Lansdowne Bridge
Review of Environmental Factors
JUNE 2014
Executive summary

The proposal

Roads and Maritime Services proposes to replace the existing Lansdowne Bridge on Bungonia Road at the crossing of Mulwaree Ponds, with a new concrete bridge on the same alignment (the proposal). The key features of the proposal include:

- Demolition of the existing Lansdowne Bridge.
- Construction of a new two lane, three span concrete bridge along the existing alignment with shared pedestrian and cyclist facilities. One pier would be constructed within Mulwaree Ponds.
- Realignment of a section of Bungonia Road from the new bridge to about 200 metres to the east of the bridge. One lane of the existing Bungonia Road alignment will be retained east of the bridge as property access to 2 Bungonia Road.
- A slight adjustment of a section of Bungonia Road from the bridge to about 90 metres to the west of the bridge.
- Permanent closure of Forbes Street, to the north of Bungonia Road. An interpretive plaque and seating area would be provided where Forbes Street is terminated.
- Removal of the unsafe access to the dog racing track located around 50 metres to the west of Lansdowne Bridge. The access located around 200 metres to the west of Lansdowne Bridge would be maintained.
- Utility adjustments including power pole relocation within the road reserve.

Need for the proposal

The proposal is needed to:

- Provide a bridge to meet the current load and configuration standards for heavy vehicles.
- Provide additional capacity on the bridge to improve freight efficiency.
- Provide safer access for all road users including pedestrians and cyclists.
- Reduce costs associated with ongoing maintenance.

Options considered

A series of options were considered for the upgrade of Lansdowne Bridge. The options included a number of strengthening and replacement options including retaining the existing de Burgh truss element of the bridge for pedestrian access while constructing a new bridge for vehicle access. The preferred option includes the demolition of the existing bridge and the construction of a new bridge along the same alignment. The selection of the preferred option took into account social, environmental and economic factors as well as stakeholder input.

Statutory and planning framework

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 the purpose of a road and is to be carried out by Roads and Maritime, development consent from council is not required and it is assessed under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).
Community and stakeholder consultation

During development of the proposal, consultation has been undertaken with the community and relevant government agencies and stakeholders. Roads and Maritime placed 10 advertisements in the Goulburn Post between December 2012 and January 2013 inviting members of the public to comment on the future of the Lansdowne Bridge. A dedicated project webpage was established on the Roads and Maritime website containing background information and the latest news on the project. Feedback received from the community during consultation has been used to refine the concept design.

In accordance with the Roads and Maritime Services’ Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI), consultation was undertaken with Gandangara Local Aboriginal Land Council and Pejar Local Aboriginal Land Council. This included inviting them to participate in the archaeological survey in December 2012 and providing them with a copy of the draft Aboriginal Archaeological Survey Report to comment.

In March 2013, a number of government agencies and stakeholders were contacted by letter and provided with preliminary details of the proposal. The letters invited the agencies and stakeholders to comment on the issues they would like addressed in the review of environmental factors.

Roads and Maritime will continue to undertake community and stakeholder consultation throughout development of the proposal. In particular, the review of environmental factors is placed on public display and comments invited. Submissions received as a result of the review of environmental factors display will be addressed in a formal submissions report and, if appropriate, considered when finalising the concept design and during development of the detailed design.

Environmental impacts

Beneficial effects of the proposal would include:

- Improved safety due to wider traffic lanes, cycle facilities and improved road approaches.
- Reduction of expensive and ongoing maintenance costs which would be required if the existing bridge were to be retained.
- Elimination of the potential for lead contamination of the waterway from the deteriorating paintwork on the bridge.
- Minimised disruption to the community in the long-term as the bridge would no longer need to be closed for frequent maintenance.
- Allowance for higher mass limit vehicles which would allow all vehicles to use the bridge.

A number of adverse environmental effects are likely to occur during construction and operation of the proposal, including:

- Construction phase traffic impacts, due to increased heavy vehicle movements on the existing road network.
- Impacts to non-Aboriginal heritage items.
- Noise and vibration impacts to properties adjacent to the proposal site during construction and operation.
- Disruptions to traffic flow and access during construction.
- Increased risk for spills and contamination during construction.
- Increased risk of occurrence of erosion and sedimentation during construction.
• Potential temporary decline in air quality during construction.
• Closure of Forbes Street.
• Increased risk of degradation of water quality and drainage lines during construction.

Adverse environmental effects would be adequately minimised, managed and mitigated through the implementation of safeguards outlined in this review of environmental factors. This would include a construction noise and vibration management plan, soil and water management plan and a traffic management plan.

**Justification and conclusion**

The proposal is considered to be consistent with national, state and local strategies and plans as it would lead to improved efficiency and safety of the local road network.

While there would be some adverse environmental impacts as a consequence of the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards. The beneficial effects are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal.

The proposal is subject to assessment under Part 5 of the EP&A Act. This review of environmental factors 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 *National Parks and Wildlife Act 1974* (NPW Act), joint management and biobanking agreements under the *Threatened Species Conservation Act 1995* (TSC Act), wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning and Infrastructure under Part 5.1 of the EP&A Act. The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the TSC Act or Fisheries Management Act 1994 (FM Act) and therefore a species impact statement is not required. The proposal is also unlikely to impact on any Commonwealth matters of national environmental significance and therefore a referral to the Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999*, is not required.

**Display of the review of environmental factors**

This review of environmental factors is on display for comment between Monday 2 June 2014 and Monday 30 June 2014. You can access the documents in the following ways:

**Internet**


You can request a copy by contacting the project team on (02) 4221 2506.
Display
The review documents can be viewed at the following locations until Monday 30 June 2014:

- Goulburn Mulwaree Council
  184-194 Bourke Street, Goulburn NSW
  Monday to Friday, 8.30am to 5pm.

- Goulburn Mulwaree Library
  Civic Centre, 184/194 Bourke Street, Goulburn NSW
  Monday to Friday, 10am to 6pm; Saturday, 10am to 1pm; and Sunday 2pm to 5pm.

- Goulburn Motor Registry
  Corner Lagoon and Sterne Streets, Goulburn NSW
  Monday to Friday, 8.30am to 5pm and Saturday, 8.30am to 12noon.

Purchase
The review documents are available for purchase in hard copy ($25.00) or CD ($10.00) at locations marked with * above or by contacting add contact name and number.

How can I make a submission?
To make a submission on the proposal, please send your written comments to:

  Roads and Maritime Services project manager:
  Peter Townsend
  PO Box 477, Wollongong NSW 2520

Submissions must be received by Monday 30 June 2014.

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 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 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 Roads and Maritime, address of relevant Roads and Maritime office.
What happens next?

After the submissions period, Roads and Maritime will collate 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 will determine whether the proposal should proceed as proposed, or whether any alterations to the proposal are necessary. The community will be kept informed regarding this Roads and Maritime determination.

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

If you have any queries, please contact the Roads and Maritime project manager on (02) 4221 2506.
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1. **Introduction**

1.1 **Proposal identification**

Roads and Maritime Services (Roads and Maritime) proposes to replace the existing Lansdowne Bridge on Bungonia Road, Goulburn at the crossing of Mulwaree Ponds, with a new concrete bridge on the same alignment (the proposal). The existing road approaches would be realigned to accommodate the new bridge. Figure 1-1 shows the major features of the proposal.

Key features of the proposal include:

- Demolition of the existing Lansdowne Bridge.
- Construction of a new two lane, three span concrete bridge along the existing alignment with shared pedestrian and cyclist facilities. One pier would be constructed within Mulwaree Ponds.
- Realignment of a section of Bungonia Road from the new bridge to about 200 metres to the east of the bridge. One lane of the existing Bungonia Road alignment will be retained east of the bridge as property access to 2 Bungonia Road.
- A slight adjustment of a section of Bungonia Road from the bridge to about 90 metres to the west of the bridge.
- Permanent closure of Forbes Street, to the north of Bungonia Road. An interpretive plaque and seating area would be provided where Forbes Street is terminated.
- Removal of the unsafe access to the dog racing track located around 50 metres to the west of Lansdowne Bridge. The access located around 200 metres to the west of Lansdowne Bridge would be maintained.
- Utility adjustments including power pole relocation within the road reserve.

The proposal is needed to:

- Provide a bridge to meet the current load and configuration standards for heavy vehicles.
- Provide additional capacity on the bridge to improve freight efficiency.
- Provide safer access for all road users including pedestrians and cyclists.
- Reduce costs associated with ongoing maintenance.

1.2 **Location and context**

The proposal is located on Bungonia Road at the crossing of Mulwaree Ponds in the suburb of Goulburn, about 1.6 kilometres south-east of Goulburn town centre in the Goulburn Mulwaree local government area and Roads and Maritime Southern region. Figure 1-2 shows the location of the proposal in a regional context. Mulwaree River is one of the largest and southernmost tributaries of the Wollondilly River. At the location of the proposal, the Mulwaree River is referred to as Mulwaree Ponds due to the slow flow of the river and variation in channel width.

The study area is primarily made up of rural properties with some other key land uses in proximity including the Goulburn Recreation Area, Goulburn Brewery and the Historic Lansdowne Park (Goulburn’s oldest homestead and farming complex). The nearest residential area is Eastgrove, which is located about 0.6 kilometres north-east of the proposal site. The nearest residential property is located around eight metres south of Bungonia Road.
For the purpose of this report, the ‘proposal site’ refers to the area that would be directly impacted by the proposal, including the construction compound as shown in Figure 1-1. The ‘study area’ includes the area that may indirectly be impacted by the proposal and is defined as the area within 500 metres of the proposal site, as shown in Figure 1-2.

Access to the western bridge abutment is available from an access track that currently services the dog racing track in the Goulburn Recreation Area which is located about 50 metres to the west of the bridge. Access to the eastern bridge abutment is available directly from Bungonia Road.

Construction of the proposal is anticipated to start in the second quarter of 2014 and take about 12 months to complete.

1.3 Purpose of the report

This review of environmental factors has been prepared by GHD Pty Ltd (GHD) on behalf of Roads and Maritime Southern region. For the purposes of this work, Roads and Maritime is the proponent and the determining authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The purpose of the review of environmental factors is to describe the proposal, to document the likely impacts of the proposal on the environment, and to detail protective measures to be implemented.

The description of the proposal and associated environmental impacts have been undertaken in context of Clause 228 of the Environmental Planning and Assessment Regulation 2000, the Threatened Species Conservation Act 1995 (TSC Act), the Fisheries Management Act 1994 (FM Act), and the Australian Government’s Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). In doing so, the review of environmental factors helps to fulfil the requirements of Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the review of environmental factors 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 and Infrastructure under Part 5.1 of the EP&A Act.

- The significance of any impact on threatened species, populations or communities, or their habitats, listed under the TSC Act and FM Act, in accordance with Section 5A of the EP&A Act and therefore the requirement for a species impact statement.

- The potential for the proposal to significantly impact on 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.
- Retaining wall
- Permanent closure of Forbes Street, to the north of Bungonia Road.
- Provision of a 3.0 m wide shared pedestrian and cyclist path separated from traffic with concrete barriers.
- Minor regrading of the driveway to meet the levels of the re-aligned section of Bungonia Road.
- Provision of a 3.0 m wide shared pedestrian and cyclist path and a locked removeable guardrail.
- Realignment of Bungonia Road to improve road geometry, site distance and efficiency of the road.
- Improved approaches designed for 60km/h speed limit.
- One lane of the existing Bungonia Road alignment will be retained as property access to 2 Bungonia Road.
- New 100.6 m four span concrete bridge provides 2 x 3.5 m lanes and 2 x 1.0 m shoulders.
- Demolition of existing bridge and replacement with new bridge along the same alignment.
- Removal of the unsafe access to the dog racing track located around 50 metres to the west of Lansdowne Bridge.
- Driveway to 33 Bungonia would be maintained along the same alignment. Minor regrading of the driveway would be required to meet the levels of the re-aligned section of Bungonia Road.
- Provision of an interpretive plaque and seating area where Forbes Street is terminated.
- Provision of a 3.0 m wide shared pedestrian and cyclist path separated from traffic with concrete barriers.
- One lane of the existing Bungonia Road alignment will be retained as property access to 2 Bungonia Road.
- Improved approaches designed for 60km/h speed limit.
2. **Need and options considered**

2.1 **Strategic need for the proposal**

Lansdowne Bridge is located on Bungonia Road, which is classified as a recognised travelling stock route providing an important transport link for goods and stock between Goulburn and the surrounding rural community. Bungonia Road connects Goulburn township with the Goulburn Airport about 4.2 kilometres to the east.

The Lansdowne Bridge and approach roads have long presented a bottleneck and safety issue for local and regional traffic movement. The Lansdowne Bridge has a load capacity of 42.5 tonnes and is limited to single directional traffic movement with vehicles required to queue while vehicles approaching from opposing directions cross the bridge. The confined travelling surface, poor line of sight on approaches and the poor intersection with Forbes Street has created a local safety hazard.

The existing bridge was not designed for either the mass or speed of current day vehicles, nor the traffic densities that currently use the bridge. In particular it has been identified that the bridge conveys a substantial volume of stock movement by articulated vehicles, which contribute to the impact and fatigue and consequentially high maintenance costs required for bridge upkeep (RTA, 2007). Traffic counts in 2012 showed an average of 2190 vehicles per day using Bungonia Road (GHD, 2013). Nine per cent of the total vehicles recorded using this section of Bungonia Road were heavy vehicles.

One motor vehicle crash (a rear end, non-casualty crash) occurred on Bungonia Road within the study area (about 10 metres west of Lansdowne Bridge) within the five year period of 1 October 2007 to 30 September 2012 (NSW Centre for Road Safety, 2013).

**Timber Truss Bridge Conservation Strategy**

In 2010, Roads and Maritime prepared the draft *Timber Truss Road Bridges – A Strategic Approach to Conservation* (the Strategy) which detailed a methodology for assessing the conservation suitability and management approach for 48 remaining timber truss bridges managed by Roads and Maritime. The Strategy outlined both operational and heritage considerations and applied a methodology to determine which of the bridges represent better candidates for long-term conservation within the road network.

The Strategy was advertised for public comment between 18 July and 26 August 2011 in a range of local and state wide newspapers. Lansdowne Bridge was included in the strategy and at the time of public display was marked for retention.

The Strategy was amended in July 2012 in response to the results of the community consultation. The amended Strategy proposes retaining 26 timber truss bridges and progressively replacing the remaining 22 as road demands and funding become available.

The retention of Lansdowne Bridge was reconsidered following strong representations from Goulburn Mulwaree Council due to safety concerns. The revised strategy proposes the replacement of the bridge.

2.1.1 **Other relevant strategies and plans**

**National Road Safety Strategy 2011-2020**

The *National Road Safety Strategy 2011-2020* (Australian Transport Council, 2011) has a vision to have no person killed or seriously injured on Australia’s roads. Aims of the strategy include reducing fatalities and crashes on our roads by at least 30 per cent in the period 2011 to 2020.
The proposal would assist in contributing to this aim by improving road safety by providing:

- Improved line of sight on approaches to Lansdowne Bridge through the realignment of Bungonia Road and the permanent closure of Forbes Street.
- A shared pathway for cyclists and pedestrians.

**NSW 2021**

NSW 2021 (NSW Government, 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 business plan, setting priorities for action and guiding resource allocation. NSW 2021 lists a number of goals to achieve five strategies including ‘return quality services’ and ‘renovate infrastructure’. Relevant goals within these strategies areas include:

- Reduce travel time.
- Improve road safety.
- Invest in critical infrastructure.
- Protect our natural environment.

The proposal would assist in meeting these targets by improving traffic flow, freight efficiency and road safety along Bungonia Road. The proposal has also been designed to minimise impacts on local biodiversity and other environmental factors.

The proposal is therefore consistent with NSW 2021.

**NSW Government State Infrastructure Strategy**

The NSW Government State Infrastructure Strategy, released by the NSW Department of Premier and Cabinet in December 2012, assists in understanding NSW infrastructure needs for the next 20 years, particularly in light of key drivers for infrastructure demand in NSW including increased Sydney region population and demand for freight movement. The NSW Government identified the following transport priorities for regional NSW:

- Improve access to employment and to connect people and communities.
- Improve local transport networks.

The proposal is considered to be consistent with these goals as it would provide improved access for heavy vehicles to Goulburn CBD via Bungonia Road as the new bridge would be able to cater for the heavy loads, providing a safer option with improved travel times and distances.

**Roads and Maritime Services Corporate Delivery Plan - 2012 to 2013**

The Roads and Maritime Services’ Corporate Delivery Plan 2012-2013, released in August 2012 outlines specific project deliverables in line with strategy statements made in the overarching Roads and Maritime Services’ Corporate Strategy 2012 to 2016. The plan specifically mentions the proposal and its objective which is to provide asset and access solutions that support the movement of freight in urban and regional areas by implementing the Roads and Maritime Services’ Timber Truss Bridge Strategy, including the construction of a new bridge in place of Lansdowne Bridge.
Summary

The review of relevant strategies and plans summarised above has identified that there is a need to improve infrastructure to meet the demands of anticipated increase in traffic volumes and to improve road safety. The proposal is consistent with the above strategies.

2.2 Existing road and infrastructure

2.2.1 Lansdowne Bridge

Lansdowne Bridge is an asphalt sealed timber decked bridge with a travelling surface width of 5.48 metres. The bridge was constructed in 1902 and consists of seven timber spans of about 10 metres in length and a main timber (steel reinforced) de Burgh truss span of 27.43 metres. The bridge has a main channel crossing of about 20 metres in width although the area to the west of the bridge is subject to flooding. There is no capacity for two-way vehicle movement on the bridge and there are no shoulder or cycle lane facilities provided on the existing structure. The bridge has a current load capacity of 42.5 tonnes. Telecommunication and power utilities are located on the eastern approach to the bridge. The posted speed limit in the vicinity of the proposal is 60 kilometres per hour (RTA, 2007).

The existing bridge length is about 98.5 metres with a main crossing over Mulwaree Ponds of about 20 metres. The existing deck level on the western side (Goulburn side) is about RL 630.720 and is lower than the eastern deck level (Gundary side) which is about RL 631.598. The area of obstruction created by the deck is calculated to be about 150 square metres. The calculated average depth of the superstructure is about 1.15 metres. The existing pier width is about 0.545 metres. There are fifteen piers on the existing bridge. The area of obstruction created by the piers is about 55 square metres.

The approach to the west of the bridge is below the 1 in 100 year flood immunity level and during a 1 in 100 ARI flood level; most of the bridge superstructure is submerged.

The key deficiencies associated with the existing bridge include:

- Designed for loads much less than those applied by modern heavy trucks.
- Unable to carry higher mass limit vehicles.
- Built as a single lane bridge and inconvenient to modern traffic densities.
- The deck, cross girder and timber girders and truss elements were designed for traffic travelling much slower than today, so impact and fatigue defects are greater.
- Maintenance costs have continued to be relatively high because much of the work is labour intensive.
- Some structural timber elements are in fair to poor condition. Support beneath the western approach spans has been installed to extend the life of the bridge and allow heavy vehicles to continue to utilise the route.
- Lead paint detected on the timber elements of the bridge and sections on the approach span painted containing polycyclic aromatic hydrocarbons (CTI Consultants, 2013a).

In 1998, Roads and Maritime commissioned consultants McMillan Britton & Kell Pty Ltd (MBK) to carry out a study of the Relative Heritage Significance of all Timber Truss Bridges in NSW. The MBK study assessed the bridge as being of regional heritage significance and consequently, the bridge was listed on the Roads and Maritime Services Heritage and Conservation Register. The bridge is also listed as a local heritage item on the Goulburn Mulwaree Local Environmental Plan 2009 (Goulburn Mulwaree LEP).
2.2.2 Bungonia Road

Bungonia Road is a local road that runs east to west from Braidwood Road to Windellama Road. It has a two-lane carriageway consisting of unsealed shoulders and no separate cycle or pedestrian capacity. Lane widths are generally between three and 3.5 metres with variable width unsealed shoulders. Bungonia Road within the study area has a posted speed limit of 60 kilometres per hour. Bungonia Road provides an important transport link for goods and stock movement between Goulburn and the surrounding rural community.

2.2.3 Forbes Street

Forbes Street runs south to north in the study area, intersecting Bungonia Road from the south, on the eastern approach to the bridge. Forbes Street is a local collector road providing access between Bungonia Road and Park Road in Eastgrove. It has a two lane, undivided carriageway and no separate pedestrian or cyclist facilities.

The existing intersection with Bungonia Road is poorly configured and is considered to be a local safety hazard.

2.3 Proposal objectives

The objectives of the proposal are to:

- Provide a bridge to meet current load and configuration standards.
- Reduce local travel times along Bungonia Road.
- Improve safety for all road users.
- Provide shared pedestrian and cyclist access.
- Reduce ongoing maintenance frequency and cost.
2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

Roads and Maritime has been investigating the upgrade of Lansdowne Bridge for a number of years. Options were assessed against the project objectives and the following criteria:

- Replace or rehabilitate Lansdowne Bridge which is nearing the end of its asset life.
- Improved road safety and traffic efficiency.
- Impacts on landowners.
- Impacts on ecologically significant habitats.
- Cost effectiveness.

During the options selection process, consultation was undertaken with Goulburn Mulwaree Council, and the local community. Further details on community consultation undertaken as part of the options selection process is provided in section 5.1.

The preferred option was identified based on meeting the project objectives and criteria with consideration to the feedback received from the local community and stakeholders.

2.4.2 Identified options

A series of options were considered for the future of Lansdowne Bridge including: do nothing, options for strengthening the existing bridge and a number of new bridge options. A description of the options considered is provided below.

**Option 1 – Do nothing**

The do nothing option involves not undertaking the proposal, continuing maintenance activities, and retaining the existing Lansdowne Bridge and existing road alignment to the east of the bridge.

**Option 2 – Strengthening options (A, B, C & D)**

Four strengthening options were considered, all of which would retain the most important heritage element of the bridge which is the de Burgh truss. Option A provides for the conservation of the existing bridge ‘as is’ in operational condition while options B, C and D provide for the conservation of the existing bridge in operational condition with structural changes that would alter the visual character of the approach spans. Options A, B and C would require the replacement of the existing timber trestles, retaining a similar general arrangement and support on new pile foundations. Abutments for Options A and B would be strengthened with minor changes to the existing visual character.

The specific attributes for each option are outlined below.

- **Option 2A** - Reconstruction of the approach span decks in timber elements while retaining all of the heritage related visual character of the existing structure.
- **Option 2B** - Reconstruction of the approach span decks in timber or concrete composite while retaining most of the heritage related visual character of the existing structure.
- **Option 2C** - Reconstruction of the approach span decks in steel or concrete composite while retaining some of the heritage related visual character of the existing structure.
- **Option 2D** - Replacement of the entire approach spans in modern concrete construction. The visual character of the approach spans would be changed considerably from the existing.
Option 3 – Replacement options (A, B & C) retaining the existing bridge for pedestrian access

Three replacement options were considered. Each option would retain the existing de Burgh truss element of the bridge for pedestrian access. The western approaches would be removed and replaced by a timber stair access. The eastern approach would be maintained although alterations would be made to prevent vehicular access.

All bridge elements for the three replacement options would be in pre-stressed concrete and designed to fully comply with the requirements of the current Australian Standard for Bridge Design (AS 5100). The attributes for each of the replacement options are provided below:

- Option 3A - This option would branch north downstream of the existing bridge on a horizontal radius curve of 190 metres. The new bridge would be located about 25 metres downstream of the existing bridge and would consist of two piers and three spans spaced at 23, 23 and 25 metre intervals (west to east), respectively.

- Option 3B - This option would branch north about 70 metres before the existing western approach span abutment and would be located 45 metres north of the existing bridge. This option would require the crossing of Mulwaree Ponds at two points.

- Option 3C - This option would branch north downstream of the existing bridge on a horizontal radius curve of 170 metres. The new bridge would be located about 25 metres downstream of the existing and would consist of two piers and three spans spaced at 24, 24 and 25 metres intervals (west to east), respectively.

Option 4 – Removing the existing bridge and construction of a new bridge

This option would involve building a new bridge on the same alignment, removing the existing bridge, closing Forbes Street to the north of Bungonia Road and realigning Bungonia Road to the east and west to improve the road geometry and site distances.

2.4.3 Analysis of options

Option 1 – Do nothing

The existing bridge over Mulwaree Ponds is structurally inadequate from both a load bearing and configuration perspective. Maintenance activities to keep the bridge in operation are frequent and costly. Support beneath the western approach spans has been installed to extend the life of the bridge and allow heavy vehicles to continue to utilise the route. No pedestrian or cyclist facilities are provided on the existing bridge and the capacity for single directional traffic movement only is restrictive. In addition, the approaches are poorly aligned and the intersection treatment with Forbes Street is poorly configured. The do nothing option is considered inappropriate as it presents an unacceptable risk to road users and high maintenance costs in the short and long-term.

Option 2 – Strengthening option (A, B, C & D)

All four strengthening options were not deemed suitable as they would not overcome the width limitations and the resultant implications for vehicle and pedestrian or cyclist movement. No improvements to travel time along Bungonia Road would be achieved and there would be very minor safety improvements with the improved deck on the approaches. Retaining the existing bridge would also not resolve the high ongoing maintenance costs required for the bridge upkeep. Furthermore, rehabilitation work and ongoing maintenance would require the use of old growth hardwood trees which are generally difficult to grow and source in the short to medium term. This would contribute to an unsustainable general depletion of Australian old growth forests.
Option 3 – Replacement options (A, B & C) retaining the existing bridge for pedestrian access

All options considered for replacement would retain the existing de Burgh truss element of the bridge for pedestrian access and construct a new bridge for vehicle movement. Options 3A, B and C would require ongoing maintenance including the use of old growth hardwood trees for the de Burgh truss element and associated high costs. Although all the options would meet the load standards, a T-intersection would be required at the intersection of Bungonia Road and Forbes Street, which would increase travel time on Bungonia Road as vehicles would be required to make a 90 degree turn onto the bridge from Forbes Street. Safety would be improved and pedestrian and cyclist facilities would be provided.

Option 4 – Removing the existing bridge and construction of a new bridge

This option would involve removing the existing bridge and building a new bridge on the same alignment, closing Forbes Street to the north of Bungonia Road and realigning the approaches on Bungonia Road to improve the road geometry and site distances.

Option 4 arose from consultation with Goulburn Mulwaree Council. Roads and Maritime was informed that Council was proposing to close Forbes Street just to the north of Bungonia Road to remove the current substandard intersection. By removing the Forbes Street intersection, the new bridge could be built on the existing alignment and priority could be given to the majority of traffic which travels east-west along Bungonia Road.

Table 2-1 outlines the advantages and disadvantages of all the options considered for the proposal.

**Table 2-1 Summary of the advantages and disadvantages of options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>• No impacts to landowners.</td>
<td>• Would not improve road safety and traffic efficiency on approaches to the bridge.</td>
</tr>
<tr>
<td></td>
<td>• No impacts on ecologically significant habitats.</td>
<td>• Ongoing high maintenance costs.</td>
</tr>
<tr>
<td></td>
<td>• No immediate high capital expenditure.</td>
<td>• Retains load restrictions.</td>
</tr>
<tr>
<td></td>
<td>• Retains heritage value of Lansdowne Bridge.</td>
<td>• Retains structurally deficient bridge that does not meet Australian Standards.</td>
</tr>
<tr>
<td>Options 2A, 2B, 2C and 2D</td>
<td>• No impacts to landowners.</td>
<td>• Ongoing maintenance would require the use of old growth hardwood trees.</td>
</tr>
<tr>
<td></td>
<td>• Retains all or some of the heritage value of Lansdowne Bridge.</td>
<td>• Would not replace Lansdowne Bridge.</td>
</tr>
<tr>
<td></td>
<td>• Lower initial expenditure.</td>
<td>• Would not improve road safety and traffic efficiency on approaches to the bridge.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ongoing high maintenance costs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ongoing maintenance would require the use of old growth hardwood trees.</td>
</tr>
</tbody>
</table>
### Option 3A, 3B and 3C

- New bridge to Australian Standards.
- Safer alignment with Forbes Street.
- Low ongoing maintenance costs for the new bridge.
- Provides safer pedestrian and cycling facilities.
- Removes load limits from bridge.
- Retains heritage value of Lansdowne Bridge.

**Disadvantages**

- Higher initial cost.
- Does not give priority to the majority of vehicles which travel east-west along Bungonia Road.
- T-Intersection required at the end of the bridge at Forbes Street.
- Impact on landholders.
- Ongoing high maintenance costs for the remaining de Burgh truss element.
- Ongoing maintenance would require the use of old growth hardwood trees.

### Option 4

- New bridge on same alignment.
- Removes intersection with Forbes Street.
- Improved road user safety.
- Gives priority and reduces travel time for majority of traffic.
- Low ongoing maintenance costs.
- Provides safer pedestrian and cycling facilities.
- Removes load limits from bridge.

**Disadvantages**

- Impact on landholders.
- Closure of Forbes Street will impact some road users.
- Higher initial cost.
- Demolition of Lansdowne Bridge and loss of heritage values.

## 2.4.4 Analysis of options against proposal objectives

Each of the options was assessed against the project objectives and the criteria described above in section 2.4.2. Table 2-2 provides a summary of whether each option meets the objectives of the proposal.

### Table 2-2 Analysis of options against proposal objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Does option meet the objective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>To provide a bridge to meet current load and configuration standard</td>
<td>No</td>
</tr>
<tr>
<td>To reduce local travel times along Bungonia Road.</td>
<td>No</td>
</tr>
<tr>
<td>To improve safety for all road users</td>
<td>No</td>
</tr>
<tr>
<td>To provide shared pedestrian and cyclist access</td>
<td>No</td>
</tr>
</tbody>
</table>
### Objective

<table>
<thead>
<tr>
<th>Objective</th>
<th>Does option meet the objective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>To reduce ongoing maintenance frequency and cost</td>
<td>No</td>
</tr>
</tbody>
</table>

#### 2.5 Preferred option

The preferred option selected is option 4, which involves constructing a new Lansdowne Bridge on the same alignment with the closure of Forbes Street and the realignment of the approaches on Bungonia Road.

This option best achieves the project objectives and the supporting criteria by:

- Improving the geometry and alignment of Lansdowne Bridge and its approaches by constructing a new bridge with wider lanes and providing shoulders, which would improve traffic and freight efficiency and road safety.
- Reducing ongoing maintenance costs by building a new bridge with a 100 year design life and replacing the existing bridge.
- Providing safer access for all road users including cyclists and pedestrians.
- Maintaining safe access for existing landowners along the proposal. While some property acquisition would be required, the proposal results in an overall positive social impact to landowners.

The concept design was developed based on option 4.
3. **Description of the proposal**

3.1 **The proposal**

The proposal is to replace the existing Lansdowne Bridge on Bungonia Road at the crossing of Mulwaree Ponds, with a new concrete bridge on the same alignment. The key features of the proposal are shown on Figure 1-1 and include:

- Demolition of the existing Lansdowne Bridge.
- Construction of a new two lane, three span concrete bridge along the existing alignment with shared pedestrian and cyclist facilities. One pier would be constructed within Mulwaree Ponds.
- Realignment of a section of Bungonia Road from the new bridge to about 200 metres to the east of the bridge. One lane of the existing Bungonia Road alignment will be retained east of the bridge as property access to 2 Bungonia Road.
- A slight adjustment of a section of Bungonia Road from the bridge to about 90 metres to the west of the bridge.
- Permanent closure of Forbes Street, to the north of Bungonia Road. An interpretive plaque and seating area would be provided where Forbes Street is terminated.
- Removal of the unsafe access to the dog racing track located around 50 metres to the west of Lansdowne Bridge. The access located around 200 metres to the west of Lansdowne Bridge would be maintained.
- Utility adjustments including power pole relocation within the road reserve.

3.2 **Design**

A detailed description of the concept design is provided in section 3.3. The concept design would be further refined during the detailed design phase.

3.2.1 **Design criteria**

The concept design was prepared in accordance with a Design Management System certified under AS/NZS ISO 9001:2008 Quality Management Systems – requirements and with reference to:

- *Beyond the Pavement - Roads and Traffic Authority of NSW urban design policy, procedure and design principles* (RTA, 2009).

Specific design criteria developed for the proposal are summarised in Table 3-1.
### Table 3-1 Design criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design speed</td>
<td>Horizontal 60 km/h</td>
</tr>
<tr>
<td></td>
<td>Vertical 60 km/h</td>
</tr>
<tr>
<td>Minimum “K” value</td>
<td>Crest – 16.24</td>
</tr>
<tr>
<td></td>
<td>Sag – 21.27</td>
</tr>
<tr>
<td>Stopping sight distance</td>
<td>Reaction time 1.5 s</td>
</tr>
<tr>
<td></td>
<td>Horizontal 83 m</td>
</tr>
<tr>
<td></td>
<td>Vertical 83 m</td>
</tr>
<tr>
<td>Horizontal radius</td>
<td>Minimum 120 m</td>
</tr>
<tr>
<td>Upgrade lanes (in each direction)</td>
<td>1</td>
</tr>
<tr>
<td>Grade</td>
<td>Maximum 5 %</td>
</tr>
<tr>
<td>Lane width</td>
<td>3.5 m</td>
</tr>
<tr>
<td>Shoulder width</td>
<td>2.5 m</td>
</tr>
<tr>
<td>Clearance to boundary</td>
<td>Minimum 10</td>
</tr>
<tr>
<td>Flood immunity</td>
<td>1 in 100 for new bridge structure</td>
</tr>
<tr>
<td>Batters:</td>
<td>2:1 – Until determined from geotechnical</td>
</tr>
<tr>
<td></td>
<td>investigation</td>
</tr>
<tr>
<td>Fill less than 1.5 metres high</td>
<td></td>
</tr>
<tr>
<td>Fill greater than 1.5 metres high</td>
<td></td>
</tr>
<tr>
<td>Design vehicle local road</td>
<td>12.5 m single unit truck</td>
</tr>
<tr>
<td>Design vehicle – property access</td>
<td>12.5 m single unit truck (farm residence and paddock access by negotiation with the land owner)</td>
</tr>
<tr>
<td>Shoulder</td>
<td>2.0 m shoulders with 2.5 m adjacent to barriers</td>
</tr>
</tbody>
</table>

#### 3.2.2 Engineering constraints

The following engineering constraints have been identified for the design and construction of the proposal:

- The temporary closure of Lansdowne Bridge which provides an important transport link for goods and stock between Goulburn and the surrounding rural community. The proposal would in also involve the temporary closure of a section of Bungonia Road within the proposal site, including the Lansdowne Bridge, for the duration of the demolition and construction work (about 12 months) during which a detour would be established.

- Construction works over, in and adjacent to Mulwaree Ponds, a sensitive waterway which is subject to flooding. One pier would be constructed within the waterway.

- The presence of existing utilities including electricity and telecommunication infrastructure which would require adjustments.

- Property access requirements during road construction for the properties to the north and south of Bungonia Road.
3.3 Major design features

The major design features of the proposal are described in the following sections, and are shown on Figure 1-1.

3.3.1 Lansdowne Bridge

The new Lansdowne Bridge would have a length of 100.6 metres and a width of 13 metres. The new bridge would be a concrete construction with two concrete piles, one of which would be constructed in the waterway. In elevation, it would appear to be a straight beam crossing the Mulwaree Ponds with supporting piers. The new bridge would include two-rail parapet fencing along each side of the bridge, allowing views from the bridge deck. The bridge has been designed in accordance with relevant guidelines (as listed in section 3.2.1). The bridge would include:

- Two 3.5 metre wide travel lanes and two one metre wide shoulders.
- Three metre wide shared pedestrian and cyclist facilities along the northern side of the bridge separated from traffic with concrete barriers.
- Three piers (with two piles each) with a width of one metre. One pier would be in the waterway. The piles would be bored piles to a depth of about six metres below ground surface level.
- Bridge length of 100.6 metres with a channel crossing of about 20 metres.
- Deck surface of asphalt.
- Foundation of cast in place bored piles for abutments and piles.
- Substructure of four spans with a length of about 25 metres each. Prestressed concrete, bored piles for abutments.
- Superstructure with a depth of about 2.9 metres.
- A continuous deck slab over piles with deck joints at abutments.
- Overall bridge width of about 13 metres.
- Concrete traffic barriers on both sides of the carriageway.
- Straight alignment with a skew angle of about 20 degrees to line up with the stream contours.

The new bridge would not be designed for 1 in 100 year flood immunity as the approach to the west of the bridge is not above this level. During a 1 in 100 year flood a quarter of the western end of the bridge would be submerged.

The western road approach (Goulburn side) would match the existing road approach level. The proposed abutment on the western side of the river (Goulburn side) would be set back by two meters from the existing abutment. This would provide an additional two metres of waterway opening on the Goulburn approach.

The western deck level would be about RL 630.724 and would be lower than the eastern deck level (Gundary side) which would be about RL 633.249.

The area of obstruction created by the new deck is calculated to be about 220 square metres. The calculated average depth of the superstructure is about 2.93 metres. The proposed bridge has four spans, span 1 (25.3 metres), span 2 (25 metres), span 3 (25 metres) and span 4 (25.3 metres). Each pier would be 0.9 metres wide. The area of obstruction in the waterway created by the piers is 4.3 square metres.
Once constructed, the bridge would be maintained by Goulburn Mulwaree Council.

A photomontage of the new bridge is shown in Figure 3-1 and the general arrangement of the bridge is shown in Appendix A.

![Photomontage of proposed new bridge](image)

**Figure 3-1 Photomontage of proposed new bridge**

### 3.3.2 Bungonia Road realignment

The proposal includes the realignment of Bungonia Road to the east and west of the bridge to improve road geometry, site distance and efficiency of the road network.

The proposal would include construction of new road pavement and associated infrastructure from the new bridge to about 200 metres east of the bridge and 220 metres west of the bridge. The realignment would tie in with the existing Bungonia Road and would include the removal of vegetation and cut and fill work.

The realignment would be constructed to a 60 kilometre per hour design speed. The realignment would have two 3.5 metre wide lanes, one metre wide shoulders with a three metre wide shared path separated by a concrete barrier and a maximum grade of five per cent. The new alignment would include a new pavement with a 20 year design life.

Pavement type would be subject to investigations during detailed design. The preliminary pavement design is a spray seal wearing surface on a layer of gravel.

About 150 metres of one lane of the existing Bungonia Road from the eastern abutment of the bridge to the existing eastern access of the property at 2 Bungonia Road would be retained to allow access to the property. The existing pavement not to be retained would be removed and the area rehabilitated. This would include milling and ripping the existing road in situ and revegetation.

As a result of the realignment of Bungonia Road, the western driveway to 33 Bungonia would be shortened and regraded, while maintaining the same alignment. The existing stone gates and fencing would be removed and reinstated further north at the new property boundary.

The proposal would also involve the removal of the access to the dog racing track located around 50 metres to the west of Lansdowne Bridge. The access track would be removed as it currently poses a safety hazard. The alternative access to the racing track located around 200 metres to the west of Lansdowne Bridge would be maintained.
3.3.3 Forbes Street closure

Following the completion of bridge construction works, Forbes Street would be closed north of Bungonia Road. A turning circle would be constructed so that vehicles can safely turn around. The turning circle would extend about 17 metres to the east of the current Forbes Street road reserve (refer to Figure 1-1). Forbes Street would remain open during construction of the bridge.

South of the turning circle, a three metre wide shared pedestrian and cyclist path, about 90 metres long, would be provided. The path would connect to the proposed shared path along the northern side of Lansdowne Bridge. The path would be realigned up to four metres to the east from the existing road pavement, to match the level of the new bridge.

A locked removable guardrail would be provided at the intersection with Bungonia Road. Access to Forbes Street from Bungonia Road via the new pedestrian and cycle path would only be available to emergency services in emergency situations.

An interpretive plaque and seating area would be provided where the street is terminated, providing views of Mulwaree Ponds. The plaque would explain the connection of the remaining piers in the water and would include a photograph of the current bridge.

3.3.4 Other design features

Drainage

The proposal would involve upgrading the existing stormwater system to accommodate the new bridge and the redirected section of Bungonia Road. This would include:

- Extension of two culverts west of the bridge to accommodate the proposal.
- Kerb and gutter along the length of the bridge.
- Table drains would direct water into the existing drainage system east of the bridge.

Cut and fill

Cut and fill work would be required for the construction of the realigned section of Bungonia Road. The largest batter would be about six metres high at its highest point and 200 metres long.

Cut and fill for the new road realignment would require about 15,760 cubic metres of excavation, of which about 2220 cubic metres would be required for fill and about 12,460 cubic metres of surplus excavated soil. Earthwork volumes are all calculated assuming two horizontal to one vertical batter slopes.

Retaining wall

One retaining wall of about 78 metres in length would be constructed along the north-western side of the proposal site in order to avoid encroaching on the Mulwaree River. The height of the wall would range between one metre and 3.9 metres. The indicative location of the retaining wall is shown in Figure 1-1.
3.4 Construction activities

3.4.1 Work methodology

General methodology

Construction activities would be guided by a construction environmental management plan to ensure that all work is carried out to Roads and Maritime Services’ specifications within the specified work area and are completed to incorporate all safeguards described in this review of environmental factors.

Construction is expected to take up to 12 months and would generally include the following activities:

- Site establishment, including:
  - Progressive installation of environmental controls including temporary erosion and sediment controls (drainage diversions, geotextile fabric, sediment fences, floating booms etc).
  - Establishment of a temporary construction compound (for the storage of equipment and materials).
  - Installation of an access track on the southern side of the bridge.
  - Installation of fencing and signage to delineate the construction areas.
  - Installation of traffic controls and detour signage.

- Utility adjustments (electricity, water and telecommunications) as required.

- Demolition of the existing Lansdowne Bridge, including:
  - Hazardous paint management work.
  - Removal of bridge timbers using chainsaws, crowbars and sledgehammers. Timbers would then be lifted and loaded onto trucks with a mobile crane.

- Construction of new bridge along the same alignment, including:
  - Construction of temporary pad for piling rig.
  - Piling.
  - Construction of piers.
  - Construction of bridge abutments.
  - Placement of deck.

- Construction of bridge approaches, including:
  - Removal of vegetation, mulching and grubbing.
  - Stripping and stockpiling of topsoil.
  - Surface preparation using graders, dozers, scrapers and other equipment.
  - Mark-out cut and fill locations.
  - Excavate cuttings.
  - Recycling of suitable excavated material and incorporation of suitable material as fill.
  - Place and compact fill material.
  - Trim surface to required level.
  - Installation of utilities (roadside drainage structures, street lights etc).
  - Sub-grade preparation and pavement work including the application of flexible asphalt pavement using pavers and rollers.
- Adjustment of westernmost driveway at 33 Bungonia Road including regrading of the driveway and relocating the existing stone fence and gate to the new property boundary.
- Installation of line marking, signs and guide posts.

- Closure of Forbes Street following construction of the bridge, including:
  - Removal of vegetation, mulching and grubbing.
  - Surface preparation.
  - Mark out fill locations, where required.
  - Place and compact fill material for the minor realignment works.
  - Removal of pavement, if required.
  - Construction of cul-de-sac.
  - Pavement works for the new shared path.
  - Line marking where required.
  - Installation of guardrail, including removable section at the Bungonia Road intersection for emergency services access.
  - Installation of plaque and seating area, where the street is terminated.

- Decommissioning of temporary construction compound, site clean-up and disposal of all surplus waste materials.
- Restoration and revegetation of disturbed areas.

Figure 1-1 illustrates the indicative proposal site. Some of the above listed activities may run concurrently. The proposed general methodologies for demolition of the existing bridge and construction of the new bridge are described below. Detailed work methodologies would be determined during construction planning and detailed design.

**Demolition of existing bridge**

The existing Lansdowne Bridge would need to be demolished before construction of the new bridge as it utilises the existing alignment. Demolition would be undertaken in a controlled manner by a specialist contractor using a combination of machinery and power tools. Floating booms would be installed within the waterway, downstream of the work, as a last defence to capture any floating debris that may fall into the waterway.

The dismantling work would be undertaken from the existing bridge starting from the centre and progressively working towards the abutments. Larger equipment including cranes and excavators would be used to remove the larger timber members from the bridge. This would be undertaken from the established access track that currently services the dog racing track. Once the approach spans are removed, the main truss would then be removed using a crane. The crane would most likely be placed at the Forbes Street and Bungonia Road intersection. The existing monier pier would be cut off above the water level and left in place.

A lead management plan would be prepared based on the procedures outlined in Australian Standard (AS) 4361.1 Guide to lead paint management Part 1: Industrial applications as part of the construction environment management plan for the appropriate management of bridge elements painted with lead or polycyclic aromatic hydrocarbons. All procedures and techniques used in the preparation and demolition work for the management of hazardous paint would be dust-free. The only deliberate disturbance of lead paint or polycyclic aromatic hydrocarbons would occur during the preparation of cutting margins, where paint removal would be required. The proposed general methodology would include:

- Installation of containment structures, including:
Impermeable ground sheets, drop nets and shade cloth to prevent spreading of paint debris onto the surrounding land or into the waterway.

Ground sheets would be placed below and beside each span of the bridge as it is being demolished, extending for at least three metres on each side. Catch sheets would be hung below the bridge, or a fully scaffolded platform erected with impervious covers would be installed over the water crossing.

- Removal of timber elements containing lead or polycyclic aromatic hydrocarbons, including:
  - Removal of large flakes of paint. Large flakes of paint would first be removed by wet scraping, ensuring no dust is created or allowed to escape to the environment. All debris would be captured on ground sheets, and collected and placed in dedicated waste containers.
  - Removal of paint from ‘cut zones’ before cutting timber elements. This would be undertaken with the use of a chemical stripper or vacuum-shrouded power tools to prevent the generation of hazardous dust during cutting.
  - Stabilisation of flaking paint. All remaining paint would be stabilised in-situ by applying a high-build flexible water-borne acrylic paint. Application of the paint would be by airless spray to minimise disturbance of the existing paint.

- Handling and transport of timber elements. Dismantled timber elements with traces of lead or paint containing polycyclic aromatic hydrocarbons would be placed on heavy duty plastic and securely wrapped in plastic to prevent the paint from becoming dislodged during handling and transport.

- Unpainted timber and any steel from the truss section would then be removed without the need for controls for hazardous paints.

All waste collected from the work area or containment would be collected daily, and stored in secure, labelled drums or covered skip bins within the construction compound for off-site reuse or disposal. All waste would be classified in accordance with the Waste Classification Guidelines (DECCW, 2009) before disposal at an Environmental Protection Authority (EPA) licensed facility. It is anticipated that some components of the existing steel elements not contaminated with hazardous paints would be salvaged for re-use.

All demolition work would be carried out in such a way to ensure there would be no pollution of the receiving environment, that the public would not be placed at risk of exposure to hazardous substances and that the demolition and transport workers involved are not occupationally exposed to hazardous substances.

**Construction of new bridge**

In order to enable piling within the waterway, a temporary pad of about 15 metres by 15 metres for the piling rig would be constructed within the waterway. The pad would be constructed from the western bank out to 2.5 metres past the location of the two piles by placing geotextile and clean rock of 300-500 millimetres diameter to allow water to pass through. This would be covered with a layer of smaller rock of about 100-200 millimetres diameter, a second layer of geofabric and then a layer of road base to provide stable access for the piling rig. The platform would be in place for about four months.

Piling work associated with the construction of the bridge would require piling in six locations to a depth of about six metres. Two piles would be constructed within the waterway (refer to Figure 3-1).

Once construction of the piles has been completed and the piers and headstocks cast, the bridge abutments would be constructed and the deck would be placed with a crane. Following
the completion of the bridge construction, the temporary pad would be removed and the disturbed areas rehabilitated.

### 3.4.2 Construction duration and working hours

Proposed works are expected to start in the second quarter of 2014 and would take up to 12 months.

About 20 construction and site management personnel would be required on-site each day.

It is anticipated that the proposal would require a full road closure and all work for the proposal would be undertaken during the recommended standard hours for construction work according to the *Interim Construction Noise Guideline* (DECC, 2009):

- Monday to Friday: 7am to 6pm.
- Saturday: 8am to 1pm.
- Sundays and public holidays: no work.

Should any out of hours work be required, work would be undertaken in line with procedures contained in Roads and Maritime Services’ *Environmental Noise Management Manual 2001 (ENMM), Practice Notes vii – Roadworks Outside of Normal Working Hours* (RTA, 2001a). This would include notifying the local community of any work planned to be undertaken outside the standard hours.

### 3.4.3 Plant and equipment

Plant and equipment for the proposal would be determined during the construction planning phase. An indicative list of plant and equipment likely to be used for the proposal includes:

- Large crane
- Excavators (30, 20 and 8 tonne)
- Air compressors
- Asphalt milling machine
- Asphaltic paving machines
- Bulldozers
- Chain saws
- Concrete cutters
- Concrete pump
- Concrete supply agitator trucks
- Concrete vibrators
- Cranes and hiabs
- Demolition saw
- Dump trucks
- Excavation plant
- Front end loaders.
- Bobcat
- Graders
- Jack hammers
- Kerbing machine
- Light vehicles
- Line marking vehicles
- Mulcher
- Pneumatic hand or power tools
- Road sweeper
- Rollers and vibrating compactors
- Scrapers
- Skid steer loaders
- Small excavator or backhoe
- Stump grinder
- Trucks
- Water tankers.
3.4.4 Earthworks

Earthworks for the realignment of Bungonia Road would require about 12,460 cubic metres of excavation and 2220 cubic metres of fill. Surplus excavated material would be used to widen batters on-site. Earthwork volumes are all calculated assuming two horizontal to one vertical batter slopes. All remaining material would be disposed of at a licenced landfill or transported to nearby road projects for immediate reuse.

3.4.5 Source and quantity of materials

Fill material would be sourced from cut materials from the site where possible, for which about 2220 cubic metres would be required. It should be noted that the accuracy of fill required is subject to variations in bulking factors for excavated material, relative compaction achieved for placed material and volume of unsuitable material. This would be refined during detailed design.

The road pavement would be sourced from appropriately licensed facilities. About 3000 cubic metres of pavement materials, gravel and select materials would be required to be imported. Exact material quantities are unknown at this stage but would include concrete, asphalt, steel road base, sand and top soil.

These materials would be sourced from local quarries and commercial suppliers in the Goulbourn area. The maximum haulage distance for transport of materials would be about 50 kilometres. It is anticipated that the prestressed girders would be sourced from a number of prequalified precasters in NSW.

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 concurrent private and local government projects.
- Disposal at an approved materials recycling or waste disposal facility.

Volumes of water required during construction are unknown at this stage and would depend on material sources and methodologies applied by the contractor. It is proposed that the water would be sourced from local water supplies. This water is likely to be required for earthworks during construction and dust suppression as appropriate. No groundwater extraction or water from the Mulwaree Ponds would be undertaken as part of the works.

3.4.6 Traffic management and access

Vehicle movements

Construction of the proposal would generate heavy vehicle movements as a result of the transportation of construction machinery, equipment and materials to the proposal site, and the removal of waste from the site. Construction vehicles would access the site via Bungonia Road.

About 10 to 15 heavy vehicles would be required on-site per day, resulting in 20 to 30 heavy vehicles movements in and out of the site per day. In addition, up to 15 small vehicles would be required to transport staff, resulting in up to 30 small vehicle movements in and out of the site per day.

Small vehicles used to transport staff to and from the site would be parked in the construction compound (refer to section 3.5.1).
Traffic management

Bungonia Road within the construction areas would be closed for the duration of work. Forbes Street would remain open until major construction work starts.

General traffic travelling to and from Goulburn city would be detoured around the work areas with the following detours shown in Figure 3.2:

- Heavy vehicles (over 42.5 tonnes) would be directed via Windellama Road to Brisbane Grove Road and Braidwood Road to Goulburn. This would add about seven minutes to the journey for these vehicles. This is the same route that these vehicles currently take as the bridge currently has a 42.5 tonne load limit.
- Light vehicles would be able to use Memorial Road and Park Road which would add about three minutes to the journey for these vehicles.

The detours would be clearly sign posted and residents notified before closure of the section of Bungonia Road. Traffic would be returned to the new configuration upon completion of road work. Forbes Street would be permanently closed to general traffic after the completion of work, but would remain accessible for emergency vehicles.

A traffic management plan would be prepared in accordance with the Traffic Control at Work Sites Manual (RTA, 2010a) and Specification G10 – Control of Traffic. The plan would provide details of traffic management to be implemented during construction to ensure the safe passage of vehicles around the construction area. The plan would include details of construction sequences. All traffic management would be in accordance with current Roads and Maritime standards. The traffic management plan would be reviewed by Roads and Maritime before implementation.

Access management

Access to the proposal site for all work would be via Bungonia Road (from both east and west directions).

Access to properties 2 and 33 Bungonia Road to the east of the Lansdowne Bridge would be temporarily affected during construction of the realignment. Alternative access would be provided in consultation with the landowners. No other access roads would be directly impacted by construction.

3.5 Ancillary facilities

3.5.1 Construction compound

A temporary construction compound of about 2000 square metres would be established within the Goulburn Recreation Area managed by Goulburn Mulwaree Council adjacent to the proposal site to stockpile materials, store plant and equipment and to provide for construction staff parking, toilets and amenities. Council has agreed to Roads and Maritime using the land and Roads and Maritime would enter a lease agreement with Council for the construction period.

Chemicals and fuels for construction would be stored in designated areas in the construction compound. The proposed location for the construction compound is immediately south of Bungonia Road, about 120 metres to the west of the Lansdowne Bridge crossing of the Mulwaree Ponds (refer to Figure 1-1).

Roads and Maritime considered council requirements as well as heritage constraints to select a preferred option for the location of the construction compound. The proposed location was selected as:
• It affords good access off Bungonia Road and is located close to the proposal.
• It is located away from the Mulwaree River and on a higher part of the floodplain.
• Site conditions are appropriate.

Should additional site compounds or stockpile areas be required, the Roads and Maritime Senior Environmental Officer would be consulted for advice on the level of further environmental assessment required.

The construction compound and stockpile site/s would be subject to the site location criteria set out in Roads and Maritime Services’ Draft Stockpile Site Management Procedures 2011 (RTA, 2011a). Acid sulphate soils are not considered to occur on-site and therefore the stockpiling of these materials is not considered likely to be required. Specific management measures would be required for the stockpiling of hazardous waste and potentially contaminated material and are discussed further in sections 6.2 and 6.12.

The construction compound would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of construction work, the temporary construction compound would be removed and the site cleared of all rubbish and materials and rehabilitated.

### 3.5.2 Access track

A temporary access track would be established which would be extended to the temporary work platform at Mulwaree Ponds from the western abutment of the bridge to the temporary work area as shown on Figure 1-1. The track would be appropriately stabilised with the placement of geotextile and rock. After construction is complete, all imported material would be removed and the disturbed area rehabilitated. Access to the eastern abutments of the bridge would be directly from Bungonia Road.

### 3.6 Public utility adjustment

#### 3.6.1 Existing services

Dial-before-you-dig searches were undertaken to ascertain the position of existing services within the proposal site. Public utilities that occur within the proposal site and would require relocation include:

• Power lines and power pole(s) (Essential Energy).
• Irrigation pipe on eastern bank of Mulwaree ponds (operated by Goulburn Brewery west of Lansdowne Bridge).

#### 3.6.2 Strategy for protection and relocation of assets

All utility owners with assets identified above would be contacted as part of the detailed design process before work starts to determine appropriate strategies for the relocation and protection of their assets.

Following discussion with the impacted utility owners, actions would be put in place to relocate services. These actions would potentially include:

• Obtaining specific approvals from utility authorities.
• Relocating the affected service.
• Adjusting the design where required.
The methodology for the management of the assets would be confirmed in consultation with the utility provider during detailed design. Concept design investigations indicate that adequate room exists within the proposal site for the relocation of assets. No relocations are anticipated outside of the proposal site, however, if relocation works are required outside the proposal site, the Roads and Maritime Senior Environmental Officer would be consulted for advice on the level of further environmental assessment required. Further assessment may include the preparation of an addendum to this review of environmental factors.

3.7 Property acquisition

The proposal would require the acquisition of about 8500 square metres (0.85 hectares) from private property (Lot 1 DP 598475 and Lot 2 DP 67346) and Crown land primarily for the realignment of Bungonia Road and the closure of Forbes Street. The indicative property acquisitions required for the proposal are illustrated in Figure 3-3.

In addition, Roads and Maritime proposes to lease about 50 metres by 20 metres for use as a temporary construction compound from Goulburn Mulwaree Council. Lease areas would be required for the period of construction only and would be returned to the landowner on completion of work. A lease fee would be paid to landowners for the period of the lease.

All property valuations, lease fees and acquisition payments would be carried out in accordance with the RTA Land Acquisition Information Guide (2011) and the Land Acquisition (Just Terms Compensation) Act 1991. Property acquisition plans would be prepared for each of the properties to be acquired as part of the detailed design. Property acquisition impacts are discussed in section 6.9.
The proposal

Heavy Rail

Heavy vehicles detour

Waterways

Light vehicles detour
4. Statutory and planning framework

4.1 State Environmental Planning Policies

4.1.1 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 a road infrastructure facility and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from council is not required.

The proposal is not located on land reserved under the *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 (Transitional Major Projects) 2005*.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities before the start of certain types of development. Consultation, as required by ISEPP (where applicable) is discussed in section 5.3 of this review of environmental factors.

4.1.2 State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

The *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* (SDWC SEPP) aims to provide healthy water catchments that will deliver high quality water while still allowing for development with the goal of have a neutral or beneficial effect on water quality.

The proposal site and surrounding areas are located within the Sydney drinking water catchment to which the SDWC SEPP applies.

Clause 12 of the SDWC SEPP states that:

> A public authority must, before it carries out any activity to which Part 5 of the Act applies, consider whether the activity would have a neutral or beneficial effect on water quality.

A neutral or beneficial effect on water quality occurs when an activity:

- Has no identifiable potential impact on water quality.
- Will contain any such impact on the site of the activity and prevent it from reaching any watercourse, waterbody or drainage depression on the site.
- Will transfer any such impact outside the site by treatment in a facility and disposal approved by a public authority (but only if the public authority is satisfied that water quality after treatment will be on the required standard).

A neutral or beneficial effect assessment has been undertaken for the proposal and is included in Appendix B. The assessment concluded that the proposal would have a neutral effect on water quality.
4.1.3 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy 44 Koala Habitat Protection (SEPP 44) aims to encourage the ‘proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline’. Although SEPP 44 does not apply to the proposal because Roads and Maritime does not require development consent, the provisions of SEPP 44 have been considered.

Schedule 1 of SEPP 44 lists the local government areas to which SEPP 44 applies. The study area is located within the Goulburn Mulwaree local government area which is listed under Schedule 1 of SEPP 44.

Potential Koala habitat is defined as ‘an area of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component’. Core Koala habitat, is defined as ‘an area of land with a resident breeding population of Koalas, evidenced by attributes such as breeding females and recent sightings and historical records of a population’. Where core Koala habitat is found to occur, SEPP 44 requires a site-specific Koala Plan of Management be prepared, unless a local government area-based Koala Plan of Management exists.

As mentioned in section 6.3, no Koala feed trees would be removed as a result of the Proposal. Therefore no potential or core Koala habitat would be impacted on as a result of the Proposal. Hence, no further provisions of SEPP 44 apply.

A summary of biodiversity findings are included in section 6.3.

4.2 Local Environmental Plans

4.2.1 Goulburn Mulwaree Local Environmental Plan 2009

The Proposal is located within the Goulburn Mulwaree local government area. Land use zonings relevant to the proposal are subject to the Goulburn Mulwaree Local Environmental Plan 2009 (Goulburn Mulwaree LEP).

The road corridor within the study area is zoned as RU2 Rural Landscape under the Goulburn Mulwaree LEP. Land adjoining the road in to the south is zoned as RE1 Public Recreation; to the north-west and south-east is zoned as RU2 Rural Landscape, to the north-east is R2 Low Density Residential and SP2 Infrastructure.

As discussed in section 4.1.1, consent requirements under the Goulburn Mulwaree LEP are not relevant to the proposal. Clause 94 of the 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.

Lansdowne Bridge is listed on Schedule 5 of the Goulburn Mulwaree LEP. Under Clause 5.10(a)(i) of the LEP, development consent is required for the demolition of a heritage item. The ISEPP overrides the heritage controls included in the Goulburn Mulwaree LEP.

4.3 Other relevant legislation

Heritage Act 1977

The NSW Heritage Act 1977 (Heritage Act) is concerned with all aspects of heritage conservation ranging from basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement.
Heritage places and items of particular importance to the people of NSW are listed on the State Heritage Register (SHR). Only those heritage items that are of State significance are listed on the SHR. An approval under Section 60 of the Heritage Act may be required if there are any impacts on a listed heritage item.

Two items in the vicinity of Lansdowne Bridge are listed on the SHR:

- The Goulburn Brewery and curtilage, which includes land to the north of Lansdowne Bridge and, at its nearest point is about 12 metres from the bridge.
- ‘Lansdowne’ homestead and surrounding complex. The proposed change in road alignment to the east of the bridge would fall within the SHR curtilage of Lansdowne.

Potential impacts to these items have been considered in section 6.1. As the proposal would involve impacts within the SHR curtilages of both of these items a copy of the heritage report should be provided to the NSW Heritage Council and a Section 60 permit or Section 57(2) exemption would be required before work starts within these curtilages.

The Heritage Act also protects 'relics', which can include archaeological material, features and deposits. Section 4(1) of the Heritage Act (as amended 2009) defines a 'relic' as follows:

\[
\text{relic means any deposit, artefact, object or material evidence that:}
\]

(a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and

(b) is of State or local heritage significance.

Under Section 139 of the Heritage Act, approval from the NSW Heritage Council is required before the disturbance or excavation of land if a project will, or is likely to result in, disturbance to a relic.

Areas with archaeological potential within the study area are discussed in section 6.1. The potential construction compound is located within an area of low archaeological potential. An exception notification would be sought from the NSW Heritage Division under Part 139 (4) of the Heritage Act prior to mobilisation of the construction compound.

**Fisheries Management Act 1994**

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations including conserving fish stocks and fish habitat and promoting ecologically sustainable development.

The FM Act requires a permit for certain work including dredging, reclamation or work that blocks fish passage.

Dredging is defined under the FM Act as any work that involves excavating water land, or any work that involves the removal of material from water land and includes the removal of woody debris, snags, gravel beds, cobbles, rocks, boulders, rock bars or aquatic vegetation from water land.

Reclamation refers to using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge), or draining water from water land for the purpose of its reclamation.

The proposal would involve dredging and reclamation work. Public authorities are exempt from obtaining a permit for dredging or reclamation work under Part 7 of the FM Act (refer Section 199). Therefore, in accordance with Section 199 of the FM Act, notification would be
given to the Minister and any matters raised by the Minister would be considered within 28 days after the giving of the notice.

The proposal would result in partial temporary obstruction to fish passage as a result of the construction of a temporary piling pad in Mulwaree Ponds, which is identified as key fish habitat (refer to section 6.3). A permit is therefore required under Section 219 of the FM Act to block fish passage.

### 4.4 Commonwealth legislation

#### 4.4.1 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 B and section 6 of the review of environmental factors.

Two threatened ecological communities, four threatened flora species, 16 threatened fauna species and 15 migratory species listed under the EPBC Act were recorded as potentially occurring in the vicinity of the proposal. Ten parcels of Commonwealth land and one Commonwealth Heritage Place were also identified as occurring within 10 kilometres of the proposal. No other matters of national environmental significance were identified.

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.

### 4.5 Confirmation of statutory position

The proponent and determining authority for the proposal is Roads and Maritime. *State Environmental Planning Policy (Infrastructure) 2007* provides that the proposal may be carried out without the need for development consent. Development consent from Council is not required for the proposal.

### 4.6 Summary of licences and approvals

Relevant licences, permits, notifications and approvals needed to construct and operate the proposal are listed in Table 4-1.

**Table 4-1 Summary of licences and approvals required**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Minister for Primary Industries must be notified of any dredging or reclamation work before undertaking such work.</td>
<td>A minimum of 28 days before work starts.</td>
</tr>
<tr>
<td>A Section 219 permit from Fisheries NSW would be required for the temporary obstruction to fish passage in Mulwaree Ponds as a result of the construction of a temporary piling pad.</td>
<td>Before work starts.</td>
</tr>
<tr>
<td>A Section 60 permit or Section 57(2) exemption would be required before work starts within the curtilages of SHR listed items.</td>
<td>Before work starts.</td>
</tr>
<tr>
<td>Requirement</td>
<td>Timing</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>An exception notification would be sought from the NSW Heritage Division under Section 139 (4) of the <em>Heritage Act 1977</em> prior to mobilisation of the temporary construction compound. If relics were located at the site, further investigation and permits would be required.</td>
<td>Before work starts.</td>
</tr>
</tbody>
</table>
5. **Stakeholder and community consultation**

5.1 **Community involvement**

**Timber Truss Bridge Strategy**

In 2010, Lansdowne Bridge was included in the Roads and Maritime Services’ Timber Truss Bridge Strategy which outlined a methodology for assessing the conservation suitability and management approach for 48 timber truss bridges managed by Roads and Maritime.

The Strategy was advertised for public comment between 18 July and 26 August 2011. At the time of public display Lansdowne Bridge was marked for retention. During the consultation period, an extensive submission was received from Goulburn Mulwaree Council requesting a new bridge be built. This was the only submission received in relation to Lansdowne Bridge.

After extensive discussions with Council and the consideration of a range of other factors including safety, maintenance and future bridge requirements, the Timber Truss Bridge Strategy (August 2012) was revised to include the replacement of Lansdowne Bridge.

**Options selection process and review of environmental factors**

Roads and Maritime placed 10 advertisements in the Goulburn Post between December 2012 and January 2013 inviting members of the public to comment on the future of the Lansdowne Bridge. A dedicated project webpage was established on the Roads and Maritime website containing background information and the latest news on the project. A media release inviting the community to comment was also distributed to local media in late November 2012.

Eight submissions were received from the community during the consultation period. Three of the submissions were via phone, one via letter and four via email.

A meeting was also held with the Goulburn Heritage Group in February 2013 following concerns raised during the consultation period.

Issues raised by the community during consultation are summarised in Table 5-1. A summary of how each issue has been considered by Roads and Maritime is also provided.

**Table 5-1 Summary of issues raised by the local community**

<table>
<thead>
<tr>
<th>Category</th>
<th>Issue</th>
<th>Response and where addressed in this review of environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Concerns with the junction with Forbes Street and the narrow width, poor surface and the lack of pedestrian facilities on the existing bridge. Safety concerns with the poor alignment of the existing bridge, particularly the intersection with Forbes Street.</td>
<td>Access to Forbes Street from Bungonia Road would be permanently closed. This would improve safety by removing the possibility of conflicts at the intersection. Refer to section 3. The proposal would improve the geometry and alignment of Lansdowne Bridge and its approaches to improve traffic and freight efficiency and road safety. Pedestrian facilities would be provided on the new bridge.</td>
</tr>
<tr>
<td>Category</td>
<td>Issue</td>
<td>Response and where addressed in this review of environmental factors</td>
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<tr>
<td></td>
<td>Concerns with the increased traffic volumes that currently use the bridge and future traffic increases.</td>
<td>The proposal would increase the capacity of the bridge to cater for existing and future traffic volumes by providing two lanes to allow two-way vehicle movement across the bridge. Refer to section 3.</td>
</tr>
<tr>
<td></td>
<td>If a new bridge were to be built to the south of the existing bridge the alignment would be improved.</td>
<td>As discussed in section 2.4, a number of options were considered for the location of the new bridge, to the north of the existing bridge and along the existing alignment. Options to the south of the existing bridge were not considered because it would require the acquisition of land from the property on Bungonia Road and the demolition of some of the property. It would also require realigning the road to west of the bridge where there is an area of archaeological significance associated with the former Toll House. The bridge would also need to be extended as it would cross diagonally from the western abutment to a location further to the east on Bungonia Road, resulting in additional impacts to the Mulwaree Ponds. As discussed in section 3, the replacement of the existing bridge in its current location involves realignment of the Bungonia Road approaches. This would improve the alignment of the bridge and approaches whilst posing minimal impacts on adjacent properties and the environment.</td>
</tr>
<tr>
<td>Heritage</td>
<td>Concerns with heritage aspects of the existing de Burgh truss Bridge and requests for the existing bridge to be retained/rehabilitated and a new bridge built adjacent to the existing bridge.</td>
<td>The impact of the proposal on heritage is discussed in section 6.1. As discussed in section 2.4.3, retaining the existing bridge would not resolve the high ongoing maintenance costs required for the bridge upkeep. Furthermore, rehabilitation work and ongoing maintenance would require the use of old growth hardwood trees which are generally difficult to grow and source in the short to medium term.</td>
</tr>
<tr>
<td></td>
<td>Notes that the abutments from a bridge that preceded the existing de Burgh truss bridge may be at risk to building a new bridge adjacent to the existing structure.</td>
<td>As discussed in section 6.1, the proposal would avoid impacts to the extant 19th century bridge abutments to the north of Bungonia Road.</td>
</tr>
<tr>
<td>Category</td>
<td>Issue</td>
<td>Response and where addressed in this review of environmental factors</td>
</tr>
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<td>----------------</td>
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</tr>
<tr>
<td>Access</td>
<td>Concerns with the temporary detour while a new bridge is being built and the possible permanent closure of Forbes Street by Goulburn Mulwaree Council.</td>
<td>Access to and from the Goulburn CBD would be maintained from the western side of the bridge via Braidwood Road. Those travelling from Eastgrove to the CBD would be required to travel into Goulburn via Park Road and Blackshaw Road, or travel south via Memorial Road to access Bungonia Road. The detour routes are expected to add up to three to seven minutes to travel times. The closure of Forbes Street would result in extended travel time and distances for motorists accessing the Goulburn Pony Club, sports fields, private properties and businesses off Bungonia Road as vehicles would be required to travel via other roads. The permanent closure of Forbes Street, however, would improve road safety by providing an improved line of sight on approaches to Lansdowne bridge. Refer to section 6.6.</td>
</tr>
<tr>
<td>Decision</td>
<td>Concerns with the closure of Forbes Street. Detours would not be suitable for long vehicles or vehicles with trailers. Forbes Street is a useful route during flooding and fires, and should be kept open for these reasons.</td>
<td>Once Forbes Street is closed, long vehicles or vehicles with trailers wanting to travel from the east to Eastgrove would proceed along Bungonia Road, turn right onto Braidwood Road, right onto Sloane and Right onto Blackshaw Road and then onto Park Road. This detour around Forbes Street would add about two kilometres to the journey. Forbes Street would remain open during construction. Once the proposal is completed, access via the new bridge would be suitable for long vehicles or vehicles with trailers that currently travel via Forbes Street. During operation and in the event of a flood or fire, emergency vehicles would be able to access Forbes Street from Bungonia Road via a removable section of guardrail. Emergency services could allow use of Forbes Street by the public in emergency situations under the management of the emergency services. Refer to section 3.4.6, 6.6 and 6.11.</td>
</tr>
<tr>
<td>Making</td>
<td>Concerns with the decision making process, but request for new bridge to be built on the same alignment as soon as possible.</td>
<td>Refer to section 3. The new bridge would be built along the same alignment.</td>
</tr>
</tbody>
</table>
Concerns if adequate environmental assessments have been undertaken and requested a full set of options to be presented to the public for feedback.

Section 2.4 provides a summary of options that were considered and the options selection process. The selection of the preferred option took into account social, environmental and economic factors as well as stakeholder input. The review of environmental factors will also be placed on public display to provide the community with the opportunity to comment on the preferred option.

Concerns as to why Lansdowne Bridge had been changed from retention in the draft Timber Truss Bridge Strategy to demolition in the revised Strategy.

The retention of Lansdowne Bridge was reconsidered following strong representations from Goulburn Mulwaree Council due to safety concerns with the existing bridge. The revised Timber Truss Bridge Strategy 2012 proposes the replacement of the bridge. Refer to section 2.1.

## 5.2 Aboriginal community involvement

Artefact Heritage undertook consultation with the Aboriginal community as part of the heritage assessment in accordance with Stage 2 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI RTA, 2008) and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010a). A Native Title search was conducted on the 7 December 2012 by the Roads and Maritime Aboriginal Cultural Heritage Advisor. The search indicated the presence of an active Native Title claim by Gundungurra Tribal Council Aboriginal Corporation (GTCAC) within the study area. The study area is within the boundary of Pejar Local Aboriginal Land Council (PLALC).

Representatives from the GTCAC and PLALC were contacted by the Roads and Maritime Aboriginal Cultural Heritage Advisor and invited to participate in the Stage 2 PACHCI survey. One representative from the PLALC attended the site survey which was undertaken on 13 December 2012. Representatives from GTCAC were booked in for the site survey but did not attend on the day.

The PLALC provided a draft heritage assessment report to Roads and Maritime outlining their survey results. No areas of particular cultural significance were identified in their report.

The outcomes of the Aboriginal archaeological assessment are discussed further in section 6.7. As no known Aboriginal sites, areas of particular cultural significance, or areas of archaeological potential would be impacted by the proposal, Stage 3 of the PACHCI would not be initiated by Roads and Maritime.

## 5.3 ISEPP consultation

Clauses 13, 14, 15 and 16 of the ISEPP require public authorities to undertake consultation with councils and other agencies when proposing to carry out development without consent. Table 5-2 lists the clauses relevant to the proposal and identifies any requirements for ISEPP consultation.
<table>
<thead>
<tr>
<th>Item</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clause 13</strong></td>
<td></td>
</tr>
<tr>
<td>Is the work likely to generate traffic to an extent that will strain the existing road system in a local government area?</td>
<td>The proposal would result in increased traffic numbers on the local road network during construction due to the temporary closure of a section of Bungonia Road within the work area. This has the potential to result in a strain in the capacity of the road system. The proposal would, however, improve the capacity of the road system in the long-term by catering for higher mass limit vehicles. Due to the temporary impacts resulting from construction traffic, formal consultation with Goulburn Mulwaree Council is required.</td>
</tr>
<tr>
<td>Involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the <em>Roads Act 1993</em> (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).</td>
<td>The proposal involves the realignment of Bungonia Road and the replacement of Lansdowne Bridge which is managed by Goulburn Mulwaree Council. Potential impacts are expected to be more than minor or inconsequential. Therefore, formal consultation with Goulburn Mulwaree Council is required.</td>
</tr>
<tr>
<td><strong>Clause 14</strong></td>
<td></td>
</tr>
<tr>
<td>Is the work likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area.</td>
<td>The proposal involves the demolition of Lansdowne Bridge with is a locally listed heritage listed item and within a heritage conservation area. Consultation with Goulburn Mulwaree Council is therefore required.</td>
</tr>
<tr>
<td><strong>Clause 15</strong></td>
<td></td>
</tr>
<tr>
<td>Is the work located on flood liable land? If so, will the work change flood patterns to more than a minor extent?</td>
<td>Lansdowne Bridge is located in flood prone land and may result in minor impacts on flood patterns. Flood modelling would be undertaken during detailed design. If impacts to flood patterns are considered to be more than minor, formal consultation with Goulburn Mulwaree Council would be required.</td>
</tr>
</tbody>
</table>

Formal ISEPP consultation with Goulburn Mulwaree was undertaken during the preparation of the review of environmental factors. A letter was sent to council on 7 March 2013 and the key issues raised by council are provided in Table 5-3. A Statement of Heritage Impact has been undertaken for the proposal and is summarised in section 6.1 and provided in Appendix D. The review of environmental factors including the Statement of Heritage Impact will be provided to Goulburn Mulwaree Council during the public display and council’s response will be taken into consideration in accordance with Clause 14 of the ISEPP.
5.4 Government agency and stakeholder involvement

In March 2013, a number of government agencies and stakeholders were contacted by letter and provided with preliminary details of the proposal and offered an opportunity to comment on the issues they would like addressed in the review of environmental factors. The agencies and stakeholders contacted included:

- Office of Environment and Heritage.
- NSW Department of Planning and Infrastructure.
- NSW Department of Primary Industries (Fishing and Aquaculture).
- Commonwealth Department of the Environment.
- Essential Energy.
- Office of Water.
- Hawkesbury-Nepean Catchment Management Authority.
- Goulburn Mulwaree Council.

The issues raised during this process and Roads and Maritime’s responses are summarised in Table 5-3. Copies of the responses received from each agency and stakeholder are provided in Appendix C.

Table 5-3 Summary of government agency and stakeholder issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Response and/or where addressed in this review of environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Office of Environment and Heritage</strong></td>
<td></td>
</tr>
<tr>
<td>Based on the information provided the proponent will not require an Environment Protection Licence under the Protection of the Environment Operations Act 1997 (POEO Act) for the proposal.</td>
<td>Noted.</td>
</tr>
<tr>
<td>The following environmental impacts of the project should be assessed, quantified and reported on in the review of environmental factors document:</td>
<td></td>
</tr>
<tr>
<td>Control of:</td>
<td></td>
</tr>
<tr>
<td>• Water pollution.</td>
<td>Refer to section 6.2.</td>
</tr>
<tr>
<td>• Waste management.</td>
<td>Refer to section 6.11.</td>
</tr>
<tr>
<td>• Noise management.</td>
<td>Refer to section 6.4.</td>
</tr>
<tr>
<td>• Dust management.</td>
<td>Refer to section 6.10.</td>
</tr>
<tr>
<td>Details on the location of the proposed development, including the affected environment, to place the proposal in its local and regional environmental context including surrounding land uses, planning zonings and potential sensitive receptors should be provided.</td>
<td>Refer to section 1.2, section 4.2, and sections 6.1 to 6.11.</td>
</tr>
</tbody>
</table>
### Issue

The review of environmental factors should describe mitigation and management options that will be used to prevent, control, abate or mitigate identified environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

- **Response and/or where addressed in this review of environmental factors**
  - Refer to sections 6.1 to 6.11.
  - A summary of mitigation controls is provided in section 7.2.

### The EPA emphasises that all construction activities must be carried out with due diligence and best environmental management practices. The proponent should be aware of the strict liability provisions of the POEO Act, particularly section 120 of the Act which prohibits the pollution of waters. In this regard, all personnel involved in construction work for the proposal should be aware of the details of the work plans, legislation and associated pollution controls and the environmental sensitivity of the receiving waters before any work starts.

- **Response**
  - Noted.

### Waste management: All wastes generated during the project must be managed in a manner that prevents the pollution of waters and air. Waste must be classified in accordance with the POEO Act and *Waste Classification Guidelines* (DECCW, 2009). All waste materials must be taken to a place which can lawfully receive them in accordance with the requirements of the POEO Act.

- **Response**
  - Noted.

### Dust: The management of dust around the construction site is required to reduce the potential for the pollution of waters or impact on amenity of adjacent residents and other land users.

- **Response**
  - Dust management measures are provided in section 6.10.

### Noise: Noise generated during the construction of the project must be managed in a manner consistent with the objectives and provisions of the Interim Construction Noise Guidelines (DECC, 2009). This includes implementing all reasonable feasible measures to minimise noise arising from the activities, in particular from plant and equipment. This can include the selection of appropriate times for the operation of noisy equipment so as not to cause a noise nuisance to the surrounding community.

- **Response**
  - Noise management measures are provided in section 6.4.6.
<table>
<thead>
<tr>
<th><strong>Issue</strong></th>
<th><strong>Response and/or where addressed in this review of environmental factors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sediment and erosion control</strong>: The EPA considers that particular care and attention should be placed in the design and construction of the proposal as the Mulwaree Ponds form part of the Sydney Drinking Water Catchment, managed by the Sydney Catchment Authority. We suggest Council consults with the Sydney Catchment Authority during preparation of the review of environmental factors to ensure catchment protection issues are included. Sediment and erosion control measures must consider clean water diversion around the construction site in order to reduce the volume of sediment laden water to be controlled. Any activity at the site must be carried out to ensure that any discharge from the construction site complies with Section 120 of POEO Act. The review of environmental factors should present all of the sediment and erosion control measures to be employed at the site, any operational procedures that will be required to prevent the pollution of waters, and must also demonstrate that the measures are consistent with the document <em>Managing Urban Stormwater – Soils and Construction</em> (Landcom, 2004).</td>
<td>Consultation with the HNCMA has been undertaken. Roads and Maritime would consult with Sydney Catchment Authority before work starts. Erosion and sediment management measures are provided in section 6.2.3.</td>
</tr>
</tbody>
</table>

### **NSW Department of Planning and Infrastructure**

It is considered that the nine issues proposed to be addressed in the review of environmental factors (biodiversity, visual and urban design, noise and vibration, Aboriginal heritage, European heritage, soil and landscape, water quality, traffic and access and air quality) are a comprehensive list of the relevant issues. Noted. These issues are addressed in chapter 6.

### **NSW of Department of Primary Industries (Fishing and Aquaculture)**

Fisheries NSW advises that the review of environmental factors for the proposed development should include information on the following:

- **Location of work (including maps and site photos).** Refer to section 1.2.
- **Locations and descriptions of waterways (eg watercourses, wetlands) located on or adjacent to each development site and their significance.** Refer to section 6.5.
- **Description of work to be undertaken** Refer to section 3.4.
- **Methods of construction and demolition.** Refer to section 3.4.
- **Timing and duration of work.** Refer to section 3.4.2.
- **Volume and type of sediment to be excavated from the site, if relevant.** Refer to section 3.4.4.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Response and/or where addressed in this review of environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of the aquatic and riparian habitat conditions at the site – particularly extent and condition of riparian vegetation, water depth, and permanence of water flow and snags (large woody debris) in the vicinity of the proposed work.</td>
<td>Refer to 6.3.</td>
</tr>
<tr>
<td>Analysis of any interactions of the proposed work with aquatic and riparian environments and predictions of any impacts upon aquatic and riparian environments including riparian vegetation. In particular details of any impacts on aquatic habitats and riparian areas associated with the demolition of the existing bridge and construction of the new bridge and any temporary access tracks, crossings or work platforms.</td>
<td>Refer to section 6.3.</td>
</tr>
<tr>
<td>Safeguards to mitigate any impacts upon aquatic environments and riparian habitats.</td>
<td>Refer to section 6.3.4.</td>
</tr>
<tr>
<td>Potential impacts on any aquatic threatened species, populations and ecological communities listed under the Fisheries Management Act 1994 and safeguards to mitigate any potential impacts.</td>
<td>Refer to section 6.3.4.</td>
</tr>
<tr>
<td>Potential impacts upon water quality of the proposed bridge replacement work.</td>
<td>Refer to section 6.2.3.</td>
</tr>
<tr>
<td>Safeguards to mitigate any impacts upon water quality in the Mulwaree River and its tributaries. In particular, provide details on proposals for erosion and sediment control and proposed waste management and disposal to prevent any materials entering the waterway (to be incorporated into a construction environmental management plan).</td>
<td>Refer to section 6.2.3.</td>
</tr>
<tr>
<td>Potential impediments to fish passage as a result of the work (e.g. temporary road crossings, coffer dams, bunds or work platforms) and possible mitigation measures to be employed to negate these impacts.</td>
<td>Refer to section 6.3.4.</td>
</tr>
<tr>
<td>Details of proposed revegetation of adjacent riparian areas following construction of the new bridge.</td>
<td>Refer to section 6.3.4.</td>
</tr>
<tr>
<td>Please note that approvals or concurrence may be required from Fisheries NSW for the proposed bridge replacement work including:</td>
<td>Noted. Refer to section 4.3.</td>
</tr>
<tr>
<td>• Dredging and reclamation.</td>
<td></td>
</tr>
<tr>
<td>• Blocking of fish passage.</td>
<td></td>
</tr>
<tr>
<td>• Removal or movement of large woody debris (snags) or boulders.</td>
<td></td>
</tr>
<tr>
<td>• Use of explosives in waterways.</td>
<td></td>
</tr>
<tr>
<td>Issue</td>
<td>Response and/or where addressed in this review of environmental factors</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Once the review of environmental factors has been prepared for the proposal could you please forward a copy to the Batemans Bay Southern Regional office for our review and further comment.</td>
<td>The review of environmental factors would be sent to Fisheries and other relevant agencies for review and comment.</td>
</tr>
</tbody>
</table>

**Commonwealth Department of the Environment**

The review of environmental factors needs to consider whether or not the proposed action is likely to have a significant impact on any matters of national environmental significance protected under the *Environment Protection and Biodiversity Conservation Act 1999*. Refer to Appendix B.

**Essential Energy**

There will be a requirement to relocate Essential Energy overhead power lines or poles for the proposed bridge and road work to proceed. For this work to proceed, Roads and Maritime will require the services of an ASP3 for design and an ASP1 for construction. A design information package (DIP) will need to be applied for to allow design to be undertaken. Roads and Maritime would consult with Essential Energy during detailed design for the relocation of power lines and poles.

In regards to the review of environmental factors there are two options to consider – include and address services relocation within the review of environmental factors or exclude and require a separate review of environmental factors to be undertaken, by an ASP3, for the services relocation. Refer to section 3.6. The proposal includes the adjustment of utilities within the proposal site. The methodology for the management of the assets would be confirmed in consultation with Essential Energy during detailed design. Concept design investigations indicate that adequate room exists within the proposal site for the relocation of assets.

**Office of Water**

For the purposes of the replacement of this bridge Roads and Maritime, being a public authority, will be exempt from requiring a Controlled Activity Approval for this work under Clause 38 of the *Water Management (General) Regulation 2011*. Noted.

The description of the proposed replacement bridge indicates that the general design of the bridge will be sufficient to meet the requirements of the NSW Office of Water for the construction of a bridge. Noted.
<table>
<thead>
<tr>
<th>Issue</th>
<th>Response and/or where addressed in this review of environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hawkesbury-Nepean Catchment Management Authority</strong></td>
<td></td>
</tr>
<tr>
<td>The HNCMA request that a copy of the review of environmental factors be provided to the HNCMA when complete.</td>
<td>Noted.</td>
</tr>
<tr>
<td><strong>Goulburn Mulwaree Council</strong></td>
<td></td>
</tr>
<tr>
<td>During the construction phase, vehicles will need to detour around the work site. The construction work should aim to minimise the length (in time) of any disruption to local traffic.</td>
<td>Bungonia Road within the proposal site would be closed for the duration of work (up to 12 months) and detours would be established to assist redirected vehicles. Heavy vehicles (over 42.5 tonnes) would be directed via Windellama Road to Brisbane Grove Road and Braidwood Road to Goulburn. Light vehicles would be able to use the heavy vehicle detour or travel via Memorial Road and Park Road. The duration of detours i</td>
</tr>
<tr>
<td>During construction, is there a need for vehicle turning facilities for vehicles approaching the work site from Goulburn? These arrangements should be detailed in a Construction Management Plan.</td>
<td>A vehicle turning facility for vehicles approaching the proposal site from Goulburn is not required. During construction, the detours would be clearly signposted to avoid unnecessary access to Bungonia Road. Any local traffic requiring access to locations on Bungonia Road, to the west of the bridge would still have access. Vehicles that access Ottiwell Street would be able to safely turn around at the intersection with Ottiwell Street and Bungonia Road.</td>
</tr>
<tr>
<td>Will there be any disruption caused to the Goulburn Recreation Area?</td>
<td>Impacts to the Goulburn Recreation Area are detailed in sections 6.1 to 6.16. The temporary construction compound would be located within the Goulburn Recreation Area. This may reduce the amount of area allocated to overflow parking. Council has agreed to lease this area to Roads and Maritime during the construction period. Access to the unsafe dog racing track located around 50 metres from Lansdowne Bridge would be removed. The access located around 200 metres to the west of Lansdowne Bridge would be maintained.</td>
</tr>
<tr>
<td>Issue</td>
<td>Response and/or where addressed in this review of environmental factors</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>It is understood that Forbes Street will be permanently closed but incorporate emergency access provisions. Details of the emergency access arrangements for Forbes Street are not known to council.</td>
<td>Emergency vehicles would be provided access to Forbes Street from Bungonia Road via a locked removable section of guardrail. Refer to section 3.4.6.</td>
</tr>
<tr>
<td>Consideration needs to be given to the flood provisions in council’s LEP for structural components constructed in the flood plain.</td>
<td>Flood behaviour and flood impacts are discussed in section 6.5.</td>
</tr>
<tr>
<td>Consideration needs to be given to the heritage provisions in council’s LEP.</td>
<td>A Statement of Heritage Impacts has been undertaken and is summarised in section 6.1. A copy of this review of environmental factors will be provided to council for review and any comments received will be taken into consideration in accordance with the ISEPP requirements.</td>
</tr>
<tr>
<td>Will you consult with Goulburn Heritage Group?</td>
<td>A meeting with the Goulburn Heritage Group was held in February 2013. Refer to section 5.1. Further consultation will be undertaken with the Goulburn Heritage Group during the display of the review of environmental factors.</td>
</tr>
<tr>
<td>Assumed that a flora and fauna assessment, and an archaeological investigation would be undertaken. Would consultation with Pejar Local Aboriginal Land Council be undertaken?</td>
<td>Specialist studies for biodiversity and Aboriginal cultural heritage have been undertaken and are provided as Appendix D and Appendix G respectively. Consultation with the PLALC was undertaken and representatives from the PLALC were invited to participate in the Stage 2 PACHCI survey. The PLALC provided a draft heritage assessment report to Roads and Maritime outlining their survey results. No areas of particular cultural significance were identified in their report. Refer to section 5.2.</td>
</tr>
</tbody>
</table>
5.5 Ongoing or future consultation

This review of environmental factors will be placed on public display to provide the community with the opportunity to comment. Information days will also be held during the display period. Details of these information dates and locations will be advertised before the events and issued in a Roads and Maritime Community Update and through the local media.

After public display of the review of environmental factors, submissions will be collated and a submissions report prepared which addresses any issues raised by stakeholders. The submissions report will be made available to the public via the Roads and Maritime website. The community will be informed of any major design changes required to address community concerns.

In addition, the following ongoing consultation will be undertaken:

- Consultation with community stakeholders to assist in managing impacts during construction.
- Follow-up meetings to discuss access arrangements with directly affected landholders.
- Ongoing meetings with Goulburn Mulwaree Council, government agencies, utility providers, adjacent landowners and community stakeholders as required.
- Ongoing updates throughout the planning phase and construction period to the immediately affected community as well as travelling public.
- Ongoing updates of the Roads and Maritime project webpage as required.
6. **Environmental assessment**

This section of the review of environmental factors provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in the guideline *Is an EIS required?* (DUAP, 1999) 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 B. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 **Non-Aboriginal cultural heritage**

A Statement of Heritage Impacts was prepared by Artefact Heritage in March 2014. A copy of the report is provided in Appendix D with a summary of the findings provided below.

6.1.1 **Methodology**

Searches of the following databases were undertaken:

- State Heritage Register.
- Section 170 Register.
- *Goulburn Mulwaree Local Environmental Plan 1990* (Goulburn Mulwaree LEP).
- National Heritage List.
- The Commonwealth Heritage List.

The desktop search was followed by a site survey in December 2012.

The study area for the non-Aboriginal heritage assessment included the proposal site, as well as a buffer zone of around 10 to 20 metres surrounding the proposal (shown in Figure 2 of Appendix D).

Some parts of the study area were not accessible during the site survey due to the boggy and extremely overgrown terrain surrounding the Mulwaree Ponds. Figure 4 in Appendix D shows which portions of the study area were physically inspected during the survey.

6.1.2 **Existing environment**

**History of the area**

Initial European exploration in the Goulburn region began in the late 1790s and continued to 1820, when Governor Macquarie visited the area (Higginbotham and Associates, 2010a).

In 1825, Surveyor Robert Dixon planned a township to be created to the north of the present-day site of Goulburn. The original township was built around the confluence of the Wollondilly and Mulwaree Rivers around 1829, however, due to repeated flooding Governor Bourke ordered the survey of an area of higher ground to the south-west in 1833. The site of the original town is now known as North Goulburn (RTA Operations, 2005).

The Bungonia-Goulburn Road (which is crossed by Lansdowne Bridge) has connected the two towns since the 1830s. The road is still in use, although some parts of the original road alignment have been bypassed by modern deviations (Goulburn and District Historical Society, quoted in Higginbotham and Associates, 2010a).
History of timber truss bridges in NSW

Timber truss road bridges have played a major role in the expansion of the NSW road network and the development of the state’s economy. Before the construction of bridges, dangerous river crossings meant that the transport of agricultural and mining produce was often difficult and expensive.

From the mid-19th century to the early-20th century, timber truss bridges were the preferred bridge type because they used mostly local materials and were therefore fairly inexpensive. Timber bridges were once so common in NSW that it was known as the “timber bridge state”.

There are five main types of timber truss bridge, with Lansdowne Bridge being a de Burgh truss bridge. Ernest McCartney de Burgh joined the Public Works Department in 1885 and was one of the last expatriate British engineers of the colonial period.

The inclusion of pins along the bottom steel chord of the de Burgh truss bridges allowed rapid construction however proved to impede some aspects of maintenance and future strengthening work. Therefore, the de Burgh trusses were only constructed between 1900 and 1905 (RTA Operations, 2005).

Database and survey results

Table 6-1 summarises the heritage listed items located in and near the study area. Descriptions of each are provided below the table. Heritage items are shown in Figure 6-1.

Table 6-1  Summary of heritage listings

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Heritage listings</th>
<th>Heritage significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lansdowne Bridge</td>
<td>Roads and Maritime s170 Register (#6675)</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goulburn Mulwaree LEP (Item 108)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Goulburn Brewery and Mill complex</td>
<td>SHR (#00178)</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goulburn Mulwaree LEP (Item 109)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>‘Lansdowne’ homestead</td>
<td>SHR (#00132)</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goulburn Mulwaree LEP (Item 110)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Portion of Goulburn City Conservation Area (north of Bungonia Road)</td>
<td>Goulburn Mulwaree LEP</td>
<td>Local</td>
</tr>
</tbody>
</table>
Figure 6-1
Lansdowne Bridge Replacement
Review of Environmental Factors

Heritage items within the study area

Lansdowne Bridge
Goulburn Brewery
and Mill complex
'Goukburn'
homestead
MEMORIAL ROAD
BUNGONIA ROAD
FORBES STREET
MULWA
RIVER

Legend
- The proposal
- Temporary construction compound
- Property acquisition
- State heritage curtilage
- LEP curtilage

Goulburn City Conservation Area LEP curtilage
Area of high archaeological potential associated with the former toll house
Area of low archaeological potential associated with the former toll house
19th century bridge abutments and area of archaeological potential

Heritage items within the study area

Metres
1:4,500 (at A4)

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

Figure 6-1

© 2010. While GHD has taken care to ensure the accuracy of this product, GHD and NSW DEPARTMENT OF LANDS, ROADS AND MARITIME, GEOSCIENCE AUSTRALIA, make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and NSW DEPARTMENT OF LANDS, GEOSCIENCE AUSTRALIA, cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.

Lansdowne Bridge

Study of Relative Heritage Significance of all Timber Truss Road Bridges in NSW (MBK, 1998)

In 1998, (the then) RTA commissioned a study to assess the relative significance of all timber truss road bridges in NSW (MBK, 1998). Each bridge was scored against five aspects of significance. Lansdowne Bridge scored a total of 41 out of 100. Based on this score, Lansdowne Bridge was ranked 52 of 82, in the ‘Regionally Significant’ category, and described as “an early de Burgh truss bridge, important to the Goulburn district” (MBK, 1998).

Timber truss road bridges: a strategic approach to conservation (RTA, 2011c)

In 2011, the RTA conducted a review of the timber truss bridges under its jurisdiction in NSW, to identify bridges for long-term conservation and management and identify where replacement would be acceptable if necessary. This is referred to as the Timber Truss Bridge Strategy.

Of the 48 timber truss bridges in the RTA’s s170 portfolio, it was proposed that 25 of these be retained and 23 be divested from the portfolio. Four de Burgh truss bridges (including Lansdowne Bridge) were identified for conservation, with the remaining five to be removed from the s170 portfolio.

The strategy proposed that Lansdowne Bridge be listed on the SHR, and measures should be employed in the near future to conserve and strengthen the bridge. However, the conservation strategy was revised in 2012 after public consultation. Due to strong representations from council for a new bridge, the strategy proposed that Lansdowne Bridge should be replaced instead of being conserved and listed on the SHR as previously intended (Futurepast Heritage and Roads and Maritime, 2012). The NSW Heritage Council endorsed the revised strategy in August 2012.

Assessment of heritage significance

The following assessment of the heritage significance of Lansdowne Bridge has been prepared in accordance with the ‘Assessing Heritage Significance’ (2001) guidelines from the NSW Heritage Manual, based on the seven assessment criteria.

Lansdowne Bridge is of historic significance as part of a state-wide collection of timber truss bridges that were of importance in the expansion of the NSW road network and the resulting expansion of economic activity. It also represents the evolution of local transport networks, which linked the various towns in the district (in this case Goulburn and Bungonia). Along with the other timber truss bridges in the state, Lansdowne Bridge has the ability to demonstrate the evolution of bridge engineering technology, including the use of local materials. The bridge is of some significance for its association with its designer, and is of some research potential as an example of the de Burgh truss bridge type and variations within it.

Lansdowne Bridge is rare and of representative significance as one of only nine de Burgh truss bridges remaining in NSW (five of which are to be removed from the Roads and Maritime s170 register). It is the only single-span de Burgh truss bridge in the operable RTA timber truss bridge portfolio and is one of only two surviving timber truss bridges in the Goulburn area, where timber truss bridges were once common.

The bridge is of local aesthetic significance as a component of a largely intact rural landscape which also includes two nearby SHR listed items, and as a landscape feature that marks the entrance to Goulburn from the south-east.

The bridge is of significance to at least some members of the local community.
**Goulburn Brewery and Mill complex**

The Mill is located on the western bank of Mulwaree Ponds, immediately north of Bungonia Road (around 200 metres north-west of Lansdowne Bridge). The Brewery is located further to the west and is separated from the Mill by a paddock. Both complexes consist of a number of substantial buildings (Photograph 6-1).

The statement of significance included in the SHR listing for the site is included in Appendix D. In summary, the Goulburn Brewery and Mill is one of the most substantial industrial establishments to survive in country NSW from early colonial times. The site is an important element in the heritage of Goulburn and it is a local landmark.

**Photograph 6-1  View of Goulburn Brewery and Mill buildings from the south-east along Bungonia Road**

*Lansdowne* homestead

The property includes the house and surrounding outbuildings. The house consists of a single storey and is built of timber slabs that have been covered with weatherboards and lined internally with plaster.

Between the homestead complex and the study area is a grassed hill, separated from the homestead complex by a fence and gardens around the house (Photograph 6-2).

The statement of significance included in the SHR listing for the item is included in Appendix D. In summary, Lansdowne homestead and surrounding precinct is of outstanding heritage significance. It has been associated with the development of Goulburn since the earliest days of exploration in the area and was one of the first properties settled in the area south of the Cumberland basin. It demonstrates the characteristics associated with important pioneering family homesteads. The site has the potential to provide valuable archaeological information about both Aboriginal and European periods of occupation.

**Portion of Goulburn City Conservation Area (north of Bungonia Road)**

The Goulburn City Conservation Area includes a large area covering the town centre, as well as a separate smaller area to the north of Bungonia Road which is included in the same listing on the Goulburn Mulwaree LEP heritage schedule.

The smaller area is located immediately to the north of Lansdowne Bridge, with the eastern end of the bridge falling within the Conservation Area. It stretches from the western side of the
Goulburn Brewery and Mill heritage item, to partway through the ‘Lansdowne’ heritage item, and includes the undeveloped land to the north of Lansdowne Bridge (Photograph 6-3).

The statement of significance for the item is included in Appendix D. In summary, the component of the Conservation Area which includes part of Lansdowne Bridge is of local historical and aesthetic significance. As an intact early 20th century bridge, Lansdowne Bridge makes a moderate contribution to the significance of this landscape and is also the main location from which this landscape can be viewed by travellers.
**Archaeological potential**

In 2009-2010, Higginbotham and Associates prepared the Goulburn Mulwaree Archaeological Management Plan (AMP) (2010a and b), on behalf of the council.

Five archaeological sites in the vicinity of the study area were identified by Higginbotham and Associates (2010b) in the AMP (shown in Figures 19 and 20 of Appendix D). These sites are discussed in Table 6-2.

**Table 6-2 Summary of sites and archaeological potential identified in the AMP**

<table>
<thead>
<tr>
<th>Description</th>
<th>Assessment of archaeological potential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bridge abutments between Goulburn Brewery and Lansdowne Bridge</strong></td>
<td>The bridge abutments were not located during the current survey, as access to the area to the north of Bungonia Road was not possible due to thick vegetation at the time of the survey. It is likely that these abutments are still present, since no disturbance is thought to have occurred in this area in the two intervening years.</td>
</tr>
<tr>
<td>Stone and brick bridge abutments identified on the north side of Bungonia Road, crossing a former channel of the Mulwaree Ponds. The brick type likely from the 1840s to the 1880s. Abutments could relate to the 'Great Road from Sydney to the Murrumbidgee' or Yass Plains, or to a former road from Goulburn to the south.</td>
<td></td>
</tr>
<tr>
<td><strong>Former toll house and gate near Lansdowne Bridge</strong></td>
<td>Although the site could not be examined during the survey, as it is located within private property, the area around the clump of trees that marks the site of the toll house appears to be undisturbed. There is high potential for remains associated with the toll house surviving beneath the ground surface. It is unlikely that archaeological material associated with the toll house would occur far from the trees. Due to previous disturbance at the site and topography, most of the lot is of low archaeological potential.</td>
</tr>
<tr>
<td>AMP states that there was a toll house on the south side of Lansdowne Bridge, on the western bank of Mulwaree Ponds, the site of which is now marked by a clump of trees. The entire lot in which the clump of trees is located is included as part of the site, however this does not necessarily indicate that archaeological material is likely to be located across the entire lot.</td>
<td></td>
</tr>
<tr>
<td><strong>Goulburn Brewery site</strong></td>
<td>The main Brewery complex (outside the study area) is an area of high archaeological potential. However, the portions of the item that would fall within the proposal site are likely to be of low archaeological potential. The proposal includes the acquisition of a narrow strip of land along the southern boundary of the item where former structures or features associated with the Brewery are unlikely to have occurred.</td>
</tr>
<tr>
<td>The AMP identifies the Goulburn Brewery heritage item as an archaeological site, utilising a different curtilage to the SHR listing for the item (see Appendix D). The AMP does not identify any specific archaeological resources within this area, aside from the visible features within the Brewery complex.</td>
<td></td>
</tr>
</tbody>
</table>
Assessment of archaeological potential

'Lansdowne’

The AMP categorises the entire ‘Lansdowne’ curtilage as an archaeological site, however, this does not necessarily mean that archaeological material is likely to occur across the entire property.

The AMP site maps also shows a site surrounding ‘Lansdowne’, including land within the Goulburn Brewery site and land to the south of Bungonia Road. As no specific sites of archaeological potential or known former features are noted, it would probably be more accurate to refer to this area as an area of potential archaeological sensitivity, rather than a ‘site’.

It is likely that archaeological material would occur around the main homestead complex and other historic buildings, and there are accounts of Aboriginal burials to the east of the main homestead. The portion of the property that would be impacted by the proposal is assessed to be of low archaeological potential.

A section of land in the south-west corner of the property would be acquired by Roads and Maritime for the proposal. It is unlikely that archaeological deposits would occur here.

The land to be acquired within the south-east corner of the garden to the south of the homestead would include the driveway to the property. The shallow soils are unlikely to support significant archaeological material or deposits.

Unnamed site to south of Goulburn Brewery

A site south of Bungonia Road, adjacent to the Goulburn Brewery complex represents an area of development shown on a sketch plan of Goulburn dating to 1859. However, the plan referred to does not show any development in the area indicated.

Various plans dating from 1830s to 1860 were examined as part of this assessment, and none showed any structures or development within the area of the ‘unnamed’ site.

It appears that this identification was incorrect and no former structures or features are known to have been located within this area.

This area has been subject to disturbance through the construction of Bungonia Road, the installation of underground services, and landscaping associated with the Goulburn Recreation Area. It is assessed to be of low archaeological potential.

Bungonia Road

It is likely that the road was a dirt road until the mid-20th century, and it is therefore unlikely that any former road surfaces would have survived beneath the current road pavement.

Former 1877 bridge associated with the Goulburn Brewery

Historic plans show that a former bridge associated with the brewery was once present over Mulwaree Ponds to the north of the proposal site. It appears that this bridge was not located close to the proposal site and any potential remnants of the bridge would be unlikely to be encountered during the proposal (Ian Berger from Roads and Maritime Environmental Branch pers. comm.)

Research significance within the study area

Two sites of high archaeological potential were identified within the study area:

- Bridge abutments: The bridge abutments are of moderate significance as they may provide information regarding early road networks in the Goulburn district, and early methods of bridge construction.
- Site of former toll house: This site is of moderate significance as it may provide information regarding the nature of an early 20th century toll house, including its size, design, construction materials and methods and knowledge of the transport systems of NSW.

The remainder of the study area was assessed to be of low archaeological potential.

### 6.1.3 Potential impacts

Table 6-3 provides a summary of the potential heritage impacts of the proposal.

**Table 6-3 Potential impacts on non-Aboriginal heritage items**

<table>
<thead>
<tr>
<th>Item</th>
<th>Potential impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lansdowne Bridge</td>
<td>The proposal would remove all of the heritage values of the bridge. However, with the demolition of the Lansdowne Bridge, three de Burgh timber truss bridges would remain on the Roads and Maritime s170 Register, and one timber truss bridge would retain in the Goulburn area. As there would still be representative examples of the de Burgh type of timber truss bridge in NSW and a surviving local example of a timber truss bridge, the removal of the Lansdowne Bridge is considered acceptable.</td>
</tr>
<tr>
<td>Goulburn Brewery and Mill complex</td>
<td>There are no direct views from the Goulburn Brewery/Mill complex towards Lansdowne Bridge due to the presence of screening vegetation within the Brewery/Mill complex, and along Bungonia Road. The removal of vegetation along Bungonia Road may make the bridge slightly more visible from the complex, but this would not have a significant impact on the heritage value of the item. The proposal includes the acquisition of a narrow strip of land (about 457 m²) within the SHR curtilage of the Goulburn Brewery and Mill where former structures or features associated with the Brewery are unlikely to have occurred. The impact to the Goulburn Brewery and Mill item is therefore acceptable.</td>
</tr>
<tr>
<td>‘Lansdowne’ homestead</td>
<td>There are no views from the ‘Lansdowne’ homestead complex towards Lansdowne Bridge and the replacement of the bridge would therefore not have an impact on the heritage significance of the item. The proposal would include works within the LEP curtilage of the item for the construction of a turning circle (cul-de-sac) at the termination of Forbes Street and for the realignment of Bungonia Road. Around 5827 m² of land in the LEP curtilage would be impacted by proposal. The realignment of Bungonia Road would involve cutting away part of the hill to the south-west of ‘Lansdowne’ house, including the south-western corner of the garden. A small area of around 900 m² within the SHR curtilage of the item would be impacted. This would include the westernmost driveway to the homestead. The construction of the proposed road would necessitate the relocation of the existing stone gates and a section of the driveway would need to be regraded in order to tie in to the new road alignment. This is considered to be an acceptable as impacts to the driveway fabric would be minimised where possible, and the existing gates reinstated further north to maintain the historical alignment of the driveway, its association with the historic ‘Lansdowne’ property, and the relationship of the property with the road.</td>
</tr>
</tbody>
</table>
The proposal also includes the removal of vegetation including several pine trees which form part of the avenue of pines along the driveway. These trees are of some historic significance and their removal would have an impact on the heritage item, however, the remainder of the driveway avenue and the vegetation within most of the garden would remain intact. Therefore, the removal of the trees would not have a major impact on the heritage significance of ‘Lansdowne’ and is considered to be acceptable.

The impact to the ‘Lansdowne’ item is considered to be acceptable, provided that mitigation measures provided in section 6.1.4 are implemented.

<table>
<thead>
<tr>
<th>Item</th>
<th>Potential impact</th>
</tr>
</thead>
</table>
| Goulburn City Conservation Area           | The removal of the bridge would have an impact on the historic pastoral landscape that includes the two SHR items to the east and west of the bridge, the open land to the north of the bridge, and part of the bridge itself. This landscape is included within the Goulburn City Conservation Area.  
As the bridge is an aesthetically distinctive historic landmark from which this landscape is currently viewed, its removal and replacement with a modern bridge may have a negative impact on the way travellers experience the historic landscape. However, as the design of the bridge is in sympathy with the heritage landscape this impact would be minimised. The bridge design would be similar in scale and elevation to the existing bridge, and is unlikely to have a substantial visual impact on the conservation area.  
The bridge has been designed to be as unobtrusive as possible. Views toward the bridge from the Goulburn Brewery and Mill and ‘Lansdowne’ would be screened with vegetation. The bridge would be designed in accordance with the Roads and Maritime Services’ Bridge Aesthetics: Design guideline to improve the appearance of bridges in NSW (Roads and Maritime, 2012a).  
Views over the landscape from the bridge would not be obstructed. A two-rail parapet would be incorporated into the design in order to allow views of the landscape and echo the parapet of the existing historic bridge.  
The proposal would also involve the removal of a stand of mature exotic trees along the northern side of Bungonia Road to the west of the bridge.  
The trees to be removed make a relatively significant contribution to the streetscape and their removal would have a negative impact on the pastoral landscape. However, this impact would not be major and would be acceptable provided that trees of the same or a similar species were planted to replace them, after construction is complete.                                                                                                                                                                                                 |
### 6.1.4 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise impacts to non-Aboriginal cultural heritage.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Heritage awareness would be included in site induction training for project staff.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Indirect or accidental impacts on known items</td>
<td>Temporary fencing or other measures as appropriate to the location would be installed for Goulburn Brewery/Mill, ‘Lansdowne’, the 19th century bridge abutments north of Bungonia Road, and the area of high archaeological potential associated with the former toll house. These would be used to delineate ‘no go’ heritage areas.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Impact on historical landscape and nearby heritage items</td>
<td>The bridge would be designed to be as unobtrusive as possible and views toward the bridge from the Goulburn Brewery/Mill and ‘Lansdowne’ would be screened with vegetation. In designing the bridge, the Roads and Maritime Service’s <em>Bridge Aesthetics: Design guideline to improve the appearance of bridges in NSW</em> (Roads and Maritime, 2012a) would be consulted for ideas on integrating bridges into rural landscape settings.</td>
<td>Roads and Maritime</td>
<td>Detailed design</td>
</tr>
<tr>
<td>Removal of Lansdowne Bridge</td>
<td>In accordance with the Roads and Maritime Services’ <em>Timber Truss Bridge Strategy</em> (RTA, 2011c), archival recording of Lansdowne Bridge would be undertaken before its demolition. Archival recording of the bridge would be completed before demolition work starts. Discussions would be held with council (and possibly the Goulburn and District Historical Society) to determine whether any material from the bridge could be used as a sculptural element in a public area, as a form of heritage interpretation. Any material that is not included in a local heritage display would be used to maintain other historic timber truss bridges in NSW in accordance with Roads and Maritime Service’s <em>Timber Recycling Policy</em>, as proposed in the Timber Truss Bridge Strategy.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>The 19th century bridge abutments north of Bungonia Road</td>
<td>Detailed design would avoid impacts to the 19th century bridge abutments and associated area of archaeological potential. If impacts cannot be avoided, the area would need to be inspected and further mitigation measures recommended by an appropriately qualified archaeologist.</td>
<td>Roads and Maritime</td>
<td>Detailed design</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Site of the former toll house</td>
<td>Subsurface works would be minimised near the site of the former toll house.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>General</td>
<td>If unexpected archaeological finds are identified during construction, the Roads and Maritime Services’ Unexpected Archaeological Finds Procedure 2012 (Roads and Maritime, 2012b) would be implemented. Further archaeological investigation or approvals may be required.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Impact on the Goulburn Brewery and Mill</td>
<td>Trees of the same or a similar species to the existing trees would be planted along the northern side of Bungonia Road, in order to re-establish the vegetation screen between the Brewery and Mill and the bridge.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>'Lansdowne' homestead</td>
<td>Trees of the same or a similar species would be planted along the new perimeter of the property to replace the existing pine trees that would be removed.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Fencing similar to existing fences would be erected along the perimeter of the property after construction is complete.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>The Goulburn City Conservation Area</td>
<td>Trees of the same or a similar species to the existing trees would be planted along the northern side of Bungonia Road, in order to re-establish this element of the streetscape.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

### 6.2 Soils and water quality

#### 6.2.1 Existing environment

**Topography and geology**

The landform within the study area mainly consists of alluvial river flats associated with the Mulwaree River. Steep slopes occur to the north of Bungonia Road in the eastern edge of the study area. The underlying geology consists of Quaternary alluvial gravel, sand, silt and clay.

The average elevation of the study area is 660 metres above sea level, with the landscape in the eastern extent of the study area rising to an elevation of about 690 metres to 700 metres above sea level.

Mulwaree River flows south to north through the study area and to the Wollondilly River.

**Soils**

A review of the *Soil Landscapes of Goulburn 1:250,000 Sheet* (Hird, 1990) indicates that the following two soil landscapes are mapped throughout the study area:

- The Goulburn soil landscape, which consists of Quaternary age alluvial deposits and includes a large number of individual landforms which have formed as a result of the deposition of alluvium around water courses. Distinct bands of alluvial material can be
seen throughout the profile with soil textures varying from gravels to coarse sands, to silts and light clays (Hird, 1990).

- The Collector Creek soil landscape, which is located within the narrow floodplains of a number of local creeks and the Mulwaree River, and consists of Permian age yellow solodic deposits. Soils are moderately deep, grey and yellow mottled duplex. The soils have formed on colluvial and alluvial deposits of Quaternary and Cainozoic clay, silt and sand (Hird, 1990).

Both soil landscapes are recognised as having moderate to high erodibility (Hird, 1990).

A soil profile collected from Goulburn Brewery, which is located about 700 metres west of the proposal site, indicated that the soils are classified as Dermosolic Redoxic Hydrosol under the Australian Soil Classification (OEH, 2013).

**Acid sulfate soils**

A search of the Australian Soil Resource Information System on 17 May 2013 identified the proposal site as having a low to extremely low probability of containing acid sulfate soils. Acid sulfate soil mapping from the NSW Natural Resource Atlas also indicates that acid sulfate soils are not present within the study area (OEH, 2013). Furthermore, the study area is located between 660 to 700 metres above sea level, and acid sulfate soils are generally found in areas less than five metres above sea level.

**Salinity**

Salinity potential mapping in the NSW Natural Resource Atlas did not indicate the presence of saline soils in the proposal site. However, the area immediately east of the study area is mapped as having a moderate salinity potential.

**Contamination**

A search of the EPA contaminated land register (NSW EPA, 2013a) did not find any declared contaminated sites located in or near the study area.

Land use within the local area is characterised by sheep and cattle farming, as well as the cultivation of lucerne and other fodder crops (Hird, 1990). A review of land uses, background information and field observations indicates a minimal potential for widespread contamination in the study area. However, due to the traces of lead and polycyclic aromatic hydrocarbons detected in paint on the timberwork of the bridge (CTI Consultants, 2013a), and the poor condition of the paint work, there is potential for localised contamination to be encountered within the soil beneath the bridge structure.

**Water quality**

Water quality in the Mulwaree Ponds and River is largely impacted by neighbouring agricultural activities that release nutrients into the surrounding environment. Routine water quality monitoring is undertaken along Mulwaree River at Towers Weir, located about 10 kilometres upstream of the confluence with Wollondilly River. Based on the 2011-2012 Annual Water Quality Monitoring Report (SCA, 2012), wet weather samples were found to exceed the guideline range for nutrients (nitrogen and phosphorous) and dissolved oxygen. Turbidity was low and below the benchmark values. Samples collected during ‘dry’ conditions were also found to consistently exceed the guideline range.

A previous water quality study undertaken by Woodlots and Wetlands in 1998 included a collection of samples from Thornes Bridge, which is situated about two kilometres upstream of the proposal site. The study examined the nitrogen, phosphorus and suspended solids and faecal coliform population in the sub-catchments of the Goulburn urban area, which drain into...
the Mulwaree River and found that urban stormwater was a major contributor to the pollutant load of the Mulwaree River. The presence of saleyards and intensive grazing in the Mulwaree Ponds catchment were considered to be the main contributors to pollutant loadings (Woodlots and Wetlands as quoted in RTA, 2007).

6.2.2 Potential impacts

Construction

Topography, geology and soils

As discussed in section 3.4.4, cut and fill activities would be required for the realignment of Bungonia Road. The proposal would result in about 12,460 cubic metres of cut material and about 2220 cubic metres of fill. Surplus excavated material of soil would be used to widen batters on-site. The cut and fill embankments are not considered to be major alterations to the existing topography from a regional perspective and would only be noticeable in the direct vicinity of the proposal. Overall the proposal would not result in any substantial changes to local topography and the vertical alignment would match the existing nature of the terrain wherever possible.

Erosion and sedimentation

During construction, work activities have the potential to expose areas of soil that may be eroded through wind and water leading to sedimentation of surrounding land, drainage lines and increased turbidity of the receiving Mulwaree Ponds which would affect the aquatic ecology. Potential activities that could contribute to erosion and sedimentation impacts include:

- Vegetation removal.
- Stockpiling of excess soils.
- Movement of vehicles on unsealed surfaces.
- Excavation of highly erodible soils.

Sediment controls would be established in accordance with the ‘Blue Book’ - Managing Urban Stormwater Volume 1: soils and construction (Landcom, 2004) which would minimise the potential erosion and sedimentation risks to acceptable levels during construction (this is discussed further in section 6.2.3).

Furthermore, potential impacts would be short-term and localised to the proposal site due to the slow flowing nature of the Mulwaree Ponds. Stabilisation and revegetation after construction would help prevent soil erosion in the same way that the existing vegetation functions. Provided stabilisation strategies are effectively implemented, medium to long-term impacts would be low.

Salinity

Saline soils can have a detrimental effect on vegetation growth as well as cause damage to infrastructure such as roads, bridge foundations, pipes and cables. Salinity also has the potential to make soils unsuitable for reuse and may have implications on the suitability of plants for landscaping.

Although salinity potential is not mapped within the proposal site, a moderate potential is mapped to the immediate east of the proposal site and should therefore be considered for the proposal. The potential for salinity to damage infrastructure including roads and bridge foundations, and the suitability of excavated material for reuse as fill would be considered during detailed design and managed during construction.
Contamination

There are no registered sites on the EPA contaminated sites register within the proposal site, however there is the potential to encounter contamination in soils beneath the bridge structure due to the presence of lead-based paint and polycyclic aromatic hydrocarbons detected in the timber elements of the bridge and sections on the approach span painted. Soil contaminants may pose a risk to human health including construction workers during excavation work. If not managed appropriately, contaminants also have the potential to be spread to previously uncontaminated areas.

Soil contamination could also occur as a result of accidental spills or leaks of fuels, oils and other chemicals from equipment and vehicles during construction. Fuels and chemicals would be managed in accordance with the management measures provided in section 6.2.3.

Demolition work may also result in the dislodgement of hazardous paint debris from the bridge structure which could result in soil and water contamination. There is also a risk of inadvertent disturbance of lead paint during the handling and transport of potentially contaminated bridge components. The potential for contamination is considered to be minimal with the implementation of safeguards and management measures outlined in section 6.2.3.

Water quality

Construction of the proposal has the potential to impact water quality through the introduction of sediment and other pollutants. Potential impacts on surface water quality may occur as a result of:

- Sediment runoff from exposed surfaces and stockpiles.
- Spills and leaks of fuels, oils and chemicals.
- Debris, dust, paint chips etc from the bridge demolition activities.
- Piling work within the waterway for the bridge abutments.

If not managed appropriately, the introduction of pollutants could result in the following impacts:

- Changes to pH, electrical conductivity, dissolved oxygen and temperature.
- Reduction of light penetration by increased sediments.
- Increased sediment load, organic matter and turbidity of water.
- Increased gross pollutants.
- Introduction of toxic pollutants such as construction fuels, oils and grease and chemicals.

Sediment controls would be established in accordance with Managing Urban Stormwater: Soils and Construction (Landcom, 2004) to minimise erosion and sedimentation potential. All liquids and fuels would be stored in adequately bunded areas within the construction compound.

Floating booms would be placed within the water way, downstream of the bridge to capture any debris resulting from the demolition and construction of the bridge. Plastic sheeting or similar would also be strung under the bridge to capture and contain materials as an additional measure during demolition work.

With the implementation of mitigation measures outlined in section 6.2.3, impacts to water quality during construction is considered to be low to moderate.
**Operation**

*Topography, geology and soils*

During operation, the risk of soil erosion would be minimal as all areas impacted during construction would be sealed or rehabilitated and landscaped to prevent soil erosion from occurring.

Alterations to the topographic environment from the realignment of Bungonia Road are considered to be minimal and unlikely to result in significant erosion or scouring.

*Water quality*

Maintenance during operation of the proposal may result in chemicals or fuel spills, however the risk of this occurring is low and would be managed through the implementation of standard procedures.

The proposal would improve the road geometry and alignment of Bungonia Road in the study area improving road safety and reducing the potential for vehicle incidents. However if a vehicle incident were to occur, there is potential for spilled fuels, chemicals or other contaminants to impact on the sensitive receiving environment of the Mulwaree River.

Stormwater runoff from the road may also impact on the sensitive receiving environment. Operation of roads leads to build up of contaminants on road surfaces, median areas and roadside corridors. During rain events these contaminants can be transported by road run-off into surrounding water bodies. The proposal would include operational water quality measures to manage spills from accidents and treat stormwater runoff. The range of measures would be determined during detailed design.

### 6.2.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential impacts on soils and water quality.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
</table>
| Erosion and sedimentation   | A principal erosion and sedimentation control plan (ESCP) would be prepared during detailed design which is to include as a minimum:  
  - Identification of catchment areas and the direction of on-site and off-site water flow.  
  - The likely run-off from each road sub-catchment.  
  - Separation of on-site and off-site water.  
  - The direction of run-off and drainage points during each stage of construction.  
  - The locations of erosion and sediment control measures (eg sand bags).  
  - A materials management plan.  
  The ESCP would be reviewed by a soil conservationist and would be updated to address the recommendations. | Roads and Maritime and designer | Detailed design |
<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A soil and water management plan (SWMP) would be prepared as part of the construction environment management plan in accordance with the requirements of Roads and Maritime Services’ specification G38 before construction work starts. The SWMP would also address the Roads and Maritime Services’ Code of Practice for Water Management, the Roads and Maritime Services’ Erosion and Sedimentation Procedure and incorporate specifications outlined in the <em>Soils and Construction – Managing Urban Stormwater Volume 1 ‘the Blue Book’</em>(Landcom, 2004) and Volume 2 (DECC, 2008). The SWMP would be reviewed by Roads and Maritime’s Environmental Officer, Southern Region before construction starts.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>The SWMP would include the following:</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>• Address the requirements of the principal Erosion and Sedimentation Control Plan (ESCP).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Include an ESCP in accordance with the requirements of the ‘Blue Book’ (Landcom, 2004).</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Outline a salinity management procedure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Controls to be implemented in preparation for a wet weather event.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Summarise applicable legislation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Include a procedure for regular inspection, maintenance and cleaning of sediment controls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outline regular monitoring of Bureau of Meteorology weather forecasts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outline a procedure for the containment and management of spills or leaks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>An accredited soil conservation scientist would be engaged to provide advice during development and implementation of the SWMP and would regularly inspect work throughout the construction phase.</td>
<td>Construction contractor</td>
<td>Pre-construction and throughout construction</td>
</tr>
<tr>
<td>Spread of existing contamination</td>
<td>The construction environment management plan would include contingency measures to be followed in the event that contaminated material is identified during the construction phase.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
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<td>---------------------------------------</td>
</tr>
<tr>
<td>Contamination of soil and water</td>
<td>An incident emergency spill plan would be developed and incorporated into the construction environment management plan. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into the adjacent waterway and an emergency response plan. An emergency spill kit would be kept on-site at all times.</td>
<td>Construction contractor</td>
<td>Pre-construction and throughout construction</td>
</tr>
<tr>
<td>Contamination of soil and water</td>
<td>A lead management plan would be prepared and implemented as part of the construction environment management plan to ensure appropriate management of hazardous materials during the demolition of the bridge.</td>
<td>Construction contractor</td>
<td>Pre-construction and throughout construction</td>
</tr>
<tr>
<td>Contamination of soil</td>
<td>An appropriately qualified consultant would be engaged to carry out a background survey for lead and polycyclic aromatic hydrocarbons in soil in the immediate vicinity of the bridge in accordance with the procedure set out in Appendix G of the AS 4361.1 Guide to lead paint management Part 1: Industrial applications. All soil samples would be analysed for lead and polycyclic aromatic hydrocarbons content at an accredited laboratory. Upon completion of the work, a further set of soil samples would be taken at about the same locations, together with a visual survey for debris or wastes.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and post construction</td>
</tr>
<tr>
<td>Water quality</td>
<td>Water analysis would be undertaken before construction starts to provide a baseline for water quality at the site and following the completion of works. Samples would be collected and tested for lead and polycyclic aromatic hydrocarbons content in accordance with Appendix H of AS4361.1 Guide to lead paint management Part 1: Industrial applications. An appropriately qualified water quality specialist would be employed to undertake the water analysis.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and post construction</td>
</tr>
<tr>
<td>Erosion and sedimentation</td>
<td>A rehabilitation plan would be prepared for areas disturbed during construction. This would identify appropriate methods for stabilising and progressively revegetating disturbed soils to resist erosion and weed invasion. Sediment and erosion controls would be implemented before any construction starts and inspected regularly, particularly after a rainfall event, and maintenance work undertaken as needed.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>Impact</td>
<td>Where possible, ‘clean’ surface water would be directed away from disturbed areas to stabilised discharge points using temporary diversion drains.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Clearing of vegetation and stabilisation and revegetation activities would be carried out progressively to limit the time disturbed areas are exposed to erosion processes.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Site stabilisation of disturbed areas would be undertaken progressively as stages are completed. Batters would be stabilised during construction.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>All stockpiles would be designed, established, operated and decommissioned in accordance with Roads and Maritime Services’ Stockpile Management Procedures (RTA, 2011a).</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Controls would be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces. Any material transported onto pavement surfaces would be swept and removed at the end of each working day.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Weather forecasts would be checked daily to ensure that high risk soil and erosion activities are not undertaken immediately before or during high rainfall or wind events. Disturbed surfaces would be compacted and stabilised in anticipation of rain events to reduce the potential for erosion.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Contamination of soil and water with lead and polycyclic aromatic hydrocarbons</td>
<td>All hazardous paint debris dislodged during works on the bridge would be collected at least daily, to minimise risk of it becoming dispersed by human activity or escaping by other means.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Chemicals entering waterway</td>
<td>All fuels, chemicals, and liquids would be stored as far as possible from the river or drainage line and would be stored in an impervious bunded area within the construction compound.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas in the construction compound.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>All staff would be inducted about incident and emergency procedures and made aware of the location of emergency spill kits.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>
### Impact

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should a spill occur during construction, the emergency response plan would be implemented, and the Roads and Maritime Local Environmental Officer contacted immediately. The EPA would also be notified as per Part 5.7 of the Protection of the Environment Operations Act 1997 if required.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Contamination of soil and water</td>
<td>Vehicle wash downs and concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Soil contamination</td>
<td>The results of the soil surveys before and after construction would be interpreted according to the guidelines set out in AS 4361.1 Guide to lead paint management Part 1: Industrial applications and the contractor would be liable for any soil remediation indicated as being necessary according to AS4361.1.</td>
<td>Roads and Maritime Post construction</td>
<td></td>
</tr>
</tbody>
</table>

### 6.3 Biodiversity

An ecological assessment was undertaken by GHD in October 2013. A copy of the report is provided in Appendix E with a summary of the findings provided below.

#### 6.3.1 Methodology

The study area for the ecological assessment is defined as the area within 500 metres of the proposal site. The locality is defined as the area within 10 kilometres of the proposal site.

**Desktop review**

The assessment included a review of:

- Background ecology information obtained from database searches and reviews. These searches included:
  - NSW threatened species, online profiles (OEH, 2012).
  - EPBC Act Protected Matters Search Tool (DSEWPaC, 2012a) – for a 10 kilometre radius around the proposal site (searched 26 November 2012).
  - Species profile and threats database, online profiles (DSEWPaC, 2012b).
  - NSW Department of Primary Industries (DPI) – Fishing and Aquaculture records viewer (DPI, 2012a) (searched 26 November 2012).
- Ecological assessment report prepared by Hayes Environmental (2005) as part of a statement of environmental effects for a proposed new bridge over Mulwaree Ponds.
Field surveys
Terrestrial flora and fauna field surveys were conducted by two ecologists from 5 to 6 December 2012. Aquatic fauna and habitat surveys were completed on 27 March 2013. The surveys included:

- Terrestrial flora surveys including transect and quadrat surveys, vegetation mapping and tree count.
- Terrestrial fauna surveys including fauna habitat assessment, diurnal bird surveys, bridge/roost watches, microchiropteran bat echolocation surveys (using Anabat), spotlighting for nocturnal fauna, reptile and amphibian searches and opportunistic observations.
- Aquatic surveys including habitat cross sections, macroinvertebrate collection, habitat assessment, riparian surveys, velocity readings and water quality assessments.

Survey effort is detailed and mapped in the ecological assessment in Appendix E.

Assessment of the potential impacts on listed biota
An assessment of the likelihood of occurrence and possibility of impact was completed for listed species, populations and ecological communities with the potential to occur in the study area.

Assessments of significance were completed for any species identified as being likely to be impacted by the proposal.

Development of safeguards and management measures
Safeguards and management measures for the proposal were developed based on the site conditions and the potential impacts of the proposal.

6.3.2 Existing environment
Terrestrial flora
Vegetation communities
Native vegetation in the study area is confined to wetland and aquatic vegetation on the river banks and in shallow water on the fringes of the Mulwaree Ponds, north of and adjacent to the existing bridge (see Photograph 6-5). This native vegetation is confined to a strip within about two metres of the water’s edge. Vegetation here is dominated by species such as Common Reed (*Phragmites australis*), Common Rush (*Juncus usitatus*), Fen Sedge (*Carex gaudichaudiana*) and River Clubrush (*Schoenoplectus validus*).

Very little native vegetation exists in other parts of the study area due to extensive clearing and rural land uses including grazing. South of the existing bridge the riparian vegetation is dominated by Weeping Willow. Some planted eucalypts are also present, such as Sydney Peppermint (*Eucalyptus piperita*). A stand of English Elms is located between Bungonia Road and the Mulwaree Ponds at the western end of the proposal site (see Figure 6-2).

The nearest stand of native woodland is about 500 metres east of the proposal site at the southern end of the Rocky Hill Nature Reserve. This reserve covers an area of about 130 hectares along a ridgeline running north-south (see Figure 1-2). The woodland is dominated by eucalypt species such as Inland Scribbly Gum (*Eucalyptus rossii*).

Recorded flora species
Field surveys identified 92 flora species, of which 28 species are native and 64 species are introduced (see ecological assessment in Appendix E).
Tree species in the study area are dominated by introduced species including English Elm and Hawthorn (Crataegus monogyna), which occur along the roadside reserves, and Weeping Willow, which occurs in dense stands along the banks of Mulwaree Ponds (Photograph 6-4). Three introduced tree species were recorded on the hill at the eastern end of the proposal site; Aleppo Pine (Pinus halepensis), Ponderosa Pine (Pinus ponderosa) and Oak (Quercus sp.).

Planted native trees in the study area include Sydney Peppermint, River Sheoak (Casuarina cunninghamiana) and Black Wattle (Acacia mearnsii). These species coexist with the introduced Weeping Willows along the river bank south of the existing bridge. Other non-endemic eucalypts have been planted along the eastern edge of Forbes Street in the north of the study area.

Native shrub species recorded include Sticky Cassinia (Cassinia uncata) and Black Wattle (Acacia decurrens). These species were found on the hill at the eastern end of the proposal site (Photograph 6-5). Introduced shrub species such as Blackberry (Rubus sp.) were found along the banks of the river.

Photograph 6-4  The proposal site, looking east, showing the introduced groundcover and willows in the background

The ground layer in the study area is dominated by introduced species. Commonly occurring introduced species include Great Brome (Bromus diandrus), Phalaris (Phalaris aquatica) and Chilean Needlegrass (Nassella neesiana). Native grasses and forbs were generally uncommon. A small patch on the eastern hill within 50 metres of the proposal site contains a higher proportion of native species (although still dominated by introduced species) (Photograph 6-5). Native terrestrial groundcover species include Wallaby Grass (Rytidosperma racemosum) and Couch (Cynodon dactylon).

A number of native wetland and aquatic vegetation species occur along the banks of the Mulwaree Ponds north of the existing bridge (described in the section titled Vegetation communities above).
No threatened flora species or potential habitat for threatened flora species listed under the TSC Act or EPBC Act were recorded in the study area.

Photograph 6-5  The proposal site, looking west, showing the groundcover vegetation on the eastern hill in the foreground

Noxious weeds

Seven plants listed as noxious for the Goulburn Mulwaree control area (DPI 2012b) were recorded during flora surveys (Table 6-4).

Paterson’s Curse (*Echium plantagineum*) and Chilean Needlegrass (*Nassella neesiana*) are relatively common mostly on the western side of Mulwaree Ponds, with St John’s Wort (*Hypericum perforatum*) more abundant on the eastern side. The remaining species occur sporadically throughout the study area.

All but one of the noxious weeds recorded are class four weeds, meaning the growth of the plant must be managed in a manner that reduces its numbers, spread and incidence, and continuously inhibits its reproduction. St John’s Wort is a class three weed, meaning the plant must be fully and continuously suppressed and destroyed.
Table 6-4 Noxious weeds in the study area

<table>
<thead>
<tr>
<th>Name</th>
<th>Class</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Boxthorn</td>
<td>Four</td>
<td>Uncommon. Localised occurrences throughout the study area.</td>
</tr>
<tr>
<td><em>Lycium ferocissimum</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blackberry</td>
<td>Four</td>
<td>Uncommon. Scattered occurrences along the banks of the river.</td>
</tr>
<tr>
<td><em>Rubus sp.</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chilean Needlegrass</td>
<td>Four</td>
<td>Relatively common. Scattered occurrences throughout the study area.</td>
</tr>
<tr>
<td><em>Nassella neesiana</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paterson's Curse</td>
<td>Four</td>
<td>Relatively common. Scattered occurrences throughout the study area.</td>
</tr>
<tr>
<td><em>Echium plantagineum</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotch Broom</td>
<td>Four</td>
<td>Occurs on the hill at the eastern end of the study area.</td>
</tr>
<tr>
<td><em>Cytisus scoparius</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scotch Thistle</td>
<td>Four</td>
<td>Uncommon. Localised occurrences throughout the study area.</td>
</tr>
<tr>
<td><em>Onopordum acanthium subsp. acanthium</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St John's Wort</td>
<td>Three</td>
<td>Relatively common. Scattered occurrences mostly in the eastern portion of the study area.</td>
</tr>
<tr>
<td><em>Hypericum perforatum</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Terrestrial fauna

Fauna species

Field surveys identified 47 fauna species, of which 42 are native and five are introduced (see ecological assessment in Appendix E).

The study area provides habitat for a variety of bird species. Forty-one bird species were identified during field surveys, five of which were introduced: the Common Blackbird (*Turdus merula*), Common Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*), Feral Pigeon (*Columba livia*) and European Goldfinch (*Carduelis carduelis*). Commonly occurring native species included the Australian White Ibis (*Threskiornis molucca*), Superb Fairy-wren (*Malurus cyaneus*), Eurasian Coot (*Fulica atra*) and Australian Reed-warbler (*Acrocephalus australis*).

Two species of native mammals (not including bats – see below) were recorded during field surveys: the Eastern Grey Kangaroo (*Macropus giganteus*) and the Water Rat. No threatened or introduced mammals were recorded during field surveys.

Platypuses (*Ornithorhynchus anatinus*) have been observed at the proposal site by Roads and Maritime staff.

A large number of unidentified adult dragonflies and damselflies were observed during field surveys. The Giant Dragonfly, which is listed as endangered under the TSC Act, has the potential to occur in the study area. However, none of the dragonflies observed were likely to be the Giant Dragonfly based on:

- The generally small size of the adults. Giant Dragonflies are obviously large with abdomens of length between six and 9.5 centimetres and wingspans of 11 to 12.5 centimetres, depending on sex.
- Time of survey. Giant Dragonflies emerge from late October through to early February and are short-lived. Adult dragonflies were observed in the study area in late March.
No amphibians were recorded during field surveys, possibly due to unseasonably cold conditions experienced at the time of field surveys. Potential habitat is present in the study area along the river and drainage lines. No threatened species of amphibians are likely to occur in the study area.

No species of reptile were recorded during field surveys despite active searches. The cooler weather experienced during the survey period was not optimal for the detection of reptile species. Given the suitable potential habitat in and around the Mulwaree Ponds, reptiles are likely to occur in the study area. No rocky habitats for reptiles were observed. No threatened species of reptiles are likely to occur in the study area.

**Bats**

After dusk, bat calls were detected while carrying the Anabat detector on foot under the bridge and along the edges of the Mulwaree Ponds in the study area. Numerous bats were observed flying along the Mulwaree Ponds and in the vicinity of the bridge during surveys.

The Anabat detector was placed at a location under the bridge where it faced over the water for detection of bat calls throughout the night. Bat species identified by Anabat survey are listed in Table 6-5.

<table>
<thead>
<tr>
<th>Species or species group</th>
<th>Likelihood of identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Forest Bat (Vespadelus darlingtoni)</td>
<td>Definite</td>
</tr>
<tr>
<td>Southern Forest Bat (Vespadelus regulus)</td>
<td>Definite</td>
</tr>
<tr>
<td>Little Forest Bat (Vespadelus vulturnus)</td>
<td>Probable</td>
</tr>
<tr>
<td>Vespadelus sp./Australasian Bent-winged Bat (Miniopterus schreiberi oceanensis)</td>
<td>Call could only be identified to species group level</td>
</tr>
<tr>
<td>Little Forest Bat (V. vulturnus)/ Chocolate-wattled Bat (Chalinolobus morio)</td>
<td>Call could only be identified to species group level</td>
</tr>
<tr>
<td>Nyctophilus sp./ Southern Myotis (Myotis macropus)</td>
<td>Call could only be identified to species group level</td>
</tr>
</tbody>
</table>

No threatened bat species were positively identified, although two of the species groups identified include threatened bats: the Eastern Bent-wing Bat and the Southern Myotis. Potential habitat for both these species is present in the study area.

The ecological assessment in Appendix E provides example Anabat graph files for species positively identified (definite) as a result of call analysis.

**Terrestrial fauna habitat**

Due to the minimal native vegetation present in the study area, introduced trees are likely to provide alternative, albeit lower quality, habitat for fauna species in the surrounding area.

Trees provide foraging, movement and potential breeding habitat for a variety of bird species, including those recorded during surveys. The Weeping Willow trees in the study area were observed to be used as roosting habitat by Australian White Ibis (Threskionis molucca). The study area is unlikely to provide habitat for threatened species. No hollow-bearing trees were recorded in the study area.

Lansdowne Bridge may contain roosting habitat for microchiropteran bats in the timber framework underneath the bridge deck (Photograph 6-6). Although no guano was found, crevices in the bridge underneath the deck may contain potential habitat. It is possible bats
could have been roosting in parts of the bridge that were inaccessible during surveys, such as directly above the water.

The framework of the bridge also provides roosting and potential nesting habitat for birds. Feral Pigeons were observed roosting in the bridge during surveys.

Foraging and breeding habitat is available for wetland birds, such as ducks and cormorants, and other species such as amphibians. Common Reed is abundant and provides refuge for birds dependent on aquatic habitats. A number of bird species that depend on wetland habitats were recorded during field surveys, for example the Australian White Ibis, Eurasian Coot (Fulica atra), Australian Spotted Crake (Porzana fluminea) and Australian Reed-Warbler (Acrocephalus australis).

Potential habitat for frogs in the study area is present along the Mulwaree Ponds and in nearby drainage lines. The ponds may provide suitable breeding habitat for frogs.

Photograph 6-6 Potential microbat habitat underneath deck of bridge

The Mulwaree Ponds provide habitat for the Water Rat (Hydromis chrysogaster), a native species that was recorded during field surveys. The ponds also provide habitat for the Platypus, which is semi-aquatic.

Grassy areas in the study area, although predominantly introduced, provide foraging habitat for a variety of species. Grassy areas may also provide habitat for reptile species likely to inhabit the study area, such as the Tiger Snake (Notechis scutatus) and the Red-bellied Black Snake (Pseudechis porphyriacus).

The study area has the potential to provide marginal habitat for the Giant Dragonfly, which is listed as vulnerable under the TSC Act. Adults of the species may use the Mulwaree Ponds and adjacent aquatic vegetation as foraging and movement habitat. Potential breeding habitat (boggy soil adjacent to wetlands) is located about 100 metres upstream (south) of the proposal site. The larvae of the species burrow in boggy soils under wetlands. Entrances to burrows are generally terrestrial.
**Terrestrial habitat connectivity**

Terrestrial habitat connectivity in the study area is limited due to its highly cleared and developed nature. Native trees are limited to some young planted Sydney Peppermint trees along the Mulwaree Ponds. The riparian vegetation, which is dominated by Weeping Willows (*Salix babylonica*) and English Elm (*Ulmus procera*), may provide some value as a movement corridor for some fauna species. Scattered introduced trees such as Aleppo Pine occur further away from the river. Introduced trees in the study area provide limited habitat connectivity for some native bird species such as the Red-browed Finch (*Neochmia temporalis*).

**Aquatic habitat**

The Mulwaree River, which includes Mulwaree Ponds, is a major, permanent watercourse in the study area and provides potential habitat for a variety of aquatic fauna species.

A small amount of in-stream woody debris would provide habitat for aquatic species. Large woody debris exists directly upstream (south) of the bridge on the western side of the river. A large log downstream (north) of the bridge on the western side of the river would provide refuge and habitat for fish species and aquatic macroinvertebrates.

**Aquatic fauna**

The Mulwaree Ponds may provide habitat for nine fish species that have the potential to occur in the study area (Hayes Environmental, 2005). Native fish species likely to occur in the study area include Firetailed Gudgeon (*Hypseleotris galii*), Flathead Gudgeon (*Philypnodon grandiceps*), Australian Smelt (*Retropinna semoni*) and Freshwater Catfish (*Tandanus tandanus*).

The introduced Plague Minnow (*Gambusia holbrooki*) has been recorded in the ponds downstream (north) of the study area, and the introduced Rainbow Trout (*Oncorhynchus mykiss*) has previously been recorded in the Mulwaree River. Other introduced fish species likely to occur in the study area include Goldfish (*Carassius auratus*), Common Carp (*Cyprinus carpio*) and Oriental Weatherloach (*Misgurnus anguillicaudatus*) (Hayes Environmental, 2005). No threatened fish species are likely to occur in the study area.

**Macroinvertebrates**

The Mulwaree Ponds provide habitat for aquatic invertebrates. A total of 33 macroinvertebrate taxa were collected in this survey. Results indicate that the ecological health was below reference condition. Site 1 and Site 3, upstream (south) and downstream (north) of the bridge respectively (see Figure 6-2), were both assessed as ‘significantly impaired’, indicating that several of the macroinvertebrate families predicted to occur at these locations were missing. Site 2 (10 metres either side of the bridge) was assessed as being in even lower condition –as ‘severely impaired’, indicating that a large proportion of the macroinvertebrate families predicted to occur at this location was missing.

The majority of the taxa collected in this study were either tolerant or moderately tolerant to pollution. The most common taxa from the samples, which characterised the study area, were: Dytiscidae (diving beetles), Chironominae (non-biting midges), Corixidae (waterboatmen), Leptoceridae (stick caddisflies), Glossiphoniidae (leeches) and Oligochaeta (segmented worms). These taxa (except for Leptoceridae) are tolerant of degraded habitat conditions and pollution.
Aquatic flora

The banks of the Mulwaree Ponds north of the existing bridge contain suitable habitat for a number of native aquatic flora species, including Common Reed, Large River Buttercup (*Ranunculus papulentus*) and Common Rush (Photograph 6-7).

Aquatic ecology site assessment

Detailed site descriptions for each of the three sites surveyed are provided in the ecological assessment in Appendix E).

The Mulwaree Ponds in the study area was assessed as Class 2 (Moderate Fish habitat) according to the NSW Fisheries Habitat Classification Scheme (see ecological assessment in Appendix E); which is defined as:

“A named or unnamed permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area”.

Photograph 6-7  The proposal site, looking east, showing the native aquatic vegetation surrounding Mulwaree Ponds, with the existing bridge in the background

The river bed substrate (the sedimentary material at the bottom of the Mulwaree Ponds) is dominated by materials with small particle sizes, including sand and fine silt. It has a high organic content derived from decomposing plants and Weeping Willow leaf litter. Materials with larger particle sizes, including cobbles, gravel and pebbles, make up about 15 per cent of the substrate and are heavily embedded in finer sediments, suggesting that vertical connectivity is minimal. The river bed materials throughout the reach are consistent. Spaces between the river bed substrate particles are limited due to the abundance of detritus and fine sediment. Sediment odours were indicative of anaerobic conditions (a lack of free oxygen), which limit
habitat suitability for aquatic organisms. River riparian channel and environmental inventory scores were low at each location indicating a moderately disturbed channel and modified riparian zone (see ecological assessment in Appendix E). Water quality at all sites was generally within the ANZECC (2000) guidelines except for dissolved oxygen and electrical conductivity at Site 1 which were below the recommended trigger levels for aquatic ecosystems at each site (see ecological assessment in Appendix E).

**Listed biota**

**Listed biota observed during surveys**

No threatened species or ecological communities were observed during field surveys.

**Likelihood of listed biota occurring in the study area**

The literature review, database search and field surveys identified one bird species, two bat species and one insect species listed under the TSC Act, and seven bird species listed under the EPBC Act, that are known or likely to occur in the study area (see Table 6-6).

**Table 6-6 Listed species likely to occur in the study area**

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birds</strong></td>
<td></td>
</tr>
<tr>
<td>Blue-billed Duck</td>
<td>Vulnerable – TSC Act</td>
</tr>
<tr>
<td><em>Oxyura australis</em></td>
<td></td>
</tr>
<tr>
<td>Cattle Egret</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Ardea ibis</em></td>
<td></td>
</tr>
<tr>
<td>Great Egret</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Ardea alba</em></td>
<td></td>
</tr>
<tr>
<td>Latham’s Snipe</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Gallinago hardwickii</em></td>
<td></td>
</tr>
<tr>
<td>Fork-tailed Swift</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Apus pacificus</em></td>
<td></td>
</tr>
<tr>
<td>Rainbow Bee-eater</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Merops ornatus</em></td>
<td></td>
</tr>
<tr>
<td>White-bellied Sea-Eagle</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Haliaeetus leucogaster</em></td>
<td></td>
</tr>
<tr>
<td>White-throated Needletail</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Hirundapus caudacutus</em></td>
<td></td>
</tr>
<tr>
<td><strong>Bats</strong></td>
<td></td>
</tr>
<tr>
<td>Eastern Bentwing-bat</td>
<td>Vulnerable – TSC Act</td>
</tr>
<tr>
<td><em>Miniopterus schreibersii oceanensis</em></td>
<td></td>
</tr>
<tr>
<td>Southern Myotis</td>
<td>Vulnerable – TSC Act</td>
</tr>
<tr>
<td><em>Myotis macropus</em></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Status</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Insects</td>
<td></td>
</tr>
<tr>
<td>Giant Dragonfly</td>
<td>Endangered - TSC Act</td>
</tr>
<tr>
<td><em>Petalura gigantea</em></td>
<td></td>
</tr>
</tbody>
</table>

### 6.3.3 Potential impacts

**Potential direct impacts**

**Removal of vegetation**

The proposal would involve clearing and grubbing about 7000 square metres of introduced vegetation for the construction of the bridge and approach roads. About 2000 square metres of introduced groundcover vegetation would also be removed for the establishment of the construction compound (see Figure 6-2).

Introduced trees would be removed at the western and eastern ends of the proposal site (mainly English Elm and Ponderosa Pine). No locally native trees would be removed. Trees to be removed include (see Figure 6-2):

- About 10 trees greater than 40 centimetres in diameter at breast height throughout the proposal site (two English Elms, about five Ponderosa Pines and two Oaks).
- About 30 smaller pine trees growing on the hill at the eastern end of the proposal site. These trees have limited habitat value for native fauna.
- A large number of smaller English Elm and Hawthorn trees growing in a stand on the northern side of the existing road, west of the bridge.
- Some of the Weeping Willows south of the existing bridge in the ponds.
- About five planted non-endemic eucalypts (*Eucalyptus* spp.) where a cul-de-sac would be constructed for the closure of Forbes Street.

There is very little native wetland and aquatic vegetation present in the proposal site. The proposed temporary pad for the piling rig (see Figure 6-2) and construction of the retaining wall would be unlikely to remove a significant quantity of native aquatic vegetation. There is the potential for native wetland and aquatic vegetation along the edges of the Mulwaree Ponds in other areas to be inadvertently damaged by machinery and the movement of materials due to its close proximity to the proposal site. This could occur during the demolition of the existing bridge and during construction of the proposed bridge. Safeguards in section 6.3.4 would be implemented to minimise impacts to this vegetation.

**Removal of potential bat habitat**

The proposal would involve removing the existing bridge, which contains potential bat habitat in the timber framework underneath the deck of the bridge. Due to the lack of mature native trees along the Mulwaree Ponds in the study area, bat roosting habitat in the study area is limited. It is likely however that roosting habitat for bats exists in woodland in Rocky Hill Nature Reserve 500 metres east of the proposal site.

The demolition of the bridge may cause death or injury to any bats that may be roosting in the bridge at the time of demolition. To minimise potential impacts on bats, a fauna management plan would be prepared with specific attention to the potential presence of bats roosting in the bridge. Potential impacts on fauna during construction would be managed by implementing safeguards identified in section 6.3.4.
**Removal of potential bird habitat**

The framework of the bridge provides roosting and potential nesting habitat for birds. Although no native birds were observed in the bridge at the time of the field surveys, it is possible that they could be present in the bridge at the time of construction.

The proposed removal of introduced trees in the study area is unlikely to cause any significant impacts to birds due to the low quality of the habitat; however it is possible that introduced trees in the proposal site could be used for nesting by some species.

If birds are present but not nesting during construction, they will generally move away from the proposal site to escape the disturbance. Measures would be put in place to manage any birds found in the proposal site during construction (see section 6.3.4).

**Disturbance of woody debris habitat in the Mulwaree Ponds**

Although no large woody debris was observed in the Mulwaree Ponds directly under the proposed bridge alignment, it is possible that the proposal would result in the disturbance of woody debris from the bed of the ponds for the construction of bridge piers.

**Impacts to platypus burrows**

Platypuses have been observed at the proposal site by Roads and Maritime staff. No platypus burrows were observed in the proposal site during surveys; however it is possible that burrows that existed in the proposal site were not visible due to the water level in the ponds at the time of the surveys. It is also possible that burrowing may have occurred at the proposal site since the surveys were conducted. Measures would be put in place to manage platypuses should they be present in the proposal site during construction (see section 6.3.4).

**Potential indirect impacts**

**Weeds**

The groundcover vegetation in the study area is dominated by introduced species. The proposal has the potential to further introduce and spread weeds in the study area by movement of machinery and light vehicle traffic during construction of the project.

Seven noxious weed species were identified during the surveys. The proposal has the potential to cause the further spread of noxious weeds such as Chilean Needlegrass, St John’s Wort and Paterson’s Curse, which are the most commonly occurring noxious weed species and are widespread throughout the subject site and study area.

The spread of weeds would be managed by implementing safeguards identified in section 6.3.4.

**Sedimentation and bank erosion**

Due to the fine-grained nature of the sediments on the bed of the Mulwaree Ponds and the slow flow of the Mulwaree River at this location, there is a potential risk of sedimentation impacts to aquatic fauna and flora.

The proposal may cause sedimentation of the Mulwaree Ponds through construction of bridge piers in the bed of the ponds and on the banks of the ponds. Sedimentation could occur over a relatively long period of time, given the slow flow of the river and the fine sediments on the bed of the ponds.

The existing bridge piers located in the bed of the Mulwaree Ponds would remain in situ and would be cut off just above the waterline. This would reduce the potential for the proposal to cause soil erosion and sedimentation of the ponds.
Vegetation removal and machinery work adjacent to the river banks could also result in sedimentation of the Mulwaree Ponds. These works have the potential to destabilise the banks, leading to further erosion of the channel and deposition of sediment. This may be a particular risk when runoff occurs during rainfall events. Bank erosion and sedimentation is a particular risk where the river banks are likely to be unstable.

Sedimentation has the potential to affect aquatic flora and fauna, including fish and macroinvertebrates. Fish normally move away from highly turbid water; however, sedimentation may block fish passage, having detrimental impacts during times of migration.

More extreme impacts on fish and macroinvertebrate species, as a result of sedimentation and increased turbidity in the river, can include:

- Smothering of gill surfaces leading to asphyxiation.
- Swallowing of large amounts of sediment leading to illness.
- Inhibition of light penetration into the water column which can affect predator-prey interactions.
- Impacts on habitat diversity in the immediate area and downstream by smothering and filling of habitat.

Sedimentation has the potential to reduce the photosynthetic productivity and health of aquatic plants. In the Mulwaree Ponds this is a particular risk due to the slow flow of the Mulwaree River at this location and the potential for elevated turbidity levels over long periods of time. This may impact primary production in the downstream (northern) sections of the reach due to lower light penetration through the water column.

Of note, the macroinvertebrate assemblage recorded in the study area is of limited diversity and sensitivity, and comprises species that are known to adapt to aquatic environments with altered water quality. The two observed species of fish are considered noxious pest species.

Potential impacts from sedimentation would be managed by implementing safeguards identified in section 6.2.3. Provided these safeguards are effectively implemented to minimise the scale and duration of sedimentation caused by the proposal, it is unlikely that the proposal would cause major long-term sedimentation impacts to aquatic fauna and flora.

**Water quality impacts on flora and fauna**

Potential accidental spills of contaminants such as fuel or chemicals could impact on aquatic fauna and flora in the Mulwaree Ponds. Contaminants present in the timbers and deck of the existing bridge (e.g., lead paint) could also have water quality impacts on flora and fauna when the existing bridge is demolished. Provided safeguards detailed in section 6.2.3 to manage fuels, chemicals and contaminated bridge materials are implemented, the proposed demolition of the existing bridge would be unlikely to cause substantial water quality impacts.

There is also potential for spills of fertilisers to release nutrients such as nitrogen and phosphorus to the river during revegetation practices, if fertilisers are to be used. Phosphorus present in the existing sediments may also be re-mobilised during the construction of the new bridge piers. These practices have the potential to result in eutrophication which encourages algae growth. Algae blooms can deplete oxygen concentrations in waterbodies through increased respiration, sometimes resulting in fish kills. Provided safeguards detailed in section 6.2.3 to minimise the potential for nutrients from fertilisers to enter the Mulwaree Ponds are implemented, it is unlikely that the proposal would cause water quality impacts through the release of fertiliser to the ponds.
**Blockage of fish passage in the Mulwaree Ponds**

Fish passage is important for several reasons, including:

- Access to habitat, food and shelter.
- The avoidance of predators.
- Seasonal movement associated with breeding cycles (Fairfull and Witheridge, 2003).

Fish passage may be blocked by sedimentation of the Mulwaree Ponds, as described in the section titled ‘Sedimentation and bank erosion’ above.

The construction of a temporary pad in the waterway to enable construction of piers (see Figure 6-2) would be likely to cause temporary partial blockage of fish passage in the proposal site for a period of about four months. The pad would affect 15 metres of the river cross section (total width of the channel is about 25 metres, of which about two metres is occupied by the existing piers).

The use of silt curtains, partial or otherwise, within the river may also temporarily impede fish passage.

The potential deposition of debris from construction and demolition, including sediment, in the waterway could also impact on fish passage in the area by creating blockages. Construction activities would aim to avoid any deposition of debris in the waterway.

The construction of a new pier (comprising two piles) in the river, in addition to the existing three piers, would partially block fish passage in the river. The new piles would have a width of one metre. In total, the piles of the existing piers occupy about two metres of the channel cross section. The total width of piers in the channel after construction of the new bridge would therefore be about three metres. The channel width is about 25 metres. The proposal would be unlikely to substantially affect fish passage due to the relatively small proportion of the river cross section that the new pier and existing piers would occupy. The piers would be unlikely to substantially change the hydrology of the river.

At the time of the aquatic field survey, the Mulwaree Ponds in the study area had become disconnected from the downstream reaches of the river (to the north) because of low river levels and a dense stand of Common Rush extending into the waterway. Depending on the flow of water in the river it is likely that fish passage would already be restricted for periods of time due to the existing conditions.

The proposal would be unlikely to block the Mulwaree Ponds to the extent that fish passage would be severely restricted.

**Disturbance of fauna**

The proposal has the potential to temporarily affect the use of the study area by fauna as a result of increased disturbance during construction. The use of machinery may temporarily deter some fauna species from using potential habitat in the study area during construction and demolition.

**Pathogens**

The proposal has the potential to result in the spread of pathogens such as bacteria and fungi. This could occur through the spread of soils on vehicle tyres and operatives footwear. Impacts of pathogens include spread of known diseases that are detrimental to fauna such as the amphibian chytrid fungus.
Cumulative impacts

The proposal would cause impacts additional to those that have occurred due to previous land use activities in the study area, including residential and agricultural activities. Other work that may contribute to cumulative ecological impacts in the study area includes vegetation maintenance for linear infrastructure such as roads and power lines.

The study area is highly degraded and it is unlikely that the proposal would cause any greater degradation than what has already occurred.

Key threatening processes

The proposal would result in the following key threatening processes listed under the TSC Act, FM Act and/or EPBC Act:

- Invasion of native plant communities by exotic perennial grasses (TSC Act) - the study area is already heavily infested with exotic perennial grasses; however, the proposal could lead to the further spread of exotic perennial grasses such as Chilean Needlegrass and Phalaris.

- Removal of large woody debris from NSW rivers and streams (FM Act) - although no large woody debris was observed under the proposed bridge alignment, it is possible that the proposal would disturb woody debris from the bed of the Mulwaree Ponds for the construction of bridge piers.

- Degradation of native riparian vegetation along NSW water courses (FM Act) - the proposal could damage native vegetation along the margins of the Mulwaree Ponds by machinery and the movement of materials. This could occur during the demolition of the existing bridge and during construction of the proposed bridge. The proposal could also cause degradation of native vegetation by causing sedimentation of the waterway, affecting plant photosynthesis, increasing nutrient concentrations and smothering habitat.

The impacts of these key threatening processes would be minimised through the implementation of safeguards detailed in section 6.3.4.

Assessments of significance

The literature review, database search and field surveys identified eight bird species, two bat species and one insect species listed under the EPBC Act and/or the TSC Act that are known or likely to occur in the study area (see ecological assessment in Appendix E).

Of the 11 species listed above, seven species were identified as potentially being impacted by the proposal (see Table 6-7).

The assessment of likelihood of occurrence found that the proposal may affect one bird species, two bat species and one insect species listed as threatened under the TSC Act. Assessments of significance under Section 5A of the EP&A Act were completed for these species (see ecological assessment in Appendix E).

The assessment of likelihood of occurrence found that the proposal may affect three bird species listed as migratory under the EPBC Act. A significance assessment was completed for these species, as detailed in the policy statement Matters of National Environmental Significance: Significant impact guidelines 1.1 (DEWHA, 2009) (see ecological assessment in Appendix E).
Table 6-7 Listed species with the potential to be impacted by the proposal

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue-billed Duck</td>
<td>Vulnerable – TSC Act</td>
</tr>
<tr>
<td><em>Oxyura australis</em></td>
<td></td>
</tr>
<tr>
<td>Eastern Bentwing-bat</td>
<td>Vulnerable – TSC Act</td>
</tr>
<tr>
<td><em>Miniopterus schreibersii oceanensis</em></td>
<td></td>
</tr>
<tr>
<td>Southern Myotis</td>
<td>Vulnerable – TSC Act</td>
</tr>
<tr>
<td><em>Myotis macropus</em></td>
<td></td>
</tr>
<tr>
<td>Giant Dragonfly</td>
<td>Endangered – TSC Act</td>
</tr>
<tr>
<td><em>Petalura gigantea</em></td>
<td></td>
</tr>
<tr>
<td>Cattle Egret</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Ardea ibis</em></td>
<td></td>
</tr>
<tr>
<td>Great Egret</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Ardea alba</em></td>
<td></td>
</tr>
<tr>
<td>Latham’s Snipe</td>
<td>Migratory – EPBC Act</td>
</tr>
<tr>
<td><em>Gallinago hardwickii</em></td>
<td></td>
</tr>
</tbody>
</table>

The assessments of significance concluded that the proposal would be unlikely to have a significant impact on any of the species listed in Table 6-7 primarily due to the marginal nature of the habitats in the study area, the small scale of the proposal, the habitat requirements of the species assessed and the safeguards to be implemented (see ecological assessment in Appendix E).

6.3.4 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise impacts on biodiversity.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts to native vegetation</td>
<td>All staff would be inducted and informed of the limits of vegetation clearing and the areas of vegetation to be retained, with particular reference to native aquatic flora along the edges of Mulwaree Ponds. Trees and areas of native vegetation to be retained would be fenced before construction to protect aquatic habitat and native vegetation. An exclusion zone plan would be implemented in line with RTA (2011) - <em>Biodiversity Guidelines Guide 2: Exclusion zones</em>, before work starts. Exclusion zones would be marked on plans for the proposal and would be identified on-site with highly visible temporary fencing. All trees to be removed would be clearly identified on site (eg through markings).</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
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</tr>
<tr>
<td>Impacts to native fauna</td>
<td>Before demolition of the existing bridge, a fauna management plan would be prepared in line with RTA (2011) - Biodiversity Guidelines to manage impacts to listed species with the potential to be impacted by the proposal. The plan would be reviewed by Roads and Maritime’s Environmental Officer, Southern Region. The fauna management plan would have specific attention to the potential presence of bats roosting in the bridge, water birds that may occur in the study area, terrestrial birds that may be present in the bridge or introduced trees and potential presence of Platypuses and their burrows in the proposal site during construction. The plan would include:</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>• Timing of the work (with particular reference to the breeding season of any bats that may be using the bridge as breeding habitat).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Pre-clearance surveys (including potential use of endoscope to detect bats in the bridge).</td>
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</tr>
<tr>
<td></td>
<td>• Measures to be taken if evidence of bats is found (eg exclusion of bats from the bridge and techniques for demolishing the bridge that minimise harm).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measures to be taken if birds are found nesting in the bridge or introduced trees during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measures to be taken if Platypuses or their burrows are found in the proposal site.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Relocation options.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Management measures, including protocols before, during and after work (eg engagement of experienced bat handler to remove bats during the demolition of the bridge and notification of WIRES and/or veterinarian to care for injured bats collected by the bat handler).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The fauna management plan would consider the potential for harm to listed water birds that may occur in the study area (eg the Blue-billed Duck).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spread of weeds</td>
<td>A weed management plan would be prepared in consultation with Goulburn-Mulwaree Council before construction, for implementation before, during and after construction work, as detailed in RTA (2011) - Biodiversity Guidelines Guide 6: Weed management. The weed management plan would identify the weeds present in the study area and would include measures to prevent the spread of weeds. Weed management measures may include:</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>• Use of herbicides.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Integrated weed management.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Implementing exclusion zones.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
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</tr>
<tr>
<td>Restoration</td>
<td>A rehabilitation plan would be prepared for areas disturbed during construction. This would identify appropriate methods for stabilising and progressively revegetating disturbed riparian areas to minimise erosion and weed invasion.</td>
<td>Roads and Maritime Services</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Disturbance of aquatic habitat</td>
<td>Wherever possible, disturbance of woody debris in the river would be avoided. Where disturbance is necessary, management of the debris would follow a hierarchy of lopping, realignment, relocation and/or removal, as outlined in RTA (2011) - Biodiversity Guidelines Guide 10: Aquatic habitats and riparian zones. If any large woody debris is disturbed from the river bed during construction, the large woody debris would be recovered and stored on site; and replaced at the completion of the construction period, in line with the Department of Primary Industries’ Policy and guidelines for fish habitat conservation and management (DPI 2013). Silt curtains would be installed only where necessary, and would not be left within the waterway for any longer than necessary, to minimise impacts to fish moving through the study area. To maintain connectivity to the upstream (southern) reaches, where silt curtains are used, they would not extend across the full channel width. A suitable path would be provided for fish passage. Disturbance of aquatic habitat would be minimised as much as possible.</td>
<td>Construction Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Impacts to threatened species</td>
<td>If unexpected threatened fauna or flora species are discovered, stop work immediately in the vicinity of the find and follow the Roads and Maritime Services’ Unexpected Threatened Species Find Procedure in RTA (2011) – Biodiversity Guidelines Guide 1: Pre-clearing process. This would include notifying the Roads and Maritime Environment Manager immediately and commissioning an assessment of the likely impacts of the proposal on the threatened species.</td>
<td>Construction Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Spread of weeds</td>
<td>Vehicle and machinery wash/brush downs would be conducted prior to vehicles entering or leaving the site to prevent the spread of noxious weed species to non-infested areas during construction.</td>
<td>Construction Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
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<tr>
<td>Weed infested topsoil would be disposed of or treated and would not be stockpiled adjacent to any areas of native vegetation.</td>
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<tr>
<td>Declared noxious weeds would be managed according to the requirements of the NSW Noxious Weeds Act 1993.</td>
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<tr>
<td>Measures for preventing the introduction and/or spread of disease causing agents such as bacteria and fungi would be implemented, as detailed in RTA (2011) – Biodiversity Guidelines Guide 7: Pathogen management.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
</tbody>
</table>

### 6.4 Noise and vibration

This section summarises the findings from the noise and vibration assessment prepared by GHD (2013), which is attached in Appendix F.

#### 6.4.1 Methodology

The noise and vibration impact assessment included a quantitative assessment of construction noise and vibration, and operational noise. The assessment was prepared with consideration to the Environmental Noise Management Manual (RTA, 2001) and the following OEH publications:


The assessment approach involved:

- Identification of sensitive receivers and background noise levels.
- Establishment of noise and vibration assessment criteria.
- Predictions of construction and operational noise.
- Assessment of construction and operational noise against the applicable criteria.
- Provision of mitigation measures, where required.

#### 6.4.2 Existing environment

**Sensitive receivers**

The proposal is located in a rural environment. Background noise levels within the study area are primarily a function of the existing intermittent road traffic noise from Bungonia Road. Distant road traffic noise from the Hume Highway bypass is audible at low levels and does not significantly contribute to the ambient noise environment.

Sensitive receivers in the vicinity of the proposal include the following:

- Residence at 2 Bungonia Road located about eight metres south of Bungonia Road.
- Residence at 33 Bungonia Road including the Historic Lansdowne Park (holiday camping accommodation), located about 120 metres north of Bungonia Road.

Sensitive receivers are shown on Figure 6-3.
Background noise levels

Noise monitoring was undertaken from 6 December to 13 December 2012 at the two sensitive receiver locations (refer to Figure 6-3). A summary of the background noise levels is provided in Table 6-8.

**Table 6-8 Noise monitoring results**

<table>
<thead>
<tr>
<th>Noise monitoring locations</th>
<th>Background noise descriptors dB(A)</th>
<th>L_{Aeq} traffic noise level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L_{A90}(Day)</td>
<td>L_{A90}(Night)</td>
</tr>
<tr>
<td>7am to 6pm, Monday to Saturday; 8am to 6pm Sundays &amp; Public Holidays</td>
<td>39.7</td>
<td>40.2</td>
</tr>
<tr>
<td>6pm to 10pm, Monday to Sunday &amp; Public Holidays 10pm to 7am, Monday to Saturday; 10pm to 8am Sundays &amp; Public Holidays</td>
<td>34.2</td>
<td>36.2</td>
</tr>
</tbody>
</table>

Note 1: Includes a +2.5 dB(A) facade correction
Note 2: 2.5 dB(A) facade correction subtracted from the background noise descriptors

The noise monitoring results at Location 1 are typical of areas influenced by road traffic noise, and are expected due to the close proximity of the property to Bungonia Road.

Monitoring Location 2 is set back from Bungonia Road by about 120 metres, and due to the low traffic volumes on Bungonia Road, road traffic noise at this location is not a dominant feature of the ambient noise environment.

**Maximum noise level/sleep disturbance**

The existing L_{Amax} and L_{Aeq(9hr)} noise levels during the night-time period (10pm to 7am) at 2 Bungonia Road are summarised in Table 6-9. Note that there was no significant existing road traffic noise exposure at 33 Bungonia Road. The night-time L_{Aeq} of 45 dB(A) was more than 10 dB(A) lower than at 2 Bungonia Road due to the setback distance of 120 metres. Maximum noise levels at this distance from the road would be more likely to be influenced from localised noise events and not the road. Therefore the results for 33 Bungonia Road have not been presented.

**Table 6-9 Summary of maximum noise levels, dB(A)**

<table>
<thead>
<tr>
<th>Noise monitoring location</th>
<th>L_{Amax} range</th>
<th>L_{Aeq(9hr)}</th>
<th>Highest [L_{Amax} \text{ and } L_{Aeq(9hr)}] [average]</th>
<th>Number of [L_{Amax} events &gt; 65 \text{dB(A)} \text{ and 15 \text{dB(A)}} above \ L_{Aeq(9hr)}]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Bungonia Road</td>
<td>49 to 91</td>
<td>54</td>
<td>37</td>
<td>21</td>
</tr>
</tbody>
</table>

The current maximum noise levels exceed the L_{Aeq(9hr)} noise levels by more than 15 dB(A) and are above 65 dB(A) on several occasions per night at 2 Bungonia Road.
6.4.3 Noise criteria

Construction

The ICNG (DECC, 2009) provides guidance for assessment of construction noise. The ICNG recommended noise management levels during construction for residential receivers are:

- The daytime construction noise management level (LAeq (15 min)) should not exceed the background noise level (LA90) by more than 10 decibels (dB(A)). This management level is during the ICNG recommended standard construction hours of Monday to Friday 7am to 6pm, and Saturday 8am to 1pm, with no work on Sundays or public holidays.

- The highly noise affected level of 75 dB(A). This noise level represents the point above which there may be strong community reaction to noise.

- For work outside standard construction hours, the noise level should not exceed the background noise level by more than 5 dB(A).

The ICNG recommends the following noise management levels LAeq (15 min) for other sensitive receivers and areas:

- Classrooms at schools and other educational institutions internal 45 dB(A)
- Hospital wards and operating theatres internal 45 dB(A)
- Place of worship internal 45 dB(A)
- Active recreation areas (such as parks) external 65 dB(A)
- Passive recreation areas external 60 dB(A).

The established noise management levels that apply to the nearby sensitive receivers during construction are presented in Table 6-10.

Table 6-10 Table for construction noise criteria dB(A)

<table>
<thead>
<tr>
<th>Location</th>
<th>Noise affected noise management level LAeq(15 min)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>During standard ICNG recommended hours</td>
</tr>
<tr>
<td></td>
<td>Day (1pm to 6pm Saturday, 8am to 6pm Sunday &amp; Public Holidays)</td>
</tr>
<tr>
<td>Location 1-2 Bungonia Road</td>
<td>50</td>
</tr>
<tr>
<td>Location 2 – 33 Bungonia Road and the Historic Lansdowne Park</td>
<td>44</td>
</tr>
</tbody>
</table>
Construction vibration criteria for human comfort

Human comfort vibration criteria have been set with consideration to the Assessing Vibration: A Technical Guideline (DEC, 2006). British Standard BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) is recognised by OEH as the preferred standard for assessing ‘human comfort’. The BS 6472 human comfort peak vibration criteria and intermittent vibration dose values are shown Table 6-11. The intermittent vibration dose value is generally applicable to most construction work.

BS 5228.2 – 2009 Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration recommends that the guidance values presented in Table 6-11 are more appropriate for construction work as it is easier to assess the intermittent vibration criteria against a peak value rather than a dose value.

### Table 6-11 Human comfort intermittent vibration limits (BS 6472-1992)

<table>
<thead>
<tr>
<th>Receiver type</th>
<th>Period</th>
<th>Intermittent vibration dose value (m/s1.75)</th>
<th>Preferred value</th>
<th>Maximum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>Day (7am and 10pm)</td>
<td>0.2</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Night (10pm and 7am)</td>
<td>0.13</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>Offices, schools, educational institutes and places of worship</td>
<td>When in use</td>
<td>0.4</td>
<td>0.8</td>
<td></td>
</tr>
</tbody>
</table>

### Table 6-12 Guidance on effects of vibration levels for human comfort (BS 5228.2 – 2009)

<table>
<thead>
<tr>
<th>Vibration level</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.14 mm/s</td>
<td>Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.</td>
</tr>
<tr>
<td>0.3 mm/s</td>
<td>Vibration might be just perceptible in residential environments.</td>
</tr>
<tr>
<td>1.0 mm/s</td>
<td>It is likely that vibration at this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.</td>
</tr>
<tr>
<td>10 mm/s</td>
<td>Vibration is likely to be intolerable for any more than a very brief exposure.</td>
</tr>
</tbody>
</table>

Construction vibration criteria for structural damage

Guidance of limiting vibration values is attained from reference to German Standard DIN 4150-3: 1999 Structural Vibration – Part 3: Effects of vibration on structures. Table 6-13 presents guideline values for the maximum absolute value of the velocity at which “damage that reduces the serviceability of the building will not occur”.

### Table 6-13 Guideline values for short-term vibration on structures

<table>
<thead>
<tr>
<th>Line</th>
<th>Type of structure</th>
<th>Guideline values for velocity, (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 Hz to 10 Hz</td>
</tr>
<tr>
<td>1</td>
<td>Buildings used for commercial purposes, industrial buildings, and buildings of similar design</td>
<td>20</td>
</tr>
<tr>
<td>Line</td>
<td>Type of structure</td>
<td>Guideline values for velocity, (mm/s)</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Hz to 10 Hz</td>
</tr>
<tr>
<td>2</td>
<td>Dwellings and buildings of similar design or occupancy</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (for example listed buildings under preservation order)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Operation**

Bungonia Road is a sub-arterial road with consideration to the *Road Noise Policy* (DECCW, 2011) and the proposal is considered to be a road redevelopment for all sensitive receivers due to the existing noise exposure and proposed road alignment location.

The *Road Noise Policy* (DECCW, 2011) road traffic noise assessment criteria are presented in Table 6-14.

**Table 6-14 Road traffic noise assessment criteria for sub-arterial roads, LAeq(period), dB(A)**

<table>
<thead>
<tr>
<th>Road category</th>
<th>Type of project</th>
<th>Assessment criteria (external)</th>
<th>Receivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>Existing residences affected by noise from redevelopment of an existing sub-arterial road</td>
<td>$L_{A_{eq}(15hr)}$ 60 $L_{A_{eq}(9hr)}$ 55</td>
<td>All sensitive receivers</td>
</tr>
</tbody>
</table>

The Road Noise Policy (DECCW, 2011) relative increase criterion assesses any increase in the total traffic noise level at a receiver due to the proposal. The relative increase criteria is exceeded if the ‘build option’ noise levels increase by more than 12 dB(A) above the ‘no-build option’ noise levels.

The Environmental Noise Management Manual (RTA, 2001) considers it reasonable to consider noise mitigation options when:

- There is existing road traffic noise exposure above the noise assessment criteria and the ‘build option’ noise levels are 2 dB(A) above the ‘no-build option’ noise levels.
- When there is existing road traffic noise exposure and the ‘build option’ noise levels are above the acute 65 $L_{A_{eq}(15hr)}$ Day and 60 $L_{A_{eq}(9hr)}$ Night noise levels.

**Sleep disturbance**

The *Road Noise Policy* (DECCW 2011) provides a literature review for the assessment of sleep arousal due to traffic noise however does not set a sleep disturbance assessment criterion. Sleep disturbance impacts are likely to be dependent on the following:

- Maximum noise level of an event.
- Number of occurrences.
- Duration of the event.
- Level above background or ambient noise levels.
The Road Noise Policy provides a literature review for the assessment of sleep arousal due to traffic noise however does not set a sleep disturbance assessment criterion. For continuous rather than intermittent traffic flow, the Environmental Noise Management Manual recommends $L_{A_{\text{max}}}$ noise pass-by events may lead to sleep disturbance if the $L_{A_{\text{max}}}$ noise levels exceeds the $L_{A_{eq}}$ Noise level by more than 15 dB(A) when the $L_{A_{\text{max}}}$ noise levels is greater than 65 dB(A) during night time.

The Environmental Noise Management Manual advises that the maximum noise level can be used as a tool to prioritise and rank mitigation strategies, but should not be applied as a decisive noise criterion for selection of mitigation treatments.

### 6.4.4 Noise modelling

**Construction**

Noise emissions from construction were assessed at the surrounding potentially affected receivers during the standard construction hours. Noise level data for equipment was obtained from Australian Standard (AS) 2436 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites and the Environmental Noise Management Manual (RTA, 2001). The anticipated plant and equipment used for the proposal with the corresponding noise emission sound power levels is shown in Table 6-15.

#### Table 6-15  Construction plant and equipment sound pressure levels at 10 metres, dB(A)

<table>
<thead>
<tr>
<th>Plant and equipment</th>
<th>Sound pressure level at 10 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavator with rock breaker attachment (20 tonne)</td>
<td>90</td>
</tr>
<tr>
<td>Light vehicle</td>
<td>78</td>
</tr>
<tr>
<td>Trucks</td>
<td>79</td>
</tr>
<tr>
<td>Concrete pump truck</td>
<td>80</td>
</tr>
<tr>
<td>Water carts</td>
<td>79</td>
</tr>
<tr>
<td>Grader</td>
<td>82</td>
</tr>
<tr>
<td>Asphalt paver</td>
<td>80</td>
</tr>
<tr>
<td>Bobcat (small front end loader)</td>
<td>82</td>
</tr>
<tr>
<td>Backhoe</td>
<td>76</td>
</tr>
<tr>
<td>Concrete vibrators</td>
<td>75</td>
</tr>
<tr>
<td>Smooth drum roller (15 tonne)</td>
<td>80</td>
</tr>
<tr>
<td>Pad foot roller (18 tonne)</td>
<td>80</td>
</tr>
<tr>
<td>Compactor</td>
<td>85</td>
</tr>
<tr>
<td>Road sweeper</td>
<td>79</td>
</tr>
</tbody>
</table>

Noise modelling was undertaken using Computer Aided Noise Abatement (CadnaA). The program is designed for the calculation, assessment and prognosis of noise exposure. CadnaA calculates environmental noise propagation according to ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors. The assumptions and calculation parameters used in the noise model are discussed in Appendix F.
Operation

Road traffic noise predictions were undertaken using the United Kingdom Department of Transport Calculation of Road Traffic Noise (CoRTN) algorithm. Predictions were made for two scenarios:

- A ‘no-build scenario’ traffic noise model to predict road traffic noise in the vicinity of the proposal 2014 and 10 years after opening (2024).
- A ‘build scenario’ traffic noise model to predict road traffic noise in the vicinity of the proposal for 2014 and 10 years after opening (2024).

Other noise model inputs and assumptions are provided in Appendix F.

The CoRTN algorithm and noise modelling process was validated against the road traffic noise monitoring data and simultaneous traffic counts undertaken for the proposal in December 2012.

Forecast traffic volumes for 2014 and 2024 were extrapolated using a traffic growth factor of five per cent per annum based on traffic counts undertaken in December 2012 as shown in Table 6-16.

Table 6-16  Daily traffic volumes on Bungonia Road

<table>
<thead>
<tr>
<th>Year</th>
<th>Data source</th>
<th>Daily traffic volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Traffic counts undertaken as part of the noise assessment</td>
<td>2190</td>
</tr>
<tr>
<td>2014</td>
<td>Year opening forecast assuming a growth factor of 5% per annum</td>
<td>2415</td>
</tr>
<tr>
<td>2024</td>
<td>10 years after opening forecast assuming a growth factor of 5% per annum</td>
<td>3933</td>
</tr>
</tbody>
</table>

6.4.5 Potential impacts

Construction

Noise

The predicted noise levels at each receiver are shown in Table 6-17.

Table 6-17  Construction plant and equipment noise levels at residential receivers, dB(A)

<table>
<thead>
<tr>
<th>Plant and equipment</th>
<th>Sensitive receiver noise level</th>
<th>ICNG noise management level (daytime) during standard construction hours</th>
<th>ICNG highly affected noise level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 Bungonia Road</td>
<td>33 Bungonia Road and the Historic Lansdowne Park</td>
<td>2 Bungonia Road</td>
</tr>
<tr>
<td>Excavator with rock breaker attachment (20 tonne)</td>
<td>84</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Light vehicle</td>
<td>72</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>Trucks</td>
<td>73</td>
<td>49</td>
<td>50</td>
</tr>
</tbody>
</table>
Construction work during standard construction hours (and outside standard construction hours) is predicted to exceed the noise affected construction noise management levels at both residential receivers. Noise emissions are also predicted to exceed the highly noise affected construction noise management level of 75 dB(A) at 2 Bungonia Road due to the close proximity to the existing alignment.

Most of the construction machinery is likely to move throughout the study area changing noise impacts at the individual receivers. Furthermore, during any given period, the machinery would operate at maximum sound power levels for only brief periods and it is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time, in any one location.
Construction noise impacts would be managed with the implementation of mitigation measures provided in section 6.4.6.

**Vibration**

Energy from equipment is transmitted into the ground and transformed into vibration, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on a number of factors including:

- The efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment).
- The frequency content.
- The impact medium stiffness.
- The type of wave (surface or body).
- The ground type and topography.

Due to the above factors, there is inherent variability in ground vibration predictions without site-specific measurement data. The Construction Noise Strategy (Rail Projects) (TCA, 2011) provides typical equipment safe working distances for cosmetic damage and human comfort.

For construction activities, the safe working distances for equipment that have the potential to generate vibration are shown in Table 6-18.

**Table 6-18**  **Typical vibration levels at distances (mm/s peak)**

<table>
<thead>
<tr>
<th>Plant item</th>
<th>Distance from source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10 m</td>
</tr>
<tr>
<td>Roller (15 tonne)</td>
<td>7 to 8</td>
</tr>
<tr>
<td>Compactor (7 tonne)</td>
<td>5 to 7</td>
</tr>
<tr>
<td>Dozer</td>
<td>2.5 to 4</td>
</tr>
<tr>
<td>Backhoe</td>
<td>1.0</td>
</tr>
<tr>
<td>Pavement breaker</td>
<td>4.5 to 6</td>
</tr>
</tbody>
</table>

The nearest residential receiver to construction activities is the residence and buildings at 2 Bungonia Road which is located about eight metres from the existing road and about 35 metres from the proposed road realignment. Construction activities including pavement breaking, rolling and compacting activities may result in vibration impacts to 2 Bungonia Road. Vibration impacts would be intermittent and short-term and likely to be acceptable with the implementation of the mitigation measures provided in section 6.4.6. All other residential receivers are located over 100 metres from the construction area and are not expected to be impacted by vibration from construction work.

With consideration to the building damage vibration criteria, the expected magnitude of vibration at 2 Bungonia Road is potentially sufficient to cause building damage. Potential vibration impacts would be managed with the implementation of mitigation measures provided in section 6.4.6.

**Operation**

The predicted noise levels at the two sensitive receivers for the ‘no-build option’ and ‘build option’ for year 2014 and year 2024 are provided in Table 6-19. Day and night noise contour plots for each scenario are shown in Figures 3 to 7 in Appendix F. All road traffic noise levels include a +2.5 dB(A) facade correction.
Table 6-19  Predicted road traffic noise levels, dB(A)

<table>
<thead>
<tr>
<th>Receiver</th>
<th>No build scenario</th>
<th>Build scenario</th>
<th>RNP noise traffic criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 2014</td>
<td>Year 2024</td>
<td>Year 2014</td>
</tr>
<tr>
<td></td>
<td>Day</td>
<td>Night</td>
<td>Day</td>
</tr>
<tr>
<td>2 Bungonia Road</td>
<td>63</td>
<td>55</td>
<td>65</td>
</tr>
<tr>
<td>33 Bungonia Road</td>
<td>46</td>
<td>38</td>
<td>48</td>
</tr>
</tbody>
</table>

Note 1: Environmental Noise Management Manual (RTA, 2001)

During operation, no residential receivers are predicted to exceed the road traffic assessment criteria or the acute noise criteria of 65 dB(A). 33 Bungonia Road may be exposed to an increase of two to four dB(A) compared to the no-build scenario for the year of opening of 2014. The predicted noise levels at this receiver remain below the road traffic noise criteria and the relative increase criteria. Hence, no residential receivers are predicted to require mitigation treatments.

It is noted that the predicted noise levels for the build option in 2024 are similar to the build option in 2014 when traffic flows are assumed to grow by five per cent every year. This is caused by wearing of the spray seal road surface as it ages. The correction applied for spray seal as recommended by Austroads is +2 dB(A) in 2024 for worn surfaces and +4 dB(A) in 2014 for new surfaces. Therefore the predicted noise levels are similar in 2024 compared to year opening.

**Maximum noise level and sleep disturbance**

Maximum noise levels experience at 2 Bungonia Road are expected to decrease, as the new alignment would be about 35 metres further away than the existing road. In addition, the number of maximum noise level events (above 65 dB(A) and 15 dB(A) above L_{Aeq(9hr)}) would also decrease.

The improved road surface is likely to result in reduced maximum noise level events for all residential receivers due to an improved road surface which is likely to reduce road irregularities and associated maximum noise level events.

### 6.4.6 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise noise and vibration impacts during construction and operation of the proposal.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>A construction noise and vibration management plan (NVMP) would be prepared and implemented to manage and mitigate adverse noise and vibration disturbance, taking into consideration the Interim Construction Noise Guideline (DECC, 2009) and the Environmental Noise Management Manual (RTA, 2001).</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
</tbody>
</table>
The construction noise and vibration management plan would include, but not be limited to, the following:

- Identification of potentially affected properties.
- A risk assessment to determine the potential for discrete work activities to affect receivers.
- A map indicating the locations considered likely to be impacted.
- Mitigation measures to reduce excessive noise during construction activities.
- A construction staging program incorporating a program of noise monitoring at sensitive receivers.
- A process for assessing the performance of the implemented mitigation measures in accordance with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009).
- A process for resolving issues and conflicts.
- Any work generating high noise or vibration impact must only be undertaken in continuous blocks of no more than three hours with at least one hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers.
- Restrictions on delivery times for plant, equipment and material.
- Consideration of the layout of the construction compound so that primary noise sources are at a maximum distance from residences, with solid structures (sheds, containers, etc) placed between residences and noise sources (and as close to the noise sources as is practical).
- Locating compressors, generators, pumps and any other fixed plant as far away from residences as possible and behind site structures.
- Where practical, equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made.
- The plan would be reviewed in response to complaints and amended where practical throughout the construction phase of the project. This may include the provision of respite periods.
- Responsible working practices including:
  - Avoid the use of outdoor radios during the night-time period.
  - Avoid shouting and slamming doors.
  - Where practical, machines would be operated at low speed or power and switched off when not being used rather than left idling for prolonged periods.
  - Minimise reversing.
  - Avoid dropping materials from height and avoid metal to metal contact on material.

### Out of hours work

General construction activities would be limited to the recommended construction hours where feasible and reasonable. If work is planned outside normal hours, an ‘out of hours work procedure’ would be prepared as part of the construction noise and vibration management plan for the proposal in accordance with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009) and the *Environmental Noise Management Manual Practice* (RTA, 2001).

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration impacts</td>
<td>A building condition survey would be undertaken for all buildings at 2 Bungonia Road.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>When pavement breaking, rolling and compacting activities are required adjacent to 2 Bungonia Road, the resident would be informed of the nature of the work, duration and contact details.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Vibration monitoring would be undertaken at the start of activities near 2 Bungonia Road.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Noise impacts and appropriate complaints handling</td>
<td>The local community that could be affected by the proposal would be contacted and informed of the proposed work, location, duration of work, and hours involved. The contact would be made a minimum of five days before work starts.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td></td>
<td>During work hours, a community liaison phone number and site contact would be provided so that complaints can be received and responded to.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>If deemed necessary, attended compliance noise monitoring would be undertaken upon receipt of a complaint. Monitoring should be reported as soon as possible. In the case that exceedances are detected, the situation should be reviewed in order to identify means to minimise the impacts to residences.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>
6.5 Hydrology, flooding and groundwater

A hydraulic impact assessment was undertaken by Roads and Maritime in September 2013 as part of the concept design options assessment.

6.5.1 Existing environment

Hydrology

The Mulwaree River is the only major permanent watercourse in the study area. Mulwaree River (also referred to as Mulwaree Ponds or Mulwaree Creek) is one of the largest and southernmost tributaries of the Wollondilly River. It rises in the Great Dividing Range just south of Tarago and flows northward to Goulburn. The total catchment area for Mulwaree River is about 750 square kilometres. At the location of the proposal, the Mulwaree River is referred to as ‘Mulwaree Ponds’ due to the slow flow of the river and variation in channel width.

Wollondilly River is around 150 kilometres long and drains to Warragamba Dam, which in turn discharges to the Hawkesbury-Nepean River (HCNCMA, 2013).

Flooding

The proposal is located within the floodplain of Mulwaree Ponds. Based on the Goulburn Flood Study Report, the 20 year average recurrence interval (ARI) flood level is given as RL 631.310 and the 100 year ARI flood level as at about RL 631.310 (Water Resources Commission of NSW, 1986).

The existing bridge length is about 98.5 metres with a main crossing over Mulwaree Ponds of about 20 metres. The existing deck level on the western side (Goulburn side) is about RL 630.720 and is lower than the eastern deck level (Gundary side) which is about RL 631.598. The area of obstruction created by the deck is calculated to be about 113 square metres. The calculated average depth of the superstructure is about 1.15 metres. The existing pier width is about 0.545 metres. There are fifteen piers on the existing bridge. The area of obstruction created by the piers is about 55 square metres.

Groundwater

A review of the NSW Natural Resource Atlas conducted on 22 October 2013 identified three groundwater bores within 350 metres of the proposal site, all of which are located on the western side of the bridge. The standing ground water level within two of these boreholes was between 0.6 metres and five metres below ground level. No boreholes were identified on the eastern side of the bridge within proximity to the proposal site. As discussed in section 6.2.1, salinity potential mapping in the NSW Natural Resource Atlas did not indicate the presence of saline soils in the proposal site. No groundwater salinity information was available.

6.5.2 Potential impacts

Construction

Hydrology and drainage

Construction activities have the potential to result in the following impacts on drainage and hydrology:

- Changes to local drainage patterns and potential increases in the quantity of water entering Mulwaree Ponds.
- Interruptions to overland drainage flows and creation of new preferential pathways for runoff.
Temporary partial obstruction of the waterway, within the proposal site, due to the construction of the temporary pad required to enable demolition and construction of piers. The obstruction would be temporary and limited to about four months. The pad would affect 15 metres of the river cross section (total width of the channel is about 25 metres, of which about two metres is occupied by the existing piers).

Impacts to local drainage and hydrology of the waterway would be temporary and appropriately managed with the implementation of management controls provided in section 6.5.3. Overall the proposal would not result in any substantial changes to local drainage during construction.

**Flooding**

The proposal is located in an area susceptible to flooding. There is potential for flooding to impact on construction activities during prolonged or heavy rain events. Such wet weather events may cause localised flooding which could increase the potential for soil erosion and sedimentation impacts on Mulwaree Ponds. There is also potential for the inundation of stockpiles and materials and liquids storage areas which would result in potential impacts to water quality.

Management and mitigation measures are provided in sections 6.2.3 and 6.5.3 to ensure that impacts from flood events are minimised.

**Groundwater**

Groundwater has been noted between 0.6 and six metres. Groundwater may be intercepted during excavation activities along the eastern side of the bridge for the realignment of Bungonia Road. The extent of dewatering required is not known at this stage. If groundwater is encountered, it would be pumped into a contained area, tested and if necessary treated for discharge or disposal, as required.

Cutting of up to a maximum depth of six metres would be required for the construction of the new Bungonia Road alignment to the east of the bridge. As the topography in this section is higher than the bridge, it is unlikely that groundwater would be encountered during excavation.

Construction activities also have the potential to result in the contamination of groundwater through seepage from material and waste stockpiles, or spillage of fuels, oils or other chemicals. Provided mitigation measures in section 6.2.3 and 6.5.3 are implemented, impacts to groundwater would be adequately managed.

**Operation**

**Hydrology, drainage and flooding**

The proposal has been designed to minimise impacts on hydrology of the Mulwaree Ponds by:

- Constructing the new bridge along the same alignment.
- Minimising the number of piers within the waterway.
- Matching the road approaches of the proposed bridge from the east and west as much as possible to the existing road levels.

The proposal would be subject to detailed hydraulic modelling during detailed design. However, based on the preliminary hydraulic impact assessment, the proposal is unlikely to result in significant impacts on hydrology or flood behaviour.

The existing bridge with 15 timber piers in the floodplain would be replaced with a new bridge with three cylindrical shaped piers in the floodplain. The reduction in the number of piers combined with the streamlined cylindrical design of the piers would result in an improvement of water flow and a reduction in the local scour depth. When the flood level is lower than the bridge
soffit (the underside of the bridge deck), there would be more hydraulic capacity in Mulwaree Ponds than with the existing timber bridge and piers.

When flooding reaches the 100 year ARI level, the obstruction created by the existing and proposed superstructure would be similar. During a 100 year ARI flood level the existing bridge superstructure is mostly submerged. This would improve with the new bridge, with only the western approach of the bridge predicted to be submerged during a 100 year ARI flood level.

The floodplain capacity would not be impacted due to the proposal. Although the depth of the superstructure for the proposed bridge is slightly deeper than the existing bridge, when the flood level reaches the bridge deck, there are additional areas in the floodplain on the western side of the bridge. The obstruction of the waterway by the proposed bridge is, therefore, considered to be insignificant.

There should be no change in the overall flow distribution due to the proposal. Therefore the afflux upstream should be negligible and the proposal would not result in impacts to properties upstream during flood events. Furthermore, due to the large additional floodplain area to the west of the proposal site, there should be no change in flow velocities in the main channel of Mulwaree River.

**Groundwater**

The proposal would not result in any significant impacts on groundwater during operation.

### 6.5.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential impacts on hydrology, flooding and groundwater.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding</td>
<td>Detailed hydraulic modelling would be undertaken during detailed design.</td>
<td>Roads and Maritime</td>
<td>Detailed design</td>
</tr>
<tr>
<td></td>
<td>A contingency plan would be prepared in preparation for a potential flood event during construction and would outline evacuation procedures to be followed.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Dewatering of groundwater</td>
<td>Low lying areas of construction formations and excavations would be dewatered in accordance with Roads and Maritime Services’ Technical Guideline for Dewatering.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

#### 6.6 Traffic and access

##### 6.6.1 Existing environment

**Existing road network**

The local road network in the vicinity of the proposal is shown on Figure 3-2. Bungonia Road is a local collector road with a posted speed limit of 60 kilometres per hour. The road has a two lane carriageway with one lane in each direction, except for Lansdowne Bridge (the Bungonia Road crossing of Mulwaree Ponds) which is single lane only. The road is undivided at its western extent from Braidwood Road to Lansdowne Bridge. Forbes Street intersects Bungonia Road from the north on the eastern approach of Lansdowne Bridge. No formal parking is provided along the roadway, however parking is permitted within the road shoulders. A
description of Bungonia Road and the adjoining roads is provided in section 2.2. Other roads in the local road network include Memorial Road to the east and Windellama Road to the south.

**Current traffic volumes**

A traffic survey was undertaken at Bungonia Road, about 100 metres east of Forbes Street over a period of seven days in December 2012 as part of the noise assessment (refer to section 6.4 and Appendix F). The survey showed a daily average total of 2190 vehicles. About nine per cent of vehicles comprised heavy vehicles. A summary of the traffic survey is provided in Table 6-20.

**Table 6-20  Traffic volumes along Bungonia Road – December 2012**

<table>
<thead>
<tr>
<th>Direction</th>
<th>Morning peak (vph)</th>
<th>Evening peak (vph)</th>
<th>Average total vehicle movements (vpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(8.00am 9.00am)</td>
<td>(4.00pm 5.00pm)</td>
<td></td>
</tr>
<tr>
<td>Eastbound</td>
<td>49</td>
<td>118</td>
<td>1146</td>
</tr>
<tr>
<td>Westbound</td>
<td>166</td>
<td>88</td>
<td>1165</td>
</tr>
</tbody>
</table>

**Crash history**

A review of crash statistics provided by Roads and Maritime for a five year period between 1 October 2007 and 30 September 2012 indicated that only one rear end, non-casualty crash occurred on Bungonia Road (about 10 metres west of Lansdowne Bridge).

**Pedestrians, cyclists and buses**

There are no dedicated pedestrian or cycle paths located along Bungonia Road or existing bus stops.

**6.6.2 Potential impacts**

**Construction**

Construction activities would result in temporary impacts to road users as a result of the following:

- Construction vehicle movements to and from the site.
- Temporary (12 month) closure of Bungonia Road within the proposal site.
- Temporary impacts to properties.
- Loss of informal parking along Bungonia Road.

**Road traffic generation**

The proposal would result in the temporary increase in local traffic during construction due to the delivery of materials and equipment to the site and transport for the construction crew.

It is expected that about 20 to 30 heavy vehicle movements per day would be required for the delivery of materials and equipment to and from the proposal site over the 12 month construction period.

About 15 workers would access the site daily during construction. Based on the characteristics and rural nature of the site, it has been assumed there would be a typical car driver rate of 100 per cent, and a maximum of 30 light vehicle movements assumed to transport workers to and from the proposal site daily as a worst case scenario.
The most direct route from Goulburn city to the proposal site for light vehicles would be via be via Sloane Street and Braidwood Road onto Bungonia Road or via Park Road and Memorial Road or Forbes Street as shown in Figure 3-2.

The additional traffic movements generated from the construction of the proposal would cause minor impacts on local traffic and a negligible impact on the operation of the surrounding road network. With the implementation of a traffic management plan and controls described in section 6.6.3, traffic impacts are not expected to be significant.

Road network

Bungonia Road within the proposal site would be closed for the duration of work and detours would be established to assist redirected vehicles (refer to Figure 1-1). Heavy vehicles (over 42.5 tonnes) would be directed via Windellama Road to Brisbane Grove Road and Braidwood Road to Goulburn. Light vehicles would be able to use the heavy vehicle detour or travel via Memorial Road and Park Road (refer to Figure 3-2).

The proposed closures and detours would result in temporary increases in travel times and potential delays for road users due to the reduced speed limits around the construction site, increased traffic on the local road network and longer travel distances required as part of the detours. The proposed light and heavy vehicle detours would add between three and seven minutes to the travel time to Goulburn around Bungonia Road. However, this is not considered to be significant.

Forbes Street would remain open during construction of the new bridge, however, short-term closures may be needed during this period. The community would be notified in advance of any short-term closures.

Access and parking

Access to the proposal site for construction personnel and delivery of materials and equipment would be via the eastern and western approaches of Bungonia Road. A temporary access track would be established at the southern side of Lansdowne Bridge to provide access to the western bridge abutment during construction. The eastern bridge abutment would accessed directly off Bungonia Road.

Property access for residents at 2 and 33 Bungonia Road would be temporally affected during construction. Alternative access would be provided in consultation with the landowners. Other access roads within the study area would be maintained during construction.

During construction, the proposal would result in the loss of informal parking along Bungonia Road within the proposal site. The existing use of informal parking along Bungonia Road is minimal and suitable parking is available in the surrounding areas.

Construction workers would be provided with adequate parking within the construction compound.

Pedestrian and cyclists

Although there are currently no dedicated pedestrian or cycle paths along Bungonia Road, pedestrian or cyclists currently using the bridge for access to the eastern or western side of Bungonia Road would be temporarily impacted as a result of the temporary road closure. Alternative routes would be provided, however these would add a significant distance for pedestrians to cross the Mulwaree Ponds. Pedestrians would, therefore, need to seek an alternative mode of transport during construction.
Operation

The main adverse impact to road users during operation of the proposal results from the permanent closure of Forbes Street.

The closure of Forbes Street would have minor impacts on motorists who previously travelled along Forbes Street, including those accessing the Goulburn Pony Club, sports fields, private properties and businesses within proximity of the bridge. The closure of Forbes Street would result in extended travel distances for these motorists as vehicles would be required to travel via other roads to Bungonia Road. Access to and from the Goulburn CBD would be maintained from the western side of the bridge via Braidwood Road. Vehicles travelling along Bungonia Road would not experience any changes to access to Goulburn. Those travelling from Eastgrove to the CBD would be required to travel into Goulburn via Park Road and Blackshaw Road, or travel south via Memorial Road to access Bungonia Road.

Although minor impacts are anticipated, the permanent closure of Forbes Street would improve local road safety by providing an improved line of sight on approaches to Lansdowne bridge. Emergency vehicles would be provided access to Forbes Street from Bungonia Road via a removable section of guardrail.

During operation, heavy vehicles would experience improved access to Goulburn CBD via Bungonia Road as the new bridge would be able to cater for the heavy loads and two way traffic movement providing a safer option with improved travel times and distances.

Formal pedestrian and cyclist accessibility to Goulburn CBD would also be provided on the new bridge, improving accessibility to the Goulburn CBD.

6.6.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential impacts on traffic and access.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
</table>
| Road network operations     | A detailed traffic management plan would be prepared in accordance with Roads and Maritime Services’ Traffic Control at Work Sites (RTA, 2010a) and Specification G10 - Control of Traffic, and approved by Roads and Maritime before implementation to provide a comprehensive and objective approach to minimise any potential impacts on-road network operations during construction. The traffic management plan would include:  
  • Measures such as safe access points to work areas from the adjacent road network, safety barriers where necessary, impose temporary speed restrictions when necessary, maintain adequate sight distance and display prominent warning signage.  
  • Measures to minimise heavy vehicle usage on local roads.                                                                                                                                 | Construction contractor | Pre-construction |
### 6.7 Aboriginal cultural heritage

This section provides a summary of the key findings of the Aboriginal heritage report prepared by Artefact Heritage (2014). A copy of the full report is attached as Appendix G.

#### 6.7.1 Methodology

The methodology of the assessment included the following:

- An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken on 3 December 2012 to identify known Aboriginal sites within the study area. The search was undertaken for an area with the following geographical coordinates: 748200 – 750200 and 6148050 – 6150150 and included a 50 metre buffer.

- A review of previous investigations and reports relating to the study area.

- An archaeological field survey of the study area was conducted on 13 December 2012 to identify traces of Aboriginal occupation, evidence of disturbance or areas of potential archaeological sensitivity.

- Review of environmental conditions and an archaeological sensitivity assessment for the study area.

The study area for the Aboriginal heritage assessment included the proposal site, as well as a buffer zone of around 10 to 20 metres surrounding the proposal (shown in Figure 2 of Appendix G).

Consultation with local Aboriginal stakeholders was undertaken in accordance with Stage 2 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (RTA, 2008) and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010a). Refer to section 5.2 and Appendix G for information on consultation with the Aboriginal community.

#### 6.7.2 Existing environment

**Study area**

The study area is located within the boundary of the Pejar Local Aboriginal Land Council (PLALC). A Native Title search, conducted on the 7 December 2012 by the Roads and Maritime...
Aboriginal Cultural Heritage Advisor, indicated an active Native Title claim by the Gundungurra Tribal Council Aboriginal Corporation (GTCAC) within the study area.

Mulwaree River, a major watercourse, flows north through the study area to the Wollondilly River located about three kilometres to the north of the proposal site. The landform within the study area consists of alluvial river flats associated with the Mulwaree River.

The land to the north and south of Lansdowne Bridge has been used for grazing since the early 19th century until recent years, and has never been subject to development. Observations made during the field survey suggest the area within the existing road corridors of Bungonia Road and Forbes Street have already been subject to significant disturbance through the construction and maintenance of the roads and associated drainage lines. The land beneath the bridge and immediately to the north and south is low lying and known to be subject to flooding. Disturbance has also occurred in this area through activities associated with the original construction of Bungonia Road and Lansdowne bridge, as well as ongoing maintenance work.

Four potential locations for the temporary construction compound were considered as part of the assessment. The selected compound, shown in Figure 1-1, has been disturbed through levelling, landscaping and the installation of services.

**Registered Aboriginal sites**

The AHIMS database search returned eight previously recorded Aboriginal heritage items within the search area. No AHIMS sites were found to occur within the study area and no previously unidentified Aboriginal sites were recorded during the field survey.

The nearest recorded site is a burial ground recorded as being located around 200 metres from the study area, however the exact location of the site is not known. It is highly unlikely that other burial sites would occur within the vicinity of the study area. Burial sites in the Goulburn region tend to be located on ridges and hill tops and would not be expected to occur within the floodplain that makes up the western part of the study area.

The proposed realignment of Bungonia Road to the east of Lansdowne Bridge would involve cutting away part of the hill between Bungonia Road and Forbes Street. The steep slope landform and very thin soil on this slope is not considered to be suitable for a burial site. The PLALC representative who attended the site survey confirmed that burials within the study area were unlikely.

**Archaeological and cultural sensitivity**

Archaeological significance refers to the archaeological or scientific importance of a landscape or area and is characterised using archaeological criteria such as archaeological research potential, representativeness and rarity of the archaeological resource and potential for educational values.

The potential for shelter sites, rock engravings and grinding grooves is limited by the nature of the landform at the site. Areas of potential archaeological deposit (PAD) would be dependent on levels of disturbance, landform and the degree of surface visibility along with a tendency of the landform to be subject to scouring as a result of flooding.

The high levels of ground disturbance and landscape modification evident throughout most of the proposal site, the flood prone nature of the area immediately surrounding Mulwaree Ponds and the lack of top soil on top of the hill to the east of the bridge indicate that the study area has low potential for intact archaeological deposits associated with Aboriginal occupation.

No areas of particular cultural significance were identified during the survey by the PLALC representative.
6.7.3 Potential impacts

An assessment of the potential impacts of the proposal was conducted in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011). The assessment found:

- No recorded Aboriginal sites located within the study area.
- No areas of archaeological potential located within the study area.
- High levels of disturbance across much of the study area.
- In areas that have not been subject to high levels of disturbance, the landform was found to be either not suitable for Aboriginal occupation, or would be unlikely to contain intact archaeological deposits due to flooding or erosion.
- The study area was found to demonstrate low archaeological significance.
- No areas of particular cultural significance were identified during the survey by the PLALC sites officer.

No further investigation of Aboriginal heritage is required before construction starts. As no known Aboriginal sites, areas of particular cultural significance, or areas of archaeological potential would be impacted by the proposal, Stage 3 of the PACHCI would not be initiated by Roads and Maritime. As the entire study area has a low archaeological potential and a low archaeological significance no specific mitigation measures are required during construction.

6.7.4 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise impacts to Aboriginal heritage items.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguard</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal heritage item</td>
<td>In the event of an unexpected find of an Aboriginal heritage item (or suspected item), work would cease in the affected area and Roads and Maritime’s Environmental Officer, Southern Region and the Roads and Maritime Senior Environmental Specialist (Aboriginal heritage), would be contacted for advice on how to proceed. The Roads and Maritime Services’ Unexpected Finds Procedure (Roads and Maritime, 2012) would be followed in the event a potential artefact is uncovered.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

6.8 Landscape character and visual impact

A landscape character and visual impact assessment was prepared by Johnson Pilton Walker in October 2013. The report is provided in Appendix H and the relevant findings are summarised below.

6.8.1 Methodology

The landscape character and visual impact assessment report was prepared in accordance with the Roads and Maritime Services’ Environmental Impact Assessment Guidance Note – Guidelines for landscape character and visual impact assessment (Roads and Maritime, 2008).
The report defines the landscape character zones and assesses the potential landscape character and visual impacts of the proposal. The assessment is based upon the sensitivity of a view and the magnitude of the proposal in that view. Sensitivity and magnitude are combined to give a visual impact rating as follows:

- **High:** The visual impact on these receptors or viewers would require amelioration at the site planning stage to allow viewers to continue to enjoy the existing visual amenity.
- **Moderate:** The visual impact on these receptors or viewers is at a localised scale and can be mitigated at detailed design phase or already has some existing screening or setback that minimises impact.
- **Low:** The visual impact on these receptors or viewers is considered low and little or no amelioration is needed.

### 6.8.2 Existing environment

The existing landform is an expansive flat area comprising flood plain, a dog racing track and associated fields. The landform rises up about 20 to 30 metres above the level of the floodplain, immediately to the east of the bridge, with the existing road that approaches the bridge skirting around the base of the slope. The view of the bridge, when approaching from the eastern side is somewhat obscured by the landform and vegetation. The vegetation of the site is predominantly exotic species, which comprise about 85 per cent of the existing vegetation cover. The majority of the vegetation is open grassland with a few scattered trees. Pines have been planted as windbreaks along the boundary of the Historic Lansdowne Park.

**Landscape character**

The overall landscape character of the Lansdowne Bridge precinct is a rural setting. The style of Lansdowne Bridge reinforces the local rural character of the site through the materials used and its size (refer Photograph 6-8). The landform is largely flat and made up of a reedy floodplain and grassed fields with an elevated grassed bank immediately to the east of the bridge. A few exotic trees are scattered around the precinct. Few built structures are visible in the immediate vicinity of the bridge. Apart from the bridge itself, the Goulburn Brewery, to the west of the bridge is a vertical landmark in the flat floodplain (Photograph 6-9). Its red roof and red brick construction stand out in contrast to the expanse of green around it.

Landscape character zones are areas with similar physical qualities that distinguish them from other character zones. Three distinct landscape character zones identified for the proposal are shown in Figure 6-4 and include:

- **Floodplain, Fields and Ponds** (landscape character zone 1).
- **Elevated Grassed Slopes** (landscape character zone 2).
- **Vegetated Residential Property** (landscape character zone 3).
Photograph 6-8  Lansdowne Bridge – deck surface looking west

Photograph 6-9  Mulwaree Ponds and Goulburn Brewery (looking west from Forbes Street)
Figure 6-4  Landscape character zones
A description of the landscape character zones is provided in Table 6-21.

**Table 6-21  Landscape character zones**

<table>
<thead>
<tr>
<th>Landscape character zone</th>
<th>Description</th>
</tr>
</thead>
</table>
Photograph 6-10  Zone 1 - Floodplain and the Mulwaree Ponds (north of Bungonia Road) looking west

Photograph 6-11  Zone 2 – Elevated grassed sloped above Forbes Street (view looking east from the bridge)
6.8.3 Potential impacts

Construction
During construction, the positioning of plant and equipment along the alignment and the presence of construction compounds within the view of neighbouring properties and existing road users would result in minor, temporary visual impacts. Earthworks would also expose subsoil during the construction period that would be visible in the landscape.

Operation

Landscape character impacts
The potential impacts of the proposal on landscape character are summarised in Table 6-22.

<table>
<thead>
<tr>
<th>Landscape character zone</th>
<th>Magnitude</th>
<th>Sensitivity</th>
<th>Overall rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape character zone 1 – Floodplain, Fields and Ponds</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Landscape character zone 2 – Elevated Grassed Slopes</td>
<td>High</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Landscape character zone 3 – Vegetated Residential Properties</td>
<td>High</td>
<td>Low</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
Landscape character zone 1 - Floodplain, Fields and Ponds

The magnitude of the proposal in this zone is considered to be moderate as:

- The new bridge would appear ‘heavier’ than the existing bridge which has some transparency. However, the overall height of the structure would be reduced.
- The removal of trees along the creek bank on the western side of the bridge would result in the ‘opening up’ of the landscape and views in this area.

Earthwork would also have some impact on the landscape character.

The sensitivity of the landscape character zone to the proposal is rated as moderate, with the most significant impact being the loss of the historic bridge. The historic connection between the Historic Lansdowne Park and the Goulburn Brewery would also be lost to a degree.

Overall, the landscape character impact on zone 1 is considered to be moderate.

Landscape character zone 2 – Elevated Grassed Slopes

The proposed design of Bungonia Road and the associated batters would alter the feel of this zone. The grassed slopes to the north of Bungonia Road would be cut by three to five metres and create batters of a grade of 1:2 that would be exposed natural rock. This slope would also be higher and steeper than the existing slope. Therefore, the magnitude of the proposal in this zone is considered to be high. However, it is likely that over time, these batters would revegetate with the same grass species that currently cover the surrounding slopes.

On the southern side of the new road alignment, gentle batters would rise to meet the existing landform adjacent to the existing road corridor. The existing section of Bungonia Road that does not form part of the new road alignment would be retained as an access way to the adjoining properties. Half of the road width would be removed and landscaped.

The proposed earthwork associated with the realignment of Bungonia Road would alter the landscape through this zone; however, the general character of the zone would be similar to the existing. Therefore, the sensitivity of this zone is rated as low.

Overall, the landscape character impact in zone 2 is considered to be moderate.

Landscape character zone 3 – Vegetated Residential Properties

The proposed realignment of the bridge approach and the associated batters would alter the character of this zone. The properties to the south of Bungonia Road would no longer front the road. The proposed road would also be partially screened from these properties by a low mound between the properties and the road. Therefore, the magnitude of the proposal in this zone is rated as high.

To the north of the road, the batters would be three to five metres high. However, these batters would be set further away from the properties than the existing grassed slopes. The plantings surrounding the residential properties would not be impacted. Therefore, the sensitivity of this zone to the proposal is rated as low.

Overall, the landscape character impact on zone 3 is considered to be moderate.

Visual impacts

The visual envelope map (refer to Figure 6-5) of the proposal is relatively large in comparison to the size of the proposal site due to the surrounding vast flat landform. The visual envelope map is enclosed by landform, vegetation, and built structures.
Figure 6-5 Visual envelope map

The key viewpoints, as shown in Figure 6-5 include:

- Key view point 1: from Lansdowne Bridge (cutting visible too).
- Key view point 2: from Goulburn Brewery.
- Key view point 3: from Goulburn Recreation Area.
- Key view point 4: from properties south of Bungonia Road.
- Key view point 5: from western approach road.
- Key view point 6: from eastern approach road.

The overall visual impact of the proposal is considered to be moderate, with consideration of the key viewpoints. A summary of visual impacts from key view points is provided in Table 6-23.
### Table 6-23 Summary of visual impacts

<table>
<thead>
<tr>
<th>Key view point</th>
<th>Element of project visible</th>
<th>Magnitude rating</th>
<th>Sensitivity rating</th>
<th>Summary</th>
<th>Resulting visual impact rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>View point from bridge deck-cuttings and tree removals</td>
<td>M</td>
<td>L</td>
<td>The visual experience for the driver whilst crossing the new bridge would be different. The actual view from the bridge would be altered.</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>360 degree views from bridge retained through the proposed balustrade.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Proposed bridge, road widening and tree removals</td>
<td>M</td>
<td>M</td>
<td>View from driveway altered by road widening and removal of trees to west of the bridge. Proposed works more than 100 metres away. Also, some change to panoramic views from this view point.</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Impacted by the removal of the trees, altered appearance of the bridge, and road widening.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Limited earthworks and partial views of the proposed bridge</td>
<td>L</td>
<td>L</td>
<td>Limited earthworks proposed on southern side of bridge reduce impact, plus existing trees partially screen bridge from this view point.</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This view point is at a distance and lower level to the proposal.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cut batters for road realignment to east of the bridge</td>
<td>H</td>
<td>L</td>
<td>Screen planting around property limit direct views to bridge; however the road cutting is visible from boundary lines of these properties.</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Properties screened from proposal by planting.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Road widening and removal of vegetation to western side of bridge, and proposed bridge</td>
<td>M</td>
<td>L</td>
<td>Views altered due to road widening and removal vegetation.</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Temporarily viewed by drivers or pedestrians passing through. Road widening reducing roadside vegetation.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Road realignment and new proposed bridge</td>
<td>H</td>
<td>L</td>
<td>Road re-alignment and new cut batters alter views from road corridor to bridge.</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Temporarily viewed by drivers or pedestrians passing through.</td>
<td></td>
</tr>
</tbody>
</table>
The overall landscape character and visual impact of the proposal is assessed as moderate in accordance with the Roads and Maritime Services’ Environmental Impact Assessment Guidance Note: Guidelines for landscape character and visual impact assessment. This is due to the character of the bridge changing from a rustic, ‘heritage’ bridge, to a modern concrete structure. Views to and from the bridge would be altered as a result of the change, as well.

As the replacement of the bridge is necessary for safety and to serve the community better, the replacement bridge is an important proposal for the community.

The mitigation measures provided in section 6.8.4 would reduce the visual impact of the proposal.

### 6.8.4 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise impacts on landscape character and visual impacts during construction and operation of the proposal.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
</table>
| Landscape character and visual impacts      | Detailed design of the proposal would incorporate the mitigation measures outlined in the Appendix H where feasible including the following:  
- Planting would be replaced with indigenous species along the batters, in front of retaining walls and beside the bridge approaches.  
- The visual impact of batters would be reduced by blending the grades into the surrounding landform wherever possible.  
- The top and bottom of batters would be rounded to blend in seamlessly with the surrounding landform.  
- Cut batters would be seeded to revegetate the slopes with grass species to resemble the existing vegetation of adjacent slopes.  
- Trees and shrubs would be planted wherever possible, particularly on the southern side of the road alignment.  
- A low mound with screen planting would be created between the new road alignment and the residential properties.  
- Although it would be difficult to alter the appearance of the new concrete bridge, revegetating the batters and planting wherever possible would soften the impact of the proposal. | Roads and Maritime and designer | Pre-construction |
| Urban design                                | An urban design contractor from Roads and Maritime panel would be engaged for the detailed design phase to ensure adequate consideration of urban design principles and objectives, and to ensure appropriate mitigation of identified impacts. | Roads and Maritime and designer | Pre-construction |
Impact | Environmental safeguards | Responsibility | Timing
--- | --- | --- | ---
Visual impacts | The footprint for construction works would be kept to a minimum to ensure existing stands of vegetation remain intact wherever possible and to screen adjoining sensitive receivers. | Construction contractor | Construction
The work site would be left in a tidy manner at the end of each work day. | Construction contractor | Construction

6.9 Land use and property

6.9.1 Existing environment

Bungonia Road is an important east-west link between the town of Goulburn and the surrounding rural community. The area surrounding the proposal site is primarily made up of agricultural properties with some other key land uses including:

- The Goulburn Recreation Area located south-west of the proposal site.
- Goulburn Brewery, including a function centre and restaurant, located about 80 metres north-west of the proposal site.
- The Historic Lansdowne Park, including residence and holiday accommodation, located about 30 metres north-east of the proposal site.
- A number of sports fields, parks, and the Goulburn Pony Club along Forbes Street north of the proposal site.

The nearest sensitive receiver is located at 2 Bungonia Road immediately south-east of the proposal site. The nearest residential area, known as Eastgrove, is located about 0.6 kilometres north-east of the proposal site.

Zoning and land use within the study area are shown on Figure 6-6.
Zoning and land use within the study area

- **Zoning Legend**
  - **B3**, Commercial Core
  - **B4**, Mixed Use
  - **B6**, Enterprise Corridor
  - **E2**, Environmental Conservation
  - **E3**, Environmental Management
  - **IN1**, General Industrial
  - **R1**, General Residential
  - **R2**, Low Density Residential
  - **RU1**, Primary Production
  - **RU2**, Rural Landscape
  - **RU6**, Transition
  - **SP2**, Infrastructure
  - **Railway**
  - **Waterways**

**Relevant Information**

- **Goulburn CBD**
- **Goulburn Golf Club**
- **Eastgrove residential area**
- **Historic Lansdowne Park**
- **Rocky Hill Nature Reserve**

**Data Source:** NSW Department of Lands: Cadastre - Jan 2011; Roads & Maritime: Air Photo & Proposed new alignment & works. Geoscience Australia: 250k Data - Jan 2011. Created by: qjchung

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**N\AU/Sydney/Projects/23/14716/GIS/Maps/MXD/23_14716_0211_Land uses within the study area_RevB.mxd**

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**Jobs Number**

<table>
<thead>
<tr>
<th>Job Number</th>
<th>23-14716</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revision</td>
<td>0</td>
</tr>
<tr>
<td>Date</td>
<td>02 Apr 2014</td>
</tr>
</tbody>
</table>

**Map Projection:** Transverse Mercator

**Horizontal Datum:** GDA 1994

**Grid:** GDA 1994 MGA Zone 55

**Map Scale:** 1:13,500

**Paper Size:** A4
6.9.2 Potential impacts

The proposal would result in the acquisition of about 8500 square metres (0.85 hectares) of land as shown in Figure 3-3. Land acquisition required is summarised below:

- Acquisition of about 6600 square metres (0.66 hectares) of private land from the following properties:
  - Lot 2 DP 67346 – Private land located north-west of the bridge. The land is zoned as rural landscape (RU2) under the Goulburn Mulwaree LEP.
  - Lot 1 DP 598475 – Private land located to the north-east of the bridge zoned as low density residential (R2) under the Goulburn Mulwaree LEP.
- Crown land – Acquisition of about 1900 square metres (0.19 hectares) of land located to the north of the bridge. The land is zoned as rural landscape (RU2) under the Goulburn Mulwaree LEP.

In addition, an area of about 2000 square metres would be leased for the construction of the temporary construction compound for the period of construction only and would be returned to the landowner(s) on completion of work. A lease fee would be paid to landowners for the period of the lease.

If Roads and Maritime determines to proceed with the proposal, affected landowners would be contacted to discuss details of acquisition. The process is outlined in the Roads and Maritime Land Acquisition Information Guide (RTA, 2011c), which is available on the Roads and Maritime webpage and summarised below. Notice of acquisition would occur during the detailed design phase. All property acquisition would be undertaken in accordance with the Land Acquisition (Just Terms) Compensation Act 1991. Section 55 of the Act covers matters that are considered when assessing payment. These can be summarised as:

- Market value (the market value of the property as unaffected by the road proposals).
- Special value.
- Severance.
- Disturbance.
- Solatium.
- Any increase or decrease in the value of adjoining or severed land (as affected by the road proposals).

The small amount of private and Crown land acquired to accommodate the new bridge and road alignment is not considered to have a significant impact on the landowners.

The acquisition of Crown land would be undertaken in accordance with the requirements of the Crown Lands Act 1989.

6.9.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential impacts on land use and property.
### Air quality

#### Existing environment

A search of the National Pollutant Inventory on 21 May 2013 identified 31 air pollutant substances from eight sources in the Goulburn Mulwaree local government area for the 2011 to 2012 reporting period. The closest identified source of air pollutant is an industrial facility (the Hill & Co Goulburn Depo) located about 480 metres north-west of the proposal site.

Air quality within the study area is typical of an agricultural setting. The main contributors to air quality are emissions from motor vehicles on the surrounding road network. The Goulburn Mulwaree Annual Report 2010 to 2011 (Goulburn Mulwaree Council, 2011) indicated that air quality within the local government area is generally good. The lack of heavy industry or concentrations of vehicles ensures that pollutant loadings are relatively low and are usually dispersed; however, higher concentrations of pollutants may occur briefly in small areas - for example close to busy roads during peak traffic periods. Inversions can occur in valleys on some clear winter nights, which can trap gaseous and fine particle pollutants, such as wood smoke from domestic fireplaces and stoves and abattoir odours, close to ground level (GMC, 2011).

Sensitive receivers in the vicinity of the proposal include:

- Residence at 2 Bungonia Road.
- Residence at 33 Bungonia Road including the Historic Lansdowne Park (holiday accommodation).

Air quality is highly dependent on the processes of wind, temperature inversions and rainfall. Mild to hot summers and cool winters are typical of the study area’s climate. Its position inland ensures a wider temperature range than coastal areas but restricts rainfall.

Climate data for the study area was obtained from the Bureau of Meteorology station located at Goulburn TAFE (Station Number 070263), which is about five kilometres north-west of the proposal site (BoM, 2013).

Based on the climate data between 1971 and 2013, the annual average rainfall for Goulburn is 642.3 millimetres with November receiving the highest average monthly rainfall of about 65 millimetres. The average maximum summer temperature is about 28 degrees Celsius and the average minimum winter temperature is about 1.5 degrees Celsius.

#### Potential impacts

**Construction**

Construction of the proposal may have short-term localised impacts on air quality as a result of:

- Clearing of vegetation.
- Stripping, stockpiling and managing of topsoil.
- Earthworks, excavation for road realignment, and construction of the road and pathways, leading to the creation of airborne dust, especially in dry and windy conditions.
• Road sub-grade preparation and road pavement work.
• Transport and handling of soils and materials.
• Use of construction vehicles leading to the creation of exhaust fumes.
• Construction vehicle movements along unsealed surfaces.
• Spray painting for line marking.

Potential air quality impacts during construction would be predominantly associated with the generation of dust. Dust settlement may impact upon adjacent properties. Air quality impacts as a result of dust generation are considered to be minor as they would be limited to the construction phase only and would be minimised through the implementation of the safeguards and management measures outlined in section 6.10.3.

Machinery and other construction vehicles would emit exhaust fumes. The impact of these emissions would be limited to the duration of the construction phase. Implementation of the safeguards and management measures outlined in section 6.10.3 would minimise these impacts.

Odours may be generated during the application of asphalt and line marking. However, the construction period would be temporary and there would be no long-term odour impacts for nearby receivers.

Overall, potential air quality impacts during construction would be short-term in nature and appropriate mitigation measures outlined in section 6.10.3 would be implemented.

**Operation**

In the operational phase of the proposal, a small amount of emissions would be generated during maintenance activities (which would be frequency and intensity dependant). However, the impacts on local air quality are considered to be low.

The proposal is not expected to generate traffic. However it is likely that traffic volumes would increase on Bungonia Road in the future. Any increase in traffic volumes has the potential to reduce air quality in the local area.

### 6.10.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential impacts on air quality.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
</table>
| General air quality impacts   | An air quality management plan would be prepared and included within the construction environment management plan. The plan is required to address (but not be limited to) the following:  
  • A procedure for monitoring weather conditions.  
  • Identification of dust generating activities and associated mitigation measures.  
  • Limits on the area that can be opened up or distributed at any one time.  
  • Compliance with Roads and Maritime Services’ *Stockpile site management guideline (2011).*  
  • Progressive stabilisation plans.                                                                                                                        | Construction contractor | Pre-construction |
### Dust emissions

Exposed surfaces would be watered regularly to minimise dust emissions. Water would also be used to suppress dust emissions during rock hammering.

Stockpiled materials would be stabilised in accordance with Roads and Maritime Services’ *Stockpile site management guideline (2011)*.

All trucks would be covered when transporting material to and from the site.

Work activities would be reprogrammed if the mitigation measures are not adequately restricting dust generation.

Dust generating activities would be avoided during high wind conditions.

### Exhaust emissions

Construction plant and equipment would be maintained in a good working condition in order to limit impacts on air quality.

Plant and machinery would be turned off when not in use and would not

### Smoke emissions

No burning of any timbers or other combustible materials would occur.

### Impacts on sensitive receivers

Local residents would be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust emissions</td>
<td>Exposed surfaces would be watered regularly to minimise dust emissions. Water would also be used to suppress dust emissions during rock hammering.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Stockpiled materials would be stabilised in accordance with Roads and Maritime Services' <em>Stockpile site management guideline (2011)</em>.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>All trucks would be covered when transporting material to and from the site.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Work activities would be reprogrammed if the mitigation measures are not adequately restricting dust generation.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Dust generating activities would be avoided during high wind conditions</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Exhaust emissions</td>
<td>Construction plant and equipment would be maintained in a good working condition in order to limit impacts on air quality.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Plant and machinery would be turned off when not in use and would not</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>Smoke emissions</td>
<td>No burning of any timbers or other combustible materials would occur.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Impacts on sensitive receivers</td>
<td>Local residents would be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

### 6.11 Socio-economic

#### 6.11.1 Methodology

This section presents the socio-economic assessment undertaken by GHD to assess the potential socio-economic impacts resulting from the proposal. The assessment of potential impacts is based on a socio-economic profile of the area surrounding the bridge and the broader Goulburn Mulwaree local government area (based on 2011 Australian Bureau of Statistics (ABS) Census), outcomes of consultation with the community undertaken by Roads and Maritime, and a site visit. Key socio-economic indicators for the study area are provided in this section, with a full table of demographic indicators provided in Appendix I.

The assessment of potential socio-economic impacts has been developed in line with the Roads and Maritime Services’ *Environmental Impact Assessment Practice Note Socio-economic Assessment*, and informed by current best practice guidelines which highlight the importance of integrating socially sustainable outcomes and benefits for communities into infrastructure projects.

The study area for the socio-economic assessment is made up of two Census statistical area level 1 (SA1) districts (one of the smallest levels of population data collection by the ABS). These SA1 districts are split by Bungonia Road (see Figure 6-7 and Figure 6-8 which show the boundaries for each Census district). For the purpose of this report, they are referred to as
‘Eastgrove’, which covers the residential community to the north-east of the bridge, and ‘Bungonia Road South’, which covers the rural area to the south of the bridge.

The socio-economic assessment considered social infrastructure and businesses located to the east of the railway and within a radius of about 1.5 kilometres of Lansdowne bridge.

**Figure 6-7 Census district for Eastgrove (SA1 No. 1100102)**

Source: (ABS, 2013). Note: Lansdowne Bridge shown in red.
6.11.2 Existing environment

The Goulburn Mulwaree local government area is predominantly rural, with Goulburn the administrative and employment centre for a number of smaller villages. Land is used largely for agriculture, particularly sheep grazing, with some cattle grazing and boutique industries including crops and mixed farming.

The area surrounding the bridge is primarily made up of rural properties with some other key uses in proximity including the Goulburn Recreation Area, Goulburn Brewery and the Historic Lansdowne Park (Goulburn’s oldest homestead and farming complex). The nearest residential area, known as Eastgrove (a suburb of Goulburn), is located about 0.6 kilometres north-east.

Population

The population of Goulburn Mulwaree local government area in 2011 was 27,477 persons, living in 12,773 dwellings. The population has grown by 5.1 per cent since 2006 when it was 26,065. This is consistent with the growth rate for NSW at 5.3 per cent over the same period. Aboriginal and Torres Strait Islander people make up about 2.8 per cent of the population (780 persons).

With a population of 606 persons in 2011, Eastgrove is a younger area, with more school aged children and families compared to the average for the local government area. Bungonia Road South has a small population of 98 persons, and displays an older age profile, with 30.6 per cent of residents aged 60 years and over (compared to 21.8 per cent for the local government area). Figure 6-9 below displays the age profiles for Eastgrove and Bungonia Road South compared to the local government area.
Figure 6-9  Age profiles for Eastgrove, Bungonia Road South and Goulburn Mulwaree local government area, 2011

With more older residents, Bungonia Road South also has a higher proportion of lone person households compared to the local government area average, while Eastgrove has more family households. Both areas are dominated by separate houses, and both have less unoccupied private dwellings compared to the local government area average, indicating that most private dwellings are occupied by residents rather than used for holiday rentals.

Industry and employment

Goulburn Mulwaree local government area has a significant rural industry, as well as various commercial and professional sectors, and acts as an administrative centre for other surrounding rural areas (Goulburn Mulwaree Council, 2006). Key industries of employment for the local government area include retail, public administration and safety, and health care and social assistance. Key industries of employment for Eastgrove residents reflect the local government area average, while key industries for Bungonia Road South residents include accommodation and food services, and arts and recreation services.

The labour force participation rate in Eastgrove is higher than the local government area average (66.5 per cent compared to 57.8 per cent), pointing to the younger age profile for the area. While the participation rate in Bungonia Road South is similar to the local government area average, the unemployment rate is slightly higher (6.4 per cent compared to 5.7 per cent). However given the small population of the Bungonia Road South area, this represents a very low number of unemployed persons.

The average weekly household income for the local government area is $981. The average for Eastgrove is $1567 per week while for Bungonia Road South it is $900 per week. There is a higher proportion of low income households (those earning less than $614 per week) in Bungonia Road South compared to the local government area average (48 per cent of households compared to 22.8 per cent).
Socio-economic indexes for areas score

Socio-Economic Indexes for Areas (SEIFA) scores rank areas in Australia according to relative socio-economic advantage and disadvantage. The ABS develops a number of scores for areas, including the ‘Index of Relative Advantage and Disadvantage’ and the ‘Index of Relative Disadvantage’.

The Index of Relative Socio-economic Advantage and Disadvantage is a continuum of advantage (high values) to disadvantage (low values) which is derived from Census variables related to both advantage and disadvantage, like households with low income and people with a tertiary education.

The Index of Relative Socio-economic Disadvantage is derived from Census variables related to disadvantage, such as low income, low educational attainment, unemployment, and dwellings without motor vehicles (ABS, 2008). A higher score on both indexes indicates a lower level of disadvantage, while a lower score indicates a higher level of disadvantage.

The indicators described above are reflected in the SEIFA scores for the area, detailed in Table 6-24 for Eastgrove, Bungonia Road South and the Goulburn Mulwaree local government area.

### Table 6-24 SEIFA scores for Eastgrove, Bungonia Road South and Goulburn Mulwaree local government area, 2011

<table>
<thead>
<tr>
<th>Area</th>
<th>Eastgrove</th>
<th>Bungonia Road South</th>
<th>Goulburn Mulwaree local government area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index of Relative Advantage and Disadvantage Score</td>
<td>983</td>
<td>879</td>
<td>944</td>
</tr>
<tr>
<td>Index of Relative Disadvantage Score</td>
<td>998</td>
<td>868</td>
<td>951</td>
</tr>
</tbody>
</table>

The 2011 SEIFA scores show that, compared to the Goulburn Mulwaree local government area, Eastgrove has a lower level of disadvantage, while Bungonia Road South has a higher level of disadvantage. The presence of more vulnerable sections of the community should be considered in the replacement of the Lansdowne Bridge.

Travel behaviour, transport and traffic patterns

There is a high level of dependency on private motor vehicles in the local government area, with 91 per cent of households owning one or more cars. The rate of ownership is lower for the areas surrounding the bridge, with 78 per cent for Eastgrove and 84.8 per cent for Bungonia Road South. Figure 6-10 displays how workers living within Eastgrove and Bungonia Road South travel to work (by one method only). The majority of workers travel by car (267 persons). This is followed by those who walk (14 persons).
Consultation undertaken by Roads and Maritime with community members over the removal of the bridge has indicated that Lansdowne Bridge is currently used by people travelling to coastal areas such as Nowra, and many of these vehicles have trailers or boats.

Based on the traffic survey for Bungonia Road (see section 6.6), an average of 2190 vehicles travel along Bungonia Road each day. About nine percent of these are heavy vehicles, with community consultation indicating that these are articulated vehicles used for stock movement. There are a several livestock and freight companies located in Goulburn and surrounding areas which are likely to travel over the bridge on a regular basis. Consultation has indicated that some people feel that the current bridge is not wide enough for larger vehicles. There is a detour for heavy vehicles (over 42.5 tonnes) which detours vehicles south, over the Hume Highway and loops back to Goulburn via Brisbane Grove Road and Braidwood Road (see Figure 3-2).

The main public bus service in Goulburn is provided by PBC Goulburn Bus Services, which runs three public bus routes and a number of school routes, however none of these services travel along Bungonia Road as there are no existing public bus stops. A number of longer distance bus services, including Greyhound, Murray’s Coaches and Country Link, travel to Goulburn from other regional centres (eg Wollongong and Narooma) and capital cities (eg Canberra, Sydney and Melbourne) it is unlikely that these services would use Bungonia Road, as they are likely to travel into Goulburn via the main highways.

Although there has only been one reported rear end, non-casualty crash on Bungonia Road (about 10 metres west of Lansdowne Bridge) in the five years between 1 October 2007 and 30 September 2012, there are community concerns about the safety of the bridge. Safety concerns were raised a number of times in submissions to Roads and Maritime, with concerns relating to the bridge being too narrow and located on a poor alignment which results in near misses.

There are no dedicated footpaths or cycling paths located on the bridge, so any current use of the bridge by walkers of cyclists requires them to utilise the traffic lanes. Submissions that support the existing bridge being retained suggest that the bridge could be linked to a cycling or walking route.
Community values

The Goulburn Mulwaree region is valued by the community for the opportunities provided by its rural setting. Protecting the environment and character was identified as a priority during community consultation to inform Council’s *Goulburn Mulwaree Strategy 2020* (Goulburn Mulwaree Council, 2006).

As the regional centre for surrounding rural communities, Goulburn is valued by the community for its heritage architecture, including its cathedrals, schools and homes (Goulburn Mulwaree Council, 2006).

The results of consultation undertaken and submissions received by Roads and Maritime in response to the options display process for the proposal (see section 5) also indicate the strong value placed on local heritage by some members of the community. Specifically, the Goulburn Heritage Group suggested in their submission on the proposal that the existing bridge be retained due to its heritage value as one of 48 remaining timber truss bridges throughout the state, and one of ten remaining deBurgh truss bridges. The group considers Lansdowne Bridge to have high local and regional heritage value, and consider the bridge to be an aesthetic feature contributing to the historic pastoral landscape of the area.

Roads and Maritime had originally proposed to retain the bridge in its draft Timber Truss Strategy, however, the retention of the bridge was reconsidered following strong representations from Goulburn Mulwaree Council due to safety concerns. The revised strategy proposes replacement of the bridge.

Of the eight submissions received by Roads and Maritime in relation to the replacement of the bridge, half (four) are in favour of retaining the bridge. Of these, three submissions cite its heritage value as the reason the bridge should be retained. A small number of submissions were received and as a result may not be representative of the views of the broader community. Other key issues raised and community values raised in the submissions include:

- Road safety, including for pedestrians and cyclists.
- Accessibility for motorists.
- Importance of transparency and community involvement in decisions.

Businesses

Closest to Lansdowne Bridge is the Goulburn Brewery, a historic attraction which includes a function centre and restaurant. The brewery is located along Bungonia Road, on the western side of the bridge. A market is held at the brewery once a month on a Saturday. To the east of the bridge on Bungonia Road, is the Historic Lansdowne Park, Goulburn’s oldest homestead and farming complex. These attractions are shown on Figure 6-11.

Several industrial (eg earthmoving, warehouses), light industrial (eg auto wreckers), agricultural (eg stockyard manufacturers) and tourism (bed and breakfast) businesses are located to the west of the bridge and east of the railway line along Braidwood Road and Bungonia Road. To the east of the bridge, along Bungonia Road and Windellama Road, are agricultural businesses (eg farms, livestock transport). Two bed and breakfasts are located on Braidwood Road, south of the Goulburn Recreation Area (refer to Figure 6-11).

Other businesses located to the east of the bridge include the Essential Energy electricity substation on Memorial Road and the Goulburn Rifle Club and rifle range (Rifle Range Drive).
Social infrastructure

The majority of Goulburn's social infrastructure is located in the town centre. In proximity to the bridge, on the western side, is the Goulburn Recreation Area, which includes the Goulburn Paceway, used by the Harness Racing Club, Greyhound Club, Rodeo Club and Dressage Club. It also includes the Goulburn Showground, where the Agricultural Pastoral and Horticultural Society annual show occurs on a weekend in March. Other users of the Recreation Area include basketball and poultry fanciers. The Recreation Area's greyhound dog slipping track, which is used to exercise greyhounds, has two access points from Bungonia Road at about 50 and 200 metres to the west of the bridge. A multi-use hall and function facility at the Goulburn Recreation Area was under construction during 2013, and nearing completion in November 2013 (Goulburn Paceway, 2013). The complex will be an important community facility, with a recent council study concluding that it will contribute $43 million to the local economy and community over the period 2014 to 2031.

East of the bridge, along Forbes Street, are the Eastgrove Park South and Eastgrove Park North sports fields. To the west of Eastgrove Park South, is the Goulburn Pony Club, and to the north of Eastgrove Park North, is the Goulburn golf club. The Goulburn War Memorial, a square tower at the top of Rocky Hill, is located in the Memorial Park to the north-east of the bridge. The memorial was built as a tribute to those from the district who enlisted in World War I. The Goulburn War Museum is located in a cottage adjacent to the memorial. Bartlett Park is a local park with a children's playground located to the south of Memorial Park (lgoulburn, 2014).

To the west of the bridge is the Goulburn Apex Park, a small park with a small shelter, located between the railway line, Mundy Street and Ottiwell Street. Also to the west of the bridge, along Braidwood Road, is Tirranna Public School, a small school with only 11 enrolments in 2013. According to the My School website, Tirranna services both rural and urban communities, and has two staff members (My School, 2014).

Figure 6-11 shows the location of social infrastructure and businesses within close proximity to the Lansdowne Bridge.
6.11.3 Potential impacts

Impacts related to air quality and dust, traffic and access, land use, noise and vibration, amenity and heritage value would also have socio-economic impacts on the local community and road users throughout construction and operation of the new bridge. These issues have been outlined and assessed in the following sections of this report:

- Non-Aboriginal cultural heritage (section 6.1).
- Noise and vibration (section 6.4).
- Traffic and access (section 6.6).
- Visual impact (section 6.8).
- Land use and property (section 6.9).
- Air quality and dust (section 6.10).

Summaries of these and the other socio-economic impacts that may occur during construction and operation of the proposal are outlined below.

In addition to the identified socio-economic impacts below, potential socio-economic cumulative impacts have been considered. There are no planned major projects or development applications near the proposal site, however the new multi-use hall and function facility at the Goulburn Recreation Area was nearing completion in November 2013. As a result, there may be a minor negative cumulative impact associated with construction fatigue for local residents and businesses, however as the hall is located closer to Braidwood Road, any associated impacts are not expected to be significant for residents and businesses located close to the proposed construction activities.

Construction

Access

Due to the temporary closure of the bridge, socio-economic impacts resulting from changes to access during construction include increased travel distance and time for local residents, and freight and livestock transport companies that travel via Lansdowne Bridge and Bungonia Road. Those properties to the east of the bridge are likely to be most inconvenienced by the temporary bridge closure during construction, with these properties needing to utilise the longer heavy vehicle detour route to access Goulburn CBD (see Figure 3-2), or travel via Memorial Road and Park Road. These alternate routes may add up to three to seven minutes to travel times, and are considered a moderate and acceptable impact.

Other access roads within the study area would be maintained during construction including Forbes Street. Short-term closures of Forbes Street may be needed during this period. The community would be notified in advance of any short-term closures. Detours required for construction activities would not alter any school bus routes.

Property access for residents at 2 and 33 Bungonia Road would be temporarily affected during construction. Alternative access would be provided in consultation with the property owners.

Any pedestrians or cyclists using the bridge may experience moderate negative impacts during temporary bridge closure, with much longer detours necessary as alternate routes for pedestrians or cyclists will not be provided. This could potentially curb these transport modes and require pedestrians in particular to seek an alternative mode of transport during construction. These impacts are considered to be minor due to the low number of pedestrian and cyclist movements in the area.
Bungonia Road South has a higher proportion of older people, who are more likely to be vulnerable to changes in access resulting from construction activities. For example, older people may be more sensitive to changes in access to their homes or familiar routes, which may lead to increased stress and anxiety in the absence of appropriate communications.

Detours and extended travel times due to temporary bridge closure has the potential to impact on the operation of emergency services. Roads and Maritime have consulted with emergency services providers in the Goulburn area who have indicated they do not foresee any negative issues for their operations with regard to the bridge replacement proposal.

Decreased accessibility during construction could be experienced by the Goulburn Brewery and the Historic Lansdowne Park. Traffic detours and disruptions during construction are not likely to have a significant impact on the operation of these businesses and facilities, due to the availability of alternate routes. Further, access to all properties would be maintained at all times during construction.

Subject to the implementation of the safeguards and management measures outlined in section 6.11.4 these impacts are considered to be moderate, negative impacts over the 12 month construction period.

Further assessment of traffic and access for the proposal is outlined in section 6.6.

**Amenity**

Properties located along Bungonia Road, Memorial Road and Forbes Street are likely to experience temporary amenity impacts resulting from construction activities including:

- Increases in noise and vibration from construction activities as well as construction traffic (see section 6.4).
- Increase in construction traffic (see section 6.6).
- Visual impacts from construction activities (see section 6.8).
- Potential dust disturbance (see section 6.10).

These issues have been assessed and safeguards and management measures have been provided in the relevant sections in order to minimise impacts.

Older people living in the local area, and in particular along Bungonia Road South, are more likely to be vulnerable to the amenity impacts outlined above. For example, older people may be more sensitive to noise, vibration and dust impacts if they have existing health issues.

The surrounding area may also experience temporary amenity impacts, particularly from additional traffic that is diverted along detour routes. Review of the likely detour routes which would be utilised during construction indicates no presence of social infrastructure. A small number of rural residences are located along the detour route and Eastgrove residents may experience negative amenity impacts due to an increase in traffic. Despite the potential increase in traffic along the alternate routes, the impacts on these residents are expected to be temporary (12 months) and minor.

The general amenity within the Goulburn CBD would not be impacted during the construction period as the works would take place at the eastern edge of the town, away from the CBD.

**Property impacts**

As discussed in section 6.9, a small amount of private land (about 0.66 hectares on two separate properties) and Crown land (about 0.19 hectares) would be acquired to accommodate the proposal.
The small area of private land acquisition is considered a moderate negative impact on the owners of the two parcels of land, as the land loss is not expected to negatively impact the viability of the existing or any future use of the remaining properties. Both affected areas are currently un-utilised areas of the Goulburn Brewery and the Historic Lansdowne Park properties. Section 6.1 provides an assessment of the non-Aboriginal heritage impacts on these properties and concludes that, with the implementation of mitigation measures, the impact on the heritage significance of these properties is acceptable.

As outlined in section 6.9, land acquisition would be undertaken in line with the requirements of the Land Acquisition (Just Terms Compensation) Act 1991 and the Roads and Maritime Services’ Land Acquisition Information Guide (RTA, 2011c).

The Crown land to be acquired is located to the north of the bridge and along the creek line. The acquisition of this land is considered to have a minor negative impact as the land is designated as waterway and thus would not affect any public access within the area. The acquisition of Crown land would be undertaken in accordance with the requirements of the Crown Lands Act 1989.

**Business impacts**

It is anticipated that a workforce of around 15 construction and site management personnel would be required on-site each day during construction, which is anticipated to take place over 12 months. This number would vary depending on the stages of construction. It is likely that most of this workforce would be local residents of Goulburn or surrounding localities, with the remainder from other locations. The construction workforce has the potential for the following beneficial impacts on local businesses:

- Construction workers not local to the area would require accommodation throughout the construction period.
- Food outlets (e.g., cafes, take away shops), service stations, and entertainment facilities may experience a small increase in trade from construction workers.

These impacts on local businesses are expected to be minor, short-term positive impacts.

Some businesses may experience changes to amenity and access during the construction works. These may include those located along Bungonia Road (e.g., Goulburn Brewery and Markets) and Memorial Road (e.g., the Historic Lansdowne Park).

Reduced amenity due to visual, vibration and noise impacts during construction is expected for these businesses. In particular, guests at the Historic Lansdowne Park could be impacted by these amenity impacts.

As the Goulburn Brewery Markets are held monthly on Saturdays, and the Goulburn Brewery and Historic Lansdowne Park are local tourist attractions, access impacts resulting from the closure of the bridge and additional travel time resulting from detours would be greater on weekends.

Additionally, for the Historic Lansdowne Park, the detours and resultant extended travel times would impact on deliveries and staff travelling from Goulburn CBD. These impacts are considered to be minor negative and short-term during the 12 month construction period, and manageable through the adoption of appropriate safeguard measures.
**Operation**

**Access**

The closure of Forbes Street would result in extended travel distances for road users who previously travelled along Forbes Street. Older people may be more vulnerable to changes in access resulting from the closure of Forbes Street, such as driving potentially unfamiliar alternate routes.

Consultation with community members indicates that some members of the pony club travel via Forbes Street, and there is concern over its closure as alternate routes are not considered suitable for horse floats. However, the alternate route via Blackshaw Road, Sloane Street and Bungonia Road is of comparable length with appropriate slopes for all vehicles, including horse float trailers. Impacts during operation of the proposal are expected to be minor for Pony Club users currently travelling via Forbes Street.

Those travelling from locations in Eastgrove near Forbes Street to the Goulburn CBD or Tirranna Public School (on Braidwood Road) would be required to travel via Park Road and Blackshaw Road. This would add only one or two minutes to travel time, which is considered to be minor.

Replacement of the existing bridge would improve connectivity between the eastern side of Goulburn and the CBD by improving road safety. Heavy vehicles (over 42.5 tonnes) would experience improved access to the CBD via Bungonia Road as the new bridge would provide a safer option with improved travel times and distances. It is considered that the changes to access, including the closure of Forbes Street, would improve road safety in the area surrounding the bridge while maintaining safe access into Goulburn CBD.

Access to and from the Goulburn CBD would be maintained from the western side of the bridge. Vehicles travelling along Bungonia Road would not experience any changes to access to the CBD.

The replacement of the bridge would improve pedestrian and cyclist accessibility to Goulburn CBD. Whilst travel to work data indicates low levels of cycling (as a key transport mode), community consultation has evidenced support for integrating pedestrian and cycle capacity, and the proposal includes these facilities (see section 3).

**Amenity**

The proposal would result in improved amenity for some residences close to the bridge. 2 Bungonia Rd (the closest property to the bridge) is expected to experience improved amenity with a decrease in maximum noise levels during operation by 5 to 6 dB(A). Maximum noise level events at night (linked to sleep disturbance) are also predicted to decrease. At 33 Bungonia Road, the noise levels would increase slightly at proposal opening, but 10 years after opening would be the same if the proposal did not proceed (refer to section 6.4).

Properties located along Forbes Street are expected to experience a slight improvement in amenity due to a decrease in traffic and traffic noise.

A decrease in heavy vehicle traffic along the current heavy vehicle detour (Bungonia Road, Windellema Road, Brisbane Grove Road, and Braidwood Road) may also lead to a slight improvement in amenity for the properties located along these roads.

**Business impacts**

The replacement of the bridge is likely to have a moderate positive impact on livestock and freight companies operating locally as they would no longer need to use the longer heavy vehicle detour.
**Economic impacts**

Replacement of the existing bridge would result in reduced maintenance costs for Council. Construction of the new bridge would result in a higher value asset for Council that delivers greater function, safety and performance than the existing asset. This is considered to be a long-term positive impact.

**Community values**

Community consultation on the proposal has revealed that some groups in the community particularly value the heritage of the bridge and want to see it retained. In particular, the Goulburn Heritage Group opposes the replacement of the bridge. Bridge replacement would alter the character of the project site and could negatively impact the way travellers and the local community experience the historic landscape of the project area.

The proposal would contribute to the community desire for increased road safety and for enhanced facilities for more active transport forms (as pedestrian and cycle paths are integrated into the bridge design).

**6.11.4 Safeguards and management measures**

Mitigation measures provided below would be implemented to minimise socio-economic impacts. These measures are in addition to those specifically addressing issues of non-Aboriginal heritage (section 6.1.4), noise (section 6.4.6), traffic (section 6.6.3), visual impact (section 6.8.4), and land use and property (section 6.9.3).

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
</table>
| Construction related amenity impacts | A project communications strategy would be developed and would include the following:  
  - Communication with residents, businesses and organisations located in Eastgrove, along Bungonia Road, Memorial Road and Forbes Road would be undertaken in advance of construction to ascertain any specific times or events that should be considered in construction programming (eg Goulburn Markets held at the Goulburn Brewery one Saturday per month).  
  - Residents living near the bridge, and the local community would be provided with timely and relevant information to enable them to understand the likely nature, extent and duration of vibration, dust and noise impacts and access changes.  
  - Particular attention would be given to ensuring any vulnerable (elderly or low income) households are appropriately targeted.  
  - Communications would include roadside signage, letterbox dropped newsletters, newspaper advertisements, Roads and Maritime web based information, a complaints line, and advice to specific service providers such as community transport and seniors organisations. | Roads and Maritime | Pre-construction |
6.12 Waste management

Roads and Maritime is committed to ensuring the responsible management of unavoidable waste and promotes the reuse of such waste in accordance with the resource management hierarchy principles outlined in the Waste Avoidance and Resource Recovery Act 2000. These resource management hierarchy principles, in order of priority are:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling and energy recovery).
- Disposal.

By adopting the above principles, Roads and Maritime aims to efficiently reduce resource use, reduce costs, and reduce environmental harm in accordance with the principles of ecologically sustainable development.

6.12.1 Potential impacts

The proposal has the potential to generate waste from the following activities:

- Excavation for the new road realignment (including about 12,460 cubic metres of spoil).
- Excavation of pavement of Bungonia Road at the eastern approach to the bridge.
- Vegetation (native, exotic and noxious) to be removed as part of the proposal.
- Demolition of the existing Lansdowne Bridge.

Waste streams likely to be generated during construction of the proposal include:

- Bridge materials from the existing bridge (including steel, timber piles, railing and timber posts and debris).
- Hazardous waste - bridge materials contaminated with lead and polycyclic aromatic hydrocarbons.
- Excess spoil and rock materials from excavation and cutting.
- Green waste as result of vegetation clearing (about 0.9 hectares). Noxious weed material would be separated from native green waste.
- Roadside materials (fencing, guide posts, guard rails etc).
- Packaging and general waste from staff (lunch packaging, portable toilets etc).
- Chemicals and oils.
- Waste water from wash-down and bunded areas.
- Redundant erosion and sediment controls.

Construction activities that are anticipated to generate the largest quantities of waste are demolition waste from Lansdowne Bridge and spoil from excavation of cuts. The potential to reuse materials would be investigated during detailed design to minimise the impacts of waste from the proposal. Unsuitable fill material and excess cut 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 reuse on a future project only if a specific project has been identified before stockpiling. If a project cannot be identified the material would not be stockpiled.
- Disposal at an accredited materials recycling or waste disposal facility.
As otherwise provided for by the relevant waste legislation.

The following potential hazardous wastes may be generated by the proposal:

- Timber components contaminated with lead and polycyclic aromatic hydrocarbons.
- Spoil from beneath the bridge structure which may be contaminated with lead and polycyclic aromatic hydrocarbons.
- Lead based paint chips.
- Protective sheeting and other items that may have come in contact with lead paint during demolition work.

The only deliberate disturbance of lead paint would occur during preparation of cutting margins, where paint removal is to be carried out. There is also a risk of inadvertent disturbance of lead paint associated with the handling and transportation of the bridge components from the site. The implementation of controls listed in section 6.12.2 would ensure that the disturbance of lead paint during the handling and transport is minimised.

The reuse potential of the timber elements from the bridge would be determined during detailed design. Bridge elements contaminated with lead or polycyclic aromatic hydrocarbons would need to be stripped of paint and contamination before being suitable for reuse or recycling. This would be viable for significant cross-sectional areas, such as the truss posts. The reuse of small cross-sectional areas, such as handrails and kerbs is not considered to be viable. Any contaminated paint surface removal work would need to be carried out off-site in a controlled area, with suitable safety, containment and waste management procedures. Reuse options would be investigated further during detailed design and may be subject to further assessment.

### 6.12.2 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise waste generation and to ensure the appropriate management of wastes.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste minimisation</td>
<td>The following resource management hierarchy principles would be followed:</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>• Avoid unnecessary resource consumption as a priority.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Avoidance would be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery).</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>• Disposal would be undertaken as a last resort (in accordance with the Waste Avoidance and Resource Recovery Act 2001).</td>
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<td></td>
<td>A waste management plan would be prepared, which would include the following:</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
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<tr>
<td></td>
<td>• Identify all potential waste streams associated with the work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Identify opportunities to minimise the use of resources, and to reuse and recycle materials.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
</tr>
<tr>
<td>------------------------------</td>
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</tr>
<tr>
<td>Management of green waste and noxious weeks</td>
<td>Cleared weed free vegetation would be chipped and reused on-site as part of the proposed landscaping and to stabilise disturbed soils where possible. Weeds would be mulched separately and weedy mulch would not be reused.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Spoil management</td>
<td>Excess excavated material would reused appropriately for fill on the proposal site, or other Roads and Maritime projects, or be disposed of at an appropriate facility.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td></td>
<td>Excess soil requiring waste disposal would first be assessed against the <em>Waste Classification Guidelines-Part 1: Classifying Waste</em> (DECC, 2009) and disposed of to an appropriately licensed waste facility with supporting waste classification documentation.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Waste management</td>
<td>Garbage receptacles would be provided and recycling of materials encouraged. Rubbish would be transported to an appropriate waste disposal facility.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Portable toilets would be provided for construction workers and would be managed by the service provider to ensure the appropriate disposal of sewage.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Noxious weeds removed during construction would be managed in accordance with the requirements of the <em>Noxious Weeds Act 1993</em>.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Wastewater contamination of soils and water</td>
<td>A dedicated concrete washout facility would be provided during construction so that runoff from the washing of concrete machinery and equipment could be collected and disposed of at an appropriate waste facility.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>Hazardous waste contamination</td>
<td>A lead management plan would be prepared and implemented. The lead management plan would include details on hazardous waste management and disposal.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>All waste would be collected from the work area or containment daily and stored in separate clearly-labelled containers. Each waste container would be numbered and labelled as appropriate for the material, and stored in the designated waste zone within the construction compound.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>All hazardous waste must be disposed of at an EPA licensed waste facility licensed to accept that type of waste and transported by a licenced hazardous materials transporter.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>All hazardous wastes require tracking, and should be transported by licensed hazardous waste transport companies.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>
A Waste Management Register would be maintained for the project to record the reuse, recycling, stockpiling or disposal of all waste sent off-site, including test results, quantities and ultimate method of disposal or treatment.

The evaluation and management of timber removed from the existing Lansdowne Bridge would be in accordance with the requirements outlined in the Roads and Maritime Services’ Environmental Direction No. 10 – Disposal/Recycling of Replaced Bridge Timbers.

### 6.13 Climate change and greenhouse gas emissions

#### 6.13.1 Existing environment

Climate change refers to the warming temperatures and altered climate conditions associated with the concentration of greenhouse gases in the atmosphere. These potential changes to future climatic conditions have the potential to impact existing and new road infrastructure.

In 2010 the NSW Government published climate change projections for NSW. The study focused on projections to the year 2050 for rainfall, evaporation and maximum and minimum temperatures as these are the four climate variables considered to most directly affect biophysical systems across the state.

The projected climatic changes by 2050 for the South East region of NSW show that rainfall is likely to increase in summer while winter rainfall is projected to decrease. Sea levels are predicted to rise, changing flood patterns and affecting the coast. And, maximum daily temperatures are predicted to increase particularly during autumn, winter and spring (DECCW, 2010b). Table 6-25 shows the projected climate change in the South East region.

<table>
<thead>
<tr>
<th>Season</th>
<th>Minimum temperatures</th>
<th>Maximum temperatures</th>
<th>Precipitation</th>
<th>Evaporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>1.5-3°C warmer</td>
<td>2-3°C warmer</td>
<td>5–20% increase in the central and southern tablelands</td>
<td>10–20% increase in the north, No change in the south</td>
</tr>
<tr>
<td>Summer</td>
<td>1.5-2°C warmer</td>
<td>1.5-2°C warmer</td>
<td>20-50% increase</td>
<td>10-20% increase</td>
</tr>
<tr>
<td>Autumn</td>
<td>1-3°C warmer</td>
<td>2-3°C warmer</td>
<td>No change in central and southern tablelands</td>
<td>No clear pattern</td>
</tr>
<tr>
<td>Winter</td>
<td>1-3°C warmer</td>
<td>2-3°C warmer</td>
<td>20-50% decrease</td>
<td>No clear pattern</td>
</tr>
</tbody>
</table>

**Table 6-25 Projected climate in the South East region to 2050**
6.13.2 Potential impacts

Potential climate change impacts on the proposal

Changes in rainfall patterns and severe weather events may influence the risk of erosion impacts on the proposal site and associated sediment loss, potentially impacting adjacent sensitive receiving environments including Mulwaree Ponds. Severe weather events may also influence the construction schedule.

In the long-term, increases in temperature may affect the integrity of pavement and other construction elements, either directly or through evaporative changes and then changes to soil moisture content and soil instability which may eventually impact on foundations of structures, softening of pavements, and road rutting.

The proposal is not in a coastal location and would not be directly affected by sea level changes. However, in the long-term, flooding may result in:

- Increased potential for localised flooding of the site.
- Drainage and stormwater impacts.
- Aquaplaning (cars sliding in pooled water on the road).
- Changes to pest and weed species and distribution, and alterations to ecosystem services.
- Erosion impacts on the site, resulting in sediment loss from the site.
- Water quality impacts.

These impacts would be managed through implementation of the safeguards and management measures in section 6.13.3.

Potential impacts of the proposal on climate change

The effect of greenhouse gas emissions on climate is believed to be the main factor driving climate change. Each gas that has been identified by the Intergovernmental Panel on Climate Change has been classified with a global warming potential, the units of which are ‘carbon dioxide equivalents’. Greenhouse gas emissions are also categorised according to the source of emission. Scope one emissions are created directly by a person, for example fuel consumption. Scope two emissions are indirect emissions and include the generation of electricity. Scope three emissions are indirect emissions generated by the wider economy for example coal mining and export.

Construction

Construction of the proposal would result in greenhouse gas emissions being produced, including:

- Carbon dioxide from land clearing (decomposition of cleared vegetation).
- Carbon dioxide and nitrous oxide from liquid fuel use in plant and vehicles (diesel, petrol) during construction, disposal and transport of materials.
- Methane from landfilling any carbon based waste, and possible fugitive emissions from the use of natural gas.

At this early stage of the proposal it is not possible to accurately estimate the emissions likely to be generated. It is anticipated that diesel use would be the main emission source due to the heavy equipment used in the construction process. The magnitude of these emissions would be dependent on the amount of bulk earthwork required for the realignment of Bungonia Road.
Apart from the vehicle or plant emissions, the remainder of the emissions in the construction phase would mostly be associated with dismantling and removal of the existing bridge and the materials used in the construction of the new bridge, Bungonia Road realignment and vegetation clearing.

The proposal would involve the permanent removal of about 9000 square metres (0.9 hectares) of vegetation. This removal would result in an increase in carbon dioxide in the atmosphere as the carbon would no longer be stored in this vegetation through carbon sequestration. The loss of this vegetation is not considered to result in any substantial increase in carbon dioxide in the atmosphere due to the relatively small amount of clearing occurring.

**Operation**

During operation, the proposal may reduce vehicle emissions through increased efficiency of the road network, reducing congestion and travel times. A minimal amount of emissions would be generated during maintenance activities (which would be frequency and intensity dependant).

### 6.13.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential greenhouse gas emissions and impacts associated with climate change.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate change impacts on the proposal</td>
<td>Detailed design would take into consideration the potential effect of climate change on the proposal, including flooding and drainage requirements.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>Greenhouse gas emissions</td>
<td>The use of alternative fuels and power sources for construction plant and equipment would be investigated and implemented, where appropriate.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>The energy efficiency and related carbon emissions would be considered in the selection of vehicle and plant equipment.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td></td>
<td>Materials would be delivered as full loads and local suppliers would be used where possible.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Construction equipment, plant and vehicles would be appropriately sized for the task.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Equipment would be serviced frequently to ensure they are operating efficiently.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td>Clearing of natural vegetation would be minimised where possible.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>
6.14 Hazards and risks

6.14.1 Existing environment

Existing hazards and risks in the vicinity of the proposal are generally associated with operation of the existing road network. The proposal is located within flood prone land and therefore flooding is considered a risk.

6.14.2 Potential impacts

Construction

Hazards and risks associated with construction include:

- Spills or leakage of contaminants such as fuels, chemicals and hazardous substances entering surface and groundwater or contaminating soils.
- Hazardous paint debris entering the environment and associated safety risks to site personnel.
- Discharge of turbid run-off, resulting in pollution of waterways and vegetation.
- Biosecurity risks from the spread of disease, weeds or other pathogens through materials brought on-site or by the movement of material around the site.
- Encountering utilities or contaminated material during earthwork.
- Flooding of the area due to the proposal being located on flood prone land.
- Changed traffic conditions leading to incidents.
- Sparks and hot work causing grassfire particular during dry, hot periods.
- Work next to the rock cuttings (ie rock hammering for drainage excavation) may cause rock material to fall posing a safety risk to construction workers.

An emergency response plan for hazards and risk during construction would be incorporated into the construction environment management plan.

Operation

Operational hazards and risks relating to the proposal could include:

- Fuel and oil spills during maintenance activities or general road use polluting the natural environment.
- Vehicle collisions.

The majority of these potential impacts have been considered during development of the concept design and have been assessed in earlier sections of this review of environmental factors.

An initial assessment of drainage requirements has been undertaken to ensure that the bridge is designed to cope with a 1 in 100 year flood (refer section 6.14.3). Although a quarter of the western end of the bridge would be submerged during a 1 in 100 year flood, the bridge would be design to ensure that the structural integrity is not compromised.

Vehicle crashes are an inherent aspect of the operation of any road. During design of the proposal, Roads and Maritime has applied the requirements of the RTA Road Design Guide to ensure that the road is designed to an appropriate safety standard. Similarly uncontrolled pedestrian access is a risk that Roads and Maritime has endeavoured to control and the proposal includes a dedicated off-road shared path for safe pedestrian movement.
6.14.3 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential hazards and risks.

<table>
<thead>
<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk management</td>
<td>Emergency response plans would be incorporated into the construction environment management plan including a flood evacuation plan.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td></td>
<td>A pollution incident response management plan would be developed and implemented in accordance with the Protection of the Environment Operations Act 1997 requirements. The plan would form a sub plan within the construction environment management plan.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
</tbody>
</table>

6.15 Demand on resources

6.15.1 Potential impacts

Construction of the proposal would require the use of a number of resources, including:

- Resources associated with the operation of construction machinery and motor vehicles (this includes the use of diesel and petrol).
- Material required for the new bridge, road surface and pavements (road base, paints, solvents, asphalt, spray seal, sand, concrete, aggregate etc).
- Fill required to meet design levels.
- Materials required for road signage.
- Construction water (for concrete mixing and dust suppression).

The initial estimated quantities of these materials that would be required for the proposal are provided in section 3.4.5.

The materials required for construction of the proposal are not currently limited in availability, however materials such as metal and fuel are non-renewable and would be used conservatively. Excess spoil, not suitable for reuse, would be disposed of in accordance with safeguards and mitigation measures outlined in section 6.12.2.

As discussed in section 3.4.5, the amount of water required for construction is currently unknown. Extraction of water from natural sources is not anticipated however any approvals under relevant legislation would be obtained if required.

The management measures outlined in section 6.15.2 and section 6.12.2 to reuse waste on-site would assist in minimising the amount of resources required for construction.

6.15.2 Safeguards and management measures

Safeguards provided below would be implemented to minimise the demand on resources.
Demand on resources

Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.

Responsibility

Construction contractor

Timing

Pre-construction and construction

### 6.16 Cumulative environmental impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of other external projects. Roads and Maritime is required under Clause 228 (2) of the *Environmental Planning and Assessment Act 1979*, to take into account potential cumulative impacts as a result of the proposal.

A search of the Department of Planning and Infrastructure’s major projects on 24 October 2013 returned no major projects applications within the vicinity of the proposal.

A search of council’s development application search for the months of August to October 2013 returned no development applications within the vicinity of the proposal. A multi-use hall and function facility at the Goulburn Recreation Area is currently under construction. The complex is due for completion in November 2013.

No other major developments within the vicinity of the proposal are known. Other developments likely to occur within the locality would be small scale projects such as residential dwellings in adjacent residential areas, which are unlikely to have a noticeable cumulative impact.

The potential for adverse cumulative impacts would be addressed through the application of individual project specific environmental safeguards and management measures as summarised in sections 7.2 and 6.16.1.

#### 6.16.1 Safeguards and management measures

Mitigation measures provided below would be implemented to minimise potential cumulative impacts.

<table>
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<tr>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
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</thead>
<tbody>
<tr>
<td>Cumulative impacts</td>
<td>The construction environment management plan would be revised to consider potential cumulative impacts from surrounding development activities as they become known.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
</tbody>
</table>
**6.17 Summary of beneficial effects**

The beneficial effects of the proposal would include:

- Improved safety due to additional, wider traffic lanes, dedicated pedestrian and cycle facilities and improved road approaches.
- Provision of two-way vehicle movement on the bridge.
- Reduction of expensive and ongoing maintenance costs which would be required if the bridge were to be retained.
- Elimination of the potential for lead contamination of the waterway from the deteriorating paintwork on the bridge.
- Minimised disruption to the community in the long-term as the bridge would no longer need to be closed for frequent maintenance.
- Allowance for higher mass limit vehicles which would allow all vehicles to use the bridge.

**6.18 Summary of adverse effects**

Adverse effects of the proposal would include:

- Construction phase traffic impacts, due to increased heavy vehicle movements on the existing road network.
- Impacts to non-Aboriginal heritage items.
- Noise and vibration impacts to properties adjacent to the proposal site during construction and operation.
- Disruptions to traffic flow and access during construction.
- Increased risk for spills and contamination during construction.
- Increased risk of occurrence of erosion and sedimentation during construction.
- Potential temporary decline in air quality during construction.
- Increased risk of degradation of water quality and drainage lines during construction.
- Closure of Forbes Street.
7. Environmental management

This section describes how the proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Roads and Maritime QA specifications. A summary of site-specific environmental safeguards is provided as detailed in section 6 and the licence and approval requirements required before construction starts are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in order to minimise adverse environmental, social and economic impacts, 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.

The identified safeguards and management measures would be incorporated into contractual arrangements with the future contractor. A project environmental management plan and a construction environment management plan would be prepared to describe these safeguards and management measures, how they would be implemented and who would be responsible for their implementation.

The plans would be prepared before construction of the proposal and must be reviewed and certified by the Roads and Maritime Senior Environmental Officer, Southern Region, before the start of any on-site work. These plans would be working documents, subject to ongoing change and updated as necessary to respond to specific requirements. The construction environment management plan and project environmental management plan would be developed in accordance with the specifications set out in the RTA QA Specification G36 – Environmental Protection (Management System), RTA QA Specification G38 – Soil and Water Management (Soil and Water Plan) and RTA 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. These safeguards would minimise any potential adverse impacts arising from the proposal on the surrounding environment. All safeguards described in this review of environmental factors and the decision report would be incorporated into the construction environment management plan. These are summarised in Table 7-1.

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>General</td>
<td>Heritage awareness would be included in site induction training for project staff.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
</tbody>
</table>

Table 7-1 Summary of site specific environmental safeguards
<table>
<thead>
<tr>
<th>No.</th>
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<tbody>
<tr>
<td>2</td>
<td>Indirect or accidental impacts on known items</td>
<td>Temporary fencing or other measures as appropriate to the location would be installed for Goulburn Brewery/Mill, ‘Lansdowne’, the 19th century bridge abutments north of Bungonia Road, and the area of high archaeological potential associated with the former toll house. These would be used to delineate ‘no go’ heritage areas.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>3</td>
<td>Impact on historical landscape and nearby heritage items</td>
<td>The bridge would be designed to be as unobtrusive as possible and views toward the bridge from the Goulburn Brewery/Mill and ‘Lansdowne’ would be screened with vegetation. In designing the bridge, the Roads and Maritime Service’s <em>Bridge Aesthetics: Design guideline to improve the appearance of bridges in NSW</em> (Roads and Maritime, 2012a) would be consulted for ideas on integrating bridges into rural landscape settings.</td>
<td>Roads and Maritime</td>
<td>Detailed design</td>
</tr>
<tr>
<td>4</td>
<td>Removal of Lansdowne Bridge</td>
<td>In accordance with the Roads and Maritime Services’ <em>Timber Truss Bridge Strategy</em> (RTA, 2011c), archival recording of Lansdowne Bridge would be undertaken before its demolition. Archival recording of the bridge would be completed before demolition work starts.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Discussions would be held with council (and possibly the Goulburn and District Historical Society) to determine whether any material from the bridge could be used as a sculptural element in a public area, as a form of heritage interpretation.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Any material that is not included in a local heritage display would be used to maintain other historic timber truss bridges in NSW in accordance with Roads and Maritime Service’s <em>Timber Recycling Policy</em>, as proposed in the <em>Timber Truss Bridge Strategy</em>.</td>
<td>Roads and Maritime</td>
<td>Post-construction</td>
</tr>
<tr>
<td>7</td>
<td>The 19th century bridge abutments north of Bungonia Road</td>
<td>Detailed design would avoid impacts to the 19th century bridge abutments and associated area of archaeological potential. If impacts cannot be avoided, the area would need to be inspected and further mitigation measures recommended by an appropriately qualified archaeologist.</td>
<td>Roads and Maritime</td>
<td>Detailed design</td>
</tr>
<tr>
<td>8</td>
<td>Site of the former toll house</td>
<td>Subsurface works would be minimised near the site of the former toll house.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>No.</td>
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<tr>
<td>9</td>
<td>General</td>
<td>If unexpected archaeological finds are identified during construction, the Roads and Maritime Services’ <em>Unexpected Archaeological Finds Procedure 2012</em> (Roads and Maritime, 2012b) would be implemented. Further archaeological investigation or approvals may be required.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>10</td>
<td>Impact on the Goulburn Brewery and Mill</td>
<td>Trees of the same or a similar species to the existing trees would be planted along the northern side of Bungonia Road, in order to re-establish the vegetation screen between the Brewery and Mill and the bridge.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>11</td>
<td>‘Lansdowne’ homestead</td>
<td>Trees of the same or a similar species would be planted along the new perimeter of the property to replace the existing pine trees that would be removed.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Fencing similar to existing fences would be erected along the perimeter of the property after construction is complete.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>13</td>
<td>The Goulburn City Conservation Area</td>
<td>Trees of the same or a similar species to the existing trees would be planted along the northern side of Bungonia Road, in order to re-establish this element of the streetscape.</td>
<td>Construction contractor</td>
<td>Construction</td>
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</table>

**Soils and water quality**

<table>
<thead>
<tr>
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</table>
| 14  | Erosion and sedimentation | A principal erosion and sedimentation control plan (ESCP) would be prepared during detailed design which is to include as a minimum:  
- Identification of catchment areas and the direction of on-site and off-site water flow.  
- The likely run-off from each road sub-catchment.  
- Separation of on-site and off-site water.  
- The direction of run-off and drainage points during each stage of construction.  
- The locations of erosion and sediment control measures (eg sand bags).  
- A materials management plan.  
The ESCP would be reviewed by a soil conservationist and would be updated to address the recommendations. | Roads and Maritime and designer | Detailed design |
<p>| 15  |        | A soil and water management plan (SWMP) would be prepared as part of the construction environment management plan in accordance with the requirements of Roads and Maritime Services’ specification G38 before construction work starts. | Construction contractor | Pre-construction |</p>
<table>
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</thead>
</table>
| 16  |        | The SWMP would include the following:  
- Address the requirements of the principal Erosion and Sedimentation Control Plan (ESCP).  
- Include an ESCP in accordance with the requirements of the ‘Blue Book’ (Landcom, 2004).  
- Outline a salinity management procedure.  
- Controls to be implemented in preparation for a wet weather event.  
- Summarise applicable legislation.  
- Include a procedure for regular inspection, maintenance and cleaning of sediment controls.  
- Outline regular monitoring of Bureau of Meteorology weather forecasts.  
- Outline a procedure for the containment and management of spills or leaks. | Construction contractor | Pre-construction |
<p>| 17  |        | An accredited soil conservation scientist would be engaged to provide advice during development and implementation of the SWMP and would regularly inspect work throughout the construction phase. | Construction contractor | Pre-construction and throughout construction |
| 18  | Spread of existing contamination | The construction environment management plan would include contingency measures to be followed in the event that contaminated material is identified during the construction phase. | Construction contractor | Pre-construction |</p>
<table>
<thead>
<tr>
<th>No.</th>
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<tbody>
<tr>
<td>19</td>
<td>Contamination of soil and water</td>
<td>An incident emergency spill plan would be developed and incorporated into the construction environment management plan. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into the adjacent waterway and an emergency response plan. An emergency spill kit would be kept on-site at all times.</td>
<td>Construction contractor</td>
<td>Pre-construction and throughout construction</td>
</tr>
<tr>
<td>20</td>
<td>Contamination of soil and water</td>
<td>A lead management plan would be prepared and implemented as part of the construction environment management plan to ensure appropriate management of hazardous materials during the demolition of the bridge.</td>
<td>Construction contractor</td>
<td>Pre-construction and throughout construction</td>
</tr>
<tr>
<td>21</td>
<td>Contamination of soil</td>
<td>An appropriately qualified consultant would be engaged to carry out a background survey for lead and polycyclic aromatic hydrocarbons in soil in the immediate vicinity of the bridge in accordance with the procedure set out in Appendix G of the AS 4361.1 Guide to lead paint management Part 1: Industrial applications. All soil samples would be analysed for lead and polycyclic aromatic hydrocarbons content at an accredited laboratory. Upon completion of the work, a further set of soil samples would be taken at about the same locations, together with a visual survey for debris or wastes.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and post construction</td>
</tr>
<tr>
<td>22</td>
<td>Water quality</td>
<td>Water analysis would be undertaken before construction starts to provide a baseline for water quality at the site and following the completion of works. Samples would be collected and tested for lead and polycyclic aromatic hydrocarbons content in accordance with Appendix H of AS4361.1 Guide to lead paint management Part 1: Industrial applications. An appropriately qualified water quality specialist would be employed to undertake the water analysis.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and post construction</td>
</tr>
<tr>
<td>23</td>
<td>Erosion and sedimentation</td>
<td>A rehabilitation plan would be prepared for areas disturbed during construction. This would identify appropriate methods for stabilising and progressively revegetating disturbed soils to resist erosion and weed invasion.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
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<td>24</td>
<td></td>
<td>Sediment and erosion controls would be implemented before any construction starts and inspected regularly, particularly after a rainfall event, and maintenance work undertaken as needed.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>Where possible, ‘clean’ surface water would be directed away from disturbed areas to stabilised discharge points using temporary diversion drains.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>Clearing of vegetation and stabilisation and revegetation activities would be carried out progressively to limit the time disturbed areas are exposed to erosion processes.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>Site stabilisation of disturbed areas would be undertaken progressively as stages are completed. Batters would be stabilised during construction.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>All stockpiles would be designed, established, operated and decommissioned in accordance with Roads and Maritime Services’ Stockpile Management Procedures (RTA, 2011a).</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>29</td>
<td></td>
<td>Controls would be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces. Any material transported onto pavement surfaces would be swept and removed at the end of each working day.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>Weather forecasts would be checked daily to ensure that high risk soil and erosion activities are not undertaken immediately before or during high rainfall or wind events. Disturbed surfaces would be compacted and stabilised in anticipation of rain events to reduce the potential for erosion.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>31</td>
<td>Contamination of soil and water with lead and polycyclic aromatic hydrocarbons</td>
<td>All hazardous paint debris dislodged during works on the bridge would be collected at least daily, to minimise risk of it becoming dispersed by human activity or escaping by other means.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>32</td>
<td>Chemicals entering waterway</td>
<td>All fuels, chemicals, and liquids would be stored as far as possible from the river or drainage line and would be stored in an impervious bunded area within the construction compound.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>No.</td>
<td>Impact</td>
<td>Environmental safeguards</td>
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<tr>
<td>33</td>
<td>The refuelling of plant and maintenance of machinery would be undertaken in impervious bunded areas in the construction compound.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>All staff would be inducted about incident and emergency procedures and made aware of the location of emergency spill kits.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Should a spill occur during construction, the emergency response plan would be implemented, and the Roads and Maritime Local Environmental Officer contacted immediately. The EPA would also be notified as per Part 5.7 of the Protection of the Environment Operations Act 1997 if required.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Vehicle wash downs and concrete truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken off-site.</td>
<td>Construction contractor</td>
<td>Construction</td>
<td></td>
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<tr>
<td>38</td>
<td>The results of the soil surveys before and after construction would be interpreted according to the guidelines set out in AS 4361.1 Guide to lead paint management Part 1: Industrial applications and the contractor would be liable for any soil remediation indicated as being necessary according to AS4361.1.</td>
<td>Roads and Maritime</td>
<td>Post construction</td>
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</table>

**Biodiversity**

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<tr>
<td>39</td>
<td>All staff would be inducted and informed of the limits of vegetation clearing and the areas of vegetation to be retained, with particular reference to native aquatic flora along the edges of Mulwaree Ponds.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
<td></td>
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<tr>
<td>40</td>
<td>Trees and areas of native vegetation to be retained would be fenced before construction to protect aquatic habitat and native vegetation. An exclusion zone plan would be implemented in line with RTA (2011) - Biodiversity Guidelines Guide 2: Exclusion zones, before work starts. Exclusion zones would be marked on plans for the proposal and would be identified on-site with highly visible temporary fencing.</td>
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<tr>
<td>41</td>
<td>All trees to be removed would be clearly identified on site (eg through markings).</td>
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</table>
Before demolition of the existing bridge, a fauna management plan would be prepared in line with RTA (2011) - Biodiversity Guidelines to manage impacts to listed species with the potential to be impacted by the proposal. The plan would be reviewed by Roads and Maritime’s Environmental Officer, Southern Region.

The fauna management plan would have specific attention to the potential presence of bats roosting in the bridge, water birds that may occur in the study area, terrestrial birds that may be present in the bridge or introduced trees and potential presence of Platypuses and their burrows in the proposal site during construction. The plan would include:

- Timing of the work (with particular reference to the breeding season of any bats that may be using the bridge as breeding habitat).
- Pre-clearance surveys (including potential use of endoscope to detect bats in the bridge).
- Measures to be taken if evidence of bats is found (eg exclusion of bats from the bridge and techniques for demolishing the bridge that minimise harm).
- Measures to be taken if birds are found nesting in the bridge or introduced trees during construction.
- Measures to be taken if Platypuses or their burrows are found in the proposal site.
- Relocation options.
- Management measures, including protocols before, during and after work (eg engagement of experienced bat handler to remove bats during the demolition of the bridge and notification of WIRES and/or veterinarian to care for injured bats collected by the bat handler).

The fauna management plan would consider the potential for harm to listed water birds that may occur in the study area (eg the Blue-billed Duck).
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</table>
| 44  | Spread of weeds                | A weed management plan would be prepared in consultation with Goulburn-Mulwaree Council before construction, for implementation before, during and after construction work, as detailed in RTA (2011) - *Biodiversity Guidelines Guide 6: Weed management*. The weed management plan would identify the weeds present in the study area and would include measures to prevent the spread of weeds. Weed management measures may include:  
  - Use of herbicides.  
  - Integrated weed management.  
  - Implementing exclusion zones.  
  - Weed disposal. | Roads and Maritime | Pre-construction |
<p>| 45  | Restoration                    | A rehabilitation plan would be prepared for areas disturbed during construction. This would identify appropriate methods for stabilising and progressively revegetating disturbed riparian areas to minimise erosion and weed invasion. | Roads and Maritime      | Pre-construction |
| 46  | Disturbance of aquatic habitat | Wherever possible, disturbance of woody debris in the river would be avoided. Where disturbance is necessary, management of the debris would follow a hierarchy of lopping, realignment, relocation and/or removal, as outlined in RTA (2011) - <em>Biodiversity Guidelines Guide 10: Aquatic habitats and riparian zones</em>. | Construction contractor | Construction |
| 47  |                                | If any large woody debris is disturbed from the river bed during construction, the large woody debris would be recovered and stored on site; and replaced at the completion of the construction period, in line with the Department of Primary Industries' <em>Policy and guidelines for fish habitat conservation and management</em> (DPI 2013). |                          |              |
| 48  |                                | Silt curtains would be installed only where necessary, and would not be left within the waterway for any longer than necessary, to minimise impacts to fish moving through the study area. |                          |              |
| 49  |                                | To maintain connectivity to the upstream (southern) reaches, where silt curtains are used, they would not extend across the full channel width. A suitable path would be provided for fish passage. |                          |              |
| 50  |                                | Disturbance of aquatic habitat would be minimised as much as possible. |                          |              |</p>
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<tbody>
<tr>
<td>51</td>
<td>Impacts to threatened species</td>
<td>If unexpected threatened fauna or flora species are discovered, stop work immediately in the vicinity of the find and follow the Roads and Maritime Services’ <em>Unexpected Threatened Species Find Procedure in RTA (2011) – Biodiversity Guidelines Guide 1: Pre-clearing process</em>. This would include notifying the Roads and Maritime Environment Manager immediately and commissioning an assessment of the likely impacts of the proposal on the threatened species.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>52</td>
<td>Spread of weeds</td>
<td>Vehicle and machinery wash/brush downs would be conducted prior to vehicles entering or leaving the site to prevent the spread of noxious weed species to non-infested areas during construction.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>53</td>
<td></td>
<td>Weed infested topsoil would be disposed of or treated and would not be stockpiled adjacent to any areas of native vegetation.</td>
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<tr>
<td>54</td>
<td></td>
<td>Declared noxious weeds would be managed according to the requirements of the NSW <em>Noxious Weeds Act 1993</em>.</td>
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<tr>
<td>55</td>
<td>Pathogen spread and establishment</td>
<td>Measures for preventing the introduction and/or spread of disease causing agents such as bacteria and fungi would be implemented, as detailed in RTA (2011) – Biodiversity Guidelines Guide 7: Pathogen management.</td>
<td>Construction contractor</td>
<td>Construction</td>
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**Noise and vibration**

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</table>
| 56  | Construction noise | A construction noise and vibration management plan (NVMP) would be prepared and implemented to manage and mitigate adverse noise and vibration disturbance, taking into consideration the *Interim Construction Noise Guideline* (DECC, 2009) and the *Environmental Noise Management Manual* (RTA, 2001). The construction noise and vibration management plan would include, but not be limited to, the following:  
- Identification of potentially affected properties.  
- A risk assessment to determine the potential for discrete work activities to affect receivers.  
- A map indicating the locations considered likely to be impacted.  
- Mitigation measures to reduce excessive noise during construction activities. | Construction contractor | Pre-construction |
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<tr>
<td>•</td>
<td></td>
<td>A construction staging program incorporating a program of noise monitoring at sensitive receivers.</td>
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<td>•</td>
<td></td>
<td>A process for assessing the performance of the implemented mitigation measures in accordance with the requirements of the <em>Interim Construction Noise Guideline</em> (DECC, 2009).</td>
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<td>•</td>
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<td>A process for resolving issues and conflicts.</td>
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<td>•</td>
<td></td>
<td>Any work generating high noise or vibration impact must only be undertaken in continuous blocks of no more than three hours with at least one hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers.</td>
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<td>•</td>
<td></td>
<td>Restrictions on delivery times for plant, equipment and material.</td>
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<td>•</td>
<td></td>
<td>Consideration of the layout of the construction compound so that primary noise sources are at a maximum distance from residences, with solid structures (sheds, containers, etc) placed between residences and noise sources (and as close to the noise sources as is practical).</td>
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<tr>
<td>•</td>
<td></td>
<td>Locating compressors, generators, pumps and any other fixed plant as far away from residences as possible and behind site structures.</td>
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<td>•</td>
<td></td>
<td>Where practical, equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made.</td>
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<td>•</td>
<td></td>
<td>The plan would be reviewed in response to complaints and amended where practical throughout the construction phase of the project. This may include the provision of respite periods.</td>
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<td>•</td>
<td></td>
<td>Responsible working practices including:</td>
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<td>– Avoid the use of outdoor radios during the night-time period.</td>
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<td>– Avoid shouting and slamming doors.</td>
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<td>– Where practical, machines would be operated at low speed or power and switched off when not being used rather than left idling for prolonged periods.</td>
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<td></td>
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<td>– Minimise reversing.</td>
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<td></td>
<td>– Avoid dropping materials from height and avoid metal to metal contact on material.</td>
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<tr>
<td>57</td>
<td>Out of hours work</td>
<td>General construction activities would be limited to the recommended construction hours where feasible and reasonable. If work is planned outside normal hours, an ‘out of hours work procedure’ would be prepared as part of the construction noise and vibration management plan for the proposal in accordance with the requirements of the <em>Interim Construction Noise Guideline</em> (DECC, 2009) and the <em>Environmental Noise Management Manual Practice</em> (RTA, 2001).</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>58</td>
<td>Vibration impacts</td>
<td>A building condition survey would be undertaken for all buildings at 2 Bungonia Road.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>When pavement breaking, rolling and compacting activities are required adjacent to 2 Bungonia Road, the resident would be informed of the nature of the work, duration and contact details.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Vibration monitoring would be undertaken at the start of activities near 2 Bungonia Road.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>61</td>
<td>Noise impacts and appropriate complaints handling</td>
<td>The local community that could be affected by the proposal would be contacted and informed of the proposed work, location, duration of work, and hours involved. The contact would be made a minimum of five days before work starts.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>62</td>
<td></td>
<td>During work hours, a community liaison phone number and site contact would be provided so that complaints can be received and responded to.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>63</td>
<td>If deemed necessary, attended compliance noise monitoring would be undertaken upon receipt of a complaint. Monitoring should be reported as soon as possible. In the case that exceedances are detected, the situation should be reviewed in order to identify means to minimise the impacts to residences.</td>
<td>Roads and Maritime Services</td>
<td>Pre-construction</td>
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**Hydrology, flooding and groundwater**

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<tbody>
<tr>
<td>64</td>
<td>Flooding</td>
<td>Detailed hydraulic modelling would be undertaken during detailed design.</td>
<td>Roads and Maritime</td>
<td>Detailed design</td>
</tr>
<tr>
<td>65</td>
<td>A contingency plan would be prepared in preparation for a potential flood event during construction and would outline evacuation procedures to be followed.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
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</tr>
<tr>
<td>66</td>
<td>Low lying areas of construction formations and excavations would be dewatered in accordance with Roads and Maritime Services’ Technical Guideline for Dewatering.</td>
<td>Construction contractor</td>
<td>Construction</td>
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**Traffic and access**

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| 67  | A detailed traffic management plan would be prepared in accordance with Roads and Maritime Services’ *Traffic Control at Work Sites* (RTA, 2010a) and *Specification G10 - Control of Traffic*, and approved by Roads and Maritime before implementation to provide a comprehensive and objective approach to minimise any potential impacts on road network operations during construction. The traffic management plan would include:  
- Measures such as safe access points to work areas from the adjacent road network, safety barriers where necessary, impose temporary speed restrictions when necessary, maintain adequate sight distance and display prominent warning signage.  
- Measures to minimise heavy vehicle usage on local roads. | Construction contractor | Pre-construction |
<p>| 68  | The community would be kept informed about the construction activities, in particular temporary closure of Bungonia Road, through advertisements in the local media and by prominently placed advisory notices or variable message signs. | Roads and Maritime | Pre-construction and construction |</p>
<table>
<thead>
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<tr>
<td>69</td>
<td>Access to properties</td>
<td>Property access would be maintained at all times. Where temporary changes to access arrangements are necessary, Roads and Maritime would advise owners and tenants and consult with them in advance regarding alternate access arrangements.</td>
<td>Construction contractor and Roads and Maritime</td>
<td>Construction</td>
</tr>
<tr>
<td>70</td>
<td>Impacts on road users</td>
<td>Signage would be developed to provide adequate guidance on the permanent closure of Forbes Street and availability of alternate routes.</td>
<td>Roads and Maritime</td>
<td>Pre-construction and construction</td>
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**Aboriginal cultural heritage**

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<tr>
<td>71</td>
<td>Aboriginal heritage item</td>
<td>In the event of an unexpected find of an Aboriginal heritage item (or suspected item), work would cease in the affected area and Roads and Maritime’s Environmental Officer, Southern Region and the Roads and Maritime Senior Environmental Specialist (Aboriginal heritage), would be contacted for advice on how to proceed. The Roads and Maritime Services’ <em>Unexpected Finds Procedure</em> (Roads and Maritime, 2012) would be followed in the event a potential artefact is uncovered.</td>
<td>Construction contractor</td>
<td>Construction</td>
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**Landscape character and visual impact**

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| 72  | Landscape character and visual impacts| Detailed design of the proposal would incorporate the mitigation measures outlined in the Appendix H where feasible including the following:  
• Planting would be replaced with indigenous species along the batters, in front of retaining walls and beside the bridge approaches.  
• The visual impact of batters would be reduced by blending the grades into the surrounding landform wherever possible.  
• The top and bottom of batters would be rounded to blend in seamlessly with the surrounding landform.  
• Cut batters would be seeded to revegetate the slopes with grass species to resemble the existing vegetation of adjacent slopes.  
• Trees and shrubs would be planted wherever possible, particularly on the southern side of the road alignment.  
• A low mound with screen planting would be created between the new road alignment. | Roads and Maritime and designer            | Pre-construction                        |
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<tr>
<td></td>
<td></td>
<td>and the residential properties.</td>
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<tr>
<td></td>
<td></td>
<td>• Although it would be difficult to alter the appearance of the new concrete bridge, revegetating the batters and planting wherever possible would soften the impact of the proposal.</td>
<td></td>
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</tr>
<tr>
<td>73</td>
<td>Urban design</td>
<td>An urban design contractor from Roads and Maritime panel would be engaged for the detailed design phase to ensure adequate consideration of urban design principles and objectives, and to ensure appropriate mitigation of identified impacts.</td>
<td>Roads and Maritime and designer</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>74</td>
<td>Visual impacts</td>
<td>The footprint for construction works would be kept to a minimum to ensure existing stands of vegetation remain intact wherever possible and to screen adjoining sensitive receivers.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>75</td>
<td></td>
<td>The work site would be left in a tidy manner at the end of each work day.</td>
<td>Construction contractor</td>
<td>Construction</td>
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### Land use and property

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<tr>
<td>76</td>
<td>Property acquisition</td>
<td>Roads and Maritime would liaise and consult on an ongoing basis with landowners and tenants whose property would be acquired or leased regarding the status and timing of acquisition.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
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### Air quality

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| 77  | General air quality impacts | An air quality management plan would be prepared and included within the construction environment management plan. The plan is required to address (but not be limited to) the following:  
  • A procedure for monitoring weather conditions.  
  • Identification of dust generating activities and associated mitigation measures.  
  • Limits on the area that can be opened up or distributed at any one time.  
  • Compliance with Roads and Maritime Services’ *Stockpile site management guideline* (2011).  
  • Progressive stabilisation plans. | Construction contractor             | Pre-construction     |
<p>| 78  | Dust emissions           | Exposed surfaces would be watered regularly to minimise dust emissions. Water would also be used to suppress dust emissions during rock hammering.                                                                                                                                                   | Construction contractor             | Construction     |</p>
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<tr>
<td>79</td>
<td></td>
<td>Stockpiled materials would be stabilised in accordance with Roads and Maritime Services’ Stockpile site management guideline (2011).</td>
<td>Construction contractor</td>
<td>Construction</td>
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<td>80</td>
<td></td>
<td>All trucks would be covered when transporting material to and from the site.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>81</td>
<td></td>
<td>Work activities would be reprogrammed if the mitigation measures are not adequately restricting dust generation.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>82</td>
<td></td>
<td>Dust generating activities would be avoided during high wind conditions</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td>83</td>
<td>Exhaust emissions</td>
<td>Construction plant and equipment would be maintained in a good working condition in order to limit impacts on air quality.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>84</td>
<td></td>
<td>Plant and machinery would be turned off when not in use and would not</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>85</td>
<td>Smoke emissions</td>
<td>No burning of any timbers or other combustible materials would occur.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>86</td>
<td>Impacts on sensitive receivers</td>
<td>Local residents would be advised of hours of operation and duration of work and supplied with a contact name and number for queries regarding air quality.</td>
<td>Construction contractor</td>
<td>Construction</td>
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<tr>
<td></td>
<td>Socio-economic</td>
<td>A project communications strategy would be developed and would include the following:</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
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<tr>
<td>87</td>
<td>Construction related amenity impacts</td>
<td>• Communication with residents, businesses and organisations located in Eastgrove, along Bungonia Road, Memorial Road and Forbes Road would be undertaken in advance of construction to ascertain any specific times or events that should be considered in construction programming (eg Goulburn Markets held at the Goulburn Brewery one Saturday per month).</td>
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<td></td>
<td>• Residents living near the bridge, and the local community would be provided with timely and relevant information to enable them to understand the likely nature, extent and duration of vibration, dust and noise impacts and access changes.</td>
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<td>• Particular attention would be given to ensuring any vulnerable (elderly or low income) households are appropriately targeted.</td>
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<td></td>
<td>Communications would include roadside signage, letterbox dropped newsletters, newspaper advertisements, Roads and Maritime web based information, a complaints line, and advice to specific service providers such as community transport and seniors organisations.</td>
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</tbody>
</table>
| 88  | Waste minimisation           | The following resource management hierarchy principles would be followed:  
• Avoid unnecessary resource consumption as a priority.  
• Avoidance would be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery).  
• Disposal would be undertaken as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*). | Construction contractor | Construction    |
| 89  |                               | A waste management plan would be prepared, which would include the following:  
• Identify all potential waste streams associated with the work.  
• Identify opportunities to minimise the use of resources, and to reuse and recycle materials.  
• Outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities. | Construction contractor | Pre-construction |
<p>| 90  | Management of green waste and noxious weeks | Cleared weed free vegetation would be chipped and reused on-site as part of the proposed landscaping and to stabilise disturbed soils where possible. Weeds would be mulched separately and weedy mulch would not be reused. | Construction contractor | Construction    |
| 91  | Spoil management             | Excess excavated material would reused appropriately for fill on the proposal site, or other Roads and Maritime projects, or be disposed of at an appropriate facility. | Construction contractor | Construction    |
| 92  |                               | Excess soil requiring waste disposal would first be assessed against the <em>Waste Classification Guidelines- Part 1: Classifying Waste</em> (DECC, 2009) and disposed of to an appropriately licensed waste facility with supporting waste classification documentation. | Construction contractor | Construction    |</p>
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<tr>
<td>93</td>
<td>Waste management</td>
<td>Garbage receptacles would be provided and recycling of materials encouraged. Rubbish would be transported to an appropriate waste disposal facility.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>94</td>
<td>Portable toilets</td>
<td>Portable toilets would be provided for construction workers and would be managed by the service provider to ensure the appropriate disposal of sewage.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>95</td>
<td>Noxious weeds removed</td>
<td>Noxious weeds removed during construction would be managed in accordance with the requirements of the <em>Noxious Weeds Act 1993</em>.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>96</td>
<td>Wastewater contamination</td>
<td>A dedicated concrete washout facility would be provided during construction so that runoff from the washing of concrete machinery and equipment could be collected and disposed of at an appropriate waste facility.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>97</td>
<td>Hazardous waste contamination</td>
<td>A lead management plan would be prepared and implemented. The lead management plan would include details on hazardous waste management and disposal.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>98</td>
<td>All waste</td>
<td>All waste would be collected from the work area or containment daily and stored in separate clearly-labelled containers. Each waste container would be numbered and labelled as appropriate for the material, and stored in the designated waste zone within the construction compound.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>99</td>
<td>All hazardous waste</td>
<td>All hazardous waste must be disposed of at an EPA licensed waste facility licensed to accept that type of waste and transported by a licenced hazardous materials transporter.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>100</td>
<td>All hazardous wastes</td>
<td>All hazardous wastes require tracking, and should be transported by licensed hazardous waste transport companies.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>101</td>
<td>A Waste Management Register</td>
<td>A Waste Management Register would be maintained for the project to record the reuse, recycling, stockpiling or disposal of all waste sent off-site, including test results, quantities and ultimate method of disposal or treatment.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>102</td>
<td>Waste minimisation</td>
<td>The evaluation and management of timber removed from the existing Lansdowne Bridge would be in accordance with the requirements outlined in the Roads and Maritime Services’ <em>Environmental Direction No. 10 – Disposal/Recycling of Replaced Bridge Timbers</em>.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>No.</td>
<td>Impact</td>
<td>Environmental safeguards</td>
<td>Responsibility</td>
<td>Timing</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
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<td>----------------------</td>
</tr>
<tr>
<td>103</td>
<td>Climate change impacts on the proposal</td>
<td>Detailed design would take into consideration the potential effect of climate change on the proposal, including flooding and drainage requirements.</td>
<td>Roads and Maritime</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>104</td>
<td>Greenhouse gas emissions</td>
<td>The use of alternative fuels and power sources for construction plant and equipment would be investigated and implemented, where appropriate.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>105</td>
<td></td>
<td>The energy efficiency and related carbon emissions would be considered in the selection of vehicle and plant equipment.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
<tr>
<td>106</td>
<td></td>
<td>Materials would be delivered as full loads and local suppliers would be used where possible.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>107</td>
<td></td>
<td>Construction equipment, plant and vehicles would be appropriately sized for the task.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>108</td>
<td></td>
<td>Equipment would be serviced frequently to ensure they are operating efficiently.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>109</td>
<td></td>
<td>Clearing of natural vegetation would be minimised where possible.</td>
<td>Construction contractor</td>
<td>Construction</td>
</tr>
</tbody>
</table>

**Hazards and risks**

<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>Risk management</td>
<td>Emergency response plans would be incorporated into the construction environment management plan including a flood evacuation plan.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
<tr>
<td>111</td>
<td></td>
<td>A pollution incident response management plan would be developed and implemented in accordance with the <em>Protection of the Environment Operations Act 1997</em> requirements. The plan would form a sub plan within the construction environment management plan.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
</tbody>
</table>

**Demand on resources**

<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>112</td>
<td>Demand on resources</td>
<td>Procurement would endeavour to use materials and products with a recycled content where that material or product is cost and performance effective.</td>
<td>Construction contractor</td>
<td>Pre-construction and construction</td>
</tr>
</tbody>
</table>

**Cumulative environmental impacts**

<table>
<thead>
<tr>
<th>No.</th>
<th>Impact</th>
<th>Environmental safeguards</th>
<th>Responsibility</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>113</td>
<td>Cumulative impacts</td>
<td>The construction environment management plan would be revised to consider potential cumulative impacts from surrounding development activities as they become known.</td>
<td>Construction contractor</td>
<td>Pre-construction</td>
</tr>
</tbody>
</table>
7.3 Licensing and approvals

Table 7-2 outlines the licensing and approvals required before construction of the proposal.

**Table 7-2 Summary of licensing and approvals required**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Minister for Primary Industries must be notified of any dredging or reclamation work before undertaking such work.</td>
<td>A minimum of 28 days before work starts.</td>
</tr>
<tr>
<td>A Section 219 permit from Fisheries NSW would be required for the temporary obstruction to fish passage in Mulwaree Ponds as a result of the construction of a temporary piling pad.</td>
<td>Before work starts.</td>
</tr>
<tr>
<td>A Section 60 permit or Section 57(2) exemption would be required before work starts within the curtilages of SHR listed items.</td>
<td>Before work starts.</td>
</tr>
<tr>
<td>An exception notification would be sought from the NSW Heritage Division under Section 139 (4) of the <em>Heritage Act 1977</em> prior to mobilisation of the temporary construction compound. If relics were located at the site, further investigation and permits would be required.</td>
<td>Before work starts.</td>
</tr>
</tbody>
</table>
8. Conclusion

This section provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the principles of ecologically sustainable development as defined in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

8.1 Justification

The proposal is considered to be consistent with the following strategies or plans as it would lead to improved efficiency and safety of the local road network:

- NSW 2021.
- NSW Government State Infrastructure Strategy.
- Roads and Maritime Services’ Corporate Delivery Plan 2012-2013.

The proposal is considered justified as it would:

- Improve road safety through additional, wider traffic lanes, dedicated pedestrian and cycle facilities and improved road approaches.
- Provide two-way vehicle movement on the bridge.
- Eliminate the potential for lead contamination of the Mulwaree Ponds from the deteriorating paintwork on the bridge.
- Minimise disruption to the community in the long-term as the bridge would no longer need to be closed for frequent maintenance.
- Allow for higher mass limit vehicles which would allow all vehicles to use the bridge.

While there would be some environmental impacts as a consequence of the proposal, they have been avoided or minimised wherever possible through design and site-specific safeguards summarised in section 6. The beneficial effects listed in section 6.17 are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposal (refer section 6.18).

8.2 Ecologically sustainable development

An objective of the Environmental Planning and Assessment Act 1979 (EP&A Act) is to encourage ecologically sustainable development. The principles of ecologically sustainable development have been considered throughout development of the proposal and are considered further below.

8.2.1 Precautionary principle

This principle states ‘if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation’.

Evaluation and assessment of alternative options have aimed to reduce the risk of serious and irreversible impacts on the environment. Stakeholder consultation considered issues raised by stakeholders and a range of specialist studies were undertaken for key issues to provide accurate and impartial information to assist in the evaluation of options.
The detailed assessment of potential environmental impacts in the preparation of the concept design has sought to minimise impacts on the urban and natural amenity of the study area while maintaining engineering feasibility and safety for all road users. A number of safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposal. No safeguards have been postponed as a result of lack of scientific certainty.

A construction environment management plan would be prepared before construction starts. This requirement would ensure the proposed upgrade achieves a high-level of environmental performance. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

The principle states, ‘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 proposal would benefit future generations by ensuring the proposal does not give rise to long-term adverse impacts on the environment and potential impacts are minimised by implementation of appropriate safeguards. This would ensure the principle of intergenerational equity is not compromised.

Should the proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service associated with the Lansdowne Bridge. Public safety would be compromised due to age and condition of the bridge, lack of dedicated pedestrian and cycle facilities, and substandard road geometry and alignment. Maintenance work would continue to be high in cost and labour intensive.

The proposal would benefit future generations as it would ensure the improved road safety through additional, wider two-way traffic lanes, provision of shared pedestrian and cyclist facilities and improved road approaches. It would also eliminate the potential for lead contamination of the Mulwaree Ponds from the deteriorating paintwork on the bridge.

8.2.3 Conservation of biological diversity and ecological integrity

This principle states the ‘diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival.

A thorough assessment of the existing local environment has been undertaken in order to identify and manage any potential impacts of the proposal on local biodiversity. Specific design efforts have been taken to minimise impacts upon the local biodiversity.

The proposal is not considered to have a significant impact on biological diversity and ecological integrity. An ecological assessment and appropriate site-specific safeguards are provided in section 6.3. Site-specific safeguards include consideration of design impacts upon biodiversity, vegetation management and weed management.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires ‘costs to the environment should be factored into the economic costs of a project’.

The review of environmental factors has examined the environmental consequences of the proposal and identified mitigation measures for areas which have the potential to experience adverse impacts. Requirements imposed in terms of implementation of these mitigation measures would result in an economic cost to Roads and Maritime. The implementation of
mitigation measures would increase both the capital and operating costs of the proposal. This signifies environmental resources have been given appropriate valuation.

The design for the proposal has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates the concept design for the proposal has been developed with an environmental objective in mind.

### 8.3 Conclusion

The proposal involves the demolition of the existing de Burgh truss bridge and the construction of a new two lane, three span concrete bridge along the same alignment with shared pedestrian and cyclist facilities. The proposal also involves the realignment of Bungonia Road at the bridge approaches and the permanent closure of Forbes Street north of Bungonia Road.

The proposal is subject to assessment under Part 5 of the EP&A Act. The review of environmental factors 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. 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 review of environmental factors best meets the project objectives but would still result in some impacts including potential impacts on water quality during construction, removal of the existing heritage listed de Burgh Truss bridge, permanent closure of Forbes Street, construction noise and traffic impacts.

Mitigation measures as detailed in this review of environmental factors would ameliorate or minimise these expected impacts. The proposal would also improve safety for road users, improve driving conditions including two-way vehicle movement and higher mass limit vehicle movement across the bridge, reduce expensive and ongoing maintenance, and eliminate the potential lead contamination of the waterway. On balance the proposal is considered justified.

The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the proposal from the Minister for Planning and Infrastructure under Part 5.1 of the EP&A Act. The proposal is unlikely to 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. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance and therefore a referral to the 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, 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.

Monique Roser  
Principal Environmental Planner  
Date: 3/04/14

I have examined this review of environmental factors and the certification by Monique Roser and accept the review of environmental factors on behalf of Roads and Maritime.

Peter Townsend  
Project Manager  
Date: 23/05/14
10. **References**


Department of Environment, Climate Change and Water (DECCW), 2010b. *NSW Climate Impact Profile*. DECCW, Sydney.


Department of Primary Industries (DPI), 2013, *Policy and guidelines for fish habitat conservation and management: Update 2013*. NSW Department of Primary Industries, June 2013.


Penalver, D, 2012. Bridge is no place to be sentimental. (Article in the Goulburn Post, November 7). (L. Thrower, Interviewer)

Roads and Maritime Services, 2012a. Bridge Aesthetics: Design guideline to improve the appearance of bridges in NSW.


11. Terms and acronyms used in this review of environmental factors

Table 11-1 Terms and acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHIMS</td>
<td>Aboriginal Heritage Information Management System.</td>
</tr>
<tr>
<td>ARI</td>
<td>The average recurrence interval (ARI) is a measure of the rarity of a rainfall event and is the average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration.</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td><em>Environmental Planning and Assessment Act 1979 (NSW).</em> Provides the legislative framework for land use planning and development assessment in NSW.</td>
</tr>
<tr>
<td>EPBC Act</td>
<td><em>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).</em> Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.</td>
</tr>
<tr>
<td>ESD</td>
<td>Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.</td>
</tr>
<tr>
<td>FM Act</td>
<td><em>Fisheries Management Act 1994 (NSW).</em></td>
</tr>
<tr>
<td>GHD</td>
<td>GHD Pty Ltd.</td>
</tr>
<tr>
<td>Heritage Act</td>
<td><em>Heritage Act 1977 (NSW).</em></td>
</tr>
<tr>
<td>ICNG</td>
<td>Interim Construction Noise Guideline.</td>
</tr>
<tr>
<td>ISEPP</td>
<td><em>State Environmental Planning Policy (Infrastructure) 2007.</em></td>
</tr>
<tr>
<td>LALC</td>
<td>Local Aboriginal Land Council.</td>
</tr>
<tr>
<td>Noxious Weeds Act</td>
<td><em>Noxious Weeds Act 1993 (NSW).</em></td>
</tr>
<tr>
<td>NPW Act</td>
<td><em>National Parks and Wildlife Act 1974 (NSW).</em></td>
</tr>
<tr>
<td>OEH</td>
<td>Office of Environment and Heritage.</td>
</tr>
<tr>
<td>Proposal site</td>
<td>The area that would be directly impacted by the proposal.</td>
</tr>
<tr>
<td>RTA</td>
<td>NSW Roads and Traffic Authority which now forms part of Roads and Maritime.</td>
</tr>
<tr>
<td>RTA QA Specifications</td>
<td>Specifications developed by Roads and Maritime for use with roadwork and bridgework contracts let by Roads and Maritime.</td>
</tr>
<tr>
<td>SEPP 14</td>
<td><em>State Environmental Planning Policy No.14 – Coastal Wetlands.</em></td>
</tr>
</tbody>
</table>
The study area encompasses the proposal site and the area that may indirectly be impacted by the proposal.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study area</td>
<td>The study area encompasses the proposal site and the area that may indirectly be impacted by the proposal.</td>
</tr>
</tbody>
</table>