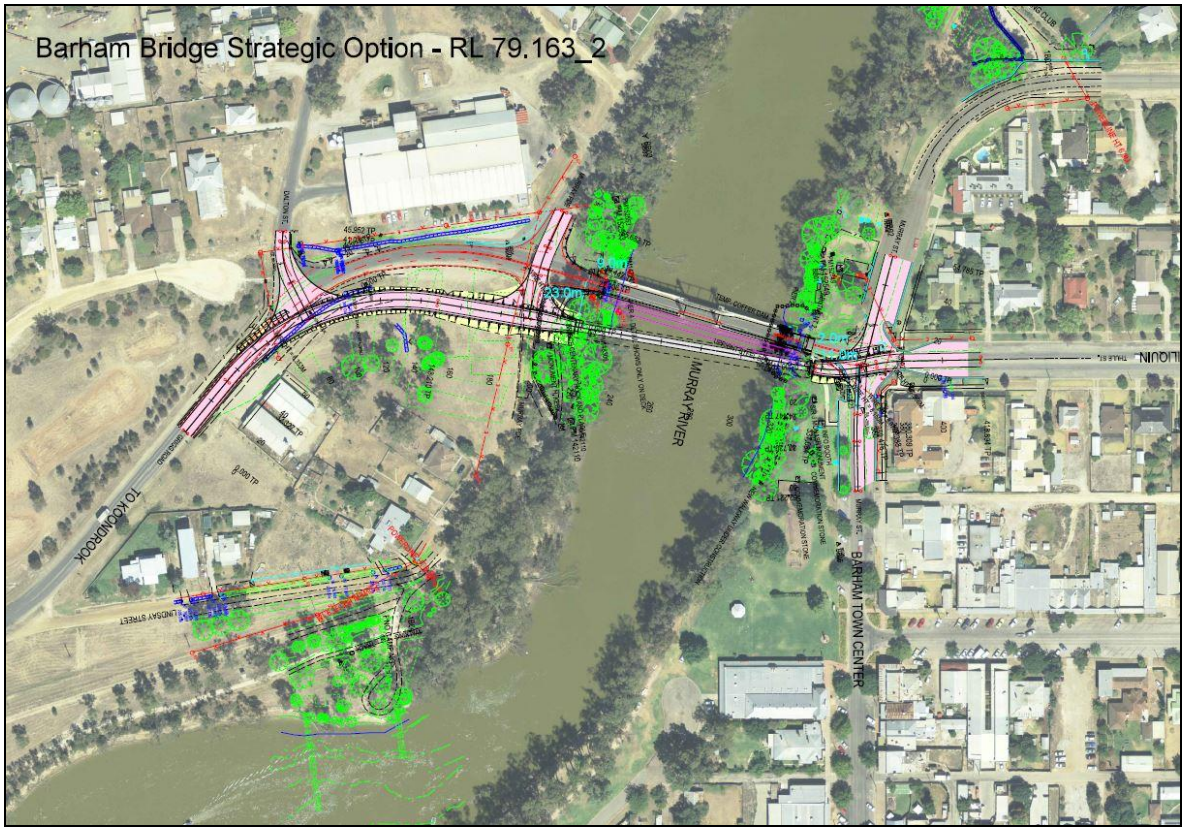

Figure 3-3 Location of the Temporary bridge

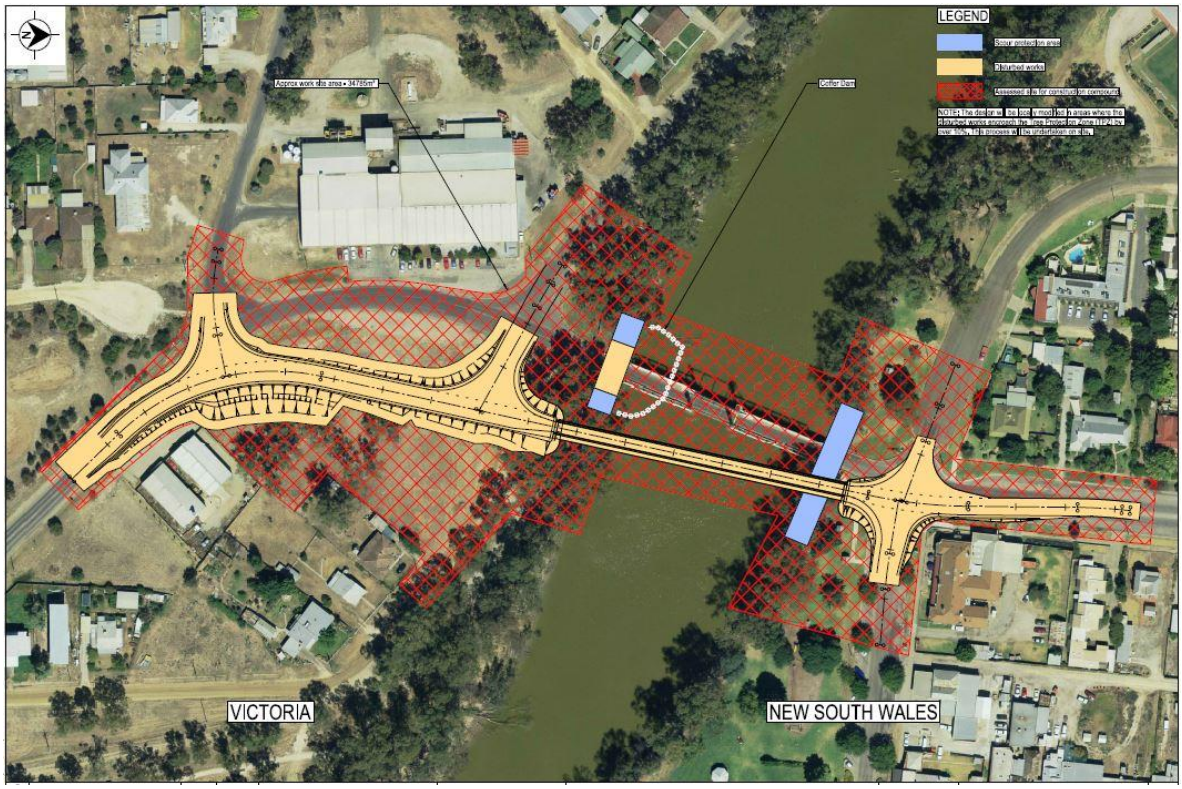

Figure 3-4 Proposed Work Site

3.2 Design

3.2.1 Design criteria

The two main design criteria for the proposal are to maintain the existing load limit of 62.5 tonnes to allow for B-Doubles, and to preserve the heritage values of the bridge. Typical cross sections of the existing bridge are provided in Figure 3-5 and Figure 3-6.

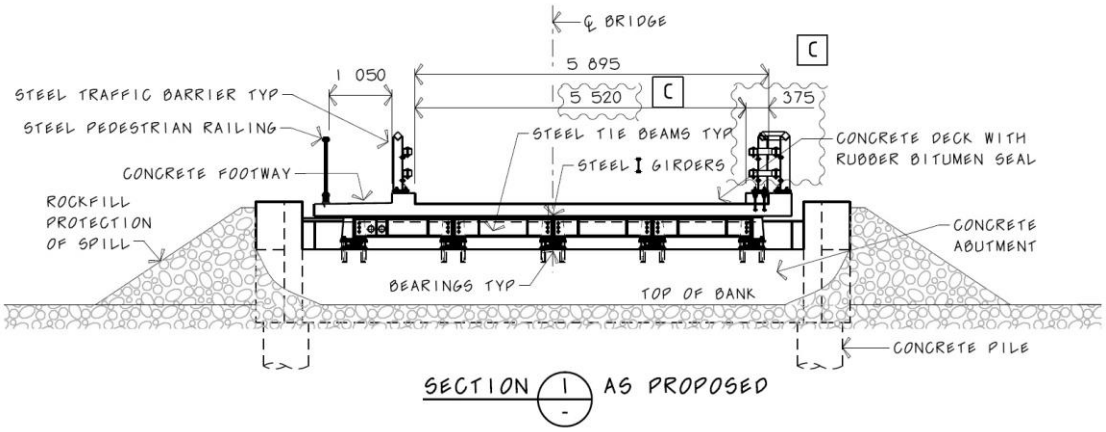

Figure 3-5 Typical cross section of the existing bridge near the Victorian abutment

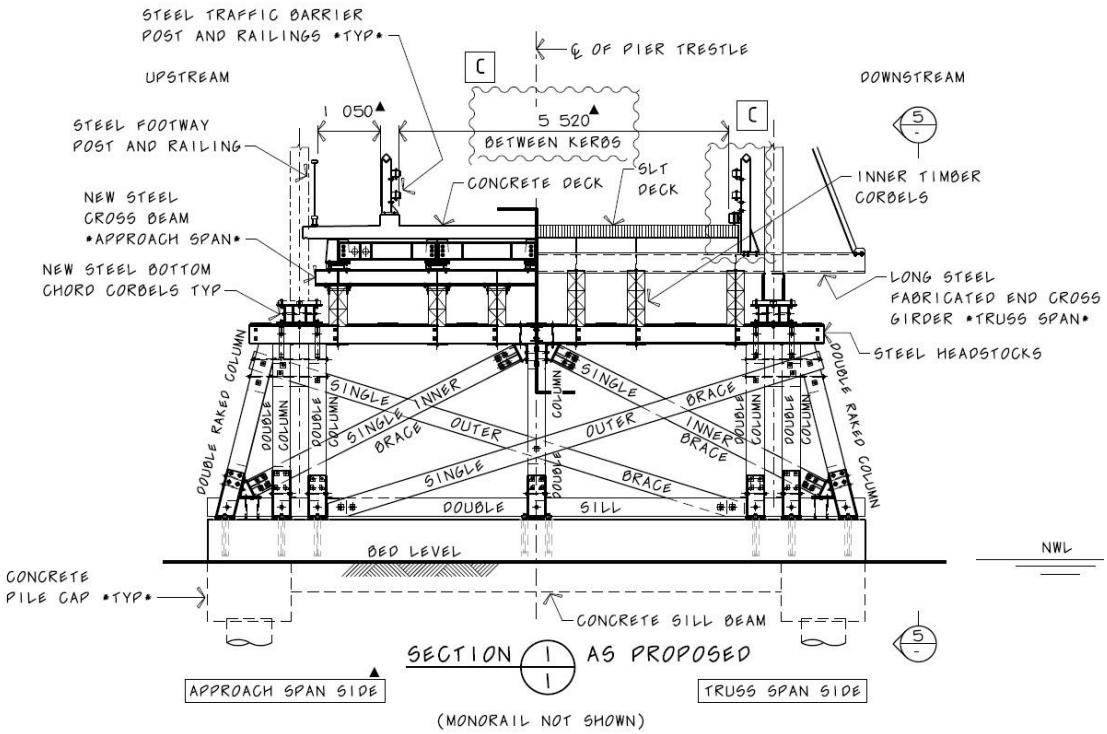

Figure 3-6: Typical cross section of the existing bridge

3.2.2 Engineering constraints

Engineering constraints that have been identified for the proposal include:

- Access to the bridge structures
- Working in a waterway
- Respecting the heritage values of the bridge
- Locating the temporary bridge to minimise the impact for existing users. Waterway users and wide load transport have been identified as existing users who would be affected. Traffic controls may affect other users such as emergency vehicles
- Minimising traffic disruption with appropriate timing for any staging work.

3.3 Construction activities

This section provides a summary of the likely methodology, staging, work hours, plant and equipment that would be used to complete the proposed work. For the purposes of the REF, indicative construction staging and options are provided. Detailed methods would be determined after the detailed design is finalised.

3.3.1 Work methodology

The proposed work would generally involve the following construction activities.

Overview of key elements

- Construction of the temporary bridge about one metre upstream of the bridge on the NSW side of the river and about 18 metres upstream of the bridge on the Victorian side
- Establishing a site compound on the Victorian side of the river, upstream of the bridge in an open area away from the trees, as shown in Figure 3-4. The compound would be about 750 square metres in area
- Establishing other ancillary sites for the storage of materials removed from the bridge, new materials for the restoration work, storage of the temporary bridge components, work area to assemble new bridge trusses and a work area to remove lead paint from removable bridge components
- Maintaining the site office and compound currently on the NSW side of the river
- Constructing access ramps to pier four (the pier closest to the bank on the Victorian side of the river). The ramps would be on both upstream and downstream sides of the bridge within 10 metres of the bridge abutment
- Installing a sheet piling cofferdam around pier four and the abutment on the Victorian side of the river
- The use of cranes to lift the bridge trusses may need: the construction of crane pads close to the river bank on both sides of the river within the red hatched area shown in Figure 3-4; the installation of a temporary work platform in the river; or the use of a barge floating on the river.

Site establishment

- Pre-construction identification and marking of sensitive areas as identified in this REF, the Construction Environmental Management Plan (CEMP) and relevant sub-plans
- Installation of environmental controls
- Installation of erosion and sedimentation controls

- Establishment of site compounds
- Relocation of utilities
- Establishment of site boundaries (for example installation of security fencing)
- Construction of temporary access tracks and haulage roads within the construction footprint
- Installation of traffic controls or detours across temporary bridge
- Clearing and grubbing of vegetation
- Stripping, stockpiling and management of topsoil
- Drainage work (longitudinal and transverse)
- Temporary stockpiling.

Temporary bridge

A temporary bridge would be constructed upstream of the existing bridge. It would lie at an angle compared with the existing bridge, and be about one metre upstream of the bridge on the NSW side of the river and about 18 metres upstream of the bridge on the Victorian side. The bridge would be about 119 metres long with an overall deck width of about 4.2 metres. The temporary bridge would generally consist of three spans, each about 40 metres long, with two piers. The piers in the river channel would generally align with the piers of the existing bridge. There would be a minimal vertical clearance of about four metres for navigational purposes.

Construction of the temporary bridge would include the following:

- Remove electrical wires and two power poles in Murray Street
- Protect underground services and survey stations
- Remove the red gum river walk statues and other items from the reserve along Murray Parade in Koondrook. These would be temporarily stored in a secure place or placed in another public space
- Construct the temporary approach roads to access the temporary bridge from Grigg Road in Koondrook and Thule Street in Barham. This would also involve constructing three temporary intersections at: Dalton Street and Grigg Road in Koondrook; Murray Parade and Grigg Road in Koondrook; and Murray Street and Thule Street in Barham
- Store the temporary bridge components in the Victorian compound on the upstream side of the temporary bridge approach road
- Provide a platform for piling equipment. This platform would be either a temporary rock platform in the river; a barge if there is enough water at the time; or another form of temporary structure such as a pontoon or jetty
- Install piles for abutments and piers
- Install abutments and piers
- Construct bridge segments on the Victorian approach road
- Launch the bridge spans over the Victorian abutment and piers to the NSW Bank
- Install temporary line marking and road furniture
- Detour traffic from the existing bridge to the temporary bridge.

Removal of temporary bridge

Remove the temporary bridge by either:

- De-launching: spans would be rolled off the piers one at a time. Each span would then be dis-assembled on the ground on the bridge approach road

- Crane lift: the temporary bridge would be separated into parts that can be lifted off by crane. The parts would then be dis-assembled on the ground on the bridge approach road.

Remove the steel framed piers from the river either:

- By crane from the river bank
- By crane on a barge.

Cut off concrete piles at river bed level using either:

- A coffer dam to provide a dry area for access to the river bed
- If the temporary bridge was constructed using a temporary rock platform in the river, this platform would be used for these activities
- A temporary platform structure, either floating or fixed, along with a diver working in the river to cut the piles.

The concrete abutments would be removed by using one or a combination of the following methods: cutting, breaking up, and lifting out precast sections. The temporary approach roads and intersection adjustments would be removed and the area rehabilitated.

Barham-Koondrook bridge

Work on the main bridge would include:

- Construction of truss spans two and four
    - The new NSW truss span (span two) would be assembled offsite in a licensed facility in NSW. This includes the stress laminated timber deck, cross girders, bottom chord, struts, top chord and traffic barrier
    - The new Victorian truss span (span four) would be assembled offsite in a licensed facility in Victoria. This includes the stress laminated timber deck, cross girders, bottom chord, struts, top chord and traffic barrier.

- Replacement of Pier four on the Victorian side of the river
    - Two access ramps would be built to pier four. The ramps would be within about 10 metres of the bridge, one upstream and the other downstream
    - A cofferdam would be installed around pier four about 20 metres upstream and downstream of the pier
    - The piles for pier four and the abutment would be installed
    - The pile cap for pier four would be constructed
    - A temporary steel support frame would be constructed at pier four, on the new pile cap
    - Spans four and five would be lifted up by a jack off the old pier four. A gap of about 10 millimetres is needed
    - The existing spans four and five would be lowered onto the temporary steel support frames using cranes (see “replacement of truss spans two and four” below)
    - The timber from pier four would be removed and replaced with new timber
    - Spans four and five would be lowered onto the new pier, with the temporary steel frame retained for the replacement of spans two, four and five and the abutment work (see below).

- Replacement of truss spans two and four and approach span five, and construction of the new abutment on the Victorian side of the river. The following options have been considered. The preferred method would depend on the river level at the time and further design refinement:
    - Using a rail system along bridge trusses
        - Set up a piling machine on span two and span four
        - Drive piles into river bed in lines about 6.5 metres each side of centreline of span two and span four
        - Place concrete pads on bank in line with each row of piles
        - Set up jack and skate equipment on piles and pads
        - Lift off the old span two
        - Lift on new span two
        - Lift off old span five (Victorian approach span)
        - Lift off old span four
        - Remove old abutment B with an excavator
        - Lift in new precast abutment B
        - Lift in new pier four timber
        - Lift on new span four
        - Lift on new span five (Victorian approach span)
        - Lift in new precast approach span slab
        - This is the preferred option and approval for tree removal is being sought from Gannawarra Shire Council.
    - Crane on the ground
        - Set up large crane along NSW river bank
        - Lift off the old span two
        - Lift on new span two
        - Relocate large crane to the Victorian river bank
        - Lift off old span five (Victorian approach span)
        - Lift off old span four
        - Remove old abutment with an excavator
        - Lift in new precast abutment in place
        - Lift in new pier four timber
        - Lift on new span four
        - Lift on new span five (Victorian approach span)
        - Lift in new precast approach span slab
        - Remove temporary steel support frame
        - This option would require tree removal downstream of the bridge on the Victorian side of the river and tree lopping on the New South Wales side of the river. This tree removal would require approval from Gannawarra Shire Council.

- Lift span restoration:
    - Install scaffolding
    - Remove all mechanical parts that are able to be removed
    - Remove lead-based paint from the lift span and lift span superstructure by

either:

a. Grit blasting and repainting where it stands
b. Off-site blasting and repainting of lift span superstructure by a suitable qualified and authorised subcontractor.

- Re-paint the lift span and lift span superstructure on site and off site as needed
- Rebalance the lift span and re-install turnbuckles on counter-weight ropes
- The upgrade of the moving span operation and new equipment would be done in accordance with American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design Movable Highway Bridge Design Specifications.

- Replace corroded webbing between piers two and three
- Reconstruct approach roads to the bridge
- Replace timber traffic barriers on the bridge with steel.

Ancillary project work

Ancillary work would include:

- Sealing the bridge deck
- Line marking and installing road furniture
- Carrying out any required landscaping and tree planting
- Building a pedestrian boardwalk underneath the bridge on the NSW side of the river in consultation with Wakool Shire Council
- Reinstating the red gum river walk statues and any other items along the river in Koondrook
- Restoring parks that have been disturbed by the work near the Barham-Koondrook bridge in consultation with Wakool and Gannawarra Councils
- Installing heritage interpretation signage as needed.

Site disestablishment

Following the completion of all work, the following activities would occur:

- Removal of site environmental controls
- Removal of compound, stockpile and ancillary sites
- Removal of erosion and sedimentation controls
- Removal of traffic control.

3.3.2 Construction hours and duration

The proposal is expected to start construction in April 2016 and is expected to finish by January 2018.The proposal would be carried out during standard working hours in accordance with the Interim Construction Noise guideline (DECC, 2009). Standard working hours include:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sunday and Public Holidays: No work

To minimise disruptions to daily traffic and businesses, it may be necessary to do some work outside of these hours. This would most likely be done on Saturday afternoons or on Sundays. It is unlikely that work would be carried out during the evening or night-time periods.

Work outside of standard working hours would be carried out in accordance with the Office of Environment and Heritage (formerly DECC) Interim Construction Noise Guideline (DECC 2009) and the Roads' Environmental Noise Management Manual (RTA 2001): Practice Note vii – Road works outside normal working hours.

Prior advice would be given to the community if any work is planned to be undertaken outside normal construction hours.

3.3.3 Plant and equipment

Plant and equipment needed for the proposal would be determined during the construction planning phase. Indicative plant and equipment that may be used for the work include:

- Various sized mobile cranes, the largest expected to be about 600T
- Nail guns
- Chainsaw
- Circular saw
- Planes
- Sanders
- Drills
- Oxy cutting tools
- Welder
- Work vehicles – commercial utes, bridge trucks 29T
- Elevated Work Platforms
- Scissor lift
- Boats
- Barge
- Excavator mounted sheet pile driving attachment
- Pile driving rig
- Pile drilling rig
- Generator
- Compressor
- Low loader trucks
- Semi-trailer trucks
- Tipper trucks
- Excavators
- Grader
- Road Roller.

3.3.4 Earthwork

The proposal would involve the disturbance of soil for the activities listed below:

- Victorian Abutment and Pier Four. A coffer dam would be placed around the

existing pier four, about 20 metres upstream and downstream of the pier. This would involve the disturbance of an area about 400 square metres. When the abutment and pier have been built the surrounding area would be shaped and scour protection would be installed

- Crane Pads. If cranes are set up along the river bank, an area of about 625 square metres would be cleared on both the NSW and Victorian sides of the river. To make sure the crane pads are stable the soil would be replaced with an engineered fill. Piles may also be used to stabilise the crane pads. When the work has finished the engineered fill would be removed and the area rehabilitated, including replanting.
- Temporary Bridge. An area of about 150 square metres would be disturbed on each bank to build the temporary bridge abutments. The area to be disturbed would be about 15 metres along each bank and 10 metres out from the edge of the water. The work would include shaping, piling and placing engineered fill. When the temporary bridge is no longer required, the abutments would be removed down to undisturbed ground level and then made good with top soil and replanted.
- Temporary Bridge Approach Road. An area of about 2250 square metres would be disturbed to construct a temporary approach road between the temporary bridge and Grigg Road.
- Temporary Bridge Construction Area. An area 50 metres by 20 metres would be fenced off next to the temporary bridge approach road to allow for the storage and assembly of the temporary bridge components. There would be no tree removal required for the establishment of this area.

Therefore the estimated earthwork required for the proposal are:

- Strip topsoil and stockpile for later re-use
- Disposal off site of surplus topsoil
- Cut to fill
- Imported select fill
- Cut to dispose of off site.

Detailed earthwork requirements would be determined during detailed design of the proposal. It is estimated that about 3000 cubic metres of earthwork would be required.

3.3.5 Source and quantity of materials

Table 3-1 shows the estimated materials and quantities for the construction of the proposal. The materials would be sourced from local quarries and commercial suppliers in nearby areas wherever possible. None of the materials proposed to be used in construction are considered to be in short supply.

Table 3-1 Estimated quantity of materials needed and their sources

Materials	Quantities		Source
	Cubic Metres	Tonnes	
Timber	20	20	NSW
Steel	-	150	Australian
Concrete	100	250	Local
Scour protection rock	200	450	Local
Road sub-base	1000	2000	Local – and local reuse
Road fill	2000	4000	Local – and local reuse

Surplus material that cannot be used on-site would be reused or disposed of in the following order of priority:

- Transfer to nearby Roads and Maritime projects for immediate use
- Transfer to an approved Roads and Maritime stockpile site for future use during projects or routine maintenance
- Transfer to a Roads and Maritime approved site for reuse on immediate private or local government projects
- Disposal at an approved materials recycling or waste disposal facility
- As otherwise provided for by the relevant waste legislation.

Water use

The required quantities of water are not yet known, however, water would be used for the following:

- Dust suppression
- Addition of moisture to earthwork and pavement materials to optimise compaction
- Miscellaneous concrete work
- Machinery wash-down.

Water for construction would be sourced firstly from stormwater collected from the coffer dam area which is filtered and would otherwise be discharged back into the river. Additional water would be taken from the town water supply.

3.3.6 Traffic management and access

The proposed work would generate heavy vehicle movements. These heavy vehicle movements would mainly be associated with:

- Delivery of construction materials
- Spoil removal
- Delivery and removal of construction equipment and machinery
- Movement of construction personnel.

Traffic movements would vary depending on the work being carried out at the time. The most traffic would be generated by the construction of the temporary bridge. This would result in an average of about 10 traffic movements per week for around three months. Most of these movements would be heavy vehicles.

The abutment construction would need around 31 heavy vehicle deliveries over a period of about three months.

Overall, it is estimated that around 20 small vehicle movements per day would be generated by the proposal. The small vehicles used to transport staff to and from the site would be parked at the main site compound facility in NSW.

Construction vehicles, including cranes, would access the site via Grigg Road or Thule Street wherever possible.

About 3750 vehicles cross the Barham-Koondrook bridge per week with about 10.5% of these being heavy vehicles. The bridge also provides pedestrian access between Barham and Koondrook. Given the bridge provides pedestrian, vehicular and heavy vehicular access over the Murray River the proposed work would need a comprehensive traffic, vehicle and pedestrian control plan to be prepared in accordance with the relevant guidelines, including the *RTA's Traffic Control at Work Sites Volume 4*. This would be carried out in consultation with key stakeholders.

The proposal would restrict wide load transport and waterway users for about 12 months between December 2016 and December 2017.

Bridge closures to switch over to the temporary bridge would occur in the early hours of a Monday morning and would be well publicised in accordance with Roads and Maritime *Community engagement and communications: A resource manual for staff 2012*.

Access to the compound and stockpile sites would use local roads. Access to the bridge by wide and high loads would use an approved transport plan.

3.4 Ancillary facilities

The proposal would utilise a number of ancillary sites that would be located within the red hatched area shown in Figure 3-4, including the following:

- The previously established compound site near the bridge on the NSW side of the river
- A new compound site in a clear area on the Victorian side of the river South of Murray Parade and East of Grigg Road. The site would be located away from trees and would be about 50 metres by 20 metres. No trees would need to be removed for this compound
- If the restoration work involves the crane on ground option, two crane pads would be established, one on each side of the river immediately downstream of the bridge, as shown in Figure 3-4. Each crane pad would be about 25 metres by 25 metres in area, being 625 square metres in area.

The main construction compound would typically include a combination of demountable offices, meal rooms, toilets, showers and parking facilities where possible. Other stockpile facilities would typically allow for equipment storage and stockpile of soil and construction materials.

Security fencing would also be established around each site, particularly around any crane pads located on the ground. When the construction work has been completed the ancillary sites would be removed, the site cleared and rehabilitated.

A total area of about 1250 square metres would be cleared of vegetation if the crane on ground option is selected to restore the Barham-Koondrook bridge. At the other ancillary sites vegetation removal is not anticipated and power and water are already available.

Off-site licensed premises in NSW and Victoria would be used to source and store materials, assemble truss spans and size and shape bridge timber, before they are needed on site.

The final location of the ancillary sites would be determined during the detailed design process. The location of the stockpile and storage areas would be subject to criteria set out in the Stockpile Site Management Guideline (Roads and Maritime 2015). Once the contractor has a preferred location for the stockpile and storage areas, consultation with a Roads and Maritime Environment Officer (South Western Region) would be required before work starts in those locations to find out if any additional environmental assessment is needed.

3.5 Public utility adjustment

Two electricity lines and two poles on the NSW side of the river, and possibly one line and one pole on the Victorian side of the river, would be moved and put underground to give clearance for the safe operation of a crane.

It is also possible that there is a Telstra cable and an unused fibre optic line near the bridge on the NSW side of the river. If present, these utilities would be protected from work or would be relocated.

3.6 Property acquisition

No property acquisition would be needed for the proposed work.

4 Statutory and planning framework

This Section details the statutory and planning approvals required under NSW and Victorian legislation. For the purposes of this proposal, only work in NSW require approvals from that state, and similarly only work in Victoria requires approval under that state's legislation. For details on which parts of the proposal are located in each state, refer to Section 1.1.

4.1 New South Wales

4.1.1 NSW Environmental Planning and Assessment Act 1979 (EP&A Act)

This REF has been completed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and describes the expected level of impact of the proposed work. This REF has been prepared to consider whether the proposal would have a significant impact on the environment under section 111 of the EP&A Act and section 228 of the Environmental Planning and Assessment Regulation 2000.

4.1.2 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP 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 bridge restoration work and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the NSW *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

The proposal is not located on land reserved under the NSW *National Parks and Wildlife Act 1974* and does not affect land or development regulated by *State Environmental Planning Policy No. 14 - Coastal Wetlands, State Environmental Planning Policy No. 26 - Littoral Rainforests*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (Major Development) 2005.*

Part 2 of the ISEPP 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 ISEPP (where applicable), is discussed in chapter 5 of this REF.

4.1.3 Murray Regional Environmental Plan No. 2 – Riverine Land

The main objective of this plan is to ensure that appropriate consideration is given to development with the potential to adversely affect the riverine environment of the River Murray. Wakool is one of 11 local government areas to which the Murray REP applies.

Clause 8(c) states that the planning principles set out in Part 2 (clauses 9 and 10) apply when a public authority proposes to carry out development which does not require development consent but which has the potential to adversely affect the riverine environment of the River Murray. The general principles of the plan that must be taken into account include:

- *The aims, objectives and planning principles of this plan,*
- *Any relevant River Management Plan,*
- *Any likely effect of the proposed plan or development on adjacent and downstream local government areas,*
- *The cumulative impact of the proposed development on the River Murray.*

Clause 10 of the plan also states a number of specific principals that should be taken into account with regards to access, bank disturbance, flooding, land degradation, landscape, river related uses, settlement, water quality and wetlands. In developing the concept design, Roads and Maritime have aimed to conserve the environment, minimise the amount of vegetation to be removed, minimize disturbance to the river including the banks and balance impact to river use against the needs of the community. Safeguards have been outlined in Section 7 to further minimise impact to heritage, water quality, river morphology and flora and fauna. Based on this, it is considered unlikely that the proposal would significantly compromise the principles of the Murray.

Clause 12 requires consultation under specific circumstances. Of relevance to this proposal, consultation is required with the following agencies:

- National Parks and Wildlife Service (now the NSW Office of Environment and Heritage) for potential impacts to endangered fauna as defined under the National Parks and Wildlife Act 1974
- Maritime Safety Board (Now Roads and Maritime Services), as the proposal may affect boating safety

Clause 13 requires consultation with agencies and authorities for particular activities and undertakings. The proposal falls into three categories under Clause 13:

- Category 3 – Bank and/or bed work (including bank stabilization)
- Category 9 – Destruction of Native Vegetation
- Category 21 – Public utility undertakings (relating to road) that is likely to significantly affect the environment

Pursuant to Clause 13, consultation with the following agencies is required:

- Murray Darling Basin Commission (now the Murray Darling Basin Authority)
- The relevant NSW local council (Wakool Shire Council)
- Forestry Commission (now the NSW Department of Primary Industries (Agriculture))
- NSW Fisheries (now Department of Primary Industries (fisheries))
- National Parks and Wildlife Service (now the NSW Office of Environment and Heritage)
- NSW Department of Conservation and Land Management (now the NSW Office of Environment and Heritage)
- NSW Department of Water Resources (now NSW Department of Primary Industries - Water)
- NSW Environment Protection Authority
- NSW Maritime Services Board-Maritime Authority of NSW (now Roads and Maritime Services)

- Victorian Department of Conservation and Natural Resources (now the Department of Environment, Land, Water and Planning).

See Section 4.4 for details of consultation.

4.1.4 State Environmental Planning Policy No. 44 Koala Habitat Protection (SEPP 44)

The SEPP 44 encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free living populations would be maintained over their present range.

The SEPP 44 aims to identify areas of potential and core Koala Habitat. These are described as follows:

- Core Koala Habitat is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females, and recent and historical records of a population
- Potential Koala Habitat is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component.

While SEPP 44 does not apply to proposals assessed under Part 5 of the EP&A Act, as a matter of best practice, consideration has been given to the intent of the SEPP.

The Koala has been recorded within 10 kilometres of the proposal site, including within the Kondrook- Pericoota State Forest several kilometres away. The riparian vegetation along the Murray River next to the proposal site provides potential Core Koala Habitat, and is contiguous with the Koondrook-Pericoota State Forest. SEPP 44 applies to the Wakool LGA and koala feed tree species, namely River Red Gum (*Eucalyptus camaldulensis*) were identified on site. An assessment of potential impact to the Koala has been included in Section 6.3.

4.1.5 Wakool Local Environmental Plan 2000

The proposed bridge restoration work is located within the Wakool Local Government Area (LGA) and is governed by the Wakool Local Environmental Plan 1992 (LEP). The provisions of the LEP do not apply to the proposal due to the application of the ISEPP. Nevertheless, consideration is given below to the provisions of the LEP.

The work proposed in NSW is located on land zoned as 2(v) (Village or Urban Zone) under the LEP. The objective of this zone is to promote development in existing towns and villages in a manner which is compatible with their urban function. The proposal is consistent with the objective in that it would provide for continued functioning of the bridge, an important function in the urban landscape.

This zone is divided further into precincts based upon land uses under the Development Control Plan No. 1 (DCP). Under this DCP the parkland areas located adjacent to the bridge and the area proposed as a stockpile/compound sites are categorised as Public Open Space. All development, other than for the purpose of landscaping, gardening or bush fire hazard reduction work, requires a development application to be submitted to Council.

4.1.6 NSW Fisheries Management Act 1994 (FM Act)

The provisions of the *Fisheries Management Act 1994* (FM Act) relating to the development approval process operate similarly to the TSC Act, discussed above. The FM Act identifies threatened aquatic species, populations and ecological communities and also requires an assessment of significance. Significant impacts trigger the need for a species impact statement for projects assessed under Part 5 of the EP&A Act. The potential impacts of the proposal on biota listed under the FM Act are assessed in Section 6.3.

If the following activities form part of a proposal, a permit from the Department of Primary Industries (DPI) under the FM Act is required:

- Aquaculture
- Harm marine vegetation such as mangrove, seagrass or seaweed
- Dredging or reclamation of waterways, including removal of snags or aquatic vegetation (28 days notification) (sections 198 and 199)
- Temporary or permanent blockage of fish passage (section 219).

Public authorities are exempt from obtaining a permit for dredging or reclamation work under Part 7 of the FM Act (refer section 201(2)(b)). However, Section 199 of the FM Act requires that notification be given to the Minister before a public authority carries out or authorises the carrying out of dredging or reclamation work and any matters raised by the Minister be considered within 28 days after the giving of the notice.

The proposal would involve the installation of at least one cofferdam as part of the proposed work. As this is considered dredging or reclamation of waterways Roads and Maritime are required to notify DPI Fisheries of the proposed work.

The proposal would not block fish passage.

Refer to Appendix C for background search results and Section 6 for a detailed assessment.

4.1.7 NSW Water Management Act 2000

The objects of this Act are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. Those objects relating to biodiversity in particular are:

a) To protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality
b) To integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna
c) To encourage best practice in the management and use of water.

These have been considered in the preparation of this assessment and mitigation measures.

The Act also controls the carrying out of activities in or near water sources in NSW, the extraction and use of water and the construction of work such as dams and weirs. ‘Water sources' are defined as a river, lake, estuary, place where water occurs naturally on or below the surface of the ground or NSW coastal waters. The Murray

Water Sharing Plan applies to the proposal. Therefore, permits and approvals are required for:

- Water Use Approval - using water extracted from the Murray River for the proposal
- Water Supply Work Approval - undertaking any work involving the supply of water to the proposal, such as operating a pump
- Controlled Activity Approval - undertaking any controlled activities, which includes work within 40 metres of the Murray River

Roads and Maritime are exempt from requiring a Water Use and a Controlled Activity Approval. However, approval would be required if water from the Murray River is to be used for the proposal.

4.1.8 NSW Threatened Species Conservation Act 1995 (TSC Act)

The *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve and protect certain classes of threatened, endangered and vulnerable species, populations and ecological communities.

Section 5A of the EP&A Act lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then an assessment of significance would be required to determine the significance of the impact.

The potential for impact on ecology have been considered in Section 6.3. The assessment concludes that the proposal would be unlikely to have a significant impact on any threatened species, populations, ecological communities or their habitats listed under the TSC Act. A species impact statement is therefore not required.

Where a significant impact is likely to occur a species impact statement must be prepared for projects assessed under Part 5 of the EP&A Act. The content of a species impact statement is outlined in Sections 110 – 112 of the TSC Act and includes requesting Director General's requirements.

Clause 50 requires public authorities to have regard to critical habitat when exercising their functions on land to which a critical habitat declaration applies.

4.1.9 NSW National Parks and Wildlife Act 1974 (NPW Act)

This Act aims to conserve nature, habitat, ecosystems, ecosystem processes and biological diversity at the community, species and genetic levels. Under this Act all native fauna is protected, threatened or otherwise. Schedule 13 of the act lists protected plants which shall not be harmed or picked on any land either on or off National Park estate.

With regard to threatened species a person must not:

- Harm any animal that is of, or is part of, a threatened species, an endangered population or an endangered ecological community
- Use any substance, animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of harming any such animal.

This Act also provides the basis for legal protection and management of Aboriginal sites within NSW. Aboriginal cultural heritage has been assessed in Section 6.4. The assessment concluded that the proposal is unlikely to affect Aboriginal cultural heritage in NSW.

4.1.10 NSW Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act) establishes control mechanisms to reduce the negative impact of weeds on the economy, community and environment. Under Section 13 of the NW Act, Roads and Maritime, as a public authority, is required to control noxious weeds on land that it owns and prevent noxious weeds from spreading to adjoining properties.

One noxious weed species (Bridal Creeper *Asparagus asparagoides*) (Class 4) was found to occur within the proposal site. Class 4 weeds are locally controlled weeds that pose a threat to primary production, the environment or human health. Noxious weeds are discussed in section 6.3.

4.1.11 NSW Heritage Act 1997

The *Heritage Act 1977* provides statutory protection and conservation for heritage places and items. The objects of this act include promoting, understanding and encouraging the conservation of the State's heritage and the identification and registration of items of State's Heritage Significance. The Barham Bridge is listed on the NSW State Heritage Register (SHR) and the Roads and Maritime Section 170 Heritage and Conservation Register.

Under section 60, any impact to an item listed on the State Heritage Register requires approval from the NSW Heritage Council, unless the changes are exempt under Section 57. The proposal would have an impact to the heritage listed bridge which is not exempt. Therefore, Approval is required for the proposal. Approval has been obtained to carry out work on the bridge. Refer to Section 6 for further information and assessment.

4.2 Victoria

4.2.1 Victorian Planning and Environment Act 1987

The purpose of this Act is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.

Division 1 of Part 4 of the Act details the planning permit procedure where a permit is required by a planning scheme. The proposal is located within the Gannawarra Local Government Area, and development within this LGA is governed by the Gannawarra Planning Scheme. The planning and assessment of the work proposed in Victoria is therefore undertaken in consideration of this Scheme (see below).

4.2.2 Victorian Gannawarra Planning Scheme

The purposes of the Gannawarra Planning Scheme are to:

- To provide a clear and consistent framework within which decisions about the use and development of land can be made
- To express state, regional, local and community expectations for areas and land

uses

- To provide for the implementation of State, regional and local policies affecting land use and development.

A planning permit is needed under clause 52.17 of the planning scheme to remove, destroy or lop native vegetation, including dead native vegetation, in Gannawarra Shire.

A planning permit is needed under clause 44.04 of the planning scheme to carry out work on land that is subject to inundation.

Clause 62.01 of the scheme states that a planning permit is not needed to use land for the purpose of a road. That means that the use of land in Gannawarra Shire for a road does not need a planning permit.

4.2.3 Victorian Aboriginal Heritage Act 2006

The main purpose of this Act is to provide for the protection of Aboriginal cultural heritage in Victoria.

A Cultural Heritage Management Plan has been prepared by a qualified archaeologist under Part 4 of the Act. The main purpose of the plan is to investigate the likelihood of discovering an Aboriginal cultural object during the proposed work. This is further discussed in Section 6.5.

4.2.4 Victorian Flora and Fauna Guarantee Act 1988 (FFG Act)

The purpose of the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) is to establish a legal and administrative structure to enable and promote the conservation of Victoria's native flora and fauna. The FFG Act is to provide a choice of procedures which can be used for the conservation, management or control of flora and fauna and the management of potentially threatening processes.

The flora and fauna conservation and management objectives are:

- To guarantee that all taxa of Victoria's flora and fauna other than the taxa listed in the Excluded List can survive, flourish and retain their potential for evolutionary development in the wild
- To conserve Victoria's communities of flora and fauna
- To manage potentially threatening processes
- To ensure that any use of flora or fauna by humans is sustainable
- To ensure that the genetic diversity of flora and fauna is maintained
- To provide programs—
    - Of community education in the conservation of flora and fauna
    - To encourage co-operative management of flora and fauna through, amongst other things, the entering into of land management co-operative agreements under the Conservation, Forests and Lands Act 1987
    - Of assisting and giving incentives to people, including landholders, to enable flora and fauna to be conserved
- To encourage the conserving of flora and fauna through co-operative community endeavours.

The FFG Act establishes a list of protected flora and fish species. A permit is required to harm or move any of these species. An assessment was done to determine whether any of these species would be impacted by the work (see Section 6.3). No protected flora or fish species would be impacted and therefore no permit is required.

The FFG Act also establishes a list of threatened fauna species, and provides for the preparation of conservation strategies and management plans for these species. An assessment was undertaken to determine whether the proposal would impact upon any threatened species listed under the FFG Act (see Section 6.3). The proposal was found not to impact upon any threatened species listed in Victoria.

4.2.5 Victorian Heritage Act 1995

The main purposes of this Act are:

- To provide for the protection and conservation of places and objects of cultural heritage significance and the registration of such places and objects
- To establish a Heritage Council
- To establish a Victorian Heritage Register.

Under Section 67 of the Act a person may apply for a permit to carry out work in relation to a registered place or registered object. An application for a permit was lodged with the Victorian Department of Environment, Land, Water & Planning however the department advised that the work does not require a permit.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (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 actions that may affect nationally listed threatened species, 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 considered as part of chapter 6 of the REF and Appendix A.

Findings – matters of national environmental significance (other than biodiversity matters)
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. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment.

Findings – nationally listed biodiversity matters
The assessment of the proposal's impact on nationally listed threatened species, ecological communities and migratory species found that there is unlikely to be a

significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

NSW

The proposal is categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal can be assessed under Part 5 of the EP&A Act.

Victoria

A planning permit is required from Gannawarra Shire Council under the Gannawarra Planning Scheme to remove trees on the Victorian side of the river.

The use of land for a road does not need a planning permit under this scheme. However, approval is needed to carry out the work in the road reserve from VicRoads. This document fulfils the requirements of VicRoads in relation to seeking approval to carry out the work.

5 Stakeholder and community consultation

5.1 Consultation strategy

Community and stakeholder engagement aims to provide genuine opportunities for community and stakeholder involvement. Community consultation is guided by the following established consultation objectives:

- Build community understanding and acceptance of the decision making process including proposal phases, implementation strategy and influencers, such as funding
- Continue to foster understanding and acceptance of the broader objectives and benefits of the proposal for the local community
- Support potentially directly impacted property owners with proactive communication about concept design impacts, proposal determination and the property acquisition process
- Address community and stakeholder concerns regarding potential issues such as changed access arrangements, traffic flow, potential loss of passing trade, and construction impacts
- Update and inform the community on the REF, submissions process and determination for the proposal
- Provide a range of contact and engagement opportunities during the REF display period.

The consultation strategy includes liaison with relevant government agencies, the Aboriginal community, local Councils, key stakeholders and local residents.

5.2 Community involvement

Roads and Maritime have engaged with the community since 2005, before the first stages of restoration work started.

The following community consultation has been carried out by Roads and Maritime about the current proposed work:

- Community meetings in 2013 about closing the bridge for restoration work.
- Community survey “Barham Koondrook Bridge restoration works – have your say” carried out in August 2015
- Community newsletter delivered to every household in Barham and Koondrook in August 2015
- Community meeting on 3 September 2015
- Information stall outside the local supermarket on 3 - 4 September 2015
- Roads and Maritime proposal information website http://www.rms.nsw.gov.au/projects/south-western/barham-bridge/
- Roads and Maritime met with council officers from Wakool and Gannawarra Shire Councils
- Roads and Maritime met with a number of key businesses in Barham and Koondrook
- Roads and Maritime consulted with a number of waterway users including PS Adelaide, Spirit of Australia and Echuca Paddle Boats.

A summary of the concerns of the community and where these concerns are addressed in this REF are presented in Table 5-1.

Table 5-1 Summary of issues raised by the community

Issue Raised	Addressed in REF
Scope of work – for example bridge lighting, separate pedestrian walkway, sight distances, width of lift span	A description of what work is included in the proposal and how it would be built is discussed in Section 1
Cost of restoring the bridge rather than building a new one	The options considered, including the option of replacing the bridge, is discussed in Section 2
Life span of the restored bridge	A description of the proposal is provided in Section 1. The expected life span of the restored components of the bridge is 25 years
Closures, detours and width restrictions	Bridge closures, detours and temporary bridge width restrictions are discussed in Sections 1, 3 and 6.2
Impact on the river from bridge piles	A description of the proposal is provided in Section 1 Expected impact from piling work is discussed in Section 0
Risk of erosion and scour	Proposed river bank scour protection is discussed in Section 1 Expected erosion and scour risk and safeguards are discussed in Section 6.1
Communication methods	Community consultation that has been already been carried out and would be carried out in the future are discussed in Section 4.4

5.3 Aboriginal community involvement

NSW

The Roads and Maritime 'Procedure for Aboriginal cultural heritage consultation and investigation' (PACHCI) (Roads and Maritime 2011a) outlines a four stage process for investigating potential impacts to Aboriginal cultural heritage as a result of road planning, development, construction and maintenance activities. Aboriginal cultural heritage investigations and community consultation for the proposal have been completed up to Stage 2 of the PACHCI. This has involved site survey of the study area to identify the presence of Aboriginal objects and places. Site survey was conducted on 12 December 2014 with representatives of the Moama Local Aboriginal Land Council (MLALC) and the Roads and Maritime's Aboriginal Cultural Heritage Officer. Members of the MLALC prepared an Aboriginal stakeholder cultural heritage survey report.

There are currently no Native Title claims before the Native Title Tribunal for the proposal area.

Jo Bell Heritage Services was subsequently engaged to survey the proposal area and assess the risk of harm to Aboriginal cultural heritage. A copy of the report, 'Proposed Barham-Koondrook Bridge Upgrade Aboriginal Cultural Heritage Due Diligence Assessment Report', is provided in Appendix D. Appendix 2 of the due diligence assessment report contains a copy of the MLALC's survey report.

Victoria

Jo Bell Heritage Services was engaged to carry out consultation with the Aboriginal community, inspect the proposal area for Aboriginal artefacts and to prepare a Cultural Heritage Management Plan. A copy of the plan is provided in Appendix E.

A Notice of Intent to Prepare a Management Plan was sent to the Secretary of the Department of Premier and Cabinet on 8 December 2014. This was carried out in accordance with section 54 of the Victorian Aboriginal Heritage Act 2005. A copy of the notice of intent was sent to each of the affected landowner/occupiers on 20 April 2015. The CHMP was revised in January 2016 to reflect some changes to the proposal.

On 13 January 2015 a visual site survey was carried out by two archaeologists from Jo Bell Heritage Services, two representatives from Barapa Barapa Nation Aboriginal Corporation (BBNAC) and one representative from Wamba Wamba Wadi Wadi Barapa Barapa First Nations Aboriginal Corporation.

Given the Victorian river bank was so steep, a second survey was carried out on 31 March 2015 to view the bank by boat. This survey was attended by two archaeologists from Jo Bell Heritage Services, two representatives from BBNAC, one representative from Wamba Wamba Wadi Wadi Barapa Barapa First Nations Aboriginal Corporation and two representatives from Roads and Maritime. Four attendees surveyed from the river in a boat and three attendees assisted from the bank.

A copy of the Draft Cultural Heritage Management Plan was then sent to members of BBNAC and Wamba Wamba Wadi Wadi Barapa Barapa First Nations Aboriginal Corporation for comment. To date, no comments have been received on the Plan.

5.4 ISEPP consultation

Under clause 13 of ISEPP, Roads and Maritime must consult with the local council if the proposed work would have an impact on council infrastructure. Given the proposed work involves excavation of a Council road surface and would cause a disruption to vehicular and pedestrian traffic, consultation with the local Council is required under ISEPP. Consultation with both Wakool and Gannawarra shire councils have been carried out as detailed in Section 0 below.

5.5 Government agency and stakeholder involvement

Consultation letters were sent to a range of agencies and authorities, listed below, in April 2015. The consultation letter provided an overview of the work proposed and requested feedback from the agencies. Table 5-2 below summarises the feedback received, with copies of response letters provided in Appendix F.

- NSW Office of Environment & Heritage

- NSW Department of Primary Industries (DPI), Fisheries
- NSW Department of Primary Industries (DPI), Agriculture
- NSW Department of Primary Industries (DPI), Office of Water
- NSW Environmental Protection Authority (EPA)
- NSW Trade and Investment – Crown Lands
- NSW Department of Planning and Environment
- NSW Roads and Maritime Services - Maritime
- Murray Local Land Service
- Murray Darling Basin Authority
- Wakool Shire Council
- Victorian Aboriginal Heritage Office
- VicRoads
- EPA Victoria
- Victorian Department of Environment, Land, Water & Planning
- Regional Development Victoria
- Aboriginal Affairs Victoria
- North Central Catchment Management Authority
- Gannawarra Shire Council.

Table 5-2 Summary of responses from stakeholder consultation

Agency	Response	Addressed in REF
NSW Office of Environment & Heritage	REF to consider potential impact on biodiversity, including threatened species.	Section 6.3
	REF to consider potential impact on Aboriginal cultural heritage.	Sections 6.4 and 6.5.
	REF to consider potential impact on threatened bat species Southern Myotis (*Myotis macropus).*	Section 6.3
	The location and impact of the construction of the temporary bridge on biodiversity and Aboriginal heritage needs to be detailed.	Sections 3, 6.3, 6.4 and 6.5
	REF must be consistent with the section 60 approval under the *Heritage Act 1977*.	Sections 4.1 and 6.4
NSW DPI Fisheries	Copy of draft REF to be forwarded for comment prior to start of work.	Noted
	Roads and Maritime should consult with NSW Fisheries on the design and construction of the bridge work, adequate time should be made for this consultation.	Noted

Agency	Response	Addressed in REF
	If the work involves dredging or reclamation the Minister must be notified in writing under section 199 of the *Fisheries Management Act 1994*. Comments made within 28 days must be taken into account.	Section 4.1
	If the work would inhibit, block or obstruct the passage of fish, a permit under Part 7 of *Fisheries Management Act 1994* is required.	Section 4.1
	REF to outline any key threatening processes.	Section 6.3
NSW DPI Agriculture	No specific issues.	Noted
NSW DPI Office of Water	No response to date from consultation letter and phone call.	Not applicable
NSW EPA	No requirement for the work to be licenced under the *Protection of the Environment Operations Act 1997.*	Noted
	Requires all precautions necessary to prevent pollution of the waterways.	Section 6.1
NSW Trade & Investment – Crown Lands	No response to date from consultation letter.	Not applicable
NSW Department of Planning & Environment	No response to date from consultation letter and phone calls.	Not applicable
NSW Roads and Maritime - Maritime	Four knot speed limit within construction zone plus 2 kilometres upstream and downstream of the bridge.	Section 6.2
	Work schedule should give consideration to vessels that would need passage. It is noted that a higher number of vessels require passage during summer and peak holiday periods.	Section 6.2

Agency	Response	Addressed in REF
	Roads and Maritime would need to consult with boat owners along the river, key groups being: • Murray River Paddle steamers, Echuca • Port of Echuca Paddle Boats • Echuca-Moama River Watch and User Group • Sunraysia User Group	Section 6.2
	Maritime would declare the precinct of the work a “Special event” which can provide any necessary restrictions to navigation.	Noted
	Recommends that Maritme Section 12 Notice is published in combination with any Roads notification to negate any confusion and in the interest of agency harmonisation.	Noted

Agency	Response	Addressed in REF
	In consideration of the critical requirement of the temporary bridge to avoid significant road traffic disruptions, we recommend the following measures be put in place to reduce impacts to navigation: ○ Construct the middle section of the temporary bridge last and remove it first to ensure vessel passage is restricted for the shortest possible time period. ○ Construct the pylons and supports of the temporary bridge in-line with the pylons and supports of the existing bridge to reduce the impact of navigation for smaller vessels. ○ The temporary bridge be adequately lit between the hours of sunset and sunrise. ○ Channel markers shall be installed upstream and downstream of the centre span indicating the navigable channel. ○ Reflective material (i.e. strips) shall be placed on the upstream and downstream sides of the pylons/supports of the temporary bridge to aid navigation/visibility at night and during low light periods. The reflective strips shall be placed above the annual mean water level and should be spaced no greater than 500 mm apart. ○ Suggested deck clearance of the temporary bridge is made equal to or greater than the existing bridge.	Noted
Murray Local Lands Services	If any vegetation is to be removed from NSW, approval may be needed under the *Native Vegetation Act 2003.*	Sections 1 and 6.3
Murray Darling Basin Authority	No response to date	Not applicable
Wakool Shire Council	Preferred temporary bridge option is option 3.	Sections 2.4 and 1

Agency	Response	Addressed in REF
	Given Barham and Koondrook function as a single town, it is requested that access across the river is maintained for residents of all ages.	Sections 3.3.6, 1 and 6.2
	It is noted that the central part of the bridge is dangerous for pedestrians.	Noted
	Requested that Roads and Maritime recognise the importance of traffic flow around the Barham shopping strip.	Sections 3, 1 and 6.2
Victorian Aboriginal Heritage Council	Notes that a Registered Aboriginal Party (RAP) for the area. In this case the Office of Aboriginal Affairs Victoria is the relevant decision maker under the *Aboriginal Heritage Act 2006.*	Noted
VicRoads	Prior to start of work, VicRoads requires a copy of the detailed design for the work proposed in Victoria.	Noted
	VicRoads suggested a temporary bridge location close to the existing bridge on the downstream side. It was also suggested that Roads and Maritime, VicRoads, Wakool Shire Council and Gannawarra Council meet on site to discuss temporary bridge options.	Noted
	VicRoads requested a copy of the Draft REF be provided for comment prior to finalisation.	Noted
EPA Victoria	Sediment traps or similar must be installed to prevent sediment and litter flowing into the stormwater system or water courses.	Section 6.1
	Work must be in accordance with EPA publication 275 'Construction Techniques for Sediment Pollution Control 1991' or as amended.	Section 6.1
	Any lead paint that is removed must be collected and disposed of at an authorised waste facility.	Section 6.10
Victorian Department of Environment, Land, Water & Planning	Noted a list of Victorian legislation that may need addressing: ○ *Planning and Environment Act 1987* ○ *Native Title Act 1995* ○ *Aboriginal Heritage Act 2006 Fisheries Act 1995* ○ *Flora and Fauna Guarantee Act*	Noted

Agency	Response	Addressed in REF
	1988 ○ *Wildlife Act 1975* ○ *Environment Effects Act 1978* ○ *Environment Protection and Biodiversity Conservation Act 1999* In a phone conversation the department requested a copy of the Draft REF for comment prior to finalisation.	
Regional Development Victoria	No response to date from consultation letter or phone call.	Not applicable
Aboriginal Affairs Victoria	No response to date from consultation letter or phone call.	Not applicable
North Central Catchment Management Authority	No requirement to obtain a "Works on Waterway Permit".	Noted
	Work must comply with requirements listed in Appendix A of response letter.	Section
Gannawarra Shire Council - Planning	A planning permit is needed to remove or lop vegetation in Victoria.	Section 4.2
	Preferred temporary bridge option is option 3. Council does not want traffic to be diverted down Vine or Dalton Streets.	Sections 2.4 and 1
	Given Barham and Koondrook function as a single town, it is requested that access across the river is maintained for residents of all ages. It is noted that the central part of the bridge is dangerous for pedestrians. Council believes a permanent retractable footbridge could be built alongside the existing bridge to ensure safe pedestrian access across the river.	Section 6.2 Not in the scope of work.
	Requested a replanting program be carried out to replace trees that would be removed with mature native vegetation.	Sections 1 and 6.3
	Requested the park on the Victorian side of the river be enhanced with additional landscaping.	Sections 1 and 6.3
	Requested the installation of an interpretive centre on the bank of the	Not in the scope of work. Roads and

Agency	Response	Addressed in REF
	Murray River to complement the replanting program.	Maritime would consult with Gannawarra Shire Council about rehabilitation of parks and reserves.
	Requested the reuse of the temporary bridge approach road roadbase to upgrade Murray Parade on the upstream side of the bridge.	Not in the scope of work. Roads and Maritime would consult with Gannawarra Shire Council about rehabilitation of parks and reserves.
	Requested a time-lapse video of the restoration work.	Not in the scope of work

The comments received from these agencies have been considered in the preparation of this REF and are discussed and addressed where appropriate in Section 6.

5.6 Ongoing or future consultation

Consultation would continue while the work is being carried out. Future planned consultation activities include:

- Public display of the draft REF and preparation of a submissions report
- Publish the submissions report
- Consultation during construction work as outlined in Table 5-3.

Table 5-3 Planned consultation during construction

Milestone	Consultation Activity	Audience
Start construction of temporary bridge	Media releases Traffic alerts Email blasts VMS Website Regional traffic report Live traffic website	Residents Businesses Road users Councils Heavy vehicle industry Farmers Tourists
Construction	Media releases Traffic alerts Email blasts VMS Website Regional Traffic report Live traffic website	Residents Businesses Road users Councils Heavy vehicle industry Farmers Tourists
Start bridge	Media releases	Residents

Milestone	Consultation Activity	Audience
restoration work	Traffic alerts Email blasts Letters Website Regional traffic report Live traffic website	Businesses Road users Councils Heavy vehicle industry Farmers Tourists
Closures of temporary bridge	Media releases Traffic alerts Email blasts Letters Website Regional traffic report Live traffic website VMS	Residents Businesses Road users Councils Heavy vehicle industry Farmers Tourists
Completion of work and open to traffic	Media release Media event Website Email blasts	Residents Businesses Road users Councils Heavy vehicle industry Farmers Tourists
Removal of temporary bridge	Media release Website Email blasts Letters VMS Regional traffic report Live traffic website	Residents Businesses Road users Councils Heavy vehicle industry Farmers Tourists

6 Environmental assessment

This section of the REF provides a detailed description of the potential environmental impact 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:

- The factors specified in the guidelines Is an EIS required? (DUAP 1999) and Roads and Related Facilities (DUAP 1996) as required under clause 228(1)(b) of the Environmental Planning and Assessment Regulation 2000. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix A.
- Potential impact on matters of national environmental significance under the EPBC Act 1999.

Site-specific safeguards are provided to ameliorate the identified potential impact.

6.1 Soils and water

6.1.1 Existing environment

Topography

The regional topography near the proposal is mostly flat alluvial plains of the Murray River and associated anabranches.

Geology

In NSW the proposal area is located on Quaternary (Holocene) aged unnamed alluvium geology. This geology typically comprises fluvial and lacustrine clay, sand and sandy clay located on flood and soil plain areas.

In Victoria the proposal area is located in the Older Alluvium – Shepparton geomorphic unit on a plain above flood level landform. This Quaternary landform comprises fine textured unconsolidated deposits of red duplex soils.

Soils

An Embankment Slopes Protection Inspection Report was undertaken by Geotechnical and Scientific Services in 2005. This report indicated that the proposal area in NSW is underlain by:

- Alluvial and riverside plain deposits of gravel, sand, silt and clay
- Clay pans and outwash areas of black and red clayey silt and sand
- Coastal sand dunes and beach deposits belonging to the quaternary period.

In Victoria the south-western part of the proposal area is located on Shepparton Formation geology. This usually comprises fluvial silt and minor gravel dating to the Pleistocene. The north-eastern part of the proposal area is located on unnamed alluvium (Qa1). This comprises fluvial/lacustrine clay, sand and sandy clay dating to the Holocene and represents the active floodplain.

Acid Sulfate Soils

Acid Sulfate Soils (ASS) are naturally occurring soils and sediments that contain iron sulphides, and most commonly occur near coastal areas or near acid-bearing rock. There are no known ASS in the study area. ASS are unlikely to occur within the study area.

Contamination

A Limited Environmental Assessment and Waste Classification Report was prepared by Vantage Environmental in March 2015, provided in Appendix G. Part of the assessment involved testing soil samples from around the bridge for contamination. The results showed that the soil samples had contaminant levels below the National Environmental Protection Measure (NEPM) investigation levels for commercial and industrial sites. This means that excavated soil may be re-used on-site or disposed off-site to a licensed facility as 'general solid waste' in NSW or 'fill material' in Victoria.

A search of the NSW EPA's Contaminated Land Register found no listed contaminated land sites in the Wakool LGA. A search of EPA Victoria's Priority Sites Register, which lists known polluted sites that pose a risk to human health and the environment, found no listings in the Gannawarra Shire. Both searches were carried out on 26 August 2015.

Catchment

The proposal area is located in the Murray Riverina catchment in NSW. This catchment covers 14,950 square kilometres of southern NSW and includes towns such as Tumbarumba, Albury, Mulwala, Deniliquin, Wakool and Moulamein. It begins at Hume Dam in the south-western slopes and follows the Murray River to its junction with the Murrumbidgee River west of Balranald. Land use in the Murray Riverina catchment is dominated by agriculture.

In Victoria, the proposal area is located in the North Central Catchment area. This area is bordered by the Murray River to the north, the Great Dividing Range and Wombat State Forest to the south and Mt Camel Range to the east. It covers about 13% of the state of Victoria and includes towns such as Echuca, Swan Hill, Bendigo, Daylesford and Charlton.

Hydrology

The Barham-Koondrook Bridge crosses the Murray River which has a wide floodplain. The floodplain has many drainage depressions, however no other waterways or water bodies occur in the proposal area.

Flood events at Barham-Koondrook are very unusual and typically occur with significant warning from upstream, allowing a period of time for mitigation work if necessary.

Runoff from the proposal area either drains directly into the river, or into council stormwater systems and eventually into the river.

Water quality

The water quality of the Murray River in this area is highly influenced by agricultural activities. Runoff from surrounding agricultural properties is likely to include sediment and high levels of nutrients, such as nitrogen and phosphorus, from animal waste and fertilisers. An additional pollution source is town waste water and stormwater.

Soil material at the proposal site mainly consists of loose silty and clayey sand. Vegetation is limited along the river banks and as such bank erosion is likely to occur during high water flows near the abutment. The absence of riparian vegetation can lead to increased nutrient loading during rainfall events where nutrients can wash into the river unobstructed.

6.1.2 Potential impact

Construction

The proposal has the potential to affect water quality in the following ways:

- Disturbance of the river bed during pile removal and pile driving, causing sediment to be disturbed and be transported downstream
- Sediment-laden runoff from excavation of the abutment area, construction of temporary approach roads, vegetation removal, crane pad construction and access tracks to the coffer dam area and river bed
- Debris, including lead painted elements and treated timber, entering the river during restoration work
- Construction of a cofferdam and working platforms in-stream. These proposed activities would reduce the channel width and potentially cause erosion of the bed and banks of the river
- Sediment being deposited in the waterway during the backfilling of rock scour protection
- Chemical spills from construction work or refuelling activities and plant failure, such as hose breakages. This risk is heightened should a barge be used for crane work
- Run-off from stockpile and compound areas near the river
- Run-off from the temporary bridge construction area
- Run-off from the deck of the temporary bridge.

The driving of piles into the river would disturb a small amount of sediment, which would become suspended and be transported downstream. Sediment-laden runoff from excavated areas and backfilling of rock used for the scour protection work also has the potential to enter the river. This has the potential to affect water quality by preventing light penetration through the water and smothering habitats, including vegetation, downstream.

The river water quality in this location is already heavily affected by sediment runoff from sources upstream, and sediment is already present within the water. Standard sediment control measures can be used to reduce the amount of sediment entering the waterway from excavation, road construction and backfill work. The small amount of sediment likely to enter the river from the proposed work is unlikely to have any noticeable effect on water quality.

During the proposed work, debris from the work area has the potential to fall into the river. Debris could include large objects, such as timber and steel, and small particles such as saw dust and paint flakes. The risk of debris entering the water would be minimised by construction methodology and implementing safeguards.

Lead paint is known to be present on some parts of the bridge. Large objects are likely to either sink, or float downstream. Smaller objects are likely to become suspended in the water and disperse, or sink. Whilst lead paint may enter the river, it is considered that this would be in very small amounts. The risk of lead paint entering the water would be minimised by implementing safeguards and appropriate construction methodology for stripping and repainting the lift span tower. The proposal would utilise a number of measures to minimise the risk of this occurring.

Overall, the likely impact on water quality from debris falling into the river is considered negligible.

In-stream structures, such as coffer dams and rock platforms, can change the way in which water flows. The speed of the water flow generally increases when the passageway is confined, which can cause scouring and erosion of the river bed. Swirls, eddies and backwaters can be created, which can also result in erosion of the river bed and banks downstream. Scour protection, such as the use of rock, can assist in reducing the impact, particularly along the river banks.

Construction work carries risks of chemical and fuel spills. The consequences of these risks are greater when these activities occur near a waterway. Chemical and fuel spills have the potential to cause serious harm to the ecology of a river system, including fish kills, harm to other fauna, and damage to vegetation. The proposal is not likely to use substantial quantities of chemicals or fuels. Likely chemicals and fuels include diesel and unleaded petrol, lubricating oils, hydraulic oils and curing compounds. These would be stored in bunded areas at the compound site, and refuelling would be restricted to suitable bunded areas. Any spills near the river would likely be in small amounts, such as from leakages, hose failures and accidents. This is not likely to cause any impact on water quality. Overall, the risk of impact to water quality from chemical and fuel spills is considered low.

The proposal would also require sand blasting of bridge elements to remove grit and paint. Some of the paint used on the bridge in the past contains lead. Sand blasting produces a residue known as garnet, which in this case would also contain lead. This residue can have harmful effects on water quality and aquatic ecology if large amounts escape into the environment. The proposal would implement mitigation measures to prevent garnet from entering the river.

Hydrology

Should it flood while the temporary bridge and Victorian approach road are in place, it is not expected to cause backwater flooding at the proposal site. Flood water velocities in the Murray River at Barham-Koondrook are typically low, at around one metre per second. At this velocity, the dynamic water pressures and subsequent hydraulic effects from flood water are also expected to be low.

This means that the water tends to flow by gravity into low lying areas rather than being hydraulically forced onto land by man-made structures.

The following design measures have been included to minimise the likelihood of flood effects:

- Temporary bridge has been designed at the same deck level as the existing bridge
- Temporary approach roads have been designed lower than existing road approaches

- Reducing the number of temporary bridge piers to two
- Maximising the separation of the temporary bridge from the existing bridge by an average distance of 15m.

The proposed work is unlikely to significantly increase the effects of a flood given the above design measures and that the temporary structure would only be in place for around 12 months.

Operation

Scour protection would be installed along the Victorian river bank following the restoration work. This would prevent the river from eroding the bank around the abutment.

The removal of vegetation along the river bank has the potential to destabilise the soil and expose the area to erosion. Vegetation removal for the proposal is very small. Rehabilitation of all disturbed areas following the completion of construction would assist in preventing future erosion.

No operational impact is anticipated.

6.1.3 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
SW1	Soil and Water	Soil and Water Management Plan A Soil and Water Management Plan will be prepared in accordance with QA Specification G38 and implemented as part of the CEMP. The Plan will identify all reasonably foreseeable risks relating to soil erosion and water pollution associated with undertaking the activity, and describe how these risks will be managed and minimised during construction. That will include arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas, and monitoring during construction.	Project Manager	Pre-construction
SW2	Soil and Water	Install erosion, sediment and water quality controls Consistent with any specific requirements of the approved Soil and Water Management	Project Manager, Contractor	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
		Plan, control measures will be implemented to minimise risks associated with erosion and sedimentation and entry of materials to drainage lines and waterways. That will include, but not necessarily be limited to: - Sediment management devices, such as fencing, hay bales or sand bags - Measures to divert or capture and filter water prior to discharge, such as drainage channels and first flush and sediment basins - Scour protection and energy dissipaters at locations of high erosion risk - Installation of measures at work entry and exit points to minimise movement of material onto adjoining roads, such as rumble grids or wheel wash bays - Appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate.		
SW3	Soil and Water	<u>Stockpile management</u> Stockpiles will be designed, established, operated and decommissioned in accordance with the RTA Stockpile Site Management Guideline 2015.	Project Manager, Contractor	Pre-construction, During construction, Post construction
SW4	Soil and Water	<u>Dewatering</u> Any dewatering activities will be undertaken in accordance with the RTA Technical Guideline: Environmental management of construction site dewatering in a manner that prevents pollution of waters.	Project Manager, Contractor	During construction
SW5	Soil and	<u>Work in waterways</u> A detailed Environmental	Project Manager,	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
	Water	Work Method Statement (EWMS) will be prepared and implemented for all works undertaken within waterways. The EWMS will detail measures to avoid or minimise risks from erosion and sedimentation to water quality and biodiversity. It will be prepared in accordance with relevant guidelines including, but not limited to: - RMS Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects - NSW DPI (Fisheries) guidelines Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings.	Contractor	, During construction
SW6	Soil and Water	<u>Monitor</u> Consistent with any specific requirements of the approved Soil and Water Management Plan a monitoring program will be implemented during construction to ensure effective implementation of all temporary and permanent soil, erosion and water pollution safeguards. The timing and frequency of monitoring inspections will be set out in the SWMP. The inspections will assess implementation and success of the controls, actions required to ensure on-going effective operation, and compliance with any statutory approvals. A register of inspections will be established.	Project Manager, Contractor	During construction
SW7	Soil and Water	<u>Efficient use of water</u> Work practices will be implemented during construction to support efficient water use and minimise waste. That will include, but not necessarily be limited to, measures to	Project Manager, Contractor	During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		reuse and recycle water where practicable for use in road construction (such as dust suppression and concreting) and irrigation or revegetated areas.		
SW8	Soil and Water	<u>Rehabilitation</u> All areas disturbed during construction, including areas for stockpiles compound sites, temporary access roads and temporary work areas, would be stabilised and rehabilitated to prevent future erosion.	Project Manager	Post construction
SW9	Soil and Water	<u>Hazardous materials storage</u> All fuels, chemicals and other hazardous materials must be stored in a roofed, fire-protected and impervious bunded area at least 20 metres from waterways, drainage lines, basins, flood-affected areas or slopes above 10%. Bunding design must comply with relevant Australian Standards, and should generally be in accordance with guidelines provided in the EPA Authorised Officers Manual. Appropriate on-site signage must be provided to identify the materials stored.	Project Manager, Contractor	During construction
SW10	Soil and Water	<u>Emergency equipment</u> Appropriate emergency equipment will be provided on-site and located at strategic, accessible locations. This will include: - fire response measures, including fire extinguishers, fire blankets and accessible water - spill kits - first aid kits - external showers.	Project Manager, Contractor	During construction
SW11	Soil and Water	<u>Refuelling</u> Refuelling will occur in impervious bunded areas at least 20 metres from	Project Manager, Contractor	During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		drainage lines and waterways. Refuelling on barges will occur within a double-bunded area.		
SW12	Soil and Water	Cleaning and washing Cleaning of equipment and vehicles will only occur in areas where water pollution will not occur. Wash-down or wash-out will only occur in bunded areas.	Project Manager, Contractor	During construction
SW13	Soil and Water	Incident reporting and response Environmental incidents, such as pollution spills and unauthorised vegetation clearing, will be reported and managed in accordance with the RMS Environmental Incident Classification and Reporting Procedure.	Project Manager, Contractor	During construction
SW14	Soil and Water	Garnet Controls would be stablished during sand blasting of bridge elements to prevent garnet being released to the environment.	Project Manager, Contractor	During construction
SW15	Soil and Water	Fill imported onto the proposal site for the construction of the in-stream working platforms will be clean, inert rock spoil with a minimum grade of 50mm.	Contractor	Construction, Operation

6.2 Traffic and access

6.2.1 Existing environment

The Barham-Koondrook Bridge is a main link between regional centres including Deniliquin, 87 kilometres away in NSW, and Kerang and Cohuna, both about 20 kilometres away in Victoria. The bridge also provides an important north to south inland stock route from Queensland to Melbourne.

The main local roads are Grigg Road in Koondrook and Thule Street in Barham. The two small rural towns function as one, sharing schools, medical facilities and a commercial centre. The bridge is relied upon by pedestrian and cyclists and mobility scooters to cross between the towns for school, work and shopping.

Although uncommon, some tall river traffic travel along the Murray River. The lift span of the bridge allows this traffic to pass.

The bridge is about eight metres wide consisting of a single traffic lane and a footpath on the eastern side. The lift span of the bridge narrows to about five metres wide with no dedicated footpath in this section.

Traffic counting was conducted as part of the noise and vibration study. Daytime traffic volumes are shown in Table 6-1, and nightime volumes in Table 6-2.

Table 6-1 Average daily daytime traffic on and around the bridge (percentage of heavy vehicles shown in parenthesis)

	Highway South of Bridge	Murray Pde (East of Vine St)	On Bridge	Thule St (b/n Murray St and Whymeal St)	Thule St (b/n Whymeal St and Gonn St)	Cobwell St (b/n Murray St and Whymeal St)	Whymeal St (b/n Cobwell St and Thule St)	Dalton St / Burnett St /Vine St	All other local Roads
Existing	4029 (6%)	1500 (14.3%)	4029 (6%)	1844 (10.7%)	1844 (10.7%)	386 (8.7%)	386 (8.7%)	102 (14.3%)	386 (8.7%)

Table 6-2 Average daily nightime traffic on and around the bridge (percentage of heavy vehicles shown in parenthesis)

	Highway South of Bridge	Murray Pde (East of Vine St)	On Bridge	Thule St (b/n Murray St and Whymeal St)	Thule St (b/n Whymeal St and Gonn St)	Cobwell St (b/n Murray St and Whymeal St)	Whymeal St (b/n Cobwell St and Thule St)	Dalton St / Burnett St / Vine St	All other local Roads
Existing	266 (9.7%)	100 (5.8%)	266 (9.7%)	115 (16.3%)	115 (16.3%)	25 (5.8%)	25 (5.8%)	50 (18.0%)	25 (5.8%)

6.2.2 Potential impact

Construction

The existing bridge would be closed for the duration of the work. A temporary bridge would be constructed and operated, with all traffic to use this bridge until the existing bridge is reopened. Pedestrians and cyclists would also be able to cross the river using the temporary bridge. As is the case for the existing bridge, the temporary bridge would be a single-lane bridge with traffic control at either end. Traffic routes to and from the temporary bridge would remain the same as the current situation. The temporary bridge is narrower than the existing bridge, meaning wide loads would be unable to use the crossing during the construction period. Notification and consultation would occur to relevant industry groups and road users. Overall, there would be only a minor impact to freight transport and local traffic. There would be no changes to access for emergency vehicles or public transport, including school bus routes.

Construction of the temporary bridge and the approach roads would result in temporary delays and detours for local pedestrian, cyclist and vehicle traffic at the intersections of Grigg Road and Dalton Street in Koondrook, Grigg Road and Murray Parade in Koondrook, and Thule Street and Murray Street in Barham. Traffic would still be able to cross the existing bridge during this work with minor delays to be expected. This would be managed by suitable temporary traffic control arrangements, including consultation and notification to the community.

During operation of the temporary bridge, changes to traffic movements may be required at the intersections of Grigg Road and Murray Parade in Koondrook, and Thule Street and Murray Street in Barham. If a Give Way sign does not effectively

manage traffic movements across the temporary bridge, traffic signals would be considered. At Grigg Road and Murray Parade in Koondrook, access to and from the temporary bridge onto the eastern or upstream side of Murray Parade would be closed. At Thule Street and Murray Street in Barham, traffic turning from Murray Street (east and west) onto the temporary bridge may be restricted. Light vehicle traffic would still be able to leave the bridge and turn onto Murray Street east and west into Barham. Heavy vehicle traffic may be restricted from turning off and onto the temporary bridge from Murray Street in Barham. This would be managed by suitable temporary traffic control arrangements, including consultation and notification to the community.

During operation of the temporary bridge, work on the existing bridge may result in temporary traffic delays and detours at Murray Parade in Koondrook, and Murray Street in Barham. This would be managed by suitable temporary traffic control arrangements, including consultation and notification to the community.

Use of the temporary bridge instead of detours and closures would result in through traffic following the same road networks through Barham and Koondrook, and would avoid excessive disruption, delays and detours for local traffic, residents, businesses and farmers. It would also avoid detouring heavy vehicles on unsuitable residential roads. There would be occasions when traffic on the temporary bridge would be stopped. This may occur when construction activities make it unsafe for vehicles to use the temporary bridge, such as operating a crane. These delays would be minor and short in duration.

The temporary bridge has separate footway that would accommodate pedestrians and cyclists.

The temporary bridge would not have a liftspan and has a minimal vertical clearance of about four metres. Tall river boat traffic would not be able to pass during its operation. Consultation with NSW Maritime and affected stakeholders would be carried out about the impact on river traffic to manage this during construction, including notification to the riverboat users networks and appropriate river signage.

Access for construction vehicles to the proposal site would occur through Barham and Koondrook using local roads. If a barge is needed, access to the river upstream of the bridge would be via the existing public boat ramp. Barge access to the river downstream of the bridge would be from the natural river bank or from the public boat ramp located upstream of the bridge in Barham. A new access track may need to be built if the barge is to be launched from the river bank. This could result in erosion and sedimentation. Launching the barge from the river bank also has the potential to impact vegetation and decrease bank stability.

The work would also lead to additional traffic on local roads from workers going to and from the site, deliveries of materials, removal of waste, and moving plant and equipment around the site (refer to Section 3.3.6). There is likely to be only a very small amount of additional traffic and it is not expected that it would place pressure on local roads.

Operation

The proposal is unlikely to have any direct impact on traffic after the work is completed. Positive effects from the proposal include:

- Reduced maintenance requirements on the bridge, meaning less closures or traffic delays

- Reducing the likelihood of needing to limit heavy vehicles from using the bridge.

6.2.3 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
TT1	Minimise impacts to existing traffic	Local community notification Consultation will be undertaken with potentially affected residences prior to the commencement of and during works in accordance with the RTA's Community Involvement and Communications Resource Manual. Consultation would include but not limited to door knocks, newsletters or letter box drops providing information on the proposed works, working hours and a contact name and number for more information or to register complaints	Project Manager	Pre-construction, During construction
TT2	Minimise traffic related risks during construction	Traffic Management Plan A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the RMS Traffic Control at Work Sites Manual and the worksite manual RMS Specification G10. The TMP will include: - Confirmation of haulage routes - Measures to maintain access to local roads and properties - Site specific traffic control measures (including signage) 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	Project Manager	Pre-construction,

		- 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.		
TT3	Access	Notifications to landowners Disruptions to property access and traffic will be notified to landowners at least five days prior in accordance with the relevant community consultation processes outlined in the TMP.	Project Manager	Pre-construction, During construction
TT4	Access	Wide Loads Consultation and notification of the transport industry and road freight providers would occur in relation to the reduced width capability of the temporary bridge.	Project Manager	Pre-construction, During construction
TT7	Reduce speeds, traffic delays and disruptions during construction	Community information 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.	Roads and Maritime	Pre-construction, During construction

TT8	Local road dilapidation	Dilapidation reports Pre-construction and post construction road dilapidation reports for local roads likely to be used for construction will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road dilapidation reports will be provided to the local roads authority.	Project Manager	Pre-construction
TT9	Water Traffic	Four knot speed limit and no wash within construction zone will be implemented from 600 metres upstream and 900 metres downstream of the bridge.	Roads and Maritime	During construction
TT10	Water Traffic	Work schedule must give consideration to vessels that would need passage. It is noted that a higher number of vessels require passage during summer and peak holiday periods.	Roads and Maritime	Pre-construction
TT11	Water Traffic	Roads and Maritime will consult with boat owners along the river regarding any changes to river traffic arrangements, including but limited to: • Murray River Paddle steamers, Echuca • Port of Echuca Paddle Boats • Echuca-Moama River Watch and User Group • Sunraysia User Group.	Roads and Maritime	Pre-construction

6.3 Biodiversity

6.3.1 Methodology

NGH Environmental Pty Ltd were engaged by Roads and Maritime to undertake a biodiversity assessment for NSW to inform the REF. A copy of the full report including a detailed scope and methodology is provided in Appendix H.

Biosis were engaged to carry out a biodiversity assessment for the proposed work in Victoria to inform the REF. The report also provides information needed to accompany a planning permit application to Gannawarra Shire Council for the removal of trees. A copy of the report is provided in Appendix I.

The general methodology included a desktop review of flora and fauna likely to occur in the study area, targeted flora and fauna surveys and the assessment of the impact to flora, fauna and their habitats. For the purposes of the biodiversity assessment, the study area for the proposal includes the construction footprint, as shown in Figure 3-4, and areas with biodiversity values near the construction footprint where an indirect impact may occur.

Prior to carrying out field investigations, previous studies conducted within the region and relevant databases were consulted. Background searches were carried out in January 2015. Background searches included NSW, Victorian and federally listed flora and fauna of conservation significance.

Literature relevant to this assessment was reviewed and included but was not limited to:

- OEH Wildlife Atlas Data
- OEH Threatened species profile search
- EPBC Act Protected Matters Search
- DPI Noxious weeds database
- OEH Vegetation Information System
- Victorian Biodiversity Atlas.

A flora and vegetation survey was undertaken by NGH Environmental in February 2015. The study area was surveyed using the “random meander” method as documented by Cropper (1993). A list of all flora species found during the survey was maintained. Vegetation communities were assessed to determine their structure and condition.

Fauna surveys were conducted in February 2015 by NGH Environmental. Fauna surveys included specific searches for bats and bat roosting sites in and around the bridge, using echolocation detectors. In addition, specific searches for Koalas were undertaken in suitable woodland habitats.

Information on fauna habitats in the study area were collected, including aquatic and terrestrial habitats and resources such as instream snags, pools, stands of vegetation and hollow bearing trees. Incidental sightings of fauna species, or of evidence of the presence of fauna species, were recorded.

6.3.2 Existing environment

Regional and local land use

The proposal is located within the NSW Riverina Bioregion, between the small towns of Barham and Koondrook. Most of the surrounding land has been cleared or modified for residential, commercial and recreational purposes. As a result, vegetation within the proposal area is extremely fragmented and isolated (Figure 6-1).

The vegetation within the region is fragmented and generally isolated from vegetation elsewhere. Large areas of remnant and regrowth forest remain within Kondrook-Pericoota Forest (two kilometres from the proposal area) and Campbells Island State Forest, along with riparian habitat along the Murray River and its tributaries.

Elsewhere, vegetation is limited to along roadsides, isolated paddock trees and other small patches where clearing has not occurred. This vegetation is continuous along the river bank within the proposal area.

The regional topography near the proposal comprises of mostly flat alluvial plains of the Murray River and associated anabranches. In the proposal area, the river is deeply incised with steep banks.

Results of background research

Background research revealed the following NSW, Victorian or Federally-listed threatened species and endangered ecological communities which could occur in the study area:

- Six state-listed and five Federally-listed Endangered Ecological Communities (EEC's) have the potential to occur within the study area. Only one of these, the state-listed "*Aquatic Ecological Community In The Natural Drainage System of the Lower Murray River Catchment*" (Lower Murray River aquatic ecological community), was found to be present at the proposal site
- Four state-listed threatened flora species have the potential to occur in the study area. One species, the Boland Yellow Gum (*Eucalyptus leucoxylon subsp. Pruinosa*), has been previously recorded within the study area. None of these species were found during the field surveys
- Eleven threatened fauna species (NSW, Victorian and Federally listed) have been previously recorded within the study area. A further 15 threatened species, nine migratory species and five invasive fauna species have the potential to occur within the study area
- Five state-listed and three Federally-listed threatened fish species have been previously recorded across the Murray catchment area or have the potential to occur in the study area
- One endangered population, the Eel-tailed Catfish in the Murray Darling Basin, is known from the locality.

Details of these records are contained in Figure 6-2.

No endangered populations occur within the study area.

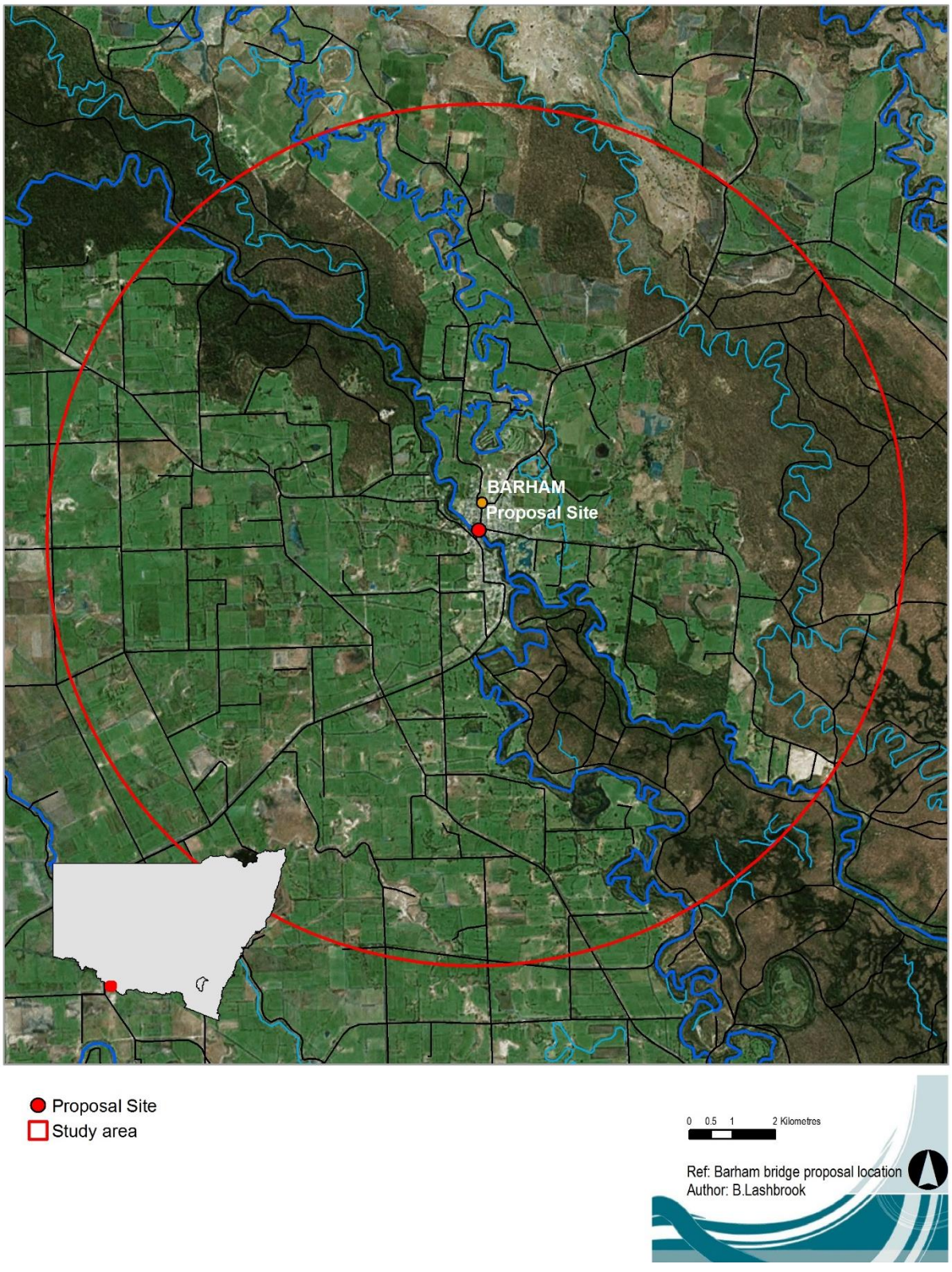

Figure 6-1 The proposal site in a regional context, showing the main areas of native vegetation to the northwest and southeast.

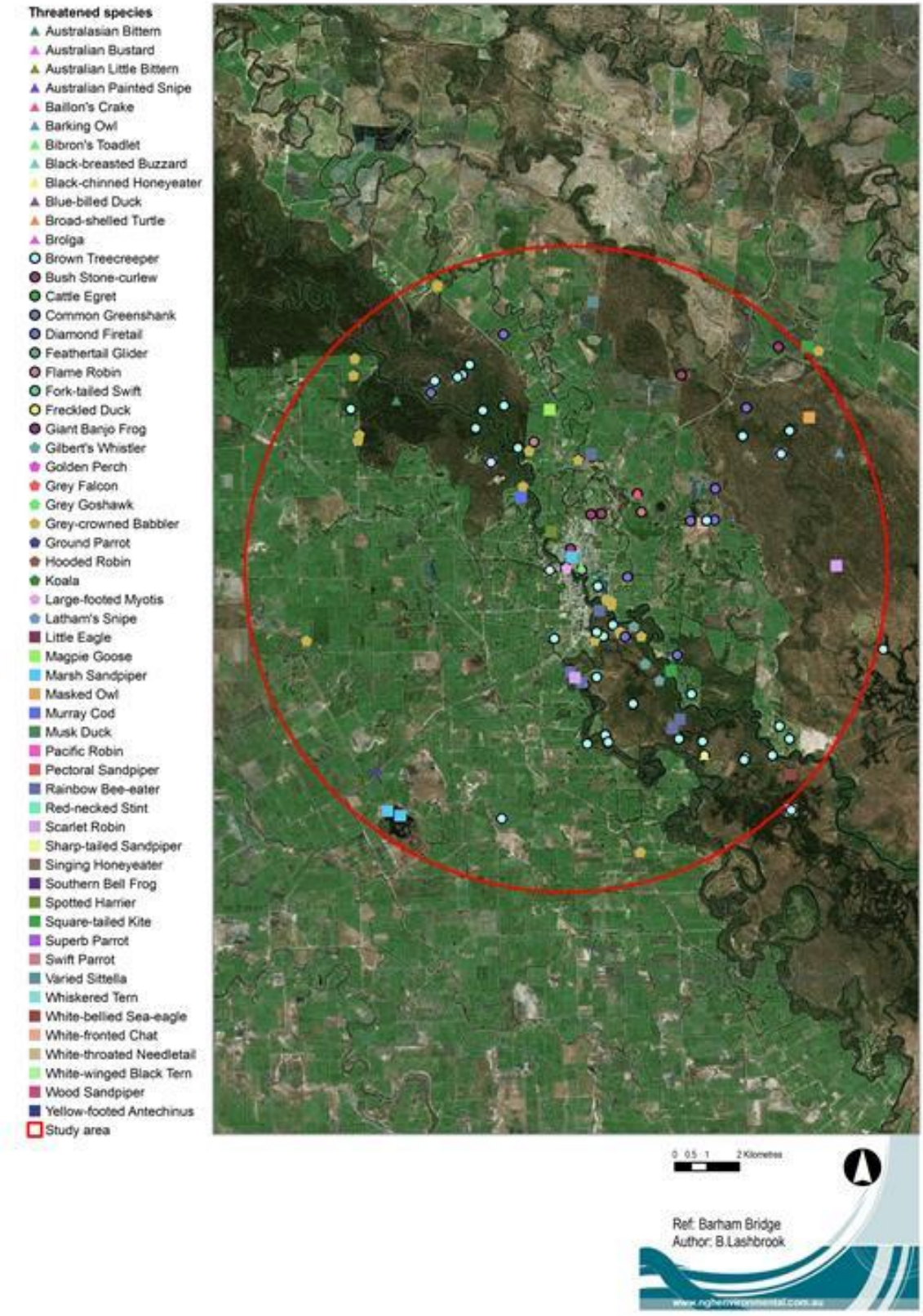

Figure 6-2 Threatened species recorded from the study area

Primary feed tree species for the Koala were recorded in the proposal area. However, no koalas or evidence of koalas were found during the field surveys and none have been recorded in the study area. The habitat is not considered core koala habitat but could be considered as Potential Koala habitat pursuant to SEPP 44.

Flora species and vegetation communities

A total of 12 flora species were recorded within the proposal area during field investigations. Five (41 per cent) of these species are weeds and one is classified as a noxious weed (Bridal Creeper *Asparagus asparagoides*). No threatened flora species were recorded.

The vegetation on the Victorian side of the river is Riverine Grassy Woodland (DEPI Ecological Vegetation Class 295). The trees consist of old remnant individuals and younger regrowth, with an understorey dominated by exotic species and noxious weeds. Overall, the vegetation on the Victorian side of the river is considered to be in poor condition. The Habitat Hectare score for the area of vegetation within the proposal site was 0.024. This vegetation community is not listed as endangered in Victoria or Federally.

The vegetation community present on the NSW side of the river is River Red Gum Forest. The trees consist of a mixture of old remnant individuals, and younger regrowth. The understorey is dominated by exotic species and noxious weeds. Overall, the vegetation on the NSW side of the river is considered to be in poor condition. This vegetation community is not listed as endangered in NSW or Federally.

Groundwater dependant ecosystems

The River Red Gum Forest vegetation along the Murray River is likely to rely on the associated shallow groundwater of the river. The vegetation in this area is considered to comprise a Groundwater Dependent Ecosystem.

There are no other wetlands, estuarine or nearshore systems within the study area. None of the other vegetation types within the study area are considered likely to rely on groundwater resources.

Fauna habitats

Fauna habitats at the site include River Red Gum Woodland and grasslands, used by some native fauna for foraging, and fallen timber on the river bank, which potentially may be used by some native fauna species for roosting and foraging. Overall, the quality of terrestrial habitats in the proposal area is poor, typical of a maintained urban environment.

Potential habitat for a number of microchioropteran bat species is present within the bridge and riparian vegetation, particularly large trees. The timber elements of the bridge are quite old, displaying a number of cracks and gaps that could provide potential roosting habitat for bats.

One hollow bearing tree was recorded within the proposal area. This tree is located on the southern bank of the Murray River, approximately 30 metres upstream of the bridge (Figure 6-3). Other hollow bearing trees are present immediately outside the proposal area.

Figure 6-3 Looking north towards the Barham-Koondrook Bridge along the proposed temporary crossing location

Fauna species

One threatened species, *Myotis macropus* (Southern Myotis), was recorded in the proposal area. Bats were observed flying throughout River Red Gum trees immediately adjacent to the bridge (south side). This species is listed as Vulnerable on the NSW TSC Act. Bats were also observed flying under the bridge.

Whilst the timber sections of the bridge were found to contain a number of cracks and gaps that could provide potential roosting habitat for many bat species, no evidence of bat activity was found within the bridge. No bats were seen flying in or out of the bridge and no insect casings were present nor was any guano found. Hollow-bearing River Red Gums located along the Murray River would provide suitable roosting and breeding habitat for microchiropteran bats.

No other threatened fauna species were observed during the biodiversity field surveys.

A number of commonly occurring bird species were observed in the proposal area, including the Australian Magpie (*Cracticus tibicen*) and the Sulphur Crested Cockatoo (*Cacatua galerita*). Other bird species would be expected to occur in the proposal area, including threatened bird species reliant upon woodland habitats.

No mammals were recorded during the field surveys. Commonly occurring mammals such as Kangaroos, Echidna's and Wombats would be expected to occur in the proposal area. Similarly, commonly occurring reptiles including snakes, lizards and turtles would occur in the proposal area.

Although the Sugar Glider is not listed as a threatened species on the TSC Act, it is an iconic native species facing threats from various sources such as habitat

modification and removal. The Sugar Glider has been previously recorded within the study area (NSW Altas of Wildlife Database). This species was not recorded during the field surveys undertaken for this assessment, although nocturnal surveys which are most likely to detect this species were not conducted. Potential habitat is present in woodland vegetation along the river, local roads and irrigation channels.

Aquatic fauna species and habitats

Aquatic habitats within the study area are associated with the Murray River. There is intact riparian vegetation and woody debris along the river corridor which provides refuge and foraging habitat for aquatic fauna such as frogs, reptiles and invertebrates. In the proposal area, the Murray River is a deeply incised channel with steep banks. The river is regulated, meaning river levels fluctuate according to irrigation and water demand as well as natural runoff events. Evidence of ongoing erosion of the banks is present both up and downstream of the proposal site. The bed of the river in the proposal area is predominantly a silty substrate, with occasional rocks closer to the banks of the river (including from rock scour protection). No in-stream aquatic vegetation was observed in the proposal area. An example of the aquatic habitats in the proposal area is shown in Figure 6-4.

Fallen timber and dead wood (including one large snag around 10 metres downstream of the southern abutment) are present on the lower banks and bed of the river in the proposal area.

Overall the quality of aquatic habitat is considered to be moderate.

Figure 6-4 The Murray River showing vegetation and snag habitat on the banks

Threatened aquatic fauna and ecosystems

The aquatic environments of the Murray River contain potential habitat for a number of threatened fish occurring in the locality, namely the Eel Tailed-catfish (*Tandanus tandanus)* Silver Perch (*Bidyanus bidyanus*) and Murray Cod (*Maccullochella peelii*). These species are known to occur in the Murray River. The Eel Tailed Catfish swims along the sandy substrate of lakes and slow-flowing waterbodies which support

fringing vegetation. The Murray Cod is known to use snags for refuge and foraging. The Silver Perch may use the river bed for spawning. None of these species are considered likely to occur at the proposal site, or to be affected by the proposed work.

One Endangered Ecological Community, the Aquatic Ecological Community in Natural Drainage System of the Lower Murray River Catchment, was identified within the proposal area.

Wildlife Corridors in the proposal area

The landscape in the study area is highly modified, with vegetation generally fragmented and isolated from other vegetation. The main vegetated wildlife corridor follows the Murray River and provides a moderate level of connectivity between areas of remnant vegetation at Campbells Island State Forest to the north-west and the Koondrook-Pericoota Forest to the south east of the proposal area. The proposal area forms part of this narrow vegetated corridor.

6.3.3 Potential impact

The preferred method for the proposal would have the following general impact on flora and fauna:

- Clearing about 0.1 hectares of River Red Gum woodland
- Removal of one hollow bearing tree
- Removal of potential bat habitat from the bridge
- Disturbance to an existing noxious weed, and the potential of spreading weeds
- Disturbance to the bed of the river
- Sedimentation of the river from pile driving and other in-stream activities
- Partial blockage of the river through the use of coffer dams and/or instream rock platform.

The proposal may require the operation of a crane to assist with the removal of components of the bridge. Several options are possible, including:

- Crane on ground option

  This would involve the construction of a crane pad on the river bank downstream of the Victorian abutment. It would require the removal of an additional about 0.1 hectares of River Red Gum vegetation on the Victorian side of the river.

- Crane on barge in the river option

  This would involve operating a crane from a floating barge within the river. This option is only possible if the water level in the river is high enough for a barge to operate. This option would have minimal impact on flora and fauna, although there is a slight increase in risks from spills and leakages of plant on the barge affecting water quality.

- Crane on other work platform in the river option

  This would involve operating a crane from a temporary structure within the river. This option would have minimal impact on flora and fauna, although

there is a slight increase in risks from spills and leakages of plant on the barge affecting water quality.

A Planning Permit is required from Gunnawarra Shire Council for tree removal in Victoria. A Biodiversity Assessment was prepared specifically to address the requirements of this permit (Appendix I).

Vegetation clearing and habitat loss

The preferred method for the proposal would require the removal of about 0.1 hectares of River Red Gum vegetation on the Victorian side of the river to allow for the proposed temporary bridge to be constructed. Should clearing be needed for a crane pad on the bank of the river, further assessment of the impact and planning permit approval would be required.

In addition, ground cover vegetation would be disturbed and/or removed as part of the proposal. This vegetation consists mostly of exotic species and noxious weeds.

Weeds

The proposal has the potential to spread Bridal Creeper (a Class 4 noxious weed species) during vegetation removal and through the movement of vehicles and machinery into or out of the site.

Groundwater dependent ecosystems

The extraction of water from the coffer dams during the bridge work is considered to be minimal compared to the other demands on the water resource and is unlikely to alter groundwater levels such that they would have an impact on any groundwater dependent ecosystems surrounding the proposal site.

Habitat removal

The proposed work would remove about 0.1 hectares of woodland habitat next to the southern abutment of the bridge. This is unlikely to significantly reduce habitat for any native fauna species. The removal of this vegetation, together with the temporary operation of an additional bridge, may have a slight impact upon the wildlife using vegetation along the riverbank for movement. Such wildlife, however, is likely to be highly mobile and able to utilise habitats in disturbed environments. Therefore, any impact would be very minor and unlikely to prevent fauna using the vegetation corridor for movement.

The landscape in the study area is highly modified, with vegetation generally fragmented and isolated from other vegetation. The main vegetated wildlife corridor follows the Murray River and provides a moderate level of connectivity between areas of remnant vegetation. The existing bridge creates an approximate 10 metre gap in the canopy of riparian vegetation at this location. The proposal would extend this gap, on the Victorian side of the river, to about 30-40 metres. Species affected by connectivity are generally limited to arboreal mammals and some ground-dwelling mammals and reptiles. In particular, the sugar gliders and Koalas can be impacted by the loss of connectivity of habitat. However, it is considered that a 30-40 metres gap in connectivity, in this river landscape, would not be likely to prevent animals from moving through the study area. Sugar gliders are known to be able to traverse 30-60

meters, and Koalas are known to travel across the ground substantial distances. The removal of trees along the southern bank of the river is unlikely to create a gap which would prevent the movement of fauna through the area.

Microchiropteran bats

The proposal has the potential to impact bat habitat within the existing bridge through the removal of timber. Given there was no evidence of bats utilising the bridge structure, the impact is likely to be minor. The amount of habitat which would be removed is small in the regional context and is located in a highly disturbed road corridor.

Aquatic

Impact from the proposal on aquatic habitat and resources would come from:

- Constructing access ramps to pier four (the pier closest to Victoria). The ramps would be on both upstream and downstream sides of the bridge within 10 metres of the bridge abutment
- Installing a sheet piling cofferdam instream around pier four and the abutment on the Victorian side
- The use of cranes to lift the bridge trusses
- Removing trees affected by the work
- Replacing the piles and pier of pier four. The timber piles would be replaced with concrete piles and concrete pile caps. The timber pier would be replaced with timber
- Constructing a new concrete Victorian abutment about three metres behind the existing timber abutment
- Installing scour protection of the Victorian river bank both upstream and downstream of the existing bridge
- Constructing a temporary bridge upstream of the existing bridge which includes installing piers in the river
- Use of coffer dams.

The primary impact from instream work would be from the use of a rock platform to carry out construction work. Should this option be chosen, there is the potential for erosion to the bed and banks of the river downstream from changes to the way in which water flows around the platform. Further impact to aquatic flora and fauna would be limited to sedimentation of the river and potential pollution of the river from spills and leakages of oils and fuels.

Overall, the area of impact is small relative to the extent of aquatic habitat within the study area. Furthermore, the quality of aquatic habitat in the proposal area is poor given past and ongoing disturbance from infrastructure and the impact of river regulation.

Fish stranding is possible during the installation of the coffer dam. Measures would be in place to monitor fish stranding and relocate fish.

Some sedimentation is considered likely during piling and instream work, although the Murray River in the proposal area is already heavily sediment-laden and the

impact from the proposal is not expected to be noticeable in the river. Any sedimentation would have minimal impact upon aquatic habitats or resources.

The small area of impact along the river bank is unlikely to disrupt any breeding events or cause any impact to fish movement through the area. Given that the proposal would not block the river nor remove any habitats of value to any threatened fish species, the proposal is unlikely to impact upon them.

Threatened Species

Assessments of significance under the TSC Act were undertaken for microchiropteran bat species. The assessments of significance concluded that a Species Impact Statement is not required, given that:

- The extent of habitats which would be impacted is very small
- The quality of the habitats which would be impacted is generally poor
- The proposal is not likely to significantly affect connectivity or increase fragmentation or isolation of habitat such that any species' life cycle would be affected.

The Lowland Murray River aquatic EEC occurs within the study area and a 7 Part Test under the FM Act was undertaken for this community. This assessment concluded no significant impact would be likely on the EEC and the long-term survival of this aquatic community within the study area would not be threatened by the proposed work.

No assessments of significance or similar are required under Victorian legislation.

It is considered that the cumulative impact would not be significant.

Operational

The proposal would not have an additional impact on flora or vegetation communities during operation.

Operationally, the proposal is unlikely to result in any increase or change to the impact on fauna. Once the temporary bridge is removed, the proposal area would be restored and rehabilitated, and would operate similarly to the existing situation, although a reduction in connectivity for the Sugar Glider and other species would remain. The replacement of old timber with new timber may reduce the amount of potential habitat for bats in the bridge structure, however given there was no evidence that bats were using the structure currently, this is not likely to result in any impact in the future.

Impact on relevant key threatening processes

The proposal would involve the clearing of native vegetation, a key threatening process. The proposal would require the removal of a small amount of woodland vegetation from the proposed temporary crossing footprint. Construction of the proposal would directly impact on native vegetation as a result of vegetation clearance. Direct impact would be via the clearance of about 0.1 hectares of vegetation.

The proposal would also involve the removal of dead wood and dead trees. Areas of fallen timber are present within the riparian areas, adjacent to the existing bridge.

Any Coarse Woody Debris would be relocated to adjacent areas and managed in accordance with the requirements the Roads and Maritime *Biodiversity Guidelines* (RTA, 2011) - Guide 5 (CWD).

6.3.4 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
B1	Pre-clearing	Obtain a planning permit from Gannawarra Shire Council to remove or prune native vegetation on the Victorian side of the Murray River.	Project Manager	Pre-construction, During construction
B2	Minimise risks to native flora and fauna during construction	<u>Flora and Fauna Management Plan</u> A Flora and Fauna Management Plan will be prepared and implemented as part of the CEMP. It will address terrestrial and aquatic matters and include, but not necessarily be limited to: a) plans for the construction site and adjoining area showing native vegetation, flora and fauna habitat, threatened species and endangered ecological communities b) plans showing areas to be cleared and areas to be protected, including exclusion zones and protected habitat features (eg. hollow-bearing trees), and areas for rehabilitation or re-establishment of native vegetation c) requirements set out in the RTA Landscape Guideline d) procedures addressing relevant matters specified in the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects (RTA 2011) including but not limited to: - pre-clearing, including the outcomes of final flora and	Project Manager	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		fauna species checks, establishment of exclusion zones and on-ground identification of specific habitat features to be retained (such as hollow-bearing trees) - vegetation clearing and bushrock removal, including staged habitat removal and any specified seasonal limits on clearing activities - fauna handling and unexpected threatened species finds - rehabilitation, revegetation, re-use of soils, woody debris and bushrock, and other habitat management actions - weed and pathogen management e) procedures addressing relevant matters specified in the NSW DPI (Fisheries) Policy and guidelines for fish habitat conservation and management f) monitoring during construction and post-construction g) adaptive management measures to be applied if monitoring indicates unexpected adverse impact.		
B3	Minimise risks to native flora and fauna during construction	<u>Pre-construction check</u> Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects (RTA 2011).	Project Manager, Contractor	Pre-construction, During construction
B4	Minimise risks to native flora and fauna during construction	<u>Detailed design</u> Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be considered during the detailed design	Project Manager, Contractor	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		stage and implemented where practicable and feasible.		
B5	Protect native flora and fauna and avoid inadvertent impacts	<u>Unexpected threatened species</u> Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan, an unexpected finds procedure will be implemented in the event that a threatened species or ecological community that had not been identified and assessed by the REF is unexpectedly encountered during the construction process.	Project Manager	Post construction
B6	Protect native flora and fauna, minimise edge effects and avoid inadvertent impacts	<u>Exclusion zones and protected habitat features</u> Consistent with the approved Flora and Fauna Management Plan: - the limits of clearing within the construction site will be delineated using appropriate signage and barriers, identified on site construction drawings and during construction staff induction - vegetation and habitat features to be retained, such as hollow-bearing trees, will be clearly identified and protected by suitable fencing, signage or markings - identified areas containing habitat for microchiropterean bats, arboreal birds and woodland species will not be cleared during the breeding season between September	Project Manager, Contractor	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		and January, where practicable.		
B7	Protect native flora and fauna and avoid inadvertent impacts	<u>Stockpiles, plant and ancillary sites</u> Vehicle parking, machinery, construction compounds, material stockpiles and the like, will be located in cleared or disturbed areas, not within the drip-zone of vegetation to be retained or within other protected or exclusion zones identified in the Flora and Fauna Management Plan.	Project Manager, Contractor	
B8	Protect native flora and fauna	<u>Fauna handling</u> Fauna handling will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan.	Project Manager	Post construction
B9	Rehabilitation	<u>Rehabilitation</u> All areas disturbed during construction, including areas for stockpiles compound sites, temporary access roads and temporary work areas, would be stabilised and rehabilitated to prevent future erosion.	Project Manager, Contractor	During construction
B10	Minimise weed, pest species and pathogen risks	<u>Weed, Pest Species and Pathogen Management</u> Weed species will be managed in accordance with Guide 6: Weed Management of the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan.	Project Manager, Contractor	Pre-construction, During construction
B11	Support future rehabiliation or	<u>Topsoil management - future re-use</u>	Project Manager,	Construction

No	Impact	Environmental safeguards	Responsibility	Timing
	revegetation	Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, topsoil removed during construction, which has been assessed as low-risk for weeds and with good potential for containing indigenous flora seed material, will be stockpiled in cleared or disturbed areas for re-use in post-construction rehabiliation or revegetation. Until re-use occurs the stockpile will be managed in accordance with the RTA Stockpile Site Management Guideline.	Contractor	
B12	Restore and rehabilitate habitat	<u>Habitat management - species selection</u> Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan, locally indigenous plant species will be used during rehabiliation and revegetation.	Project Manager, Contractor	During construction
B13	Clearing of native vegetation	• Clearing of vegetation will be restricted to that assessed in the project REF and includes trees located within 30 metres east of the bridge along the southern riverbank. The limit of clearing would be delineated (eg temporary site fencing, flagging, earth bunding) along the river and at the stockpile and compound site. Clearing limits would be discussed in the site induction to ensure staff and contractors are made aware of limits of clearing	Project Manager, Contractor	During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		• Trees will be removed in such a way as not to cause damage to surrounding vegetation. This will ensure groundcover disturbance is kept to a minimum • Areas already impacted by previous clearing or disturbance will be used to minimise clearing where feasible. Trimming is preferred over removal where feasible.		
B14	Fauna and habitat impact Microchirop-teran bat species	• A bat management plan will be developed for the proposed work and must include the following: ○ Staff should be educated about microchiropteran bats, their ecological role, conservations significance, and the risk of disease with certain species ○ Undertake final inspection of the bridge components to be removed to locate any bat roost sites prior to the commencement of removing each component ○ If evidence of roost sites are identified, implement exclusion techniques such as the use of spotlights on the bridge at night, installing netting/ plastic sheeting once bats have left, starting an oxy-torch (to cut bolts) ○ If bats are observed emerging from the bridge components to be removed, work must cease and an	Project Manager, Contractor	During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		experienced ecologist with bat handling experience be consulted. ○ If roost sites in the form of hollow bearing trees have to be removed an experienced ecologist must be on hand to inspect each hollow prior to the destruction so bats can be excluded and or have time to relocate. ○ Timing of deck removal must avoid bat breeding and lactating periods (September-November).		
B15	Disturbance to fallen timber and dead wood	• Any snags located within the study area would be relocated to nearby areas of habitat, if necessary • DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat • Coarse Woody Debris will be placed within the nearby river bank and will be managed in accordance with the requirements the Roads and Maritime Biodiversity Guidelines (RTA, 2011) - Guide 5 (CWD).	Project Manager,	Pre-construction, During construction
B16	Temporary bridge construction – Barge for crane in river.	• Ensure the height of the river is sufficient to avoid contact with the stream bed • Ensure that the barge has a sufficient bund to prevent and spills entering the waterway. • Timing of work to occur outside of spawning of native fish species.	Project Manager	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
B16	Temporary bridge construction – Rock platform for crane in the river.	• Fish passage will be maintained throughout the site during the length of the work • Any snags located within the study area will be relocated to nearby areas of habitat, if necessary. • DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat.	Project Manager	Pre-construction, During construction
B17	Crane pads on the river banks (1 in NSW and 1 in VIC)	• DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat.	Project Manager, Contractor	Pre-construction, During construction
B18	Extra coffer dams may need to be built in the river for removal of piles, depending on design of temporary bridge	• Notify DPI Fisheries prior to any work within water land not included in the scope of this Biodiversity Assessment. • Any snags located within the study area will be relocated to nearby areas of habitat, if necessary. • DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat.	Project Manager, Contractor	Pre-construction, During construction
B19	Pre-clearing	• Obtain a planning permit from Gannawarra Shire Council to remove or prune native vegetation on the Victorian side of the Murray River.	Project Manager	Post construction

6.4 NSW Aboriginal heritage

6.4.1 Methodology

Jo Bell Heritage Services was engaged to undertake an assessment of Aboriginal heritage impact of the proposal. A report that explains the results of the investigations, 'Proposed Barham-Koondrook Bridge Upgrade Aboriginal Cultural Heritage Due Diligence Assessment Report', is provided in Appendix D.

The methodology included:

- Search of the Aboriginal Heritage Information Management System (AHIMS) conducted on 17 December 2014 within five kilometre radius of the proposal area
- National Native Title Register search
- Desktop investigation of land forms to see if Aboriginal objects are likely in the proposal area
- Survey of the NSW side of the proposal area, attended by two representatives from Jo Bell Heritage Services, two representatives from Moama Local Aboriginal Land Council and Roads and Maritime's Aboriginal Community Heritage Advisor on the 12 December 2014.

The heritage assessment report was completed in accordance with the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime, 2012) and applicable OEH guideline, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010*) (referred to as the Due Diligence Code from this point).

6.4.2 Existing environment

The proposal area lies within the Barababaraba language group, which forms a part of the West Kulin language area. It is understood the language group consisted of eight clans situated across both Victoria and New South Wales. The Mially Water clan was situated around Koondrook/Barham.

Barapa Barapa economy would have focused on the resources around the Murray River and larger creeks. Aboriginal people in the area remained hunter-gatherers.

The local Aboriginal people would have hunted kangaroo, emu and wallaby on the plains surrounding the proposal area. Birds, reptiles and fish from the river and creek systems of the proposal area would have been caught and used by people living in the area. Terrestrial plants such as the River Red Gum, herbs and grasses and aquatic plants such as Cumbungi all would have provided specialised food or utilitarian items.

A search of the AHIMS database indicated that there were two Aboriginal sites or objects within the five kilometre search area, the closest being about 1.25 kilometres north of the bridge site.

There are currently no Native Title claimant applications before the Native Title Tribunal for the proposal area.

According to the Due Diligence Code, landforms likely to hold Aboriginal objects include:

- Watercourses (or within 200 metres of)
- A sand dune system
- A ridge top, ridge line or headland
- A cliff face (or within 200 metres of)
- A cave, rock shelter, or a cave mouth (or within 20 metres of).

As the proposal area is located across and near the Murray River, there is archaeological potential. However, the proposal area has been disturbed by the construction of roads and agricultural activities.

During the site survey of the NSW side of the proposal area poor ground surface visibility was encountered. Site survey results include:

- No Aboriginal places or objects were identified
- No further undisturbed landscape features or landforms likely to contain Aboriginal objects or sites were identified.

6.4.3 Potential impact

Construction work which disturbs the soil profile has the potential to uncover and damage artefacts. However, given the highly disturbed nature of the proposal area:

- The likelihood of finding sub-surface Aboriginal heritage values within the proposal area is low
- The likelihood of identifying intact, *in situ* Aboriginal cultural heritage is extremely low.

The following safeguards and mitigation measures outline the procedures that must be followed should excavation work uncover any unexpected archaeological finds.

6.4.4 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
AH1	Unexpected finds	Unexpected finds The Standard Management Procedure - Unexpected Heritage Items must be followed in the event that a known or potential Aboriginal object(s), including skeletal remains, is found during construction. This applies where RMS does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work may only re-commence once the requirements of that Procedure have been satisfied.	Project Manager, Contractor	Pre-construction, During construction

6.5 Victorian Aboriginal heritage

6.5.1 Methodology

The following investigations and reporting were carried out to assess the likelihood of impact on Aboriginal heritage in Victoria:

- **Desktop search**

  A search of the Victorian Aboriginal Heritage Register (VAHR) was carried out by Jo Bell Heritage Services on 9 December 2014.

- **Site survey**

On 13 January 2015 a site survey was carried out by two archaeologists from Jo Bell Heritage Services, two representatives from Barapa Barapa Nation Aboriginal Corporation (BBNAC) and one representative from Wamba Wamba Wadi Wadi Barapa Barapa First Nations Aboriginal Corporation (WWWWBBFNAC).

Given the Victorian river bank was so steep, a second survey was done on 31 March 2015 to view the bank by boat. This survey was attended by two archaeologists from Jo Bell Heritage Services, two representatives from BBNAC, one representative from WWWWBBFNAC and two representatives from Roads and Maritime. Four attendees surveyed from the river in a boat and three attendees assisted from the bank.

- **Cultural Heritage Management Plan** (CHMP)

  A CHMP was prepared by Jo Bell Heritage Services. A copy of the plan is provided in Appendix E. The CHMP is a mandatory plan under the Victorian Aboriginal Heritage Act 2006. The CHMP includes protocols for the management of Aboriginal cultural heritage found during the proposed work, including notification procedures.

The results of these investigations are discussed below.

6.5.2 Existing environment

The Barham-Koondrook bridge is in an area of cultural heritage sensitivity given its location on the Murray River. The proposal area has not been subject to archaeological survey or assessment in the past.

A VAHR search did not identify any registered Aboriginal places within 200 metres of the proposal area. In the geographic region there are 466 Aboriginal places including ancestral remains, artefact scatters, artefacts, objects, scarred trees and shell middens. There are 10 historical reference reports including:

- One property where people are known to have worked
- One pre-contact food resources/areas where people continued to procure food
- One spiritual place
- One land owned by Aboriginal people
- Two places of recreation
- Three locations of 'Board for the Protection of Aborigines' depots
- One location of burials within cemeteries.

The results of the desktop assessment indicated that a standard assessment was required to further investigate the potential for Aboriginal cultural heritage to be located within the proposal area and verify the results of the desktop assessment.

The results of the site surveys showed no Aboriginal cultural heritage or areas likely to contain Aboriginal cultural heritage. A summary of the findings of the standard assessment survey includes:

- A shell midden was identified outside of the proposal area in a steep section of bank over 400m upstream of the proposal area
- All mature trees were examined for cultural scarring. No scarred trees were identified
- No caves or rock shelters were present within the proposal area

- A discrete area of burnt clay was observed near a pump downstream of the bridge. This was determined to be the result of natural processes, such as burnt tree roots
- The proposal area has been cleared of most of its native vegetation and parts have been disturbed by the building of the original Barham-Koondrook Bridge
- The punt crossing area and the detour route have also been significantly disturbed by previous and current land use.

6.5.3 Potential impact

Construction work which disturbs the soil profile has the potential to uncover and damage artefacts. However, given the highly disturbed nature of the proposal area:

- The likelihood of finding sub-surface Aboriginal heritage values within the proposal area is low
- The likelihood of identifying intact, *in situ* Aboriginal cultural heritage is extremely low.

The following safeguards and mitigation measures outline the procedures that must be followed if excavation work uncovers any unexpected archaeological finds.

6.5.4 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
AH2	Accidental discovery of items of Aboriginal cultural significance	• All contractors and/or employees of contractors who are supervising work during the activity in relation to earthmoving or ground disturbance will attend an on-site cultural heritage induction. • The on-site cultural heritage induction must cover: a. The specific requirements of this CHMP; b. The contingency plans contained in this CHMP; and c. Cultural awareness training.	Pre-construction, During construction	Pre-construction, During construction

6.6 Non-Aboriginal heritage

6.6.1 Methodology

The potential and identified non-Aboriginal heritage items within the study area were identified by heritage database searches of all relevant statutory and non-statutory heritage registers including:

- Australian Heritage database
- NSW State Heritage Register
- NSW State Heritage Inventory

- National Trust Register
- LEP
- RMS S170 Heritage and Conservation Register.

One State Heritage-listed item, the Barham-Koondrook Bridge, is located within the proposal area. A detailed Statement of Heritage Impact was prepared to assess the potential impact of the proposal on the heritage values of this bridge (Appendix J).

No other heritage-listed items occur near the proposal site. Refer to Appendix C for search results.

6.6.2 Existing environment

The Barham-Koondrook Bridge is a DeBurgh Truss Bridge and is assessed as being of state heritage significance, primarily on the basis of its location, setting and materials.

The bridge was included on the State Heritage Register in 2000 because it met historical, aesthetic and social significance assessment criteria. The Barham-Koondrook Bridge has historical significance as a rare example of a type of bridge which shows the evolving pattern of bridge design in Australia.

The De Burgh timber bridge was built at various locations in New South Wales between 1899 and 1904. Of the nine remaining, four are to be retained for conservation. The only two examples 'De Burgh' lift spans are located at Barham-Koondrook and Cobram-Barooga and both would be retained as part of the timber truss strategy.

The Barham-Koondrook bridge was built by Monash and Anderson in 1904. It has aesthetic significance due to its outstanding setting and landmark qualities. The Barham-Koondrook Bridge also has high significance to the local and district residents as the gateway between Barham and Koondrook, NSW and Victoria. As the towns are not large there is considerable commuting across the bridge for services that are not duplicated in both towns. The bridge also provides a focal point between town and river. The river is the main geographical feature in the area, and the centre for most recreation. The bridge is a reminder of the part it played in the important era of Australian history, the river trade and continues serving the important north/south inland stock route from Queensland to Melbourne.

Further information can be found in the Statement of Heritage Impacts (SoHI) prepared by Roads and Maritime for the proposal contained in Appendix J.

6.6.3 Policy setting

The statutory listings that are relevant to the Barham-Koondrook bridge are:

- NSW State Heritage Register (SHR)
- NSW Roads and Maritime section 170 Heritage and Conservation Register
- Victorian Heritage Register.

All statutory and non-statutory heritage listings are detailed in the SoHI provided in Appendix J and summarised in Table 6-3 below:

Table 6-3 Statutory and non-statutory heritage listings (Source: SOHI)

Australian Heritage Database	Not listed
NSW State Heritage Register	Listed
Victorian Heritage Register	Listed
Wakool Local Environmental Plan 2013	Listed with state significance
National Trust Register	Listed at state level
Roads and Maritime s170 Heritage and Conservation Register	Listed with state significance

Approval to carry out work, other than routine maintenance, on a state listed item must be sought from the approval body, the Heritage Council of NSW. Under the Act Roads and Maritime is required to obtain a section 60 permit from the Heritage Council in order to conduct the work outlined in this report.

The future management and conservation of all Roads and Maritime managed timber truss bridges have been addressed in the Timber Truss Revised Conservation Strategy (2012) (hereafter referred to as the Strategy). The NSW Heritage Branch endorsed the Strategy. A total of 26 bridges were identified for long-term conservation, including the Barham-Koondrook Bridge.

Consultation with Heritage Victoria has been carried out about the proposed work on the bridge. Heritage Victoria has advised that heritage matters can be dealt with by the NSW Heritage Branch under NSW legislation.

6.6.4 Potential impact

An assessment of the potential impact to the heritage values of the Barham-Koondrook Bridge are detailed in the SoHI, prepared by Roads and Maritime and provided in Appendix J. The SoHI found that that the proposed work would not result in any significant reduction in the heritage value of Barham-Koondrook Bridge. While some of the proposed work would take place on elements of the bridge rated as high or moderate heritage significance, taken as a whole they would be carried out in a manner that is sympathetic to the character of the Bridge. The proposed modifications would bring the bridge into line with its current level of usage in the most sympathetic manner available and would avoid the need to replace the bridge.

Given the heritage significance of the Bridge, the NSW Office and Environment and Heritage would be consulted to finalise the methodology for repainting the lift span. A safeguard would be included to ensure this procedure is followed.

6.6.5 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
NAH1	Unexpected finds	Unexpected finds Should any heritage items, archaeological remains or potential relics of Non-Aboriginal origin be encountered, then construction work that might affect or	Project Manager, Contractor	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		damage the material must cease and notification provided to the relevant RMS officer identified in the RMS Standard Management Procedure - Unexpected Archaeological Finds. Work may only re-commence once the requirements of that Procedure have been satisfied.		
NAH2	Enhancing public understanding and awareness	<u>Heritage interpretation</u> A Non-Aboriginal Heritage Interpretation Strategy will be prepared and implemented to promote community understanding and awareness of the site's heritage values. The Strategy will be prepared in accordance with guidelines published by the Office of Environment and Heritage.	Project Manager	Pre-operation
NAH3	Legislative requirement	Roads and Maritime have obtained a Section 60 Approval for the proposal. All conditions of the approval must be followed as listed below. <u>Nominated heritage consultant</u> • A heritage consultant shall be nominated for the project. Their name is to be submitted to the Heritage Council of NSW and approved prior to the commencement of work • The nominated heritage consultant is to provide advice on the detailed design, undertake on-site heritage inductions and inspect the demolition and removal of material to ensure that no significant fabric or elements are damaged or removed • All work shall be carried out by suitably qualified tradespeople with practical experience in conservation and restoration of similar heritage items. The nominated heritage	Project Manager	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
		consultant shall be consulted prior to the selection of appropriate tradespeople. <u>Site protection and work</u> • Significant building fabric and elements are to be protected during the works from potential damage. Protection systems must ensure historic fabric is not damaged or removed • The installation of new services shall be carried out in such a manner as to minimise damage to or removal of historic fabric and shall not obscure historic features. <u>Archival recording</u> A report must be provided to the Heritage Division at the completion of work that includes: • An archival photographic recording of the bridge undertaken prior to and during the work, in accordance with the Heritage Council document, Photographic Recording of Heritage Items using Film or Digital Capture • A summary of the work, up to 5 pages, including a description of the work undertaken, the methodology and any other relevant matters.		
NAH 4	Changes to the heritage values of the bridge	An archival recording be prepared for Barham-Koondrook Bridge. This should follow the guidelines for Items of State Heritage Significance as outlined in the NSW Heritage Branch publication How to Prepare Archival Records of Heritage Items.	Project Manager	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
NAH 5	Changes to the heritage values of the bridge	Methodology for painting the lift span will be finalised during detailed design in consultation with the NSW Office of Environment and Heritage - Heritage branch.	Project Manager	Pre-construction

6.7 Noise and vibration

An assessment was carried out to identify the extent and magnitude of the potential noise and vibration impact associated with the proposal. The assessment is documented in Appendix K, and summarised below. The NSW construction noise criteria were used to assess construction noise impacts in both NSW and Victoria.

6.7.1 Existing environment

The proposal is largely surrounded by residential, commercial and industrial premises. One school is located near the proposal site. Several passive recreation areas are also located near the proposal site, mostly associated with the river (Figure 6-5).

Environmental noise monitoring was carried out at a total of seven residential locations throughout the township (Figure 6-5). The measured noise levels have been used to establish existing road traffic noise levels. This is used to model operational noise, as well as assess potential noise impacts during construction. The noise monitoring locations were selected to be representative of receivers and communities potentially affected by the construction and operation of the proposal.

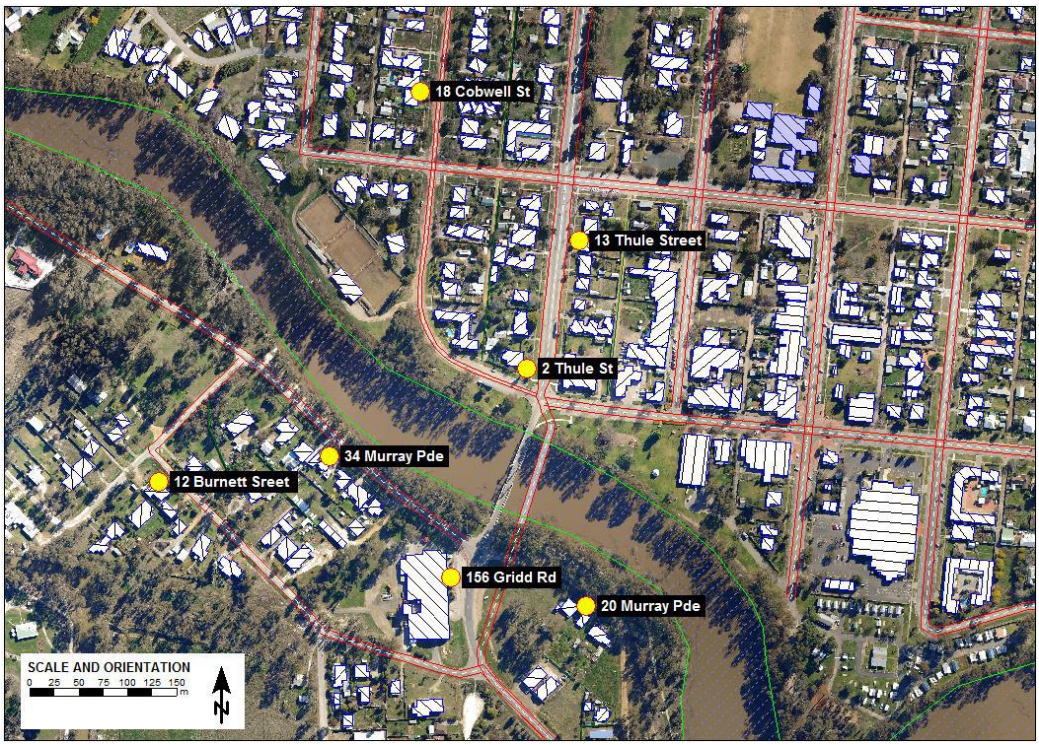

Figure 6-5 Background noise monitoring locations

The results of the background noise monitoring are presented in Table 6-4. Road traffic noise typically vary throughout the day. As such the day time (LAeq(15hour)) and night time (LAeq(9hour)) noise indices are used as they represent the average noise level that prevails during the daytime (7.00 am to 10.00 pm) and night-time (10.00 pm to 7.00 am) periods.
In general, road traffic noise at all receivers is considered low.
Table 6-4 Results of the noise monitoring survey

Address	Construction noise indices (dBA)		
	Daytime period	Evening period	Night-time period
12 Burnett St	33	34	37
2 Thule St	42	40	32
13 Thule St	36	35	30
18 Cobwell St	32	35	32
20 Murray St	38	38	37
34 Murray St	38	38	37
156 Gridd Rd	42	37	32

6.7.2 Policy setting

Noise from the operation of the proposal is required to be assessed in accordance with guidelines provided in the NSW Road Noise Policy (RNP) (NSW Environment Protection Agency, 2011) as interpreted by Roads and Maritime in the Noise Criteria Guideline (NCG) (Road and Maritime, 2014). The NCG provides a consistent approach to identifying road noise criteria for Roads and Maritime Services projects and meets the intention of the RNP. Guidance for additional noise mitigation is taken from the Noise Mitigation Guideline (NMG) (Roads and Maritime, 2014). Guidance for assessing the potential for sleep disturbance from maximum noise events is taken from Practice Note III in the Environmental Noise Management Manual (ENMM) (Roads and Maritime, 2001).

Construction noise has been assessed in accordance with the Interim Construction Noise Guideline (ICNG) (NSW Department of Environment and Climate Change, 2009). Construction road traffic noise has been assessed taking guidance from the noise assessment procedure contained in the RNP. Vibration from construction has been assessed in accordance with Assessing Vibration: A Technical Guideline (NSW Department of Environment and Conservation, 2006).

Construction vibration

Vibration from construction activities must comply with Assessing Vibration – A Technical Guideline (DECC, 2006), British Standard BS 6472-1992, Evaluation of Human Exposure to Vibration in Buildings (1-80Hz, The Australian Standard AS2187.2-2006 Explosives – Storage, Transport and Use and Australian and New Zealand Environment Council (ANZEC) guidelines. These guidelines detail a range of criteria used to determine the vibration impact on sensitive receivers.

The Standard sets values for building vibration based on the lowest vibration levels above which damage has been demonstrated.

6.7.3 Criteria – Operational Road Traffic Noise

Roads and Maritime Noise Criteria Guideline

This assessment has been prepared with guidance from the Noise Criteria Guideline (NCG). As the alignment options are only to remain in place until after the completion of the rehabilitation work, the usual approach of considering ten years after completion is not applicable. The approach adopted for this proposal is to assess the impact of the temporary bridge and detour roads whilst they are in operation.

Table 6-5, taken from the noise assessment in Appendix K, summarises the assessment criteria for residences to be applied to the proposal. Table 6-6, also from the noise assessment, summarises the criteria for non-residences.

Table 6-5 Criteria for residential land uses

Road category	Type of project/land use	Assessment criteria	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway / arterial / sub-arterial Roads	Existing Residences affected by noise from **new** freeway / arterial / sub-arterial road corridors	LAeq(15hour) 55	LAeq(9hour) 50

Table 6-6 Criteria for non-residential land uses

Existing sensitive land use	Assessment Criteria dBA		Additional Considerations
	Day (7am – 10pm)	Night (10pm – 7am)	
School Classrooms	LAeq(1hour) 40	N/A	
Open Space (active use)	LAeq(15hour) 60	N/A	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
Open Space (passive use)	LAeq(15hour) 55	N/A	Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading.

6.7.4 Criteria – NSW Interim Construction Noise Guideline

Construction noise for this proposal has been assessed in accordance with the Interim Construction Noise Guideline (ICNG) (DECC, 2009). The guideline was developed to assist with the management of the noise impact, rather than to present

strict numeric noise criteria for construction activities. The ICNG identifies a noise management level (NML), which is the project specific noise criteria used to assess the level of impact at a receiver location. The NML is derived from the existing background noise levels at representative monitoring locations. The NML is also categorised for non-residential receivers with recommended noise criteria for both standard construction hours and for work to be carried out outside of standard hours.

Residential

Relevant NML for residential receivers for this proposal are provided in Table 6-7.

Table 6-7 Recommended noise management levels for construction noise at residential locations

Time of Day	**NML, LAeq(15min)**	**How to Apply**
Recommended standard hours: Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm No work on Sundays or public holidays	Noise affected RBL+ 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. The proponent should also inform all potentially impacted residents of the nature of the work to be carried out, the expected noise levels and duration, as well as contact details
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the work proceeds, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the work, and by describing any respite periods that would be provided.
Outside recommended standard hours	Noise affected RBL + 5 dBA	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Non-residential

For other relevant land uses within the proposal area, the following noise criteria would apply:

- Industrial premises: LAeq(15minute) 75 dBA
- Offices, retail outlets: LAeq(15minute) 70 dBA.

6.7.5 Potential impact

Construction noise

The proposed construction work would be carried out using standard plant and equipment commonly used on similar sites. The construction noise assessment conducted for the proposal, provided in Appendix K, predicts exceedances of the NML at a large number of receptors for most of the construction stages. This is shown in Table 6-8. The assessment represent a worst case scenario. The large number of exceedances is partly due to the very low background noise levels (RBL) experienced in the proposal area, and the high number of receivers near to the proposed work. It is expected that noise levels during the majority of the construction work would be lower than these predicted levels.

Table 6-8 Construction noise levels at sensitive receivers

Predicted Noise Range (dBA)	Number of Receptors within Predicted Noise Range for Scenario					
	1. Driven / sheet piling works	2. Install span to temporary bridge	3. Remove old decking & clean metalwork	4. Install new timber decking	5. Install trusses to bridge	6. Temporary bridge removal
> 75	28	0	0	0	0	2
70 to 75	68	0	3	2	0	7
65 to 70	84	2	6	4	2	23
55 to 65	180	17	57	53	17	109
50 to 55	16	34	58	47	33	97
45 to 50	0	45	100	94	47	65
40 to 45	0	95	91	93	91	44
Number of receptors that would exceed the NML	**376**	**68**	**163**	**140**	**63**	**276**

In order to minimise the potential noise and vibration impact upon nearby sensitive receivers, the majority of the construction work is proposed to be carried out during standard daytime periods (7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays with no work on Sundays or public holidays). Some out of hours works may be required at times during the construction work. These would be

managed through the implementation of safeguards including some targeted notification and consultation procedures during high-noise activities, such as piling.

A brief discussion of the various scenarios is provided below.

Scenario 1 – Driven / Sheet Piling Work

The largest impact during the entire construction program is expected to occur during the piling work, required for the construction of the temporary bridge and coffer dam. During this work the noise at up to 28 receptors (located within approximately 150 m of the work area) are predicted to exceed the highly noise affected range.

The predicted noise from the piling work at the closest affected residential premises on Murray Parade (southwest of the temporary bridge) was up to 83 dBA. This is an exceedance of the daytime NML of 45 dBA.

As noise levels at both the residential and commercial / industrial receivers are predicted to exceed the highly noise affected levels, a high level of impact is probable during this work. Mitigation measures would assist in reducing the impact of noise from this work.

Scenario 2 – Install Span to Temporary Bridge

During this work the highest noise level was predicted to occur at the Royal Hotel located to the north east of the existing bridge. The noise level is predicted to be up to 67 dBA during the noisiest part of this activity. The noise levels are due to the operation of the cranes required to install the span to the temporary bridge.

The predicted noise levels at the closest residential receivers to the work is between 55 dBA and 60 dBA. For dwellings more than 150 metres from the temporary bridge, the predicted noise levels are typically below 55 dBA. Although this would still result in exceedances of the NML criteria, the exceedances are fairly minor and are likely to be tolerated.

Scenario 3 & 4 – Remove / Install Timber Decking to Bridge

There are no predicted exceedances of the highly noise affected criteria for these scenarios. The highest noise levels for both stages (up to 73 dBA) were predicted at the Orange Factory at 156 Grigg Road.

The results predicted during these stages would exceed the NML criteria at a large number of receptors. However, the high levels are mostly due to the operation of particularly loud items of hand operated equipment (such as chainsaws). This equipment is unlikely to be used throughout the entire day, and instead used sporadically for short periods of time. Where the chainsaws are not used a significant reduction (up to 10 dBA) in noise levels is predicted.

Scenario 5 – Install Trusses to Bridge

The expected noise levels from this stage of works are similar to those for Scenario 2, as both scenarios would require the use of a crane. The highest predicted noise level was 67 dBA at the Royal Hotel located opposite the intersection to the north of the bridge.

It is expected that the predicted noise levels would generally be tolerated given that work would be conducted during the day only.

Scenario 5 – Temporary Bridge Removal

The noise levels from this activity were predicted to exceed the highly noise affected criterion at up to two properties; the Royal Hotel and one location on Murray Pde.

The noise levels predicted during this stage are dominated by the excavator mounted rock breaker required to remove the concrete piles for the temporary bridge.

Construction vibration

Vibration intensive activities (earthwork and piling) are not expected to take place at distances close enough to cause structural damage to any buildings. Some residents may feel the effects of vibration during activities such as the use of rock breakers, excavators, piling activities and heavy vehicle movements. As work is to take place during the day only, any vibration is likely to be tolerated.

Operational traffic noise

Changes to the traffic noise would only occur during the operation of the temporary bridge. The assessment conducted for this proposal, provided in Appendix K, found that:

- Receivers along Thule St would not experience any change in noise levels
- Properties along Vine St and Burnett St are expected to experience elevated noise levels due to the closure of Murray Pde, the closures would be for periods less than one week. The increase is approximately 10 dBA due increased traffic movements.

Results of the modelled scenarios are summarised in Table 6-9 and Table 6-10.

Table 6-9 Number of receivers potentially effected by noise - Residential

Route	Number of dwellings which could be exposed to noise levels >55 dBA, daytime	Number of dwellings which could be exposed to noise levels >50 dBA, night-time
Existing	51	16
Temporary Bridge	54	23

Table 6-10 Number of receivers potentially effected by noise – Non-residential

Route	Schools which could be exposed to noise levels > 40 dBA internal	Open Space passive users which could be exposed to noise levels >55 dBA
Existing	1	0
Temporary Bridge	1	0

The assessment also concluded that night time disturbances from noise would be unlikely to change for sensitive receivers as a result of the proposal.

6.7.6 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
NOISE 1	Minimise noise and vibration risks during construction	<u>Noise and Vibration Management Plan</u> A Noise and Vibration Management Plan will be prepared and implemented as part of the CEMP. The Plan should generally follow the approach in Practice Note VI of the RTA Environmental Noise Management Manual and identify: - all potential significant noise and vibration generating activities associated with the activity - measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, staging, placement and operation of work compounds, parking and storage areas, temporary noise barriers, haul road maintenance, and controlling the location and use of vibration generating equipment - feasible and reasonable mitigation measures to be implemented, determined in accordance with OEH's Interim Construction Noise Guideline and taking into account the RMS Beyond the Pavement urban design policy, process and principles - a monitoring program to assess performance against relevant noise and vibration criteria - arrangements for consultation with affected neighbours and sensitive	Project Manager, Contractor	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
		receivers, including notification and complaint handling procedures - contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.		
NOISE 2	Minimise risks to local and sensitive receivers	<u>Standard construction hours</u> • Monday to Friday 7.00 am to 6.00 pm • Saturdays 8.00 am to 1.00 pm. • No construction on Sundays or Public Holidays.	Project Manager, Contractor	Pre-construction, During construction
NOISE 3	Community notification	<u>Local community notification - sensitive receivers</u> All sensitive receivers (eg. schools, local councils) likely to be affected must be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification must include details of: the project; construction period and construction hours; contact information for project management staff; complaint and incident reporting; and how to obtain further information.	Project Manager, Contractor	Pre-construction, During construction
NOISE 4	Working hours	• If possible, restrict the hours that noisy activities such as the use of rock breakers, jack hammers and piling rigs will occur, taking into account times identified by the community when they are less sensitive to noise (such as mid-	Project Manager, Contractor	During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		morning or mid-afternoon for work near residences) and whether the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.		
NOISE 5	Noise during the removal of the temporary bridge	If the temporary piles are broken by rock hammer, attended noise monitoring should occur with a focus on the 'Recommended Area' identified in Figure 9 of the Noise and Vibration Impact Assessment (Appendix K)	Project Manager, Contractor	During construction
NOISE 6	Noise monitoring	Attended noise monitoring will be undertaken during the pile driving work to confirm the predicted noise levels	Project Manager, Contractor	During construction
NOISE 7	Staff training	Briefing of the work team in order to create awareness of the locality of sensitive receivers and the importance of minimising noise emissions.	Project Manager, Contractor	Pre-construction, During construction
NOISE 8	Community information	• Prior to piling activities commencing, a letterbox drop will be conducted to all occupants of buildings within the 'Recommended Area' highlighted in Figure 8 of the Noise and Vibration Impact Assessment (Appendix K) to inform them of the proposed works ahead of time. This letter will outline the proposed timing and duration of work as well as provide the community with a contact number or liaison officer available	Project Manager	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		to adequately respond to all project related enquiries • An additional letterbox drop will be undertaken prior to the commencement of piling activities.		
NOISE 9	Vibration impacts	• All construction works should be carried out Monday to Friday, 7:00 am to 6:00 pm, where possible • When working close to sensitive receivers, use lower vibration generating items of plant and equipment where possible eg smaller vibratory rollers and hydraulic hammers • Minimise consecutive vibration intensive works in the same locality (if applicable).	Project Manager, Contractor	Pre-construction, During construction

6.8 Landscape character and visual amenity

6.8.1 Existing environment

The Barham-Koondrook Bridge has aesthetic significance due to its outstanding setting and landmark qualities. The bridge provides a gateway between NSW and Victoria.

The surrounding area is developed urban land with picturesque public reserves and parkland along the river. The land is mostly flat with the exception of the banks of the Murray River. River Red Gums along the river's edge provide aesthetic values to road users as well as the parkland areas along the foreshore.

6.8.2 Methodology

The following proposed work would have an impact on the landscape character and visual amenity of the area:

- The removal of River Red Gum trees along the river in Koondrook to build the temporary bridge
- Temporary bridge approach road in Koondrook
- If crane pads are needed on the banks of the river, trees would need to be removed. Crane pads on the river banks is not the preferred option

- The establishment of a compound and stockpile site upstream of the bridge in Koondrook
- The installation of hard rock for scour protection
- Options for a work platform in the river.

Key viewpoints were determined from site investigations, as listed below:

- View of the river banks from the river
- View of the bridge area from residences along Murray Parade
- View of the bridge area from Riverside Park in NSW
- View of the bridge area from Victorian river reserve.

The potential landscape character and visual impact of the proposal has been assessed in relation to the key viewpoints. The assessment considered the magnitude of visual change and the distance from the viewer, as well as the sensitivity. The sensitivity refers to the quality of the view and how sensitive it is to the proposed change. The categories of magnitude and sensitivity of visibility are defined in Table 6-11.

The combination of sensitivity and magnitude then provides an overall landscape character and visual impact rating based on the grading matrix shown in Table 6-12. This table has been reproduced from Roads and Maritime's 'Environmental Impact Assessment Practice Note: Guideline for landscape character and visual impact assessment' (Roads and Maritime, 2013).

Table 6-11: Magnitude and sensitivity of visibility

Rank	Description
Negligible	Very minor loss or alteration to one or more key elements/features/characteristics of the baseline visual character and/or introduction of elements that are consistent with the existing visual character.
Low	Minor loss of or alteration to one or more key elements/feature/characteristics of the baseline visual character and/or introduction of elements that are consistent with the existing visual character.
Moderate	Partial loss of or alteration to one or more key elements/features/characteristics of the baseline visual character and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic.
High	Substantial to total loss of key elements/features/characteristics of the baseline visual character and/or introduction of elements considered to be totally uncharacteristic.

Table 6-12 Landscape character and visual impact grading matrix

Sensitivity	Magnitude: High	Magnitude: Moderate	Magnitude: Low	Magnitude: Negligible
High	High Impact	High-Moderate Impact	Moderate Impact	Negligible Impact
Moderate	High-Moderate Impact	Moderate Impact	Moderate-Low Impact	Negligible Impact
Low	Moderate Impact	Moderate-Low Impact	Low Impact	Negligible Impact
Negligible	Negligible Impact	Negligible Impact	Negligible Impact	Negligible Impact

6.8.3 Potential impact

Temporary bridge and vegetation removal

The main visual amenity impact would be from the temporary bridge and the removal of vegetation to build the bridge and for crane pads if needed.

Table 6-13: Landscape character and visual impact of temporary bridge and tree removal

Viewpoint	Visual sensitivity	Magnitude	Overall impact	Comments
View from the river for river users	Low	Moderate	**Moderate-Low Impact**	Given the bends in the river, the existing bridge and the existing riverside vegetation, the proposed work would not be visible to river users until they were quite close to the bridge. The temporary bridge would not be a permanent impact. When completed, trees would be replanted to minimise permanent changes to the visual amenity. The trees would be as mature as practical.
View from Riverside Park, NSW	Moderate	Moderate	**Moderate Impact**	The alignment of Thule Street and Grigg Road would be altered slightly to access the temporary bridge. Vegetation would be

Viewpoint	Visual sensitivity	Magnitude	Overall impact	Comments
				removed from the Victorian bank with the possibility of more vegetation removal for the crane pad on the ground option. This would affect the visual amenity for the community using Riverside Park in NSW. The temporary bridge and the loss of vegetation would be visible from the park, however the loss of view would not be complete given the vegetation on the NSW river bank and the vegetation that would be untouched along the river bank in Victoria.
View from the reserve in Victoria upstream of the bridge	Moderate	Moderate	**Moderate Impact**	The loss of vegetation along the Victorian river bank would have the most impact on the visual amenity for the public using this reserve. The vegetation to be removed contributes to the visual amenity of the reserve. This impact would be reduced in the long term through the planting of trees.
View from Murray Parade residences upstream of the bridge	Negligible	Low	**Negligible Impact**	The private view from Murray Parade residences facing the river is unlikely to be impacted given that the houses face away from the work site.
View from the road network for road users	Low	Low	**Low Impact**	Given the land is very flat in and around Barham and Koondrook there is little opportunity to view the work site from height along the road network. The visual amenity of road users would only be impacted when close to the work site. Other views would be brief in between buildings and structures in the town. The impact on road users would be low given the limited available view from the road network and the temporary bridge would be a structure normally seen while crossing a river.

Other visual changes

Rock scour protection is often associated with infrastructure including bridges. It is unlikely that the addition of these elements to the river bank would reduce the visual amenity or landscape character of the area.

A landscape character and visual impact would be generated from the construction or installation of a work platform in the river. Although the work platform options would have an impact on the visual amenity of the area, these would be temporary and would be restored when the work has been completed.

The bridge restoration work has been carefully designed to minimise the impact on the heritage significance of the bridge. The proposed design is considered to have the least impact on the character of the bridge while providing the structural support needed to ensure the continued use of the bridge.

The Victorian temporary bridge approach road would be constructed over vacant land in Koondrook. The road would have an impact on the landscape character and visual amenity of the area however this would be temporary while the temporary bridge is in use. The area would be restored when the work has been completed.

The Victorian compound would have a landscape character and visual impact on the area, particularly for local residents and road users. This impact however would be temporary with the compound to be removed when the work is completed.

6.8.4 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
UD1	Pre-construction / detailed design	<u>Urban Design and Landscape Plan</u> An Urban Design and Landscape Plan will be prepared in consultation with Gannawarra Shire Council to support the final detailed project design and implemented as part of the CEMP. The Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: - location and identification of existing vegetation and proposed landscaped areas, including species to be used (cross-referencing any relevant specified biodiversity	Project Manager	Post construction

No	Impact	Environmental safeguards	Responsibility	Timing
		safeguards) - built elements including retaining walls, bridges and noise walls - pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings - fixtures such as seating, lighting, fencing and signs - details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage - procedures for monitoring and maintaining landscaped or rehabilitated areas.		
UD2	Minimise visual and landscape impacts during construction	Work sites Project work sites, including construction areas and supporting faciltities (such as storage compounds and offices) will be managed to minimise visual impacts, including appropriate storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials.	Project Manager, Contractor	During construction
UD3	Visual amenity	• Mature trees will be used for revegetation as much as possible and practical.	Project Manager	Post Constructio n

6.9 Air quality

6.9.1 Existing environment

The existing air quality at and around Barham and Koondrook is typical of a rural area and is generally considered to be good. Air quality varies each season due to the dry nature of the area and the surrounding agricultural land use. Emissions from vehicles and dwellings would be low due to the low density of housing and industry in Barham and Koondrook.

Sporadic dust storms during droughts or towards the end of summer when high wind conditions are prevalent would temporarily decrease air quality within the region.

Based upon annual wind data obtained from the Bureau of Meteorology website for Kerang, located about 21 kilometres south-west of Barham, the predominant wind direction is from the south in the morning and from the west in the afternoon.

6.9.2 Potential impact

Construction

Excavation would be required as part of the proposed work which may result in airborne dust, especially during windy conditions. Excavated material including soils and chipped vegetation would be transported by trucks which may also be a source of airborne dust if loads are not adequately covered.

Impacts to local air quality could also occur as a result of exhaust fumes from construction plant and vehicles and the removal of existing road pavements. The potential receivers most affected would include motorists and local residents, though impacts would be highly localised and temporary.

It is considered unlikely that the proposed work would cause a significant impact on air quality. Dust generating activities would be short in duration and the impact would be appropriately managed and minimised through the implementation of the safeguards and mitigation methods listed below.

Operation

While traffic over the Barham-Koondrook bridge may increase over the next 20 years, the proposal itself would not generate additional traffic. As there would be no real change to the volume of traffic through the proposal area, there would be no change in operational air quality.

6.9.3 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
AIR1	Community notification	Local community notification - sensitive receivers All sensitive receivers (eg. schools, local councils) likely to be affected must be notified at least five days prior to commencement of any works associated with the activity that may have an adverse impact on local air quality. The notification must include details of: the project; construction period and construction hours; any recommended measures that can be implemented (eg. window closure, staying indoors, etc), contact information for project management staff; complaint and incident reporting;	Project Manager	Pre-construction, During Construction

No	Impact	Environmental safeguards	Responsibility	Timing
		and how to obtain further information.		
AIR2	Protect local air quality and avoid inadvertent impacts	<u>Protecting air quality</u> Dust suppression measures will be implemented to protect local air quality.	Project Manager, Contractor	During Construction
AIR3	General air quality impact	• Construction activities are to be managed to minimise dust and fuel emissions.	Project Manager, Contractor	During Construction
AIR4	Dust	• Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Stockpile Site Management Guideline (Roads and Maritime, 2015).	Project Manager, Contractor	During Construction

6.10 Waste and resource management

6.10.1 Existing environment

Vantage Environmental Management Pty Ltd, referred to as Vantage from this point, was engaged to prepare a limited environmental site assessment (ESA) at the site of the Victorian approach of the Barham-Koondrook Bridge.

The ESA involved taking six timber samples, four paint samples and six soil samples to test for chemicals usually used to treat bridge timber, for lead in paint and asbestos. The results of the tests were then used to classify the materials, which would become waste as a result of the bridge work, to determine where the waste may be disposed.

A summary of the test results follows:

- Timber elements including piers, handrails, abutment sheeting, longitudinal top sheeting, transverse decking and longitudinal bridge beams (stringers) would be classified as *General Solid Waste* by the NSW EPA and *Industrial Waste* by the Victorian EPA
- Three of the four paint samples collected and analysed contained lead
- Asbestos was not found in any of the four paint samples.
- Painted bridge elements would be classified as *General Solid Waste* by the NSW EPA and *Industrial Waste* by the Victorian EPA
- Soil contaminant levels in all soil samples were within the National Environmental Protection Measure (NEPM) land use criteria for commercial and industrial sites. Based on these results, soils could be reused on site.
- Soils requiring off-site disposal would be classified as *General Solid Waste* by the NSW EPA and *Fill Material* by the Victorian EPA.

6.10.2 Policy setting

Waste Classification

In NSW all wastes are classified in accordance with the *Waste Classification Guidelines: Part 1 Classifying Wastes* (EPA, 2014). This guideline groups waste that would have similar risks to the environment and human health. There are six classes of waste:

- Special waste
- Liquid waste
- Hazardous waste
- Restricted solid waste
- General solid waste (putrescible)
- General solid waste (non-putrescible).

The ESA compared the analytical results of sampled soils, timber and paint to the criteria in the following guidelines:

- NEPC National Environmental Protection (Assessment of Site Contamination) Measure [NEPM] 1999 (Revised 2013)
- NSW EPA *Waste Classification Guidelines Part 1: Classifying Wastes (2014)*
- NSW DECC (EPA) Environmentally Hazardous Chemicals Act 1985 – *Chemical Control Order in Relation to Scheduled Chemical Wastes – 11 June 2004*.

The land-use setting of "commercial and industrial", as defined in the NEPM, is referenced for this assessment as it is consistent with Roads and Maritime infrastructures sites.

Criteria in the following documents was used to classify waste in the state of Victoria:

- Victorian Environment Protection Authority (Vic EPA) *Industrial Waste Resource Guidelines (IWRG) Soil Hazard Categorisation and Management Publication (IWRG621 – June 2009)* was used to classify soils
- Vic EPA *Solid Industrial Waste Hazard Categorisation and Management Publication (IWRG631 – June 2009)* for sampled timber and paint.

Roads and Maritime Policies

The policies *Towards a more sustainable RTA* (RTA, 2010) and the *Waste Reduction and Purchasing Plan* (RTA, 2010b) commit Roads and Maritime to reduce the impact of its activities through the adoption of the waste hierarchy principles of waste avoidance, resource recovery, recycling and disposal which are consistent with the NSW *Waste Avoidance and Resource Recovery Act 2001* (WARR Act).

6.10.3 Potential impact

Types of waste

The main waste streams likely from the proposal include:

- Timber from the existing bridge
- Steel and other metal from the existing bridge
- Earth and fill from the existing abutment and approach
- Asphalt and road base from approach roads
- Lead paint
- Concrete
- General construction waste
- Cleared vegetation including weeds.

It is expected that a large volume of timber waste would be generated from the restoration of the bridge. The waste classification and disposal options for the timber, based on the sampling and analysis by Vantage, are detailed in Table 2-1 below. A master table of waste management options is also provided in Appendix F of Vantage's report, which is provided in Appendix G of this REF.

Some waste metal would be generated from the restoration work. This would be recycled where possible. It is not likely there would be any problems disposing excess metals.

Asphalt and road base from the bridge approach roads would be stockpiled and reused where possible. Any excess would be disposed to an appropriately licenced landfill.

The work would involve the movement of about 3000 cubic metres of soil. Any excess soil would be stored on site and disposed to an appropriately licenced site.

Stripped lead paint or lead painted surfaces would be disposed in accordance with Table 2-1.

Small quantities of waste concrete would be generated from the restoration of the bridge including the construction and installation of concrete piles, abutments and approach spans. It is not expected that there would be any issues with concrete waste.

Other waste likely to be generated from the proposal includes general construction waste and vegetation waste. It is not likely that there would be any problems associated with the disposal of these wastes.

Table 6-14 Waste disposal options based on waste classification

Waste type	NSW	VICTORIA
Pile and abutment timber	• Landfill under the classification of General Solid Waste • Stockpile for future disposal	• Landfill under the classification of Industrial Waste • Stockpile for future disposal
Timber that is not pile and abutment timber	• Stockpile for future re-use by Roads and Maritime	• Stockpile for future re-use by Roads and Maritime

Waste type	NSW	VICTORIA
	• Stockpile for future disposal • Landfill under the classification of General Solid Waste	• Stockpile for future disposal • Landfill under the classification of Industrial Waste pending agreement from landfill operator
Painted surfaces	• Landfill under the pre-classification of General Solid Waste	• Landfill under the classification of Industrial Waste
Stripped lead paint	• Landfill under the pre-classification of Hazardous Waste	• Landfill under the pre-classification of Prescribed Industrial Waste (PIW)
Soil	• On-site re-use is the preferred option • Landfill under the classification of General Solid Waste	• On-site re-use is the preferred option • Landfill under the classification of Fill Material

Nearest landfill site locations

There are no appropriately licensed landfills within Wakool Shire in NSW. However, Roads and Maritime may be able to negotiate with NSW EPA and Wakool Shire Council to allow for disposal of bridge wastes at the Barham landfill, located close to the proposal site on Barham East Road.

Otherwise the closest appropriately licensed landfills in NSW are:

- Deniliquin Waste Disposal Depot, Hay Road, Deniliquin
- Moama Solid Waste Depot, Centre Road, Moama.

Gannawarra Shire in Victoria may be able to accept bridge waste at the Denyers Pit Landfill, which is located about 40 kilometres from the subject site along the Kerang-Quambatook Road. The Victorian EPA have also indicated that demolition wastes would likely be acceptable for disposal at the Swan Hill Rural Council Landfill, which is a licenced facility located approximately 90 kilometres northwest of the site.

Potential impact

The impact on the environment through generation of waste would be appropriately managed and minimised through the implementation of the following safeguards and mitigation methods.

6.10.4 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
WASTE1	Avoid, minimise and sustainably manage waste	<u>Waste Management Plan</u> A Waste Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste. It will also address the importation of waste to the site for use in undertaking the project. The Plan will give effect to any management measures contained in any waste assessment undertaken for the project and include, but not necessarily be limited to: - measures to avoid and minimise waste associated with the project - classification of wastes generated by the project and management options (re-use, recycle, stockpile, disposal) - classification of wastes received from off-site for use in the project and management options - identifying any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions - procedures for storage, transport and disposal - monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions.	Project Manager	Pre-construction

No	Impact	Environmental safeguards	Responsibility	Timing
		The Plan will be prepared taking into account the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land and relevant RMS Waste Fact Sheets.		
WAST E2	Pre construction / detailed design	<u>Pre-construction assessment</u> Prior to land being used for ancillary construction purposes (compounds, storage, parking, etc) a pre-construction land assessment must be undertaken to identify the presence of any pre-existing wastes. The assessment is to be prepared in accordance with the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land. Where the land is privately owned, a copy of the assessment will be provided to the landowner.	Project Manager	Pre-construction
WAST E3	Avoid, minimise and sustainably manage waste	<u>Sampling of waste materials - to be exported off-site</u> Waste materials (such as soils and aggregates) obtained from the project and to be exported to a non-road construction site or project must be sampled and managed in accordance with relevant Roads and Maritime Waste Fact Sheets.	Project Manager	Pre-construction, During construction
WAST E4	Avoid, minimise and sustainably manage waste	<u>Vegetated waste</u> Any trees to be removed shall be reused as millable timber wherever practicable. Other vegetated material from native species shall be mulched and re-use on-site for landscaping or rehabilitation purposes if consistent with the approved Flora and Fauna Plan for the project. Weed species, or vegetation not considered	Project Manager, Contractor	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		appropriate for re-use on-site, will be removed and disposed of to an appropriately licenced facility.		
WAST E5	Compliance monitoring of waste management	<u>Monitor implementation of safeguards - construction phase</u> Consistent with any specific requirements of the approved Waste Management Plan a monitoring plan will be implemented during construction for {insert time-frame} to assess effective implementation of waste safeguards, identify any unexpected or inadvertent impacts, and identify recommended revisions or improvements.	Project Manager	Pre-construction, During construction
WAST E6	Compliance monitoring of waste management	<u>Adaptive management - during construction</u> After considering the outcomes and recommendations arising from the monitoring program, and any other relevant information that becomes available during construction, appropriate measures will be implemented to address identified deficiencies or undertake actions needed to address waste related impacts. If necessary, the Waste Management Plan will be reviewed and updated to include any additional measures.	Project Manager	Pre-construction, During construction
WAST E7	Final condition of ancillary sites	<u>Post-construction assessment</u> A post-construction land assessment must be undertaken of land that was used for ancillary construction purposes (compounds, storage, parking, etc) to determine the suitability for hand-back to the landowner. The assessment is to be	Project Manager	Post construction

No	Impact	Environmental safeguards	Responsibility	Timing
		prepared in accordance with the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land. Where the land is privately owned, a copy of the assessment will be provided to the landowner.		

6.11 Socio-economic

6.11.1 Existing environment

The Barham-Koondrook Bridge over the Murray River joins the two Murray River towns of Barham (NSW) and Koondrook (Victoria). The two towns have a combined population of about 2500 people. The bridge provides a vital link between the towns and also connects regional towns in the surrounding area.

Barham has a population of about 1,500, with the median/average age of the people being 53 years of age. The majority of the population was born in Australian and are English speaking. Barham has an unemployment rate of about 4.5%. The main industries people from Barham work in are Agriculture, forestry and fishing (17.4%), Accommodation and food services (14.6%) and Health care and social assistance (10.4%). The median individual income is $405 per week and the median household income is $755 per week.

Koondrook has a population of about 1,000, with the median/average age of the people being 50 years of age. The majority of the population was born in Australian and are English speaking. Koondrook has an unemployment rate of 4.0%. The main industries people from Koondrook work in are Agriculture, forestry and fishing (20.4%), Retail trade (11.2%) and Accommodation and food services (10.1%). The median individual income is $403 per week and the median household income is $714 per week.

Barham and Koondrook economies are supported by cattle, fat lamb, dairying, citrus production, timber and tourism industries. Barham has a hospital, supermarket, sporting clubs, primary school, secondary school, two caravan parks, numerous motels and other small businesses commonly found in a rural NSW river town.

The bridge is located in an urban environment surrounded by commercial, residential and recreational landuses. Koondrook has a primary school, corner store, swimming pool, motel, caravan park and other small businesses associated with a rural Victorian river town. Businesses located near the proposed work site includes a fruit packing company in Koondrook called Border Packers and the Royal Hotel and Barham Motor Inn both in Barham.

Parkland areas and recreational facilities are located along the river foreshore adjacent to the bridge on both sides of the river. Tourist attractions including the Redgum Statues River Walk are located in the proposal area. The river is used for recreational activities including fishing, boating and water skiing.

6.11.2 Potential impact

Construction Impacts

The main construction-related socio-economic impact likely to occur from the proposal includes:

- Loss of parkland and recreational land during construction
- Noise impact on sensitive receivers
- Disruption to vehicular and marine traffic.

The temporary loss of a small area of parkland in Koondrook during the construction work is considered to have a very small impact on the availability of recreational space. Large areas of parkland would continue to be available for use, including parking areas, picnic and BBQ facilities and other public amenities.

Similarly, there would be a temporary loss of parkland in Barham as a result of the proposal, during construction work. This is considered also to have a small impact on the availability of recreational land in the locality. The proposal includes the provision of a pedestrian boardwalk underneath the bridge on the NSW side of the river in consultation with Wakool Shire Council, as well as restoring parks and reserves near the Barham-Koondrook Bridge in consultation with Wakool and Gannawarra Councils.

Part of the Redgum Statues Riverwalk would be impacted, including the temporary relocation of some statues. Visitors would still be able to access the statues and overall the impact is considered low.

Noise impact from the proposal are discussed in Section 6.7. In summary, the main impact relates to daytime high noise levels from specific construction activities, including driven/sheet Piling Work, installation of the temporary bridge and new trusses on the existing bridge, and removal of the temporary bridge. These activities would occur over relatively short periods of time, and it is expected that for the vast majority of the construction period, noise impact would be negligible.

Community consultation undertaken early for the proposal identified the main issue being the potential for financial loss if there were extensive bridge closures of the existing bridge. As a result, the proposal includes a temporary bridge to maintain this important access route. The potential for financial loss is therefore very small. Closure of the temporary bridge is expected to be short in duration to allow some specific construction activities to occur, such as operating a crane or taking delivery of materials. The temporary bridge also has pedestrian/cycle access.

Other disruption to traffic would come through the reduced width of the temporary bridge, meaning wide loads would be unable to use the crossing, and from the lack of a lift span on the temporary bridge, meaning tall vessels would be unable to pass under the structure. The impact is considered minor and readily manageable.

There may also be potential to impact the safety of the public. Construction sites have an inherent risk to the general public using areas nearby. This impact would however, be temporary, occurring only during the construction period and would be mitigated by the implementation of appropriate safety procedures.

Overall, the socio-economic impact from the proposal is largely mitigated by the provision of a temporary bridge. The temporary bridge would ensure social and economic activity would continue as it currently does.

Operational Impacts

As a state listed heritage item and a landmark in the area, the bridge contributes to local tourism. The restoration would maintain the heritage values of the bridge and protect the benefit to the local economy.

6.11.3 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
SE1	Pre construction / detailed design	Communication Plan A Communication Plan (CP) will be prepared and implemented as part of the CEMP to ensure provision of timely and accurate information to the community during construction. The CP will include (as a minimum): - mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions - contact name and number for complaints. The CP will be prepared in accordance with the RMS Community Involvement and Communications Resource Manual.	Project Manager	Pre-construction
SE2	Construction	Emergency access Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Project Manager, Contractor	During construction
SE3	Impacts to residents	Local community notification Consultation will be undertaken with potentially affected residences prior to the commencement of and during works in accordance with the RTA's Community Involvement and Communications Resource Manual. Consultation would include but not limited to door knocks, newsletters or letter box drops providing information on the	Project Manager	Pre-construction, During construction

No	Impact	Environmental safeguards	Responsibility	Timing
		proposed works, working hours and a contact name and number for more information or to register complaints.		
SE4	Property impacts	Consultation - property owners Consultation will be undertaken with all affected property owners during detailed design and construction to develop and implement measures to mitigate impacts on land use viability, infrastructure and severance.	Project Manager	Pre-construction, During construction
SE5	Impacts on viability of businesses	Consultation - businesses Consultation will occur with Koondrook and Barham businesses to identifiy appropriate management strategies to avoid or minimise impacts on access and operations. This will include consideration of measures such as additional signage and alternative access arrangements	Project Manager	Pre-construction, During construction
SE6	Impacts to community	Complaints A complaints handling procedure and register will be included in the CEMP.	Project Manager	Pre-construction, During construction
SE7	Impacts to residents and general community	Community information 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.	Project Manager	Pre-construction, During construction

6.12 Climate change

6.12.1 Existing environment

Climate change refers to the projected long-term changes to global climatic patterns as a result of increases in the concentration of greenhouse gases in the atmosphere. There is a need to understand these projected changes to future climatic conditions and the effect they could have on existing and potential projects and infrastructure. It is also important to understand how the proposal might influence these changes. Climate change projections in this REF are based on publicly available information.

Table 6-15 provides climate change forecasts for the Riverina/Murray Region of NSW, where the proposal is located, to the year 2050. The forecasts are adapted from the NSW Climate Impact Profile (DECCW, 2010).

Table 6-15 Climate change forecasts (for 2050) for the Riverina/Murray Region, NSW.

Season	Seasonal rainfall	Temperature	
		Minimum	Maximum
Spring	Up to 50% decrease	1.0–2.0ºC warmer	2.0–3.0ºC warmer
Summer	10–50% increase	0.5–1.5ºC warmer	1.5–3.0ºC warmer
Autumn	Up to 50% decrease	0.5–1.5ºC warmer	1.5–3.0ºC warmer
Winter	20–50% decrease	0.5–1.0ºC warmer	2.0–3.0ºC warmer

It is anticipated that these changing climatic conditions would lead to the following physical responses:

- Increased evaporation is likely to lead to drier soil conditions in all seasons
- A minor decrease in annual average run-off is projected
- Hydrological droughts are likely to become more severe
- Flooding behaviour is likely to change
- Fire regimes are likely to change.

Some level of climate change would occur irrespective of efforts to reduce greenhouse gas emissions. Government's key policy approach to the issue is adaptation, which involves maximising the opportunities that climate change would present, while minimising its costs.

6.12.2 Policy setting

The NSW state government has the following targets with regard to greenhouse gas emissions:

- Clean air target – to meet the national air quality goals as identified in the National Environment Protection Measure for Ambient Air Quality
- Greenhouse gas target – to achieve a 60% cut in greenhouse emissions by 2050 and a return to year 2000 greenhouse gas emission levels by 2025.

6.12.3 Potential impact

Construction

Construction would produce greenhouse gas emissions, including:

- Carbon dioxide, methane and nitrous oxide, which would be generated from liquid fuel use in plant and vehicles (diesel, petrol)
- Embedded emissions associated with the manufacture and delivery of construction materials
- Methane generated from land filling any carbon-based waste.

However, the impact on climate change from construction of the proposal would be minimal due to the size of the project.

Operation

During operation of the proposal, greenhouse gas emissions would be generated during maintenance activities. These emissions are expected to be minimal and far lower than emissions associated with traffic travelling across the bridge.

The proposal is not likely to lead to an increase in traffic using the bridge, or a change in the mix of traffic using the bridge. Therefore, greenhouse gas emissions from traffic changes are unlikely to occur as a result of the proposal.

6.12.4 Safeguards and management measures

No	Impact	Environmental safeguards	Responsibility	Timing
CC1	Climate change	The construction contractor will consider: • The life cycle environmental impact of materials and plant used in the construction process (this will be considered during procurement) • Establishing operating procedures for site vehicles to increase the efficiency of vehicle fuel use • Reducing vegetation clearing as much as feasible, and re-establishing vegetation in suitable areas when construction is completed • Reducing site wastage by re-using and recycling waste materials as a preference before disposing to landfill.	Project Manager	Pre-construction

6.13 Cumulative Impact

The scale of the proposed work has the potential to cause a substantial cumulative impact should other large-scale construction work occur during the construction period. This includes work such as:

- Work on other Murray River bridges resulting in impact to traffic
- Road work on roads leading into Barham and Koondrook
- Local road network issues, such as closures and road work
- Construction work in Barham or Kondrook with substantial noise impact.

Such cumulative work has the potential to further disrupt traffic, particularly wide vehicles, river traffic, particularly tall vessels, local traffic movements causing inconvenience and/or delays, and increased noise and amenity issues to sensitive receivers.

At the time of writing, no known construction work with the potential to cause a cumulative impact to the local community or to road users would occur during the construction period.

6.14 Summary of beneficial effects

The proposal would have the following beneficial outcomes:

- Ensure the structural integrity of the bridge to maintain the current load limit
- Protect and conserve the heritage values of the state listed heritage item
- Maintain economic benefit generated by the bridge as a tourist landmark.

6.15 Summary of adverse effects

The proposal would have the following main adverse impact:

- Removal of up to 0.2 hectares of native vegetation
- Increased risk of erosion and scour until disturbed soils can be stabilised with scour protection or vegetation
- Degradation of river water quality during piling and riverbed work
- Potential impact on water ecology
- Increased risk of pollution of the environment from spills and lead paint
- Construction noise
- Inconvenience from traffic delays and bridge closures
- Restrictions for some wide loads while the temporary bridge is in operation
- Change to the visual amenity of the area from removal of trees and the placement of the temporary bridge
- Generation of dust during earthwork.

The impact in both NSW and Victoria has been avoided or managed to an extent through selection of the preferred option and development of the concept design.

The impact in both NSW and Victoria is not considered to be significant. Safeguards and management measures have been identified to address, manage and minimise potential the adverse environmental impact from the proposal.

7 Environmental management

7.1 Environmental management plans (or system)

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

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

The plans would be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Services Environmental Officer, South West Region, prior to the commencement of any on-site work. 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 QA Specification G36 – Environmental Protection, QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing.

7.2 Summary of safeguards and management measures

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

Table 7-1 Summary of site specific environmental safeguards

No.	Impact	Environmental safeguards	Responsibility	Timing
G1	General	• All environmental safeguards must be incorporated within the following: o Project Environmental Management Plan o Detailed design stage o Contract specifications for the proposal o Contractor's Environmental Management Plan	Project manager	Pre-construction
G2	General	• A risk assessment must be carried out on the proposal in accordance with the Roads and Maritime Services Project Pack and PMS risk assessment procedures to determine an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented. • A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate is the level of risk chosen for the project is appropriate. • Any works resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.	Project manager and regional environmental staff	Pre-construction After first audit
G3	General	• The environmental contract specification G36 must be forwarded to the Roads and Maritime Services Environment Manager South West Region for review at least 10 working days prior to the commencement of	Project manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		construction. • A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Environment Manager South West Region.		
G4	General	The Roads and Maritime Services Project Manager must notify the Roads and Maritime Services Environmental Officer South-West Region at least five working days prior to work commencing.	Project manager	Pre-construction
G5	General	All businesses and residences likely to be affected by the proposed works must be notified at least five working days prior to the commencement of the proposed activities.	Project manager	Pre-construction
G6	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required.
SW1	Soil and Water	<u>Soil and Water Management Plan</u> A Soil and Water Management Plan will be prepared in accordance with QA Specification G38 and implemented as part of the CEMP. The Plan will identify all reasonably foreseeable risks relating to soil erosion and water pollution associated with undertaking the activity, and describe how these risks will be managed and minimised during construction. That will include arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas, and monitoring during	Project Manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		construction.		
SW2	Soil and Water	<u>Install erosion, sediment and water quality controls</u> Consistent with any specific requirements of the approved Soil and Water Management Plan, control measures will be implemented to minimise risks associated with erosion and sedimentation and entry of materials to drainage lines and waterways. That will include, but not necessarily be limited to: - sediment management devices, such as fencing, hay bales or sand bags - measures to divert or capture and filter water prior to discharge, such as drainage channels and first flush and sediment basins - scour protection and energy dissipaters at locations of high erosion risk - installation of measures at work entry and exit points to minimise movement of material onto adjoining roads, such as rumble grids or wheel wash bays - appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate.	Project Manager, Contractor	Pre-construction
SW3	Soil and Water	<u>Stockpile management</u> Stockpiles will be designed, established, operated and decommissioned in accordance with the RTA Stockpile Site Management Guideline 2015.	Project Manager, Contractor	Pre-construction, During construction, Post construction

No.	Impact	Environmental safeguards	Responsibility	Timing
SW4	Soil and Water	<u>Dewatering</u> Any dewatering activities will be undertaken in accordance with the RTA Technical Guideline: Environmental management of construction site dewatering in a manner that prevents pollution of waters.	Project Manager, Contractor	During construction
SW5	Soil and Water	<u>Work in waterways</u> A detailed Environmental Work Method Statement (EWMS) will be prepared and implemented for all works undertaken within waterways. The EWMS will detail measures to avoid or minimise risks from erosion and sedimentation to water quality and biodiversity. It will be prepared in accordance with relevant guidelines including, but not limited to: - RMS Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects - NSW DPI (Fisheries) guidelines Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings.	Project Manager, Contractor	Pre-construction, During construction
SW6	Soil and Water	<u>Monitor</u> Consistent with any specific requirements of the approved Soil and Water Management Plan a monitoring program will be implemented during construction to ensure effective implementation of all temporary and permanent soil, erosion and water pollution safeguards. The timing and frequency of monitoring inspections will be set	Project Manager, Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		out in the SWMP. The inspections will assess implementation and success of the controls, actions required to ensure on-going effective operation, and compliance with any statutory approvals. A register of inspections will be established.		
SW7	Soil and Water	<u>Efficient use of water</u> Work practices will be implemented during construction to support efficient water use and minimise waste. That will include, but not necessarily be limited to, measures to reuse and recycle water where practicable for use in road construction (such as dust suppression and concreting) and irrigation or revegetated areas.	Project Manager, Contractor	During construction
SW8	Soil and Water	<u>Rehabilitation</u> All areas disturbed during construction, including areas for stockpiles compound sites, temporary access roads and temporary work areas, would be stabilised and rehabilitated to prevent future erosion.	Project Manager	Post construction
SW9	Soil and Water	<u>Hazardous materials storage</u> All fuels, chemicals and other hazardous materials must be stored in a roofed, fire-protected and impervious bunded area at least 20 metres from waterways, drainage lines, basins, flood-affected areas or slopes above 10%. Bunding design must comply with relevant Australian Standards, and should generally be in accordance with guidelines provided in the EPA	Project Manager, Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Authorised Officers Manual. Appropriate on-site signage must be provided to identify the materials stored.		
SW10	Soil and Water	<u>Emergency equipment</u> Appropriate emergency equipment will be provided on-site and located at strategic, accessible locations. This will include: - fire response measures, including fire extinguishers, fire blankets and accessible water - spill kits - first aid kits - external showers.	Project Manager, Contractor	During construction
SW11	Soil and Water	<u>Refuelling</u> Refuelling will occur in impervious bunded areas at least 20 metres from drainage lines and waterways. Refuelling on barges will occur within a double-bunded area.	Project Manager, Contractor	During construction
SW12	Soil and Water	<u>Cleaning and washing</u> Cleaning of equipment and vehicles will only occur in areas where water pollution will not occur. Wash-down or wash-out will only occur in bunded areas.	Project Manager, Contractor	During construction
SW13	Soil and Water	<u>Incident reporting and response</u> Environmental incidents, such as pollution spills and unauthorised vegetation clearing, will be reported and managed in accordance with the	Project Manager, Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		RMS Environmental Incident Classification and Reporting Procedure.		
SW14	Soil and Water	<u>Garnet</u> Controls would be stablished during sand blasting of bridge elements to prevent garnet being released to the environment.	Project Manager, Contractor	During construction
SW15	Soil and Water	Fill imported onto the proposal site for the construction of the in-stream working platforms will be clean, inert rock spoil with a minimum grade of 50mm.	Contractor	Construction, Operation
TT1	Minimise impacts to existing traffic	<u>Local community notification</u> Consultation will be undertaken with potentially affected residences prior to the commencement of and during works in accordance with the RTA's Community Involvement and Communications Resource Manual. Consultation would include but not limited to door knocks, newsletters or letter box drops providing information on the proposed works, working hours and a contact name and number for more information or to register complaints	Project Manager	Pre-construction, During construction
TT2	Minimise traffic related risks during construction	<u>Traffic Management Plan</u> A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the RMS Traffic Control at Work Sites Manual and the worksite manual RMS Specification G10. The TMP will include:	Project Manager	Pre-construction,

No.	Impact	Environmental safeguards	Responsibility	Timing
		- confirmation of haulage routes - measures to maintain access to local roads and properties - site specific traffic control measures (including signage) 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.		
TT3	Access	<u>Notifications to landowners</u> Disruptions to property access and traffic will be notified to landowners at least five days prior in accordance with the relevant community consultation processes outlined in the TMP.	Project Manager	Pre-construction, During construction
TT4	Access	<u>Wide Loads</u>	Project Manager	Pre-construction, During

No.	Impact	Environmental safeguards	Responsibility	Timing
		Consultation and notification of the transport industry and road freight providers would occur in relation to the reduced width capability of the temporary bridge.		construction
TT7	Reduce speeds, traffic delays and disruptions during construction	Community information 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.	Roads and Maritime	Pre-construction, During construction
TT8	Local road dilapidation	Dilapidation reports Pre-construction and post construction road dilapidation reports for local roads likely to be used for construction will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road dilapidation reports will be provided to the local roads authority.	Project Manager	Pre-construction
TT9	Water Traffic	Four knot speed limit and no wash within construction zone will be implemented from 600 metres upstream and 900 metres downstream of the bridge.	Roads and Maritime	During construction
TT10	Water Traffic	Work schedule must give consideration to vessels that would need passage. It is noted that a higher number of vessels require passage during summer and peak holiday periods.	Roads and Maritime	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
TT11	Water Traffic	Roads and Maritime will consult with boat owners along the river regarding any changes to river traffic arrangements, including but limited to: • Murray River Paddle steamers, Echuca • Port of Echuca Paddle Boats • Echuca-Moama River Watch and User Group • Sunraysia User Group.	Roads and Maritime	Pre-construction
B1	Pre-clearing	Obtain a planning permit from Gannawarra Shire Council to remove or prune native vegetation on the Victorian side of the Murray River.	Project Manager	Pre-construction, During construction
B2	Minimise risks to native flora and fauna during construction	<u>Flora and Fauna Management Plan</u> A Flora and Fauna Management Plan will be prepared and implemented as part of the CEMP. It will address terrestrial and aquatic matters and include, but not necessarily be limited to: a) plans for the construction site and adjoining area showing native vegetation, flora and fauna habitat, threatened species and endangered ecological communities b) plans showing areas to be cleared and areas to be protected, including exclusion zones and protected habitat features (eg. hollow-bearing trees), and areas for rehabilitation or re-establishment of native vegetation c) requirements set out in the RTA Landscape	Project Manager	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Guideline d) procedures addressing relevant matters specified in the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects (RTA 2011) including but not limited to: - pre-clearing, including the outcomes of final flora and fauna species checks, establishment of exclusion zones and on-ground identification of specific habitat features to be retained (such as hollow-bearing trees) - vegetation clearing and bushrock removal, including staged habitat removal and any specified seasonal limits on clearing activities - fauna handling and unexpected threatened species finds - rehabilitation, revegetation, re-use of soils, woody debris and bushrock, and other habitat management actions - weed and pathogen management e) procedures addressing relevant matters specified in the NSW DPI (Fisheries) Policy and guidelines for fish habitat conservation and management f) monitoring during construction and post-construction g) adaptive management measures to be applied if monitoring indicates unexpected adverse impact.		

No.	Impact	Environmental safeguards	Responsibility	Timing
B3	Minimise risks to native flora and fauna during construction	Pre-construction check Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects (RTA 2011).	Project Manager, Contractor	Pre-construction, During construction
B4	Minimise risks to native flora and fauna during construction	Detailed design Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be considered during the detailed design stage and implemented where practicable and feasible.	Project Manager, Contractor	Pre-construction, During construction
B5	Protect native flora and fauna and avoid inadvertent impacts	Unexpected threatened species Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan, an unexpected finds procedure will be implemented in the event that a threatened species or ecological community that had not been identified and assessed by the REF is unexpectedly encountered during the construction process.	Project Manager	Post construction
B6	Protect native flora and fauna, minimise edge effects and avoid inadvertent impacts	Exclusion zones and protected habitat features Consistent with the approved Flora and Fauna Management Plan: - the limits of clearing within the construction site will be delineated using appropriate signage and barriers, identified on site construction drawings	Project Manager, Contractor	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		and during construction staff induction - vegetation and habitat features to be retained, such as hollow-bearing trees, will be clearly identified and protected by suitable fencing, signage or markings - identified areas containing habitat for microchiropterean bats, arboreal birds and woodland species will not be cleared during the breeding season between September and January, where practicable.		
B7	Protect native flora and fauna and avoid inadvertent impacts	<u>Stockpiles, plant and ancillary sites</u> Vehicle parking, machinery, construction compounds, material stockpiles and the like, will be located in cleared or disturbed areas, not within the drip-zone of vegetation to be retained or within other protected or exclusion zones identified in the Flora and Fauna Management Plan.	Project Manager, Contractor	
B8	Protect native flora and fauna	<u>Fauna handling</u> Fauna handling will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan.	Project Manager	Post construction
B9	Rehabilitation	<u>Rehabilitation</u> All areas disturbed during construction, including areas for stockpiles compound sites, temporary access roads and temporary work areas, would	Project Manager, Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		be stabilised and rehabilitated to prevent future erosion.		
B10	Minimise weed, pest species and pathogen risks	<u>Weed, Pest Species and Pathogen Management</u> Weed species will be managed in accordance with Guide 6: Weed Management of the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan.	Project Manager, Contractor	Pre-construction, During construction
B11	Support future rehabiliation or revegetation	<u>Topsoil management - future re-use</u> Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, topsoil removed during construction, which has been assessed as low-risk for weeds and with good potential for containing indigenous flora seed material, will be stockpiled in cleared or disturbed areas for re-use in post-construction rehabiliation or revegetation. Until re-use occurs the stockpile will be managed in accordance with the RTA Stockpile Site Management Guideline.	Project Manager, Contractor	Construction
B12	Restore and rehabilitate habitat	<u>Habitat management - species selection</u> Consistent with the Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects, and any specific requirements of the approved Flora and Fauna Management Plan, locally indigenous plant species will be used during rehabiliation and revegetation.	Project Manager, Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B13	Clearing of native vegetation	• Clearing of vegetation will be restricted to that assessed in the project REF and includes trees located within 30 metres east of the bridge along the southern riverbank. The limit of clearing would be delineated (eg temporary site fencing, flagging, earth bunding) along the river and at the stockpile and compound site. Clearing limits would be discussed in the site induction to ensure staff and contractors are made aware of limits of clearing • Trees will be removed in such a way as not to cause damage to surrounding vegetation. This will ensure groundcover disturbance is kept to a minimum • Areas already impacted by previous clearing or disturbance will be used to minimise clearing where feasible. Trimming is preferred over removal where feasible.	Project Manager, Contractor	During construction
B14	Fauna and habitat impact Microchirop-teran bat species	• A bat management plan will be developed for the proposed work and must include the following: o Staff should be educated about microchiropteran bats, their ecological role, conservations significance, and the risk of disease with certain species o Undertake final inspection of the bridge components to be removed to locate any	Project Manager, Contractor	During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		bat roost sites prior to the commencement of removing each component o If evidence of roost sites are identified, implement exclusion techniques such as the use of spotlights on the bridge at night, installing netting/ plastic sheeting once bats have left, starting an oxy-torch (to cut bolts) o If bats are observed emerging from the bridge components to be removed, work must cease and an experienced ecologist with bat handling experience be consulted. o If roost sites in the form of hollow bearing trees have to be removed an experienced ecologist must be on hand to inspect each hollow prior to the destruction so bats can be excluded and or have time to relocate. o Timing of deck removal must avoid bat breeding and lactating periods (September-November).		
B15	Disturbance to fallen timber and dead wood	• Any snags located within the study area would be relocated to nearby areas of habitat, if necessary • DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat Coarse Woody Debris will be placed within the nearby river bank and will be managed in accordance with the requirements the Roads and Maritime Biodiversity Guidelines (RTA, 2011) -	Project Manager,	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Guide 5 (CWD).		
B16	Temporary bridge construction – Barge for crane in river.	• Ensure the height of the river is sufficient to avoid contact with the stream bed • Ensure that the barge has a sufficient bund to prevent and spills entering the waterway. • Timing of work to occur outside of spawning of native fish species.	Project Manager	Pre-construction, During construction
B17	Temporary bridge construction – Rock platform for crane in the river.	• Fish passage will be maintained throughout the site during the length of the work • Any snags located within the study area will be relocated to nearby areas of habitat, if necessary. • DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat.	Project Manager	Pre-construction, During construction
B18	Crane pads on the river banks (1 in NSW and 1 in VIC)	DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat.	Project Manager, Contractor	Pre-construction, During construction
B19	Extra coffer dams may need to be built in the river for removal of piles, depending on design of temporary bridge	• Notify DPI Fisheries prior to any work within water land not included in the scope of this Biodiversity Assessment. • Any snags located within the study area will be relocated to nearby areas of habitat, if necessary. DPI Fisheries will be contacted regarding the re-use of CWD as aquatic habitat.	Project Manager, Contractor	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
B19	Pre-clearing	Obtain a planning permit from Gannawarra Shire Council to remove or prune native vegetation on the Victorian side of the Murray River.	Project Manager	Post construction
AH1	Unexpected finds	<u>Unexpected finds</u> The Standard Management Procedure - Unexpected Heritage Items must be followed in the event that a known or potential Aboriginal object(s), including skeletal remains, is found during construction. This applies where RMS does not have approval to disturb the object(s) or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work may only re-commence once the requirements of that Procedure have been satisfied.	Project Manager, Contractor	Pre-construction, During construction
AH2	Accidental discovery of items of Aboriginal cultural significance	• All contractors and/or employees of contractors who are supervising work during the activity in relation to earthmoving or ground disturbance will attend an on-site cultural heritage induction. • The on-site cultural heritage induction must cover: a. The specific requirements of this CHMP; b. The contingency plans contained in this CHMP; and c. Cultural awareness training.	Pre-construction, During construction	Pre-construction, During construction
NAH1	Unexpected finds	<u>Unexpected finds</u> Should any heritage items, archaeological remains or potential relics of Non-Aboriginal origin be encountered, then construction work	Project Manager, Contractor	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		that might affect or damage the material must cease and notification provided to the relevant RMS officer identified in the RMS Standard Management Procedure - Unexpected Archaeological Finds. Work may only re-commence once the requirements of that Procedure have been satisfied.		
NAH2	Enhancing public understanding and awareness	<u>Heritage interpretation</u> A Non-Aboriginal Heritage Interpretation Strategy will be prepared and implemented to promote community understanding and awareness of the site's heritage values. The Strategy will be prepared in accordance with guidelines published by the Office of Environment and Heritage.	Project Manager	Pre-operation
NAH3	Legislative requirement	Roads and Maritime have obtained a Section 60 Approval for the proposal. All conditions of the approval must be followed as listed below. <u>Nominated heritage consultant</u> • A heritage consultant shall be nominated for the project. Their name is to be submitted to the Heritage Council of NSW and approved prior to the commencement of work • The nominated heritage consultant is to provide advice on the detailed design, undertake on-site heritage inductions and inspect the demolition and removal of material to ensure that no significant fabric or elements are damaged or removed • All work shall be carried out by suitably	Project Manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		qualified tradespeople with practical experience in conservation and restoration of similar heritage items. The nominated heritage consultant shall be consulted prior to the selection of appropriate tradespeople. <u>Site protection and work</u> • Significant building fabric and elements are to be protected during the works from potential damage. Protection systems must ensure historic fabric is not damaged or removed • The installation of new services shall be carried out in such a manner as to minimise damage to or removal of historic fabric and shall not obscure historic features. <u>Archival recording</u> A report must be provided to the Heritage Division at the completion of work that includes: • An archival photographic recording of the bridge undertaken prior to and during the work, in accordance with the Heritage Council document, Photographic Recording of Heritage Items using Film or Digital Capture • A summary of the work, up to 5 pages, including a description of the work undertaken, the methodology and any other relevant matters.		
NAH4	Changes to the heritage	An archival recording be prepared for Barham-	Project Manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
	values of the bridge	Koondrook Bridge. This should follow the guidelines for Items of State Heritage Significance as outlined in the NSW Heritage Branch publication How to Prepare Archival Records of Heritage Items.		
NAH5	Changes to the heritage values of the bridge	Methodology for painting the lift span will be finalised during detailed design in consultation with the NSW Office of Environment and Heritage - Heritage branch.	Project Manager	Pre-construction
NOISE1	Minimise noise and vibration risks during construction	<u>Noise and Vibration Management Plan</u> A Noise and Vibration Management Plan will be prepared and implemented as part of the CEMP. The Plan should generally follow the approach in Practice Note VI of the RTA Environmental Noise Management Manual and identify: - all potential significant noise and vibration generating activities associated with the activity - measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, staging, placement and operation of work compounds, parking and storage areas, temporary noise barriers, haul road maintenance, and controlling the location and use of vibration generating equipment - feasible and reasonable mitigation measures to be implemented, determined in accordance with OEH's Interim Construction Noise Guideline and	NOISE1	Minimise noise and vibration risks during construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		taking into account the RMS Beyond the Pavement urban design policy, process and principles - a monitoring program to assess performance against relevant noise and vibration criteria - arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures - contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.		
NOISE2	Minimise risks to local and sensitive receivers	<u>Standard construction hours</u> • Monday to Friday 7.00 am to 6.00 pm • Saturdays 8.00 am to 1.00 pm. • No construction on Sundays or Public Holidays.	NOISE2	Minimise risks to local and sensitive receivers
NOISE3	Community notification	<u>Local community notification - sensitive receivers</u> All sensitive receivers (eg. schools, local councils) likely to be affected must be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification must include details of: the project; construction period and construction hours; contact information for project management staff; complaint and incident reporting; and how to obtain further information.	NOISE3	Community notification
NOISE4	Working hours	If possible, restrict the hours that noisy activities	NOISE5	Working hours

No.	Impact	Environmental safeguards	Responsibility	Timing
		such as the use of rock breakers, jack hammers and piling rigs will occur, taking into account times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for work near residences) and whether the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.		
NOISE5	Noise during the removal of the temporary bridge	If the temporary piles are broken by rock hammer, attended noise monitoring should occur with a focus on the 'Recommended Area' identified in Figure 9 of the Noise and Vibration Impact Assessment (Appendix K)	NOISE6	Noise during the removal of the temporary bridge
NOISE6	Noise monitoring	Attended noise monitoring will be undertaken during the pile driving work to confirm the predicted noise levels	NOISE7	Noise monitoring
NOISE7	Staff training	Briefing of the work team in order to create awareness of the locality of sensitive receivers and the importance of minimising noise emissions.	NOISE8	Staff training
NOISE8	Community information	• Prior to piling activities commencing, a letterbox drop will be conducted to all occupants of buildings within the 'Recommended Area' highlighted in Figure 8 of the Noise and Vibration Impact Assessment (Appendix K) to inform them of the proposed works ahead of time. This letter will outline the proposed timing and duration of work as well as provide the community with a contact number or liaison officer	NOISE9	Community information

No.	Impact	Environmental safeguards	Responsibility	Timing
		available to adequately respond to all project related enquiries • An additional letterbox drop will be undertaken prior to the commencement of piling activities		
NOISE9	Vibration impacts	• All construction works should be carried out Monday to Friday, 7:00 am to 6:00 pm, where possible • When working close to sensitive receivers, use lower vibration generating items of plant and equipment where possible eg smaller vibratory rollers and hydraulic hammers • Minimise consecutive vibration intensive works in the same locality (if applicable)	NOISE10	Vibration impacts
UD1	Pre-construction / detailed design	<u>Urban Design and Landscape Plan</u> An Urban Design and Landscape Plan will be prepared in consultation with Gannawarra Shire Council to support the final detailed project design and implemented as part of the CEMP. The Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: - Location and identification of existing vegetation and proposed landscaped areas,	Project Manager	Post construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		including species to be used (cross-referencing any relevant specified biodiversity safeguards) - Built elements including retaining walls, bridges and noise walls - Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings - Fixtures such as seating, lighting, fencing and signs - Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage - Procedures for monitoring and maintaining landscaped or rehabilitated areas.		
UD2	Minimise visual and landscape impacts during construction	<u>Work sites</u> Project work sites, including construction areas and supporting faciltities (such as storage compounds and offices) will be managed to minimise visual impacts, including appropriate storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials.	Project Manager, Contractor	During construction
UD3	Visual amenity	Mature trees will be used for revegetation as much as possible and practical.	Project Manager	Post Construction
AIR1	Community notification	<u>Local community notification - sensitive receivers</u> All sensitive receivers (eg. schools, local councils) likely to be affected must be notified at least five days prior to commencement of any	Project Manager	Pre-construction, During Construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		works associated with the activity that may have an adverse impact on local air quality. The notification must include details of: the project; construction period and construction hours; any recommended measures that can be implemented (eg. window closure, staying indoors, etc), contact information for project management staff; complaint and incident reporting; and how to obtain further information.		
AIR2	Protect local air quality and avoid inadvertent impacts	Protecting air quality Dust suppression measures will be implemented to protect local air quality.	Project Manager, Contractor	During Construction
AIR3	General air quality impact	Construction activities are to be managed to minimise dust and fuel emissions.	Project Manager, Contractor	During Construction
AIR4	Dust	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Stockpile Site Management Guideline (Roads and Maritime, 2015).	Project Manager, Contractor	During Construction
WASTE1	Avoid, minimise and sustainably manage waste	Waste Management Plan A Waste Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste. It will also address the importation of waste to the site for use in undertaking the project. The Plan will give effect to any management	Project Manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		measures contained in any waste assessment undertaken for the project and include, but not necessarily be limited to: - Measures to avoid and minimise waste associated with the project - Classification of wastes generated by the project and management options (re-use, recycle, stockpile, disposal) - Classification of wastes received from off-site for use in the project and management options - Identifying any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions - Procedures for storage, transport and disposal - Monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions. The Plan will be prepared taking into account the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land and relevant RMS Waste Fact Sheets.		
WASTE2	Pre construction / detailed design	<u>Pre-construction assessment</u> Prior to land being used for ancillary construction purposes (compounds, storage, parking, etc) a	Project Manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		pre-construction land assessment must be undertaken to identify the presence of any pre-existing wastes. The assessment is to be prepared in accordance with the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land. Where the land is privately owned, a copy of the assessment will be provided to the landowner.		
WASTE3	Avoid, minimise and sustainably manage waste	<u>Sampling of waste materials - to be exported off-site</u> Waste materials (such as soils and aggregates) obtained from the project and to be exported to a non-road construction site or project must be sampled and managed in accordance with relevant Roads and Maritime Waste Fact Sheets.	Project Manager	Pre-construction, During construction
WASTE4	Avoid, minimise and sustainably manage waste	<u>Vegetated waste</u> Any trees to be removed shall be reused as millable timber wherever practicable. Other vegetated material from native species shall be mulched and re-use on-site for landscaping or rehabilitation purposes if consistent with the approved Flora and Fauna Plan for the project. Weed species, or vegetation not considered appropriate for re-use on-site, will be removed and disposed of to an appropriately licenced facility.	Project Manager, Contractor	Pre-construction, During construction
WASTE5	Compliance monitoring of waste management	<u>Monitor implementation of safeguards - construction phase</u>	Project Manager	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		Consistent with any specific requirements of the approved Waste Management Plan a monitoring plan will be implemented during construction for {insert time-frame} to assess effective implementation of waste safeguards, identify any unexpected or inadvertent impacts, and identify recommended revisions or improvements.		
WASTE6	Compliance monitoring of waste management	<u>Adaptive management - during construction</u> After considering the outcomes and recommendations arising from the monitoring program, and any other relevant information that becomes available during construction, appropriate measures will be implemented to address identified deficiencies or undertake actions needed to address waste related impacts. If necessary, the Waste Management Plan will be reviewed and updated to include any additional measures.	Project Manager	Pre-construction, During construction
WASTE7	Final condition of ancillary sites	<u>Post-construction assessment</u> A post-construction land assessment must be undertaken of land that was used for ancillary construction purposes (compounds, storage, parking, etc) to determine the suitability for hand-back to the landowner. The assessment is to be prepared in accordance with the RMS Environmental Procedure - Management of Wastes on Roads and Maritime Services Land. Where the land is privately	Project Manager	Post construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		owned, a copy of the assessment will be provided to the landowner.		
SE1	Pre construction / detailed design	Communication Plan A Communication Plan (CP) will be prepared and implemented as part of the CEMP to ensure provision of timely and accurate information to the community during construction. The CP will include (as a minimum): - Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions - Contact name and number for complaints. The CP will be prepared in accordance with the RMS Community Involvement and Communications Resource Manual.	Project Manager	Pre-construction
SE2	Construction	Emergency access Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency.	Project Manager, Contractor	During construction
SE3	Impacts to residents	Local community notification Consultation will be undertaken with potentially affected residences prior to the commencement of and during works in accordance with the RTA's Community Involvement and Communications Resource Manual. Consultation would include but not limited to door knocks, newsletters or letter box drops providing information on the proposed	Project Manager	Pre-construction, During construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		works, working hours and a contact name and number for more information or to register complaints.		
SE4	Property impacts	Consultation - property owners Consultation will be undertaken with all affected property owners during detailed design and construction to develop and implement measures to mitigate impacts on land use viability, infrastructure and severance.	Project Manager	Pre-construction, During construction
SE5	Impacts on viability of businesses	Consultation - businesses Consultation will occur with Koondrook and Barham businesses to identifiy appropriate management strategies to avoid or minimise impacts on access and operations. This will include consideration of measures such as additional signage and alternative access arrangements	Project Manager	Pre-construction, During construction
SE6	Impacts to community	Complaints A complaints handling procedure and register will be included in the CEMP.	Project Manager	Pre-construction, During construction
SE7	Impacts to residents and general community	Community information 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.	Project Manager	Pre-construction, During construction
CC1	Climate change	The construction contractor will consider: • The life cycle environmental impact of materials and plant used in the construction	Project Manager	Pre-construction

No.	Impact	Environmental safeguards	Responsibility	Timing
		process (this will be considered during procurement) • Establishing operating procedures for site vehicles to increase the efficiency of vehicle fuel use • Reducing vegetation clearing as much as feasible, and re-establishing vegetation in suitable areas when construction is completed • Reducing site wastage by re-using and recycling waste materials as a preference before disposing to landfill.		

7.3 Licensing and approvals

The following approvals would be needed to carry out the work:

- A planning permit from Gannawarra Shire Council would be required to remove vegetation and to carry out work in land subject to inundation on the Victorian side of the river
- Approval to carry out work in the road reserve in Victoria would be required from VicRoads.

The following approvals may be needed to carry out the work:

- If the list span is to be blasted and repainted off-site, application to the Office of Environment and Heritage to amend the existing Section 60 approval conditions would be needed
- Should water need to be extracted from the Murray River, a Water Works Approval would be required from the NSW Office of Water
- If the work would inhibit, block or obstruct the passage of fish, a permit under Part 7 of *Fisheries Management Act 1994* is required.

8 Conclusion

8.1 Justification

The proposed work would ensure the long-term viability of the Barham-Koondrook Bridge structure and improve the safety for road users travelling along MR319 between Victoria and NSW. The work would also maintain the integrity and functionality of a state heritage item.

The benefits of the proposal are considered to outweigh the expected impact on the environment. Safeguards and management measures have been recommended to minimise the potential impact on the environment.

8.2 Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal meets this object. The work would improve the safety of road users and ensure the current load limits for the bridge are maintained. The proposal has been designed to minimise the impact on the community and vegetation loss. Consultation would continue with the community for the duration of the work.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	Not relevant to the proposal.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	The proposal meets this object. Utility services would be relocated as part of the proposed work.
5(a)(iv) To encourage the provision of land for public purposes.	Not relevant to the proposal.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	Not relevant to the proposal.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	The proposal meets this object, as discussed in section 6.3. A significant impact on native animals and plants is not likely to occur.
5(a)(vii) To encourage ecologically sustainable development.	The proposal meets this object, as discussed in sections 8.2.1 to 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the proposal.
5(b) To promote the sharing of the responsibility for environmental planning	Not relevant to the proposal.

Object	Comment
between different levels of government in the State.	
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Consultation with the community has occurred to date and would continue for the duration of the work.

To further address the objects of the EP&A Act in relation to ecologically sustainable development (Object 5(a)(vii)), the principles of ESD are further discussed below, as defined in the Environmental Planning and Assessment Regulation 2000, Schedule 2, Part 7, Section 4:

(a) the ***precautionary principle***, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment

(ii) an assessment of the risk-weighted consequences of various options.

(b) ***inter-generational equity***, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations

(c) ***conservation of biological diversity and ecological integrity***, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration

(d) ***improved valuation, pricing and incentive mechanisms***, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

8.2.1 The precautionary principle

In developing the proposal a number of alternative design options were considered, including options for the temporary bridge location. Options have been assessed with the purpose of reducing risk of serious and permanent impact on the environment.

Assessments included field surveys by specialists, desktop assessments and specialist reports. The findings of these assessments assisted in identifying the best performing option. Further changes have been made to the proposal through

development of the concept design and during the preparation of the REF to minimise the overall impact of the proposal.

The detailed assessment is located in section 6 of the REF and recommendations for environmental management are described in section 7.

8.2.2 Intergenerational equity

The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposed work would not impact on natural or cultural features to a level that would compromise the health, diversity or productivity of the environment to a level that would impact on future generations.

The proposed work would benefit future generations by ensuring the safety of road users utilising the Barham-Koondrook Bridge. The work would also maintain the integrity and functionality of a state heritage item for future generations.

8.2.3 Conservation of biological diversity and ecological integrity

An assessment of the existing local environment has been carried out to identify and manage any potential impact of the proposal on local biodiversity. The proposed work would require removal of vegetation. There would be some impacts to the Lower Murray River aquatic ecological community as identified in this REF. The small area of impact along the river bank is unlikely to disrupt any breeding events or cause any impact to fish movement through the area. The proposal is unlikely to have an impact on this community.

The proposal would not significantly fragment or isolate any existing large patches of vegetation and would not compromise biological diversity or ecological integrity. No significant impacts to flora and fauna species were identified. Safeguards have been developed that would assist in protecting fauna and flora at the site that could potentially be impacted by the proposal.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle gives monetary values to environmental resources. The proposed work is for the restoration of Barham-Koondrook Bridge which is a state heritage listed item. If work is not carried out the structural integrity of the bridge would deteriorate and fail. The proposed work would reduce the need for ongoing costly repairs that are temporary solutions and do not ensure structural integrity.

This review of environmental factors was prepared with careful attention to the minimisation or avoidance of impacts on the natural, built and social environments in recognition of those impacts. In doing so, the cost of impact associated with the proposal have been minimised as far as reasonably practical. These factors ensure that the development would conform to the principles of “ecologically sustainable development”.

8.3 Conclusion

The proposed bridge truss and Victorian approach span restoration at Barham and Koondrook is subject to assessment under Part 5 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 of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations 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 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 impacts on biodiversity, community and heritage. Mitigation measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also extend the life of the heritage listed bridge, thereby preserving its heritage values and ensuring it remains an integral part of the road network. On balance the proposal is considered justified and the following conclusions are made:

1. **Significant impact to the environment**
   The environmental impacts of the proposal are not likely to be significant and therefore is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act.

2. **Significant impact to NSW listed biodiversity matters**
   The proposal is not likely to significantly affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required.

3. **Significant impact to nationally listed biodiversity matters**
   The proposal is not likely to significantly affect threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*

4. **Commonwealth land and other matters of national environmental significance**
   The proposal does not significantly affect Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* and a referral to the Federal Department of the Environment is not required.

   The proposal is not likely to significantly affect other matters of national environmental significance, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* and a referral to the Federal Department of the Environment 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.

Gemma Barber

Senior Environmental Consultant

NGH Environmental

Date: 19 February 2016

I have examined this review of environmental factors and the certification by Gemma Barber from NGH Environmental and accept the review of environmental factors on behalf of Roads and Maritime Services.

Sam Millie

Bridge Works Manager

Roads and Maritime Services South-West Region

Date: 19-Feb-2016

10 References

Australian Bureau of Statistics (2011) Census of Population and Housing

Booth Associates (2011) *Narrandera Shire Council Rural Lands Study – Annexure 3 Land Capability Map*.

Department of Environment and Conservation (DEC) (2005) *Interim Guidelines for Aboriginal Community Consultation*

Department of Environment, Climate Change and Water (DECCW) 2010, *NSW Climate Impact Profile*, June 2010

Department of Environment and Climate Change (DECC) (2007) *Waste Avoidance and Resource Recovery Strategy*, Sydney.

Department of Environment and Climate Change (DECC) (2007a) *Atlas of NSW Wildlife Database*. http://wildlifeatlas.npws.gov.au

Department of Environment and Climate Change (DECC) (2007b) *Threatened species, populations and ecological communities* http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx

Department of Environment and Climate Change (DECC) (2008) *Managing Urban Stormwater – Soils and Construction, Volume 2D – Main Road Construction* (known as the Blue Book), NSW DECC, Sydney.

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

Department of Environment and Climate Change (DECC) (2009a) *Waste Classification Guidelines Part 1: Classifying Waste*, Sydney

Department of Environment, Climate Change and Water (DECCW) (2011) *NSW Road Noise Policy* (RNP).

Department of Premier and Cabinet (2011) *NSW 2021 A Plan to Make NSW Number One*, http://2021.nsw.gov.au/

Department of the Environment and Water Resources website, EPBC Act Protected matters search tool (http://www.environment.gov.au/erin/ert/epbc/index.html)

Department of Primary Industries (DPI) website http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed

Department of Urban Affairs and Planning (DUAP) (1996) *Roads and Related Facilities*

Department of Urban Affairs and Planning (DUAP) (1999) *Is an EIS Required?*

Elton Consulting (2015) *Newell Highway Realignment at Grong Grong - Social impact assessment*.

EMGA Mitchell McLennan (2015) *Newell Highway Grong Grong Realignment: Operational road noise and construction noise and vibration assessment.*

Environment Protection Authority (EPA) (1999) *Environmental Criteria for Road Traffic Noise*.

Environment Protection Authority (EPA) (2008) *Waste Classification Guidelines: Part 1 Classifying Waste*

Environment Protection Authority (EPA) (2011) *Road Noise Policy*.

Infrastructure NSW (2012) *State Infrastructure Strategy: First things first*.

Infrastructure NSW (2014) *State Infrastructure Strategy Update 2014*.

National Parks and Wildlife Service (1999) *Threatened species management - Species information*. National Parks and Wildlife Service, Hurstville, NSW. http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_species.aspx

NSW Government. BioNet website (accessed 15 May 2014)

http://www.bionet.nsw.gov.au/Area.cfm

NSW Office of Water (2011) *Water resources and management overview Murrumbidgee catchment*, ISBN 978 0 7313 3480 3

NSW SIS (2011) *NSW State Infrastructure Strategy*, Infrastructure NSW

NSW State Heritage website (accessed 15 May 2014) http://www.heritage.nsw.gov.au/07_subnav_04_1.cfm

PAA Design (2014) *Newell Highway Realignment Urban Design Strategy*, prepared for Roads and Maritime

Parolin, Bruno (2011) *Economic Evaluation of Town Bypasses: Review of Literature*. For the Roads and Maritime Services. ISBN 978-1-922040-15-2.

Roads and Maritime Services 2012 *Timber Truss Bridge Conservation Strategy: Submissions Report and Revised Conservation Strategy*.

Roads and Maritime (2012) *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI), Roads and Maritime, Sydney.

Roads and Maritime (2013) *Guidelines for landscape character and visual impact assessment* EIA-N04, Version 2.0

Roads and Maritime (2014) *Land Acquisition Information Guide*

Roads and Traffic Authority (2001) Environmental Noise Management Manual (ENMM)

Roads and Traffic Authority (2008) *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*

Roads and Traffic Authority (2010) *Towards a more sustainable RTA*

Roads and Traffic Authority (2010a) *Traffic Control at Work Sites Manual*

Roads and Traffic Authority (2010b) *Waste Reduction and Purchasing Policy*

Roads and Traffic Authority (2011) *Biodiversity Guidelines – Protecting and Managing Biodiversity on RTA Projects.* RTA Sydney.

Roads and Traffic Authority (2011a) *Stockpile Site Management Guideline,* RTA Sydney.

Roads and Traffic Authority (2011b) *Timber Truss Road Bridges: A strategic approach to conservation,* RTA Sydney

Transport for NSW (2012) *NSW Long Term Transport Master Plan*, State of New South Wales through the Director General of Transport for NSW, 2012. ISBN: 978-1-922030-31-3.

Transport for NSW (2013) *NSW Freight and Ports Strategy,* November 2013, State of New South Wales through the Director General of Transport for NSW, 2013. ISBN: 978-1-922030-36-8

11 Terms and acronyms used in this REF

CEMP	Construction environmental management plan
EIA	Environmental impact assessment
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* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
NES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
Noxious Weeds Act	*Noxious Weeds Act 1993* (NSW)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP 14	*State Environmental Planning Policy No.14 – Coastal Wetlands*
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with roadworks and bridgeworks contracts let by Roads and Maritime Services

12 Appendices

Appendix A

Consideration of clause 228(2) factors and matters of national environmental significance

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* guideline as detailed in the REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, 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 proposed work would impact the community during the construction phase through noise generation, potential night works and bridge closures. This impact, whilst manageable to some extent, would occur to some degree during the construction period. The work would have no impact on a community in the long-term and road users would benefit from extended life of the bridge.	Medium - negative Short-term
b. Any transformation of a locality? The locality would be transformed temporarily through the presence of the temporary bridge. The expected impact is minimal given the area would be rehabilitated once the temporary bridge is removed.	Minor – negative Short-term
c. Any environmental impact on the ecosystems of the locality? The proposed work has the potential to have an environmental impact on the ecosystems of a locality due to the requirement for a coffer dam, piling work in the river, working on the bridge over the river, construction of access tracks to the river bed. The work has the potential to degrade water quality and alter aquatic habitat. Potential impacts would be minimised with the implementation of the safeguards given in Section 7 of this REF.	Minor – negative Short-term
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? There would be some short term impacts to the aesthetic value of the bridge and locality during the proposed works through the use of a coffer dam, piling work in the river, working on the bridge over the river and construction of access tracks to the river bed. These areas would be restored to their original state once the work is completed.	Minor – negative Short-term

Factor	Impact
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? During construction the proposed work would have a short-term effect on a state heritage item. The effect would be short-term while the work is being carried out and the potential impact would be minimised with the implementation of the safeguards given in Section 7 in this REF. The aim of the work is to preserve the heritage significance of the bridge. Once work is complete and the rehabilitated bridge is operational the impact of the work is positive.	Minor – negative Short-term High – positive Long-term
f. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? Assessments of significance under the TSC Act were undertaken for microchiropteran bat species and concluded that a Species Impact Statement is not required. The Lowland Murray River aquatic EEC occurs within the study area and a 7 Part Test under the FM Act was undertaken for this community. This assessment concluded no significant impact would be likely on the EEC and the long-term survival of this aquatic community within the study area would not be threatened by the proposed work. There would be no long-term impact to any habitats of protected fauna from the works.	Minor – negative Short-term
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 any species of biota.	Nil
h. Any long-term effects on the environment? There would be no long-term effects on the environment from the proposal.	Nil
i. Any degradation of the quality of the environment? There would be short-term degradation of river water quality during piling and riverbed work.	Minor – negative Short-term
j. Any risk to the safety of the environment? The work would require the dismantling and removal of potentially contaminated timber. This would pose a risk to the safety of the environment although can be readily managed.	Minor – negative Short-term
k. Any reduction in the range of beneficial uses of the environment? There would be no impact to the beneficial uses of the environment from the work. River traffic may experience short term delays or partial/full channel closure for periods during the maintenance works.	Minor – negative Short-term
l. Any pollution of the environment? The proposed work would result in minor short term air and noise pollution from plant and machinery. Pollution would be minor considering the nature and duration of the work.	Minor – negative Short-term

Factor	Impact
m. Any environmental problems associated with the disposal of waste? The proposal would require the removal of potentially contaminated bridge material however these may be disposed of at an approved landfill facility capable of receiving general solid waste. Disposal would require transportation of this material. However, there are no risks associated with the transportation as the material poses no acute health or safety risks.	Nil
n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? Timber bridge maintenance work requires the use of quality timbers, which are continuing to become in short supply. The work would reduce, in the long term, the demand on this resource due to the replacement of timber elements with other materials. Therefore, in the long term, there would be no increased demand on this resource. All other materials to be used for the works are readily available.	Minor – negative Short-term
o. Any cumulative environmental effect with other existing or likely future activities? No other activities are known to occur concurrently with the proposed work. Given the minor nature of the work and isolated nature of the site, the work is unlikely to have a substantial cumulative impact on the environment.	Nil
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? There would be no impact on coastal processes and coastal hazards, including those under projected climate change conditions.	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, 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 Government Department of the Environment.

Factor	Impact
a. Any impact on a World Heritage property? A search of the EPBC Act Protected Matters Search Tool revealed that there are no World Heritage properties within 10 kilometres of the proposal site.	Nil
b. Any impact on a National Heritage place? There would not be any impact on places of National Heritage.	Nil
c. Any impact on a wetland of international importance? An EPBC Act Protected Matters search identified six wetlands of international importance as existing within the same catchment as the proposal: • Banrock station wetland complex • Gunbower forest • Kerang wetlands • NSW central murray state forests • Riverland • Coorong, and lakes alexandrina and albert wetland. The proposal is unlikely to impact on these areas given the minimal scope of the work and the distances to the wetlands.	Nil
d. Any impact on a listed threatened species or communities? The proposed work would not impact on any listed threatened species or community.	Nil
e. Any impacts on listed migratory species? The proposed work would not have an impact on migratory species.	Nil
d. Any impact on a Commonwealth marine area? The proposed work would not have an impact on a Commonwealth marine area.	Nil
g. Does the proposal involve a nuclear action (including uranium mining)? The proposed work would not have a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposed work would not have an impact on Commonwealth land.	Nil

Appendix B

Concept design plans

Appendix C

Background search results

Appendix D

Aboriginal cultural heritage due diligence assessment report

Appendix E

Aboriginal cultural heritage management plan

Appendix F

Agency consultation responses

Appendix G

Limited environmental assessment and waste classification report

Appendix H

NSW biodiversity assessment

Appendix I

Victorian biodiversity assessment

Appendix J

Statement of heritage impact

Appendix K

Noise and vibration assessment

http://www.rms.nsw.gov.au/projects/south-western/barham-bridge

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February 2016
RMS 16.012
ISBN: 978-1-925421-65-1