

Camp Street Bridge replacement

Review of environmental factors

Roads and Maritime Services | June 2018



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Roads and Maritime Services

Camp Street Bridge Replacement, Forbes

Review of environmental factors

June 2018


Prepared by AECOM Australia Pty Ltd and Roads and Maritime Services

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Executive summary

The proposal

Roads and Maritime Services propose to replace the current Camp Street Bridge over Lake Forbes with a new reinforced concrete bridge. A new bridge is required due to the poor condition of the current bridge and the high costs of maintaining the bridge to continue carrying traffic loads.

Key features of the proposal include:

- Demolition of the current Camp Street Bridge and foot bridge
- Construction of a new bridge at the same location as the current bridge
- Landscaping and drainage works
- Establishing work areas including construction compounds and temporary work areas in and around the Lake
- Temporarily lowering water levels in Lake Forbes to allow construction
- A temporary detour for heavy vehicles (above 22.5 tonnes Gross Vehicle Mass (GVM), school buses excluded) to and from Orange on the Escort Way, and to and from Cowra on the Lachlan Valley Way.
- Alternative access for light vehicles travelling to and from the eastern and western sides of Lake Forbes.

Need for the proposal

Camp Street Bridge was constructed in 1927 and is in poor condition. The concrete bridge piers (legs) that support the bridge are old, carbonated and corroded. The bridge's ability to carry the weight of traffic safely is reducing with age. The current bridge does not comply with current design standards and is not capable of supporting heavier vehicles with Higher Mass Limit (HML) loads.

A major bridge replacement is required to allow the crossing to continue carrying local traffic and traffic using the Escort Way and Lachlan Valley Way. The primary justification for the proposal is the increasing regular and expensive maintenance work necessary to maintain the structural integrity of the current bridge. The maintenance costs will be more expensive than the cost of a new bridge.

The proposal is consistent with a number of strategic plans including:

- National Road Safety Strategy
- NSW 2021 : A Plan to Make NSW Number One
- NSW Government State Infrastructure Strategy
- Rebuilding NSW State Infrastructure Strategy 2014 - Update
- Central West Region Transport Plan 2013 and update 2014-15
- Draft Future Transport Strategy 2056.

Proposal objectives and development criteria

The objectives of the proposal include:

- Provide a structure that meets community needs and expectations
- Provide a new landmark structure on the entry to Forbes
- Improving road user and pedestrian safety
- Improving pedestrians and cycling connectivity
- Improving environmental outcomes
- Reducing expensive and ongoing maintenance costs.

The criteria for the proposal include:

- Provide a new bridge at the same location on the same alignment as the current bridge
- Provide a bridge with a minimum of two 3.5 metre lanes for vehicles travelling two ways, 1.5 metre clear shoulders and footpaths for cyclists and pedestrians.
- Provide a design that does not alter the flooding behaviour of Lake Forbes
- Allow for pedestrian and cyclist connectivity with existing footpaths
- Ensure the new bridge is designed for 50km/h traffic speed, to match the current bridge speed limit
- Improve access for wide vehicles
- Consider the design and visual impacts of the new bridge
- Ensure the new bridge complements the heritage features of the town
- Provide an iconic structure for the Forbes community for the future.

Options considered

Options considered include:

1. Do nothing
2. Short, medium and long term maintenance programs to extend the life of the current bridge
3. Replacement of the current bridge at the same location on the same alignment.

Option three is the preferred option. Option three provides the best value for money and best meets the project objectives.

Statutory and planning framework

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) applies to the proposal. Under clause 94 of the ISEPP the proposal is considered development for the purposes of a road or road infrastructure facilities. ISEPP allows Roads and Maritime to carry out this type of development without development consent from Forbes Shire Council. Therefore, Roads and Maritime is the proponent and the determining authority for the proposal and is required to prepare this review of environmental factors (REF) under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

An assessment of the proposal's potential impact on matters of national environmental significance (MNES) has been conducted in accordance with the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Community and stakeholder consultation

Roads and Maritime Services has consulted a range of community members and key stakeholders. This includes Forbes Shire Council, the Forbes Chamber of Commerce, local business and government agencies. Government agencies include the Department of Primary Industry (Water) and the Department of Primary Industries (Aquatic Environment).

Community and stakeholder consultation on the proposal has been undertaken throughout the proposal. Consultation has included three community drop-in sessions in October 2017; an online community survey; door to door consultation with Camp Street businesses; and presentations to Forbes Shire Council, Forbes Historical Society and Central West Lachlan Landcare Parkes/Forbes.

The most common issues raised by the community regarding replacing the current bridge are detailed below:

- The impact on local heritage with the demolition of the current bridge
- The visual appearance of the new bridge and landscaping
- The traffic detour routes whilst the crossing is closed during demolition and construction.

Community and stakeholder consultation will continue during the public display of this REF, and during the construction of the proposal.

Environmental impacts

Detailed technical investigations have been carried out to assess, manage and mitigate the potential impacts of the proposal. The key areas of investigations include investigating potential impacts on non-Aboriginal heritage, landscape and visual impacts, traffic and transport, noise and vibration, and flooding.

The following outlines the main environmental impacts of the proposal:

- Removal of the local heritage listed Camp Street Bridge and replacement with a new bridge. A Statement of Heritage Impact (SOHI) was undertaken to determine local heritage impacts of demolition of the current Camp Street Bridge. The Camp Street Bridge has been assessed as having moderate local heritage value. The 'art deco' light fittings features of the bridge are assessed as having exceptional heritage value. "Art deco" is a visual art style from the 1920's to 1930's. These light fittings will be reused in the landscaping for the replacement bridge. Heritage archival recording will be undertaken on the bridge prior to its demolition.
- Visual appearance of the new bridge. The new bridge has been designed to blend into the surrounding open parkland setting to reduce visual impact. The art deco light fittings on the current bridge, which are a key visual feature, will be reused in the landscaping of the new bridge as an entry feature into Forbes.

Landscaping will provide vegetation features that blend into the parkland setting whilst also improving the quality of stormwater runoff. Shared pedestrian and cyclist path on the bridge will connect to the existing pedestrian and cycleways around the Lake.

- Heavy vehicle detours during bridge demolition and construction. Heavy vehicle detours will be in place for around 43 weeks of the 54 week construction period, weather permitting. The detour will not be required during early construction work such as moving utilities such as telecommunications, power, water and gas.

There are various alternative local routes available for light vehicles. It is expected that most light vehicles will use Flint Street from the roundabout at its intersection with Bridge Street, then follow either Bandon Street or Oxford Street to reach the Newell Highway.

The proposed detour route for heavy vehicles to and from Orange on the Escort Way, and to and from Cowra on the Lachlan Valley Way would be from the intersection of Newell Highway and Camp Street across the Fitzgerald Bridge then onto Wirrinya Road, Red Bend Road, Wongajong Road and then onto Lachlan Valley Way. The heavy vehicle detour route will be sign posted during construction and will add approximately 15.5 kilometres and 22 minutes to travel times.

- Noise and vibration. The proposal has an estimated construction period of around 54 weeks, weather permitting. During this time there will be periods of noise from heavy construction machinery, the bridge demolition and new bridge construction.

Up to 191 residences and buildings are predicted to have noise that exceeds Noise Management Levels (NMLs) during the loudest construction activities. This includes the demolition of the current bridge and construction of the new bridge. No receivers are predicted to be 'highly affected' (i.e predicted noise levels over 75 dB(A)) and management measures would focus on consultation with affected receivers. The most affected receivers are located along Hill Street, Barwin Street and Bridge Street. Consultation would be undertaken with potentially affected residents prior to periods of noisy construction activities. The proposal will not change traffic noise when the new bridge is opened.

- **Water quality.** Demolition and construction will be undertaken in Lake Forbes. Water quality risks during construction include sediment, large pollutants and spills. Water quality protection measures will be used to protect the Lake. This includes spill kits, bunds, protective sheeting and floating curtains in the Lake. When the proposal is finished it will improve the quality of local stormwater runoff entering the Lake. The landscape design includes vegetation that treats water from the road.
- **Flooding.** Temporary construction platforms in Lake Forbes could raise the water level in the Lake. The temporary platforms will be constructed so that water can flow over them so that upstream crossings will not be affected. The new bridge will not change flood levels when opened.
- **Lowering the Lake.** The water level in the Lake will be lowered by about 0.5 meters for around 45 weeks to allow demolition of the current bridge and construction of the replacement bridge. Roads and Maritime will consult with irrigators and Department of Industry (Water) prior to lowering the Lake. Roads and Maritime will implement a plan to relocate native fish that may be affected during the lowering.

Justification and conclusion

The current bridge is reaching the end of its economic life with maintenance costs increasing, making it more cost effective in the longer term to replace the bridge. The new bridge will meet community needs and expectations, provide a new landmark structure on the entry to Forbes and reduce expensive ongoing maintenance costs. It will improve road user safety, wide vehicle load accessibility, pedestrian and cyclist connectivity and environmental outcomes. The social, environmental and economic benefits of the proposal are consistent with the objectives of sustainable development. Replacing the bridge is therefore considered to be the best option.

The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

Environmental impacts can be effectively mitigated with the application of safeguards outlined within the REF. Environmental impacts are of a limited duration and temporary. The benefits of the proposal will outweigh any potential impacts on the environment.

The environmental impacts of the proposal are not likely to be significant and therefore the preparation of an environmental impact statement and approval from the Minister for Planning under Part 5.1 of the EP&A Act is not required for the proposal.

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the Environment Protection and Biodiversity Conservation Act 1999. A referral to the Australian Department of the Environment and Energy is not required.

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1 Introduction

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

1.1 Proposal identification

Roads and Maritime Services (Roads and Maritime) propose to replace the current Camp Street Bridge over Lake Forbes (B4286) with a new reinforced concrete bridge (B11707). A new bridge is required due to the poor condition of the current bridge and the high costs of maintaining the bridge to continue carrying traffic loads.

The “proposal” as assessed in this Review of Environmental Factors (REF) involves the removal of the existing Camp Street Bridge and replacement with a new bridge that complies with current bridge design codes.

Camp Street Bridge (Bridge B4286) is located over Lake Forbes on MR56 Lachlan Valley Way at Forbes. The project is in the local government area of Forbes Shire Council. It is in the state electorate of Dubbo.

The Camp Street Bridge was built in 1927 and is narrow, in poor condition and nearing the end of its life. A new bridge is needed to meet current design standards and improve safety for motorists and pedestrians into the future.

A new bridge across Lake Forbes will improve safety for motorists, pedestrians and reduce future maintenance requirements. The project involves building a new, wider bridge across Lake Forbes with wider travel lanes and pedestrian/cyclist paths. The design includes landscaping suitable to the surrounding lakeside environment. The lamp posts from the existing bridge will be adaptively reused in the landscaping to complement the town's heritage aesthetics.

The benefits of the project are:

- Providing a value for money solution to replace the aging bridge and secure access for local and through traffic on the Escort and Lachlan Valley Way
- Provide for Higher Mass Limit (HML) loads
- Improving road user safety through wider travel lanes, improved road approaches and pedestrian/cyclist paths across the new bridge
- Improving connections for pedestrians and cyclists between both sides of Lake Forbes
- Improving pedestrian amenity
- Reduced ongoing maintenance costs
- Improved environmental outcomes by managing stormwater runoff from the road into Lake Forbes
- Retaining the lamp posts in the landscape design on the approach to bridge, to reference the past and link the bridge to the heritage aesthetic of the town
- A unique design to provide an iconic structure for the Forbes community for the future.

The features of the proposal include:

- Relocation of utilities from the current Camp Street Bridge
- Demolition of the current Camp Street bridge and attached footbridge
- Placement of a temporary in stream structure in Lake Forbes to facilitate demolition of the current bridge and construction of a new bridge
- Construction of a new bridge on the same road alignment as the current bridge
- A bridge with a minimum of two lane, two way carriageway with 3.5m lanes and 1.5m clear shoulders with improved access for wide vehicles and provision of footpaths for cyclists and pedestrians

- Design traffic speed to match existing (50km/h horizontal and vertical design speed)
- Earthworks and roadworks
- Landscaping and drainage works
- A temporary construction compound site, temporary stockpile and laydown area on the western side of Lake Forbes in open space either side of Camp Street
- Ancillary works area including temporary stockpile and material laydown on the eastern side of Lake Forbes in open space either side of Bridge Street
- Temporary heavy vehicle detour route for heavy vehicles to and from Orange on the Escort Way, and to and from Cowra on the Lachlan Valley Way. The heavy vehicle detour route will be signposted throughout construction.
- Temporary light vehicle detour for light vehicles travelling to and from the east and western sides of Lake Forbes. There are various alternative local routes available for light vehicles. It is expected that most light vehicles will use Flint Street, from the intersection at Bridge Street, and then either Bandon Street or Oxford Street to the intersection of the Newell Highway with either Oxford Street or Sheriff Street depending on the direction of traffic.

The location of the proposal is shown in **Figure 1-1**. An overview of the proposal is provided in **Figure 1-2**. The proposed landscape design for the western and eastern abutments and adjacent public parks are provided in **Figure 1-3** and **Figure 1-4**. The temporary heavy and light vehicle detour route is shown in **Figure 1-5**. Chapter 3 describes the proposal in more detail.

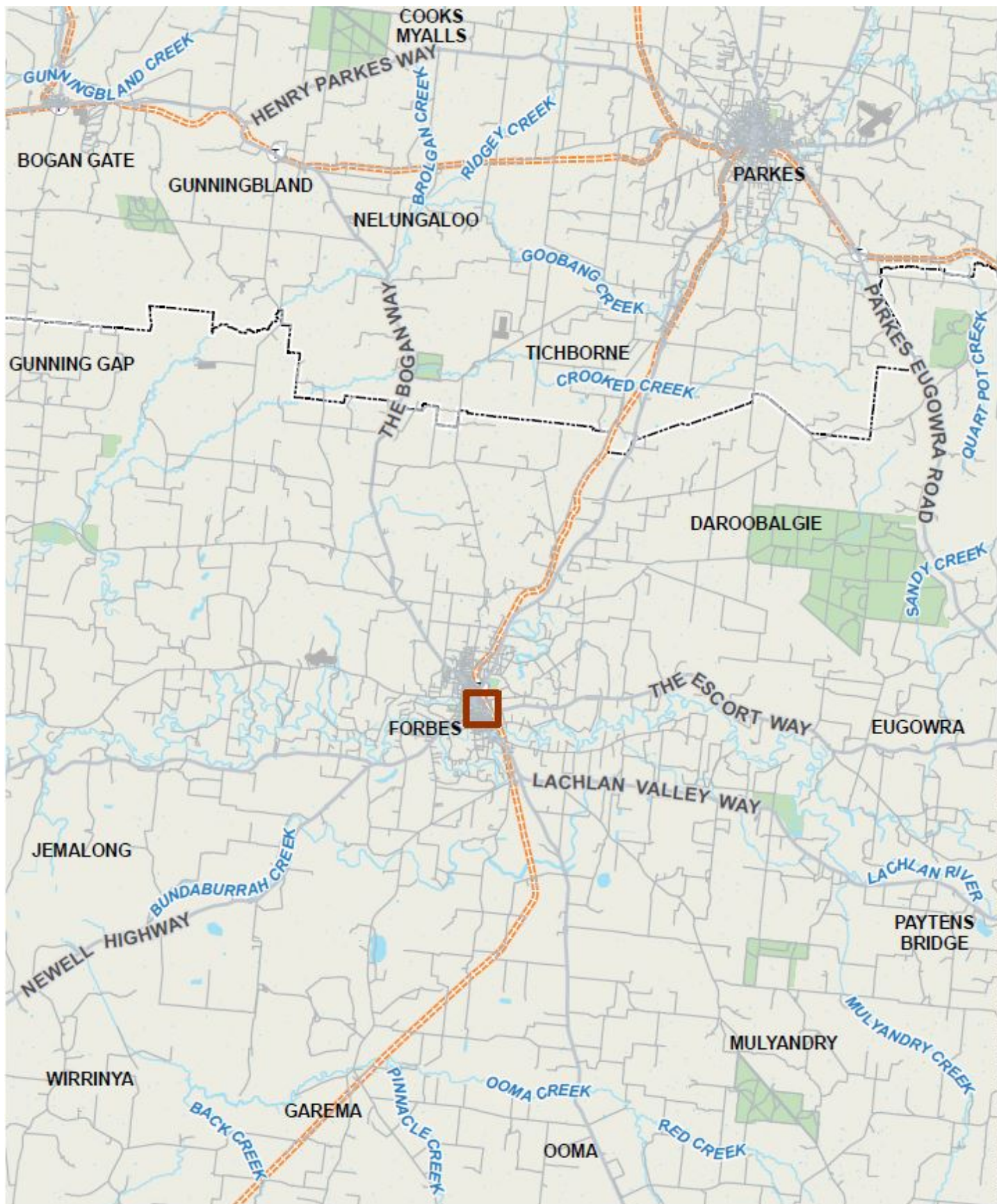


Figure 1-1: Location of the proposal



KEY

- Proposal area
- Cadastre
- Ancillary area and/or ancillary area
- Approximate utility underbore
- Bridge replacement
- Potential site compound and/or ancillary area
- Temporary in-stream structure
- Landscaped plantings potentially impacted
- Tree potentially impacted
- Water fountain
- Water level control structure



Figure 1-2: The proposal



Figure 1-3: Proposed landscape design for western abutment and adjacent public parks



LEGEND

EXISTING ELEMENTS

- TREES PROTECTED & RETAINED
- TREE PROTECTION ZONE
- + 78.0 EXISTING LEVELS
- + 70.0 DESIGN LEVELS
- CONTOURS (EXIST.)
- CONTOURS (DESIGN)

SURFACES & INCIDENTAL WORKS

PAVINGS

- CONCRETE PATH
- FEATURE PAVING

INCIDENTAL WORKS

- BOARDWALK
- RELOCATED HISTORIC BRIDGE LAMP
- CULVERT

WATER SENSITIVE URBAN DESIGN

- VEGETATED SWALE
- ROCK MULCH SWALE
- ROCK BOULDERS
- ROCK MULCH EDGE
- ROCK BANK
- WETLAND FILTER LAKE EDGE
- SLOTTED KERB
- RECLAIMED WATER EDGE

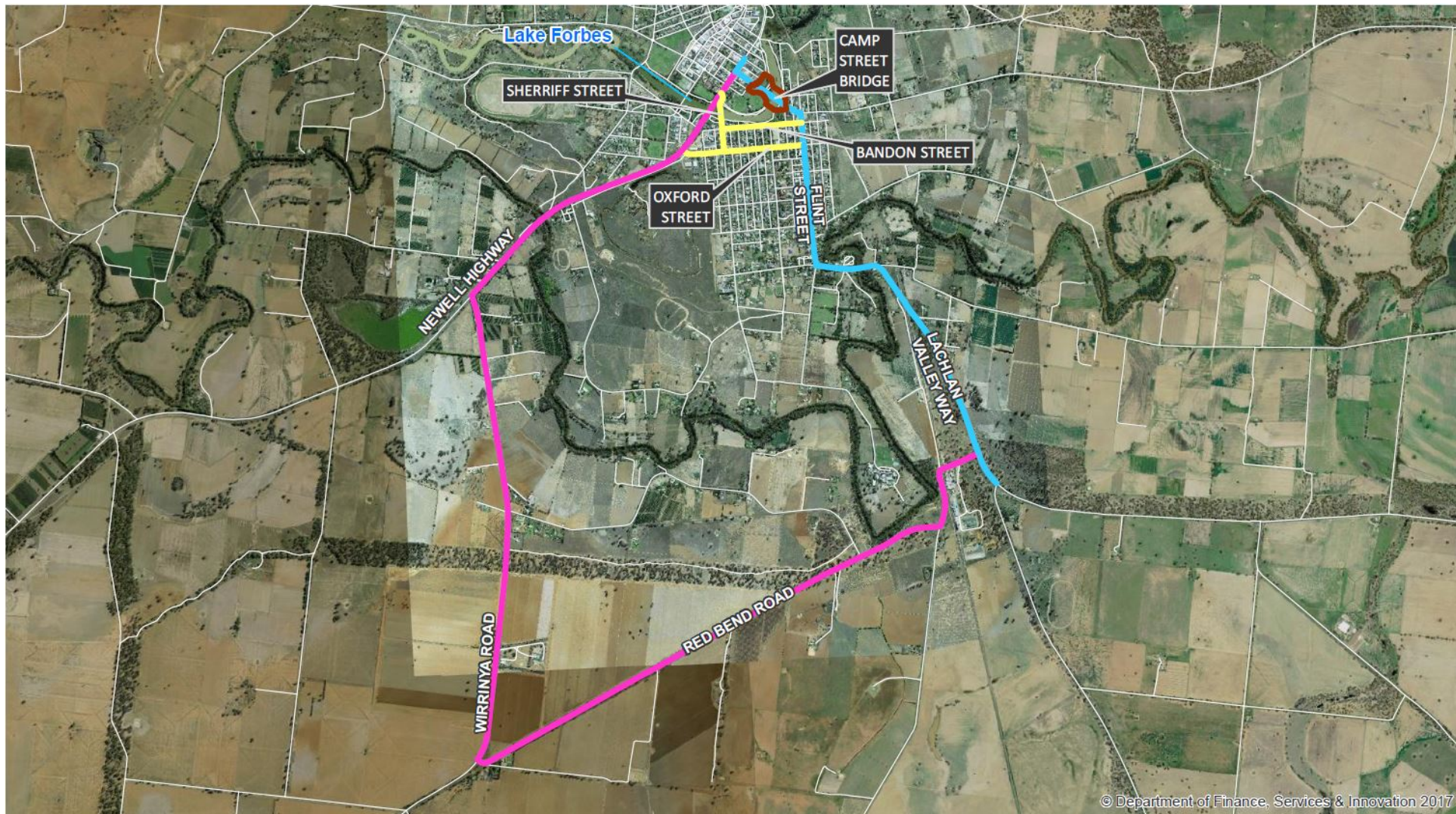
PLANTING

- MASS PLANTING BED 1 - NATIVE GRASSES
 - 100MM TUBES PLANTED @ 6M²
 - 200MM DEPTH CULTIVATION
 - 150MM DEPTH TOPSOIL (UNLESS OTHERWISE SHOWN)
 - 75MM DEPTH WOODCHIP MULCH
- MASS PLANTING BED 2 - LOW SHRUBS
 - TUBETOCK @ 1M² OR AS SHOWN
 - 200MM DEPTH CULTIVATION
 - 150MM DEPTH TOPSOIL (UNLESS OTHERWISE SHOWN)
 - 75MM DEPTH WOODCHIP MULCH
- TURF
 - MIN. 75MM DEPTH TOPSOIL

TREE PLANTING

- Eucalyptus camaldulensis*
River Red Gum
- Casuarina cunninghamiana*
River Oak
- Phoenix canariensis*
Canary Island Date Palm

Figure 1-4: Proposed landscape design for eastern abutment and adjacent public parks



- Proposal area
- Existing Traffic Route
- Heavy Vehicles Diversion Route
- Light Vehicles Diversion Route



Figure 1-5: The proposal showing light and heavy vehicle detour routes

1.2 Purpose of the report

This REF has been prepared by AECOM Australia Proprietary Limited (AECOM) on behalf of Roads and Maritime. For the purposes of these works, 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 REF 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 proposed work and associated environmental impacts have been undertaken in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), the *Biodiversity Conservation Act 2016* (BCA 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 REF 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 REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the BCA Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 Need and options considered

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

2.1 Strategic need for the proposal

2.1 Strategic need for the proposal

NSW and Australian strategic documents relevant to the proposal are considered below.

National Road Safety Strategy 2011-2020

The *National Road Safety Strategy 2011–2020* (Australian Transport Council, 2011) aims to reduce death and serious injury on Australian roads. A target of this strategy is to reduce fatalities and crashes on roads by at least 30 per cent between 2011 and 2020.

The intent of 'safe roads' is to ensure roads are designed and maintained to reduce the risk of crashes occurring and to lessen the severity of injury if a crash does occur. 'Safe roads' aims for all new and upgraded road infrastructure to be designed, constructed and operated in accordance with Safe System principles. It also aims to modify infrastructure funding guidelines and agreements to increase the safety benefits resulting from expenditure on roads.

The proposal would assist this strategy by providing a new bridge that would replace an ageing bridge which has been identified as reaching the end of its asset life. The proposal would see a new bridge designed to meet current safety standards (*AS 5100 Bridge Design*) and in doing so would remove safety issues associated with the existing bridge and issues associated with its original design.

NSW 2021: A Plan to Make NSW Number One

The proposal directly addresses two of the transport and infrastructure goals identified in the State Government's *NSW 2021: A Plan to Make NSW Number One* (Department of Premier and Cabinet, 2011), including reducing travel times and improving road safety.

To achieve the goal of reducing travel times for those travelling by car, bus or truck, the NSW Government aims to ease transport congestion by improving the efficiency of the road network. This is achieved through the delivery of road infrastructure that improves and expands capacity on road corridors.

To achieve the goal of improving road safety, the NSW Government aims to reduce fatalities to 4.3 per cent per 100,000 population in 2016 by carrying out road development, upgrades, maintenance and safety work that address crash risks.

The proposal helps to fulfil the NSW 2021 transport aims identified above by improving road safety and the efficiency of the road network in the vicinity of the proposal. Replacing the Camp Street Bridge, which has been identified as reaching its end of life, with a new bridge that meets current safety standards would provide a safe and efficient access to the township of Forbes from the east.

NSW Government State Infrastructure Strategy

The *NSW Government State Infrastructure Strategy 2012 – 2032: First Things First* (Department of Premier and Cabinet, 2012) is a strategy to plan and fund the infrastructure that the NSW Government delivers. The plan states that investment is needed to ensure sufficient road capacity is available and is utilised effectively, particularly along the motorway network. The proposal would help fulfil the regional infrastructure priorities in chapter 5 of the *State Infrastructure Strategy 2012 – 2032* by improving local transport networks. The proposal would assist this strategy by providing a new bridge that would replace an ageing bridge which has been identified as reaching the end of its asset life.

Rebuilding NSW State Infrastructure Strategy 2014 – Update

The *Rebuilding NSW State Infrastructure Strategy 2014 – Update* (NSW Department of Premier and Cabinet, 2015) is the NSW Government's response to the recommendations made by Infrastructure NSW in the *State Infrastructure Strategy 2012 – 2032* (Infrastructure NSW, 2012). This 20 year strategy identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth in NSW.

This strategy states the freight industry is critical to the NSW economy and by 2031 the amount of freight travelling in NSW will nearly double. The investment in better roads would deliver an economic dividend to regional communities through improved access to employment opportunities and regional businesses more readily attracting business investment. Regional road upgrades were a prominent theme in the Rebuilding NSW consultation. The improved road safety and efficiency objectives of the proposal are consistent with the priorities of this strategy.

The new bridge will cater for HML vehicles. This will increase the efficiency of movement of these loads and improve economic productivity.

Central West Regional Transport Plan 2013 and update 2014-15

The central west regional transport plan provides a blueprint for the future and strategic direction for the delivery of major projects over a 20 year lifespan.

One of the key actions in the regional transport plan is to invest in road upgrades including maintaining regional and local arterial roads to a standard that facilitates the movement of heavy vehicles. The proposal is consistent with this action. It will improve and secure the movement of heavy vehicles on the Lachlan Valley and Escort Way by replacing an aging bridge with a low maintenance structure that caters for heavy vehicles including HML.

Draft Future Transport Strategy 2056 and Draft Regional NSW Services and Infrastructure Plan

The Draft Future Transport Strategy is a vision for how transport can support growth and the economy of New South Wales over the next 40 years. This strategy is underpinned by the Draft Regional Services and Infrastructure Plan and the Draft Greater Sydney Services and Infrastructure Plan as well as a number of supporting plans including Road Safety and Tourism.

The Draft Regional NSW Services and Infrastructure Plan regional transport model adopts a 'hub and spoke' network model radiating out from regional cities rather than just a network focused on Sydney. Forbes is a satellite city in the model supporting regional transport hubs at Dubbo, Orange, Bathurst and Wagga Wagga.

The proposal is consistent with the draft strategy. The proposed new bridge will provide reliable and safe transport to the local community and regional centres, and improve freight movement by catering for heavier loads.

2.2 Existing infrastructure

2.2.1 Camp Street bridge

Camp Street Bridge (BN4286), on Camp Street across Lake Forbes, is a 9 span concrete beam structure. The bridge was built in 1927. The bridge is shown in **Figure 2-1**.

The reinforced concrete bridge has nine spans with a total length of around 58.826 m. The reinforced concrete deck and five integral girders are supported by reinforced concrete headstock and piers founded on driven timber piles. The piers of the bridge consist of five square piles with a concrete headstock. The abutments are of simple construction similar to the piers and the abutment areas have been protected from erosion by concrete filled revetment mattresses.

The deck carries two lanes of traffic. The two lanes are 6.096 m wide between kerbs with a footway on either side. A three rail pipe pedestrian balustrade protects the edge of the bridge and supports four lamp standards. Camp Street and Bridge Street are two way, single lane each direction, with a posted speed limit of 50km/h. The bridge has a warning sign alerting traffic to a “Narrow bridge” on the approach.

The reinforced concrete lamp posts comprise of art-deco features. The central lamp posts use single luminaires whilst the end posts have double luminaires suspended from a concrete cross-arm. The lamp posts are painted which enhances their architectural features. The lamp posts are shown in **Figure 2-2**.

A durability assessment was carried out on the bridge in 2015. The durability assessment identified that the bridge is in poor condition. The issues include spalling, corrosion and with a high concentration of corrosive chloride ions found in the piers. Over 50% of the bridge piers were found to have defects.

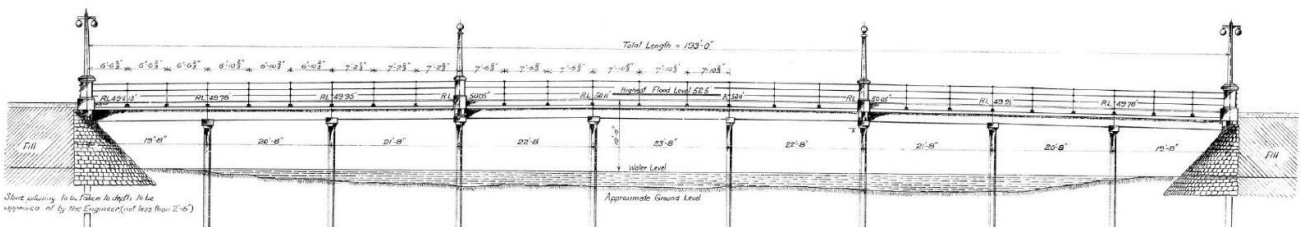


Figure 2-1: Camp Street Bridge Elevation (Above) and 1927 Work as Executed (Top)



Figure 2-2: Camp Street Bridge showing art deco light fixtures

2.2.2 Temporary heavy vehicle detour route

The temporary heavy vehicle route is from the intersection of Newell Highway and Camp Street across the Fitzgerald Bridge then onto Wurrinya Road, Red Bend Road, onto Wongajong Road and the onto Lachlan Valley Way. The heavy vehicle route is shown in **Figure 1-5**.

The Newell Highway is a two way, single lane each direction highway. The Newell highway is zoned 50km/h in the Forbes township and increases to 80 km/h from the outskirts of the Newell Highway to the intersection with Wurrinya Road. Wurrinya Road, Red Bend Road and Wongajong Road are two way, single lane in each direction roads. The posted speed of Wurrinya Road is 100km/h.

Wongajong Road crosses a rail line on a sharp bend. The road surface on the section of road from Wongajong Road to the intersection with Lachlan Valley Way has deteriorated in some areas.

Iron Bridge, on Reymond Street, is a narrow bridge located along the proposed heavy vehicle detour route. Iron Bridge is being reconfigured to single lane operation controlled by traffic lights prior to implementation of the proposed detour route.

2.3 Proposal objectives and development criteria

2.3.1 Proposal objectives

The objectives of the proposal include:

- Improving road user safety
- Improving pedestrians and cycling connectivity
- Reduced ongoing maintenance costs
- Improving environmental outcomes.

2.3.2 Development criteria

The development criteria for the proposal include:

- Provide a new bridge on the same road alignment as the old bridge
- Provide a bridge with a minimum of two lane, two way carriageway with 3.5m lanes and 1.5 m clear shoulders with provision of footpaths for cyclists and pedestrians.
- Provide a bridge that complies with current bridge design codes (*AS 5100 Bridge Design*) and is capable of supporting HML loading
- Provide a design that does not have an adverse effect on hydraulics in the Lake Forbes area
- Consider pedestrian and cyclist interactions in the design
- Provide boxed-in abutments
- Design traffic speed to match existing (50km/h horizontal and vertical design speed)
- Improve access for wide vehicles
- Consider urban design and visual impact associated with the proposed replacement bridge
- Link the bridge to the heritage aesthetic of the town
- Provide an iconic structure for the Forbes community for the future.

2.3.3 Urban design objectives

The urban design objectives for the proposal include:

- Replace the existing bridge and footbridge with a new landmark structure that celebrates the entry into Forbes
- Minimise visual impacts to the existing character of the setting
- Respect the heritage values of the existing structure
- Enhance the urban connectivity and respond to the desired future character and functioning of the area
- Reinforce the entry into Forbes with a strong landscape design
- Minimise impact on the community
- Design for low maintenance.

2.4 Alternatives and options considered

2.4.1 Methodology for selection of preferred option

Roads and Maritime commissioned a durability assessment in 2015 (CTI Consultants, 2015) which identified that the Camp Street Bridge is in poor condition. Concrete components of the bridge are suffering from spalling, cracking, high chloride concentrations, and carbonation in the bridge concrete.

The 2015 report recommended a number of repair and maintenance activities to address these issues. Roads and Maritime developed a range of options to address the recommendations. This included various maintenance regimes to increase the bridge's lifespan, and an option to replace the bridge. Roads and Maritime commissioned an engineering and heritage assessment in 2017 (Focus Engineering 2017). A summary of the options considered are summarised in section 2.4.2.

The selection of a preferred option has been undertaken by comparing:

- Performance against the proposal objectives as described in section 2.3.1
- Ability of the proposal to meet the requirements of the proposal development criteria as described in section 2.3.2
- The capital and maintenance costs over its lifespan
- The lifespan of the option to safely cater for vehicles and pedestrians
- The ability to cater for HML loads.

2.4.2 Identified options

The options considered are described below:

Option: “Do nothing”

The “Do Nothing” option involves retaining the existing bridge. Routine and minor maintenance activities would be undertaken as well as routine inspections.

Routine maintenance activities include:

- Clean bridge scuppers and remove vegetation
- Graffiti removal
- Minor repairs pedestrian balustrade
- Street lighting
- Replace damaged signs.

Minor maintenance activities include:

- Patch repair all concrete spalls annual allowance
- Patch paint repairs to the steel pedestrian balustrades
- Replace small movement joints to all concrete spans.

This option would not address the major condition issues identified in the 2015 durability assessment report of the bridge.

Option: Short, medium and long term maintenance programs to increase the bridge operational life

Roads and Maritime have considered a number of maintenance strategies to extend the operational life of the bridge. The strategies include asset condition monitoring and the implementation of minor and major maintenance programs to extend the lifespan of the bridge. Although these maintenance strategies delay the timeframes to replace the bridge, they do not stop the eventual need for a new bridge. These options do not provide for any improved connectivity for pedestrians and cyclists or improved environmental outcomes.

The maintenance regimes considered include:

1. Short term maintenance program with the bridge replaced by 2020.

This option would involve 2 yearly inspections and minimal maintenance on the bridge. This option does not address the major condition issues identified in the 2015 durability assessment of the bridge. This option aims to limit the funds spent on the bridge recognising that it will be replaced in the near term.

2. Medium term maintenance program with the bridge replaced by 2035.

This option involves a more rigorous monitoring program than the short term maintenance program. Minor and major maintenance activities would be undertaken.

This option does not address all of the major condition issues identified in the 2015 durability assessment of the bridge. Concrete repairs would be undertaken and a sacrificial anode applied to protect the bridge. The deck would be water proofed and re-asphalted.

3. Long term maintenance program with the bridge replaced by 2070. This option has the same monitoring and minor maintenance activities as the medium term maintenance program. This option increases the extent of major maintenance activities to include either pier rehabilitation or replacement.

Option: Replacement of Camp Street bridge

This option involves the construction of a new bridge on Camp Street across Lake Forbes. The existing bridge will be demolished and the new bridge constructed on the current alignment. This allows the bridge to tie in with the existing road network and minimise the extent of additional proposal footprint. The new bridge will be constructed to cater for HML and provide pedestrian and cycling connectivity.

This option includes measures to improve environmental outcomes. It includes waster sensitive urban design features to improve road water quality entering Lake Forbes and landscaping. This option improves pedestrian and cycling connectivity.

Option: Bridge Piling methods

Roads and Maritime investigated two bridge piling methods for the bridge piles. These two options consisted of:

1. Pile bored with casing method
2. Driven steel tube with concrete infill method. This technique uses a seven to nine tonne hammer to drive the piers.

2.4.3 Analysis of options

Bridge

The options assessment was undertaken in the Focus Engineering (2017) “*Camp Street Bridge (BN4286) at Forbes, NSW Strategic Options and Engineering Heritage Assessment Report*”. A summary of the options against the option assessment criteria is provided **Table 2-1**.

The “do nothing” option does not meet the project objectives. The operational capability of the bridge would degrade as concrete structural components deteriorate. This increases the risk for road users. This option does not offset the eventual need for a new bridge and hence does not result in any economic savings over the New Camp Street Bridge option. The “Do nothing” option is subsequently discarded.

The options that considered various maintenance regimes to expand the life of the bridge were found to perform poorly against key project objectives. These options did not cater for HML, with the exception of the long term maintenance option that included replacement of the piers. The maintenance options perform poorly economically. They have increased annual maintenance costs versus a new bridge over Camp Street. The maintenance options do not replace the eventual need to replace the bridge and hence there are no capital costs savings. Maintenance options are subsequently discarded in favour of a new bridge.

The option for a new Camp Street bridge meets the project objectives. This option meets the load bearing requirements for HML and has the longest lifespan of the options considered. This option has the lowest maintenance costs, being a new structure. It is the most economical when considering the total maintenance costs and eventual bridge replacement cost of the “do nothing” option and options involving various maintenance regimes to increase the operational life cycle.

Piling methodology

Geological investigations and noise and vibration assessment were used to assess the two piling methods. The pile bored with casing method was found to have the less noise and vibration effects. Geotechnical investigations identified that the geology under the bridge consists of fractured rock. The pile bore with casing method is not suitable in fractured rock. Subsequently the driven steel tube with concrete infill method has been adopted due to the geological constraints.

Table 2-1 Summary of bridge options against selection criteria

Option	Performance against Objectives	Option Longevity	Higher Mass Limit loads	Cost estimate*
Do nothing	Does not meet the project objectives	Short term	Does not cater for HML Load bearing capacity reduced as concrete components deteriorate	\$0.2 M Estimated cost to year 2020. A new bridge would be required
Short term maintenance program	Does not meet the project objectives	Short term 2020	Does not cater for HML. Load bearing capacity reduced as concrete components deteriorate	\$0.2M Estimated cost to year 2020 at which point the bridge would need to be replaced
Medium term maintenance program	Does not meet the project objectives	Medium term 2035	Does not cater for HML	\$3.1M Estimated costs to year 2035 at which point the bridge would need to be replaced
Long term maintenance program	Does not meet the project objectives	Long term 2070	May cater for HML depending on whether piers are replaced or rehabilitated	\$16.5M Estimated costs to year at 2070 at which point the bridge would need to be replaced
New Camp Street Bridge	Meets the project objectives	Long term – 100 year design life	New bridge meets criteria for HML	Total project estimate of about \$7.5M

* Costs are strategic estimates for comparative purposes only

2.5 Preferred option

The preferred option is a new Camp Street Bridge with driven steel tube and concrete infill method for bridge piling.

This option best meets the project objectives and option selection criteria. This option is the most economically sustainable option of all options considered over the lifespan of the project. The option improves the local and regional transport network by providing the capacity for HML loads.

3 Description of the proposal

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

3.1 The proposal

Roads and Maritime proposes to build a new Camp Street Bridge on Lake Forbes, Forbes. The proposal is shown in **Figure 1-2** and **Figure 3-1**.

Key features of the proposal would include:

- Utility relocations of power, water, gas and telecommunications including underbore under Lake Forbes
- A temporary construction compound site, temporary stockpile and laydown area on the western side of Lake Forbes in open space either side of Camp Street
- Ancillary works area including temporary stockpile and material laydown on the eastern side of Lake Forbes in open space either side of Bridge Street
- Placement of a temporary in stream structure in Lake Forbes to facilitate demolition of the current bridge and construction of a new bridge
- Construction of earthworks platform on either side of the existing bridge
- Excavation of banks of Lake Forbes to allow for drainage and construction access during the works
- Trimming and clearing of vegetation
- Temporary access tracks to provide access in and out of Lake Forbes
- Demolition of the existing Camp Street bridge and attached footbridge
- A new bridge on the same road alignment as the old bridge
- A bridge with a two lane, two way carriageway with 3.5m lanes and 1.5m clear shoulders with improved access for wide vehicles and provision of footpaths for cyclists and pedestrians
- Design traffic speed to match existing (50km/h horizontal and vertical design speed)
- Scour protection on both abutments and the banks of Lake Forbes
- Construction of open swale, piped drainage and drainage structures
- Final roadworks including pavement, road stabilisation, kerb and gutters, signs and linemarking
- Landscaping including footpaths, boardwalks, planting and street furniture
- Temporary heavy vehicle detour route for heavy vehicles to and from Orange on the Escort Way, and to and from Cowra on the Lachlan Valley Way. The detour from the intersection of Newell Highway and Camp Street across the Fitzgerald Bridge then onto Wirrinya Road, Red Bend Road, onto Wongajong Road and the onto Lachlan Valley Way
- Temporary light vehicle detour for light vehicles travelling to and from the east and western sides of Lake Forbes. There are various alternative local routes available for light vehicles, and it is expected that most vehicles will use Flint Street and then either Bandon Street or Oxford Street to the intersection of the Newell Highway with either Oxford Street or Sheriff Street depending on the direction of traffic
- A heritage interpretation area.

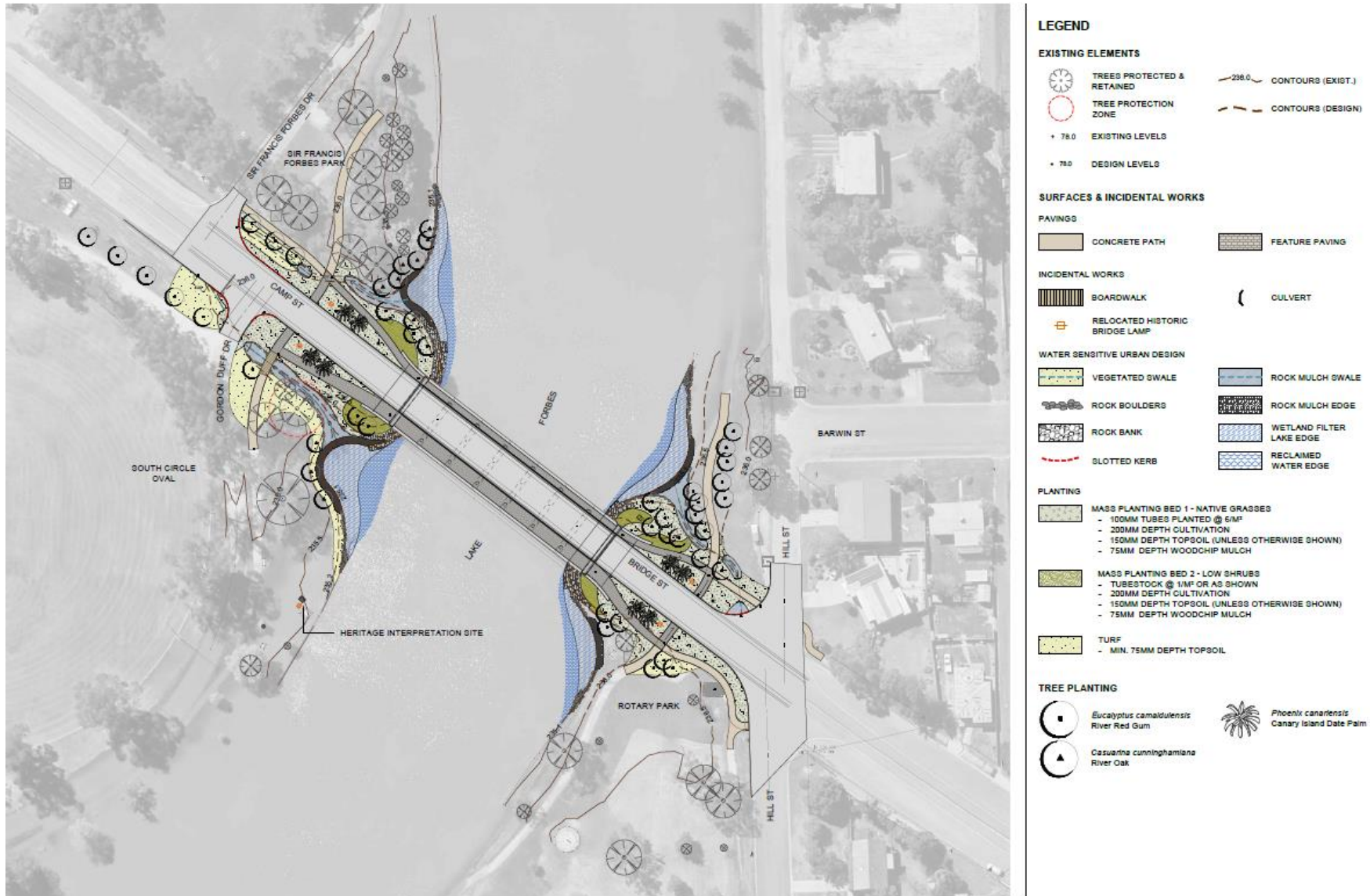


Figure 3-1: Proposal showing Camp Street Bridge, landscaping and the heritage interpretation area

3.2 Design

3.2.1 Design criteria

The design criteria for the new Camp Street Bridge are:

- New bridge on same alignment as the current bridge
- 50km/h poster speed limit
- Two lane, two way carriageway with 3.5m lanes
- 1.5m shoulders
- 4m shared path
- 2m footway.

A typical cross section for the bridge is shown in **Figure 3-2**. The long section is shown in **Figure 3-3**. The proposed bridge design is provided in **Appendix B**. The proposed landscape design is provided in **Appendix C**.

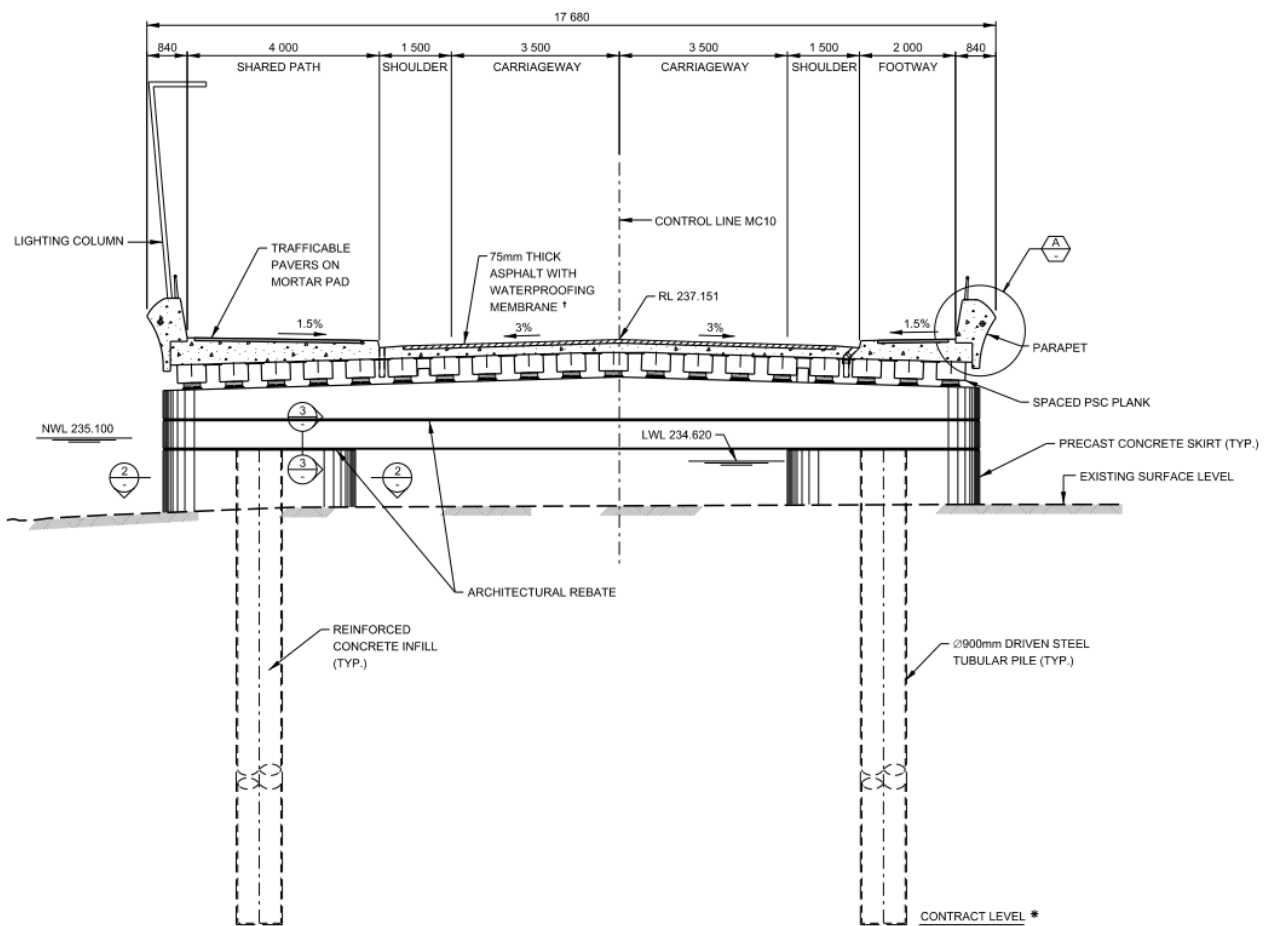


Figure 3-2: Typical cross section, Camp Street Bridge

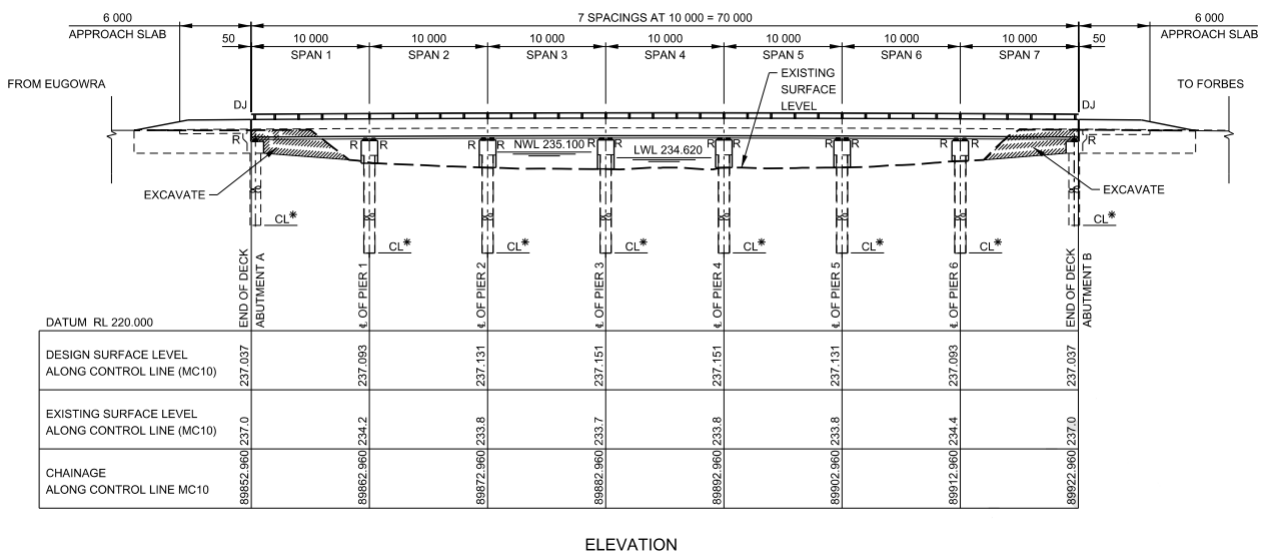


Figure 3-3: Long section, Camp Street Bridge

3.2.2 Engineering constraints

Key engineering constraints are:

- Floodplain, flood levels and hydraulic performance of the bridge in a flood are not to alter the existing flood characteristics. Any temporary in-stream structures during flooding must not result in inundation of the upstream catchment area
- Street drainage on Camp Street and Bridge Street
- Tie in with existing road levels on either side of the bridge
- Utilities on and adjacent to the existing bridge which will be required to be relocated
- Avoid clashes with existing bridge foundations.

3.2.3 Major design features

Major design features of the proposal are a new bridge on Camp Street and landscaping that incorporates water sensitive urban design to treat road runoff (refer **Figure 3-1**). The new bridge will be 70 m long. It will be constructed on the alignment of the current bridge. The bridge will consist of a 7 x 10m span spaced plank structure. The depth of the bridge superstructure has been minimised to mitigate potential flooding issues by matching existing road levels.

An urban design concept was developed and integrated into the bridge design in order to prevent visual impacts. The urban design concept and the visual elements of the new bridge are described in detail in KI Studio (2018) in **Appendix C**. The concept design includes elements to soften the visual design of the new bridge and retain the art deco features of the current bridge. This addresses some of the visual and heritage aspects of removing the current bridge. A visualisation of the new bridge and the landscaping is shown in **Figure 3-4**.

Visual features in the concept design include:

- The bridge piers designed as piles with a deep headstock. The headstock is partially screened by a precast element, deep enough to create the appearance of a blade pier and to provide a neat appearance
- The bridge parapets truncated in height from 1300mm to 820mm to keep a slender appearance for this element
- Stainless steel cables on the balustrade with steel supports. The cables reduce visual obstruction and provide an open visual character
- Pole lighting on the bridge integrated on top of the bridge parapets and spaced in line with the piers. The poles would be tilted and have a minimalist design with neat lines to provide a unobtrusive and contemporary character

- The art deco lights on the current bridge reused in a landscaped area on the approach to the new bridge
- The abutments softened by using rock scour protection to integrate in with the proposed landscaping
- Swales, biofiltration areas and wetland filter areas integrated into the landscaping to soften the design. These features treat stormwater from the road and aim to improve water quality entering into Lake Forbes
- Boardwalk, pedestrian and bike path connections between the new bridge and existing pathways around the Lake.



Figure 3-4: Visualisation of new Camp Street Bridge and landscaping

3.3 Construction activities

Construction of the proposal would be carried out by one or more prequalified Roads and Maritime contractors. The general work methodology and other construction activities are summarised in the following sections.

3.3.1 Work methodology

Key work activities, and plant and equipment that will apply at each key activity are described in the following sections. Detailed work methodologies and construction activity sequencing will be refined during construction planning.

Stage 1 Early works

The early works are the relocation of utilities on the bridge and in the footprint area that may be affected by the proposal. This includes utilities such as Telstra fibre optic, gas, electricity and water mains.

Utilities will be relocated using trenching and underboring also known as Horizontal Directional Drilling (HDD). Underboring will reposition the utilities under the bed of Lake Forbes. The utilities will be relocated parallel to and outside of the footprint area of the new bridge. Utilities will be relocated so that they will not be impacted during construction.

Temporary underbore launch pads and retrieval areas will be established in cleared, open parkland areas away from the Lake banks. Returned water and slurry from under boring will be collected in

bunds or tanks and disposed off-site to a licensed facility. There will be a temporary stockpile of utility conduits until they are placed in trenches or underbores. Erosion and sediment controls will be established at the locations of trenching and underboring to prevent sediment entering waterways. Temporary amenities will be provided.

Above ground utilities such as power and telecommunications will be relocated with auger, cranes, and cherry pickers used to install new poles and connections. The limbs on trees may be trimmed to establish safe clearance distances for powerlines. Individual trees may be removed if required to provide safe buffer distances to overhead utilities.

Disturbed areas will be contoured to the surrounding ground surface and either turfed or seeded to provide ground cover at the completion of works.

Stage 2 Compound and preliminary earthworks

A temporary construction compound will be set up in the western banks of Lake Forbes on land owned by Forbes Shire Council. The compound will include temporary site offices, amenities, car parking, secured storage shed and designated stockpile materials areas. The construction compound will be gravelled to protect the ground surface. Power and telecommunications will be installed to the site offices. The site compound will be surrounded by a secured person proof fence.

An earthworks platform will be constructed on the bank on either side to allow the construction of the new, wider bridge. Excavation of the banks will be undertaken to allow for drainage during construction works. Erosion and sediment controls will be installed around works areas to prevent sediment from entering the Lake. Individual trees may be cleared and branches trimmed on the east and west banks of the lake to allow for safe machinery access and operations during the construction.

Stage 3 Demolition of existing bridge

Traffic control and detour

Detour advisory signs will be placed along the heavy vehicle detour routes prior to the Bridge demolition. Camp Street and Bridge Street will be closed on the approaches.

Installation of sediment controls

Water quality protection measures will be installed prior to the bridge demolition. This may include measures such as sandbags and protective sheets on the deck to capture particulates from cutting and grinding; protective sheets underlying the bridge to capture particulates from cutting and grinding; floating booms and silt curtains in the Lake; and sediment fences on the approaches to the bridge and around areas of earthworks.

Designated construction waste areas will be established to hold materials until transported off site.

Demolition works

The levels in Lake Forbes will be lowered to reduce temporary flood risks to the upstream catchment whilst in-stream structures are in operation. The levels would be gradually reduced to prevent any scour, slumping and water quality risks. The Lake would be lowered down to a level of approximately 234.62m AHD by removing the boards from the weir structure at the Johnny Woods crossing.

A rock platform up to 6m wide would be constructed upstream and downstream of the existing bridge. The banks will be protected by geotextile material with rock overlay, or similar to protect them from tracked equipment and heavy vehicles accessing the instream platform. The rock platforms would be extended following demolition (within the footprint of the existing bridge) to help construct piles, piers and headstocks.

Clean rock will be placed on top of a geotextile liner. A silt curtain will be installed around the rock platform to protect water quality. Rigid tip trucks will haul in the rock and a 20-32 tonne excavator will place the material.

The platform would have a middle opening or pipes so that there are no major obstructions to water flow and fish passage. The platform would be at a level lower than the downstream Johnny Woods crossing to prevent potential flood effects on the catchment.

The art deco light fittings on the existing bridge will be removed and stored for later re-use. Potentially hazardous materials will be removed from the bridge prior to demolition.

The bridge deck would be cut into small sections using equipment such as saw cutters, welding and grinding equipment or an excavator with pulveriser attachment. A crawler crane sitting on the rock platform will then remove these sections of the bridge deck. Drilling fluid from the cutting process can be caught in a channel suspended under the bridge and collected in a flat bottom barge. The sections of deck slab will be broken up on the lake bank in a designated area or trucked away to be broken up and crushed up prior to re-use or disposal at Forbes Shire Council waste management facility.

Once the deck slab is removed, the temporary rock platform would be extended under the existing bridge. This would allow removal of the existing headstocks either by saw cutting and lifting or breaking up using a 32 tonne excavator with pulveriser attachment. The existing piles will be removed using a small steel cofferdam (say 3m x 3m prefabricated steel box) lifted into place using the crane and pushed down using a 32 tonne excavator. The excavator would then snap the piles or a jack hammer could be used in the prefabricated box to complete the removal of the piers to just below the bed of Lake Forbes.

The existing bridge abutments will be excavated out for the longer span on the new bridge. The abutment material excavated from the banks will be allowed to dewatered in a closed bund if required, and stockpiled for re-use in later landscaping or taken off site for disposal to an approved area.

Stage 3 Alternative methods

The method and staging of demolition and construction would be determined by the contractor. Alternative methods for the demolition may include construction of a temporary bridge structure, sheet piling and partial coffer dams. Sheet piles are thin interlocking sheets that are driven into the ground to create a continuous barrier and keep water out of the construction area. Temporary coffer dams use the same processes as rock platforms.

Installation of the temporary bridge would involve an additional operation of installing temporary driven piles to support the deck modules. The previous deck module would be used as a piling platform to install temporary piles for the next deck module working from one bank to the next bank. Demolition of the deck would then take place using the same saw cutting methodology as the rock platform and a barge to catch drilling fluid. The contractor would then install side staging to the temporary bridge to remove the headstocks and then carry out piling operations.

Sheet piling could be used as an alternative method for the placement of caissons around individual piles for demolition. Caissons are large watertight chambers that allow construction work to be undertaken under water. Sheet piling would utilise either a vibratory arm or pile driving using a pneumatic hammer on an excavator to place in the sheet piles.

Stage 4 Bridge Construction

Piling for new bridge

After the existing bridge and piers have been removed, the piling works will commence for piers for the new bridge. The rock platforms would be used as working platforms to install the piles.

Piling will be undertaken using the driven tubular steel pile with reinforced concrete infill method. The steel pile casings will be driven into the bed of the Lake using a piling rig operating a large hydraulic hammer. The piles will then be extended by alternately augering inside and then re-driving the steel casing. This process will be repeated until the pile reaches design contract level. The steel tubes will be 900mm diameter with a 16mm wall.

Construction of headstocks

Headstock are the component of the bridge that sits on top of the piers and under the bridge planks (or deck). Headstocks will be placed on the bridge after the completion of the piling. The headstocks will either be constructed using precast components or in situ using shuttering or a combination of both techniques. The headstocks and headstock reinforcement cages will be stored on site and fixed into position using a crane.

Installation of planks

The bridge planks will be laid after the headstocks have been put in place. The planks are 10m long prefabricated concrete bridge spans that will be delivered to site. They will be stored on site and likely erected using a crawler or slew cranes on either end of the bridge and/or from a temporary bridge or rock working platform within the waterway.

Construction of deck, slabs and kerbs

The bridge deck carriageway, shared path, footway and parapets will be constructed onto the plank surface. Cement wash out bays will be installed in designated areas on the eastern and western bank away from drainage lines to manage cement wastes.

Removal of temporary in stream structures

The temporary in-stream structures will be removed at the completion of the bridge. Rock and geofabrics will be removed from the bed of the Lake. The water levels in the Lake will then be allowed to return to normal levels.

Stage 5 Final Roadworks and Landscaping

The final roadworks will include:

- The project roadworks will involve simple tie-ins with the Lachlan Valley Way, extending approximately 100m west towards Forbes CBD and 90m east
- Completing project earthworks including open swale and piped drainage structures
- Completing the road pavement and kerbs on the bridge and surrounds
- Sealing and line marking the completed road surface
- Installing signs
- Installing lighting for the bridge and on the connecting streets
- Removing temporary instream construction rock platforms
- Installing the original art deco light fixtures.

Landscaping activities include:

- Installing erosion and sediment controls, and contouring the lake banks for the construction and planting of water sensitive urban design open swale drains and landscaping features
- Excavating and installing stormwater drainage pipes and drainage structures
- Installing landscaping irrigation systems and power for lighting
- Installing scour protection rock at abutments and banks of Lake Forbes
- Constructing concrete and paved footpaths
- Constructing planting areas and boardwalk areas including placement of topsoil and rock mulch in drainage swales
- Installing macrophage planting at lake edge
- Constructing a heritage interpretation area.

Stage 6 Open to traffic and site demobilisation

This stage includes activities such as:

- Removing all construction advisory and warning signage

- Opening the bridge to traffic
- Decommissioning the detour routes
- Decommissioning the site compound
- Restoring and revegetating site compound and disturbed work areas
- Maintaining landscaping until it has established
- Removing erosion and sediment controls when sufficient ground cover has established.

3.3.2 Construction hours and duration

The proposal is expected to commence third quarter 2019 subject to final approvals and funding availability.

The proposal has an expected duration of 54 weeks subject to weather. It is envisaged the detour will be in operation for 43 weeks.

The construction hours are:

- normal work hours 7am to 6pm Monday to Friday and 8am to 1pm Saturdays
- occasional deliveries will be undertaken on Saturday afternoons (1pm – 4 pm) or Sunday (8am to 1pm) where required to manage other potential impacts such as traffic disruption
- night works will be undertaken occasionally where required for important safety or constructability reasons
- no works will be undertaken on public holidays.

3.3.3 Plant and equipment

The following plant and equipment will be used at various stages throughout the project:

- Air compressor to clean out formwork
- Air powered scabbler
- Backhoe/mini excavator
- Boat – small low horsepower
- Chainsaws
- Concrete vibrators
- Concrete pump
- Cranes 50 – 100 tonne (crawler or slew configuration), 25-50 tonne, franna crane
- Directional drilling equipment – under bore, pump, generator
- Generators
- Excavator 12-20 tonne, 32 tonne, long arm excavator
- Hand held power tools such as grinder, metal and timber cut off saw, electric hand saw, hammer drill etc.
- Heavy vehicles to transport and offload demountable buildings and bridge planks
- Hydraulic breaker (excavator mounted)
- Hydraulic vibrating hammer crane mounted at approximately 4-5 tonne weight
- Hydraulic impact hammer 7-9 tonne crane or rig mounted
- Jackhammer - Air powered hand jack hammer 75-90 pound size
- Grader
- Portable welding equipment
- Pumps - water pump flex drive, water pump standard 2", cement pump
- Light vehicles and utility vehicles
- Loader
- Motorised vibration screed
- Oxy cutting equipment
- Pile boring rig 50-80 tonne with rock attachments / tools
- Pile driving rig wit 7 – 9 tonne hammer
- Rollers - Padfoot, smooth drum, rubber tyre rollers, trench rollers
- Saw – concrete road saw, concrete wall saw, demolition saw

- Small trucks and utility vehicles
- Spreader truck
- Soil stabiliser
- Sprinklers
- Trucks - aggregate spreading trucks, light trucks, rigid haulage tipping trucks, concrete agitating, road sealing
- Water cart.

3.3.4 Earthworks

The proposed earthworks are minor. The earthworks are limited to:

- Excavation of the existing bridge abutments. Approximately 400 cubic meters of material will be excavated
- Importation of fill to provide wider abutments on both sides of the Lake Forbes. This widening is required to accommodate the wider bridge. Approximately 1200 cubic meters of imported material may be required
- Landscaping and drainage works to create water sensitive urban design features such as swales.
- Excavation of the road for the new road pavement. Approximately 500 cubic metres of material will be excavated.

The volumes of material being imported to the site are low. Only small, temporary stockpiles are required. The location of potential ancillary areas for soil stockpiles is discussed in section 3.4 .

3.3.5 Source and quantity of materials

Key materials to be imported into the site include:

- Precast concrete bridge planks. The bridge planks are specialised components. They will be sourced from casting yards in NSW or Victoria
- Select material. Select material will be imported for the bridge abutments. The material will come from local quarries
- Reinforcing steel and steel casing. This material will be sourced from manufacturers in NSW
- Road aggregates. Road aggregates will be sourced from local quarries
- Clean rock. Clean rock will be required for temporary construction pads. The clean rock will be sourced from local quarries in Forbes
- In situ concrete will likely be sourced from batching plants in Forbes.

3.3.6 Traffic management and access

Street and access closures

The Camp Street Bridge will be closed during construction. Access to the bridge will be closed at:

- Bridge Street at the intersection of Bridge Street with Hill Street on the eastern banks
- Camp Street at the intersection of Camp Lane
- Gordon Duffy drive at the intersection with Camp Street
- Templar Street at the intersection with Sir Francis Forbes Drive.

Access to the hardstand area off Camp Street near South Circle Oval, Apex Park may be restricted by the placement of a site compound and stockpile area.

There will not be any restriction on the access for residential properties on the eastern banks on Bridge Street and Hill Street during construction.

Light and heavy vehicle detours.

The detour will be in place for 43 weeks, subject to weather.

A temporary heavy vehicle detour route will be in place for heavy vehicles to and from Orange on the Escort Way, and to and from Cowra on the Lachlan Valley Way. The heavy vehicle detour from the intersection of Newell Highway and Camp Street across the Fitzgerald Bridge then onto Wurrinya Road, Red Bend Road, onto Wongajong Road and then onto Lachlan Valley Way.

There are various alternative local routes for light vehicles travelling to and from the east and western sides of Lake Forbes. It is expected that most vehicles will use Flint Street and then either Bandon Street or Oxford Street to the intersection of the Newell Highway with either Oxford Street or Sheriff Street depending on the direction of traffic.

The light and heavy vehicle detours are shown in **Figure 1-5**.

Construction vehicle movements

Construction vehicles will access the work area on the western banks of the Bridge from the Newell Highway and Camp Street. Vehicles will access the work area on the eastern banks via Bridge Street from either Flint Street or the Escort Way.

Truck movements during the construction phase are expected to increase by approximately 20 truck movements per day during earth work staging. Light vehicle movements from employees on site are expected to increase by 10 vehicle movements per day during the construction of deck slabs.

The construction vehicle movements will be negligible. The number of vehicle movements on Camp Street will decrease with the road closure and detour during the construction.

3.4 Ancillary facilities

A number of ancillary facilities have been considered for use over the duration the project. These areas shown in **Table 3-1** will be used for activities such as:

- Site compounds including construction office, amenities, materials and equipment storage, car parking, and stockpiles
- Short term stockpile sites
- Laydown area for plant and materials
- Utility works such as directional drilling launch and retrieval points.

The proposed ancillary areas are shown in **Figure 1-2**. The hours of operation of the facilities are discussed in section 3.3.2. The site access requirements are discussed in section 3.3.6. The location of noise sensitive receivers in proximity to ancillary areas is discussed in section 6.4.

Ancillary areas will be as far as practicable from Lake Forbes. It will not always be possible to locate ancillary areas more than 40 m from the Lake or out of the flood zone due to the nature of the works.

Table 3-1 Proposed ancillary areas

No	Location	Description	Ancillary use
1	Camp Street	Existing hardstand area on the western side of Camp Street near South Circle Oval, Apex Park	Potential site compound location. Short and long term stockpile. Plant and materials laydown area
2	Sir Frances Forbes Drive	Open space in Sir Francis Forbes Park off Sir Francie Forbes Drive	Potential site compound location. Stockpile. Plant and materials laydown area

No	Location	Description	Ancillary use
3	Camp Street	Western bank of Lake Forbes in open parkland on the northern side of existing bridge	Directional drilling launch / retrieval
4	Bridge Street	Eastern bank of Lake Forbes in open parkland on northern side of existing bridge	Directional drilling launch / retrieval Short term stockpile Plant and materials laydown area Portable toilet
5	Bridge Street	Eastern bank of Lake Forbes in open parkland on the southern side of Bridge Street and bridge	Short term stockpile Plant and materials laydown area Portable toilet

3.5 Public utility adjustment

There are number of public utilities on the existing bridge. This includes Telstra fibre optic, gas, electricity and water mains. Utilities will be relocated parallel to and outside of the footprint area of the new bridge.

Utility adjustment will be undertaken by the utility service providers. The utility relocation will be undertaken as part of early works prior to the commencement of the bridge demolition.

3.6 Property acquisition

The proposed bridge structure lies within the existing road corridor, within the cadastral boundary of Roads and Maritime owned land. No land acquisition is required.

4 Statutory and planning framework

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

4.1 Environmental Planning and Assessment Act 1979

The NSW EP&A Act and its associated regulations provide the framework for assessing environmental impacts and determining planning approvals for developments and activities in NSW. The EP&A Act also establishes State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) which may include provisions relevant to the proposal.

The proposal does not require development consent under Part 4 of the EP&A Act due to permissibility in State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) (refer to section 4.1.1 below), and is not classified as state significant infrastructure under Part 5.1. Therefore, the proposal may be assessed under Part 5 of the EP&A Act. Under Part 5 of the EP&A Act, Roads and Maritime is classified as a proponent and a determining authority.

4.1.1 State Environmental Planning Policies

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 road infrastructure facilities (which include vehicle and pedestrian bridges) 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*. 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.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in chapter 5 of this REF.

4.1.2 Local Environmental Plans

Forbes Local Environmental Plan 1986 and Forbes Local Environmental Plan 2013

The proposal is located within the Forbes Local Government Area (LGA). There are two local environmental planning instruments that apply to the Forbes LGA. These are the Forbes Local Environmental Plan 1986 (Forbes LEP 1986) and the Forbes Local Environmental Plan 2013 (Forbes LEP 2013). The Forbes LEP 1986 remains in force for portions of the Forbes LGA which are identified as deferred matters on the Forbes LEP 2013 land zoning maps. No elements of the proposal are proposed on land that is identified as a deferred matter in the Forbes LEP 2013, therefore no further consideration of the Forbes LEP 1986 is required.

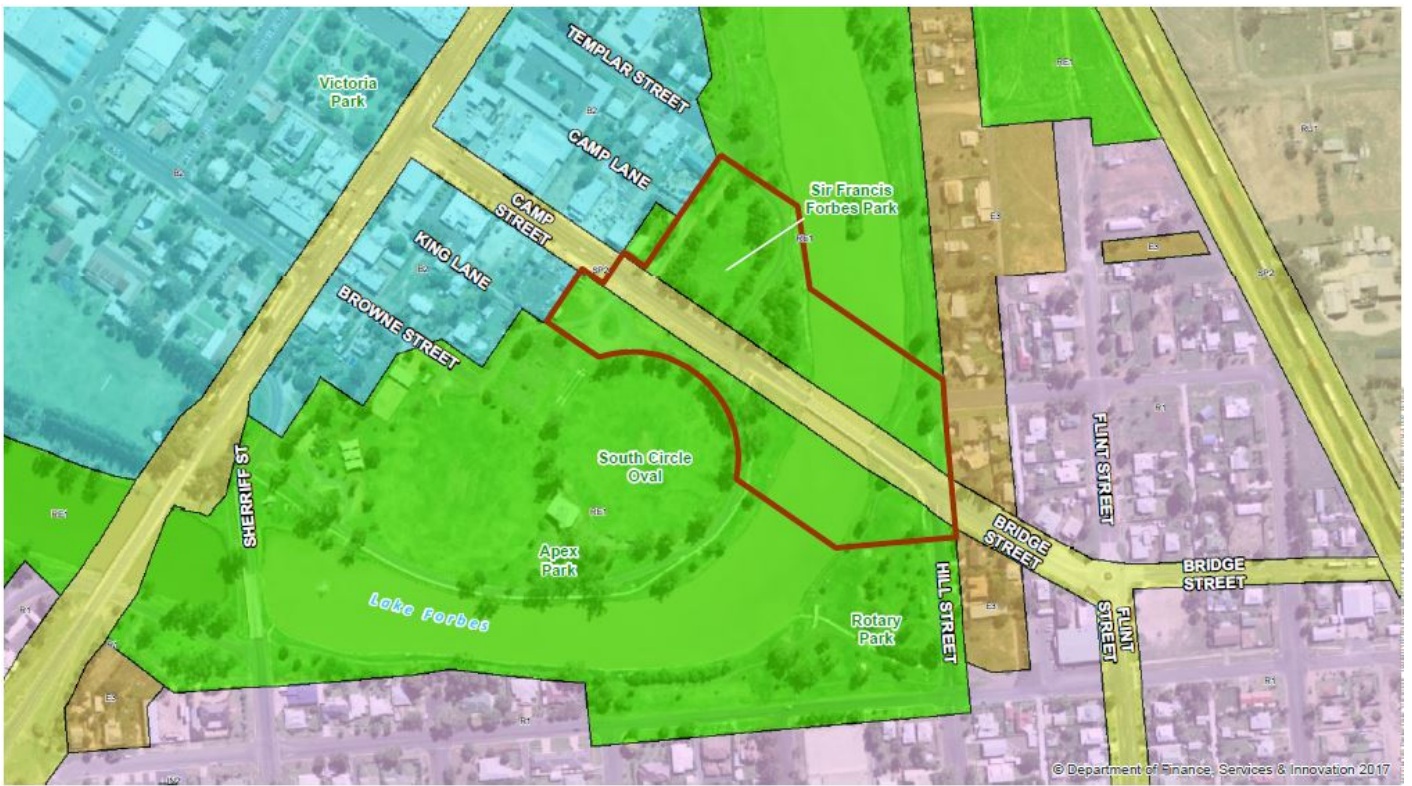
Under the Forbes LEP 2013, the bridge upgrade works for the proposal is located within the existing road corridor and zoned SP2 Infrastructure. The proposed ancillary facilities would also be located on land zoned RE1 Public Recreation, however these works would only be for the duration of the construction of the new bridge. **Table 4-1** details the objectives of these zones and discusses the proposals consistency with these objectives.

Table 4-1 Forbes LEP 2013 zoning objectives

Zoning and objectives	Proposal consistency with objectives
<p>SP2 Infrastructure:</p> <ul style="list-style-type: none"> • To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure. 	<p>The proposal is consistent with the objective to provide infrastructure and related uses.</p> <p>The proposal will replace a deteriorating infrastructure (Camp Street Bridge) with a new improved bridge of a higher standard. It will allow for continued use as a road.</p>
<p>RE1 Public Recreation:</p> <ul style="list-style-type: none"> • To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes. 	<p>The proposal is consistent with the objective to allow land to be used for recreational purposes. The proposal has integrated pedestrian and bikeway connectivity into the design to link to the walkways in the parkland surrounding Lake Forbes.</p> <p>The proposal is consistent with the objectives to protect and enhance the natural environment for recreational purposes. The proposal includes landscaping that use native plants to improve native habitat, and provides natural stormwater treatment for road runoff.</p>

Development for the purposes of roads is permitted in the SP2 Infrastructure zone with development consent. However, as discussed in **Section 4.1.1**, Clause 94 of the ISEPP permits Roads and Maritime, as a public authority, to carry out development for the purpose of a road and/or road infrastructure facilities on any land without consent. As a result, consent from Forbes Council is not required for the proposal.

The zoning for the Camp Street Bridge and surrounding areas is shown in **Figure 4-1**.



- Proposal area
- IN2 Light Industrial
- R1 General Residential
- B2 Local Centre
- RE1 Public Recreation
- RU1 Primary Production
- E3 Environmental Management
- SP2 Infrastructure



Figure 4-1: Forbes Local Environmental Plan (2013)

4.2 Other relevant NSW legislation

4.2.1 Biodiversity Conservation Act 2016

The purpose of the Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community consistent with the principles of ecologically sustainable development.

Under the act it is an offence to harm animals and plants; damage areas of outstanding biodiversity value; damage habitat of threatened species or ecological communities.¹ Under Part 2, Division 2 of the act it is a defence if the harm or damage was necessary for the carrying out of a Part 5 EP&A Act activity undertaken in compliance with the determination, or undertaken consistent with a state significant infrastructure approval under Part 5.1 of the EP&A.

The act establishes a test to establish whether a proposed development or activity is "likely to significantly affect threatened species." If an activity under Part 5 is likely to significantly affect threatened species then a Species Impact Assessment will be required to be prepared.²

A search of the NSW Office of Environment and Heritage (OEH) BioNet wildlife atlas database was undertaken on the 25/09/2017. The search results are provided in **Appendix D**. A search was also undertaken on the EPBC protected matters database. The results are provided in **Appendix E**. The results of both threatened species searches are discussed in **Section 6.7**. A species impact statement is not considered to be required for the proposal.

4.2.2 Biosecurity Act 2015

The Biosecurity Act 2015 replaces the Noxious Weeds Act 1993. The objectives of the Act include improving shared responsibility for biosecurity between government, industry and communities; and to provide a framework for the timely management of pests, diseases and contaminants. Pests include plants and animals. The Act binds the Crown.

A visual inspection of the proposal areas was undertaken on the 12th October 2017. The study area is well maintained parkland and recreational area. Methods to reduce the introduction of weed species will be undertaken as part the construction phase.

4.2.3 Contaminated Lands Management Act 1997

The object of the Act is to establish a process for investigating and remediating land where required. The act allows the EPA to declare land as significantly contaminated land. The EPA may order a public authority to carry out actions or prepare a plan of management for significantly contaminated land.

A search was undertaken of the NSW EPA's contaminated land register on the 11/01/2018. No NSW EPA contaminated land records have been identified in the study area.

4.2.4 Crown Lands Act 1989 and Crown Lands Management Act 2016

The Crown Lands Act (1989) is proposed to be replaced by the Crown Lands Management Act in 2018.

The object of the Crown Lands Act (1989) is to ensure that Crown land is managed on behalf of the NSW people. The objects of the Crown Lands Management Act (2016) include providing for the ownership, use and management of Crown land; considering environmental, social, heritage

¹ Biodiversity Conservation Act Part 2.

² Biodiversity Conservation Act Part 7, Division 2, 7.8

and economic issues in decision on Crown land; provide a consistent and transparent management of Crown land; facilitate the use of Crown land by Aboriginal people.

Under Part 9 of the Crown Lands Management Act it is an offence to use, reside, erect a structure, clearing or excavate Crown land without a lawful authority under the Act. It is also an offence to pollute or contaminate Crown land.³

A search was undertaken of Crown Lands in the vicinity of the proposal by Roads and Maritime Services. The bridge is located in a road reserve as shown in **Figure 4-2**. The new bridge will be located on the centre line of the current bridge. No acquisitions or easement are required for the new bridge.

The proposed site compound and ancillary areas are Crown land managed by Forbes Shire Council. Roads and Maritime Services have consulted with Forbes Shire Council on the temporary use of the park areas for site compound and ancillary sites as noted in section 5.

Short term occupancy licenses and leases under the Crown Lands Management Act may be required for construction activities such as construction compounds. Roads and Maritime Services undertook consultation with Forbes Shire Council on the 14 March 2018 on temporary access agreement requirements for construction activities on Crown Land around the Lake. Council advised on the 16 March 2018 that the subject lands are Crown land vested in council. No permits, access agreements or leases are required in this instance. Council is a partner in the delivery of the project.



Figure 4-2: Camp Street Bridge showing Crown land watercourse (blue).

³ Crown Land Management Act Part 9.

4.2.5 Fisheries Management Act 1994

The objectives of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The FM Act includes provisions for threatened fish and marine vegetation and associated threatening processes and is administered by the NSW DPI.

The FM Act applies to all waters within the limits of the State, except where Commonwealth legislation applies. Part 7A Division 4 of the FM Act prohibits, without a licence, activities that damage habitats or harm threatened species, populations or ecological communities. The proposal is located on a 'Key Fish Habitat' as defined by DPI. Activities which may require a permit under the FM Act include, but are not limited to, dredging works, reclamation work and works that would block fish passage.

The construction of temporary in stream structures during construction may be considered as reclamation being:

- (a) using any material (such as sand, soil, silt, gravel, concrete, oyster shells, tyres, timber or rocks) to fill in or reclaim water land, or
- (b) depositing any such material on water land for the purpose of constructing anything over water land (such as a bridge)⁴

The reclamation includes reclamation on artificial water bodies where intermittently connected to a natural water body.⁵ Under clause 199 of the Act a public authority must provide the Minister with 21 days written notice of the proposal.

Clause 219 of the FM Act makes it an offence to obstruct fish passage without a permit issued under CI 200 of the Act. In-stream structures, such as rock platforms or sheet piling, may obstruct fish passage subject to the extent of works. Consultation is required with DPI (Fisheries) on the permit requirements if the construction methodology requires temporary works that obstruct the full width of the Lake.

A review of the DPI (Fisheries) Fisheries Spatial Data Portal was undertaken on the 22/12/2017 at <https://www.dpi.nsw.gov.au/about-us/science-and-research/spatial-data-portal>. The search results are provided in **Figure 6-14**. The results are discussed in Section 6.7. A species impact statement under the FM Act is not considered to be required for the proposal.

4.2.6 Heritage Act 1977

The Heritage Act 1977 (Heritage Act) provides for the conservation of items of heritage in NSW. The Heritage Act defines heritage as items or places that are of State and/or local heritage significance and include: places, buildings, works, relics, moveable objects and precincts. The Heritage Act establishes a register including an inventory and list to protect the listed items.

The proposal would impact upon the Camp Street Bridge which is a locally listed heritage item under the Forbes LEP 2013 (refer **Section 6.1**). As the Bridge is a local listed heritage item, a Statement of Heritage Impact (SOHI) is required to be prepared and consultation undertaken with Forbes Shire Council in accordance with the SEPP (Infrastructure). The SOHI is provided in **Appendix F** and the impacts on local heritage are addressed in Section 6.1.

A permit under the Heritage Act is not required. Roads and Maritime notified the Heritage Division of the OEHL on 7 March 2018 of intention to demolish the Camp Street Bridge. Correspondence from the Heritage Division (dated 28 March 2018) confirmed that the notification meets the

⁴ Fisheries Management Act Part 7 Division 7 CI 198A Definitions

⁵ Fisheries Management Act Part 7 Division 7 CI 198B Application of Division (a)

requirements of Section 170A(1)(c) of the Heritage Act and that the proposed mitigation measures identified within the SOHI are considered appropriate. Copies of the notification letter and response from the Heritage Division are attached at **Appendix K**.

4.2.7 Protection of the Environment and Operations Act 1997

The NSW Protection of the Environment Operations Act 1997 (POEO Act) aims to protect, restore and enhance the environments of NSW and reduce potential risks to human health and the environment.

The management of environmental impacts in relation to air, noise and water quality fall under the provisions of the POEO Act. The POEO Act identifies a number of pollution offences, including offences relating to:

- Wilful or negligent disposal of waste in a manner that is likely to harm the environment
- Wilful or negligent causing of a substance to leak, spill or otherwise escape in a manner that harms or is likely to harm the environment
- The pollution of water.

Under the provisions of the POEO Act, Roads and Maritime is required to notify the NSW Environmental Protection Authority (EPA) if a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.

Environmental Protection Licences (EPL) are issued under section 122 of the POEO Act for various scheduled development and activities. The proposal does not involve undertaking any scheduled activities as listed under Schedule 1 of the POEO Act, therefore no EPL is required.

4.2.8 National Parks and Wildlife Act 1974

The objectives of this act include the conservation of nature and places and items of significance to the aboriginal people.

Under the SEPP Infrastructure development for the purpose of a road or road infrastructure facility cannot be carried out as development without consent on land reserved under the *National Parks and Wildlife Act 1974* unless authorised under that Act.⁶ A review was undertaken of the Forbes LEP and the NSW national parks web site for national parks in the study area. There are no national parks in the study area that would be affected by the proposal. Authorisation under the NPW Act is not required for the purpose of the SEPP (Infrastructure).

Under the Act it is an offence to harm or desecrate aboriginal objects or places unless the harm was authorised by a Aboriginal Heritage under section 90 of the Act or due diligence was exercised to prevent harm.⁷ Roads and Maritime has completed a Stage 1 due diligence assessment in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). The PACHCI is the Roads and Maritime due diligence process to avoid damaging Aboriginal objects. The Stage 1 assessment is provided in **Appendix G**. As part of the due diligence assessment a Aboriginal Heritage Information Management System (AHIMS) data base search was undertaken on the 25/09/17. The results of the search are provided in **Appendix H**.

The proposal would not impact on any known sites, item or objects of Aboriginal heritage significance. No AHIP is required by the proposal (refer to Section 6.7).

4.2.9 Roads Act 1993

The objects of the Roads Act include classifying roads; declaring RMS and other public authorities as roads authorities; and regulation of various activities on public roads.

⁶ SEPP (Infrastructure) s94 (1)

⁷ NPW Act Part 6 Division 1 s86, 87, 90.

Under cl138 of the Roads Act it is an offence on a public road to erect a structure or carry out a work; dig up or disturb the surface; remove or interfere with a structure, work or tree; pump water into a road from adjoining land; and connect a road to a classified road without consent.

A cl138 consent will be required for the proposal for the construction phase.

4.2.10 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the State's water for the benefit of both present and future generations. The Act controls the extraction and use of water and any activity that is in or near water sources in NSW. It provides for the implementation of water sharing plans that establish rules for sharing a water resource while taking into account the environmental need of the resource. The construction footprint for the proposal is covered by the Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources.

Section 56 of the WM Act establishes access licences for the take of water within a particular water management area. Under section 18(1) of the Water Management (General) Regulation 2011 (Water Management Regulation) and Schedule 5 Part 1 Roads and Maritime, as a roads authority, is exempt from the need to obtain an access licence in relation to water required for road construction and road maintenance.

Sections 89 to 91 of the WM Act establish three types of approvals that a proponent may be required to be obtain. These are water use approvals, water management work approvals (including water supply work approvals, drainage work approvals and flood work approvals) and activity approvals (including controlled activity approvals and aquifer interference approvals). Due to the proximity of the proposal to Forbes Lake and the nature of the bridge construction work, construction activities would be undertaken in and adjoining the watercourse.

“Controlled activities” include the erection of a building or carrying out of a work, removal of material or vegetation, the deposition of material, and the carrying out of an activity that affects the quantity or flow of water in a water source. Typically a controlled activity approval would be required under section 91E(1) of the WM Act to allow for construction within 40 metres of a watercourse. However, clause 38 of the Water Management (General) Regulation 2004, exempts public authorities such as Roads and Maritime and local councils from section 91E(1) of the WM Act in relation to all controlled activities that they carry out in, on or under waterfront land. This allows Roads and Maritime to carry out controlled activities on waterfront land.

Despite not requiring controlled activity approvals, NOW guidelines for controlled activities have been considered in this assessment. Under the NSW Aquifer Interference Policy, the proposal is exempt from requiring an aquifer interference approval. Section 3.3 of the policy states that trenches and pipelines (intersecting the water table) would be considered as having a minimal impact on water-dependent assets, if a water access licence is not required. Therefore, the proposal would be defined as a minimal impact aquifer interference activity given that a water access licence is not required.

A search was undertaken of licensed groundwater and surface water bores in or adjacent to the proposal. The results of these searches are discussed in **Section 6.6**.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land.

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

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

Findings – matters of national environmental significance (other than biodiversity matters)

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

Findings – nationally listed biodiversity matters

The assessment of the proposal's impact on nationally listed threatened species, populations, endangered ecological communities and migratory species found that there is unlikely to be a significant impact on relevant matters of national environmental significance. Chapter 6 of the REF describes the safeguards and management measures to be applied.

4.4 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and/or road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Part 5 of the EP&A Act.

Roads and Maritime is the determining authority for the proposal. This REF fulfils Roads and Maritime's obligation under clause 111 of the EP&A Act to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity. Development consent from Council is not required.

5 Consultation

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

5.1 Consultation strategy

Community and stakeholder involvement has been an integral component in the development of the proposal. At each stage, Roads and Maritime has proactively engaged the community and stakeholders to increase public understanding of, and participation in, the development of the proposal. The proposal has benefited from the input of local knowledge provided through community engagement, which has helped identify issues, potential mitigation strategies and opportunities to improve proposal outcomes.

The consultation strategy has included:

- Community on line survey and drop in sessions on the proposed design
- Provision of information via a project website and social media such as Facebook
- Ongoing consultation with Forbes Council throughout the proposal development
- Targeted consultation and presentations with key stakeholders during the proposal development
- Targeted consultation and one on one meeting with key business on Camp Street during the proposal development
- Proactive consultation with key agencies on potential approval requirements during the proposal development.

The results of the community and stakeholder engagement to date are provided in the section following. The consultation strategy will be updated as the proposal proceeds. Further consultation with bus and transport companies and emergency services will be conducted prior to construction of the project.

5.2 Community involvement

Extensive community consultation has been undertaken during the development of the proposal. The community consultation undertaken during development is detailed in **Table 5-1** and the issues raised are summarised in **Table 5-2**.

The common themes recorded in the community consultation included:

- Strong support and recognition for the need of the proposal
- The aesthetics of the new bridge
- Reusing components of the existing bridge such as lamp posts
- Remembering the historic bridge
- The vehicle detour route during construction
- The removal of the pedestrian footbridge.

Table 5-1: Summary of previous consultation

Group	Consultation
Community	<ul style="list-style-type: none"> • Three community drop in sessions were held. They were attended by about 80 people in total. The drop in session were held at: <ul style="list-style-type: none"> • Forbes Town Hall on the 9th October 2017 and the 12th October 2017 • Forbes IGA supermarket on the 14th October 2017. • On line survey in 2017. There were 11 records, including two blank responses, to the survey. The survey had three key questions on the concept design including: <ul style="list-style-type: none"> • <i>What do you like most about the design?</i> • <i>Do you have suggestions to improve the design?</i> • <i>Would you like to provide other comments about the concept design?</i> • Project web site. http://www.rms.nsw.gov.au/projects/western-nsw/forbes-bridge/index.html • Community Update September 2017 on the project web site.
Local Business on Camp Street	<ul style="list-style-type: none"> • Door knocking of business on the 9th October 2017.
Forbes Historical Society	<ul style="list-style-type: none"> • Presentation to the Forbes Historical society 4th October 2017.
Parkes and Lachlan Landcare group	<ul style="list-style-type: none"> • Presentation to the Parkes and Lachlan Landcare group 4th October 2017.

Table 5-2: Summary of items raised in previous consultation

Group	Items raised	Response / where addressed in REF
Community	<p>Items raised in the drop in sessions included:</p> <ul style="list-style-type: none"> • Support for the proposal • Detour route including for vehicles accessing the Forbes livestock exchange • Removal of the pedestrian bridge • Aesthetics of the bridge • Pedestrian barrier on the bridge <p>Issues raised in the on line survey to the three questions included:</p>	<p>Noted</p> <p>A proposed heavy vehicle detour will be provided during the construction of the proposed bridge. The heavy vehicle detour will cater for vehicles moving to and from location north and west of Forbes and the Lachlan Valley and Escort Way. There is various alternative local routes available for local commuting traffic. The detour routes are discussed in Section 6.2</p> <p>The proposed new bridge will provide pedestrian access including a 4m shared path and a 2m footway as shown in Figure 3-2.</p> <p>The proposed new bridge, including the parapet and landscaping, has been designed to soften the features. The art deco light fittings on the existing bridge will be re-used on the new bridge to maintain an important heritage visual link to the existing bridge. Heritage and visual aspects of the proposal are discussed in Sections 6.1 and 6.2.</p> <p>The proposed new bridge provides considerable enhanced clearance distance in the form of 1.5m shoulders to pedestrians on the bridge as shown in Figure 3-2.</p>

Group	Items raised	Response / where addressed in REF
	<p><i>What do you like most about the design?</i></p> <ul style="list-style-type: none"> • Four responses included positive reference to the wider or safer bridge design for motorist • Two responses included positive references to the wider pedestrian footpaths • Two responses included positive reference to reuse of the existing art deco light fixtures on the new bridge • One response included positive reference to the landscape design • Three responses included reference to the new bridge aesthetics. One response was positive on the new bridge aesthetics. One was neutral noting that although the bridge kept the lamp features, it was otherwise plain. One response was negative noting that the design was not consistent with the existing heritage bridge. 	<p>Noted</p> <p>It is not possible to replicate the current bridge or visual design features. This is due to modern bridge building techniques and materials requirements to handle the increased loads of modern freight.</p>

Group	Items raised	Response / where addressed in REF
	<p><i>Do you have suggestions to improve the design?</i></p> <p>Five responses included references to measures to maintaining the heritage visual elements of the existing bridge. This included:</p> <ul style="list-style-type: none"> • Reuse of other elements from the existing bridge • Design of new bridge is more reflective, or copies, the existing bridge. <p>Two response included references to safety. This included:</p> <ul style="list-style-type: none"> • Ensuring that vehicles cannot run off the bridge into Lake Forbes • Improved pedestrian safety measures to cross over at either side of the bridge • Installation of fixed speed camera on the bridge <p><i>Would you like to provide other comments about the concept design?</i></p> <p>Suggestions included:</p>	<p>Roads and Maritime recognise the historical importance of the existing bridge and has sought to re-use the key art deco features. A heritage interpretation area will be provided as part of the landscaping to remember the existing bridge.</p> <p>It is not possible to replicate the current bridge or design features. This is due to modern bridge building techniques and materials requirements to handle the increased loads of modern freight.</p> <p>Heritage and visual aspects of the proposal are discussed in sections 6.1 and 6.2.</p> <p>The proposed new bridge is a safer design than the current bridge. The proposed bridge has been designed to current bridge specifications. This includes design and materials selection measures to reduce the risk of vehicles entering the Lake.</p> <p>The proposal will not alter the location of the current pedestrian crossings on Bridge Street and Camp Street. The posted urban road speed limit of 50 km/h at the approaches will not be altered. The wider bridge will improve site distances for vehicles on the bridge. This provides a safer road environment for pedestrians at the existing crossings.</p> <p>The design does not allow for the installation of a speed camera on the bridge. Fixed speed cameras are installed at sites that meet the criteria developed by Transport for NSW (Centre for Road Safety) in consultation with the NRMA and NSW Police. The criteria are based on crash rates and travelling speeds. The bridge on Camp Street does not currently meet the criteria for the installation of a fixed speed camera.</p>

Group	Items raised	Response / where addressed in REF
	<ul style="list-style-type: none"> • Recreational fishing allowed on the bridge • Park bench looking over the lake • New dual pedestrian paths enhancing accessibility around the Lake • Consideration of the landscaping plan for the proposal with the wider lake landscape plan and heritage values 	<p>It is Roads and Maritime policy that fishing is not allowed on bridges.⁸</p> <p>A park bench has not been considered as this may interfere with commuters on the shared path</p> <p>Noted</p> <p>The urban design objectives adopted for the proposal which incorporates the landscape plan, integration with the Lake, and heritage values are provided in 2.3.3. The landscape plan has been developed recognising the visual characteristics of the surrounding park land as well as the older sections of Forbes. The landscaping design also includes a proposed heritage interpretation area to link to the heritage values. The proposed landscaping and heritage interpretation link are shown in Figure 3-1.</p> <p>A “Urban design concept, landscape character and visual impact assessment” was undertaken in 2017. This provided in Appendix C. A SOHI was undertaken to assess impacts on heritage and identify mitigation measures in 2017. This is provided in Appendix F.</p> <p>Heritage and visual aspects of the proposal are discussed in sections 6.1 and 6.2.</p>
	<ul style="list-style-type: none"> • Pedestrian safety and installation of a fixed speed camera 	<p>Please refer previous comments on this item</p>

⁸ RTA (2007) *Control of fishing, jumping or climbing from or on bridges*. Policy number PN135

Group	Items raised	Response / where addressed in REF
	<ul style="list-style-type: none"> The proposed design has no link to the heritage of the existing bridge 	<p>The proposed design includes the reuse of the art deco light fittings on the bridge. The landscaping design also includes a proposed heritage interpretation area to link to the heritage values. Heritage and visual aspects of the proposal are discussed in sections 6.1 and 6.2. A SOHI was undertaken to assess impacts on heritage and identify mitigation measures in 2017. This is provided in Appendix F.</p> <p>It is not possible to replicate the current bridge or design features. This is due to modern bridge building techniques and materials requirements to handle the increased loads of modern freight.</p>
Local Business on Camp Street	<ul style="list-style-type: none"> Recognised the need for the project Potential flood changes to flood levels. 	<p>Noted</p> <p>The bridge has been designed so that there will not be any changes to flood levels and behaviour. A flood impact assessment was undertaken in 2017 to assess the impacts of the proposed new bridge design. The Flood Impact assessment is provided in Appendix I. Flooding is discussed in section 6.5.</p>
Forbes Historical Society	<p>The modern aesthetic of the new bridge compared to the existing bridge</p> <p>Entry to boardwalks and mobility scooter accessibility</p> <p>Railing / parapet aesthetics and height</p>	<p>The urban design objectives are provided in 2.3.3. The proposal incorporates methods to soften the visual aspects of the bridge as described in section 3.2.3. The new bridge, including the parapet and landscaping, has been designed to soften the features. The new bridge includes key heritage and visual features.</p> <p>Heritage and visual aspects of the proposal are discussed in sections 6.1 and 6.2. A SOHI was undertaken to assess impacts on heritage and identify mitigation measures in 2017.</p> <p>Boardwalks have been designed to allow accessibility by mobility scooters.</p> <p>It is not possible to replicate the current railing design due to differences in modern bridge building techniques and materials</p>

Group	Items raised	Response / where addressed in REF
	<p>Support for the reuse of lamp posts</p> <p>Support for the heritage interpretation area in the design.</p> <p>Support of the proposal</p>	<p>Noted. The art deco lamp posts on the existing bridge will be re-used as part of the proposal</p> <p>Noted. A heritage area is part of the proposal</p> <p>Noted</p> <p>Heritage and visual aspects of the proposal are discussed in sections 6.1 and 6.2.</p>

5.3 Aboriginal community involvement

All Aboriginal community involvement in Roads and Maritime proposals is governed by the provisions of the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime, 2011) relevant legislation and guidelines. PACHCI provides a consistent means of effective consultation with Aboriginal stakeholders regarding activities which may impact on Aboriginal Cultural Heritage and is generally consistent with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010).

An inspection of the proposal area was undertaken by the Roads & Maritime Services Cultural Heritage Officer in accordance with Stage 1 of the RMS PACHCI. The Stage 1 assessment has concluded that the proposal is unlikely to affect Aboriginal Cultural heritage. The Stage 1 PACHCI is provided in **Appendix G**.

5.4 ISEPP consultation

Forbes Shire Council has been consulted about the proposal as per the requirements of clause 13, 14, and 15 of the ISEPP. Roads & Maritime Services wrote to Forbes Shire Council on the 8th November 2017 in accordance with the provisions of the ISEPP. **Appendix J** contains an ISEPP consultation checklist that documents how ISEPP consultation requirements have been considered.

Items that have been raised as a result of this consultation are outlined below in **Table 5-3**.

Table 5-3: Issues raised by Forbes Shire Council in ISEPP consultation 4th December 2017

Issue raised	Response / where addressed in REF
Council supported the replacement of the Camp Street bridge with the proposed design as presented to Council on the 4 th September 2017	Noted. The proposal considered in this REF is as per the design submitted to Council on the 4 th September 2017.
Council confirmed financial support for the undertaking of landscaping works	Noted.
Council supported the proposed bridge design and use of heritage lighting on the approach to the bridge as per the design presented to council on the 4 th September 2017.	Noted. The proposal considered in this REF is as per the design submitted to Council on the 4 th September 2017. Heritage is discussed in section 6.1.
Council indicated that it would work with Roads & Maritimes Services on the project including assistance with constructing the road approaches, managing the detour route, and an interest in undertaking landscaping for the project.	Noted.

Roads and Maritime Services have also undertaken ongoing consultation with Forbes Shire council outside of the formal ISEPP consultation process.

5.5 Government agency and stakeholder involvement

Various government agencies and stakeholders have been consulted about the proposal, including:

- Forbes Shire Council
- Department of Industry (Fisheries)
- Department of Industry (Office of Water).

The agency consultation undertaken during the development of the proposal is provided in **Table 5-4**. Issues raised as part of ISEPP consultation are discussed in section 5.4 and **Table 5-3**.

Table 5-4: Agency consultation

Agency	Date and Type
Forbes Shire Council	<p>Roads and Maritime Services has undertaken targeted consultation with Forbes council on a number of matters relating to construction methodology including:</p> <ul style="list-style-type: none"> • Temporary lowering of water levels in Lake Forbes • Use of Sir Francis Forbes Park as a compound site • Council and Crown Lands Management Act approvals for temporary occupancy of reserves • Water supply of the golf course and reliance on water in Lake Forbes • Recreational water uses of Lake Forbes • Water quality monitoring in Lake Forbes <p>Dates and types of key consultation with council includes:</p> <ul style="list-style-type: none"> • 15th December 2016. Presentation on project • 23rd August 2017. Presentation on project • 4th September 2017. Presentation on project • 13th October 2017. Correspondence on proposed lowering of Lake Forbes • 8th November 2017. SEPP Infrastructure Consultation letter • 1st February 2018. Email correspondence on proposed lowering of Lake Forbes • 14th March 2018. Email correspondence on water quality monitoring and temporary access agreements
Department of Industry (Water)	<ul style="list-style-type: none"> • 27th October 2017. REF Consultation letter • 16th March 2018. Consultation letter on temporary lowering of levels in the lake.
Department of Industry (Fisheries)	<ul style="list-style-type: none"> • 27th October 2017. REF Consultation letter

Roads and Maritime received comments in response to formal consultation letters from:

- Department of Industry (Fisheries) on the 31st October 2017
- Department of Industry (Water) on the 20th November 2017
- Forbes Shire Council response to the proposed lowering of Lake Forbes on the 16th October 2017
- Forbes Shire Council response to the SEPP (Infrastructure) letter on the 4th December 2017.

The consultation letters and agency responses are provided in **Appendix K**.

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined below in **Table 5-5**. SEPP(Infrastructure) matters raised by Forbes Shire Council are addressed in section 5.4 and **Table 5-3**.

Table 5-5: Issues raised through stakeholder consultation

Agency	Issue raised	Response / where addressed in REF
Forbes Council	<p>Council confirmed that it had no objection to the temporary lowering of water levels in Lake Forbes during construction.</p> <p>Council requested communication with the community on the reasons for the lowering of the levels.</p> <p>Council noted no objection to the use of Sir Francis Forbes Park as a temporary construction compound site.</p> <p>Council noted the monthly use of Sir Francis Forbes Park by the Rotary Club for markets and the need to find an alternate site whilst the site is used for construction purposes.</p> <p>Council provided additional information relating to the lowering of Lake Forbes and potential impact to downstream water users. While the Forbes Golf Club do not use water from Lake Forbes to irrigate the golf course, other water users that may be impacted include the Forbes Racecourse, the Forbes Dragon Boat Club, and local organisations which use sections of the lake for events such as the Barefoot Water-Skiing Tournament and an annual triathlon. Consultation with relevant affected water users will be required.</p>	<p>Noted.</p> <p>This is addressed in Section 5.6, 6.5 and 6.6.</p> <p>Noted</p> <p>This is addressed in Section 5.6 and 6.12.</p> <p>This is addressed in Section 6.6.</p>

Agency	Issue raised	Response / where addressed in REF
Department of Industry (Fisheries).	1. Blockages to fish Passage - DPI Fisheries requests that the REF consider whether any temporary dams, construction pads, sidetracks, etc. are likely to be used that may result in the blockage of fish passage within Key Fish Habitat. If so, details on proposed design and construction methods, likely duration of installation or removal methods should be outlined within the REF.	<p>Is noted that fish passage is obstructed in Lake Forbes by upstream and downstream water level control structures.</p> <p>Temporary in-stream works, which may include structures such as rock platforms, coffer dams and sheet piling will be required. However it is not envisaged that these in-stream structures would obstruct the full width of the Lake and obstruct fish passage. These temporary structures can be built to enable the movement of fish.</p> <p>This is addressed in section 3.3 and 6.7.</p>
Department of Industry (Fisheries).	2. Damage to Riparian Vegetation - DPI Fisheries seeks information on any damage to riparian vegetation such as river red gums that may occur, noting that Degradation of Riparian Vegetation along Watercourses is listed as a Key Threatening Process under the FM Act.	<p>There are no proposals to remove or otherwise damage riparian vegetation. There is no riparian vegetation in the study area.</p> <p>This is addressed in section 6.7.</p>
Department of Industry (Fisheries).	3. Removal, realignment of snags - DPI Fisheries requests information on any proposal to remove, realign or relocate snags (large woody debris). Proposed works should be outlined within the REF. Snags should not be removed, realigned or relocated without first contacting DPI Fisheries. Note: that the removal of large woody debris is listed as a Key Threatening Process under the FM Act.	No snags are proposed to be removed by the proposal.

Agency	Issue raised	Response / where addressed in REF
Department of Industry (Fisheries).	<p>4. Bank Stabilisation and Rehabilitation – DPI Fisheries seeks information on any destabilisation of the banks with heavy machinery or damage to the bed or banks. DPI Fisheries requests that any bed and bank rehabilitation works be completed immediately after the completion of works. Proposals to ensure replacement of aquatic and riparian vegetation with native/endemic species are encouraged.</p>	<p>The proposed works will include the access to the banks by heavy machinery in order to access temporary in-stream structures for the demolition and construction of the new bridge. This is discussed in section 3.3.</p> <p>The proposed works will involve bank stabilisation and rehabilitation. The landscaping plan includes the planting of naïve vegetation and water sensitive drainage features to improve the water quality of runoff into Lake Forbes.</p> <p>The proposed landscaping is shown in Figure 3-1 and provided in detail in Appendix C.</p>
Department of Industry (Fisheries).	<p>5. Threatened species, populations, and ecological communities –Threatened species provisions are listed within the Fisheries Management Act 1994.</p> <p>The REF must address the threatened species provisions of the Act; for species, populations or communities listed under schedules 4 and 5 whose historical geographical distribution extends to within the waterway adjacent the works. The proposal should address whether there are likely to be any significant impacts on the listed species, know or expected populations or ecological communities within the project area. Threatened species distributions available at; https://www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps.</p>	<p>This is addressed in section 6.7.</p> <p>Searches have been undertaken on OEH Biodiversity database, EPBC searches, and DPI(Fisheries) spatial mapping. The terrestrial and aquatic habitats are considered degraded environments with poor habitat values.</p>

Agency	Issue raised	Response / where addressed in REF
Department of Industry (Water).	Details of water proposed to be taken via groundwater interception or water supply sources.	<p>The proposal is a temporary construction activity for a new bridge. The proposal does not seek to take surface or groundwater sources. No groundwater interception activities will be undertaken of note.</p> <p>Groundwater may be dewatered in the immediate vicinity of bridge abutments or utility trenches for construction adjacent to the Lake. Should this be required the volumes of water taken are minimal and less than 1ML/year.</p> <p>This is addressed in section 6.6.</p>

Agency	Issue raised	Response / where addressed in REF
Department of Industry (Water).	Assessment of impacts on surface and ground water sources (both quality and quantity), watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts	<p>A search of groundwater and surface water license in the area has been undertaken. There are surface water licenses and groundwater licenses in Lake Forbes. The results of these searches are provided in 6.6.</p> <p>Lake Forbes will be lowered during construction. Lake Forbes is a modified parkland, ornamental water body. The water levels in the Lake are controlled upstream and downstream. The impacts will be isolated.</p> <p>There are no groundwater dependent ecosystems or riparian areas around the subject area of Lake Forbes. The riparian, aquatic and terrestrial habitats have been removed with the conversion of the watercourse into an ornamental Lake since the 1930's</p> <p>The proposal will not impact on:</p> <ul style="list-style-type: none"> • surface water or groundwater source volumes or quality; • riparian land; • groundwater dependent ecosystems (GDEs) <p>The proposal will involve temporary instream works in Lake Forbes. Measures will be in place to mitigate water quality risks and reinstate the bed and banks at the completion of the proposal.</p>

Agency	Issue raised	Response / where addressed in REF
Department of Industry (Water).	Assessment of potential impacts to flow behaviour under normal and flood conditions both during and following construction activities, and measures proposed to reduce and mitigate these impacts	<p>An assessment has been undertaken on flow behaviour. The bridge has been designed such that the proposal will not alter the flow behaviour under normal and flood conditions when operational.</p> <p>Instream structures will be in place as part of the construction phase of the project. These structures will allow the flow of the Lake and have restrictions on levels so that the Lake Forbes inundation levels under normal flow conditions are not affected.</p> <p>This is provided in section 6.5. The flood impact assessment is provided in Appendix I.</p>
Department of Industry (Water).	Assessment of any water licensing requirements	An assessment of water licensing requirements of the proposal has been undertaken. This is provided in section 4.2.10.
Department of Industry (Water).	Consideration of relevant policies and guidelines such as the “Guidelines for Controlled Activities on Waterfront Land (2012)” and the “NSW Aquifer Interference Policy (2012)”	An assessment of the Guidelines for Controlled Activities on Waterfront Land (2012)” and the “NSW Aquifer Interference Policy (2012)” has been undertaken. This is provided in section 4.2.10.

5.6 Ongoing or future consultation

5.6.1 Public display of REF

The review of environmental factors will be advertised and placed on public display for three weeks (from 25 June 2018 to 16 July 2018) and will be available for viewing at the following locations:

- Forbes Shire Council office chambers at 2 Court Street Forbes
- Forbes library at 2 Victoria Lane, Forbes.

5.6.2 Consultation during construction phase

If the proposal proceeds, a Community and Stakeholder Engagement Plan would be developed and implemented during the detailed design and construction phases of the proposal. It would describe the community consultation objectives, stakeholders, strategies, activities and evaluation for the proposal.

During the pre-construction and construction phases of the proposal targeted consultation will be undertaken with:

- Forbes Shire Council on matters including potential temporary short term infrastructure impacts, lowering of the Lake, detours, short term loss of car parking at Netball courts and South Circle Oval, and relocation of commemorative plaques
- Forbes Shire Council and the Rotary Club on an alternate location for the monthly market whilst access to Sir Francis Forbes Parks is restricted
- Community on the lowering of the water levels Lake Forbes and the reasons for lowering the levels
- Department of Industry (Fisheries) on permit requirements and timing of works
- Department of Industry (Water) on potential impacts to surface water licenses in Lake Forbes prior to lowering
- Crown lands on temporary occupancy licenses for site compounds and ancillary works areas on Crown reserves
- Holder of any extractive water licenses in the affected area of Lake Forbes prior to reducing water levels
- Emergency Services in Forbes and Parkes on the timing of works and detour route operation
- Businesses on Camp Street on the closure of Camp Street, detour routes and timing of works
- Key sports clubs users (Netball, cricket and football) on alternate parking arrangements and signage for the South Circle Oval during road closure on Camp Street
- Bus companies on timing and detour routes
- Forbes chamber of commerce on project timing and detour routes
- Forbes historical society on opportunities for archival reporting
- Ongoing consultation with the community and stakeholders will be undertaken including potentially directly impacted and adjacent property owners, interest groups, government and non-government agencies and the wider community.

Consultation with the wider community will also take place through:

- Regular updates to the community throughout the remainder of the planning and construction phases
- Development and maintenance of a comprehensive complaints management system
- Proposal signage
- Toll free community information line
- Email address
- Website.

6 Environmental assessment

6.1 Non-Aboriginal heritage

A SOHI was prepared by Focus Bridge Engineering in August 2017. A copy of the report is provided in Appendix F with a summary of the findings provided below.

6.1.1 Methodology

Searches of the following were undertaken:

- State Heritage Register
- Section 170 Register Forbes Local Environmental Management Plan 2013
- Forbes Shire Council LEP
- National Heritage List
- The Commonwealth Heritage List.

The results of the database searches are provided in **Table 6-1**.

A site condition assessment site inspection has been undertaken on the bridge in May 2017. A SOHI was prepared consistent with the NSW OEH (2002) Statements of Heritage Impact guidelines. A visual inspection of the proposed area including potential ancillary sites was undertaken on the 12th October 2017.

6.1.2 Existing environment

The area now known as Forbes was originally inhabited by the Wiradjuri Aboriginal peoples. The surveyor John Oxley was the first European to explore the area and named the site Camp Hill in 1817. Forbes owes its development to the gold rush which began in Forbes in 1861 when the population expanded from 124 to 30,000. Miners named the district "Forbes" after Sir Frances Forbes, the first Chief Justice of New South Wales.

The population reduced to 3,500 in 1863 after the gold rush boom. The town's main economic source became sheep in the 1870s. By the mid-twentieth century Forbes had become the centre of an important agricultural and pastoral area with secondary industries related to the primary products, including meat works, butter factory, flour mill and winery.

The route from the Hume Highway near Yass, to Cowra was proclaimed a secondary main road under the Local Government Act of 1923. The route was transferred into State management with the institution of the Main Roads Board in 1924. In 1928 this route was amalgamated with the route from the Mid-Western Highway near Cowra through Gooloogong to Forbes to form the Lachlan Valley Way.

Lake Forbes was called The Lagoon prior to 1930. It was a natural billabong regulated by an overflow from the Lachlan River and often dry. The Camp Street Bridge was constructed in 1927/8 by State Monier Pipe and Reinforced Concrete Works, a state owned enterprise. It replaced a timber bridge over the lagoon between Camp and Bridge Streets, which was over 46 years old. The bridge was officially opened on 24 January 1928. Newspaper reports noted the "handsome lighting arrangements" of the new bridge.⁹

From 1925 to 1940 more than 1,000 bridges were constructed by the NSW Department of Main Roads. The main bridge types constructed during this period were: concrete slab; reinforced

⁹ NSW Office of Environment State Heritage Inventory Listing for Camp Street Bridge (data base number 4306123)

concrete beam; steel truss on concrete piers; and timber beam bridges. Camp Street Bridge is a reinforced concrete beam bridge.

An assessment of the heritage significance of pre-1984 concrete beam bridges was undertaken by RMS in 2007. This report assessed the Camp Street Bridge as having local heritage significance. Camp Street Bridge is recognised by Roads and Maritime as having a strong local connection and an important entry feature to the town.

Heritage databases searches were undertaken in September 2017. The results of the database searches are provided in **Table 6-1**. The Camp Street Bridge has local heritage status. There are no other heritage items recorded in the proposal area.

Table 6-1: Statutory and non-statutory heritage listings

Heritage listing	Status
Australian heritage database	Not listed
OEH Heritage Division State Heritage Inventory	Listed (database number 4306123)
Local Environment Plan	Not listed
NSW National Trust register	Not listed
RMS S170 Heritage and Conservation register	Listed

Three commemorative plaques were identified in a site inspection on the 12th October 2017. These plaques are relatively new with dates of 1982, 2008 and 2013. They have not been identified on heritage registers or as having heritage value. The plaques include:

1. “The Shared Pathway over Lake Forbes.” 7th December 2013. This plaque is located on the southern side of the Camp Street Bridge at the entrance to the pedestrian bridge
2. “Commemorates 75 years of scouting.” 3rd October 1982. This plaque is located in Sir Francis Forbes Park on the western side of Sir Francis Forbes drive
3. “World Youth Day 2008” plaque. 13th July 2008. This plaque is located in Apex Park on the western banks of Lake Forbes.

The plaques are shown in **Figure 6-2**.



- Proposal area
- Non-aboriginal Heritage
- Conservation Area - General
- Item - General

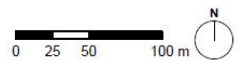


Figure 6-1: Non-aboriginal heritage



Figure 6-2: Commemorative plaques clockwise from left (1) “The shared pathway over Lake Forbes” 2013. Camp Street shared pathway bridge entrance (2) “Commemorates 75 years of scouting” 1982. Sir Francis Ford Park (3) “World Youth Day 2008” Apex Park on western banks of Lake Forbes.

6.1.3 Potential impacts

Camp Street Bridge

The potential impacts are discussed in the SOHI prepared by Focus Bridge Engineering in August 2017. A copy of the report is provided in Appendix F with a summary of the findings provided below. The findings of the SOHI are supported by the Heritage Division of OEH as detailed in their letter provided in Appendix K.

The bridge condition was assessed in 2017 and found to be in fair to poor condition. A number of options were considered to keep and maintain the bridge as described in section 2.4 and in the SOHI in Appendix F. These bridge maintenance options did not meet all of the project objectives and performed poorly in providing value for money as noted in section 2.4. The replacement of the bridge has been adopted as the preferred option. Camp Street Bridge, which has local heritage significance, will be demolished to make way for the new bridge.

The SOHI has identified that the bridge type is common for a bridge of that era. A review of bridges light fittings has identified seven bridges with comparable art deco style light fittings. Camp Street Bridge was declared to be of moderate overall heritage significance at a local level. The majority of the individual components appear to be of low or intrusive significance, although the pedestrian balustrades are of high significance and the art deco lamp posts are considered to be exceptional.

The art deco light fittings will be re-used as part of the proposed new bridge in order to retain and re-use the items of key visual and heritage value from the existing bridge.

A heritage interpretation area is proposed as shown in **Figure 3-1**. The proposed heritage interpretation area will include a display of the current bridge.

Commemorative plaques

Although not identified as having heritage values one of the three commemorative plaques will be directly affected by the proposal. The other two plaques may be in areas of ancillary works activities and may also be impacted.

The shared pathway plaque on the Camp Street Bridge shared path entrance will be removed with the demolition of the bridge. This plaque is to celebrate the opening of a new pedestrian bridge in 2013. The pedestrian bridge will be removed as part of the demolition works for the Camp Street Bridge. Neither the pedestrian bridge nor the plaque has heritage significance. Nonetheless consultation should take place with Forbes Shire Council on whether this plaque is to be disposed or relocated prior to construction.

The plaque commemorating 75 years of scouting is in an area identified as a potential compound site in Sir Francis Forbes Park. Measures should be put in place to protect this plaque from construction vehicles and the direct footprint of the construction compound itself. The World Youth day 2008 plaque is the furthest from direct and ancillary activities and unlikely to be damaged by direct construction activities.

6.1.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Non-Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered Work will only re-commence once the requirements of that Procedure have been satisfied. 	Contractor	Detailed design / pre-construction	Core standard safeguard H2 Section 4.10 of QA G36 <i>Environment Protection</i>
Non aboriginal heritage	<ul style="list-style-type: none"> Detailed quality photographic recording of the bridge be completed prior to the work commencing. Any images taken would be placed on the Roads and Maritime Services bridge files and could be utilised in any heritage interpretive signage. Copies are to be provided to the State Library of NSW, Forbes Shire Council and the Forbes historical society as a heritage resource for future researchers. 	Roads and Maritime	Pre-construction	Additional safeguard
Non aboriginal heritage	<ul style="list-style-type: none"> Reuse the art deco light fittings from the existing bridge within the project landscaping 	Roads and Maritime	Detailed design / operation	Additional safeguard
Non aboriginal heritage	<ul style="list-style-type: none"> The art deco light fittings on the existing bridge are to be removed prior to construction and stored in a safe location for use in the project landscaping. A work procedure is to be developed for the safe removal and handling of the light fixtures to prevent accidental damage 	Roads and Maritime	Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Non aboriginal heritage	<ul style="list-style-type: none"> Develop and implement a heritage interpretation plan in consultation with Forbes Shire Council Implement a heritage interpretation area in consultation with Forbes Shire Council and the Forbes Historical society 	Roads and Maritime	Pre-construction	Additional safeguard
Non aboriginal heritage	<ul style="list-style-type: none"> S170 heritage register to be amended to reflect the demolition of the bridge 	Roads and Maritime	Pre-construction	Additional safeguard
Non aboriginal heritage	<ul style="list-style-type: none"> Consult with Forbes Shire Council on the Camp Street pedestrian footbridge commemorative plaque 2013 and whether it is to be disposed or relocated 	Roads and Maritime	Pre-construction	Additional safeguard
Non aboriginal heritage	<ul style="list-style-type: none"> Provide protection and visually mark the “Commemorates 75 years of scouting” 1982 plaque prior to the establishment of ancillary areas such as site compounds, stockpiles, and construction car parking on Sir Francis Forbes Park 	Roads and Maritime	Pre-construction	Additional standard safeguard / additional safeguard

Other safeguards and management measures that would address landscape character and visual impacts are identified in section 6.2.

6.2 Landscape character and visual impacts

6.2.1 Methodology

The landscape character and visual impact assessment was undertaken by KI Studio (2018) in accordance with Roads and Maritime *Environment impact assessment practice note: guideline for landscape character and visual impact assessment (EIA-N04)*. The landscape character and visual impact assessment is provided in Appendix C.

The landscape character impact is based on an area’s built, natural and cultural character and sense of place. It is measured by the considering the area’s sensitivity, and the magnitude of the proposal consisting of the scale, character and distance.

The level of sensitivity and magnitude are combined to achieve an overall level of impact for both the landscape character impact and the visual impact. This is shown in **Figure 6-3**. These ratings are relative to each other. The ratings are not an absolute or quantitative measure of impact. The landscape character impact rating is specific to the proposal. It identifies areas with the highest and lowest impact.

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

Figure 6-3: Landscape character and visual impact assessment grading matrix

6.2.2 Existing environment

The Camp Street Bridge has been assessed as being of moderate aesthetic value. The light poles are the most important elements that give the bridge its character as shown in **Figure 2-2**. The rest of the structure has been assessed as being of limited visual appeal (KI Studio 2018).

The bridge is about nine metres wide with a single vehicular traffic lane in each direction. There are two narrow footpaths to either side of the carriageway. Adjacent to the existing bridge is a recently completed pedestrian bridge that partially screens the historic bridge when viewed from the south.

Three landscape zones were identified in the immediate vicinity of the bridge by KI Studio (2018). The sensitivity of all three zones is considered high either due to the historic fabric, its recreational and community value or its residential land use.

The three landscape zones are shown in **Figure 6-4** and include:

Zone A: Town Centre

This zone comprises the historic buildings surrounding Victoria Park and forms the commercial hub of the town. It includes historic buildings and churches that combine with statues and a Victorian style central park to create a distinctive identity that defines the township.

Zone B: Lake Forbes

Lake Forbes is the main park in the town. It includes waterways and grassed parklands with mature trees and open vistas. This park provides a fitness loop, picnic benches and a playground. The Camp Street Bridge is located across Lake Forbes.

Zone C: Residential

This residential area includes dwellings ranging from modern double storey villas to single storey weatherboard cottages. The residential area has a character with wide streets and generous front gardens.

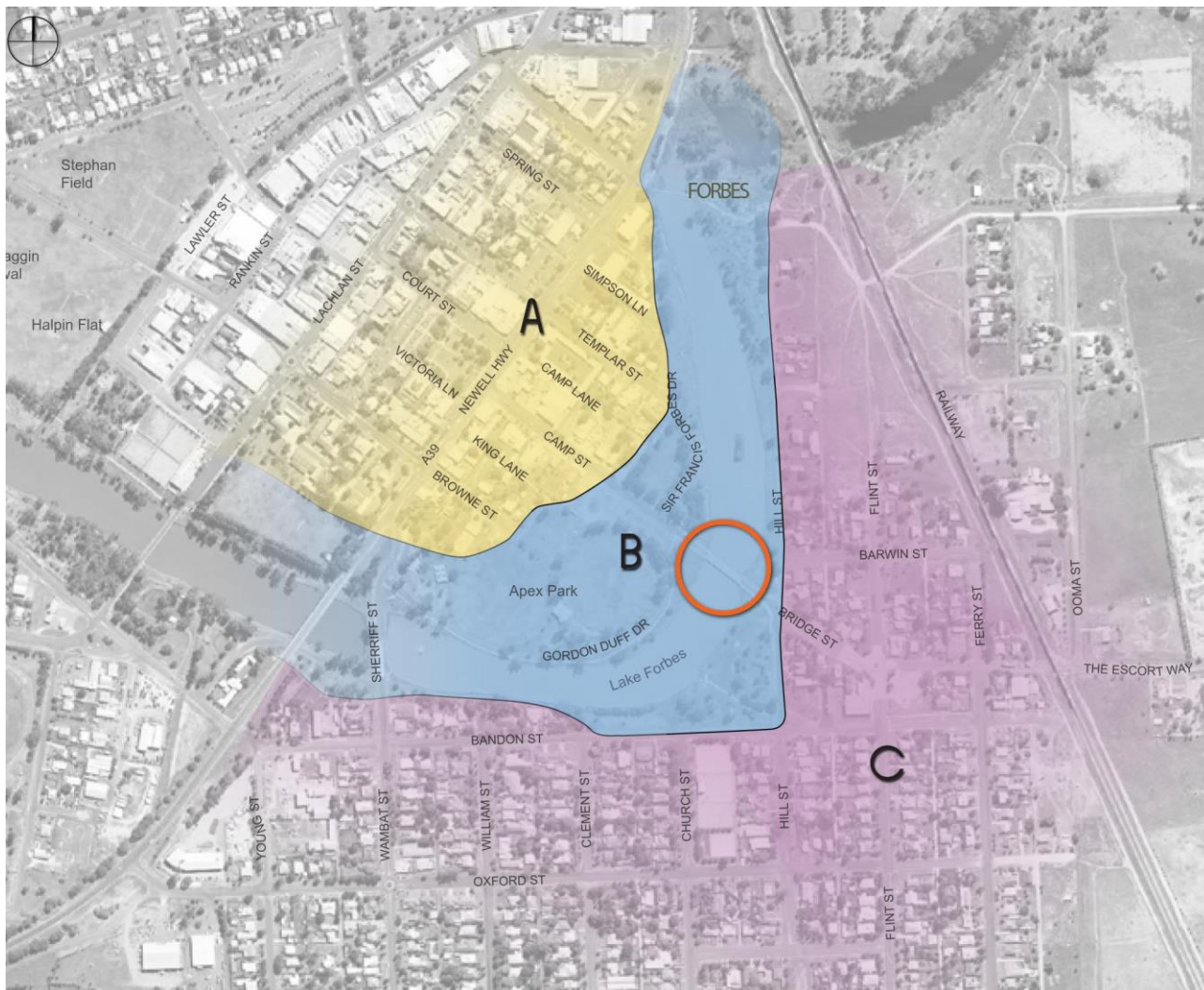


Figure 6-4 Landscape zones (source KI Studio 2018)

6.2.3 Potential impacts

Construction

During construction the main visual impacts will be in Zone B and associated with the demolition and replacement with the new bridge. During construction there will be in-stream structures, protective sheeting in locations to protect water quality and visible heavy machinery such as cranes and excavators. The construction period is approximately 54 weeks subject to weather. The visual impacts are temporary.

Operation

The visual context, aesthetics of the proposal and potential for visual impacts has been a key consideration in the development of the proposal. An urban design concept has been developed for the bridge design as part of the visual impact assessment for the proposal. The urban design concept has been integrated into the bridge design as noted in section 2.3.3 and 3.2.3. A landscape plan that includes plantings and water sensitive urban design features has also been prepared to improve the visual amenity of the proposal. The urban design concept and the proposed plantings are provided in Appendix C.

The impact of the proposal on the landscape character of the three zones has been assessed by KI Studio (2018). It found:

- **Zone A: Town Centre.**
The landscape and visual impacts of the proposal on this zone are negligible. The visual identify and character of the main street would not be affected by the proposal.
- **Zone B: Lake Forbes.**
The landscape and visual impacts of the proposal on this zone are minor. The proposed bridge would have a different character to the existing structure yet its overall built form is similar to the existing structure. This limits the effect on the current parkland setting.

The open space system and waterways would continue to operate in the same way. Hence, the low magnitude of impact, resulting in a moderate landscape character impact. The proposed changes to the existing crossing would enhance the arrival into the town, and the interface with Lake Forbes, providing a positive contribution to the identity and character of the township.

- **Zone C: Residential zone.**
The landscape and visual impacts of the proposal on the residential zone are negligible. The visual identify and character of the residential areas would not be affected by the proposal.

6.2.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Landscape character and visual impact	Implement the urban design and landscaping concept for the proposal as per Appendix C where compatible with the project and safety objectives.	Roads and Maritime Services	Detailed design / pre-construction	Additional safeguard

Other safeguards and management measures that would address landscape character and visual impacts are identified in section 6.1.

6.3 Traffic and transport

6.3.1 Methodology

A Traffic and Transport Assessment was undertaken by AECOM (2017) to determine the potential traffic and transport impacts during construction of the new bridge.

The study area for the purpose of traffic and transport studies is wider than that of other areas of the REF. Seven key intersections within the study area were surveyed and modelled using SIDRA modelling software. Two mid-block traffic surveys were conducted on 26 October 2017 at key locations along the proposed detour route, including Camp Street Bridge and Iron Bridge. The key intersections considered in the study area are shown in **Figure 6-5**.

The Traffic and Transport Assessment is provided in Appendix N. This section summarises the Traffic and Transport report.

6.3.2 Existing environment

Camp Street Bridge (labelled M-1 on **Figure 6-5**) is a two-lane, two-way bridge linking Lachlan Valley Way from the southeast to Newell Highway and Forbes Town Centre. Footpaths on either side provide pedestrian and cycling access. The bridge is narrow with a posted speed limit of 50km/h.

Camp Street is a designated B-Double truck route for trucks up to 25m in length with connections to other B-Double routes in the area including Newell Highway to the west, the Escort Way to the east, Henry Lawson Way to the south and Lachlan Valley Way to the southeast.

Iron Bridge (labelled M-2 on **Figure 6-5**) is located on Reymond Street, west of Reisling Street. Iron Bridge is on the proposed heavy vehicle detour route. Iron Bridge is narrow and only one heavy vehicle is permitted on the bridge at any one time. Access to the Apex Riverside Tourist Park is located approximately 90m east of Iron Bridge.

The study area for the purpose of traffic and transport studies encompasses the following key intersections along the proposed detour routes:

- 1: Newell Highway and Camp Street
- 2: Flint Street and Bridge Street
- 3: Flint Street and Bandon Street
- 4: Newell Highway and Sheriff Street
- 5: Newell Highway and Oxford Street
- 6: Lachlan Valley Way and Wongajong Road
- 7: Newell Highway and Wirrinya Road.

All of these intersections are priority give-way intersections with the exception of a roundabout at Flint Street and Bridge Street (Intersection No. 2). The intersections are shown on **Figure 6-5**.

Private vehicles are the predominant mode of transport in the study area, with public transport accounting for around 1% of transport mode share in Forbes. There are three scheduled bus routes operating within the area. Route 558 currently operates along Camp Street, connecting Camp Hill / south Forbes with the Forbes Town Centre, with three scheduled services daily. Two other bus routes (Route 556 and 557) service the residential area north and west of Forbes Town Centre (North Hill). All scheduled bus services operate between the interpeak periods (after 9.00 am and before 3.00 pm). A number of school bus services also operate within the area.

Traffic studies were undertaken at two key locations on the study route at Camp Street and Iron Bridge to assess likely traffic volumes on the proposed detour route. Total daily traffic volumes of 5,623 vehicles were recorded on Camp Street Bridge and 1,943 vehicles on Iron Bridge. This indicates traffic volume on Camp Street Bridge is significantly higher compared to Iron Bridge. Morning and afternoon peaks occur between 7.00 am – 9.00 am and 3.00 pm – 6.00 pm respectively. The earlier start to the afternoon peak period can be attributed to proximity to local schools, with Redbend College located south of Iron Bridge and Forbes Public School located west of Camp Street Bridge.

Both Camp Street Bridge and Iron Bridge are classified as B-Double routes. Traffic surveys indicate that the proportion of heavy vehicles at Camp Street Bridge and Iron Bridge were approximately 10% and 13% of total traffic respectively.

Modelling of seven key intersections along the proposed detour route indicates that all of the intersections currently operate at a satisfactory level of service (LoS A) during peak hours, with minimal intersection delays and queuing on all approaches.

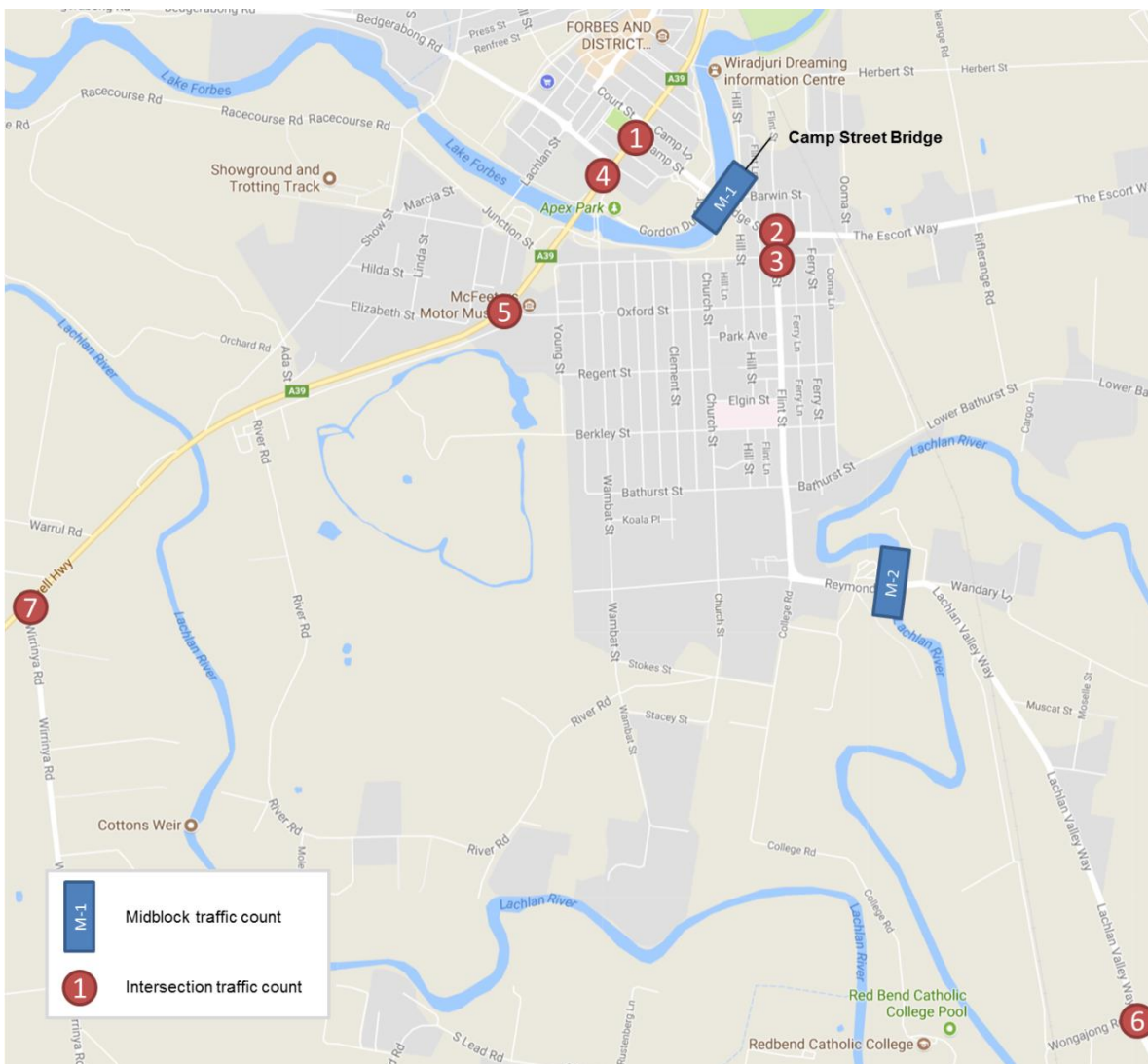


Figure 6-5: Key intersections within the study area and proposed detour route

6.3.3 Potential impacts

Construction

During the construction of the new bridge, the existing Camp Street Bridge would be closed, requiring existing light and heavy vehicle traffic to detour on alternative routes travelling to and from the east and western sides of Lake Forbes.

The proposed detour route for heavy vehicles to and from Orange on the Escort Way, and to and from Cowra on the Lachlan Valley Way would be from the intersection of Newell Highway and Camp Street across the Fitzgerald Bridge then onto Wirrinya Road, Red Bend Road, Wongajong Road and then onto Lachlan Valley Way (as shown on **Figure 6-6**).

There are various alternative local routes available for light vehicles. It is expected that most vehicles would travel southbound on Flint Street from the roundabout at its intersection with Bridge Street, then follow either Bandon Street or Oxford Street to reach the Newell Highway (as shown in **Table 6-2** and **Table 6-3**).

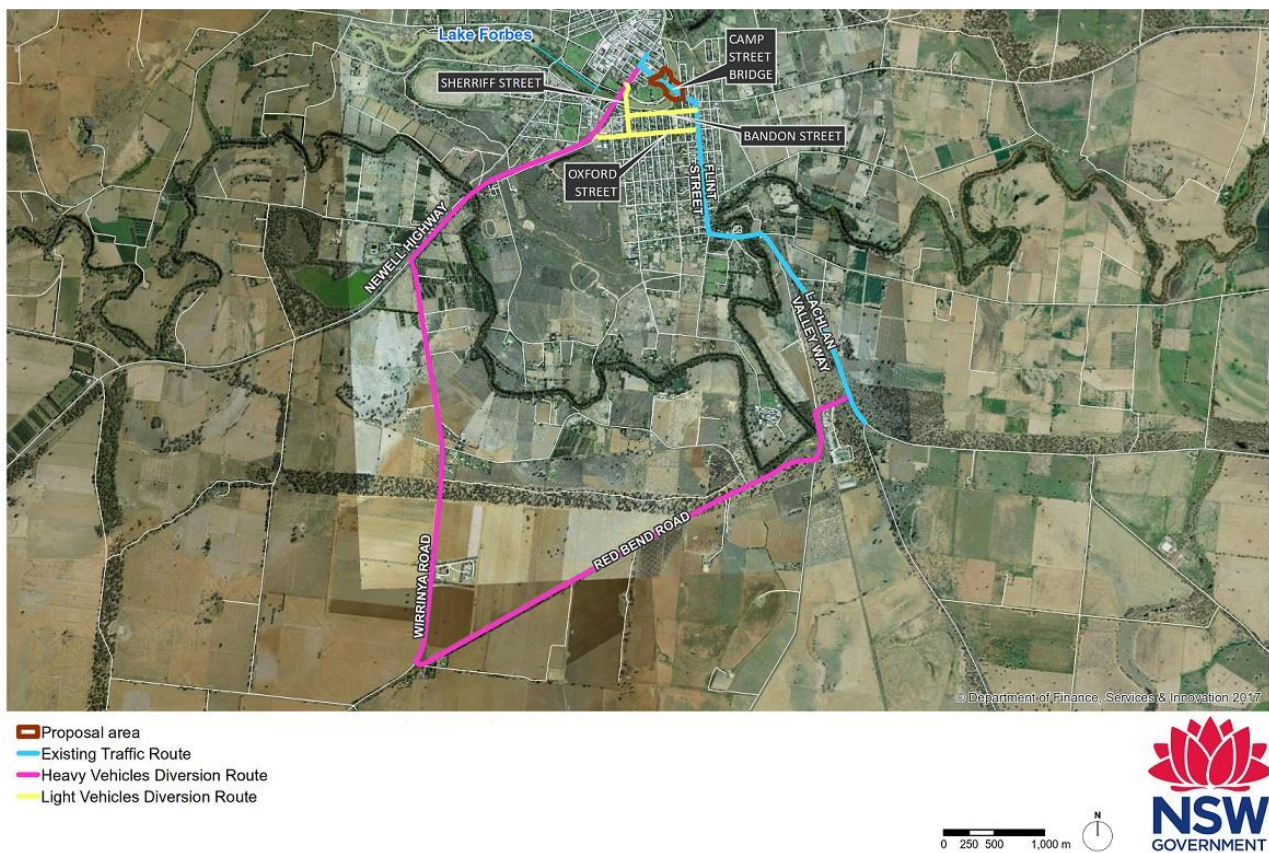


Figure 6-6: Proposed heavy vehicle and light vehicle diversion routes

Light vehicle detour

To assess the impacts of the light vehicle detour traffic on the surrounding road network, the existing light vehicle traffic on Camp Street Bridge was redistributed based on the following general assumptions:

- No sign posted / fixed detour route for light vehicles
- Based on existing land use and site observations, it is assumed that the majority of left turning traffic from Camp Street is destined for Forbes Town Centre (accessed via Browne Street) rather than continuing south along Newell Highway
- Traffic generated between Oxford Street and Sheriff Street along Newell Highway is minor
- The majority of the detour traffic will take the shortest detour path along Sheriff Street and Bandon Street. A small percentage of traffic may filter through Oxford Street to join onto Newell Highway.

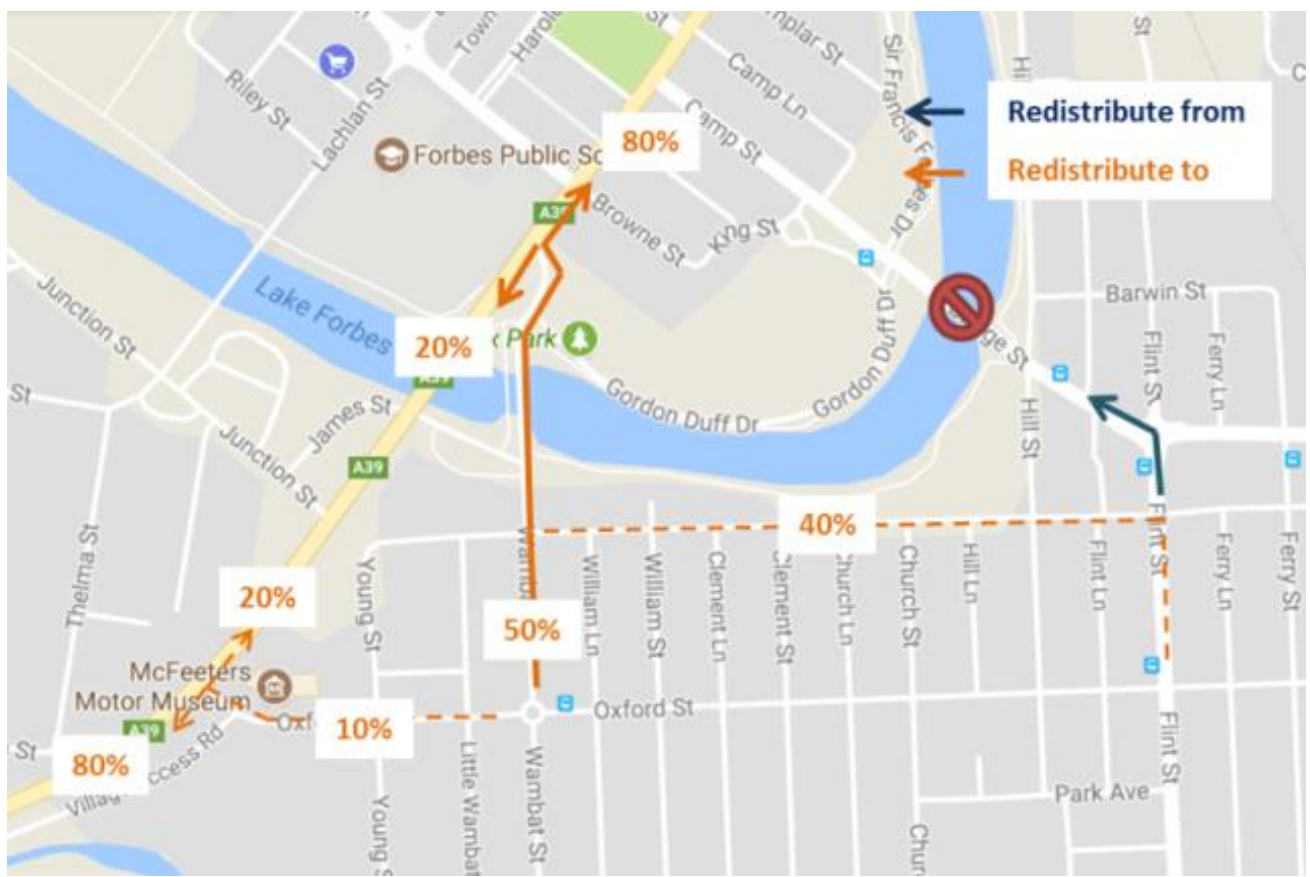
The existing light vehicle traffic was distributed depending on the direction of travel based on the existing traffic survey and the assumptions outlined in **Table 6-2** and **Table 6-3**.

Table 6-2: Light vehicle detour route and assumptions for traffic originating from Flint Street and Bridge Street



Light Vehicle Traffic Originating From Bridge Street and Flint Street

From Flint Street South



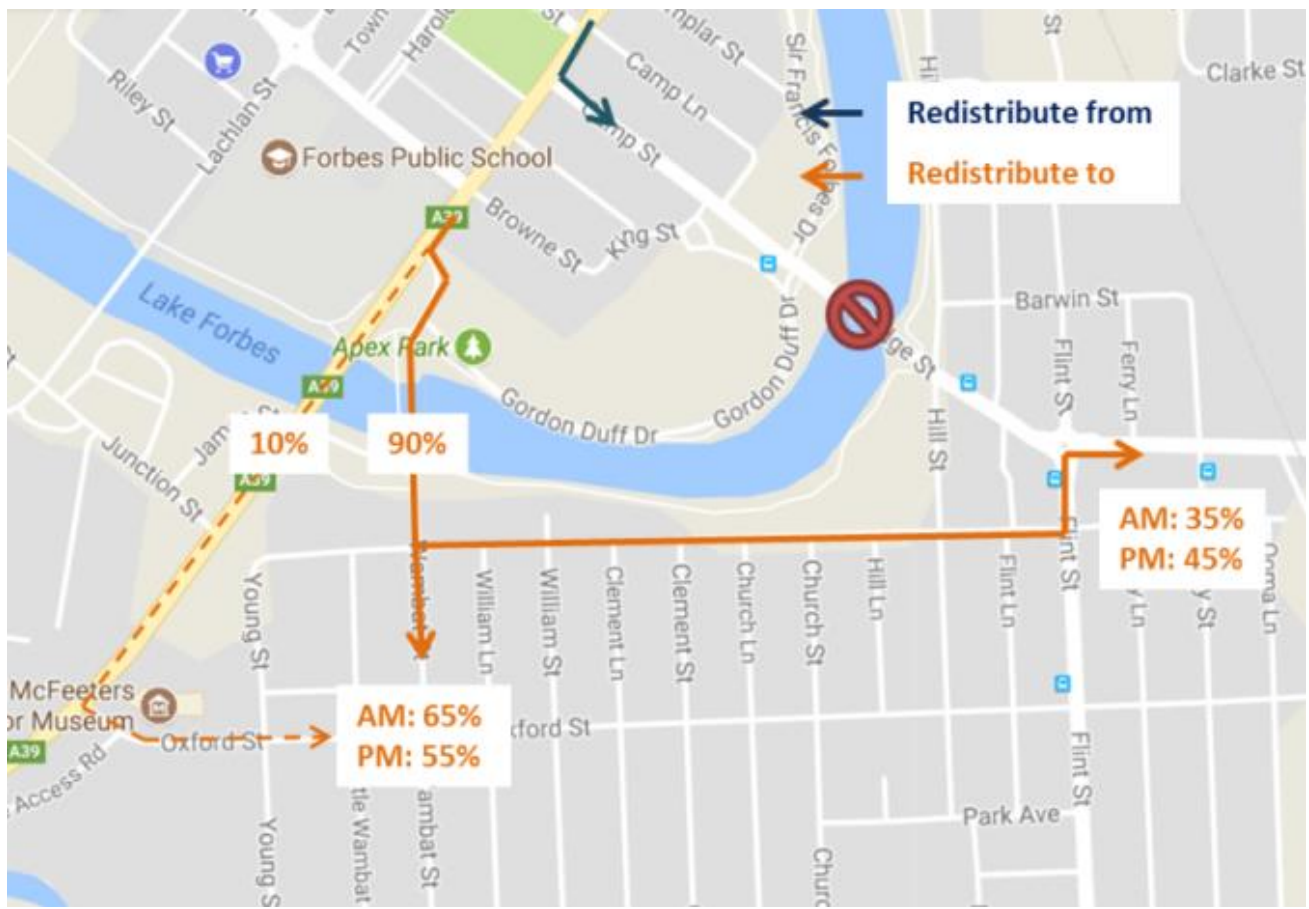
Movement: Flint Street South turning left into Bridge Street:

- Majority of the traffic will take existing E-W streets (Reymond Street, Bathurst Street, Berkley Street and Oxford Street) to Wombat Street / Sheriff Street rather than traveling north on Flint Street
- Majority of traffic at Sheriff Street / Newell Highway intersection is heading to Forbes Town Centre and North using the same assumption as Bridge Street East
- Remainder of the traffic is heading south on Newell Highway through Oxford Street.

Table 6-3: Light vehicle detour route and assumptions from Newell Highway and Camp Street

Light Vehicle Traffic Originating From Newell Highway North and South

From Newell Highway North

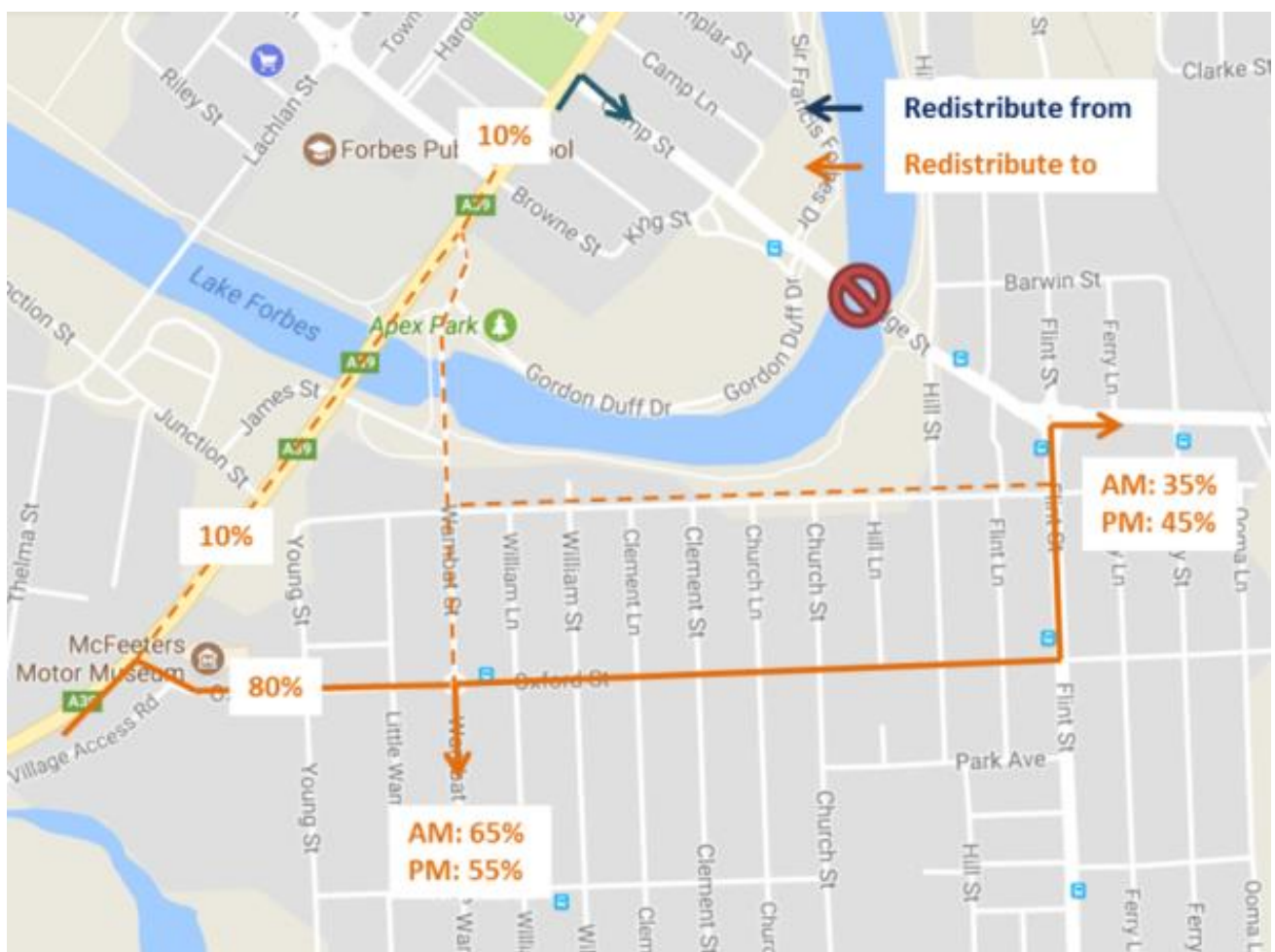


Movement: Flint Street South turning left into Bridge Street:

- Majority of the traffic will take existing E-W streets (Reymond Street, Bathurst Street, Berkley Street and Oxford Street) to Wambat Street / Sheriff Street rather than traveling north on Flint Street
- Majority of traffic at Sheriff Street / Newell Highway intersection is heading to Forbes Town Centre and North using the same assumption as Bridge Street East; and
- Remainder of the traffic is heading south on Newell Highway through Oxford Street.

Light Vehicle Traffic Originating From Newell Highway North and South

From Newell Highway South



Movement: Flint Street South turning left into Bridge Street:

- Majority of the traffic will take existing E-W streets (Reymond Street, Bathurst Street, Berkley Street and Oxford Street) to Wambat Street / Sheriff Street rather than traveling north on Flint Street
- Majority of traffic at Sheriff Street / Newell Highway intersection is heading to Forbes Town Centre and North using the same assumption as Bridge Street East
- Remainder of the traffic is heading south on Newell Highway through Oxford Street.

Heavy vehicle detour

To assess the impacts of the heavy vehicle detour traffic on the surrounding road network, the existing heavy vehicle traffic on Camp Street Bridge was redistributed based on the following general assumptions:

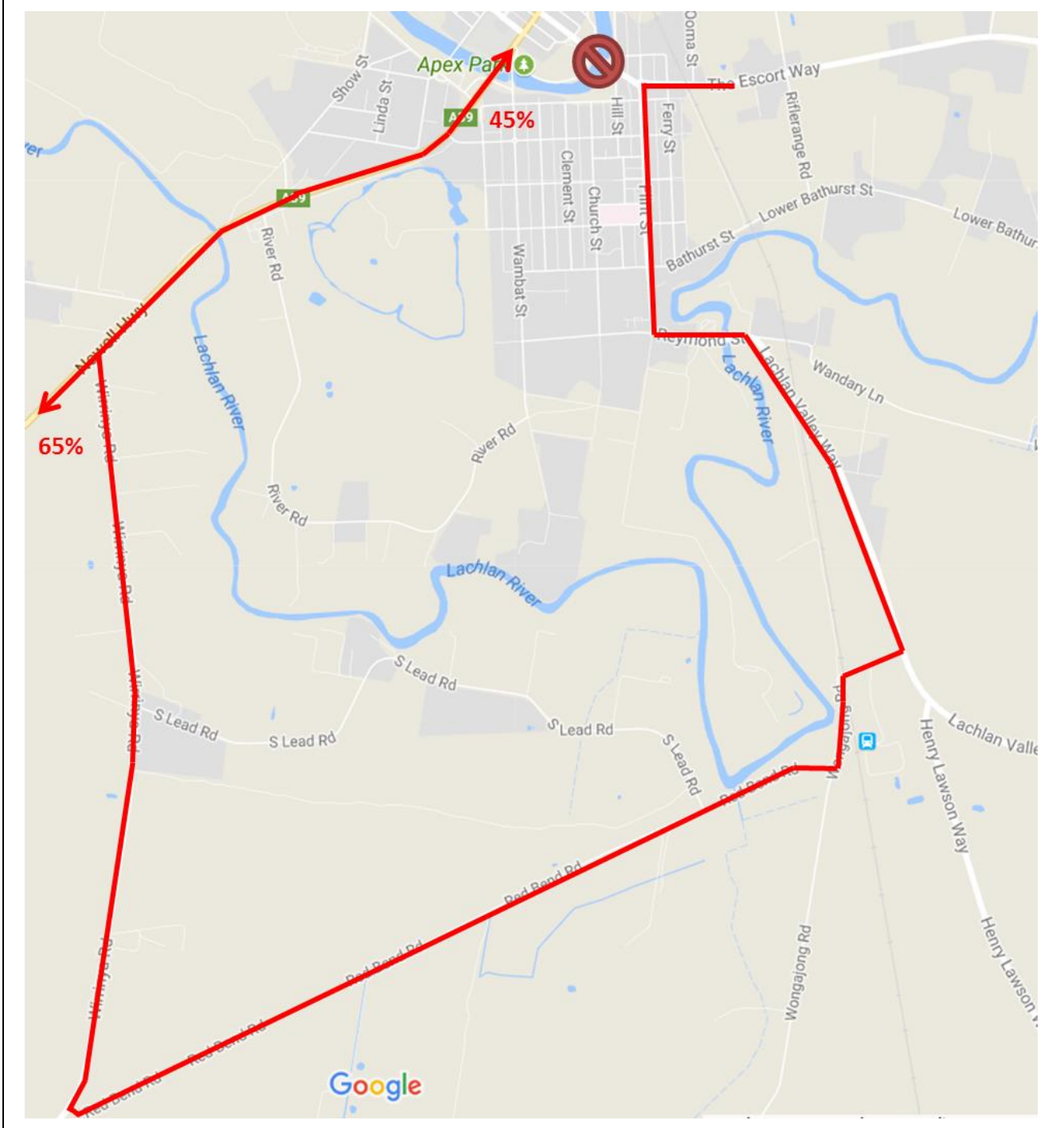
- There will be a fixed detour route for the duration of the Camp Street closure
- All heavy vehicles will use the defined detour route and no heavy vehicles will filter through Oxford Street and Sheriff Street between Newell Highway and Flint Street
- Based on existing land use south of Lake Forbes, there are no significant heavy vehicle generation along Newell Highway and Flint Street along the detour route.

The existing heavy vehicle traffic was distributed depending on the direction of travel based on the existing traffic survey and the assumptions outlined in **Table 6-4** and **Table 6-5**.

Table 6-4: Heavy vehicle detour route assumptions for traffic originating from Flint Street and Bridge Street

Heavy Vehicle Traffic Originating From Bridge Street and Flint Street

From Bridge Street East

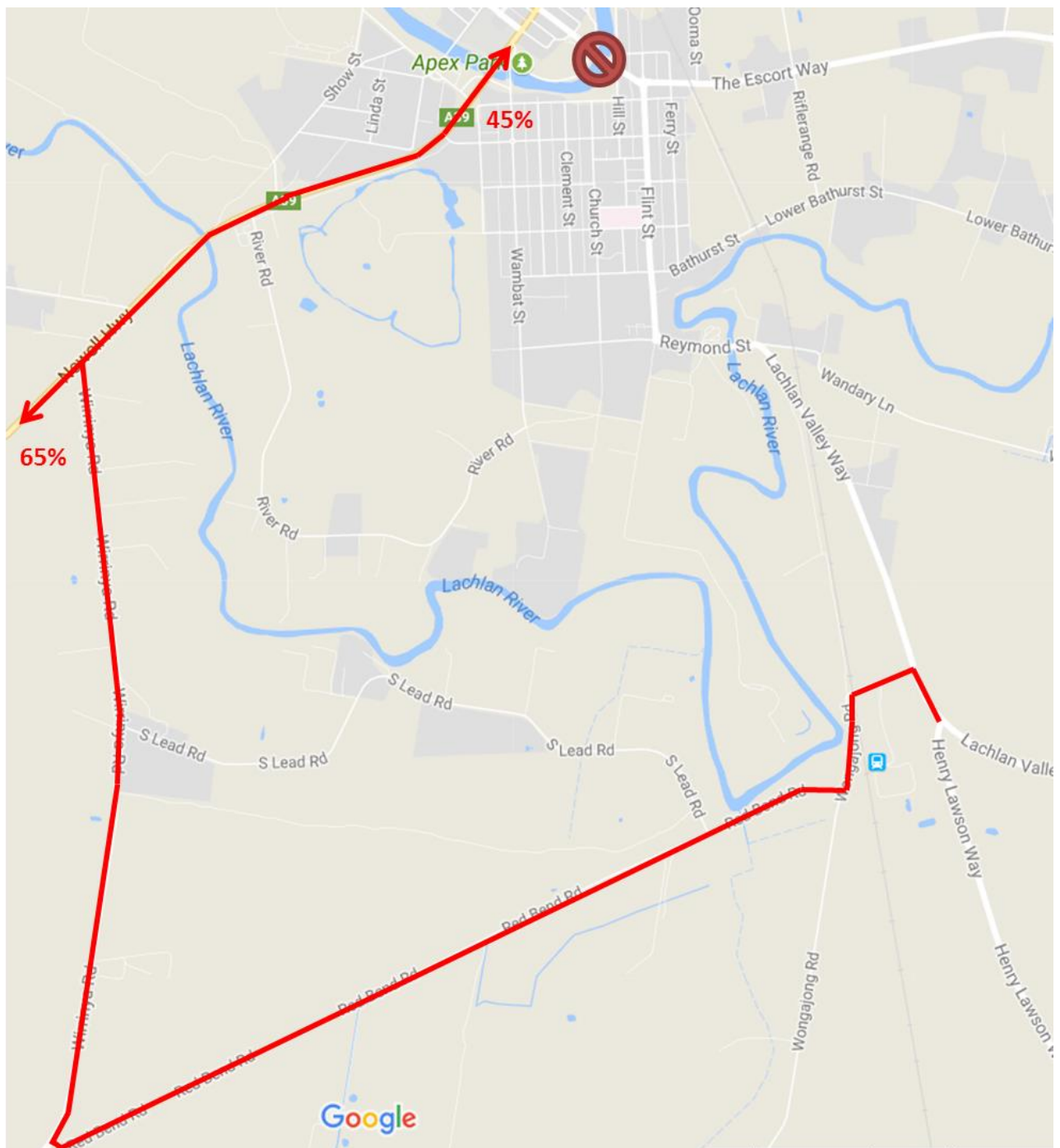


Movement: Bridge Street East continuing straight:

- Traffic is distributed at the Wirrinya Road (E) approach at Newell Highway based on the heavy vehicle survey distribution at Camp Street (E) approach at Newell Highway.

Heavy Vehicle Traffic Originating From Bridge Street and Flint Street

From Flint Street South



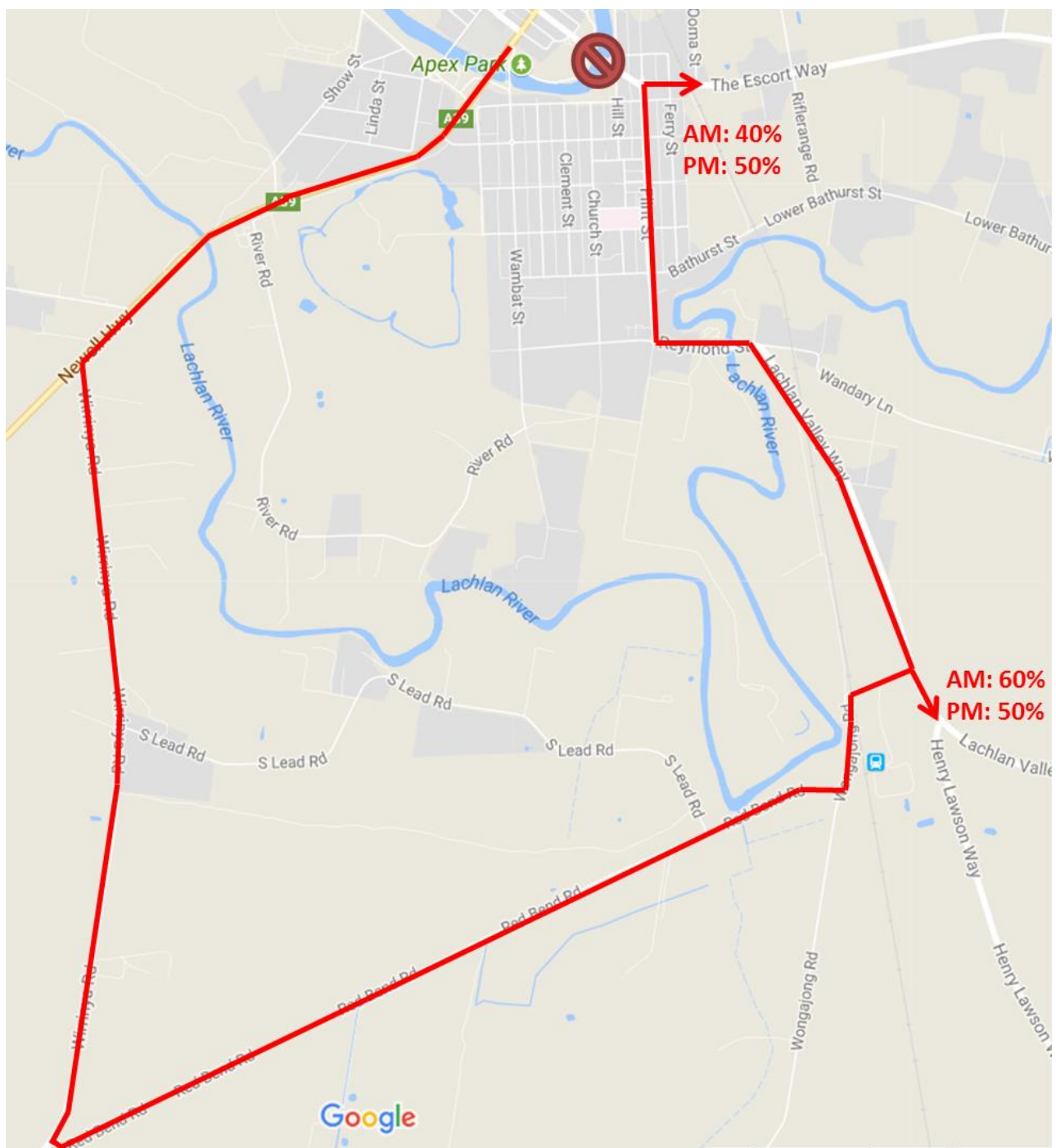
Movement: Flint Street South turning left into Bridge Street:

- Traffic will turn left at Wongajong Road from Lachlan Valley Way instead of continuing straight
- Traffic is distributed at the Wirryna Road (E) approach at Newell Highway based on the surveyed distribution at Camp Street (E) approach at Newell Highway
- No significant heavy vehicle generation between Wongajong Road and Bridge Street based on existing land use.

Table 6-5: Heavy vehicle detour route and assumptions from Newell Highway and Camp Street

Heavy Vehicle Traffic Originating From Newell Highway North and South

From Newell Highway North



Movement: Newell Highway North turning left into Camp Street:

- Traffic will continue straight on the highway and turn left at Warrinya Road
- Traffic is distributed at Wongajong Road (W) approach at Lachlan Valley Way based on the surveyed distribution at Bridge Street (W) approach at Flint Street.

Heavy Vehicle Traffic Originating From Newell Highway North and South

From Newell Highway South



Movement: Newell Highway South turning right into Camp Street:

- Heavy vehicles will turn right at Worrinya Road instead of continuing along the highway
- Traffic is distributed at Wongajong Road (W) approach at Lachlan Valley Way based on the surveyed distribution at Bridge Street (W) approach at Flint Street
- No significant heavy vehicle generation between Worrinya Road and Sheriff Street based on existing land use.

Bus services

The 558 bus route and two bus stops along Camp Street at South Circle Park (287148) and Bridge Street near Hill Street (287131) would be impacted by the closure of the Camp Street Bridge. A new temporary route connecting South Forbes with Forbes Town Centre would need to be determined through consultation between Roads and Maritime and Forbes Bus Lines.

School services operating in the area would also be potentially impacted and new detour routes would need to be determined prior to the closure of the bridge.

Pedestrians and cyclists

Pedestrians and cyclists would be diverted along Lake Forbes to Johnny Woods crossing at Sherriff Street, through the underpass at Newell Highway and along Newell Highway towards Camp Street (refer **Figure 6-7**).

There are existing separate shared path facilities on the southern side of Lake Forbes with a dedicated path on the western side of Sheriff Street. As pedestrians and cyclist would need to cross Sheriff Street near James Street in order to access Johnny Woods crossing on the west, there is potential for increased conflicts at Sheriff Street with diverted light vehicles traffic from Camp Street.

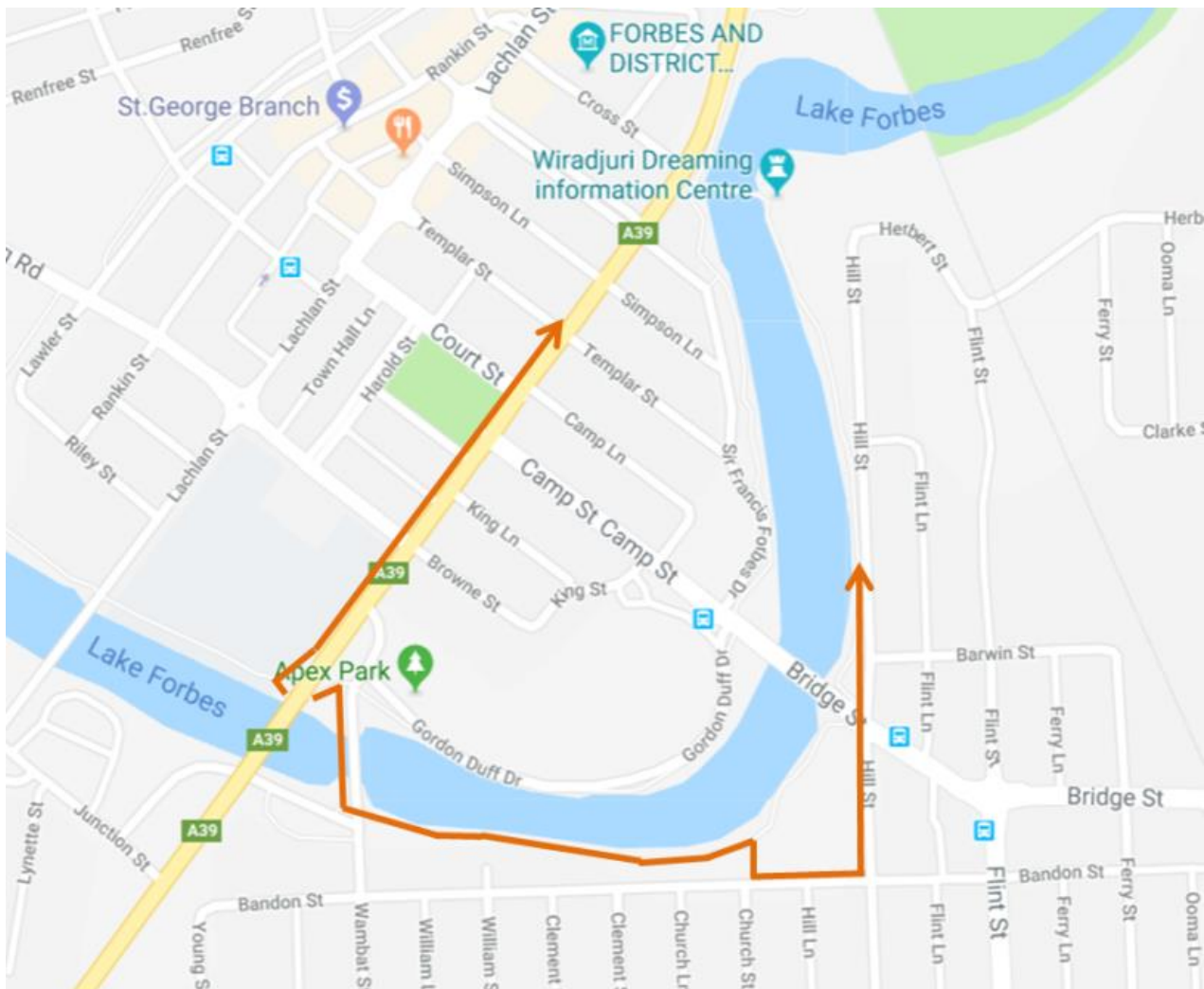


Figure 6-7: Pedestrian and cyclist detour

Emergency vehicles

Emergency vehicles crossing Lake Forbes at Camp Street Bridge are assumed to be diverted using the alternative light vehicle route from the intersection of Flint Street and either the intersection of Bandon Street or Oxford Street to the intersection the Newell Highway with either Oxford Street or Sheriff Street depending on the direction of traffic.

Based on site observations, there appears to be sufficient clearance at the key intersections along Newell Highway at Sheriff Street and Oxford Street, and along Flint Street at Bandon Street and Oxford Street to accommodate turning emergency vehicles.

Construction traffic

Impacts on traffic during reconstruction of the Camp Street Bridge would be temporary in nature. Traffic delays may occur as a result of the movement of construction and service vehicles along Newell Highway and access roads, for the haulage of construction materials and employee access to the site compound located west of Camp Street Bridge.

Truck movements during the construction phase are expected to increase by approximately 20 truck movements per day during earth work staging. Light vehicle movements from employees on site are expected to increase by 10 vehicle movements per day during the construction of deck slabs.

Newell Highway and Camp Street currently experience varied heavy vehicle movements. Based on traffic data collected, over 560 heavy vehicles per day use Camp Street Bridge and over 100 heavy vehicles per hour were recorded along Newell Highway at Camp Street during the AM peak. The additional truck movements are not expected to have a significant effect along Newell Highway, but may have locally concentrated impacts at construction accesses through Camp Street and Sir Francis Forbes Drive.

Intersection performance

SIDRA modelling using the forecast turning movements was undertaken to determine the operational impacts to key intersections along the proposed light and heavy vehicle detours. The performance assessment (**Table 6-6** and **Table 6-7**) demonstrates that all intersections are forecast to continue to operate at a satisfactory level of service (LoS A) during peak periods, with minimal intersection delays and queuing on all approaches. As expected, the intersection at Newell Highway and Sheriff Street would have the largest increase in traffic volumes due to the detour of light vehicle traffic from Camp Street Bridge. The average delay for the AM peak at Sheriff Street increased from 6.4 seconds to 7.4 seconds and queue lengths increased from 3.8m to 11.6m.

The intersection of Lachlan Valley Way and Wongajong Road is located approximately 290 metres from the railway level crossing to the west of Lachlan Valley Way. With the increase in heavy vehicle volumes on Wongajong Road due to the detour, the queue length for this intersection is predicted to increase to 2.8m during the AM peak, which is minimal and would provide sufficient clearance from the railway level crossing.

Table 6-6: Detour period intersection performance along proposed detour routes (AM peak hour)

Intersection	Traffic volume (veh/hr)	Level of Service (LoS)	Degree of Saturation (DoS)	Average delay (s)	95% Back of Queue	
					Queue lengths (m)	Worst queuing approach
1: Newell Highway & Camp Street (priority)	NA – Camp Street closed to through traffic					
2: Flint Street & Bridge Street (roundabout)	254	A	0.09	5.7	3.6	Bridge Street (E)
3: Flint Street & Bandon Street (priority)	323	A	0.09	6.6	3.2	Flint Street (N)
4: Newell Highway & Sheriff Street (priority)	1002	A	0.37	7.4	11.6	Sheriff Street (E)
5: Newell Highway & Oxford Street (priority)	495	A	0.13	9.1	3.7	Oxford Street (E)
6: Lachlan Valley Way & Wongajong Road (priority)	192	A	0.06	10.4	2.8	Wongajong Road (W)
7: Newell Highway & Wurrinya Road (priority)	317	A	0.10	9.8	3.9	Wurrinya Road (E)

Table 6-7: Detour period intersection performance along proposed detour routes (PM peak hour)

Intersection	Traffic volume (veh/hr)	Level of Service (LoS)	Degree of Saturation (DoS)	Average delay (s)	95% Back of Queue	
					Queue lengths (m)	Worst queuing approach
1: Newell Highway & Camp Street (priority)	NA – Camp Street closed to through traffic					
2: Flint Street & Bridge Street (roundabout)	269	A	0.09	8.2	3.3	Flint Street (S)
3: Flint Street & Bandon Street (priority)	352	A	0.07	6.6	2.6	Flint Street (N)
4: Newell Highway & Sheriff Street (priority)	1031	A	0.34	7.2	10.3	Sheriff Street (E)
5: Newell Highway & Oxford Street (priority)	498	A	0.12	8.7	3.2	Oxford Street (E)
6: Lachlan Valley Way & Wongajong Road (priority)	157	A	0.04	9.1	1.5	Wongajong Road (W)
7: Newell Highway & Wurrinya Road (priority)	273	A	0.06	9.5	1.7	Wurrinya Road (E)

Iron Bridge capacity

Existing and projected traffic volumes on Iron Bridge are summarised in **Table 6-8** and **Table 6-9** and are based on the traffic volumes captured by the midblock traffic counts and the projected increase in heavy vehicles traffic during operation of the detour.

During the operation of the heavy vehicle detour, the largest increase in heavy vehicle traffic on Iron Bridge would occur during the AM peak period, with an increase of 16 heavy vehicles per hour eastbound and 5 heavy vehicles per hour westbound.

Iron Bridge is being reconfigured to single lane operation controlled by traffic signals at each approach prior to implementation of the heavy vehicle detour.

The queue length from the operation of traffic signals on the bridge was assessed based on the following assumptions:

- Green phase time of 60 seconds per direction
- All red phase time of 30 seconds (where both directions are stopped) based on the total time for a vehicle to clear a distance of 150 metres between the two approaches with an average travel speed of 25 km/h and set up phase time
- Total cycle time of 180 seconds, consisting of 30 seconds of all red phase time and 60 seconds of green phase time from opposing direction.

The results of the queueing assessment are provided in **Table 6-10**. The average queue length at Iron Bridge for the peak direction is estimated to be approximately four vehicles during each of the red phases with a maximum waiting time of two minutes. This is not expected to have significant impact on property access within the immediate vicinity of Iron Bridge, including access to the holiday park. Traffic conditions at Iron Bridge will be periodically monitored during construction and adjustments to signals would be made if queue lengths exceed these predictions.

Table 6-8: Existing and projected traffic volumes on Iron Bridge (AM peak hour)

	Eastbound			Westbound		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
Existing	40	13	53	98	15	113
Detour operation	40	29	69	98	20	118

Table 6-9: Existing and projected traffic volumes on Iron Bridge (PM peak hour)

	Eastbound			Westbound		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
Existing	77	8	85	64	7	71
Detour operation	77	14	91	64	13	77

Table 6-10: Average que length at Iron Bridge

Direction	AM Peak		PM Peak	
	Average arrival rate (veh/min)	Average queue length (veh)	Average arrival rate (veh/min)	Average queue length (veh)
Eastbound	1	2	2	4
Westbound	2	4	1	2

Operation

The proposal is for the replacement of the existing Camp Street Bridge with a new wider bridge constructed within the current alignment, which allows the new bridge to tie in with the existing road network.

The proposal would not significantly increase traffic volumes or result in permanent changes to traffic routes or access within the local road network. Operational traffic conditions would be similar to the existing scenario and adverse traffic impacts would therefore be minimal. The proposal would improve safety for motorists, pedestrians and cyclists through wider travel lanes, improved road approaches and the removal of potential safety risks associated with the poor condition of the existing bridge structure (spalling, corrosion and a high concentration of corrosive chloride ions found in the piers).

The proposal would enhance the regional road network by catering for HML. The proposal is consistent with the strategic road planning objectives for the region.

6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Traffic and transport	<p>A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime, 2008). The TMP will include:</p> <ul style="list-style-type: none"> • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms. 	Contractor	Pre-construction	<p>Core standard safeguard TT1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>
Traffic and Transport	Signpost heavy vehicle detour routes prior to road closure.	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Traffic and Transport	<p>Monitor the performance (queue lengths) of the traffic control signals for the detour operation on Iron Bridge.</p> <p>If required, the performance of the signal operation on Iron Bridge would be further improved with the use of actuated signals and loop detectors on each approach rather than fixed time signals. This would be beneficial during the AM peak period where there is a dominant westbound traffic flow on the bridge.</p>	Contractor	Construction	Additional safeguard
Traffic and Transport	A new temporary detour route for school bus services and the Route 558 bus service will be determined through consultation between Roads and Maritime and Forbes Bus Lines.	Roads and Maritime	Pre-construction	Additional safeguard
Traffic and Transport	Provision of a temporary pedestrian footpath along Hill Street to connect the footpaths between Camp Street and Bandon Street would be considered. This will depend on the final location of the construction compound on the eastern side of Camp Street Bridge.	Roads and Maritime	Pre-construction	Additional safeguard
Traffic and Transport	Opportunities will be explored to improve the safety of the pedestrian and cyclist crossing at Sherriff Street during construction detours, such as additional signage near James Street.	Contractor	Construction	Additional safeguard

6.4 Noise and vibration

A Noise and Vibration Impact Assessment (NVIA) was prepared by AECOM in December 2017. A copy of the report is provided in Appendix O with a summary of the findings provided below.

6.4.1 Methodology

Existing noise environment

In order to establish the existing noise environment within the vicinity of the bridge replacement works, ambient noise monitoring was conducted at three representative locations as shown in **Table 6-11** and **Figure 6-8**. Noise logging was conducted from 12 October to 26 October 2017 to measure the background noise level. The noise monitoring was conducted and processed in accordance with the *Noise Policy for Industry* (NPfI).

Table 6-11: Noise logging locations and periods

Logger	Address	Start Date	End date
L1	14 Bandon Street, Forbes	12/10/17	12/10/17
L2	Corner of Oxford Street & Newell Highway, Forbes	12/10/17	26/10/17
L3	88 Reymond Street, Forbes	12/10/17	26/10/17

The background noise level is defined by the NSW EPA as ‘the underlying level of noise present in ambient noise when all unusual extraneous noise is removed’. It can include sounds that are normal features of a location and may include birds, traffic, insects etc. The background noise level is considered to be represented by the LA90 descriptor. The measured noise levels were analysed to determine a single assessment background level (ABL) for each day, evening and night period in accordance with the EPA’s NSW Noise Policy for Industry (NPfI), for each monitoring location.

The ABL is established by determining the lowest ten-percentile level of the LA90 noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring period. An overall representative LAeq noise level is determined by logarithmically averaging each assessment period for the entire monitoring period. The background noise levels are shown in **Table 6-12**.

Attended monitoring was also undertaken at site L1, L2 and L3 and at 423 Red Bend Road, Forbes. The purpose of these measurements was to characterise the noise environment in the vicinity of the residential receivers. The results are shown in **Table 6-13**.



Camp Street Bridge Replacement - Logger and Alternative Route Map

- Camp Street Bridge
- Logging locations
- Alternate Route

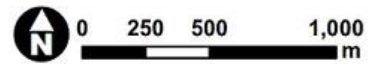


Figure 6-8: Camp Street Bridge – Logger and proposed Heavy Vehicle detour

Construction noise modelling

In order to assess noise impact from the site during the bridge replacement works, a noise model was created to represent 'reasonable' worst periods of construction activities. The construction of the proposal was modelled in SoundPLAN Version 7.3. The following features were included in the noise model:

- Ground topography
- Ground absorption and reflection
- Buildings (residential and non-residential)
- Construction noise sources.

Noise modelling was undertaken for the proposed construction stages listed in section 3.3.1. The predicted impact from the assumed 'reasonable' worst case 15 minute period of each stage of construction works has been assessed. The assessment assumes no noise mitigation at the construction site and that relevant equipment as listed in 3.3.3 for the construction stage is in use for the entire 15 minute period. Neutral weather conditions were assumed for all construction scenarios. The results of the noise modelling for the different construction phases are provided in **Table 6-18**.

Vibration assessment

The assessment of intermittent vibration is outlined in the EPA guideline Assessing Vibration: A Technical Guideline is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

No Australian Standards exist for the assessment of building damage caused by vibration. Conservative criteria for vibration are subsequently adopted.

6.4.2 Existing environment

The existing noise environment was determined by analysing the results of noise monitoring undertaken on the 12 October to 26 October 2017. The existing noise environment is shown in **Table 6-12**.

Table 6-12: Existing environment noise background (L_{A90}) and ambient (L_{Aeq}) noise levels

Monitoring location	Day	Evening	Night
L1 14 Bandon Street, Forbes			
Rating background level L_{A90}	40*	35*	30*
Log Average L_{Aeq}			
L2 Corner of Oxford Street & Newell Highway, Forbes			
Rating background level L_{A90}	39	42	33
Log Average L_{Aeq}	59	58	55
L3 88 Reymond Street, Forbes			
Rating background level L_{A90}	39	38	33
Log Average L_{Aeq}	62	58	54

Notes:

Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays & Public Holiday; Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday & Public Holidays; Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.

* Logger 1 failed during the first day of monitoring. However from the limited data it was noted that noise levels at this location were similar to the levels measured at L2 and L3 (L_{A90} 44 dB(A)) during the late afternoon period. To provide a conservative approach background noise levels were estimated using the Roads and Maritime Construction Noise Estimator Tool. It is noted that the daytime noise levels are very similar to those measured at L2 and L3.

Table 6-13: Attended noise monitoring results

Monitoring location	Description	Attended measurement results, dB(A)			
		$L_{A1, 15min}$	$L_{A10, 15min}$	$L_{Aeq, 15min}$	$L_{A90, 15min}$
L1 14 Bandon Avenue, Forbes	<ul style="list-style-type: none"> Predominantly road traffic noise from Newell Highway. Light wind noise in trees, some insect noise. Water fountain approximately 100 m away can be heard in addition to truck noise over nearby bridge. 	56	52	49	45
L2 Newell Highway & Oxford Street, Forbes	<ul style="list-style-type: none"> Ambient noise levels controlled by road traffic from Newell Highway, light intermittent traffic noise from Oxford Street. Light wind noise in nearby bushes. Cicadas barely audible. 	70	63	59	45
L3 88 Reymond Street, Forbes	<ul style="list-style-type: none"> Ambient noise levels controlled by road traffic along College Road and Reymond Street. Moderate wind noise in surrounding trees. 	70	66	60	42

Monitoring location	Description	Attended measurement results, dB(A)			
423 Red Bend Road, Forbes	<ul style="list-style-type: none"> Ambient noise levels controlled by nearby magpies and sheep. Occasional road traffic pass-by event on Wirrinya Road and Red Bend Road (about once every 5 minutes). 	60	48	49	31

6.4.3 Noise Criteria

Noise - construction noise criteria

The NSW Environment Protection Authority's (EPA) *Interim Construction Noise Guideline* (ICNG) is the principal guidance for the assessment and management of construction noise in NSW. The ICNG recommends that a quantitative assessment is carried out for all 'major construction projects that are typically subject to the EIA processes. Noise levels due to construction activities are predicted at nearby receivers using environmental noise modelling software and compared to the levels provided in Section 4 of the ICNG.

Where an exceedance of the management levels is predicted, the ICNG advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practises to minimise the noise impact. The proponent should also inform all potentially impacted residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details.

Where construction noise levels reach 75 dB(A) residential receivers can be considered as 'highly noise affected' and the proponent should, in consultation with the community, consider restricting hours to provide respite periods.

Construction noise management levels for the most affected residential receivers are shown in **Table 6-14**. Noise management levels recommended by the ICNG for non-residential receivers are shown in **Table 6-15**.

Table 6-14: Construction noise management levels –residential receivers

Noise catchment area	Rating background level, LA90 dB(A)	Noise management levels, LAeq dB(A)
NCA 1	40	50

Table 6-15: Construction noise management levels – Non-residential receivers

Land use	Management level, LAeq (15 min) (applies when properties are in use)
Place of worship	55 dB(A)*
Commercial - Offices, retail outlets	70 dB(A)

Notes: *These external management levels are based upon a 45 dB(A) internal noise management level and a 10 dB reduction from outside to inside through an open window.

Noise – detour traffic road noise criteria

To assess noise impacts from construction and detour traffic, an initial screening test should be undertaken by evaluating whether existing road traffic noise levels will increase by more than 2 dB

(A). Where the predicted noise increase is 2 dB (A) or less, then no further assessment is required. Where the predicted noise level increase is equal to or greater than 2 dB (A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

Vibration - structural damage criteria

The Structural Vibration Standard – Effects of vibration on structures DIN 4150 provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in **Table 6-16**. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage. Roads and Maritime adopts a conservative limit of 2 mm/s at the property boundary as part of its environmental procedures.

Table 6-16: DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	Vibration velocity in mm/s			
		At foundation at a frequency of			Vibration at the horizontal plane of the highest floor
		Less than 10Hz	10Hz to 50Hz	50Hz to 100 Hz	
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (eg buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Vibration – Human comfort intermittent vibration criteria

The assessment of intermittent vibration outlined in the EPA guideline Assessing Vibration: A Technical Guideline is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in **Table 6-17**. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 6-17: Preferred and maximum vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime (7am – 10pm)		Night time (10pm – 7 am)	
	Preferred	Max	Preferred	Max
Critical areas	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions and places of worship	0.4	0.8	0.4	0.8

6.4.4 Potential impacts

Construction noise assessment

A summary of the number of receivers where construction noise levels are predicted to exceed NMLs during the loudest construction stages are presented in **Table 6-18** during standard construction hours.

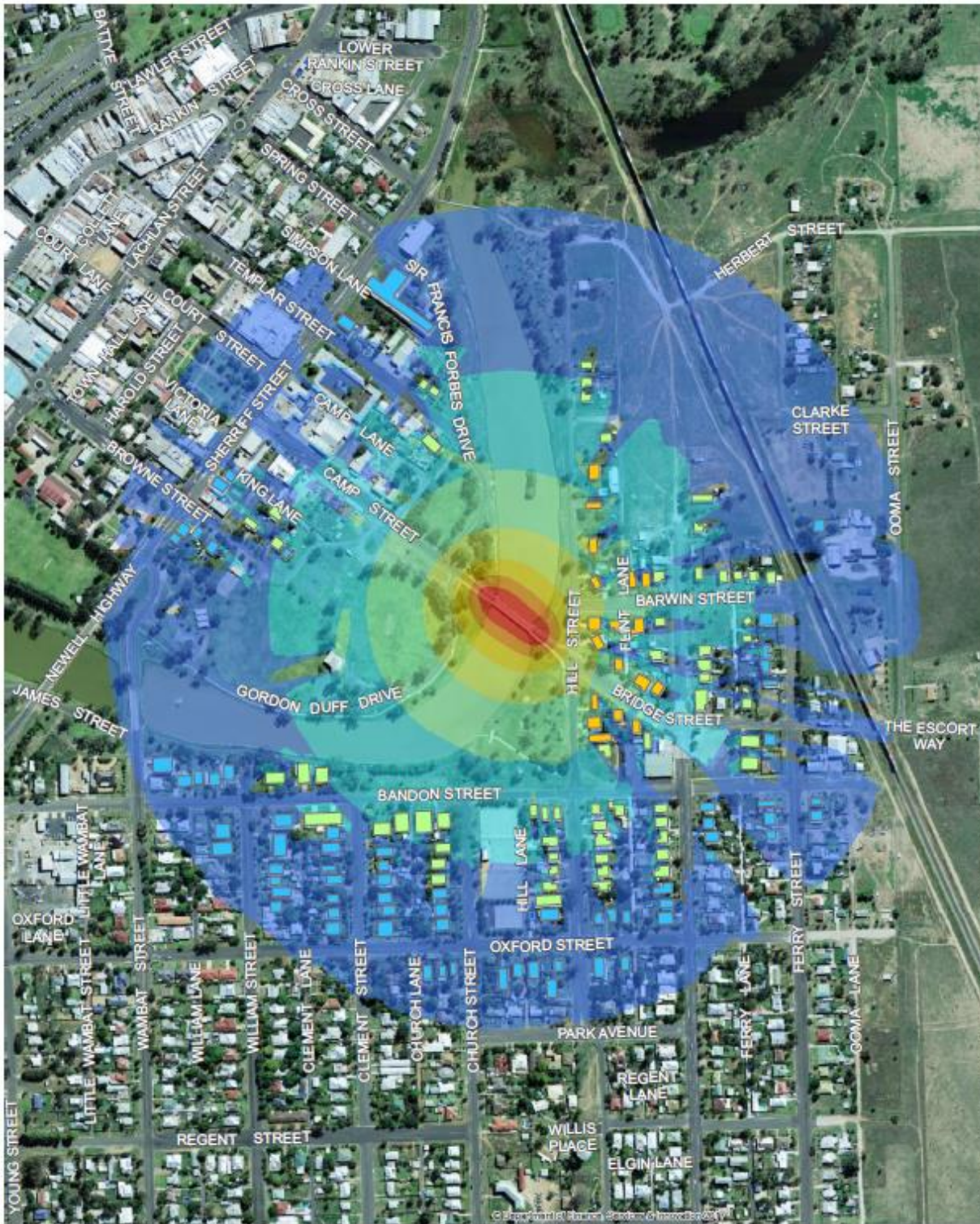
Results show noise levels at up to 191 receivers are predicted to exceed NMLs during the loudest construction stages, demolition of the existing bridge and construction of the new bridge. Of these exceedances, 104 are predicted to exceed by up to 5 dB, 68 are predicted to exceed by up to 10 dB and 19 to exceed by up to 20 dB. The most affected receivers are located along Hill Street, Barwin Street and Bridge Street. The predicted noise levels at the worst affected receivers are 69 dB(A). No receivers are predicted to be 'highly affected' where noise levels over 75 dB(A) are predicted during the loudest construction stage. The extent of areas with modelled sound pressure exceedance during one of the noisiest stages, new bridge construction, is shown in **Figure 6-9**. Appendix O presents the construction noise contours for all construction phases and also indicates the level of exceedance over the noise management levels for each nearby noise sensitive receiver.

There may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to fixed building structures would also vary as the construction equipment moves around the site.

Table 6-18: Predicted construction noise impacts

Construction scenario	Overall sound power level of construction stage, dB(A)	Exceedance of NML		
		0-5 dB	6-10 dB	11-20 dB
		Number of receivers exceeding NML		
1 – Advance works	111	19	13	3
2 – Preliminary earthworks	115	72	22	7
3a – Demolition - Sheet piling	116	68	32	15
3b – Demolition of existing bridge	119	104	68	19
4 – Bridge construction ¹	119	104	68	19
5 – Final roadworks and landscaping	118	73	64	18
6 – Construction compound	114	22	19	1

Notes: 1 When the impact or sheet piling rigs are in use, it is unlikely that any other noisy equipment will be in use concurrently



Camp Street Bridge Replacement - Stage 4

AECOM

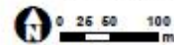


Figure 6-9: Camp Street Bridge construction noise contours showing sound pressure exceedance of Noise Management Levels

Construction noise assessment: detour traffic

Table 6-19 below presents the existing traffic flows at two locations in Forbes during the am and pm peak periods and the additional detour traffic and relative noise increase. The noise increases are less than 2 dB(A) therefore no further assessment is required, in accordance with the RNP.

Table 6-19: Existing and additional traffic flows and relative noise increase (dB(A))

Period	Route	Existing am peak hour flow		Additional am peak hour flow on detour		Relative noise increase, dB(A)
		Light	Heavy	Light	Heavy	
AM peak	Newell Highway Near Oxford Street	256	66	25	26	1.1
PM Peak		272	45	30	8	0.6
AM peak	Reymond Street	138	28	0	21	1.6
PM Peak		141	15	0	12	1.3

Construction vibration assessment

Vibration intensive works may take place as part of the bridge replacement. The works may include the use vibratory rollers, hydraulic hammers and pile boring.

Typical safe working distances for vibratory rollers are provided below in **Table 6-20**. With the exception of the impact pile driver, these safe working distances are based upon the safe working distances presented in the Road and Maritime’s Construction Noise and Vibration Guideline and AECOM’s library of vibration data. The safe working distances for the impact pile driver are based upon the *BS 5228-2:2009 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”*. Should these safe working distances be maintained, no adverse vibrational impacts are predicted.

Table 6-20: Recommended safe working distances for vibration intensive plant

Plant	Rating /description	Minimum safe working distance (m)	
		Cosmetic damage	Human response
		Residential	
Vibratory roller	< 50 kN (Typically 1-2t)	5	15-20
	< 100 kN (Typically 2-4t)	6	20
	< 200 kN (Typically 4-6t)	12	40
	< 300 kN (Typically 7-13t)	15	100
	> 300 kN (Typically 13-18t)	20	100
	> 300 kN (> 18 t)	25	100
Small Hydraulic Hammer	(300 kg – 5 to 12t excavator)	2	7
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7	23
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22	73
Vibratory Pile Driver	Sheet piles	2 – 20	20
Impact Pile Driver (9t) ¹	10 kJ per blow	35	104
	25 kJ per blow	49	147
	50 kJ per blow	64	192
	85 kJ per blow	79	236
	133 kJ per blow	93	280
Pile Boring	≤ 800 mm	2 (nominal)	4

Notes: 1 The safe working distances are based on the use of a 9t hammer, however the energy produced would vary depending on the drop height. The safe working distances are based on the piles being driven at refusal.

Operation

The proposed activity will not increase the volumes of traffic, traffic composition, traffic behaviour, or change the alignment of the current road. There will not be any changes to the current operating noise environment.

6.4.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (Roads and Maritime, 2014). • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Contractor	pre-construction	<p>Core standard safeguard NV1</p> <p>Section 4.6 of QA G36 <i>Environment Protection</i></p>
Noise and vibration	<p>All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact.</p> <p>The notification will provide details of:</p> <ul style="list-style-type: none"> • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information. 	Contractor	Construction	Core standard safeguard NV2

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and vibration	<p>Out of hours works. All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least five days prior to commencement of any out of hours works associated with the activity that may have an adverse noise or vibration impact.</p> <p>The notification will provide details of:</p> <ul style="list-style-type: none"> • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information. 	Contractor	Construction	Additional safeguard
Noise and vibration	The sections of deck slab will be broken up on the lake bank in a designated area away from residences or trucked away to be broken up and crushed up prior to re-use or disposal at the Forbes Shire Council waste management facility.	Contractor	Construction	Additional safeguard
Noise and vibration	<p>In addition to the standard mitigation measures set out in Appendix E of the NVIA, specific noise mitigation measures would be implemented where noise levels are anticipated to be more than 10 dB(A) over the NML (up to 19 receivers, as detailed in Table 6-18). This includes the following:</p> <ul style="list-style-type: none"> • Notification - letterbox drops will be undertaken for the noise affected residences (as identified in Figure 6-9 of this REF and Appendix D of the NVIA) at least 5 days prior to the start of works • Verification – will be undertaken to assess the most affected receivers on Hill Street, Barwin Street and Bridge Street, and will include measurement of the background noise level and construction noise. 	Roads and Maritime / Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and Vibration	<p>If it is expected that the safe working distances will be encroached at any point in the works, vibration monitoring will be undertaken to determine site specific safe working distances. Works would begin farthest from sensitive receivers and then site specific safe working distances calculated based on the vibration measurements.</p> <p>If ongoing works are required within the site specific safe working distances then a temporary relocatable vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic damage objective.</p>	Contractor	Construction	Additional safeguard
Noise and Vibration	Prior to the commencement of vibration intensive work, existing condition surveys would be undertaken on all properties and structures within 100 metres from the nearest impact piling location.	Roads and Maritime	Pre-Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Noise and Vibration	<p>Impact hammer size and maximum drop height would be selected taking into account the safe working distances and the distance between the area of construction and the most affected sensitive receiver.</p> <p>The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable when working in proximity to existing structures.</p> <p>Equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts.</p>	Contractor	Construction	Additional safeguard
Noise and vibration	Wherever feasible, vibration intensive works at locations where high vibration levels are generated at sensitive receivers would be scheduled during less sensitive times of the day, e.g. 9.00am to 5.00pm or as determined through community consultation.	Contractor	Construction	Additional safeguard

6.5 Hydrology and flooding

6.5.1 Methodology

Flood impact assessment was undertaken by Jacobs 2017. The flood impact assessment is provided in Appendix I.

Flood impact assessment was undertaken using the MIKE11 hydraulic model for Forbes developed by Jacobs (formerly Sinclair Knight Merz) in 2001 as part of the Forbes Flood Study (SKM 2001). The existing Camp Street Bridge was replaced with the proposed bridge in the MIKE11 model. A comparison of modelled peak flood levels, discharges and velocities were undertaken on the proposed replacement bridge to identify any changes to flood behaviour. Flood impact assessment of the replacement bridge was undertaken for the 1% annual exceedance probability (AEP). The model was run with the 1952 inflow hydrographs. 1952 is the highest flood on record in Forbes. It is the flood adopted by Forbes Shire Council for flood planning within the Forbes local government area. An extreme theoretical event considering inflows at twice the 1952 event was also modelled.

6.5.2 Existing environment

Forbes has experienced on average a major flood every seven years since 1887. The study area is located in an area mapped as High Hazard Floodway in Forbes Shire Council's flood risk mapping.

A review of flood behaviour was undertaken by Jacobs (2017). The flood behaviour in Forbes is complex. It varies significantly during major and minor floods. Lake Forbes has a catchment area of approximately 260 square kilometres. During significant floods in the Lachlan River, water flows into Lake Forbes via the 'Southern Cross' breakout resulting in frequent flooding in Lake Forbes.

The highest flood on record at Forbes is the 1952 flood. This flood event reached a peak event of 238.86 m Australian Height Datum (AHD) at the Iron Bridge gauge and Bridge gauge and 239.06 mAHD at the Municipal Baths situated on the Batty Street runner (SKM 2001).

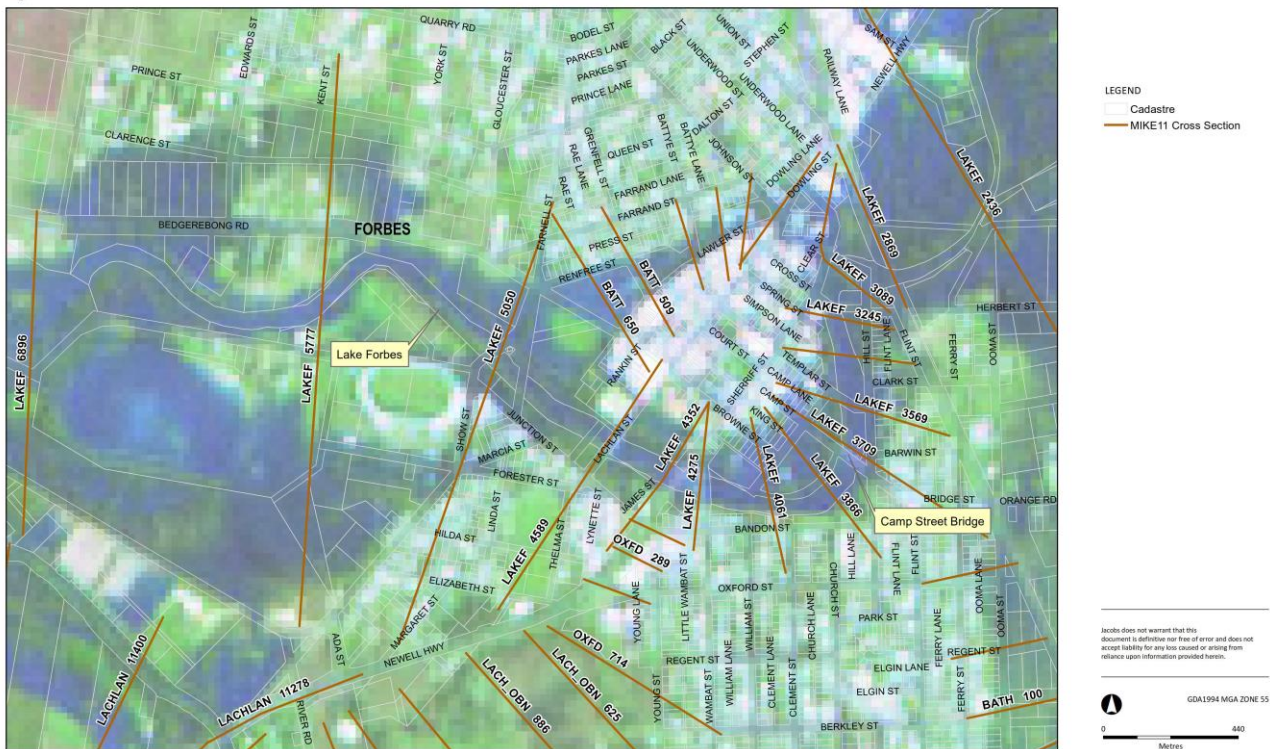
Minor floods tend to follow the defined floodplain routes. They usually involve a breakout of the Lachlan River at the Southern Cross which results in flooding of Lake Forbes. Minor floods tend to break out near College Road and Raymond Street and flow south or south west and re-enter the Lachlan River shortly after the College Bend. Overbank flow from the Lachlan is limited to the peripheral areas and there is diminished cross flow between Lake Forbes and the Lachlan River upstream of the Newell Highway.

At the Camp St Bridge the lowest level on the eastern approach is located at a height of approximately RL 236.3 m and on the western approach at Bridge Street at RL 236.85 m. The eastern approach is flooded first followed by the western approach and the bridge deck.

The nature of flooding (shown in blue) in Lake Forbes in the vicinity of Camp Street Bridge during the flood event of March 2012 is shown in **Figure 6-10**. The catchment typically has a long lag time between rainfall in the catchment and the arrival of the flood peak. This provides numerous days of advance warning of a flood approaching.

The water levels in Lake Forbes are controlled by a number of small weirs. Forbes Shire Council controls the water levels in the weir. Council has previously lowered the water levels to similar levels proposed by Roads and Maritime Services as part of the construction of the Camp Street pedestrian footbridge. Roads and Maritime wrote to Forbes Shire Council on the 13 October 2017 regarding the proposal to lower water levels in Lake Forbes. Council responded on the 16 October 2017, noting that it didn't have any objections to the proposal however community communication should be undertaken on the reasons for the lowering.

Figure A-1 Location of MIKE11 Cross Sections



SPOT5 Image Captured on 7 March 2012 shows the extent of flooding close to the peak of the flood in Forbes. The Image was provided by NSW Office of Environment & Heritage

Figure 6-10: Flooding in Lake Forbes March 2012. Source Jacobs 2017

6.5.3 Potential impacts

Construction

The proposed new bridge is located in a flood way. The proposed construction compound site on the western bank is located in open space parkland that floods (as shown in Figure 6-10). Flooding may result in temporary inundation of works areas and the construction compound site on the west bank. There is a number of days lag between rainfall in the upstream catchment and the arrival of the flood peak. This lead in time provides adequate time to implement risk mitigation measures to manage potential water quality and flood impacts prior to the arrival of the flood. Long term rainfall forecasting can be used to program high risk works that may be more susceptible to flooding such as instream works.

Temporary structures such as rock platforms, coffer dams, temporary bridges and sheet piles will be constructed in- stream to facilitate bridge demolition and construction. These structures can potentially detain water, increasing inundation, and alter flood paths. Temporary in-stream structures used in the bridge demolition and construction must maintain water levels so that upstream crossings are not inundated.

The following measures will be implemented to reduce the risk of inundation with temporary instream structures:

- Water levels in Lake Forbes will be lowered to approximately 234.62m AHD. This increases the flood storage capacity in the Lake
- Temporary instream structures, such as rock platforms, will have gaps or pipes to allow flow of water
- Temporary in stream structures will be constructed at levels below the lowest downstream crossing.

The lake has aesthetic and amenity values. The temporary lowering of the Lake during construction may impact on these. Council has requested Roads and Maritime undertake community communications on the need for the temporary lowering of levels in the lake during construction.

Operation

An assessment of the effect of the proposed new bridge on flooding was undertaken by Jacobs (2017). The flood impact assessment is provided in Appendix I.

The flood study concluded that the proposed bridge would not result in adverse changes in peak flood levels, discharges and velocities with the proposed replacement bridge when modelled with the 1952 inflow hydrographs. The proposed replacement bridge provides more waterway area under the bridge deck than the existing bridge. This reduces peak flood levels in Lake Forbes upstream of the bridge up to a maximum of 0.01m just upstream of the bridge. It increases peak flood levels downstream of the bridge up to a maximum of 0.01m. A maximum change in peak flood level up to 0.01m is considered negligible and within the model error limits.

In the event that the bridge design is changed, an assessment will be required to determine if there are any changes to the flood characteristics.

6.5.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Flooding	<p>A Flood Contingency Management Plan is to be prepared for the work site, compound site and ancillary areas.</p> <p>The plan is to:</p> <ul style="list-style-type: none"> • Monitor long term rainfall forecasts and schedule work high risk activities around forecast • Have contingency locations for the temporary flood storage of equipment and materials outside of potential inundations areas • Have contingency measures to secure and stabilise work areas and compound sites prior to flooding 	RMS Project Manager	Pre-construction	Additional safeguard
Flooding	Any changes in bridge design of a structural nature are to be investigated for potential changes to flood characteristics. This includes changes to upstream and downstream water levels, velocities and direction	RMS Project Manager	Detailed design	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Flooding	Lake Forbes lowering. The water levels in Lake Forbes are to be gradually lowered prior to construction to reduce any risks associated with bank slumping or scour risk	RMS Project Manager	Pre-construction	Additional safeguard
Flooding	Temporary instream structures such as rock platforms and sheet piles are to be kept at levels below the downstream Johnny Woods crossing to avoid potential flood impacts during construction.	RMS Project Manager	Construction	Additional safeguard
Flooding	Temporary instream structures are to avoid fully impeding flow in Lake Forbes where possible.	Contractor	Construction	Additional safeguard

Additional safeguards and management measures for water quality risks posed by flooding are provided in in section 6.6 and 6.7.

6.6 Surface water and groundwater

6.6.1 Methodology

An inspection was undertaken of Lake Forbes, drainage and downstream water level control structures on the 12th October 2017. Reviews of aerial photography were undertaken from 2006 onwards to assess visual water quality conditions in the Lake.

A desktop review was undertaken of surface water licenses in the area using the DPI (Office of Water) Water register at <http://www.water.nsw.gov.au/water-licensing/registers> and the Water Sharing Plan for the Lachlan Unregulated and Alluvial. The results of the NSW Water Register search are provided in Appendix L.

A desktop review was undertaken of groundwater bores in the study area using the DoI Water groundwater map for the Lachlan River Basin <http://allwaterdata.water.nsw.gov.au/water.stm>.

6.6.2 Existing environment

Surface water

Prior to the 1930s, Lake Forbes was called The Lagoon. The Lagoon was a natural, ephemeral billabong system. It was often dry and unpleasant. The Lagoon was fed by overflows from the Lachlan River. From the 1930s onwards the lagoon was converted into an ornamental lake. Native vegetation was replaced with open parkland, and the water level controls have been installed to keep the Lake full.¹⁰

The Lake is shallow. Depths are typically less than 2m. A number of small weirs have been installed to keep the Lake full and control levels. A water control device is located downstream of Camp Street Bridge on Sherriff Street that maintains the water levels in this section of Lake Forbes as shown in **Figure 6-15**. There are further weirs controlling the Lake downstream. Forbes Shire Council maintains the levels in the Lake and lowers it when required for operations and maintenance.

A fountain sits in the Lake approximately 500m downstream of the Camp Street Bridge. This fountain may provide some aeration and mixing of the Lake. The Lake receives stormwater from roadside drainage on Camp Street and Bridge Street. The riparian vegetation around the Lake has been removed and converted into lawn and open space parkland. Pavers have been installed around the banks of the Lake in some areas on the eastern bank near Sherriff Street, possibly as bank protection for erosion.

A site inspection was undertaken on the 12 October 2017. The water quality in the Lake was highly turbid during the inspection. Reviews of aerial photography from 2006 onwards suggest that the Lake suffers from periods of high turbidity and downstream sections may be suffering from periods of eutrophication. The combination of runoff from surrounding areas, shallow water body, and stagnant water can lead to poor water quality conditions such as low Dissolved Oxygen.

Forbes Shire Council undertakes water quality monitoring of the Lake. Monthly blue green algae monitoring is undertaken during the warmer months normally from October to March.

¹⁰ Focus Bridge Engineering (2017) Camp Street Bridge BN4286. Statement of Heritage Impact for the Proposed Bridge Replacement.

Surface Water entitlements

A search was undertaken of the NSW water register and the Water Sharing Plan for the Lachlan Unregulated and Alluvial. Lake Forbes is part of the Lake Forbes and Back Yamma Creek Water source in the Water Sharing Plan. Under the Water Sharing Plan there are 239 entitlements (shares) and 11 licenses in the Lake Forbes and Back Yamma Creek water source. Water Access Licenses (WALs) in the area are shown in **Table 6-21** and **Figure 6-11**. The majority of WALs in the area are held for the Golf Course.

Roads and Maritime Services consulted with Forbes Shire Council in February 2018 on the implications of temporary lowering levels in the Lake. The Golf club is provided with water primarily from a pump and license on the Lachlan River. The pipeline passes along Rifle Range Road. There is a back-up supply for the Golf Course in the event that the Lachlan River cannot supply the demand. There is a pipeline under the rail corridor to fill a dam between the Gold Course holes 2 and 3.

The surface water entitlements on Lake Forbes have not been used for the Golf Course in the last 20 years. This allocation has been transferred downstream to the Racecourse.

Table 6-21: Water Access License (WAL)

WAL	Allocation (ML)	Work approval	LOT/DP	Work Type	Use purpose	Use location
31795	6	70CA611117	Lot 9, DP 739034	Diversion Works - Pumps	Irrigation	Lot 9, DP 739034
31798	18	70CA611123	Lot 1633, DP 750158	Diversion Works - Pumps	Irrigation	Lot 822, DP 750158
31793	4	70CA611126	Lot 1564, DP 750158 Lot 1611, DP 750158 Lot 734, DP 750158 Lot 16, DP 1178669 Lot 17, DP 1178669 Lot 1564, DP 750158 Lot 734, DP 750158	Diversion Works – Pumps Storages	Recreation - Low Security	Lot 1564, DP 750158 Lot 1611, DP 750158 Lot 734, DP 750158 Lot 16, DP 1178669 Lot 17, DP 1178669
31794	142	70CA611129	Lot 150, DP 750146	Diversion Works - Pumps	Irrigation	Lot 150, DP 750146 Lot 171, DP 750146 Lot 172, DP 750146 Lot 182, DP 750146 Lot 183, DP 750146



Figure 6-11: Location of land parcels with surface water entitlements (orange shaded areas).

Groundwater

The proposal area is in the Upper Lachlan Alluvial Groundwater source and Management Zone 3.

A search was undertaken for groundwater bores in the study area on the 11/01/2018. The results of the search are shown in **Figure 6-12**. There are no groundwater bores within 500m of the study area. There is one groundwater bore, GW700130, downstream of the Lake on the northern banks beyond the water level control structure at Sherriff Street. The licence for this bore has been cancelled.

Groundwater bore GW026600 is located approximately 600m upstream of the Camp Street bridge on Lake Forbes. This bore license is held by Forbes Shire Council. The bore was established in 1967 with the authorised purpose of recreation. The license notes that the bore is for Forbes town beautification – Forbes Lake.



Figure 6-12: Groundwater bores in locality (source DoI Water groundwater map <http://allwaterdata.water.nsw.gov.au/water.stm> 11/01/2018)

6.6.3 Potential impacts

Construction

Early works

The early works includes construction activities such as underboring, also known as Horizontal Directional Drilling (HDD). This process involves the construction of launch and retrieval pits for horizontal drills under Lake Forbes. Utilities, such as telecommunications, are pulled through the drill holes under the Lake when the boring is complete.

Potential surface water impacts during the early works component include:

- “Frac” out. A frac out is when pressurised drilling fluid in an underbore finds a weak point in the strata. The drilling fluid can run through these weak fissures to the ground surface or under the bed of the Lake
- Drilling mud management. Underbores use lubricants as part of the boring process and return drilling mud to the surface. If not properly managed the drilling mud can result in smothering of habitat and turbidity in waterbodies
- Erosion and sediment from construction of the launch and retrieval pit
- Hydrocarbon spill. Small volumes of fuels and lubricants may be used in the underbore. A spill can pollute water in the Lake.

The risks posed by the early works can be mitigated and prevented using conventional controls and management measures. The volumes of potential contaminants used in early works are very small. The Lake is contained by the downstream water level control at Sherriff Street. In the event that a water quality event occurred, the impact would be localised and captured for clean-up.

Bridge demolition and construction

Potential impacts during the construction include:

- Flooding of work compounds and works areas. The bridge demolition and construction requires works to be undertaken in a flood prone area. The potential water quality impacts of flooding of the works area and construction compound may include :
 - Erosion and sediment from areas of exposed earth such as the abutments, landscaping, swale drainage and temporary stockpiles
 - Water pollution from chemicals, lubricants, solvents, paints and fuels that may be used in small quantities during construction
 - Gross pollutants such as construction materials and waste.

Given the nature of the catchment, there is a considerable lead in period before a flood peak reaches the works area. This provides ample time to plan and implement measures to remove materials and stabilise the site to reduce the risk of water quality impacts.

- Lowering Lake Forbes. Lake Forbes will be partially lowered to allow demolition constructability and manage inflows during the construction period. The water level in the lake would be lowered to a water level of approximately 234.62 m AHD. This would leave 0.8m to 1m depth of water in the Lake. Forbes Shire Council has previously lowered water levels in the Lake to a similar depth for the construction of the footpath. No issues have been reported.

The physical and chemical properties of the water in Lake Forbes in the section upstream of the control structure at Sherriff Street may be variable from that downstream. A sudden release of different water quality, such as DO or temperature, can affect biota. The water will be monitored and slow release made from the control structure to avoid a sudden release of variable water quality. The fountain can also be used to aerate and mix water prior to release.

Lowering Lake Forbes would increase the volumes of water downstream of the Sherriff Street water level control structure and may benefit the environment and downstream users. Lowering levels in the Lake may also impact on surface water entitlements. The water sharing rules for Lake Forbes and Back Yamma Creek place a restriction on pumping when the water levels in Lake Forbes is 50% below the Lakes full capacity.¹¹

There is a risk that lowering the Lake may impact on licensees in the section upstream of the water level control at Sherriff St. Consultation is required with DPI (Water) on the location of water license holders in proximity to downstream and upstream water level controls, prior to lowering water levels. Consultation is to be undertaken with the owners of licences in the affected area prior to lowering the levels in the Lake.

The Golf course is unlikely to be affected by any temporary lowering of levels in Lake Forbes. The Golf Course receives water from the Lachlan River via a pipeline along Rifle Range road. The allocation has been transferred downstream to the Racecourse.

Downstream irrigation water users include the Forbes Racecourse, which uses water from the Lake to irrigate its track and grounds. Recreational users include the Forbes Dragon Boat Club, which uses a section of the lake between Wambat Street and Show Street for training. The section of the lake between Show Street and Salisbury Crossing is used for recreational purposes including events such as the Barefoot Water-Skiing Tournament and an annual

¹¹ Department of Primary Industries (2012) Water sharing rules Lake Forbes and Back Yamma Creek. Lachlan Unregulated and Alluvial Water Sources 14th September 2010.

triathlon. Users downstream of Sherrif Street will not be affected by the lowering of level in the upper reaches.

There is one groundwater bore upstream GW026600 in Lake Forbes. Subject to aquifer connectivity, the temporary lowering of the lake may influence groundwater recharge in this area for a short period. The bore is license is held by Forbes Shire Council and is used for recreational purposes. There is another bore further upstream near the Forbes golf course. Consultation by Roads and Maritime Services with council has indicated that the Golf Course receives its water from the Lachlan River via pipeline along Riflerange road.

- Temporary in-stream construction platforms and sheet piling. Turbidity can arise from earth on rock and disturbance of sediments on the bed of the Lake. Silt curtains can prevent turbidity affecting downstream areas.
- Piling demolition and construction works. Piles will be removed and cut to below the bed level of the Lake. The demolition will involve vibration and jack hammering in dry work areas provided by caissons or alternate construction methodology. Particulates and loose sediment may be left at the completion of works which may contribute to turbidity. The construction of new piles may disturb sediments in the bed of the Lake resulting in turbidity. Silt curtains are an effective measure to manage this risk.
- Excavation of the banks of the lake and the existing abutments. Exposed soil and earthworks on the banks can contribute to turbidity and sedimentation of the Lake. Erosion and sediment control will be used to reduce risks.
- Cross pollutants, particulates, fine materials and slurries from demolition. Particulates and slurries can emerge process such as sawing, cutting, grinding and jack hammering undertaken as part of the bridge demolition. Drilling fluid from the cutting processes will be caught in a steel top hat channel suspended under the bridge and collected in a flat bottom barge. Protective sheets and temporary bunding can be used to prevent material falling into the Lake during cutting processes.
- Stockpiles. A number of small, temporary stockpiles may be required. This includes stockpiles for materials at the approach widening, landscaping materials, waste materials from the bridge demolition, and green waste should any clearing be required. Materials for earthworks and demolition waste stockpiles can increase turbidity if they enter waterways and smother aquatic habitat. Green waste stockpiles can leach tannins and high Biological Oxygen Demand (BOD) rich material, although this risk is unlikely in this instance as green waste volumes are minimal.
- Water from concrete curing. Water is critical and essential element of the concrete curing process. Concrete may crack if sufficient wetting is not undertaken during the curing process. The water can be have an elevated, basic pH, and be milky in appearance.

Roads and Maritime Services have reduced the volume of water required for curing by using precast concrete elements in the proposal where possible. Concrete curing will be required for the columns and headstocks, and for the deck slabs. Curing water on the columns and headstock can be managed as the water will be retained on the top of the bridge components within the four sides of the shuttering. Curing water on the deck will be managed by using overhang formwork as a catch drain and sealing all joints with silastic during placement of the formwork. This will allow the curing water to run off the abutments to a sediment pond. Should curing water enter the Lake it will be captured in the silt curtain.

- Dewatering – Groundwater. Groundwater dewatering is the process of lowering the water table immediately adjacent to the works area to provide a safe and dry work site. Groundwater dewatering typically involves a spear or trench to collect and pump groundwater from the work site. Groundwater dewatering may be required for the construction of the new bridge

abutments and in areas where trenching may be undertaken for utilities. In some instances, the chemical and physical quality of the groundwater can differ from the surface water. Groundwater can be a potential pollutant if it enters surface waters in these instances.

The volumes of groundwater that may be required to be extracted for construction purposes are very minor and less than 1 ML/year. There will not be any impact on groundwater resource availability. There are no groundwater bores within 500m of the site. The closest bore, GW026600 is located approximately 600m upstream of the Camp Street bridge on Lake Forbes.

- Dewatering – abutment material. The abutment material from the existing bridge will be excavated as part of the proposal. The material may have a high moisture content and potentially a slurry. This material may need to be dewatered (dried out) prior to being worked and transported. If this material reaches waterways it can increase turbidity and smother aquatic habitat.
- Concrete washout waste. Concrete waste can arise during the construction phase when surplus concrete is leftover in cement mixers. If this cement is disposed inappropriately and enters the waterway it can alter the properties of the water (alkalinity), increase turbidity, and impact on aquatic habitat.
- Hydrocarbon and chemical spill. Small volumes of hydrocarbons and chemicals may be used during demolition and construction. This include fuels, lubricants, solvents and paints. A spill of these materials could pollute the Lake with water quality, aquatic habitat, odour, and aquatic habitat impacts.
- Drainage and landscaping works. Drainage and landscaping works involve temporary ground disturbance. This can result in erosion and sediment entering the waterway with subsequent increase turbidity.
- Fertiliser inputs from landscaping. Fertilisers can be used as part of the landscaping works to encourage the uptake of vegetation. Lake Forbes is a shallow, stable waterbody with low turnover. These properties make the Lake susceptible to processes such as eutrophication.

The Lake is contained by the downstream water level control at Sherriff Street. Should an accidental spill escape the mitigation measures proposed in this REF, it will not reach the waterway areas downstream of Sherriff Street.

Operation

The proposal will have a net overall benefit to surface water quality. The proposed water sensitive drainage features in the landscape design will provide some water quality treatment for road runoff. The water sensitive design drainage features include grass swale system, bioretention areas and wetland infiltration areas. The proposed drainage features are shown in **Figure 3-1** and in Appendix C. These features can improve the quality of road runoff by filtering out gross pollutants such as litter, acting as sediment traps, and the vegetation can remove nutrients.

The new bridge will reduce the frequency and requirements for bridge maintenance. This reduces the risk to surface waters from the chemicals used in these activities.

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water	Early works. Underbores are to be monitored for sudden pressure drop and the Lake visually monitored for evidence of a “frac out.”	Early works contractor	Early works	Additional safeguard
Surface water	Early works. Underbore contractor to have contingency plan to manage and contain ‘frac outs.’ Spill containment kits to be on site including a silt curtain to contain any frac outs in the Lake.	Early works contractor	Early works	Additional safeguard
Surface water	Early works. Underbore machinery to be in bunded area to capture any spills.	Early works contractor	Early works	Additional safeguard
Surface water	Early works. ESCP control plan to be prepared for Early works which includes: <ul style="list-style-type: none"> Monitoring for frac outs including evidence of plumes in Lake Forbes ESCP for launch and retrieval areas Management of drilling mud Site restoration. Turf should be used to quickly reinstate ground cover. 	Early works contractor	Early works	Additional safeguard
Surface water	Early works. No storage of fuels and chemicals on site.	Early works contractor	Early works	Additional safeguard
Surface water	Early works. All generators are to be kept in a bunded area.	Early works contractor	Early works	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water	Early works. No works or materials within drainage lines.	Early works contractor	Early works	Additional safeguard
Surface water	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP for the main construction works (Bridge demolition, construction, drainage and landscape works). The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Pre-construction	Core standard safeguard SW1 Section 2.1 of QA G38 <i>Soil and Water Management</i>
Surface water	An incident management is to be developed as a component of the CEMP and/or Soil and Water Management Plan. The incident management plan is to include: <ul style="list-style-type: none"> • Locations for spill kits and floating booms to contain spills • Procedure to ensure that downstream water quality control at Sherriff Street is closed and any contaminant is contained in the immediate area of the Lake • Adopting the Roads and Maritime Services Environmental Incident Classification and Reporting Procedure and notification of the Roads and Maritime Services Contract Manager as soon as practicable • Contact details for RMS Project and Environment Managers, and the for incident notification purposes under the POEO Act including Forbes Shire Council, local EPA, EPA pollution line, NSW Health, SafeWork NSW and Fire and Rescue NSW. 	Contractor	Pre-construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water	<p>An emergency spill kit is to be kept on site at all times and maintained throughout the construction work.</p> <p>The spill kit must be appropriately sized for the volume of substances at the work site.</p> <p>The spill kit must be readily accessible on the bridge and temporary instream work structures.</p>	Contractor	Construction	Additional safeguard
Surface water	Emergency contacts will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures	Contractor	Construction	Additional safeguard
Surface water	All workers will be advised of the location of the spill kit and trained in its use.	Contractor	Construction	Additional safeguard
Surface water	<p>A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan for the main construction works (Bridge demolition, construction, drainage and landscape works).</p> <p>The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms), measures to stabilise work areas over weekends and in the event of a flood, and specific controls and follow-up measures to be applied in the event of wet weather.</p>	Contractor	Pre-construction	<p>Core standard safeguard SW2</p> <p>Section 2.2 of QA G38 <i>Soil and Water Management</i></p>
Groundwater	<p>Lake Forbes lowering.</p> <p>Consult with Council on lowering Lake Forbes and potential groundwater bore GW026600.</p>	RMS project manager	Pre construction. Lake Forbes lowering	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water and groundwater entitlements	<p>Lake Forbes lowering.</p> <ul style="list-style-type: none"> • Consultation is to be undertaken with DoI (Water) on the location of water license holder in proximity to downstream and upstream water level controls prior to lowering water levels. Consultation is to be undertaken with the owners of licences in the affected area prior to lowering the levels in the Lake. • Consultation will also be conducted with key downstream recreational and event water users such as the Forbes Racecourse, the Forbes Dragon Boat Club and triathlon. 	RMS project manager	Pre construction. Lake Forbes lowering	Additional safeguard
Surface water	<p>Lake Forbes lowering.</p> <ul style="list-style-type: none"> • Prior to lowering levels in Lake Forbes monitor DO, temperature, turbidity and pH in Lake Forbes upstream and downstream of the water control structure at Sherriff Street • Do not release water from Lake Forbes if DO is significantly less than the receiving water body • If DO in Lake Forbes is less than the downstream waterbody, consider measures such as the fountain or compressor and bubble hose to improve DO prior to release 	RMS project manager	Pre construction. Lake Forbes lowering	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water	<p>Lake Forbes lowering.</p> <ul style="list-style-type: none"> Gradually lower water levels in Lake Forbes to avoid bank slumping and allow mixing of water Monitor DO upstream and downstream and visual inspect for signs of distressed aquatic biota. Cease lowering immediately in the event that DO reduces or evidence of impact on aquatic biota 	RMS project manager	Pre construction. Lake Forbes lowering.	Additional safeguard
Surface water	<p>In stream temporary rock platforms are to be placed on a geofabric layer and removed at the end of construction.</p> <p>Clean rock is to be used</p>	Contractor	Construction	Additional safeguard
Surface water	Cover exposed areas on the banks (such as abutments) with geofabric when exposed for prolonged periods	Contractor	Construction	Additional safeguard
Surface water	<p>Erosion and sediment control measures are to be implemented and maintained to:</p> <ul style="list-style-type: none"> Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets Reduce water velocity and capture sediment on site Minimise the amount of material transported from site to surrounding pavement surfaces Divert clean water around the site. <p>(in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book))</p>	Contractor	Construction	Standard safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request	Contractor	Construction	Standard safeguard
Surface water	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised	Contractor	Construction	Standard safeguard
Surface water	Work areas are to be stabilised progressively during the works	Contractor	Construction	Standard safeguard
Surface water	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10)	Contractor	Construction	Standard safeguard
Surface water	There is to be no release of dirty water into drainage lines and/or waterways	Contractor	Construction	Standard safeguard
Surface water	Visual monitoring of local water quality (ie turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills, deficient controls, silt curtains or erosion and sediment controls	Contractor	Construction	Standard safeguard
Surface water	Silt curtain/s are to be installed prior to any instream works and works that may disturb the bed of Lake Forbes	Contractor	Construction	Standard safeguard
Surface water	Silt curtains and erosion and sediment controls are to be installed, monitored and maintained as needed to contain any sediment	Contractor	Construction	Standard safeguard
Surface water	No storage of potential pollutants such as fuels, solvents, chemicals paints, lubricant on the bridge or temporary in stream structures	Contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Surface water	No refuelling in or near Lake Forbes or drainage lines. Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 metres from drainage lines or waterways	Contractor	Construction	Additional safeguard
Surface water/ Groundwater	Prepare a dewatering management plan to manage groundwater and dewatering of slurries during works	Contractor	Construction	Additional safeguard
Surface water	Establish concrete wash bays prior to any concreting works	Contractor	Construction	Additional safeguard
Surface water	Provide temporary sheeting and/or bunds to capture any particulates or gross pollutants from activities such as cutting, grinding, sawing and welding and prevent them from entering the waterway	Contractor	Construction	Additional safeguard
Surface water	Curing water on the deck will be managed by using plastic sheeting and the overhang formwork as a catch drain and sealing all joints with silastic during placement of the formwork. This will allow the curing water to run off the abutments to a sediment pond.	Contractor	Construction	Additional safeguard
Surface water	Use turf as a preference to seeding in disturbed areas to quickly establish ground cover	Roads & Maritime Services	Operation	Additional safeguard
Surface water	Limit the use of fertilisers in landscaping, use only slow release fertilisers, and do not apply prior to rainfall events.	Roads & Maritime Services	Operation	Additional safeguard

Other safeguards and management measures that would address surface water impacts are identified in sections 6.5 and 6.7.

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6.7 Contamination (land and water)

6.7.1 Methodology

A hazardous materials survey of the Camp Street Bridge completed by Roads and Maritime in December 2017. This survey tested samples of soil and debris near the bridge, the bridge, and utilities on the bridge for evidence of asbestos, lead, synthetic mineral fibres (SMF), polychlorinated biphenyls (PCBs), and Copper, Chrome and Arsenic (CCA). The hazardous materials report is provided in full in Appendix M.

A review was undertaken of the NSW EPA contaminated lands record on the 11/01/2018. A site inspection was undertaken on the 12th October 2017 for any signs of visible contaminants.

6.7.2 Existing environment

The study area consists of open recreational parkland. The Camp Street Bridge SOHI (Focus Bridge Engineering 2017) suggests a long history as recreational park land. The risk of contamination from historical land use activities is low.

A search of NSW EPA records did not identify any contaminated lands records in the study area. There were no signs of soil discolouration, water slicks or potentially contaminating land use practices in or adjoining the proposal area during the site inspection on the 12th October 2017.

The hazardous materials survey of the bridge recorded one positive result for friable asbestos. This was detected in a small fragment of dust located between the top sections of the PVA pipe underneath the concrete slab on the eastern section of the bridge. The sampling did not identify any positive results of CCA or lead paint. Hazardous materials are discussed in section 6.13.

6.7.3 Potential impacts

Construction

Potential sources of contamination during construction include accidental spills and leaks of substances such as hydrocarbons, lubricant, solvents and paints. Potentially contaminating activities include the refuelling and maintenance of plant, the use of paints and chemical in the bridge construction, and the storage or construction chemicals. Restrictions will be placed on potentially contaminating activities and incident management plans will be prepared to prevent the risk of contamination of surface, groundwater or soil during construction. These are addressed in sections 6.6.

Hazardous materials, which includes asbestos, can contaminate surrounding soils and water during demolition activities such as sawing and cutting. The removal and management of these materials to prevent contamination are addressed in section 6.13.

Blue-green algae have previously been detected in Lake Forbes. Forbes Shire Council undertakes monitoring and has installed warning signs around the lake. Algal blooms can impact human health through contact with or consumption of affected water. Forbes Shire Council will conduct blue green algae monitoring during construction of the project and would inform Roads and Maritime of the results. In the event that an algal bloom occurs, mitigation measures would be implemented to prevent harm to construction personnel.

Operation

Potential contamination sources during operation of the new bridge are a spill from a vehicle accident. The proposal reduces the risks of accidents. The new bridge and approaches are safer with improved standards, wider shoulders, safer barriers on the bridge, and drainage features that slow down and treat road runoff. The existing water level weirs in Lake Forbes provide containment

in the event of a contamination spill in the Lake. Local emergency services have access to spill kits and procedures to address spills. No additional measures are proposed.

6.7.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Land and water contamination	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction	Core standard safeguard C2 Section 4.2 of QA G36 <i>Environment Protection</i>
Land and water contamination	In the event of an algal bloom, management measures would be implemented in accordance with Forbes Shire Council procedures. Measures to improve mixing in the lake, such as using the water fountain for aeration, would be investigated.	Contractor	Construction	Additional safeguard
Land and water contamination	Liaise with Forbes Shire Council on the results of Council's blue green algae monitoring.	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address contamination impacts are identified in sections 6.5, 6.6 and 6.13.

6.8 Air quality

6.8.1 Methodology

A review as undertaken of NSW EPA POEO public register for premises with air emission releases in the study area. A site inspection was undertaken on the 12th October 2017.

6.8.2 Existing environment

The site is in open parkland. There are residential areas to the east and south of the site. Commercial and light industrial premises lie to the west and north of the site. Review of the NSW EPA POEO indicates that there are no licensed air quality emission sources in the study area. The Newell Highway is located approximately 300m to the northwest of the Camp Street Bridge.

The nearest residential receivers to the study area are approximately 50m on Hill Street on the eastern banks and 70m from the proposed compound site in Sir Francis Forbes Park, on Templar Street on the western banks. There are no childcare or healthcare facilities in the study area.

6.8.3 Potential impacts

Construction

Potential impacts during the construction phase include:

- Particulates from activities such as grinding, sawing, jackhammers and welding. These activities will mainly occur during the demolition of the existing bridge
- Dust from earthworks and exposed earth surfaces. The extent of earthworks and soil stockpile requirements is comparatively small. Key earthworks include the removal of the current bridge abutments; widening of the approach to the new bridge; and landscaping and drainage works
- Stockpiles. Stockpiles may include stockpiles of earth as well as waste stockpiles during the bridge demolition. Stockpiles may generate dust.
- Dust from temporary construction platforms. Rock used in rock platforms can have earth on it. This can give rise to dust emissions
- Dust from new road surfaces prior to sealing.
- Transportation. Transportation of materials for the road construction and waste materials can result in dust impacts if loads are not covered.
- Emissions from construction vehicle exhausts.

Operation

The proposal will not affect the existing air environment.

6.8.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: <ul style="list-style-type: none">• potential sources of air pollution• air quality management objectives consistent with any relevant published EPA and/or OEH guidelines	Contactors	Pre-construction	Core standard safeguard AQ1 Section 4.4 of QA G36 <i>Environment Protection</i>

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	<ul style="list-style-type: none"> mitigation and suppression measures to be implemented methods to manage work during strong winds or other adverse weather conditions a progressive rehabilitation strategy for exposed surfaces. 			
Air quality	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust	Contractor	Construction	Standard safeguard
Air quality	Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction	Standard safeguard
Air quality	Vegetation or other materials are not to be burnt on site.	Contractor	Construction	Standard safeguard
Air quality	Vehicles transporting waste or other materials that may produce dust are to be covered during transportation.	Contractor	Construction	Standard safeguard
Air quality	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Construction	Standard safeguard
Air quality	Exposed areas on the banks and abutments are to be covered with geofabric when not worked.	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address Air quality impacts are identified in section 6.6 and 6.15.

6.9 Biodiversity

6.9.1 Methodology

Database searches were undertaken of terrestrial and aquatic flora and fauna databases including:

- EPBC Protected Matters search on the 25/09/2017. The search results are provided in Appendix
- NSW OEH BioNet wildlife atlas search on the 25/09/2017. The search results are provided in Appendix D
- NSW DPI Fisheries Spatial Data Portal on the 22/12/2017 at <https://www.dpi.nsw.gov.au/about-us/science-and-research/spatial-data-portal>. The search results are provided in Figure 6-14
- NSW DPI Key Fisheries habitat maps <https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/key-fish-habitat-maps>.

A site inspection was undertaken on the 12th October 2017. Reviews of aerial photography were undertaken from 2006 to inspect habitat and riparian connectivity.

6.9.2 Existing environment

The study area is considered to have poor terrestrial and aquatic biodiversity values arising from the conversion of an ephemeral billabong system to an ornamental parkland, recreational area and artificial Lake.

Terrestrial biodiversity

Ornamental park land with landscaped plantings on both sides of Lake Forbes and the approach to the Camp Street Bridge characterise the study area. The original vegetation native to the area has been cleared, potentially in the 1930's when works commenced to convert the ephemeral billabong to an ornamental Lake and parklands. Trees have been planted along Camp Street, Sir Francis Forbes Drive, Gordon Duff Drive and around the recreational fields in Apex Park and Sir Francis Forbes park. The parkland is well maintained, mown, and with no signs of visible weeds.

The site is isolated ecologically. There are no habitat corridors and no habitat connectivity. The study area is surrounded by open parkland, sports fields, residential areas and commercial areas.

A small island is located in Lake Forbes approximately 150 m north of the Camp Street Bridge. This island may offer a refuge to some species, such as birds, as it would be protected from human disturbance and domestic animals.

Threatened species.

Database searches were undertaken of NSW OEH Bionet Atlas listed species in a 10km by 10km and Commonwealth listed species using a 1 km buffer. A summary of the results of the NSW OEH Bionet Atlas data base searches are provided in **Table 6-22**. The results of the Bionet Atlas search were mapped onto the study area as shown in **Figure 6-13**.

The search results of a 10 km by 10 km grid around the site yielded records of:

- 18 threatened species listed as threatened under NSW legislation. This included 16 species listed as vulnerable and two species listed as Endangered under NSW legislation. The two Endangered listed species include the *Botaurus poiciloptilus* (Australasian Bittern) and *Rostratula australis* (Australian Painted Snipe)
- 15 species protected under EPBC listings, including international migratory bird agreements. Five of these species were also listed as threatened under NSW legislation. Three of species are listed as Endangered under the EPBC Act including the *Dasyurus maculatus* (Spotted tailed quoll), *Botaurus poiciloptilus* (Australasian Bittern) and *Rostratula australis* (Australian Painted Snipe). The Spotted Tailed Quoll is listed as Vulnerable in NSW.

There is one record of the *Rostratula australis* (Australian Painted Snipe) near the proposal area as shown in **Figure 6-13**. The habitat of *Rostratula australis* includes shallow freshwater wetlands and lakes.

Table 6-22: Summary of OEH (Bionet Atlas) data base search in 10km by 10km grid showing NSW and Commonwealth listed species

Scientific Name	Common Name	NSW status	Comm. status
<i>Anseranas semipalmata</i>	Magpie Goose	V,P	
<i>Oxyura australis</i>	Blue-billed Duck	V,P	
<i>Stictonetta naevosa</i>	Freckled Duck	V,P	
<i>Apus pacificus</i>	Fork-tailed Swift	P	C,J,K
<i>Ardea ibis</i>	Cattle Egret	P	C,J
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1,P	E
<i>Plegadis falcinellus</i>	Glossy Ibis	P	C
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P	C
<i>Falco subniger</i>	Black Falcon	V,P	
<i>Rostratula australis</i>	Australian Painted Snipe	E1,P	E
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	P	C,J,K
<i>Tringa glareola</i>	Wood Sandpiper	P	C,J,K
<i>Tringa nebularia</i>	Common Greenshank	P	C,J,K
<i>Tringa stagnatilis</i>	Marsh Sandpiper	P	C,J,K
<i>Gelochelidon nilotica</i>	Gull-billed Tern	P	C
<i>Hydroprogne caspia</i>	Caspian Tern	P	C,J
<i>^Polytelis swainsonii</i>	Superb Parrot	V,P	V
<i>Merops ornatus</i>	Rainbow Bee-eater	P	J
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V,P	
<i>Chthonicola sagittata</i>	Speckled Warbler	V,P	

Scientific Name	Common Name	NSW status	Comm. status
<i>Epthianura albifrons</i>	White-fronted Chat	V,P	
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V,P	
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V,P	
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V,P	
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V,P	
<i>Stagonopleura guttata</i>	Diamond Firetail	V,P	
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V,P	E
<i>Diuris tricolor</i>	Pine Donkey Orchid	V,P	

Key C= CAMBA China-Australia Migratory Bird Agreement, J = JAMBA Japan-Australia Migratory Bird Agreement, K – ROKAMBA Republic of Korea-Australia Migratory Bird Agreement
E =Endangered (Commonwealth listing), E1 = Endangered (NSW listing), P=Protected, V= Vulnerable.



Legend

- Proposal area
- Species**
- Australia Painted Snipe
- Inland Snake-eyed Skink
- Little Red Flying Fox
- Purple Swamphen



Figure 6-13: NSW OEH Bionet search results

Endangered Ecological Communities.

An EPBC search was undertaken with a 1 km buffer from the study area. The EPBC search identified three EPBC listed threatened ecological communities that may occur in the study area. These are:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia. This is listed as Endangered under the EPBC Act
- Weeping Myall Woodlands. This is listed as Endangered under the EPBC Act
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. This is listed as Critically Endangered under the EPBC Act.

The ecological communities are not in the proposal footprint area. The proposed work sites, including ancillary areas, are in cleared road reserve, open parkland and recreational areas. The vegetation is introduced lawn grass species and landscape plantings.

Aquatic biodiversity

The Camp Street Bridge passes over Lake Forbes. The Lachlan River lies to the south of the study area. Lake Forbes was originally an ephemeral billabong fed by overflows from the Lachlan River. The dry billabong was converted into an ornamental Lake from the 1930s onwards. A number of downstream water weirs have been constructed to provide and maintain artificial water levels in the Lake. The riparian and surrounding vegetation has been removed as the Lake has been converted to open recreational parkland.¹²

Lake Forbes is mapped as Key Fisheries Habitat by the DPI (Fisheries). Despite this mapping classification, the Lake in the study area was observed to have very poor fisheries habitat value during the inspection on the 12th October 2017. Items noted during the site inspection included:

- There was no visible riparian vegetation or riparian habitat around the lake perimeter
- Absence of instream habitat features such as snags, riffles and pools
- Bank vegetation has been removed. Pavers have been installed around the banks in some areas possibly as an erosion control measure in the absence of riparian vegetation
- Fish passage is prevented by water level controls upstream and downstream
- Stagnant water and shallow water depth. This can reduce the Dissolved Oxygen (DO) in the water profile. There is a water fountain in the Lake approximately 500 m downstream from the bridge. This may provide some aeration and mixing.
- There is no connectivity of fisheries or riparian habitat
- Visible turbidity in the water
- Stormwater discharges into the Lake on both sides
- Presence of introduced Carp which is a pest fish species.

Reviews of aerial photography from 2006 onwards confirmed the lack of aquatic and riparian habitat connectivity and water quality problems including turbidity and potentially eutrophic conditions downstream.

Searches of the NSW DPI Fisheries Spatial Data Portal did not identify any freshwater fish community or threatened freshwater fish habitat in the area. The nearby Lachlan River was mapped as "Very Poor" freshwater fish community status (**Figure 6-14**). There are no wetlands of international importance (Ramsar) in or adjacent to the study area. No groundwater dependent ecosystems (GDEs) were identified in the study area or downstream.

¹² Focus Bridge Engineering (2017) Camp Street Bridge BN4286. Statement of Heritage Impact for the Proposed Bridge Replacement.

Fish passage is prevented through downstream and upstream small weirs on Lake Forbes that control the water levels. There is a water level control structure downstream of the Camp Street Bridge on Lake Forbes at Sherriff St (refer **Figure 6-15**). During periods of flooding the Lake would connect with the Lachlan River. Fish may traverse between the river and Lake during these infrequent flooding events when these existing obstructions are drowned out.

The water levels in the Lake are regulated by Forbes Council. Council has previously lowered the levels in the Lake for the construction of the pedestrian footpath on the bridge.

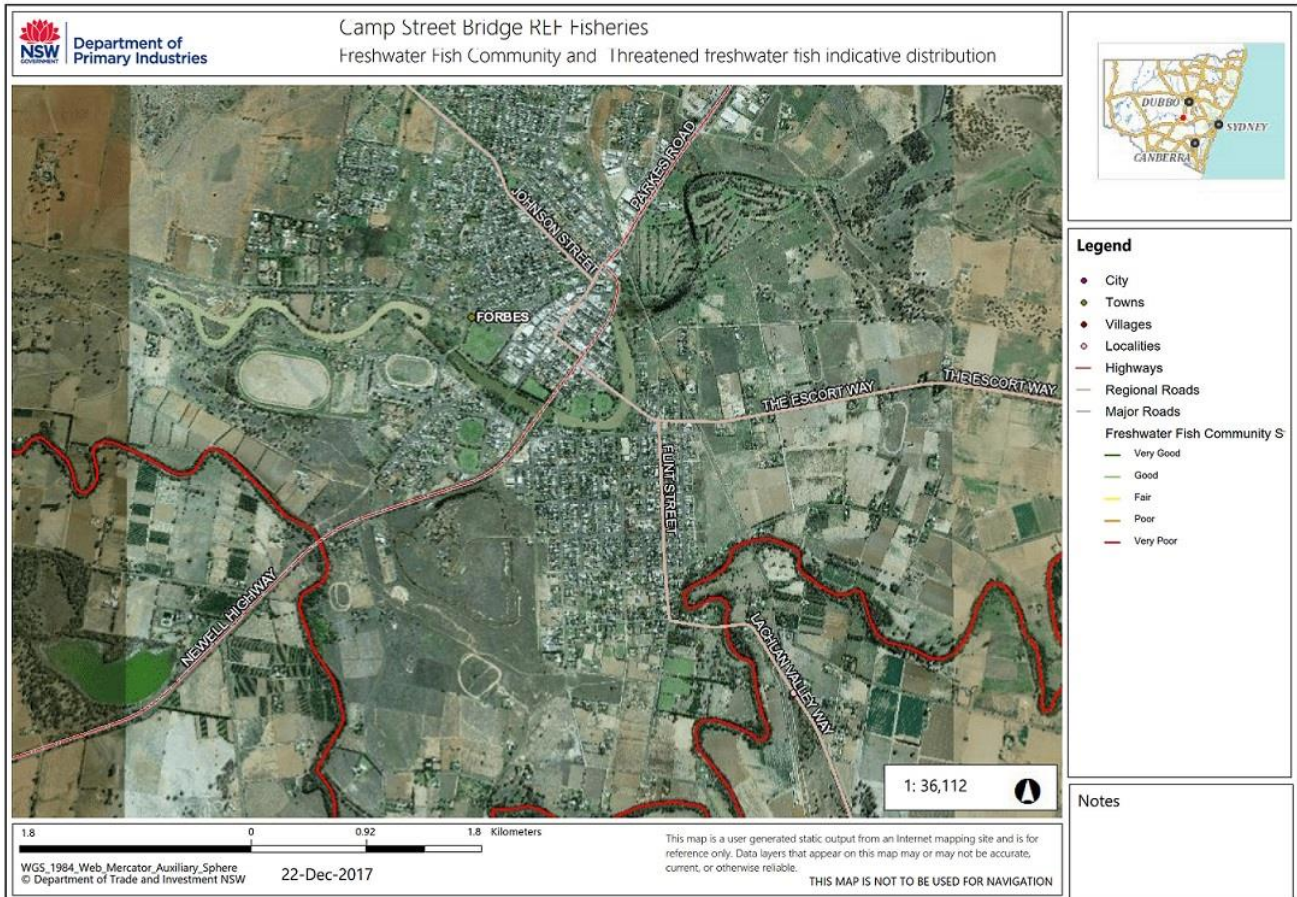


Figure 6-14: Camp Street DPI Fisheries Spatial Data



Figure 6-15: Water level control structure downstream of Camp Street Bridge, Lake Forbes at Sherriff Street.

Two protected fish species were identified as potentially occurring or having habitat in the area in the EPBC protected matters search. These are shown in **Table 6-23** and include *Maccullochella peelii* (Murray Cod) and *Macquaria australasica* (Macquarie Perch). *Maccullochella peelii* (Murray Cod) is listed as Vulnerable under EPBC but is not listed in NSW. *Macquaria australasica* (Macquarie Perch) is listed as Endangered under the EPBC Act and NSW Fisheries Management Act. There were no protected fish species records identified in the OEH data base searches. Lake Forbes is not in an area of threatened freshwater fish indicative distributions as mapped by DPI Fisheries and shown in **Figure 6-14**. Considering the habitat preferences for the two species, the artificial nature of Lake Forbes, and DPI Fisheries distribution mapping for *Macquaria australasica*, Lake Forbes is considered very poor habitat for the two species.

Table 6-23: Results of EPBC Protected Fish and aquatic habitat searches

Name	EPBC listing	NSW listing	Habitat preference	Comment
<i>Maccullochella peeli</i> Murray Cod	Vulnerable Species or species habitat may occur within the area.	Not listed	Species are frequently found in main channels of rivers and larger tributaries. Preferred microhabitat includes complex structural features in streams such as large rocks, large submerged woody debris), overhanging stream banks and vegetation, logs and branches. ¹³	Lake Forbes does not meet preferred habitat requirements.
<i>Macquaria australasica</i> – Macquarie Perch	Endangered Species or species habitat may occur within the area.	Endangered	The species is a schooling species that prefers clear water and deep rocky holes with lots of cover. ¹⁴	Lake Forbes does not meet the preferred habitat requirements. Lake Forbes is not mapped in the distribution area of the species by DPI Fisheries.

6.9.3 Potential impacts

The proposed works are in an area that has previously been impacted by road and bridge works. Ancillary areas will be in open parkland and existing hard stand area used for parking. Any vegetation removal will be limited to isolated, planted trees. The risk of biodiversity impacts is considered low given the nature of the works and poor habitat values of the site.

There is one record of the endangered *Rostratula australis* (Australian Painted Snipe) near a small island in Lake Forbes to the north and outside of the proposal area. The proposal will not affect the habitat availability for this species. The proposal is likely to enhance biodiversity values due to the proposed landscape plantings.

Construction

Potential construction phase impacts of the proposal include:

Terrestrial

- Clearing of trees in landscaping. The proposal may require clearing of individual trees for safe operation of cranes, construction access to banks, and clearance distances for overhead utilities. It may be possible to trim rather than clear vegetation in most instances. Should

¹³ Department of Environment and Energy Species Profile and Threats Database (2017) *Maccullochella peeli* – Murray Cod http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66633

¹⁴ Department of Environment and Energy Species Profile and Threats Database (2017) *Macquaria australasica* – Macquarie Perch

clearing be required the loss of individual trees will be more than offset by plantings in the proposed Landscape design shown in **Figure 3-1** and Appendix C.

- Soil compaction near tree roots. Heavy machinery, vehicle parking, and stockpiles can compact soil and damage tree roots and affect tree health. There are tree plantings along the proposed ancillary site, particularly on Sir Francis Forbes drive. Buffer distances should be established between work areas and vegetation to avoid compaction of the soil and roots.
- Weed incursion. Construction machinery and vehicles can transport weed seeds between construction sites in clumps of soil.

Aquatic biodiversity

- Lowering the Lake and downstream discharge. The Lake will be lowered to a level of approximately 234.62m during demolition and construction.

A sudden release of water of lower DO or temperature from the downstream water quality can affect aquatic biota. Lowering in the Lake may also affect DO and temperature. Reducing the depth in the water profile can remove cooler water refuge areas for fish during high temperatures.

- Aquatic weed incursion. Construction machinery and equipment can transport aquatic weeds if used in wet areas prior to entering the site. Machinery should be washed down to reduce the risk.
- Sedimentation and turbidity. Earthworks on the road, abutments and utilities can increase the risk of sediment entering the Lake. Rock used in temporary in-stream structures can also import sediment. A “Frac out,” which is where directional drilling fluid under pressure from an under bore seeps through a weak fissure in the soils, can also occur. Sediment can result in infilling of aquatic habitat and smothering of the bed of the Lake. Earthworks and areas of disturbance are relatively small and potential impacts are localised. The risk can be mitigated using standard erosion and sediment controls.
- Physical infilling. Temporary rock platforms for construction will physically occupy aquatic habitat during demolition and bridge construction. Aquatic biodiversity values are considered poor. Any potential impacts are localised and of a limited duration. Temporary structures would be removed at the end of construction.
- Obstructions to fish passage. Temporary instream structure such as rock platforms may obstruct fish passage in a small section of the Lake Forbes. There are existing obstructions that prevent fish passage up and downstream of the proposed bridge works. Aquatic biodiversity values are considered poor. Fish in the Lake are likely to be introduced pest Carp species. Temporary structure could be built to provide gaps such that fish passage is not obstructed. Temporary structures would not affect fish passage during flood events when the Lake would connect with the Lachlan river upstream and downstream. Temporary structures would be removed at the end of construction.
- Pollutants. Machinery and activities in demolition and construction can increase the risk of accidental spills of fuels, lubricants or paints that may impact on the health of aquatic ecosystems. There are measures to reduce these risks. This includes placing limits on the volumes of chemicals stored on site; preventing the storage of chemicals on or near Lake Forbes and drainage lines; providing bunding in areas where chemicals and fuels are required to be used; having standard operating procedures for the use of chemicals; and having spills kits and floating booms available.

Operation

The operation of the proposal will improve the terrestrial and aquatic biodiversity values in the study area. The water sensitive drainage features will provide some water quality treatment for road runoff during stormwater events. This includes the removal of sediment, particulates and nutrient reduction. The proposed landscape planting as shown in **Figure 3-1** and Appendix C includes plantings of River Red Gum (*Eucalyptus camaldulensis*) and River Oak (*Casuarina*

cuninhamiana) will also enhance biodiversity. The River Red Gum is a key native floodplain species.

Conclusion on significance of impacts

The proposal is not likely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the Biodiversity Conservation Act 2016 or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required.

The proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the *EPBC Act 1999*.

6.9.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> • plans showing trees to be cleared and trimmed, areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) • procedures for unexpected threatened species finds and fauna handling • procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens. 	Contractor	Detailed design / pre-construction	<p>Core standard safeguard B1</p> <p>Section 4.8 of QA G36 <i>Environment Protection</i></p>

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity (aquatic)	<p>Lake Forbes lowering</p> <p>A Fish Incident Response Plan is to be developed prior to lowering the levels in the Lake. The Plan is to include:</p> <ul style="list-style-type: none"> • Visual monitoring for evidence of distressed fish • Action such as turning on fountain or air compressor to aerate and mix water • Procedure to relocate any distressed native fish to downstream of the control structure at Johnny Woods crossing • Procedures to remove and dispose any deceased pest fish • Procedure to notify (as required) RMS Project Manager, RMS Environment Manager, DoI(Fisheries), OEH and Council in the event of a fish kill 	Roads & Maritime Services and Contractor	Pre-construction	Additional safeguard
Biodiversity	All earthmoving machinery is to be high pressure hosed to remove dirt and weed seed off site prior to commencement of activities on site.	Contactors	Construction	Additional safeguard
Biodiversity	Compound sites, stockpiles, car park areas are to be at least 5 m from trees to be retained.	Contactors	Construction	Additional safeguard
Biodiversity	Where vegetation removal is required seek to trim in preference to clearing where feasible.	Contactors	Construction	Additional safeguard
Biodiversity	Temporary in stream structures are to avoid obstructing the whole Lake where possible. Where a structure does fully cross the Lake, a temporary pipe (>350mm) is to be provided or equivalent to provide fish passage.	Contactors	Construction	Additional safeguard
Biodiversity	No persons or equipment are to be allowed on the small island approximately 150m to the north of the Camp Street Bridge.	Contactors	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Biodiversity	Lake Forbes lowering. Monitor DO levels in Lake Forbes. Examine options such as using the fountain to aerate the water if DO falls below typical levels, particularly during hot periods.	Roads & Maritimes Services	Construction	Additional safeguard
Biodiversity	Implement landscaping plan including planting of River Red Gum (<i>Eucalyptus camaldulensis</i>) and River Oak (<i>Casuarina cunninghamiana</i>).	Roads & Maritimes Services	Operation	Additional safeguard

Other safeguards and management measures that would address biodiversity impacts are identified in sections 6.5, 6.6 and 6.7.

6.10 Aboriginal heritage

6.10.1 Methodology

A Stage 1 assessment was undertaken in accordance with the “Procedure for Aboriginal Cultural Heritage Consultation and Investigation” (Roads and Maritime, 2011). A database search was undertaken of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) on the 25th September 2017. A visual inspection of the site was undertaken on the 12th October 2017.

The results of the Stage 1 PACHCI and AHIMS search are provided in Appendix G and Appendix H.

6.10.2 Existing environment

Forbes is in the area of coverage of the Peak Hill Local Aboriginal Land Council (LALC). The traditional owners of the Forbes region are the Wiradjuri people. The Wiradjuri tribe was the largest in the state and covered the area from Albury in the south to Coonabarabran in the north. At the time of European settlement the area now known as Forbes was inhabited by groups of the Wiradjuri Aboriginal peoples.

The physical environment has been modified in and surrounding the study area. The landform has been modified on the approaches to the Camp Street Bridge on both sides for the bridge abutment and approaches, road formation, drainage works, car parking, sports fields (western bank) and parkland (both side of the Lake). The environment in the surrounding area has been cleared, modified and converted into open lawn, landscaped parkland and recreational areas. This includes Apex Park, Sir Frances Forbes Park and South Circle Oval on the western banks of Lake Forbes and Rotary Pak on the eastern bank. Trees have been planted to line Camp Street and Sir Francis Forbes drive on the western side of Lake Forbes. There are occasional trees in the open parkland areas on both sides of Lake Forbes.

Prior to the 1930’s Lake Forbes was an ephemeral billabong. It has been modified into an ornamental feature from the 1930’s onwards.¹⁵ There are small check weirs downstream of Camp Street Bridge to control water levels in the Lake and restrict the free movement of water. The riparian vegetation has been removed and the banks of the Lake converted into lawn. There was a former wooden bridge built across Lake Forbes approximately 46 years prior to the construction of the current Camp Street Bridge in 1927.

There are light industrial and commercial businesses immediately to the west of the study area on Camp Street. Further west there are urban, commercial areas on the Newell Highway. Land use on the eastern extent of the study area is residential housing along Bridge Street and Hills street.

The study area has been extensively modified and is regularly disturbed. The search of the OEH AHIMs register site did not identify any aboriginal sites or places in the study area. The archaeological potential of the study area is considered low given the site context and results of data base searches.

6.10.3 Potential impacts

Construction

There are no Aboriginal site records in the area. The Stage 1 PACHCI assessment has concluded that the activity is unlikely to harm an Aboriginal object or place of cultural heritage significance. A Stage 2 PACHCI is subsequently not required for the proposal.

¹⁵ NSW Office of Environment State Heritage Inventory Listing for Camp Street Bridge (data base number 4306123)

The proposal activity is in areas that have previously been disturbed for bridge works, road works and recreational areas. Excavation would be undertaken as part of the proposal. The excavation is in area of previous work activities such as the bridge abutment and drainage. Tree lopping and pruning may be undertaken as part of the proposal. The trees in the parklands have been planted and are introduced in some occasions. They are unlikely to have been used for cultural purposes.

Due to the highly modified nature of the site, it is considered unlikely that any objects of Aboriginal significance would be impacted by the proposed works.

Operation

The proposal is not expected to impact on any items of Aboriginal heritage or cultural values.

6.10.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied. 	Contractor	Construction	Core standard safeguard AH2 Section 4.9 of QA G36 <i>Environment Protection</i>

6.11 Property, land use and access

6.11.1 Methodology

To determine land use in the study area, Forbes LEP 2013 was reviewed together with aerial photography and a site inspection was undertaken on the 12th October 2017.

6.11.2 Existing environment

Land use in the area is a mix of public recreational open space immediately adjacently to Lake Forbes and the proposal site. The urban areas of Forbes, which is predominantly single detached dwellings on residentially zoned land, lies beyond the study area. The public recreation areas immediately adjoining the proposal include a mix of active and passive recreation areas including the lake foreshore area and sporting fields in Apex Park.

The land around Lake Forbes in the immediate vicinity of the proposal site is Crown land that has been vested to Forbes Shire Council. The nearest privately owned properties to the proposal are located about 40 metres from the eastern abutment at 42 and 44 Hill Street. There are commercial and light industrial premises on Camp Street from the intersection of Camp Street with the Newell Highway to the intersection with Camp Lane. The western side of Camp St, from the intersection of Gordon Duff drive to the intersection with King Street, is used as car parking space for sport events at the South Circle Oval. The space near King Street is also used for bus parking. Sir Francis Forbes Park is used as a market place by the Rotary club on a monthly basis.

6.11.3 Potential impacts

Construction

Camp Street will be closed at approximately the intersection with King Street / Camp Lane as well as Gordon Duff drive during construction. The proposal has an expected duration of 54 weeks subject to weather. It is envisaged the detour will be in operation for 43 weeks. The detour is not required for the full duration of works such as the early works, initial site establishment works, and finalisation works such as landscaping after the bridge opening. This will prevent public entry to car parking areas adjoining the South Circle Oval and netball courts. The open space and hard stand areas on the western side of Camp St, from the intersection of Gordon Duff drive to the intersection with King Street will be closed as potential compound sites and ancillary areas. Public access will not be possible due to safety risks associated with construction practices.

There are alternate car parking spaces for the netball courts and South Circle Oval on Brown Street and King Street from the Newell Highway intersection. There are also alternative car parking spaces on Gordon Duff Drive accessible via the Newell highway and Sherriff Street.

Sir Francis Forbes Park is used as a monthly market place. Roads and Maritime has consulted with Forbes Shire Council on the use of the Park as a construction compound during the duration of the construction period. Access to the park will be prevented during the construction period. A temporary alternate site for the markets will be implemented during the closure. This is addressed in section 6.12.

The proposal should not require any long term obstructions to private property access due to the proximity of the works to adjoining residents. There may be very short term, temporary obstructions to private property access in order to maintain safe operations for utility relocation, such as overhead power poles, and delivery of components and materials to the eastern banks of Lake Forbes. If such operations are required they would be a limited to a few hours and most likely limited to private premises on the corner of Hill Street and Bridge Street only.

Operation

The proposal will not affect ongoing land use or property impacts during operation. The proposal does not require any land acquisitions.

6.11.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Land use	Consult with bus company on closure timeframes and potential impacts on bus parking.	Roads and Maritime	Pre-construction	Additional safeguard
Car parking	Consult with Forbes Shire Council and key sports clubs users (Netball, cricket and football) on alternate parking arrangements and signage for the South Circle Oval during road closure on Camp Street.	Roads and Maritime	Pre-construction	Additional safeguard
Private Property access	Consult with any potentially affected private residence prior to any short term obstruction of access. Time works around residence requirements	Contractor	Construction	Additional safeguard

Other safeguards and management measures that would address property and land use impacts are identified in section 6.3 and 6.12.

6.12 Socio-economic

6.12.1 Methodology

A review of the 2016 Census data was undertaken to understand the socio and economic context of the area. A review of the Forbes LEP was undertaken in addition to a site inspection on the 12th October 2017 to identify surrounding land use. Roads and Maritime services undertook consultation with businesses on Camp Street to identify any potential impacts as part of the consultation in October 2017.

6.12.2 Existing environment

The proposal site is located on Camp Street which is located less than 1 kilometre to the east of the centre of the township of Forbes. Census data for the statistical area of Forbes has been used to provide demographic information for the township of Forbes. The 2016 Census (ABS, 2016) provides the following core demographic data about Forbes:

- At the time of the Census there was a population of 8432 people in Forbes
- The number of dwellings was 3525 with an average household size of 2.3
- The proportion of people aged 19 years or younger was 26.8%
- The proportion of people aged 60 years or older was 29%
- The medium weekly household income was \$1,033.00
- The average number of motor vehicles per dwelling is 1.8.

Employment data for Forbes was not available from the 2016 Census, however 2015 data was available from the ABS which identified the top employment industries for Forbes as shown in **Table 6-24**.

There are a number of businesses along Camp Street including a petrol station, agricultural suppliers, automotive repairs and auto electricians. Consultation with the business in October 2017 indicated that the bulk of patronage was from the Newell Highway and not from the east via Bridge Street. Consultation with Forbes Shire Council has identified that Sir Francis Forbes Park is used for monthly markets by the Rotary Club.

Table 6-24 Top employment industries for Forbes

Industry	Percentage of people employed
Agriculture, forestry and fishing	19.2
Retail trade	10.9
Health care and social assistance	10.9
Education and training	9.4

Land use in the study area outside the urban area of Forbes is typified by a wide range of agricultural activities including cropping, beef and sheep grazing and a variety of other food and livestock production.

The lake is used for recreational water sports including the Forbes Dragon Boat Club, which uses a section of the lake between Wambat Street and Show Street for training. The section of the lake between Show Street and Salisbury Crossing is used for events such as the Barefoot Water-Skiing Tournament and an annual triathlon.

6.12.3 Potential impacts

Construction

Road Users

During construction road users would be impacted by the need to utilise the proposals construction detours as detailed and assessed in section 6.3. Detours would need to be in place for the 43 week construction period. Measures detailed in section 6.3 have been recommended to manage the impacts of the detour on both light and heavy vehicle traffic.

Local businesses

Local business on Camp Street will not be affected by the closure of Bridge-Camp Street and the detour. Consultation undertaken by Roads and Maritime Services with these businesses indicates that the bulk of patronage is from the Newell Highway to the north-west. The temporary closure of access across the bridge and operation of the detour route will subsequently have limited effect on these businesses.

Community organisations

The Rotary Club uses the Sir Francis Forbes Park for monthly markets. Access will be prevented during construction due to the location of the construction compound and ancillary areas. Access and car parking will also be restricted to Sir Francis Forbes Park with the closure of Camp Street and Sir Francis Forbes Drive. Access may be prevented for a periods of 54 weeks over the construction period subject to weather.

There are alternate areas for markets in Apex Park along Gordon Duff Drive from Sherriff Street that may be suitable as a short term temporary location for markets. Other potential sites may include Rotary Park on the eastern banks of Lake Forbes from Hill Street or Bandon Street. Roads and Maritime Services will consult with Council and the Rotary club on potential short term temporary sites.

Recreation

During the construction period access to the areas in around the bridge abutments would be restricted and the ancillary facility would use a portion of the parkland on the Lake Forbes Foreshore. These areas would be no longer available for active or passive recreational activities by the community.

Construction works would require the lowering of Lake Forbes to a level of 234.6 metres which would leave about 1 metre of water depth in the lake. This may impact on the ability for recreational water sports, including boating and fishing, to be undertaken from the lake. These impacts would be offset by access to Lake Forbes downstream of the water level control weir at Sherriff Street and the Lachlan River which provides an alternative for recreational water sports.

Consultation would be undertaken with Forbes Shire Council and the Rotary club on the utilisation of alternate open park space areas in Apex Park whilst access to Sir Francis Forbes Park is restricted.

Benefits

The local area would experience a minor short-term increase in employment opportunities and procurement of local goods and services over the construction period. The construction may also allow provide for opportunities for the local and regional workforce to develop skills in construction techniques and management.

Operation

Benefits

The proposal involves the removal of a bridge that is ending its design life resulting in increasing maintenance costs to the community. The bridge will cater for HML loads which improves the efficiency of heavy transport and economic productivity in the locality and regional as part of a transport network corridor.

The project has a number of social benefits. The new bridge is safer. It is designed to current road standards, provides greater lane widths and a dedicated pedestrian pathway with improved separation from live traffic. This results in safety benefits to road users.

The new bridge will provide social, connectivity and amenity benefits. The bridge has been designed with pedestrian and bike connectivity to the existing pathways around Lake Forbes. The new Camp Street Bridge and associated landscaping has been designed to improve the aesthetics of the approaches to the bridge, blend into the existing parkland, and maintain the unique heritage features of the art-deco lights. The landscape plantings will also provide some localised benefits to water quality and habitat which may improve aesthetic and recreational values of the Lake in the longer term.

6.12.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Socio-economic	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Contactor	Pre-construction	Core standard safeguard SE1
Socio-economic	Consult with the Forbes Shire Council and the Rotary Club on an alternate location for the monthly market whilst access to Sir Francis Forbes Parks is restricted.	Roads and Maritime	Pre-construction	Additional safeguard
Water Recreation	Consult with recreational water users such as the Forbes Dragon Boat Club, water skier tournament and triathlon prior to lowering levels.	Roads and Maritime	Pre-construction	Additional safeguard

Other safeguards and management measures that would address socio-economic impacts are identified in section 5.6 and section 6.3.

6.13 Hazardous materials

6.13.1 Methodology

Roads and Maritime undertook a hazardous materials survey (attached at Appendix M) of the Camp Street Bridge in December 2017. The result of the survey is summarised in this section.

The hazardous materials assessment included a survey of the site to determine the location, extent and condition of hazardous materials on site including asbestos, lead, synthetic mineral fibres (SMF), polychlorinated biphenyls (PCBs), and Copper, Chrome and Arsenic (CCA).

Representative samples of materials suspected of containing asbestos were taken in accordance with the *Code of Practice: How to Manage and Control Asbestos in the Workplace* (Safe Work Australia, 2016) and analysed in accordance with the Australian Standard AS 4964 – 2004 *Method for the qualitative identification of asbestos in bulk samples*. A risk assessment was undertaken to assess the associated risks of identified asbestos containing material.

Representative samples of paint systems suspected of containing lead were taken in accordance with AS 4361.2 - 1998 *Guide to Lead Paint Management Part 2: Residential and Commercial Buildings*. Samples were tested for lead content by a NATA accredited laboratory.

Representative samples of timber suspected of being treated with CCA were taken and analysed for CCA content by a NATA accredited laboratory.

6.13.2 Existing environment

An asbestos register was prepared for the site (Section 3.1 in Appendix M). The register presents the results of the sampling analyses and indicates that asbestos containing material is present at one location ('Dust and debris on top of concrete ledge and around eastern end pipe'). At this location, friable asbestos was detected in a small fragment of dust located between the top sections of the PVA pipe underneath the concrete slab on the eastern section of the bridge (refer to **Figure 6-16**)



Figure 6-16: Friable asbestos detected within loose fibre bundle within the underside of the concrete slab.

Under the AS 4361.2: 1998 *Guide to Lead Paint Management Part 2: Residential and Commercial Buildings*, 'Lead Paint' is defined as having a lead content of greater than 1%. Analytical results of the paint samples taken from the site (Section 3.2 of Appendix M) indicate that the lead content in each sample is less than the 1% parameter and therefore is not considered to be lead paint.

The NSW EPA *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, November 2014) list the maximum values in general solid waste for arsenic and chromium as 100 mg/kg (copper is not listed). A wooden telegraph pole located on the western bank of the bridge was tested for CCA content and the results indicate that levels are well below the specified maximum (arsenic - less than 4 mg/kg; chromium - less than 1 mg/kg; and copper – 3 mg/kg).

6.13.3 Potential impacts

Construction

Potential impacts of the proposal associated with hazardous materials would relate to the disturbance of asbestos containing material during utility relocation and demolition of the existing bridge.

Asbestos is formed in fibre bundles and as it is further processed or disturbed, the fibre bundles become progressively finer and more hazardous to health. Significant health risks may arise from the inhalation of airborne asbestos fibres. Breathing in asbestos fibres brings a risk of asbestosis, lung cancer and mesothelioma. Asbestos related diseases have a delay or latency period of 20 to 40 years between first exposure and the onset of symptoms and detection of the disease.

Friable asbestos material is any material that contains asbestos and is in the form of a powder, or can be crumbled, pulverized or reduced to powder by hand pressure when dry. Asbestos fibres may be released into the air whenever they are disturbed, and especially during the following activities:

- Any direct action on asbestos containing material, such as drilling, boring, cutting, filing, brushing, grinding, sanding, breaking, smashing or blowing with compressed air
- The inspection or removal of asbestos containing material from structures
- The maintenance or servicing of materials from vehicles, plant, equipment or workplaces
- The renovation or demolition of buildings or structures with asbestos containing material.

Safeguards and management measures for the removal of asbestos containing materials would be implemented during utility relocation and demolition of the existing bridge structure.

The hazardous material survey did not identify any other hazardous materials. A precautionary approach will be adopted nonetheless in the construction phase and demolition of the bridge.

Operation

The proposal would see the replacement of an existing bridge with a new bridge. The proposal would not result in increased operational impacts associated with hazardous materials.

6.13.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Hazards and risk management	<p>A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP.</p> <p>The HRMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • details of hazards and risks associated with the activity • measures to be implemented during construction to minimise these risks • record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • a monitoring program to assess performance in managing the identified risks • contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. <p>The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or Office of Environment and Heritage publications.</p>	Contractor	Detailed design / pre-construction	Core standard safeguard HAZ1
Removal of asbestos material	<p>The HRMP would specify the measures to be implemented for the removal and disposal of asbestos containing material. The removal and disposal of asbestos would be undertaken in accordance with the requirements of the <i>Code of Practice How to Safely Remove Asbestos</i> (Safe Work Australia, 2016) and with the recommendations set out in Section 4.1 of Appendix M.</p>	Contractor	Construction (Pre-bridge demolition)	Additional safeguard

6.14 Waste

6.14.1 Existing environment

Roads and Maritime is committed to ensuring responsible management of unavoidable waste and to promoting the reuse of such waste through appropriate measures in line with the resource management hierarchy principles embodied in the Waste Avoidance and Resource Recovery Act 2001 (WARR Act).

The resource management hierarchy principles in order of priority as outlined in the WARR Act are:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, reprocessing, recycling and energy recovery)
- Disposal.

By adopting the above principles, Roads and Maritime encourages the most efficient use of resources and reduces cost and environmental harm in line with the principles of ecologically sustainable development.

No significant waste streams are produced by operation of the existing bridge.

6.14.2 Potential impacts

Construction

Typical construction waste

The proposal has the potential to generate waste from the following activities:

- Demolition of the existing Camp Street Bridge
- Excavation of the new connecting road alignment and abutments
- Green waste from ground cover and tree pruning and removal.

Waste streams likely to be generated during construction of the proposal include:

- Bridge materials from the existing bridge including steel and concrete
- Waste materials from the removal of the existing pilings
- Hazardous waste including bridge materials with asbestos
- Excess spoil from excavations
- Rock fill and geotextiles from temporary in-stream structures
- Green waste
- Roadside materials such as fence posts and railings
- Packaging and general waste from construction staff
- Redundant sediment and erosion controls such as silt fences
- Waste water from wash-downs and bunded areas
- Chemicals and oils remaining following construction activities.

The largest quantities of waste likely to be generated by construction activity would be the waste materials left over from the removal of the existing bridge. As this would mainly consist of metal and concrete components, this waste would be recycled where possible.

Other liquid and solid waste materials would be removed by tanker or truck and disposed of off-site at a facility that is licensed or approved to accept those wastes for storage, reuse or disposal. Fuel and chemical storage areas would be bunded and protected in accordance with specifications set out by OEH.

Any spoil material that cannot be used on site would be classified in line with the 'Waste Classification Guidelines' (EPA 2014) and disposed of at an approved materials recycling or waste disposal facility. Materials not reused would be removed to a licensed or approved facility. Waste generation impacts at the site are considered to be low, and would be minimised. Stockpiles would be managed to avoid causing pollution or contamination in line with the 'Stockpile Site Management Guideline' (RTA 2011a).

Green waste volumes are expected to be very small. The requirements for trimming of vegetation and clearing are minimal. Green waste may be used on site as temporary groundcover for erosion and sediment control as well as landscaping works.

Disturbance of asbestos may occur during the removal of the existing bridge. The implementation of the controls listed in section 6.9.3 would ensure that the disturbance of asbestos during the handling and transport is minimised.

Operation

The proposal would see the replacement of an existing bridge with a new bridge. There is not expected to be any increase in operational waste as a result of the proposal.

6.14.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • measures to avoid and minimise waste associated with the project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contractor	Pre-construction	<p>Core standard safeguard W1</p> <p>Section 4.2 of QA G36 <i>Environment Protection</i></p>

6.15 Greenhouse gas and climate change

6.15.1 Existing environment

Existing sources of greenhouse gas emissions within proximity to the proposal site are most likely from diffuse sources on the surrounding road network. These include heavy freight vehicles on the Newell Highway.

6.15.2 Policy Setting

In NSW the Policy framework sits under the NSW 2021: A Plan to Make NSW Number One plan (NSW Government 2014) which includes goals and targets supplemented by practical action to minimise impacts upon local communities.

The NSW Climate Impact Profile prepared by OEH assesses the potential impacts projected for NSW as a result of climate change. It outlines the risks NSW faces in terms of climate change and helps decision makers in developing planning and response strategies under the NSW Policy.

6.15.3 Potential impacts

Construction

The proposal may generate emissions in the construction phase through:

- Exhaust emission from plant and equipment
- Vehicle emissions used for construction and transportation of materials.

Due to the small scale and limited timeframe of the project, the volume of emissions is not consequential.

Operation

The proposal would not increase the volumes of traffic or emissions.

6.15.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Greenhouse gas and emissions	Ensure construction vehicles, plant and equipment are maintained in accordance with manufacturer instructions and monitor vehicle and equipment for 'dirty' exhaust fumes.	Contractor	Construction	Additional safe guard

6.16 Cumulative impacts

6.16.1 Study area

The study area for the consideration of cumulative impacts includes the township of Forbes, the Newell Highway through the town centre as well as the Lachlan Valley Way and the Escort Way.

6.16.2 Other projects and developments

A search of the Department of Planning and Environments major project register on 10 October 2017 identified no major projects in close proximity to the proposal.

A search of Forbes Shire Council's development application tracker for the months of September and October 2017 identified that there were no significant proposed or approved development application in close proximity to the proposal. The largest identified project is a service station redevelopment at the Forbes Homemakers Centres located approximately 2 kilometres to the north of the proposal. Due to its size and proximity relative to the proposal, this is unlikely to result in cumulative impacts.

No other major developments within the vicinity of the proposal are known. Any other developments likely to occur within the locality would be of a small scale, for example residential projects in adjacent urban areas. These are unlikely to result in any noticeable cumulative impacts

6.16.3 Potential 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 or activities. The nearest proposed development is more than 2 km away and unlikely to interact with this proposal. The bridge replacement is not part of a program of works on the Newell Highway, Lachlan Valley Way or Escort Way, subsequently there are no cumulative traffic delay risks.

Cumulative impacts are unlikely to arise based on current development proposals in the locality.

6.16.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Cumulative impacts	<ul style="list-style-type: none">The construction environment management plan would be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Project manager and contractor	Construction	Additional safeguard

7 Environmental management

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

7.1 Environmental management plans (or system)

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

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

The CEMP will be prepared prior to construction of the proposal and must be reviewed and certified by the Roads and Maritime Environment Officer, Western, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

The CEMP would be developed in accordance with the specifications set out in the QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan), QA Specification G40 – Clearing and Grubbing, QA Specification G10 - Traffic Management.

7.2 Summary of safeguards and management measures

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

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
GEN1	General - minimise environmental impacts during construction	<p>A CEMP will be prepared and submitted for review and endorsement of the Roads and Maritime Environment Manager prior to commencement of the activity.</p> <p>As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review. <p>The endorsed CEMP will be implemented during the undertaking of the activity.</p>	Contractor / Roads and Maritime project manager	Pre-construction / detailed design	Core standard safeguard GEN1
GEN2	General -	All businesses on Camp Street, residential properties and other key	Contractor /	Pre-	Core

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
	notification	<p>stakeholders (e.g. Forbes Shire Council, bus operators, agencies) affected by the activity will be notified at least five days prior to commencement of the activity.</p> <p>The notification should include:</p> <ul style="list-style-type: none"> • Details of the proposal • The duration of works and working hours • Any changed traffic or access arrangements • How to lodge a complaint or obtain more information • Contact name and details. 	Roads and Maritime project manager	construction	standard safeguard GEN2
GEN3	Community, Agency and Stakeholder consultation	Prepare and implement a Community and Stakeholder Engagement Plan to plan and manage statutory, agency and other consultation identified in section 5 with particular reference to section 5.5 and 5.6.2.	Contractor / Roads and Maritime project manager	Pre-construction	Additional safeguard
GEN4	Community consultation	All complaints are to be recorded on a complaints register and attended to promptly.		Construction	Additional safeguard
GEN5	General – environmental awareness	<p>All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings.</p> <p>Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include:</p> <ul style="list-style-type: none"> • The local heritage importance of Camp Street bridge • Adjoining residential areas requiring particular noise management measures • Incident management plan and notification requirements • Location of spill kits and use of spill kits. 	Contractor / Roads and Maritime project manager	Pre-construction	Core standard safeguard GEN3

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
GEN6	General - minimise environmental impacts during construction	<p>Works and ancillary areas are to be clearly delineated and marked.</p> <p>Parking of vehicles and storage of plant/equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant/equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees.</p>	Contractor	Construction	Additional safeguard
NAH1	Non-Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered Work will only re-commence once the requirements of that Procedure have been satisfied. 	Contractor	Detailed design / pre-construction	<p>Core standard safeguard H2</p> <p>Section 4.10 of QA G36 <i>Environment Protection</i></p>
NAH2	Non Aboriginal heritage	<ul style="list-style-type: none"> Detailed quality photographic recording of the bridge be completed prior to the work commencing Any images taken would be placed on the Roads and Maritime Services bridge files and could be utilised in any heritage interpretive signage Copies are to be provided to the State Library of NSW, Forbes Shire Council and the Forbes historical society as a heritage resource for future researchers. 	Roads and Maritime	Pre-construction	Additional safeguard
NAH3	Non Aboriginal heritage	<ul style="list-style-type: none"> Reuse the art deco light fittings from the existing bridge within the project landscaping 	Roads and Maritime	Detailed design / operation	Additional safeguard
NAH4	Non Aboriginal heritage	<ul style="list-style-type: none"> The art deco light fittings on the existing bridge are to be removed prior to construction and stored in a safe location for use in the project 	Roads and Maritime	Pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		landscaping. <ul style="list-style-type: none"> A work procedure is to be developed for the safe removal and handling of the light fixtures to prevent accidental damage 			
NAH5	Non Aboriginal heritage	<ul style="list-style-type: none"> Develop and implement a heritage interpretation plan in consultation with Forbes Shire Council Implement a heritage interpretation area in consultation with Forbes Shire Council and the Forbes Historical society 	Roads and Maritime	Pre-construction	Additional safeguard
NAH6	Non Aboriginal heritage	<ul style="list-style-type: none"> S170 heritage register to be amended to reflect the demolition of the bridge 	Roads and Maritime	Pre-construction	Additional safeguard
NAH7	Non Aboriginal heritage	<ul style="list-style-type: none"> Consult with Forbes Shire Council on the Camp Street pedestrian footbridge commemorative plaque 2013 and whether it is to be disposed or relocated 	Roads and Maritime	Pre-construction	Additional safeguard
NAH8	Non Aboriginal heritage	<ul style="list-style-type: none"> Provide protection and visually mark the “Commemorates 75 years of scouting” 1982 plaque prior to the establishment of ancillary areas such as site compounds, stockpiles, and construction car parking on Sir Francis Forbes Park 	Roads and Maritime	Pre-construction	Additional standard safeguard / additional safeguard
UD1	Landscape character and visual impact	Implement the urban design and landscaping concept for the proposal as per Appendix C where compatible with the project and safety objectives.	Roads and Maritime Services	Detailed design / pre-construction	Additional safeguard
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Roads and Maritime <i>Traffic Control at Work Sites Manual</i> (RTA, 2010) and <i>QA Specification G10 Control of Traffic</i> (Roads and Maritime, 2008). The TMP will include:	Contractor	Pre-construction	Core standard safeguard TT1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		<ul style="list-style-type: none"> • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms. 			Section 4.8 of QA G36 <i>Environment Protection</i>
TT2	Traffic and Transport	Signpost heavy vehicle detour routes prior to road closure.	Contractor	Construction	Additional safeguard
TT3	Traffic and Transport	<p>Monitor the performance (queue lengths) of the traffic control signals for the detour operation on Iron Bridge.</p> <p>If required, the performance of the signal operation on Iron Bridge would be further improved with the use of actuated signals and loop detectors on each approach rather than fixed time signals. This would be beneficial during the AM peak period where there is a dominant westbound traffic flow on the bridge.</p>	Contractor	Construction	Additional safeguard
TT4	Traffic and Transport	A new temporary detour route for school bus services and the Route 558 bus service will be determined through consultation between Roads and Maritime and Forbes Bus Lines.	Roads and Maritime	Pre-construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
TT5	Traffic and Transport	Provision of a temporary pedestrian footpath along Hill Street to connect the footpaths between Camp Street and Bandon Street should be considered. This will depend on the final location of the construction compound on the eastern side of Camp Street Bridge.	Roads and Maritime	Pre-construction	Additional safeguard
TT6	Traffic and Transport	Opportunities will be explored to improve the safety of the pedestrian and cyclist crossing at Sherriff Street during construction detours, such as additional signage near James Street.	Contractor	Construction	Additional safeguard
NV1	Noise and vibration	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline (ICNG)</i> (DECC, 2009) and identify:</p> <ul style="list-style-type: none"> • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented, taking into account <i>Beyond the Pavement: urban design policy, process and principles</i> (Roads and Maritime, 2014). • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Contacto	pre-construction	<p>Core standard safeguard NV1</p> <p>Section 4.6 of QA G36 <i>Environment Protection</i></p>
NV2	Noise and vibration	<p>All sensitive receivers (eg. schools, local residents) likely to be affected will be notified at least five days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact.</p> <p>The notification will provide details of:</p>	Contacto	Construction	Core standard safeguard NV2

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		<ul style="list-style-type: none"> • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information. 			
NV3	Noise and vibration	<p>Out of hours works. All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least five days prior to commencement of any out of hours works associated with the activity that may have an adverse noise or vibration impact.</p> <p>The notification will provide details of:</p> <ul style="list-style-type: none"> • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information. 	Contractor	Construction	Additional safeguard
NV4	Noise and vibration	The sections of deck slab will be broken up on the lake bank in a designated area away from residences or trucked away to be broken up and crushed up prior to re-use or disposal at the Forbes Shire Council waste management facility.	Contractor	Construction	Additional safeguard
NV5	Noise and vibration	<p>In addition to the standard mitigation measures set out in Appendix E of the NVIA, specific noise mitigation measures would be implemented where noise levels are anticipated to be more than 10 dB(A) over the NML (up to 19 receivers, as detailed in Table 6-18). This includes the following:</p> <ul style="list-style-type: none"> • Notification - letterbox drops will be undertaken for the noise affected residences (as identified in Figure 6-9 of this REF and Appendix D of the NVIA) at least 5 days prior to the start of works 	Roads and Maritime / Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Verification – will be undertaken to assess the most affected receivers on Hill Street, Barwin Street and Bridge Street, and will include measurement of the background noise level and construction noise.			
NV6	Noise and Vibration	<p>If it is expected that the safe working distances will be encroached at any point in the works, vibration monitoring will be undertaken to determine site specific safe working distances. Works would begin farthest from sensitive receivers and then site specific safe working distances calculated based on the vibration measurements.</p> <p>If ongoing works are required within the site specific safe working distances then a temporary relocatable vibration monitoring system would be installed, to warn operators (via flashing light, audible alarm, short message service (SMS) etc) when vibration levels are approaching the cosmetic damage objective.</p>	Contractor	Construction	Additional safeguard
NV7	Noise and Vibration	Prior to the commencement of vibration intensive work, existing condition surveys would be undertaken on all properties and structures within 100 metres from the nearest impact piling location.	Roads and Maritime	Pre-Construction	Additional safeguard
NV8	Noise and Vibration	<p>Impact hammer size and maximum drop height would be selected taking into account the safe working distances and the distance between the area of construction and the most affected sensitive receiver.</p> <p>The use of less vibration intensive methods of construction or equipment would be considered where feasible and reasonable when working in proximity to existing structures.</p>	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		Equipment would be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts.			
NV9	Noise and vibration	Wherever feasible, vibration intensive works at locations where high vibration levels are generated at sensitive receivers would be scheduled during less sensitive times of the day, e.g. 9.00am to 5.00pm or as determined through community consultation.	Contractor	Construction	Additional safeguard
FL1	Flooding	A Flood Contingency Management Plan is to be prepared for the site, compound site and ancillary areas. The plan is to: <ul style="list-style-type: none"> • Monitor long term rainfall forecasts and schedule work high risk activities around forecast • Have contingency locations for the temporary flood storage of equipment and materials outside of potential inundations areas • Have contingency measures to secure and stabilise work areas and compound sites prior to flooding 	RMS Project Manager	Pre-construction	Additional safeguard
FL2	Flooding	Any changes in bridge design of a structural nature are to be investigated for potential changes to flood characteristics. This includes changes to upstream and downstream water levels, velocities and direction	RMS Project Manager	Detailed design	Additional safeguard
FL3	Flooding	Lake Forbes lowering. The water levels in Lake Forbes are to be gradually lowered prior to construction to reduce any risks associated with bank slumping or scour risk	RMS Project Manager	Pre-construction	Additional safeguard
FL4	Flooding	Temporary instream structures such as rock platforms and sheet piles are to be kept at levels below the downstream Johnny Woods crossing to avoid	RMS Project Manager	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		potential flood impacts during construction.			
FL5	Flooding	Temporary instream structures are to avoid fully impeding flow in Lake Forbes where possible.	Contractor	Construction	Additional safeguard
SW1	Surface water	Early works. Underbores are to be monitored for sudden pressure drop and the Lake visually monitored for evidence of a “frac out.”	Early works contractor	Early works	Additional safeguard
SW2	Surface water	Early works. Underbore contractor to have contingency plan to manage and contain ‘frac outs.’ Spill containment kits to be on site including a silt curtain to contain any frac outs in the Lake.	Early works contractor	Early works	Additional safeguard
SW3	Surface water	Early works. Underbore machinery to be in bunded area to capture any spills.	Early works contractor	Early works	Additional safeguard
SW4	Surface water	Early works. ESCP control plan to be prepared for Early works which includes: <ul style="list-style-type: none"> Monitoring for frac outs including evidence of plumes in Lake Forbes ESCP for launch and retrieval areas Management of drilling mud Site restoration. Turf should be used to quickly reinstate ground cover. 	Early works contractor	Early works	Additional safeguard
SW5	Surface water	Early works. No storage of fuels and chemicals on site.	Early works contractor	Early works	Additional safeguard
SW6	Surface water	Early works. All generators are to be kept in a bunded area.	Early works contractor	Early works	Additional safeguard
SW7	Surface water	Early works.	Early works	Early works	Additional

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		No works or materials within drainage lines.	contractor		safeguard
SW8	Surface water	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP for the main construction works (Bridge demolition, construction, drainage and landscape works). The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Pre-construction	Core standard safeguard SW1 Section 2.1 of QA G38 <i>Soil and Water Management</i>
SW9	Surface water	An incident management is to be developed as a component of the CEMP and/or Soil and Water Management Plan. The incident management plan is to include: <ul style="list-style-type: none"> • Locations for spill kits and floating booms to contain spills • Procedure to ensure that downstream water quality control at Sherriff Street is closed and any contaminant is contained in the immediate area of the Lake • Adopting the Roads and Maritime Services Environmental Incident Classification and Reporting Procedure and notification of the Roads and Maritime Services Contract Manager as soon as practicable • Contact details for RMS Project and Environment Managers, and the for incident notification purposes under the POEO Act including Forbes Shire Council, local EPA, EPA pollution line, NSW Health, SafeWork NSW and Fire and Rescue NSW. 	Contractor	Pre-construction	Additional safeguard
SW10	Surface water	An emergency spill kit is to be kept on site at all times and maintained	Contractor	Construction	Additional

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		<p>throughout the construction work.</p> <p>The spill kit must be appropriately sized for the volume of substances at the work site.</p> <p>The spill kit must be readily accessible on the bridge and temporary instream work structures.</p>			safeguard
SW11	Surface water	Emergency contacts will be kept in an easily accessible location on vehicles, vessels, plant and site office. All workers will be advised of these contact details and procedures	Contractor	Construction	Additional safeguard
SW12	Surface water	All workers will be advised of the location of the spill kit and trained in its use.	Contractor	Construction	Additional safeguard
SW13	Surface water	<p>A site specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the Soil and Water Management Plan for the main construction works (Bridge demolition, construction, drainage and landscape works).</p> <p>The Plan will include arrangements for managing wet weather events, including monitoring of potential high risk events (such as storms), measures to stabilise work areas over weekends and in the event of a flood, and specific controls and follow-up measures to be applied in the event of wet weather.</p>	Contractor	Pre-construction	<p>Core standard safeguard SW2</p> <p>Section 2.2 of QA G38 <i>Soil and Water Management</i></p>
SW14	Groundwater	Lake Forbes lowering. Consult with Council on lowering Lake Forbes and potential groundwater bore GW026600.	RMS project manager	Pre construction. Lake Forbes lowering	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
SW15	Surface water and groundwater entitlements	Lake Forbes lowering. <ul style="list-style-type: none"> • Consultation is to be undertaken with DoI (Water) on the location of water license holder in proximity to downstream and upstream water level controls prior to lowering water levels. Consultation is to be undertaken with the owners of any active licences in the affected area prior to lowering the levels in the Lake. • Consultation will also be conducted with key downstream recreational and event water users such as the Forbes Racecourse, the Forbes Dragon Boat Club and triathlon. 	RMS project manager	Pre construction. Lake Forbes lowering	Additional safeguard
SW16	Surface water	Lake Forbes lowering. <ul style="list-style-type: none"> • Prior to lowering levels in Lake Forbes monitor DO, temperature, turbidity and pH in Lake Forbes upstream and downstream of the water control structure at Sherriff Street (Johnny Woods Crossing) • Do not release water from Lake Forbes if DO is significantly less than the receiving water body • If DO in Lake Forbes is less than the downstream waterbody, consider measures such as the fountain or compressor and bubble hose to improve DO prior to release. 	RMS project manager	Pre construction. Lake Forbes lowering	Additional safeguard
SW17	Surface water	Lake Forbes lowering. <ul style="list-style-type: none"> • Gradually lower water levels in Lake Forbes to avoid bank slumping and allow mixing of water • Monitor DO upstream and downstream and visual inspect for signs of distressed aquatic biota. Cease lowering immediately in the event that DO reduces or evidence of impact on aquatic biota. 	RMS project manager	Pre construction. Lake Forbes lowering.	Additional safeguard
SW18	Surface water	In stream temporary rock platforms are to be placed on a geofabric layer and removed at the end of construction. Clean rock is to be used	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
SW19	Surface water	Cover exposed areas on the banks (such as abutments) with geofabric when exposed for prolonged periods	Contractor	Construction	Additional safeguard
SW20	Surface water	Erosion and sediment control measures are to be implemented and maintained to: <ul style="list-style-type: none"> Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets Reduce water velocity and capture sediment on site Minimise the amount of material transported from site to surrounding pavement surfaces Divert clean water around the site. (in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book))	Contractor	Construction	Standard safeguard
SW21	Surface water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request	Contractor	Construction	Standard safeguard
SW22	Surface water	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised	Contractor	Construction	Standard safeguard
SW23	Surface water	Work areas are to be stabilised progressively during the works	Contractor	Construction	Standard safeguard
SW24	Surface water	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10)	Contractor	Construction	Standard safeguard
SW25	Surface water	There is to be no release of dirty water into drainage lines and/or waterways	Contractor	Construction	Standard safeguard
SW26	Surface water	Visual monitoring of local water quality (ie turbidity, hydrocarbon	Contractor	Construction	Standard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		spills/slicks) is to be undertaken on a regular basis to identify any potential spills, deficient controls, silt curtains or erosion and sediment controls			safeguard
SW27	Surface water	Silt curtain/s are to be installed prior to any instream works and works that may disturb the bed of Lake Forbes	Contractor	Construction	Standard safeguard
SW28	Surface water	Silt curtains and erosion and sediment controls are to be installed, monitored and maintained as needed to contain any sediment	Contractor	Construction	Standard safeguard
SW29	Surface water	No storage of potential pollutants such as fuels, solvents, chemicals paints, lubricant on the bridge or temporary in stream structures	Contractor	Construction	Additional safeguard
SW30	Surface water	No refuelling in or near Lake Forbes or drainage lines. Refuelling of plant and equipment is to occur in impervious bunded areas located a minimum of 50 metres from drainage lines or waterways	Contractor	Construction	Additional safeguard
SW31	Surface water/ Groundwater	Prepare a dewatering management plan to manage groundwater and dewatering of slurries during works	Contractor	Construction	Additional safeguard
SW32	Surface water	Establish concrete wash bays prior to any concreting works	Contractor	Construction	Additional safeguard
SW33	Surface water	Provide temporary sheeting and/or bunds to capture any particulates or gross pollutants from activities such as cutting, grinding, sawing and welding and prevent them from entering the waterway	Contractor	Construction	Additional safeguard
SW34	Surface water	Curing water on the deck will be managed by using plastic sheeting and the overhang formwork as a catch drain and sealing all joints with silastic during placement of the formwork. This will allow the curing water to run off the abutments to a sediment pond.	Contractor	Construction	Additional safeguard
SW35	Surface water	Use turf as a preference to seeding in disturbed areas to quickly establish	Roads &	Operation	Additional

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		ground cover	Maritime Services		safeguard
SW36	Surface water	Limit the use of fertilisers in landscaping, use only slow release fertilisers, and do not apply prior to rainfall events.	Roads & Maritime Services	Operation	Additional safeguard
C1	Land and water contamination	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Roads and Maritime Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction	Core standard safeguard C2 Section 4.2 of QA G36 <i>Environment Protection</i>
C2	Land and water contamination	In the event of an algal bloom management measures would be implemented in accordance with Forbes Shire Council procedures. Measures to improve mixing in the lake, such as using the water fountain, would be investigated.	Contractor	Construction	Additional safeguard
C3	Land and water contamination	Liaise with Forbes Shire Council on the results of Council's blue green algae monitoring.	Contractor	Construction	Additional safeguard
AQ1	Air quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: <ul style="list-style-type: none"> • potential sources of air pollution • air quality management objectives consistent with any relevant published EPA and/or OEH guidelines • mitigation and suppression measures to be implemented 	Contactor	Pre-construction	Core standard safeguard AQ1 Section 4.4 of QA G36

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		<ul style="list-style-type: none"> • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces. 			<i>Environment Protection</i>
AQ2	Air quality	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust	Contractor	Construction	Standard safeguard
AQ3	Air quality	Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.	Contractor	Construction	Standard safeguard
AQ4	Air quality	Vegetation or other materials are not to be burnt on site.	Contractor	Construction	Standard safeguard
AQ5	Air quality	Vehicles transporting waste or other materials that may produce dust are to be covered during transportation.	Contractor	Construction	Standard safeguard
AQ6	Air quality	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).	Contractor	Construction	Standard safeguard
AQ7	Air quality	Exposed areas on the banks and abutments are to be covered with geofabric when not worked.	Contractor	Construction	Additional safeguard
B1	Biodiversity	<p>A Flora and Fauna Management Plan will be prepared in accordance with Roads and Maritime's <i>Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects</i> (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to:</p> <ul style="list-style-type: none"> • plans showing trees to be cleared and trimmed areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the <i>Landscape Guideline</i> (RTA, 2008) 	Contractor	Detailed design / pre-construction	<p>Core standard safeguard B1</p> <p>Section 4.8 of QA G36 <i>Environment</i></p>

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		<ul style="list-style-type: none"> procedures for unexpected threatened species finds and fauna handling procedures addressing relevant matters specified in the <i>Policy and guidelines for fish habitat conservation and management</i> (DPI Fisheries, 2013) Protocols to manage weeds and pathogens. 			<i>Protection</i>
B2	Biodiversity (aquatic)	<p>A Fish Incident Response Plan is to be developed prior to lowering the levels in the Lake. The Plan is to include:</p> <ul style="list-style-type: none"> Visual monitoring for evidence of distressed fish Action such as turning on fountain or air compressor to aerate and mix water Procedure to relocate any distressed native fish to downstream of the control structure at Johnny Woods crossing Procedures to remove and dispose any deceased pest fish Procedure to notify (as required) RMS Project Manager, RMS Environment Manager, DoI(Fisheries), OEH and Council in the event of a fish kill 	Roads and Maritime Services / Contractor	Pre-construction	Additional safeguard
B3	Biodiversity	All earthmoving machinery is to be high pressure hosed to remove dirt and weed seed off site prior to commencement of activities on site.	Contractor	Construction	Additional safeguard
B4	Biodiversity	Compound sites, stockpiles, car park areas are to be at least 5 m from trees to be retained.	Contractor	Construction	Additional safeguard
B5	Biodiversity	Where vegetation removal is required seek to trim in preference to clearing where feasible.	Contractor	Construction	Additional safeguard
B6	Biodiversity	Temporary in stream structures are to avoid obstructing the whole Lake where possible. Where a structure does fully cross the Lake, a temporary pipe (>350mm) is to be provided or equivalent to provide fish passage.	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
B7	Biodiversity	No persons or equipment are to be allowed on the small island approximately 150m to the north of the Camp Street Bridge.	Contractor	Construction	Additional safeguard
B8	Biodiversity	Lake Forbes lowering. Monitor DO levels in Lake Forbes. Examine options such as using the fountain to aerate the water if DO falls below typical levels, particularly during hot periods.	Roads & Maritimes Services	Construction	Additional safeguard
B9	Biodiversity	Implement landscaping plan including planting of River Red Gum (<i>Eucalyptus camaldulensis</i>) and River Oak (<i>Casuarina cunninghamiana</i>).	Roads & Maritimes Services	Operation	Additional safeguard
AH1	Aboriginal heritage	<ul style="list-style-type: none"> The <i>Standard Management Procedure - Unexpected Heritage Items</i> (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Roads and Maritime does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place Work will only re-commence once the requirements of that Procedure have been satisfied. 	Contractor	Construction	Core standard safeguard AH2 Section 4.9 of QA G36 <i>Environment Protection</i>
SE1	Land use	Consult with bus company on closure timeframes and potential impacts on bus parking.	Roads and Maritime	Pre-construction	Additional safeguard
SE2	Car parking	Consult with Forbes Shire Council and key sports clubs users (Netball, cricket and football) on alternate parking arrangements and signage for the South Circle Oval during road closure on Camp Street.	Roads and Maritime	Pre-construction	Additional safeguard
SE3	Private Property access	Consult with any potentially affected private residence prior to any short term obstruction of access. Time works around residence requirements	Contractor	Construction	Additional safeguard

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
SE4	Socio-economic	<p>A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum):</p> <ul style="list-style-type: none"> • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. <p>The CP will be prepared in accordance with the <i>Community Involvement and Communications Resource Manual</i> (RTA, 2008).</p>	Contractor	Pre-construction	Core standard safeguard SE1
SE5	Socio-economic	Consult with the Forbes Shire Council and the Rotary Club on an alternate location for the monthly market whilst access to Sir Francis Forbes Parks is restricted.	Roads and Maritime	Pre-construction	Additional safeguard
SE6	Water Recreation	Consult with key recreational water users and events such as the Forbes Dragon Boat Club, water skier tournament and triathlon prior to lowering levels.	Roads and Maritime	Pre-construction	Additional safeguard
HAZ1	Hazards and risk management	<p>A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP.</p> <p>The HRMP will include, but not be limited to:</p> <ul style="list-style-type: none"> • Details of hazards and risks associated with the activity • Measures to be implemented during construction to minimise these risks • Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • A monitoring program to assess performance in managing the identified risks • Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. 	Contractor	Detailed design / pre-construction	Core standard safeguard HAZ1

No.	Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
		The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or Office of Environment and Heritage publications.			
HAZ2	Removal of asbestos material	The HRMP would specify the measures to be implemented for the removal and disposal of asbestos containing material. The removal and disposal of asbestos would be undertaken in accordance with the requirements of the <i>Code of Practice How to Safely Remove Asbestos</i> (Safe Work Australia, 2016) and with the recommendations set out in Section 4.1 of Appendix M.	Contractor	Construction (Pre-bridge demolition)	Additional safeguard
WAS1	Waste	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to:</p> <ul style="list-style-type: none"> • Measures to avoid and minimise waste associated with the project • Classification of wastes and management options (re-use, recycle, stockpile, disposal) • Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • Procedures for storage, transport and disposal • Monitoring, record keeping and reporting. <p>The WMP will be prepared taking into account the <i>Environmental Procedure - Management of Wastes on Roads and Maritime Services Land</i> (Roads and Maritime, 2014) and relevant Roads and Maritime Waste Fact Sheets.</p>	Contacto	Pre-construction	<p>Core standard safeguard W1</p> <p>Section 4.2 of QA G36 <i>Environment Protection</i></p>
GHG1	Greenhouse gas and emissions	Ensure construction vehicles, plant and equipment are maintained in accordance with manufacturer instructions and monitor vehicle and equipment for 'dirty' exhaust fumes.	Contractor	Construction	Additional safe guard
CUM1	Cumulative impacts	The construction environment management plan would be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Project manager and contractor	Construction	Additional safeguard

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7.3 Licensing and approvals

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Fisheries Management Act 1994 (s199)</i>	Notification to the Minister for Primary Industries prior to any dredging or reclamation works.	A minimum of 28 days prior to the start of work.
<i>Fisheries Management Act 1994 (s219)</i>	Subject to the extent and nature of the adopted temporary in-stream structure : Permit to obstruct the free passage of fish (temporary or permanent) from the Minister for Primary Industries.	Prior to start of the activity.
<i>Roads Act 1993 (s138)</i>	A consent under s138 for road closures associated with construction.	Prior to start of the activity

8 Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

8.1 Justification

8.1.1 Social factors

The proposal will remove the Camp Street Bridge. The existing bridge has local heritage significance and is important in the history of the Forbes township and community. The art deco light fittings on the bridge have been assessed as high heritage significance. The proposal includes measures to mitigate the impacts on heritage including the reuse of the light fittings in the landscaping for the replacement bridge.

The current bridge is aging. The proposal will improve safety. The proposal will maintain transportation and local connectivity across the Lake for social, economic and recreational purposes. The proposal includes measures to enhance amenity and connectivity. The proposal includes landscaping and a shared walkway on the new bridge that connects with the existing pathway around the Lake.

8.1.2 Biophysical factors

The proposal has considered biophysical factors in section 6.9. The proposal is in a heavily modified terrestrial and aquatic environment.

The proposal has been assessed as improving the habitat values in the long term. The proposed water sensitive landscaping feature on the approaches to the bridge provide water quality and habitat improvements over the current environment at the Camp Street Bridge.

8.1.3 Economic factors

Roads and Maritime Services undertook value management exercises as part of the identification of a preferred option, this proposal. The options considered, and economic performance are discussed in section 2.4. The proposal provides the greatest value and reduces maintenance costs in the long term. The proposal is strongly justified on the grounds of economically sustainable development.

8.1.4 Public interest

The proposal is strongly in the public interest. The current bridge is aging and deteriorating. The continued safe operation of the bridge cannot be guaranteed without major maintenance or replacement. The option is consistent with strategic transportation plans as described in 2.1.

8.2 Objects of the EP&A Act

The consistency of the proposal with the objectives of the EP&A Act are provided in the **Table 8-1**.

Table 8-1: Consistency of the proposal with EP&A Act objectives

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The proposal is consistent with this object. Replacement of the existing bridge with a new bridge would improve the safety of road users and provide access for HML vehicles which would benefit the regional economy.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The proposal is consistent with this object. The proposal would replace an existing ageing bridge which is in poor condition with a new bridge. The proposal would result in lower maintenance costs compared to the existing structure. The new bridge would cater for HML vehicles which would increase the efficiency of movement of these loads and improve economic productivity.
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	The proposal is consistent with this object. Roads and Maritime would consult with all utility providers regarding the requirements for protection and relocation of utilities.
5(a)(iv) To encourage the provision of land for public purposes.	Not relevant to this proposal
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	Not relevant for this proposal
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	<p>The proposal is consistent with this object, as discussed in Section 6.7. The proposal may require clearing of a small number of individual trees, however this would be offset by plantings as part of the proposal landscape design. Potential impacts to aquatic biodiversity may occur as a result of demolition and construction works, however management measures would be implemented to minimise these impacts. The proposal is not likely to have a significant impact on threatened species, populations or ecological communities or their habitats.</p> <p>In the long term, the proposal would improve terrestrial and aquatic biodiversity values in the study area through the water sensitive drainage features of the proposal, which would include water quality treatment for road runoff during</p>

Object	Comment
	stormwater events.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 to 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the project.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the project.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	The proposal is consistent with this object. Roads and Maritime has undertaken extensive community consultation during development of the proposal. This has included consultation with Forbes Council, regulatory agencies, key stakeholders, local businesses, community groups, and the local community. Issues raised during consultation in relation to the proposal have been addressed during the environmental assessment process. This REF will be placed on public display to provide further opportunity for public involvement and participation.

8.2.1 The precautionary principle

The precautionary principle states that “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.”

Due to the nature, scale, location and context of the proposal, there are minimal risks of serious or irreversible damage to the environment. Lake Forbes is a contained and artificially maintained water body. The aquatic and terrestrial ecological values of the area are poor due to the extensive modification to create an ornamental Lake and surrounding parkland. The proposal is a standard Roads and Maritime Services construction project in a highly disturbed context. The implementation of standard environmental mitigation measures will prevent or greatly reduce the risk of impacts to the environment.

A construction environment management plan would be prepared before construction starts. This requirement would ensure the overall proposal achieves a high-level of environmental performance.

8.2.2 Intergenerational equity

The intergenerational equity 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 principle includes both intragenerational equity (within generations) and intergenerational equity (between generations).

The REF proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. As noted previously the natural environment in and surrounding the proposal has been significantly altered. Environmental risks posed by the project are of a limited duration.

The overall proposal would protect and improve this transportation route for local and regional traffic. It would improve safety and freight efficiency by catering for HML.

Should the proposal not proceed, the principle of intergenerational equity may be compromised. It would increase the risk of eventual failure of the bridge and restrict heavy loads.

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”.

Searches were undertaken of state and federal biodiversity records and an assessment undertaken of the aquatic and terrestrial values in the area. The assessment is provided in section 6.9. Lake Forbes is a contained and artificially maintained water body. The aquatic and terrestrial ecological values of the area are poor due to the extensive modification to create an ornamental Lake and surrounding parkland. There is no terrestrial or riparian habitat connectivity. The aquatic habitat is modified, artificially maintained and there are existing obstructions to fish passage.

The proposal would not alter the terrestrial or aquatic biological diversity and ecological integrity.

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 REF has examined the environmental consequences of the REF proposal and identified safeguards and management measures to manage the potential for adverse impacts. These safeguards will be implemented through Roads and Management contract specifications and priced as a component of the works. Waste disposal costs associated with the proposal will also be priced as part of the construction estimating and bidding process. The design for the bridge has included measures to address heritage and visual impacts. The proposed landscaping includes measures to address visual and water quality impacts.

Incorporating environmental mitigation measures into the physical design and contractual requirements ensure that the costs of environmental impacts and mitigation are recognised and valued by the proposal.

8.3 Conclusion

The proposed Camp Street Bridge BN4286 replacement at Camp Street, Forbes, is subject to assessment under Part 5 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts including:

- Removal of the local heritage listed Camp Street bridge
- Visual impacts
- Light and heavy vehicle detours
- Noise impacts

- Water quality risks.

Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also improve road user safety, pedestrians and cycling connectivity whilst reducing on-going maintenance costs and improving environmental outcomes. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposal is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of the Environment is not required.

9 Certification

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



Simon Murphy
Principal Planner
AECOM
Date:04/06/18

I have examined this review of environmental factors and accept it on behalf of Roads and Maritime Services.



Peter Hamilton
Project/Contract Manager
Roads and Maritime Services
Date: 04/06/18

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Terms and acronyms used in this REF

Term / Acronym	Description
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ARI	Average recurrence interval
BC Act	Biodiversity Conservation Act 2016
BOD	Biological Oxygen Demand
Caisson	Large watertight chamber that allows construction works to be undertaken under water
CEMP	Construction environmental management plan
CSCP	Community and stakeholder consultation sub plan
DO	Dissolved Oxygen
Dol Dol (Fisheries) Dol (Water)	NSW Department of Industry. Includes Fisheries and Water
EC	Electrical conductivity
EEC	Endangered Ecological Community
EIA	Environmental impact assessment
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	Fisheries Management Act 1994 (NSW)
Heritage Act	Heritage Act 1977 (NSW)

Term / Acronym	Description
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LAeq	Equivalent continuous level. A term utilised to define the period of measurement of continuous noise or energy average noise level.
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
MNES	Matters of national environmental significance under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
NCC	Newcastle City Council
Noxious Weeds Act	Noxious Weeds Act 1993 (NSW)
NPW Act	National Parks and Wildlife Act 1974 (NSW)
OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PoEO Act	Protection of the Environment Operations Act 1997
RBL	Rated Background Level
REF	Review of environmental factors
RNP	Road noise policy
Roads and Maritime	NSW Roads and Maritime Services
RTA	NSW Roads and Traffic Authority
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
TfNSW	Transport for NSW
TMP	Traffic Management Plan
TSC Act	Threatened Species Conservation Act 1995 (NSW) now repealed
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

Term / Acronym	Description
VMS	Variable message sign
WARR Act	Waste Avoidance and Recovery Act 2007



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