Newell Highway Upgrade at Coonabarabran

Review of Environmental Factors

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Executive summary

The proposal

Transport for NSW (TfNSW) propose to build a new highway bypass of Coonabarabran, NSW (the proposal). The proposal would include a new highway about eight kilometres long east of the existing Newell Highway alignment which currently runs through the Coonabarabran town centre.

Key features of the proposal would include:

- A new two-lane, two-way road, about eight kilometres long to the east of Coonabarabran, between the Newell Highway and Oxley Highway with a posted speed limit of 110 kilometres per hour
- Changes to the intersection arrangement of the Newell Highway and Oxley Highway to the north of Coonabarabran
- Intersections and local road adjustments at Purlewaugh Road and River Road
- A bridge crossing of the Castlereagh River
- Two stock culverts; one under the highway just south of Purlewaugh Road and a private stock access under the highway between River Road and Chinamans Gully
- Property acquisitions and adjustments to some property access
- Drainage adjustments and utility relocations
- Temporary ancillary facilities during construction including water quality controls, site offices and stockpile sites.

The work is expected to take around 20 months to complete.

Need for the proposal

The Newell Highway is the longest highway in NSW, running 1058 kilometres through the State and providing an essential road link for freight travelling between Queensland and Victoria. The Highway also forms an essential regional traffic route that links towns and major centres, providing a connection for domestic and export markets for the agricultural industry.

The proposal would improve freight efficiency around Coonabarabran by avoiding the need for heavy vehicles to travel through the Coonabarabran town centre by diverting them onto a bypass. At present, High Productivity Vehicles (HPVs) are permitted to travel through the town, however this impacts the amenity of the town, local and through traffic movements including travel speed and efficiency. In addition, freight traffic is also expected to increase along the Newell Highway, even with the development of other infrastructure projects across regional NSW such as Inland Rail.

Proposal objectives

The objectives for the proposal are to:

- Improve travel efficiency for all vehicles, in particular heavy vehicles through Coonabarabran.

- Reduce conflict between freight vehicles, local and through traffic and vulnerable road users.
- Improve amenity for the urban commercial area of Coonabarabran.

The benefits associated with the development and delivery of this proposal would include:

- Better facilitate access for HPV PBS3a on the Newell Highway from Dubbo to Queensland by avoiding geometrically substandard intersections.
- Reduced vehicle operating costs (VOC) and increases in travel time savings (TTS).

Options considered

The Newell Highway upgrade at Coonabarabran has been subject to investigation since the early 1990s. Following the release of the Newell Highway Corridor Strategy, investigations for the current proposal started in 2017. Six preliminary options were developed for the proposal including a through town option and a number of east and west bypass options. It was then refined to three shortlisted options for concept design development (consisting of a through town option and two easterly bypass options). The options were assessed based on functionality, environmental impact, socio-economic impact and cost.

A value management workshop was held on 11 July 2019 which recommended the preferred option after considering the issues raised during options assessment, community and stakeholder consultation. The preferred option was chosen as it provides the best outcomes for the proposal objectives and key impact criteria.

Statutory and planning framework

The potential environmental impacts of the proposal have been identified through this review of environmental factors (REF) and will be assessed by TfNSW under Division 5.1 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). Clause 94, Section 1 of the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. In assessing the proposal, TfNSW will consider Sections 5.5 and 5.6 of EP&A Act and Clause 228 of the *Environmental Planning and Assessment Regulation 2000*.

An assessment of the proposal concluded it would not significantly impact on the matters of national environmental significance protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or significantly affect threatened species or ecological communities and their habitats under the *Biodiversity Conservation Act 2016* (BC Act).

The proposal is a valid development to be taken forward under Division 5.1 of the EP&A Act and no other planning pathway requirements would be triggered.

Community and stakeholder consultation

A community and consultation plan was prepared and implemented for the proposal to guide consultation activities. The following stakeholders were consulted:

- Directly and indirectly affected landowners

- Interested local individuals and the wider community
- The Aboriginal community
- Local interest groups
- Warrumbungle Shire Council
- Siding Spring Observatory
- Local Land Services
- John Holland (Country Rail Network)
- Australian Rail Track Corporation (ARTC).

The main comments raised during consultation were in reference to:

- Social and business impacts
- Traffic and road conditions
- Property and land use
- Safety
- Options, design and proposal scope
- Urban amenity.

Environmental impacts

The main environmental impacts of the proposal are summarised in the following sections.

Biodiversity

Vegetation around the proposal mostly comprises of a mixture of grasslands with some patches of woodland. The proposal would require the removal of up to 46.78 hectares of native vegetation including about 12.05 hectares and 0.54 hectares of threatened ecological communities listed under the *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999*, respectively. This would result in a reduction of habitat, including hollow-bearing trees, for a range of birds and mammals including threatened species, and loss of fauna habitat connectivity.

An assessment of significance has been carried out for potentially impacted threatened species and ecological communities. The assessment found the proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* or *Fisheries Management Act 1994*. The proposal is also not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*.

These biodiversity impacts would also be minimised through safeguards including the implementation of TfNSW standard practices such as exclusion zones for protected habitat features and revegetation areas, pre-clearing survey requirements, procedures for unexpected threatened species finds and fauna handling and protocols to manage weeds and pathogens.

Noise and vibration

During the build, residential receivers in properties surrounding the proposal have been predicted to be the most affected during standard daytime hours for associated noise intensive activities, with exceedances of over 20dB noise management levels (NML's) The worst-case night-time impacts are predicted to be high at the nearest receivers adjacent to the proposal during noise intensive works. Of these works, up to 31 receivers are predicted to be above the night-time NML by greater than 25dB. These 31 receivers may also experience sleep disturbance. Exceedances of the NMLs would be managed by avoiding out of hours works where possible and appropriate respite, if required. The assessment of commercial and 'other sensitive' receivers indicated that minor to moderate exceedances of between 5dBA and 10dBA are predicted to occur at the Cooinda Aged Care Centre during the daytime period and night-time period when noise intensive equipment is in use.

Vibration impacts during the build would occur during the use of vibration intensive equipment. Some structures located near the proposal, particularly in the eastern section, are located closer to the proposal than the recommended minimum working distances from vibration intensive equipment, which may result in some vibration impacts. To minimise potential impacts, the feasibility of lower vibration build methods would be investigated. Attended vibration measurements would also be collected to monitor actual vibration impacts.

During operation, an increase in road traffic noise is predicted at receivers close to the proposal, due to existing low noise levels and distance from the bypass. There are 15 sensitive receiver buildings which would experience noise exceedances and require additional noise mitigation. There is expected to be a reduction in traffic noise along sections of the Newell Highway entering Coonabarabran and some other local roads. With the shift of traffic onto the bypass, road traffic noise within Coonabarabran is expected to decrease, particularly heavy vehicle noise impacts.

Landscape and visual

Construction of the proposal would result in temporary visual impacts to receivers within the vicinity. Views would be impacted by construction vehicles and machinery and the erection of fencing, lighting and ancillary facilities. Excavation, earthworks and associated vegetation removal would also result in visual impacts. During the build, residential receivers that overlook the proposal area would experience the highest impact.

Permanent impact to the landscape character of the proposal area and surrounds would occur during operation. Depending on the location of receivers, including facades of dwellings and the elevation of the proposal, visual impacts would vary. Residential receivers that have direct line of sight to the proposal would be impacted most as the new road corridor would be clearly visible within the landscape. The proposal would be result in a dominant change in the adjoining scenic, rural landscape resulting in a noticeable change to the surrounding rural residential properties. Urban design and landscape treatments would be implemented to reduce the visual impacts of the proposal and integrate the proposal into the existing landscape character. These include design treatments of built elements and landscape treatments.

Socio-economic, property and land use

The proposal is expected to have both beneficial and adverse impacts on the socio-economic environment. Potential impacts during the build include:

- Positive business impacts through the creation of local short-term employment opportunities, opportunities to source local materials for construction, demand for accommodation by the workforce and their expenditure
- Permanent acquisition and temporary property leases of some land parcels including private land, Crown land, Travelling Stock Route and a section of the disused Gwabegar railway line
- Changes to access and connectivity are expected to have a moderate impact on residents and road users, particularly for local residents on River Road and Purlewaugh Road
- Reduction of amenity for educational facilities, aged care and recreational facilities close to the proposal
- Reduction of amenity in the proposal area during the build, with receivers in the vicinity of the proposal experiencing the most impact.

Potential impacts during the operation of the proposal include:

- Changes in land use as the proposal would transform the existing rural land to new road infrastructure. Land surrounding the proposal would not be altered. Some partially acquired land may impact future land use/development due to changes in minimum lot sizes
- Changes to property access at River Road, Purlewaugh Road and the Oxley Highway
- Some potential loss of passing trade to businesses in the Coonabarabran town centre. Based on feedback from business surveys, some businesses identified high dependence on passing trade
- Directly affected agricultural businesses may experience moderate impacts in reduced productivity due to land acquisitions and access changes, including for movement of cattle/machinery along TSRs. However, local and regional agricultural businesses are also expected to benefit from the proposal through increased efficiency to transport agricultural goods.
- Impacts to community values, including natural landscape, businesses, local economy and amenity. Impacts to surrounding receivers in the form of visual and noise impacts is expected. The bypass alignment could also result in feelings of severance from those persons who would need to cross the bypass to go into town
- Improvements in amenity and road safety through Coonabarabran town centre due to the reduction of noise and visual impacts from heavy vehicles.

Various consultation activities would be carried out with the local community and key stakeholders to minimise impacts during the build and operation. This includes the development of strategies and initiatives to encourage travellers to pass through Coonabarabran and the planning of construction activities to minimise potential noise, traffic and visual impacts.

Traffic and transport

During the build, the majority of the works would be within greenfield areas, limiting impacts to the road network. There would be an increase in the presence of heavy and light vehicles for deliveries and site access. Vehicles would predominately use the Newell Highway, Oxley Highway, River Road and Purlewaugh Road. Traffic volumes experienced during the build are expected to be easily absorbed on these roads, however, during peak times road users may experience delays such as queuing at intersections to allow for the safe movement of heavy vehicles.

At intersection locations potential impacts are expected due to the construction of new intersection arrangements. Temporary access tracks would be installed while these new sections of road are constructed, either north or south of existing road alignments. Road occupancy licences may also be required from the relevant roads authority.

Some impacts are also expected to occur within Coonabarabran town centre during the work. This includes traffic queuing at the Dalgarno Street / Newell Highway and Edwards Street / Newell Highway intersections to access the Newell Highway.

Once operational, the proposal would result in a reduction in traffic on the existing Newell Highway through Coonabarabran. This is attributed to traffic using the bypass for greater travel efficiency rather than passing through the centre of town.

Intersection performance at all key intersections would be similar to existing conditions with new intersections operating at high levels of service, with minimal delays. Cyclists using Purlewaugh Road and River Road would need to give way to the traffic on the bypass at intersections. Improved amenity and safety for all road users within Coonabarabran would occur due to the reduction in heavy vehicle traffic.

Permanent impacts to several property accesses would also occur once the proposal is operational, however these accesses would be relocated in consultation with property owners.

Hydrology and flooding

During the build, activities and structures including earthworks, machinery and ancillary facilities have the potential to impact flooding behaviour. Temporary diversions of small creeks may be required for culvert works.

Once constructed, the majority of the proposal would have a one percent annual exceedance probability (AEP) flood immunity with the exception of minor overtopping at one location at the northern intersection.

The proposal would alter the flood behaviour due to constrictions from the Castlereagh Bridge and several culverts passing under the highway. Under a one per cent AEP design event, peak flood levels are expected to increase by up to 40 centimetres within the river upstream of the Castlereagh Bridge. Additionally, diverted flows to the north west of the Castlereagh Bridge would result in a flood level (afflux) of up to one metre over an area of about four hectares of farming/ grazing land. Although flood levels would increase, water peak velocities would only have a minor increase. Flooding impacts would only be across agricultural land, no impact to properties is expected. These impacts could be minimised by optimising the drainage structures during detailed design.

Heritage

There are a number of listed Aboriginal heritage items that are located close to the proposal area. However, no direct impact would occur. Mitigation measures would be put in place so that the sites are not inadvertently impacted. There is the potential for discovering additional unexpected Aboriginal items, objects and values during construction, and an unexpected finds procedure would be put in place to manage this.

Construction and operation of the proposal would not impact any listed non-Aboriginal heritage items. However, a historic blaze tree (used for surveying) is within the proposal area and would be removed during construction. While not listed as a heritage item, it still holds minor historic heritage and community value which would be permanently lost by its removal. The blaze tree is protected under the *Surveying and Spatial Information Act 2002* and approval for its removal under the Act must be sought.

Management of environmental impacts

Site-specific safeguards have been provided to avoid, minimise and manage environmental and social impacts during construction and operation. A Construction Environmental Management Plan (CEMP) will be prepared to detail 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 proposal impacts would be further minimised during detailed design and construction planning, and via the application of environmental management and mitigation measures. This will include further consultation with affected landholders and stakeholders.

Justification and conclusion

The proposal would meet its objectives in:

- Improving the travel efficiency of all vehicles, particularly heavy vehicles through Coonabarabran.
- Reducing conflict between freight vehicles, local and through traffic and vulnerable road users.
- Improving amenity for the urban commercial area of Coonabarabran.

This is consistent with the NSW and Australian governments' strategic priorities of improving the road's safety performance and efficiency needs. The proposal has been designed in accordance with relevant guidelines, safety and traffic efficiency requirements.

Several potential environmental impacts from the proposal have been avoided or reduced during the design development and options assessment. The proposal, as described in the REF, best meets the proposal objectives but would still result in some environmental impacts regarding biodiversity, noise and vibration, the visual landscape, property and socio-economic issues, traffic and flooding.

However, the potential benefits associated with the development and delivery of this proposal would include:

- Removal of around 700 heavy vehicles through traffic from the town centre, the majority of which are B-doubles.

- Improvement of motorist and pedestrian safety.
- Improvement of traffic flow in Coonabarabran, particularly east-west travel.
- Improvement of the amenity of the retail district for shoppers, residents and workers.
- Reduction of heavy vehicle noise and stock created odour.
- Removal of the conflicts between local traffic and heavy through vehicles.

Overall, the proposal would achieve acceptable environmental, social and economic outcomes and deliver substantial road safety and road user benefits.

Display of the review of environmental factors

This REF is on display for comment between 30 November 2020 and 29 January 2021. You can access the documents in the following ways:

Internet

The documents are available as pdf files at https://www.rms.nsw.gov.au/projects/newell-highway/coonabarabran.html.

Printed copies

The documents can be viewed at the following locations:

- Warrumbungle Shire Council

  14–22 John Street

  Coonabarabran NSW 2357
- Macquarie Regional Library

  John Street

  Coonabarabran NSW 2357

How can I make a submission?

To make a submission about this proposal, please send your written comments to:

newell.upgrade@transport.nsw.gov.au or PO Box 36, Dubbo NSW 2830.

Submissions must be received by Friday 29 January 2021. Submissions will be managed in accordance with the TfNSW Privacy Statement which can be found here: https://www.rms.nsw.gov.au/about/access-to-information/my-privacy.html

What happens next?

TfNSW will collate and consider the submissions received during public display of the REF.

After this consideration, TfNSW will determine whether or not the proposal should proceed as proposed and will inform the community and stakeholders of this decision.

If the proposal is determined to proceed, TfNSW will continue to consult with the community and stakeholders throughout the project lifecycle.

1 Introduction

This chapter introduces the proposal, the key objectives for the proposal and provides the context of the environmental assessment.

1.1 Proposal identification

Transport for NSW (TfNSW) proposes to build a new highway bypass of Coonabarabran, NSW (the proposal). The proposal would include a new two-lane, two-way highway east of the existing Newell Highway alignment which currently runs through the Coonabarabran town centre.

The proposal is located in the Warrumbungle local government area (LGA) about 120 kilometres north-east of Dubbo central business district (CBD) and 335 kilometres north-west of Sydney CBD. The location and an overview of the proposal is provided in Figure 1-1.

TfNSW is seeking approval for the proposal under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

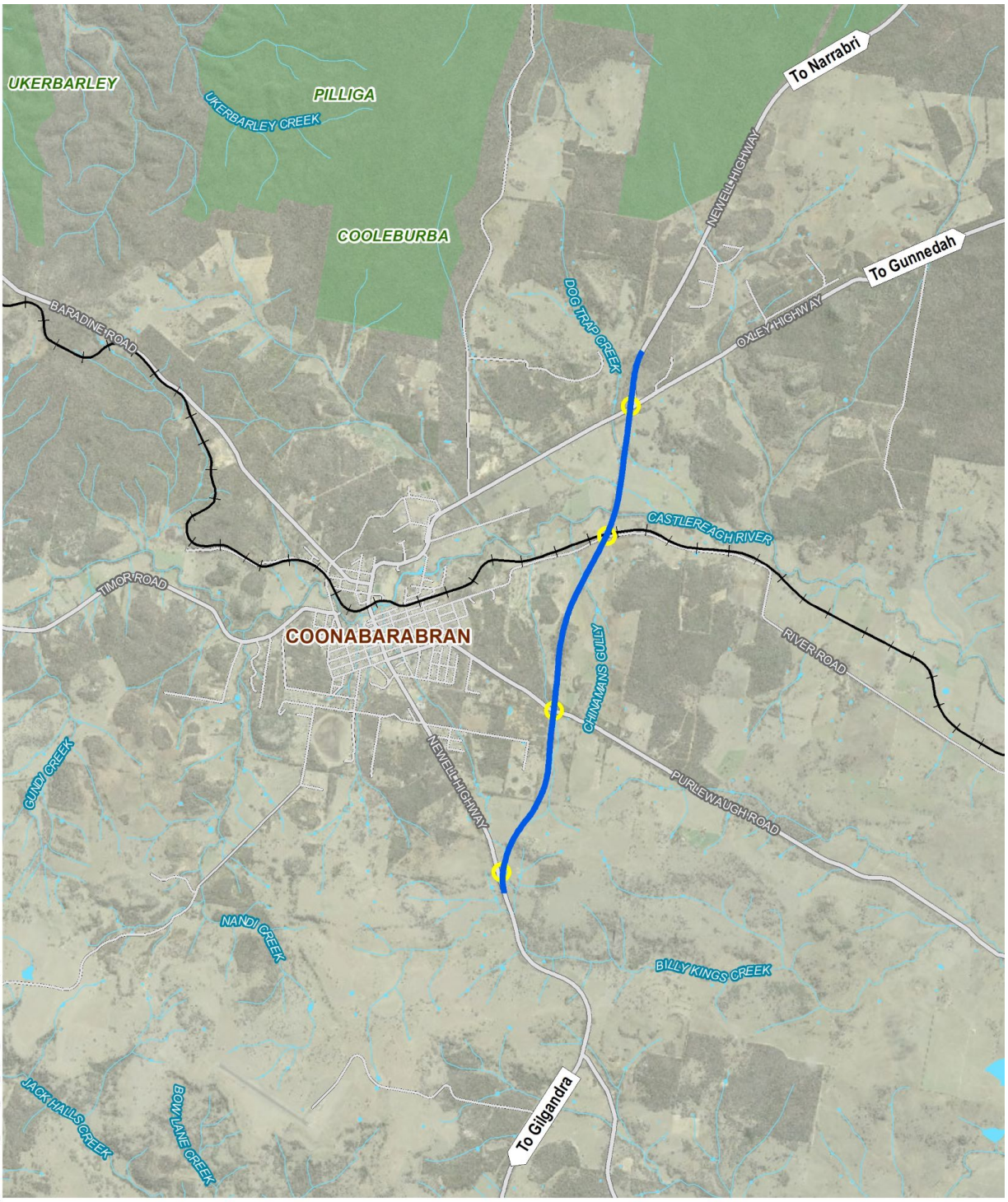
Key features of the proposal would include:

- A new two-lane, two-way road, about eight kilometres long to the east of Coonabarabran, between the Newell Highway and Oxley Highway with a posted speed limit of 110 kilometres per hour
- Changes to the intersection arrangement of the Newell Highway and Oxley Highway to the north of Coonabarabran
- Intersections and local road adjustments at Purlewaugh Road and River Road
- A bridge crossing of the Castlereagh River
- Two stock culverts; one under the highway just south of Purlewaugh Road and a private stock access under the highway between River Road and Chinamans Gully
- Property acquisitions and adjustments to some property access
- Drainage adjustments and utility relocations
- Temporary ancillary facilities during construction including water quality controls, site offices and stockpile sites.

Chapter 3 describes the proposal in more detail.

The proposal is one of several highway upgrades proposed for the Newell Highway as part of the Newell Highway Corridor Strategy (refer to Section 2.2.1). A key target of the strategy and the proposal is to enable safe access for High Productivity Vehicles (HPVs), in particular, Performance Based Standard 3a (PBS3a) freight vehicles along the highway. This would enhance the highway as an inland freight route between Queensland and Victoria. The proposal would improve freight efficiency around Coonabarabran by avoiding the need for heavy vehicles to travel through the Coonabarabran town centre and diverting them onto a bypass. A detailed discussion of the strategic need for the proposal is presented in Chapter 2.

Construction is expected take up to 20 months to complete. Construction would be carried out in stages which would be developed as part of the detailed design and finalised by the construction contractor.



Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 1-1: Location of the proposal

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by Aurecon Australasia on behalf of TfNSW. For the purposes of these works, TfNSW is the proponent and the determining authority under Division 5.1 of the EP&A Act.

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

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of 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), *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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

- Section 5.5 of the EP&A Act including that TfNSW 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 Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and 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

The Newell Highway is a major road link for freight travelling between Queensland and Victoria. It is the economic backbone for freight and livestock transporters, tourism operators, caravanners and holiday makers, emergency services, media and business owners (Roads and Maritime, 2020). The Newell Highway near Coonabarabran experiences high levels of heavy vehicle use, with up to 36 per cent of daily traffic made up of heavy vehicles.

Due to the importance of the Newell Highway as a freight route, the Newell Highway Corridor Strategy (TfNSW, 2015a) was developed to set the direction for managing the Newell Highway in the future (refer to Section 2.2). The strategy identifies that freight along the Newell Highway is expected to grow over the next 20 years, with daily truck movements and annual tonnage predicted to increase by 67 to 103 per cent between 2009 and 2031. The predicted increases in traffic along the Newell Highway would occur regardless of the development of the ARTC's Inland Rail (ARTC, 2015). A bypass at Coonabarabran is proposed following the recommendations of the strategy. To support this, the State Government has invested $500 million as part of the NSW State Infrastructure Strategy to upgrade the Newell Highway as an inland freight route (NSW Government, 2016).

The Newell Highway passes through the Coonabarabran town centre. When the investigations for the REF and the concept design were started, High Productivity Vehicles (HPVs) were restricted through Coonabarabran. This was due to concerns around intersection design, road safety and pavement performance constraints. However, in November 2019, after a review of the highway conditions through Coonabarabran, HPVs were permitted to travel through the town. The existing highway alignment in Coonabarabran includes a roundabout (containing a War Memorial Clock Tower), narrow lane widths and raised, landscaped centre medians that limit the swept path of HPVs. There is a wide load vehicle detour route in place using the local road network (Namoi Street) and a low-level crossing of the Castlereagh River.

The Newell Highway through Coonabarabran affects the amenity of the town through noise and visual impacts and results in community severance impacts. This is due to conflicts between local and through traffic (particularly parking on the highway), which result in road safety issues. Due to restricted travel speeds in the town, the highway is not efficient for highway travellers and results in traffic congestion, particularly when school zone speed limits are in force.

The existing intersection of the Newell Highway and the Oxley Highway, five kilometres north of Coonabarabran, is a T-intersection with priority given to the Oxley Highway. However, the Newell Highway as a national highway and major freight route, is the dominant road with three times the volume of the Oxley Highway.

The bypass of Coonabarabran would address the following issues:

- Inefficient movement of HPVs through Coonabarabran including changing speed limits, substandard lane widths and tight intersection movements
- Unnecessary vehicle operating costs and travel times

- Amenity issues with through traffic, particularly large heavy vehicles through town
- Safety issues from the interaction of through traffic, local traffic, pedestrians and cyclists particularly at the John Street angled on-street parking area
- Heavy vehicle noise and stock created odour in Coonabarabran due to the Newell Highway
- Oxley Highway having priority at the Newell Highway / Oxley Highway intersection when there is a third of the traffic using the Oxley Highway than the Newell Highway.

2.2 NSW policy context

The proposal is supported by policies, goals and objectives of key strategic planning and policy documents. The following documents provide a framework and guidance for the delivery of the proposal:

- Newell Highway Corridor Strategy (TfNSW, 2015)
- Future Transport Strategy 2056 (TfNSW, 2018a)
- Regional NSW Services and Infrastructure Plan (TfNSW, 2018b)
- Premier's and State priorities (NSW Government, 2015)
- State Infrastructure Strategy 2018 (NSW Government, 2018)
- NSW Long Term Transport Master Plan (TfNSW, 2012a)
- NSW Road Safety Strategy 2012-2021 (TfNSW, 2012b)
- NSW Freight and Ports Strategy (TfNSW, 2013a)
- Central West Regional Transport Plan (TfNSW, 2013b)
- Warrumbungle Shire Council Land Use Strategy (Warrumbungle Shire Council, 2013).

2.2.1 Newell Highway Corridor Strategy

The Newell Highway Corridor Strategy (TfNSW, 2015) outlines the NSW Governments plan to manage the Newell Highway over a 20 year timeframe. The Newell Highway is the longest highway in NSW running from Tocumwal on the Victorian border to Goondiwindi on the Queensland border. It is 1058 kilometres in length and passes through 15 local government areas. It provides the following:

- A major interstate connection between Victoria, New South Wales and Queensland for freight
- A regional traffic route that links towns and major centres
- A link to domestic and export markets for the agricultural industry.

A large proportion of vehicles on the Newell Highway are heavy vehicles ranging from 26 per cent to 52 per cent of all traffic. This is expected to increase by 67 to 103 per cent by 2031.

This strategy outlines the objectives, current performance and current and future challenges along the Newell Highway. It also addresses the NSW Government's strategic response to long term management of the Newell Highway. This includes the plan to accommodate HPVs on the full length of the Newell Highway, as currently

restricted access for HPVs is present at multiple locations along the highway. As mentioned in Section2.1, the Newell Highway through Coonabarabran was opened to HPVs in 2019. The allowance of HPVs will continue to cause congestion and safety issues through the Coonabarabran town centre. The proposal would therefore form part of the solution to improve the safety, productivity, efficiency and performance of the Newell Highway.

2.2.2 Future Transport Strategy 2056

The NSW Government's *Future Transport Strategy 2056* (TfNSW, 2018a) is an overarching strategy that aims to integrate the rapid transport challenges throughout the transport industry and provide a world class, safe, efficient and reliable transport system. By 2056, the Australian population is predicted to increase by 12 million and freight volumes in the Greater Sydney area are estimated to double.

The plan addresses regional NSW and Greater Sydney, with a Services and Infrastructure Plan for the two areas. The strategy incorporates a 'hub and spoke' model to the regional transport network in NSW. This 'hub and spoke' model includes transport links that connect to surrounding towns and communities (spokes) from strategic centres and cities (hubs). The strategy involves a changing focus from individual functioning modes of transport to customer focused solutions and an integrated transport network. The strategy acknowledges the vital role transport plays in land use, tourism, economic and cultural development of places.

The plan was developed with six outcomes:

- Customer focused
- Successful places
- A strong economy
- Safety and performance
- Accessible services
- Sustainability.

The proposal is consistent with the above goals as it aims to:

- Increase safety for the Coonabarabran community and HPV drivers
- Increase the performance of the road by reducing travel times and increasing profitability for business
- Provide accessible services for all vehicles.

The proposal incorporates customer and sustainability focused design and strategies to create a successful place and a strong economy. For instance, the community was consulted during detailed design with information gathered on option preferences.

2.2.2.1 Regional NSW Services and Infrastructure Plan

The *Regional NSW Services and Infrastructure Plan* (TfNSW, 2018b) provides a long-term strategic vision for regional NSW until 2056. It aims to reconfigure the regional freight network in NSW and provide more efficient and cost-effective ways to transport freight in NSW. The plan is divided up into nine areas to better focus on regional issues. The plan details regional NSW policy, planning, service and infrastructure initiatives into three categories:

- Committed initiatives with a timeframe of 0-10 years
- Initiatives for investigation with a timeframe of 0-10 years or 10-20 years

- Visionary initiatives with a timeframe of beyond 20 years.

A total of 72 committed regional NSW initiatives are listed in the Regional NSW Services and Infrastructure Plan. The proposal is listed as one of the 72 initiatives and is within the Central West and Orana region. As such the proposal is line with the regional NSW planning policies.

2.2.3 Premier's and State priorities

In 2015 NSW Premier Mike Baird revealed 12 Premier and 18 State priorities (NSW Government, 2015) that target the following areas:

- Economic growth
- Infrastructure development
- Vulnerable communities
- Health, education and public services

The priorities are used to guide the NSW Government sector in the future. Of the 20 priorities the following are consistent with the proposal:

- Building infrastructure (Premier)
- Creating jobs (Premier)
- Reducing road fatalities (State)
- Improving road travel reliability (State).

2.2.4 State Infrastructure Strategy

The *State Infrastructure Strategy* (Infrastructure NSW, 2018) identifies the NSW Government's infrastructure vision for the state over the next 20 years, across all sectors. It is supported by the Future Transport Strategy 2056 and looks beyond the current projects and identifies policies and strategies needed to provide the infrastructure that meets the needs of a growing population and a growing economy. The strategy aims to create a 'hub and spoke' regional transport network model in NSW. This 'hub and spoke' model includes transport links that connect to surrounding towns and communities (spokes) from strategic centres and cities (hubs).

The proposal would support this model by helping to strengthen the regional transportation connections in Western NSW, particularly for the efficient and safe transportation of PBS3a heavy vehicles.

2.2.5 NSW Long Term Transport Master Plan

The *NSW Long Term Transport Master Plan* (TfNSW, 2012a) sets a framework for the NSW Government to deliver an integrated modern transport system that is customer focused. It identifies the future challenges of the transport system to 2031 and identifies actions to address these challenges. The six key transport challenges are:

- Integrating modes to meet customer needs
- Getting Sydney moving again
- Sustaining growth in Greater Sydney
- Providing essential access to regional NSW
- Supporting efficient and productive freight

- Statewide actions.

The proposal is relevant to the challenges of providing essential access for regional NSW and supporting efficient and productive freight. Of the 12 actions in the master plan two apply:

- Connecting regional communities through major highway upgrades
- Improving freight efficiency and productivity through major investments

Improving connectivity and accessibility is crucial in regional NSW as this region relies on a well-connected and efficient transport network to sustain industries and link to markets. The proposal is in line with this goal as the bypass would reduce travel time and improve HPV access on the Newell Highway, thereby improving connectivity and accessibility.

2.2.6 NSW Road Safety Strategy 2012-2021

The *NSW Road Safety Strategy 2012-2021* (TfNSW, 2012b) is a 10 year strategy which aims to reduce fatalities on NSW roads with a 30 per cent reduction in road deaths and injuries by the end of 2021. The strategy involves the implementation of the following to achieve this target:

- Safer Roads program
- NSW Stars on Cars program
- NSW Community Road Safety Fund
- New road safety technologies
- Continued integration road safety enforcement
- Working with local government to share road safety information and resources
- Increased focus on addressing serious injuries and post-crash care and response
- Strategies to support speed enforcement, motorcycle safety and Aboriginal road safety.

One third of the total NSW population live in country areas, however two thirds of all fatalities occur in country areas. Country residents have a fatality rate per 100,000 population that is more than four times that of the metropolitan area. A large proportion of fatalities in country areas occur on roads with speed limits of 100 kilometres per hour. The speed limit of the majority of the Newell Highway is 110 kilometres per hour. In Coonabarabran, the highway speed limit varies from 100 kilometres per hour to 40 kilometres per hour school zone near Coonabarabran High School. Details of the posted speeds are provided in Section 2.3.

The proposal would improve the safety of the Coonabarabran community by diverting the Newell Highway traffic away from Coonabarabran town centre and reducing the interaction of through traffic and local traffic, pedestrian and cyclists. The proposal would also improve road safety for drivers on the Newell Highway through the free flowing conditions on the bypass.

2.2.7 NSW Freight and Ports Strategy 2011-2031

The *NSW Freight and Ports Strategy* 2013 is a 20 year strategy to build an effective and efficient freight network that strengthens economic productivity and growth and generates employment.

The movement of freight in NSW occurs on a shared transport network. Annual freight movement in NSW is estimated at approximately 67 billion tonne kilometres, with an associated value of $200 billion. The network that freight employs is primarily provided by government owned roads. This links government actions to logistic performances across the economy. Therefore, an efficient transport network is essential to ensure economic growth.

The key challenges identified until 2031 include:

- Increasing the efficiency of the existing network infrastructure
- Expanding the network capacity to support economic growth
- Funding infrastructure construction
- Funding growing operations and maintenance tasks in line with increasing utilisation of the network.

The strategy includes short, medium and long-term actions to improve freight movement on the network. The two freight specific objectives of the strategy are:

- Delivery of a freight network that efficiently supports the projected growth of the NSW economy
- Balancing of freight needs with those of the broader community and environment.

As the number of HPVs on the Newell Highway is set to increase with the increasing population and associated increase in freight movement, the proposal would satisfy the above objectives as the bypass would reduce travel time, increase economic growth and improve community safety in Coonabarabran.

2.2.8 Central West Regional Transport Plan

The *Central West Regional Transport Plan* (TfNSW, 2013) outlines specific actions to address the challenges of the Central West region. This region is a major agricultural, industrial and commercial region. It is rich in natural resources and spans the Central Tablelands and plains. The region has the following characteristics which present various challenges:

- Slowly growing population
- Ageing population
- Employment clustered in major centres
- Existing and future freight movements
- Social disadvantage
- Significant population dispersed in many small settlements
- Road safety
- Domestic and international tourism seasonal demand.

Of the characteristics the Central West region face, road safety is one of relevance to the proposal. Heavy vehicle crashes in the Central West region occur in a number of locations including the:

- Great Western Highway from Lithgow to Bathurst
- Mitchell Highway from Bathurst to Molong
- Newell Highway with clusters around Parkes, Dubbo and Coonabarabran.

The transport plan lists a number of initiatives to tackle road safety. One of which includes the:

- Widening of the shoulders
- Installation of profile edge line
- Installation of audio tactile centre line on the Newell Highway north of the Oxley Highway at Coonabarabran.

This initiative was completed in 2013-2014. The proposal would further contribute to road safety in Coonabarabran by diverting HPVs travelling through Coonabarabran to the bypass increasing road safety for the community and drivers.

2.2.9 Warrumbungle Shire Council Land Use Strategy

The *Warrumbungle Shire Council Land Use Strategy* (Warrumbungle Shire Council, 2013) provides a framework for the long-term and sustainable planning of the Warrumbungle LGA. It was developed to support the current Local Environmental Plan (LEP) and considers the complexity and interrelationships of issues involving land-use, transport, and infrastructure including community facilities; while incorporating social, cultural, economic and environmental values.

The strategy supports the need for the proposal as it would reduce heavy vehicles in the Coonabarabran town centre thus improving road safety and traffic interactions. The strategy recommends that Council needs to lobby the State and federal governments to progress the proposal.

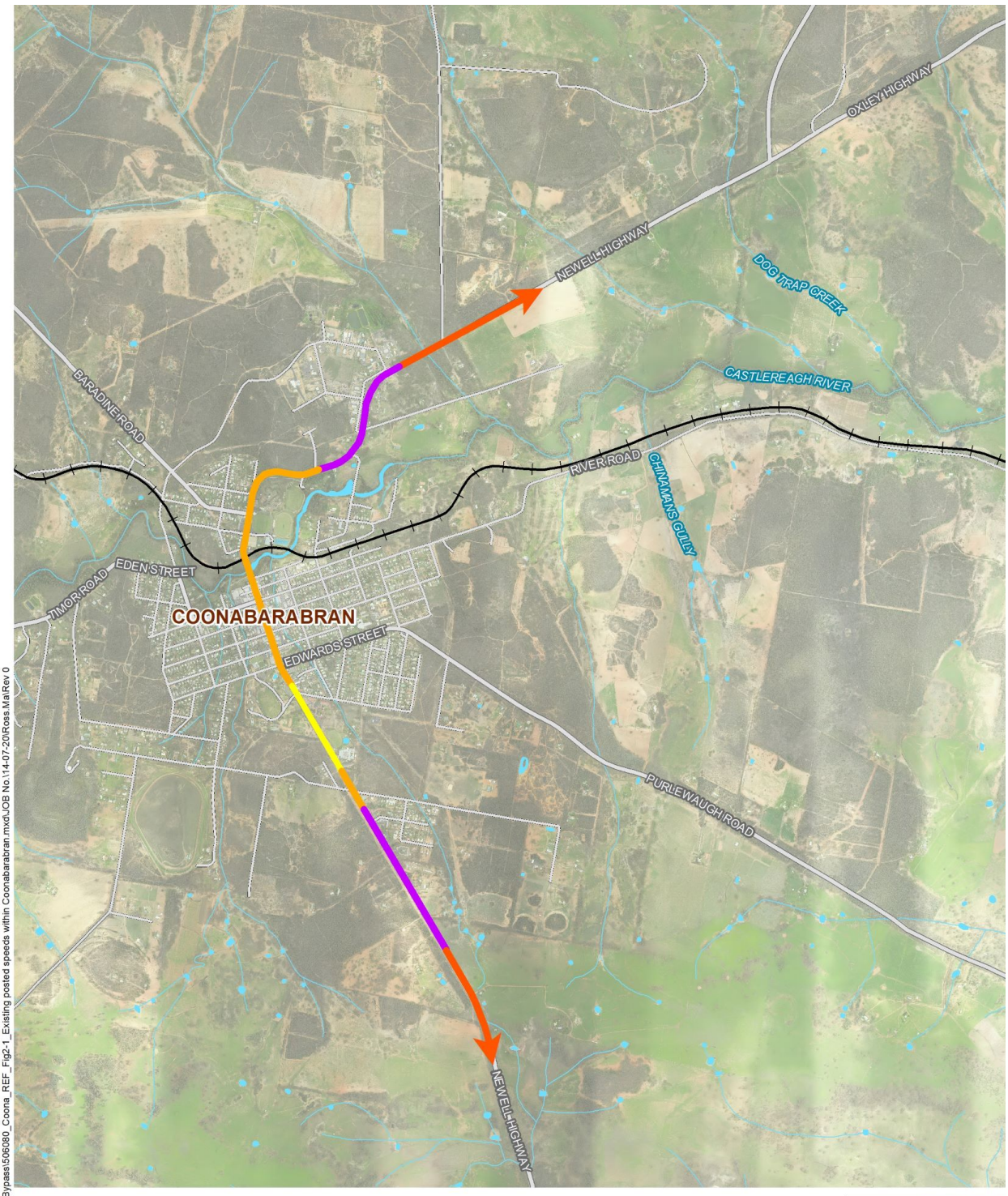
2.3 Existing infrastructure

The Newell Highway extends to the north and south of Coonabarabran. The existing highway is generally a two-lane, two-way, undivided road with sealed shoulders on both sides of the road. Centre and edge line marking are provided along the highway. Lanes are generally three metres wide and shoulders are one metre wide. The posted speed is 110 kilometres per hour along most of the highway which reduces to 100 kilometres per hour when approaching Coonabarabran.

The Newell Highway is the main access road through Coonabarabran. Within the town centre (between Essex Street and King Street), garden beds divide small sections of the road. Lanes are variable, with lanes up to nine metres wide and shoulders up to four metres wide.

Posted speeds within town are as follows:

- 70 kilometres per hour at the outskirts of town from the north and south
- 50 kilometres per hour when passing Coonabarabran High School and the town centre
- 40 kilometres per hour when passing Coonabarabran High School between 8am to 9:30 am and 2pm to 4pm on school days (as shown in Figure 2-1).



100 km/h
50 km/h
70 km/h
School zone (40 km/h between 8am to 9:30 am and 2pm to 4pm on school days)
Railway
Watercourse
Water body

P:\GIS\Project-4\project506080_Coonabarabran_Bypass\506080_Coona_REF_Fig2-1_Existing posted speeds within Coonabarabran.mxd\JOB No.\14-07-20\Ross.Mai\Rev 0

Source: Aurecon, LPI

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Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 2-1: Existing posted speeds within Coonabarabran

Intersections and road infrastructure along the Newell Highway within the Coonabarabran town centre include:

- Four way intersections with Edwards Street and Cassilis Street
- T-intersections with give way signs at North Street, White Street, Gordon Street, George Street, Reservoir Street, Bandulla Street and Kirban Street
- A roundabout at Dalgarno Street centred by a War Memorial Clock Tower
- Pedestrian crossings near the Coonabarabran Memorial Swimming Pool and Cassilis Street
- A disused, non-operational railway level crossing about 160 metres south of Gordon Street
- A bridge crossing the Castlereagh River
- Discontinuous sections of footpaths and cycle lanes
- Roadside drainage
- Street lighting.

The following parking is provided on the Newell Highway within Coonabarabran:

- Unrestricted parallel parking north of Castlereagh Street and south of King Street
- Four 1- hour (9am to 5.30pm Monday to Friday, 9am to 12.30pm Saturday) parallel parking spaces either side of the Dalgarno Street roundabout
- One- hour (9am to 5.30pm Monday to Friday, 9am to 12.30pm Saturday) 45 degree angled parking between Castlereagh Street and Cassilis Street
- Unrestricted 45 degree angle parking between Cassilis Street and King Street.

Roads that would be intersected by the proposal are described in Table 2-1.

Table 2-1 Intersected roads

Road	Classification	Posted speed	Description
Oxley Highway	State	100 km/h	East-west, two-lane, two-way, undivided road with sealed shoulders and centre and shoulder line markings.
River Road	Local	100 km/h	East-west, two-lane, two-way, undivided road with unsealed shoulders with no line markings.
Purlewaugh Road	Regional	100 km/h	East-west, two-lane, two-way, undivided road with unsealed shoulders and centre line markings. Purlewaugh Road is a designated B-Double route.

2.4 Proposal objectives and requirements

The objectives for the proposal are to:

- Improve travel efficiency for all vehicles, in particular heavy vehicles through Coonabarabran.

- Reduce conflict between freight vehicles, local and through traffic and vulnerable road users.
- Improve amenity for the urban commercial area of Coonabarabran.

The benefits associated with the development and delivery of this proposal would include:

- Better facilitate access for HPV PBS3a on the Newell Highway from Dubbo to Queensland by avoiding geometrically substandard intersections.
- Reduced vehicle operating costs (VOC) and increases in travel time savings (TTS).

Table 2-2 describes the proposal requirements that have been considered through the development of the proposal. The proposal requirements have been developed to consider road users, the environment, urban design and health and safety.

Table 2-2 Proposal requirements

Proposal requirement	Description / where addressed
Minimise environmental impacts	Environmental factors have been considered throughout the design development. Assessments of potential impacts to environmental features are provided in Section 6.
Achieve positive urban design outcomes	Specific urban design objectives have been developed for the proposal (refer to Section 2.4.1). These objectives have been implemented throughout design development. These objectives have been considered in the assessment of landscape and visual impacts in Section 6.3 and Appendix E.
Fit for purpose design	Fit for purpose design has been considered through the design development to meet the required design life and to maximises the proposal's 'value for money'.
Safety of workers and customers	Design features have been selected to increase safety of customers during operation (refer to Section 3.2). Further design refinements and the development of safety protocols will promote safe, efficient and practical environment for construction workers and customers.

2.4.1 Urban design objectives

Specific urban design objectives were developed for the proposal as part of the landscape character and visual impact assessment (refer to Section 6.3 and Appendix E). The objectives were developed in accordance with the Roads and Maritime urban design policy, *Beyond the Pavement* (2014) and are intended to guide the concept design, and ensure the proposal integrates physically and visually with the surrounding environment.

Table 2-3 lists the objectives and briefly outlines how they can be implemented into the design. Further details are provided in Section 6.3 and Appendix E.

Table 2-3 Urban design objectives

Objective	Principles	Relevance to proposal
Contribute to the overall landscape structure and revitalisation of the wider region	• consider the Newell Highway's role in the movement of goods and people in the region • consider a design response which acknowledges the town centre of Coonabarabran • maintain connections with existing secondary roads and internal rural access roads	• develop entry signage to encourage travellers to stop at Coonabarabran • consider the use of tree species, seasonal colour and plantings at the northern and southern intersections to promote the local region • consider how the World's Largest Virtual Solar System Drive especially planet 'Saturn' is accommodated in the proposal
Respond to the landscape patterns and character of the local area	• minimise the removal of vegetation in order to maintain existing character and habitat • replace any removed vegetation, at tie-in intersections, with vegetation of a similar character • preference the use of endemic species where possible otherwise indigenous plants should be used	• ensure tree planting at suitable intersections • ensure revegetation techniques that respond to areas of scattered remnant vegetation and open grassland areas • utilise progressive revegetation methods that suit the endemic landscape and local materials
Protect sensitive environments adjacent to the new road corridor	• minimise the removal of vegetation in order to maintain existing character and habitat • restore areas outside the corridor disturbed by construction with appropriate native vegetation from local ecological communities • select batter vegetation on either side of the new road corridor to screen it from sensitive receptors and reduce the scale of new infrastructure elements	• ensure the construction footprint and bridge piers are minimised across Castlereagh River, Chinamans Gully, Dog Trap Creek and near watercourses • ensure existing woodland area is restored either side of the new road corridor • develop appropriate species mixes for riparian corridors based on ecological investigations

Objective	Principles	Relevance to proposal
Design an experience in movement	• maintain the highway journey which is characterised by long stretches with views alternating between long range vistas across open flat grassland plains or confined to road reserve areas and stands of remnant trees • maintain and enhance existing views to the Warrumbungle Mountain Range and exploit new views to improve the road user experience.	• provide visual stimuli along the corridor to provide a sense of progression and connection with the social, natural and geographic context of the corridor • celebrate views to the Warrumbungle Mountain Range to support a sense of place along the proposal.

2.5 Alternatives and options considered

This section summarises the options that were considered for the proposal and details the justification of why the preferred option was chosen.

2.5.1 Previous investigations

A bypass of the Newell Highway at Coonabarabran has been considered since the early 1990s. There have been ongoing developments for a bypass of Coonabarabran including funding commitments by the Federal and State governments, and investigations into feasibility, preferred route options and environmental impacts. A summary of the previous investigations are as follows:

- 1990 – the start of local campaigning for a bypass of Coonabarabran
- 1997/98– a feasibility study was carried out which identified four options
- 1998 – the feasibility study recommended the bypass option of the Newell Highway at Coonabarabran
- 2003 – Coonabarabran Bypass route chosen
- 2004 – AusLink plan announced and $1 million committed to Coonabarabran bypass
- 2014 – Newell Highway Taskforce considers plans for upgrades and improvements along the Newell Highway
- 2015 – Newell Highway Corridor Strategy released and includes bypass at Coonabarabran as medium priority.

Following the release of the Newell Highway Corridor Strategy (TfNSW, 2015), investigations into the current proposal began in 2017, building upon previous work. The previous investigations were used as background information in the options assessment for the current proposal.

2.5.2 Methodology for selection of preferred option

Investigations for the proposal began in 2017 following the outcomes of the Newell Highway Corridor Strategy (TfNSW, 2015). Six preliminary options were initially developed of which three options were shortlisted for further development. The preferred option was progressed to the concept stage, public display and business case. The assessment of the shortlisted options included:

- A preliminary environmental investigation (Roads and Maritime, 2018b) which identified various environmental constraints to be further investigated and considered throughout the development of the concept design to minimise the environmental impact of the proposal across the study area
- Community consultation to collect comments, feedback and ideas about the options (refer to Section 5)
- A constructability workshop which identified the potential issues associated with the construction phase of the proposal
- Cost estimates for each option.

A value management workshop was held on 11 July 2019 which identified the preferred option.

At the workshop, the three options were assessed against the proposal objectives and four key impact criteria (Table 2-4). The options were scored for each criterion. The scoring system ranged from one to three, with one being the lowest score and three the highest score. The scores were weighted to account for their relative importance with the proposal objectives.

Table 2-4 Assessment criteria

Criteria	Sub criteria	Weighting
Function	• short term (construction) – the number of traffic switches and stages of construction and ease of constructability. • long term (operational) – function, flexibility and capacity including road safety, travel efficiency, future transport requirements and maintainability.	40%
Environment	• biodiversity – total area of vegetation impacted, threatened species and plant communities • heritage – Aboriginal heritage and heritage landmarks • noise and vibration.	20%
Socio-economic	• land use – directly affected properties and current and potential future land use • urban design – meeting the objectives, town entry gateway • amenities – town amenities and parking • community – local community feedback.	25%
Cost	• capital cost of each option.	15%

2.5.3 Identified options

2.5.3.1 Option 1

Option 1 involves the upgrade of the existing Newell Highway through Coonabarabran, including minor widening and intersection improvements through the town centre. The option would start about 2.5 kilometres south of Bandulla Road and extend to connect to the Oxley Highway. The Newell Highway / Oxley Highway intersection would also be upgraded.

The Newell Highway would remain a two-lane, two-way highway. Various speed limits would be provided including 40 (within the school zone), 50, 70 and 100 kilometres per hour.

2.5.3.2 Option 2

Option 2 involves the construction of an inner bypass route to the east of Coonabarabran. It would start about 1.4 kilometres south of Bandulla Street and re-join the existing Newell Highway near Dandry Road.

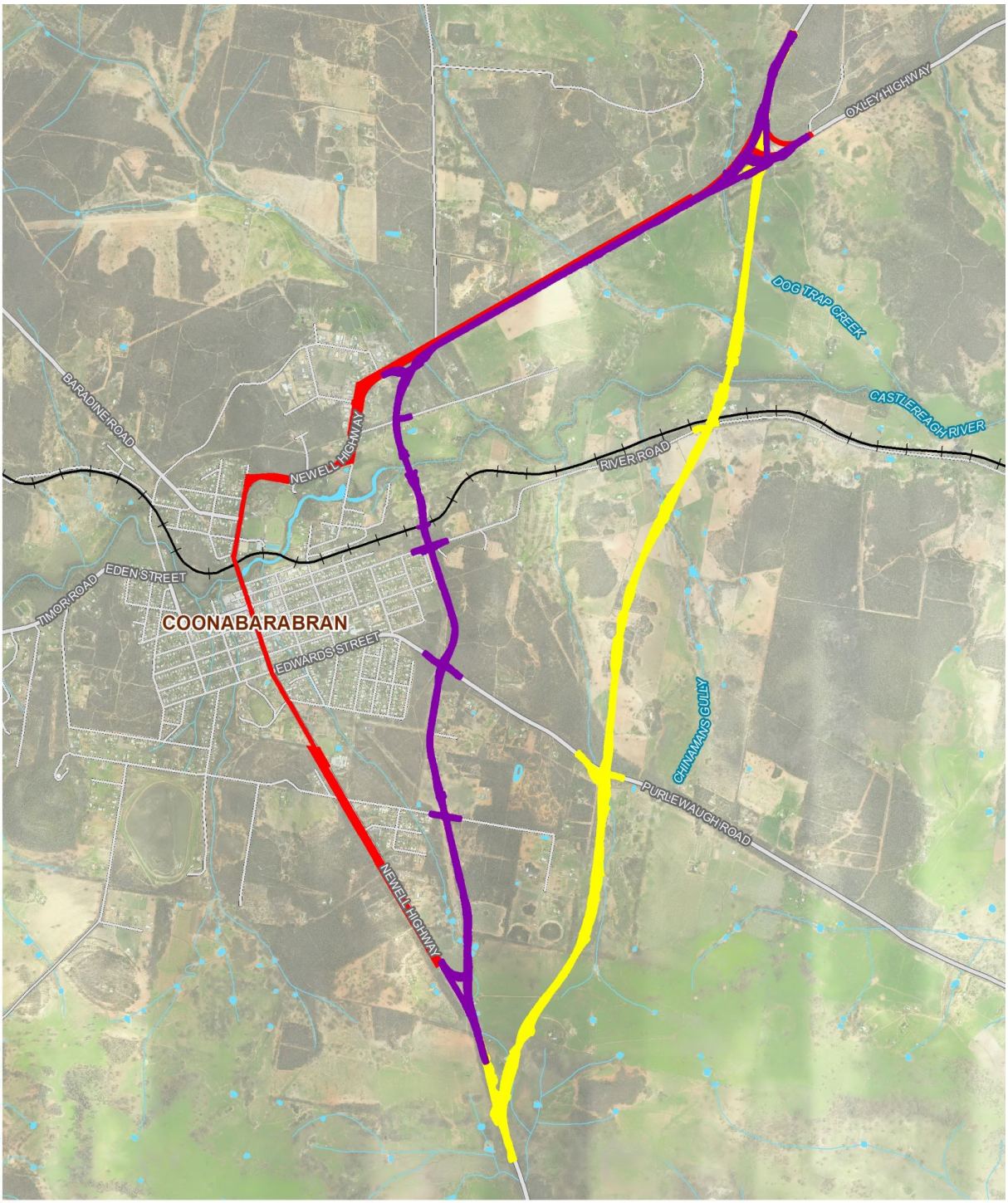
This option would involve constructing a two-way, two-lane, highway with a posted speed of 80 kilometres per hour. It would be a single carriageway with a wide centreline treatment and have a bridge over the Castlereagh River. It would involve new intersections with Bandulla Street, Purlewaugh Road, River Road, Dows Lane and the existing Newell Highway. This option would pass along Sutton Lane and continue north, to the west of the Coonabarabran General Cemetery. It would be immediately to the east of residences along East Street.

2.5.3.3 Option 3

Option 3 involves the construction of an outer bypass route to the east of Coonabarabran. It would start about 1.6 kilometres south of Bandulla Street and re-join the exiting Newell Highway at the Oxley Highway intersection.

This option would involve constructing a two-way, two-lane, 110 kilometre per hour highway. It would be a single carriageway with a wide centreline treatment and have a bridge over the Castlereagh River. It would involve new intersections with Purlewaugh Road, River Road and the existing Newell Highway. This option would mostly pass through rural land.

The options are shown in Figure 2-2.



Newell Highway Upgrade Coonabarabran Bypass REF

FIGURE 2-2: Shortlisted options

2.5.4 Analysis of options

During the value management workshop, the three options were assessed and scored against the four key impact criteria (refer to Section 2.5.2). The summary of the analysis discussion is provided in Table 2-5.

Table 2-5 Options analysis summary

Criteria	Option 1	Option 2	Option 3
Function	• construction staging would be complex and impact the local community within the town centre throughout construction • full road closures would be required during construction • location in town centre restricts future upgrades • high level of road maintenance • does not remove heavy vehicles from town centre • travel efficiency estimated at 9.01 minutes.	• most construction work can be undertaken offline. Disruption to traffic at the six intersections during tie-in. • location enables growth and future upgrades • low level of road maintenance • would remove most heavy vehicles from town centre • increased travel speeds and efficiency • travel efficiency estimated at 6.25 minutes.	• most construction work can be undertaken offline Disruption to traffic at the four intersections during tie-ins • location enables growth and future upgrades • low level of maintenance • would remove most heavy vehicles from town centre • increased travel speeds and efficiency • travel efficiency estimated at 5.15 minutes.
Environment	• would require least vegetation removal • threatened ecological communities not likely impacted • would impact two heritage items: the Coonabarabran Clock Tower and the courthouse • highest number of sensitive receivers impacted.	• would require the most vegetation removal • would impact some threatened ecological communities • minimal potential heritage impacts • lower number of sensitive receivers impacted that Option 1.	• would require slightly more vegetation removal than Option 1 • would impact some threatened ecological communities • minimal potential heritage impacts • least number of sensitive receivers impacted.

Criteria	Option 1	Option 2	Option 3
Socio-economic	• least number of affected properties • no changes to town entry gateway • Impacts to schools, parks and public areas • large impacts to parking in town centre • preferred by community feedback	• highest number of affected properties • six entry points to the town centre, provided many opportunities • impacts to local roads, the golf course, residential homes and the cemetery • least preferred by community feedback	• slightly less affected properties than Option 2 • difficulties seeing the town and would rely on signage • more preferred than Option 2 by community feedback
Cost	• cheapest option	• slightly lower cost than Option 3. Nearly double the cost of Option 1	• most expensive option

2.5.5 Preferred option

Option 3 was chosen as the preferred option as it provides the best outcomes for the proposal objectives and the key impact criteria. The preferred option has the following outcomes:

- It allows for the safe and efficient passage of HPV including PBS3a and reduces the number of conflict points, increasing the safety for light vehicles, pedestrians and cyclists
- It has the best reduction in travel times and greatest improvement in freight productivity
- It has the lowest impact on town amenities and does not impact parking availability
- It has the lowest impact on the community in the short and long-term as it allows for ease of constructability
- It removes noise, traffic and stock odour presence from heavy vehicles in the town centre
- It has the least impact on sensitive receivers and heritage items
- It removes heavy vehicles from the school zone and childcare precinct
- It allows for the easiest maintainability.

TfNSW announced the preferred option in October 2019.

2.5.6 Design refinement

After identification of the preferred option, further design development occurred to optimise the design. Key design refinements are summarised in Table 2-6.

Table 2-6 Key design refinements

Proposal element	Design refinement	Reason
Construction area	The construction area has been reduced from 15 m from the alignment to 5.5 m in several locations.	Minimisation of vegetation impacts on threatened ecological communities and hollow bearing trees.
Stock underpass	Addition of two stock culverts under the Newell Highway, both south of the intersections with Purlewaugh Road and River Road.	To provide continuation of the Travelling Stock Route along Purlewaugh Road and provide internal farm stock movement on a private property.
Northern intersection	Staggered-T intersection layout was refined.	Different intersection layouts were reviewed to determine the best option for the proposal and the community.
Purlewaugh Road and River Road intersections	Intersection crossroad locations were repositioned, Newell Highway median turn lanes were lengthened.	To improve road safety and improve driver sight lines.
Wide centre line treatment	Centre line width was increased from 1m to 1.4m and the addition of a wire rope safety barrier.	Increase safety and for consistency with other upgrades on the Newell Highway.
Horizontal and vertical alignments	The horizontal and vertical alignments were refined in several locations which removed unnecessary curves.	Improve the drive experience on the highway.

3 Description of 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.

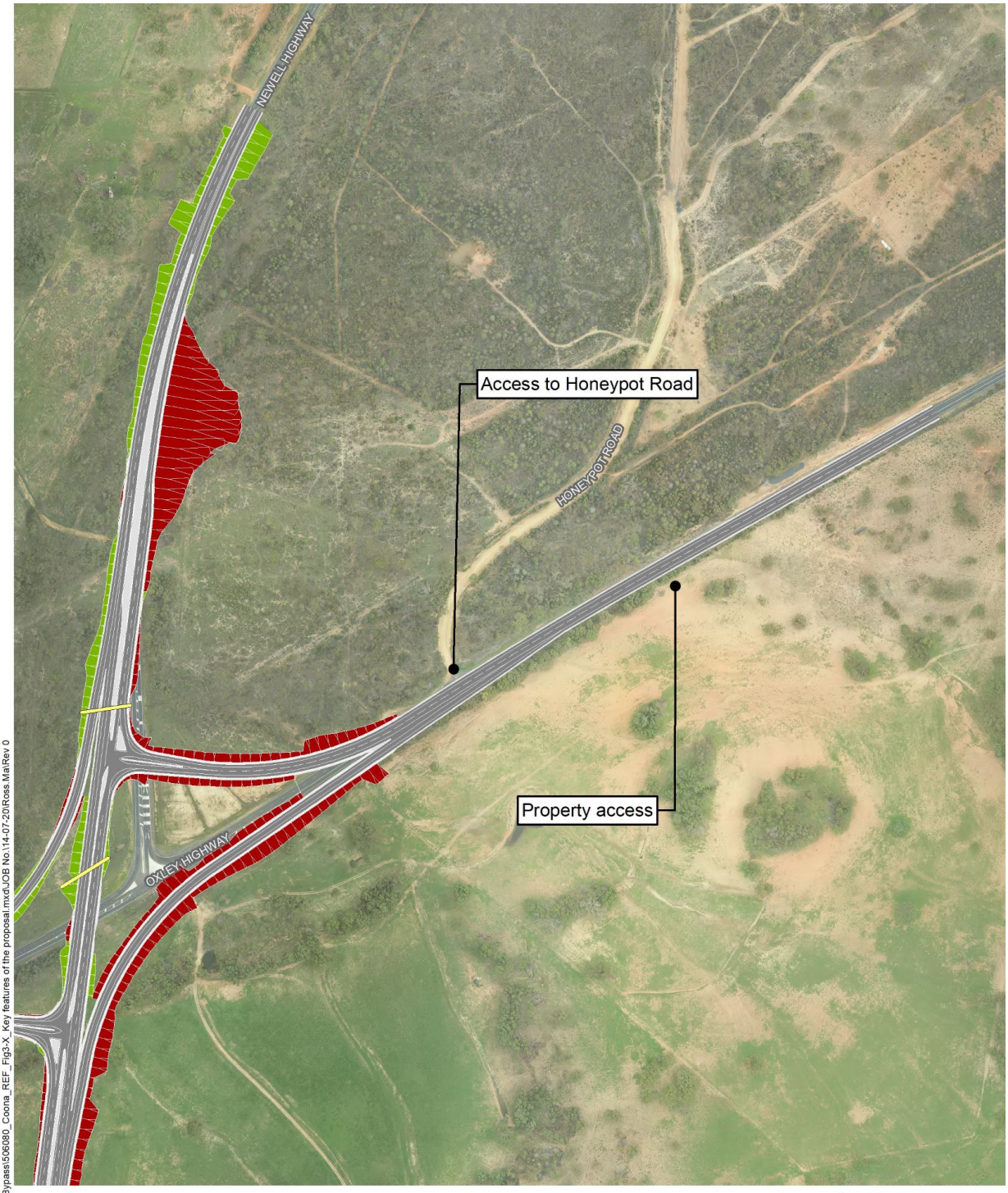
3.1 The proposal

TfNSW proposes to build a highway bypass of Coonabarabran, NSW (the proposal). The proposal would be about eight kilometres long and extend north-south between the Newell Highway and Oxley Highway. The proposal is located about 2.5 kilometres east of the Coonabarabran central business district and is within the Warrumbungle LGA. An overview of the proposal is shown in Figure 1-1. Details of the proposal are shown in Figure 3-1 to Figure 3-8 and discussed in the following sections.

Key features of the proposal would include:

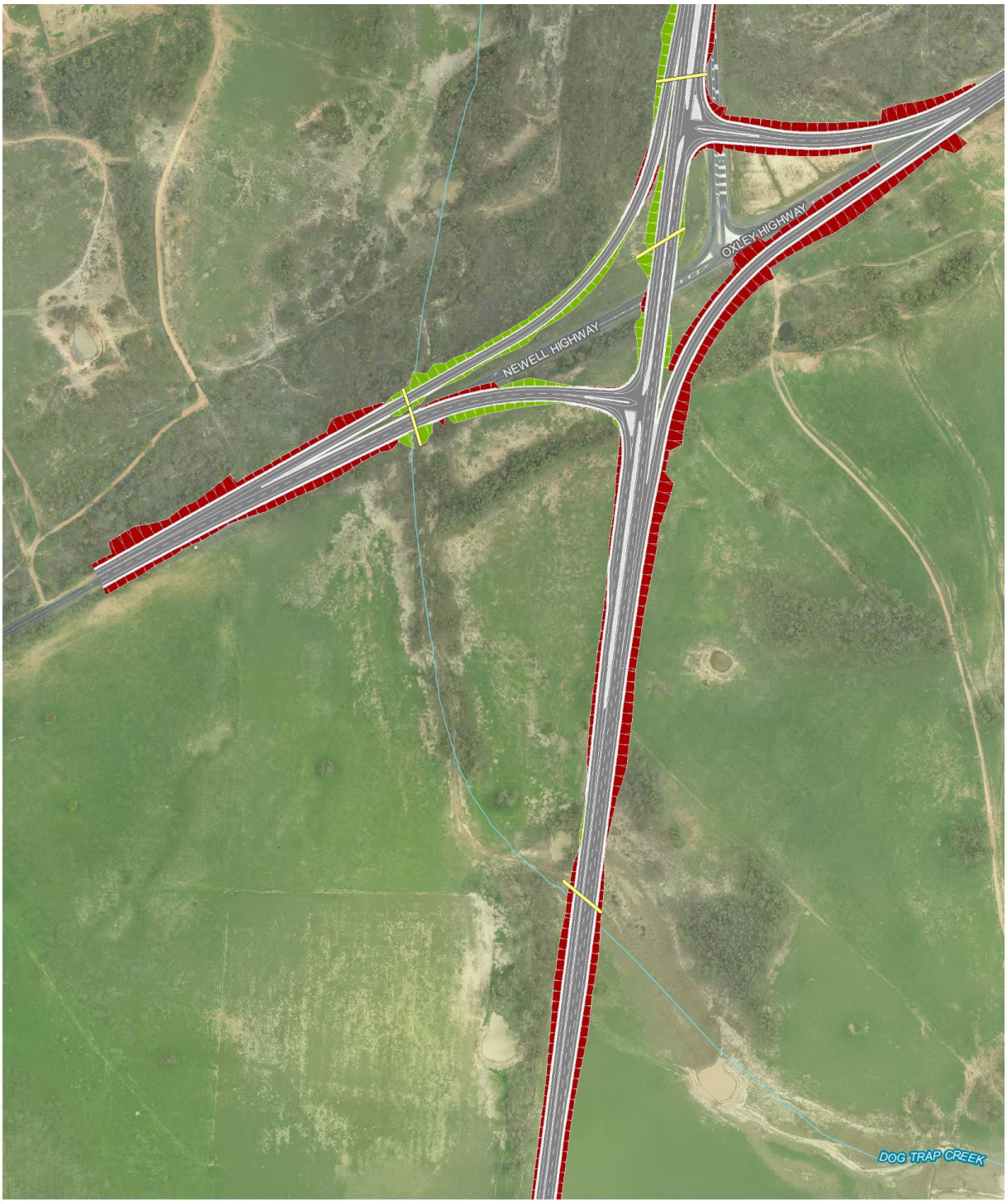
- A new two-lane, two-way, highway about eight kilometres long between the Newell Highway and the Oxley Highway with a posted speed limit of 110 kilometres per hour
- Changes to the intersection arrangement of the Newell Highway and Oxley Highway to the north of Coonabarabran
- Intersections and local road adjustments at Purlewaugh Road and River Road
- A bridge crossing of the Castlereagh River
- Two stock culverts; one under the highway just south of Purlewaugh Road and a private stock access under the highway between River Road and Chinamans Gully
- Property acquisitions and adjustments to some property access
- Drainage adjustments and utility relocations
- Temporary ancillary facilities during construction including water quality controls, site offices and stockpile sites.

The proposal description in this REF is based on the concept design for the proposal. This design would be refined prior to construction through the detailed design phase.



Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-1: Key features of the proposal



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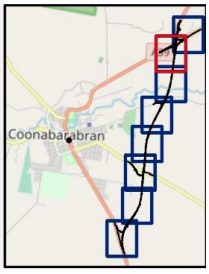
Road
Cut
Fill
Median
Proposed drainage culvert
Railway
Watercourse



The proposal will be refined during detailed design

Source: Aurecon, LPI

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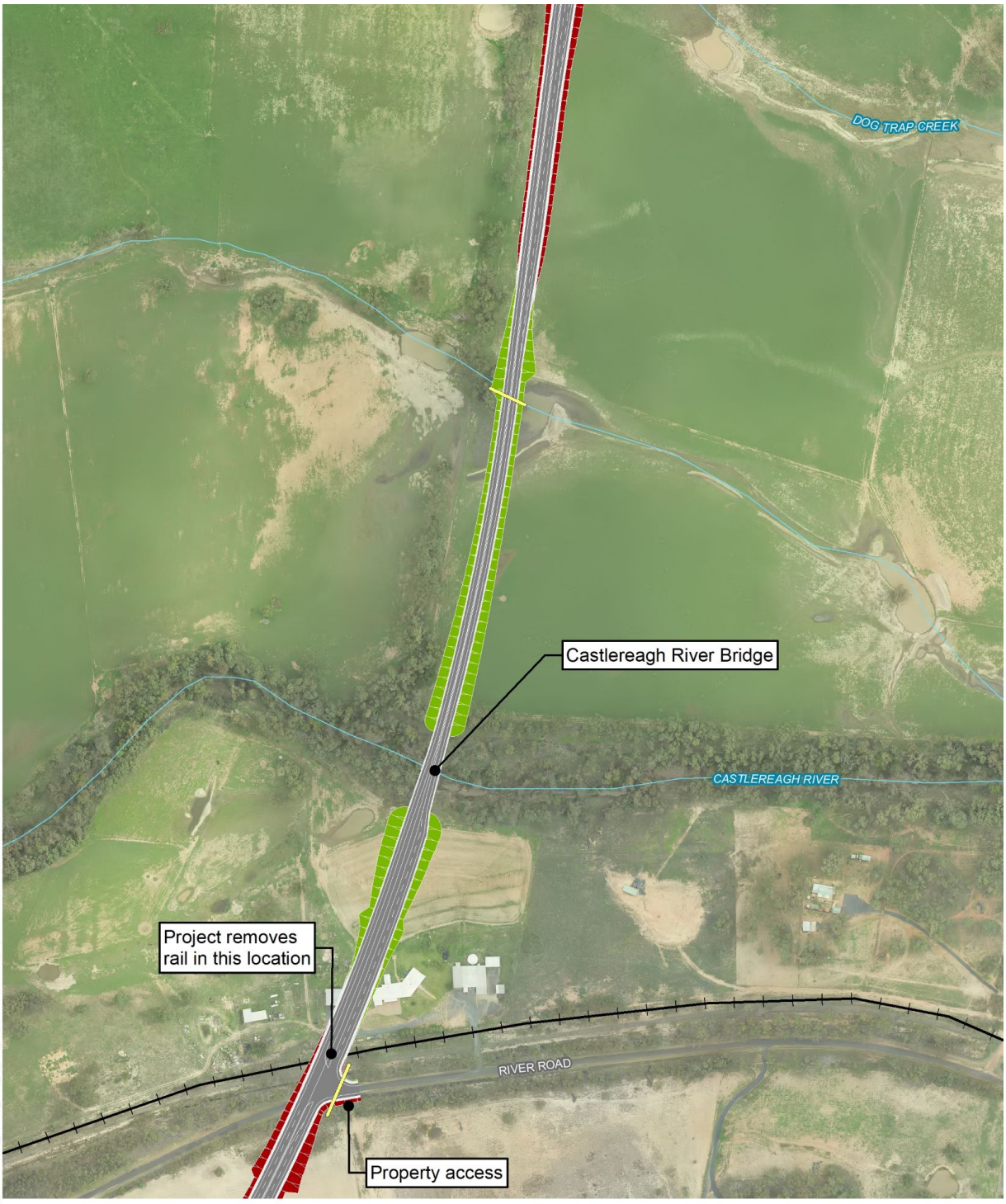
0
150 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass REF

FIGURE 3-2: Key features of the proposal



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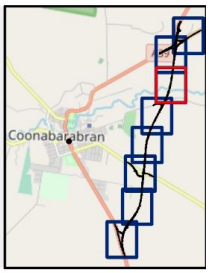
Road
Cut
Fill
Median
Proposed drainage culvert
Railway
Watercourse



The proposal will be refined during detailed design

Source: Aurecon, LPI

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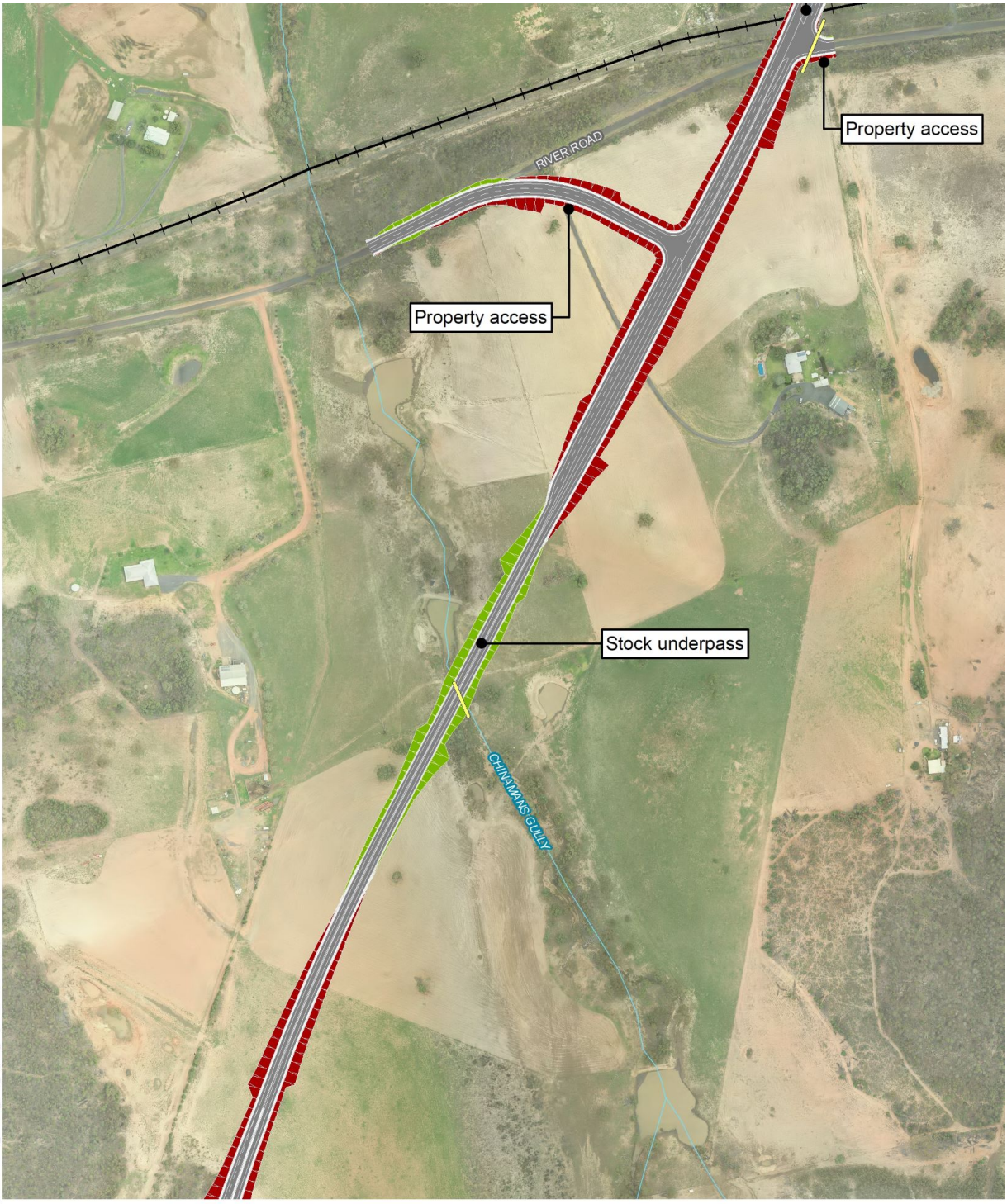
150 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-3: Key features of the proposal



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Road
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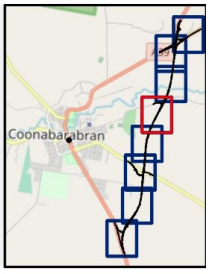
Fill
Median
Proposed drainage culvert
Railway
Watercourse



The proposal will be refined during detailed design

Source: Aurecon, LPI

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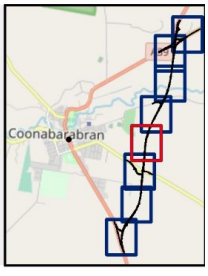
0
150 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-4: Key features of the proposal

Road
Cut
Fill
Median
Proposed drainage culvert
Railway
Watercourse



The proposal will be refined during detailed design

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Source: Aurecon, LPI

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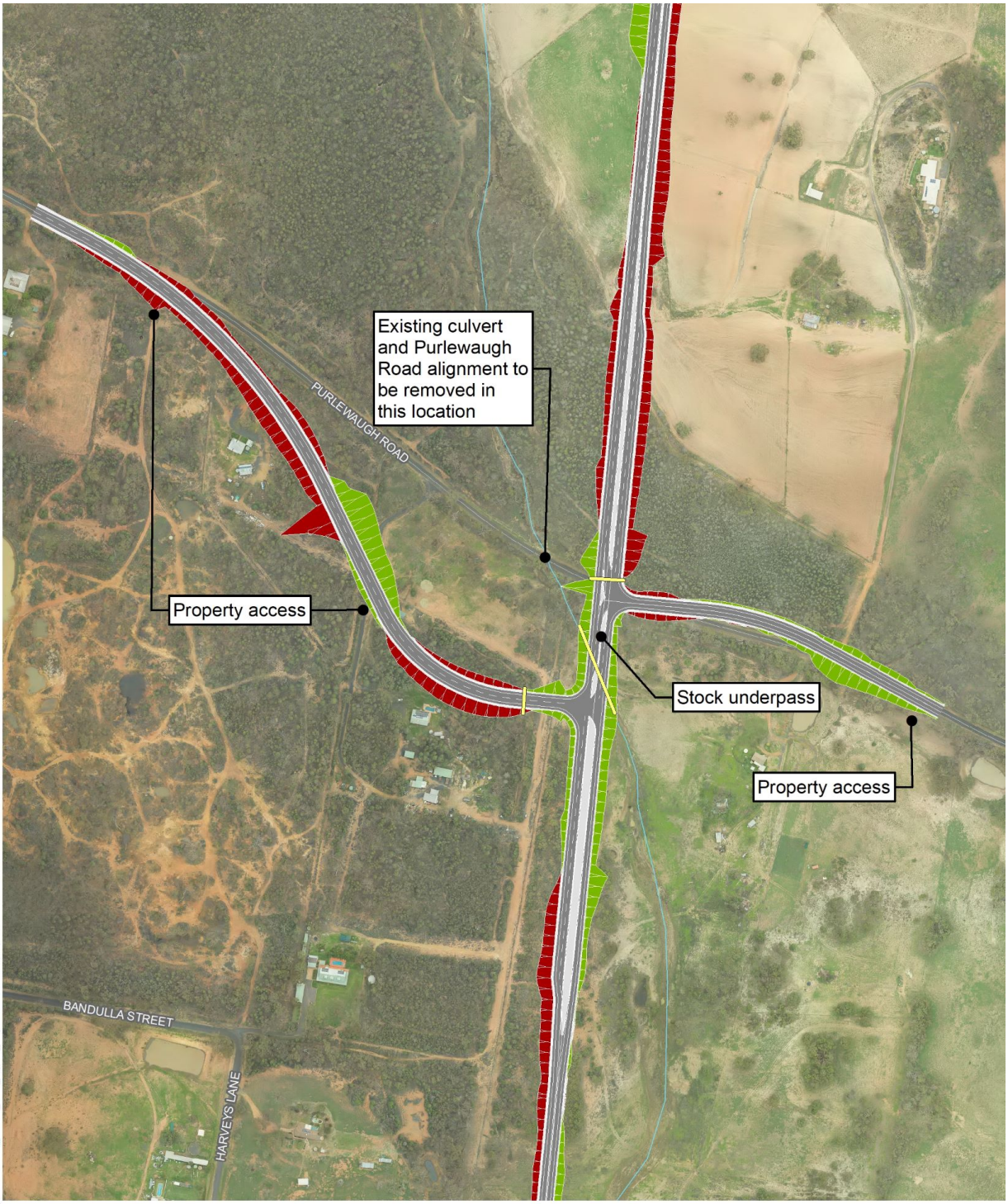
Projection: GDA 1994 MGA Zone 55

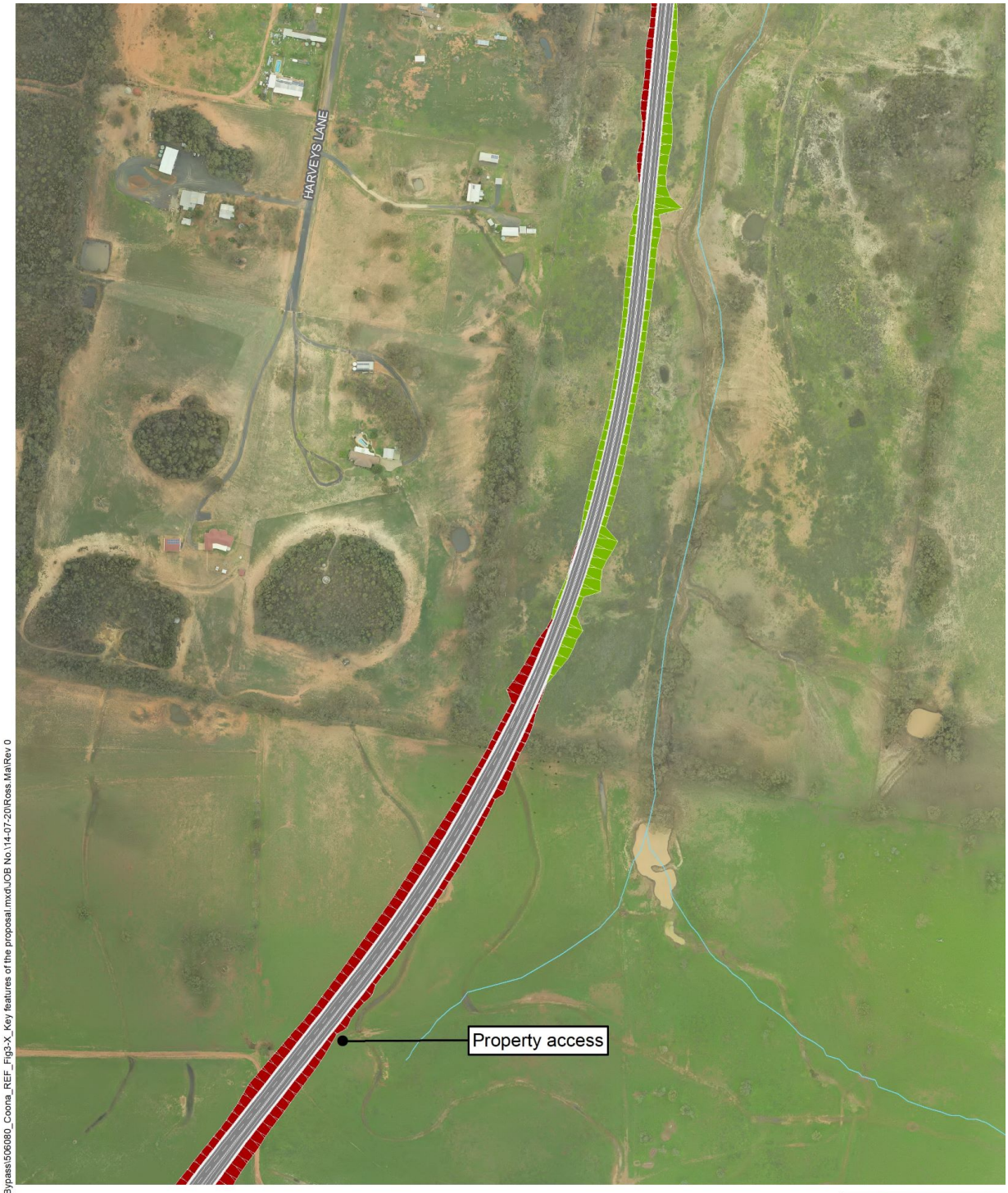
Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-5: Key features of the proposal



Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-6: Key features of the proposal



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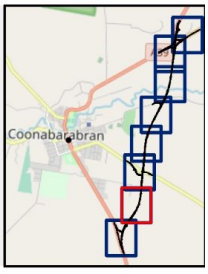
Road
Cut
Fill
Median
Proposed drainage culvert
Railway
Watercourse



The proposal will be refined during detailed design

Source: Aurecon, LPI

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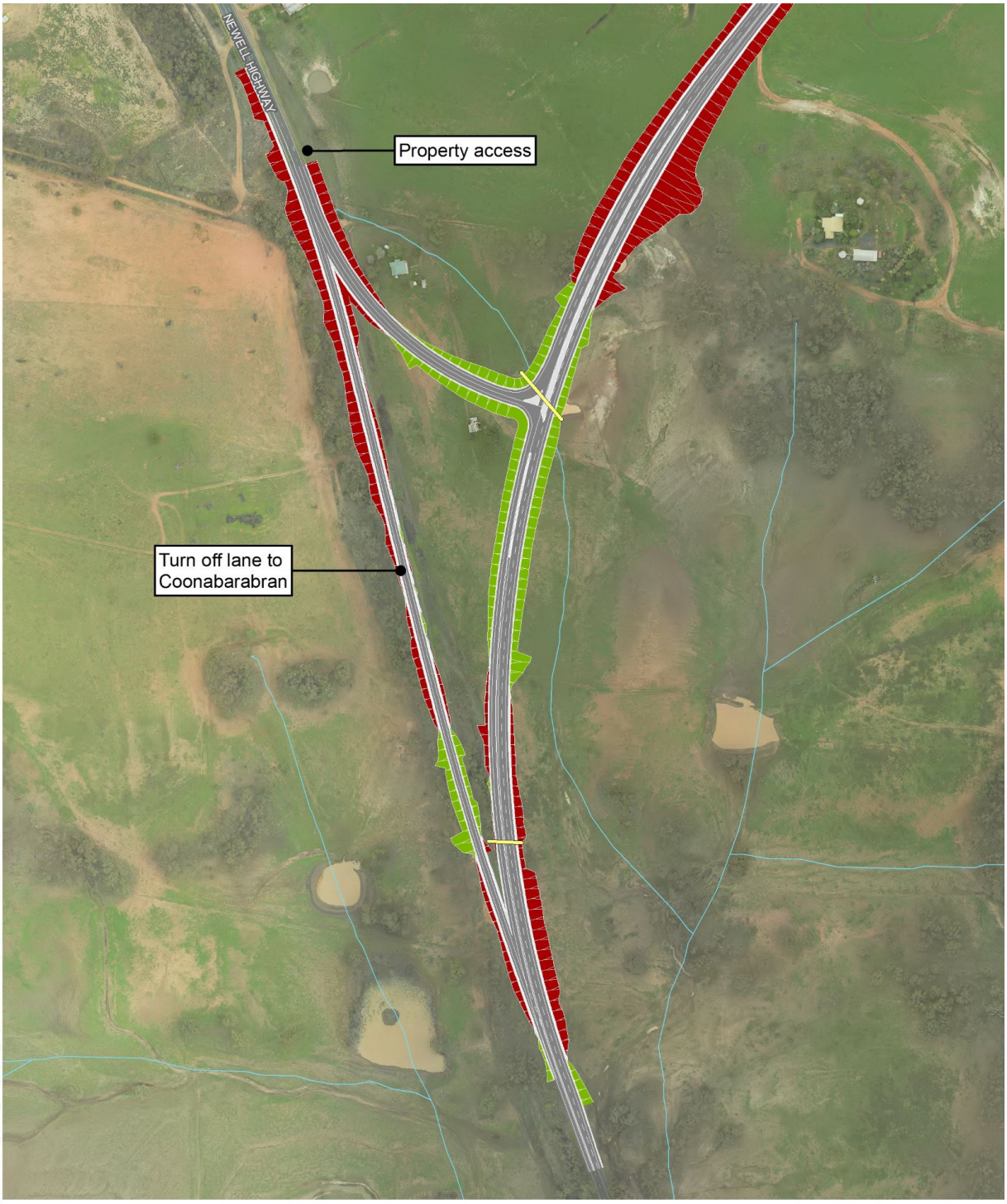
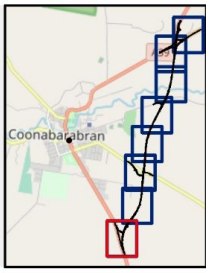
Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-7: Key features of the proposal



Road
Cut
Fill
Median
Proposed drainage culvert
Railway
Watercourse



The proposal will be refined during detailed design

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Source: Aurecon, LPI

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Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 3-8: Key features of the proposal

3.2 Design

A description of the overall proposal design is provided in the following sections.

3.2.1 Design criteria

The concept design for the proposal was prepared in accordance with the guidelines and standards in Table 3-1.

Table 3-1 Design guidelines and standards

Feature	Standards
Road design	• Austroads Guide to Road Design Series (2009- 2019) • Roads and Maritime Supplements to Austroads Guides (2019) • Austroads Guide to Road Safety Series (2006 -2019.
Bridge design	• AS 5100 - 2017 Bridge design set • AS 2159 - 2009 Buildings Piled Footings Requirements • AS1170.0 - 2002 Design Actions – General Principles • Roads and Maritime QA Specification PS261 – Bridge and Structures concept design.
Signage and road marking	• AS1742 - 2014 Manual of Uniform Traffic Control Devices • Roads and Maritime Supplement to AS1742 (2019) • AS1743 -2018 Road signs – Specifications • Roads and Traffic Authority Delineation Section 15 Raised pavement markers (2012) • Roads and Traffic Authority Guide Signposting Manual (2007) • Roads and Maritime Specification R142 Retroreflective Raised Pavement Markers (2013).
Urban design	• Roads and Maritime *Beyond the Pavement* (2014). • Roads and Maritime Urban Design Vision, Objectives and Design Principles for the Upgrade of the Newell Highway (2018) • Roads and Maritime Bridge Aesthetics Design Guideline (2019)

Specific design criteria for the proposal are listed in Table 3-2.

Table 3-2: Design criteria for the main alignment

Design element	Design criteria	
	Main alignment	Local roads
Carriageway	Single carriageway, one lane either direction	Single carriageway, one lane either direction
Posted speed limit	110 km/h	River Road: 100 km/h Purlewaugh Road: 100 km/h
Design speed	120 km/h	110 km/h
Design vehicle	36.5 m B-Triple	19 m semi-trailer
Stopping site distance (reaction time) on main carriageway	285 m	83 m

Design element	Design criteria	
	Main alignment	Local roads
Maximum vertical grade	5%	5%
Batter slopes	6:1 maximum	6:1 maximum
Typical lane width	3.5 m	3.5 m
Shoulder width	2.5 m	2.5 m
Minimum verge width	1 m	1 m
Centre line width	1.4 m	Nil
Road pavement life	20 years	20 years
Flood immunity	100-year ARI flood event for the Castlereagh River Bridge 20-year ARI for new alignment	20-year ARI flood event

No pedestrian access would be permitted along the highway. Cyclists would be able to use the road shoulders.

3.2.2 Engineering constraints

The major engineering constraints considered in the design of the proposal are summarised in Table 3-3.

Table 3-3: Engineering constraints

Design element	Design criteria
Property impacts	The proposal passes through private properties. The road alignment has been designed to minimise property severance.
Traffic	The existing Newell Highway, the Oxley Highway and Purlewaugh Road support heavy vehicle traffic. Sufficient length entry and exit ramps and staggered T-arrangement intersections are required to minimise impacts to cross traffic. The Northern intersection arrangement would be amended to better reflect the dominant direction of travel.
Construction and traffic staging	The proposal would be largely within a greenfield zone away from existing live traffic. However, tie-ins are required at Newell Highway, Oxley Highway and existing local roads. Intersections would either be constructed off-line or temporary access tracks used to separate traffic flow and construction workers.
Local roads	The proposal would require the adjustments and realignments of Purlewaugh Road and River Road. The design includes staggered T-Intersections at these local roads to increase safety and redirect heavy vehicle traffic to the highway.
Minimising impacts to Endangered Ecological Communities (EECs)	The proposal passes through areas of EEC. Where possible, the impact footprint has been adjusted to minimise impacts, including changes to intersection designs, the construction footprint and the location of construction compounds.

3.2.3 Major design features

The major design features of the proposal are described in the following sections and shown in Figure 3-1 to Figure 3-10.

3.2.3.1 Highway profile

The highway alignment would be a new two-way, two-lane highway, designed for a posted speed limit of 110 kilometres per hour. It would be about eight kilometres long and extend between the Newell Highway in the south and the Oxley Highway intersection to the north.

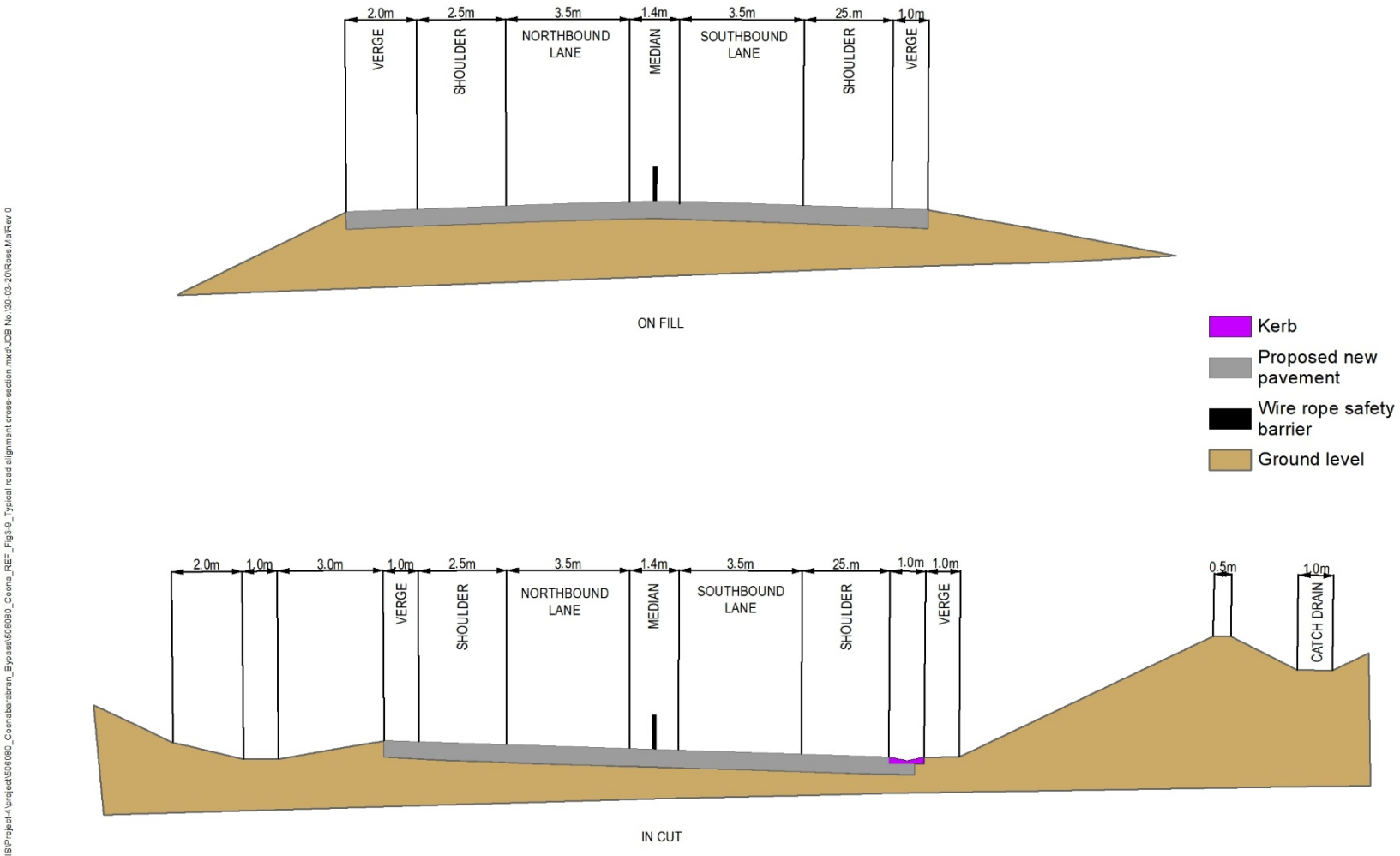
Each lane would be 3.5 metres wide with a 2.5 metre wide shoulder. The median would be up to 1.4 metres wide to facilitate a wire rope barrier between the northbound and southbound lanes. A typical cross section of the road alignment is shown in Figure 3-9.

3.2.3.2 Bridges and structures

Castlereagh River crossing

The bridge over the Castlereagh River would be about 100 metres long and stand about 8.6 metres above the Castlereagh River. The bridge would be constructed from concrete and have three spans with four piers along the length. The piers of the new bridge will fall outside the Castlereagh River based on normal water levels. Each pier would be supported on three piles which would be bored into the bedrock.

The bridge would provide two lanes of road traffic (one lane each direction). Each lane would be 3.5 metres wide with a 2.5 metre wide shoulder and a 1.4 metre wide median. The bridge approaches would have minimum of 1:1.5 batters. Traffic barriers would consist of twin steel rails. The typical bridge cross section is shown in Figure 3-10.



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NO SCALE

Newell Highway Upgrade Coonabarabran Bypass REF

FIGURE 3-9: Typical road alignment cross-section

Figure 3-9: Typical road alignment cross section

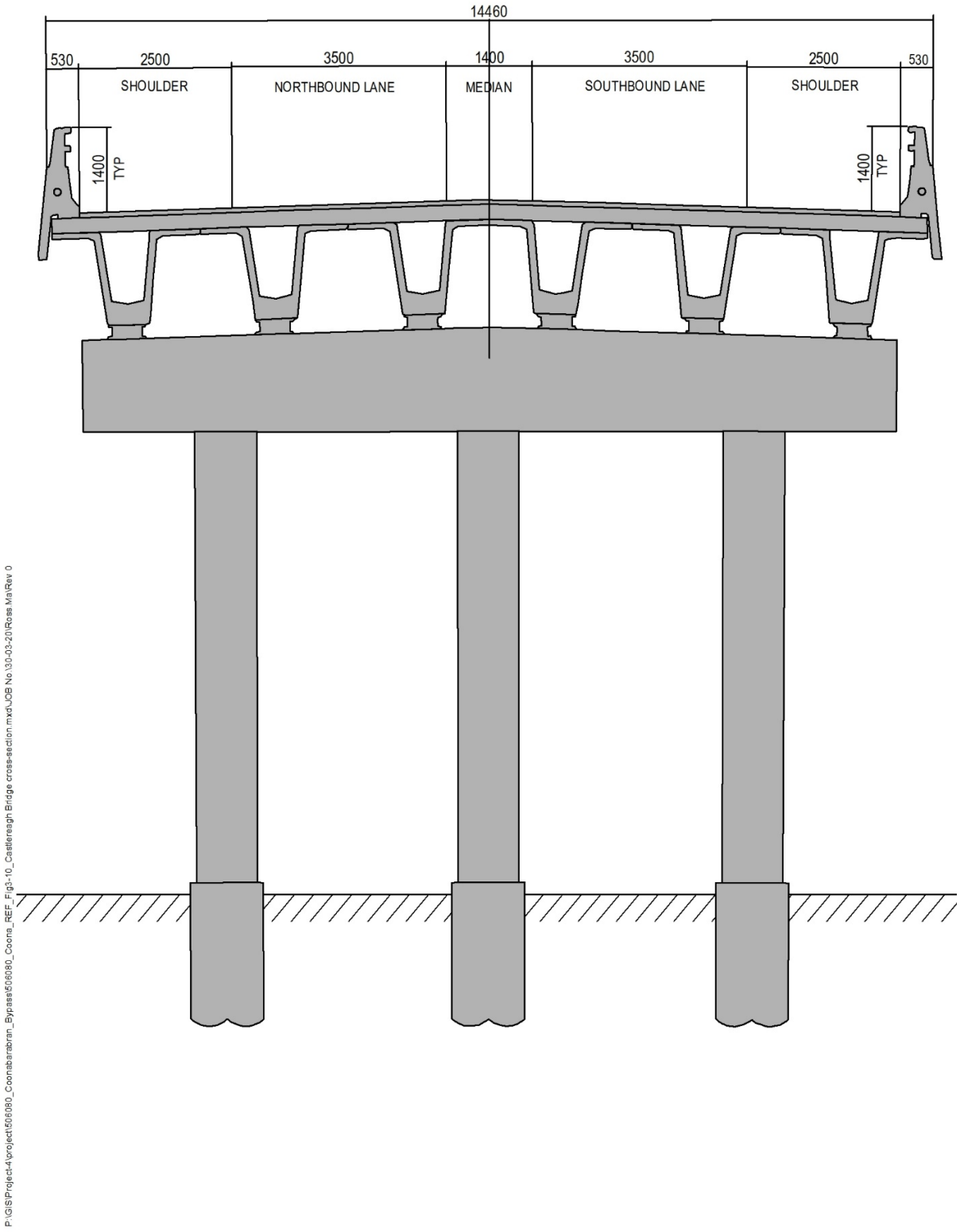


Figure 3-10: Castlereagh River bridge cross section

3.2.3.3 Intersections and local road adjustments

Northern intersection (Newell Highway / Oxley Intersection)

The northern intersection would be upgraded to a staggered T-intersection arrangement with separate access and exit ramps between the Newell Highway and Oxley Highway. The upgrade would be to the west of the existing Newell Highway / Oxley Highway T-intersection and would incorporate travel movements shown in Figure 3-1 and Figure 3-2. Access and exits turning left on and off the Newell Highway would be a posted speed of 60 kilometres per hour with a design speed of 70 kilometres per hour.

The design of the intersection would prioritise traffic travelling north-south along the Newell Highway, which is the dominant traffic movement, compared to the current intersection, where traffic on the Oxley Highway is prioritised. Traffic travelling east-west along the Oxley Highway would have to stop at the staggered T-intersections.

River Road

River Road would be upgraded to include a staggered T-intersection arrangement. The upgrade would be to the south of the existing River Road alignment and would incorporate travel movements shown in Figure 3-3 and Figure 3-4. Access and exits off the Newell Highway would be a posted speed of 60 kilometres per hour with a design speed of 70 kilometres per hour.

A section of River Road to the west of the Newell Highway would be realigned due to the staggered T-intersection. This would include the removal of a 260-metre section of pavement of the existing roadway. At the intersection of Newell Highway and River Road on the eastern site, a section of the existing rail line would be removed.

No change will be made to the classification of River Road and it is not expected that large heavy vehicles would access the highway from River Road.

Purlewaugh Road

Purlewaugh Road would be upgraded to include a staggered T-intersection arrangement. The upgrade would be to the south of the existing Purlewaugh Road alignment and would incorporate travel movements shown in Figure 3-6. Access and exits off the Newell Highway would be a posted speed of 60 kilometres per hour with a design speed of 70 kilometres per hour.

A section of Purlewaugh Road to the west of the Newell Highway would be realigned due to the staggered T-intersection. This would include the removal of a 460-metre section of pavement and culvert under the existing road.

The classification of Purlewaugh Road would be changed so that only up to semi-trailer size heavy vehicles, with a 42.5 tonne General Mass Limit (GML), would be able to travel along the road. Larger vehicles would access the highway at the northern and southern intersections.

Southern intersection

The existing Newell Highway would be upgraded to provide an intersection with the new Newell Highway. The upgrade would be to the east of the existing Newell Highway alignment and would incorporate travel movements shown in Figure 3-8. Access and exits off the new Newell Highway would be a posted speed of 60 kilometres per hour with a design speed of 70 kilometres per hour.

A turnoff lane would be provided for traffic travelling northbound into Coonabarabran on the existing Newell Highway. The turnoff lane would be a posted speed of 70 kilometres per hour with a design speed of 80 kilometres per hour. Within the

Coonabarabran town centre, there would be no changes to the posted speed limits (including school zones).

3.2.3.4 Pavement

Different pavement designs would be applied across the proposal. The main alignment would generally consist of a fit for purpose pavement (in accordance with the TfNSW design guidelines) with a nominal design life of 20 years. The pavement would likely consist of a bituminous sprayed seal over granular base layers. Pavement designs for intersections and local access roads would be suitable for the proposed traffic loading and may incorporate an asphalt wearing course or other bound pavement layers depending on the traffic loading and turning movements that are anticipated. These would have a design life of 20 years.

3.2.3.5 Drainage

An average recurrence interval (ARI) of 100 years has been adopted for the drainage design on Castlereagh River Bridge and a 20-year ARI for the road pavements.

Cross-drainage would be provided by culverts to transfer surface water under the road. Culverts would include box culverts and vary in size depending on the water flow and velocity and have generally been designed to follow existing waterways. To minimise potential for bank erosion, several culverts are positioned on a skewed alignment.

Pavement drainage including gutters (at intersections), pits and pipes would be provided to collect and convey storm water runoff from the road pavement. Longitudinal open drains at the top of cuttings, or a toe drain at the bottom of batters would be provided to direct surface runoff from the road pavements. Runoff would discharge to water quality devices before being released into the local receiving waterway.

Bridge deck drainage systems would discharge to the pavement drainage system and would avoid direct discharge into the watercourse. Piped drainage in the bridge superstructure would provide adequate drainage of surface water from the bridges.

Appropriate scour protection, including headwalls and rock mattresses, would be provided at inlets and outlets for all cross drainage and high flow pavement drainage features. Need and location of water quality devices including basins and gross pollutant traps (if required) would be determined during detailed design.

3.2.3.6 Stock underpasses

The proposal would include two stock underpasses (see Figure 3-4 and Figure 3-6):

- Chainage 4856: a private stock underpass to provide internal farm stock movement. The underpass would provide east-west passage under the highway. The stock underpass would be around three meters wide and three meters high.
- Chainage 2952: Travelling Stock Route (TSR) stock underpass to continue the use of the existing category 2 TSR. The underpass would provide east-west passage under the highway. Stock travelling east-west would be required to cross Purlewaugh Road on the eastern side of the highway to return to the Travelling Stock Route. The stock underpass would be around three metres wide and three metres high.

3.2.3.7 Earthworks

The proposal would require earthworks along the alignment to create the required cut and fill profile. The areas of cut and fill are shown in Figure 3-1 to Figure 3-8. Cuts would be between one and nine metres deep. Earthworks would be a maximum of around 14 metres high. Earthworks generally involve removal and temporary stockpiling of suitable material for fill and grading work elsewhere. Movement of materials between work sites would be required, from cutting, to fill and embankment areas, and batter treatments. The earthwork volumes are estimated in section 3.3.5 and will be confirmed during detailed design.

3.2.3.8 Road lighting

Coonabarabran is near Warrumbungle National Park and is Australia's first Dark Sky Park and the first in the southern hemisphere. As the proposal falls within a 50-kilometre radius of the Dark Sky Park, the *Dark Sky Planning Guidelines* (DPE, 2016) are applicable. TfNSW has been in consultation with the Siding Spring Observatory as part of the development of the REF and the concept design.

The proposal would not be lit along the entire length. Rather, lighting would be provided at the four intersections for safety purposes due to the change in road conditions and on the bridge structure.

As a result of the consultation and consideration of the guidelines, TfNSW will install specific lighting that meet the requirements of the guidelines and include use of light guards to minimise any light spilling upwards into the sky.

3.2.3.9 Property access

Where the proposal would interrupt access to properties, all properties would be provided with restored or new permanent access arrangements. Seven properties to the east of Newell Highway would be provided with alternative access off the Oxley Highway (Lot 232 DP 753378), River Road (Lots 8 and 9 DP 789103), Purlewaugh Road (Lot 1 DP 1184962, Lot 20 and 21 DP876036) and Newell Highway (Lot 504 DP 753378).

3.2.3.10 Utilities relocation

Based on available information and site investigations, there are limited services within the proposal area. There are overhead telecommunication lines near the large cuttings in the southern section of the alignment. These utilities may require relocation or protection during construction. Confirmation of the relocation of utilities and associated strategies would be carried out in consultation with utility authorities during detailed design.

3.2.3.11 Urban design

The concept landscape and urban design has been developed in accordance with Roads and Maritime's *Beyond the Pavement* (2014). The urban design objectives for the proposal are:

- **Objective 1:** Reinforce the vegetated character of the road corridor through the use of appropriate native and cultural planting
- **Objective 2:** Protect sensitive environments adjacent to the road corridor including endangered ecological communities, riparian crossings and local rural residential properties
- **Objective 3:** Promote, enhance and frame views out from the corridor to distant significant landscape context

- **Objective 4:** Ensure that the road corridor fits sensitively into the existing landscape, is well designed and contributes to the character and functioning of the area
- **Objective 5:** Contribute to the accessibility and connectivity of people within regions and local communities across all modes.

The urban design, landscape character and visual assessment is provided in Section 6.3 with the full assessment included in Appendix E.

3.2.3.12 Signage strategy

Signage along the alignment would be implemented in accordance with the TfNSW Bypassed Town signage initiative. This initiative uses image-based road signage to encourage travellers to stop and visit bypassed towns. Indicative photo signs have been developed and would be installed on the Newell Highway near the southern and the northern intersections to promote the town. These are shown in Figure 3-11.

Figure 3-11: Indicative photo signs

3.3 Construction activities

This section provides a summary of the likely construction methodology, work hours, plant and equipment, and associated activities that would be used during construction of the proposal.

3.3.1 Construction area

The construction area encompasses all areas required for construction of the proposal. The construction area generally comprises of a 15-metre buffer around the alignment and includes a number of ancillary facilities. Sections of the construction area have been reduced to a 5.5 metre buffer in environmentally sensitive areas. The total construction area is about 105.7 hectares.

The construction footprint is indicative only and would be subject to refinement during detailed design and construction. The construction area and key construction features are shown in Figure 3-12 and detailed in the following sections.

3.3.2 Work methodology

The proposal is expected to involve the following general work sequence:

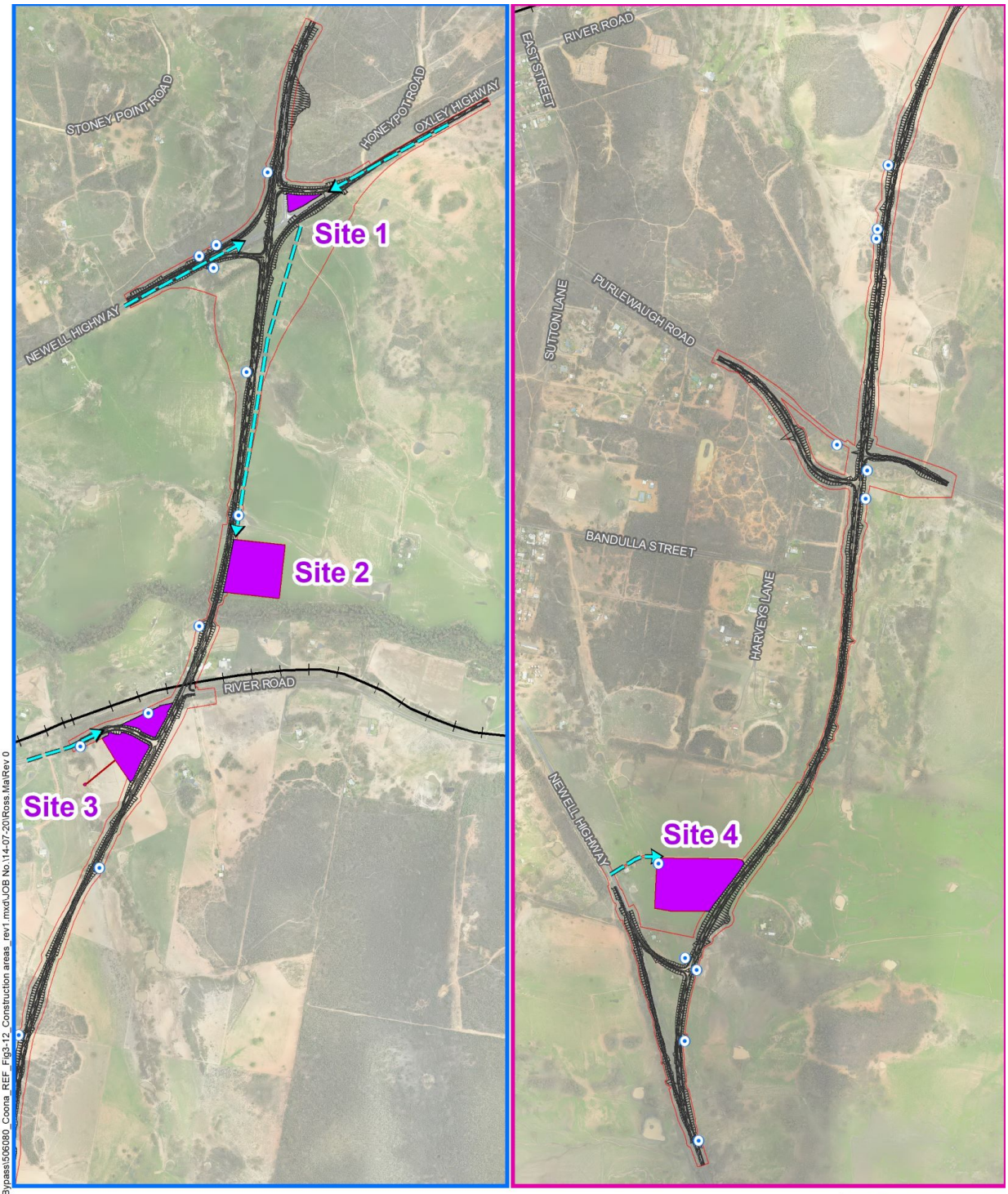
- Site establishment
- Earthworks
- Drainage, utilities and structures
- Pavement works
- Landscaping and finishing works.

The work methodology may be modified or refined during detailed design due to engineering constraints or to minimise environmental impacts, including:

- The identification and location of underground and overhead utilities and services
- On-site conditions identified during pre-construction activities
- Ongoing refinement of the detailed design
- Outcomes of community consultation, including submissions on the REF.

The detailed construction staging plans and methods would be developed as part of the detailed design and finalised by the construction contractor.

The potential works for each stage are listed in Table 3-4.



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Newell Highway Upgrade Coonabarabran Bypass REF

Projection: GDA 1994 MGA Zone 55

FIGURE 3-12: Construction areas

A construction environmental management plan (CEMP) would be developed for the proposal. The methods used would be consistent with TfNSW's commitments, statutory requirements, including work, health and safety (WH&S) regulations and all conditions of approval issued following determination of the proposal.

Table 3-4 Potential pre-construction and construction activities

Stage	Typical activities	Approximate duration
Pre construction works	• vegetation clearing and grubbing • adjustments and / or relocation of existing fencing.	12 weeks
Site establishment	• demolition of existing buildings • set-up of stockpile sites, ancillary facilities and fencing • temporary traffic management arrangements • progressive installation of environmental controls including environmental exclusion zones and erosion and sediment controls • construction of diversion drains and sediment control measures • temporary modification to existing local roads and construction of minor site access roads.	3 weeks
Earthworks	• clearing and grubbing of vegetation • stripping topsoil and stockpiling for reuse in landscaping • cut and fill activities to the road formation levels including trimming of batters • construction of the upper zone of formation layers as the foundation for the pavement structure • removal of unsuitable or surplus excavated materials to a suitable pre-determined on-site location, or alternatively a licenced off-site facility.	13 months
Drainage, utilities and structures	• construction of new utilities, as required • construction of subsurface drainage • construction of bridge structures, including foundations, abutments, substructure and superstructure • construction of cross drainage culverts, consisting of pipe or box culverts as appropriate • installation of stormwater pits and pipe networks as required • installation of scour protection as required.	13 months
Pavement	• construction of base and subbase layers as specified • construction of pavement drainage including kerb and guttering • placement of wearing course or sprayed seal as specified. • construction of road safety barriers (such as concrete barriers, wire rope fencing and guardrails).	4 months

Stage	Typical activities	Approximate duration
Landscaping and finishing works	• installation of road pavement markings, signposts, lighting and road furniture • placement of topsoil on batters • rehabilitation of disturbed areas and landscaping • construction of verges • reinstatement of fencing • site clean-up and demobilisation, including restoration of ancillary facilities and access roads.	3 months

Note: Construction stages may be carried out in a staggered approach, with some overlap. This will be confirmed during construction planning.

3.3.3 Construction hours and duration

Construction of the proposal is expected to take about 20 months to complete.

Construction hours would be in accordance with the *Construction Noise and Vibration Guidelines* (Roads and Maritime, 2016b) and the *Interim Construction Noise Guideline* (DECC, 2009). Standard construction hours would be:

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

It is expected that some work would be required outside standard hours. Any work outside the standard construction hours would be carried out in accordance with the *Construction Noise and Vibration Guidelines* (Roads and Maritime, 2016b) and would consider the *Dark Sky Planning Guideline* (DPE, 2006). The potential impacts of work outside of standard construction hours are assessed in Section 6.

Typical work activities completed outside standard hours would include:

- Changes to traffic management arrangements
- Construction of tie-ins encompassing utility, drainage and road surfacing works
- Transport of oversize materials and equipment to and from the construction area
- Large concrete pours.

3.3.4 Plant and equipment

The plant and equipment likely to be used in each construction phase is listed in Table 3-5. The final plant and equipment requirements would be identified by the construction contractor before starting construction.

Table 3-5: Indicative construction plant and equipment

Construction phase	Plant and equipment
Pre construction works	Light vehicles, medium to rigid trucks, dump truck, excavators, bulldozer, generators, traffic management devices, jack hammers, concrete saws, chainsaws, various hand tools, mulchers, chippers and water carts.
Site establishment	Light vehicles, medium to rigid trucks, concrete trucks, excavators, backhoes, graders, stabilisers, spreader trucks, various hand tools, generators, traffic management devices, jack hammers, concrete saws, concrete pumps, welding equipment, cranes and water carts.
Earthworks	Light vehicles, medium to rigid trucks, dump trucks, excavators, bulldozers, backhoes, graders, profilers, vibrating and smooth rollers, compactors, wacker packers, skid steer, various hand tools, generators, traffic management devices, jack hammers, mobile crushing plant and water carts.
Utility, drainage and structures	Light vehicles, medium to rigid trucks, dump trucks, concrete trucks, excavators, backhoes, trench rollers, wacker packers, generators, traffic management devices, concrete pumps, cranes, welding equipment, various hand tools, elevated work platforms, piling rigs, skid steer, pugmills and water carts.
Pavement works	Light vehicles, medium and large heavy vehicles, graders, backhoes, paving machines, skid steer, vibrating and smooth drum rollers, wacker packer, profiler, spray seal truck, shuttlebuggy, asphalt paver, various hand tools, compactors, generators, traffic management devices, mobile batch plants, slip form machines, welding equipment and water carts.
Landscaping and finishing works	Light vehicles, medium to rigid trucks, backhoes, excavators, generators, traffic management devices, linemarking machines, water carts, skid steer, auger drill, various hand tools.

3.3.5 Earthworks

Earthworks would be required along the length of the alignment at varying degrees to create the required cut and fill profile. Earthworks generally involve removal and temporary stockpiling of suitable material for fill and grading work elsewhere. Movement of materials within the construction area would be required, from embankment cuttings to embankment fill areas including batter treatments.

The estimated quantities of materials associated with the earthworks are provided in Table 3-6. The final earthwork requirements would be confirmed during detailed design.

Table 3-6: Estimated earthworks balance

Material type	Volume (cubic metres)
Material from excavations (cut)	313,321
Material required for embankments and new road alignment (fill)	376,004
Total deficit cut to fill	313,321
Imported fill	52,683

Excavated materials would be managed and stored (stockpiled) in accordance with TfNSW protocol. This would include the testing and classification of material in accordance with the *Waste Classification Guidelines* (DECCW, 2014). Surplus material that cannot be used on-site or on adjacent projects would be classified in accordance with the *NSW EPA Waste Classification Guidelines* (EPA, 2014) and disposed of at an approved materials recycling or waste disposal facility.

3.3.6 Source and quantity of materials

Various construction materials that are readily available across NSW would be needed to build the proposal. Certain design components, such as the drainage infrastructure and structural bridge components would arrive pre-formed, while other materials, such as stone and aggregate, would be delivered to one of the site compounds.

Materials required would include:

- Earthworks and road base materials such as sand, soil, stone and aggregate
- Road pavement materials such as gravels, bitumen and asphalt
- Kerbing, drainage infrastructure (pipes, pits and culverts) and safety barriers
- Reinforcing steel, concrete, concrete girders, concrete parapets, steel railings, signage, lighting posts and fencing
- Landscaping materials including trees, seedlings, chippings, topsoil and turf.

The indicative quantities of key construction materials are listed in Table 3-7, however these quantities will be revised during detailed design. It is expected that materials would be sourced from appropriately licenced commercial suppliers in nearby areas. None of the materials are considered to be in short supply.

Table 3-7: Indicative quantities and sources of construction materials

Material type	Quantity
Precast concrete	5600 tonnes
Insitu cast concrete	1850 m^3
Steel (for barriers and reinforcement)	30 tonnes
Asphalt	2695 m^3
Road base	74,300 m^3

Sourcing and reduction of materials would be considered in conjunction with other projects within the Newell Highway Upgrade Program. Surplus material that cannot be used on-site or on nearby projects would be classified in accordance with the *NSW EPA Waste Classification Guidelines* (EPA, 2014) and disposed of at an appropriately licenced facility.

Water would be required for plant operations for pavement and/or asphalt production, road formation and earthworks, all concrete works including curing, dust suppression, landscape work, maintenance of plant and equipment and staff amenities. The amount of water required for construction would depend on the material sources and methodologies chosen by the construction contractor. It would likely be sourced from groundwater bores.

Installation of any new boreholes would require a Water Supply Works Approval under the *Water Management Act 2000* obtained from NSW Department of Primary Industries (Water) (refer to Section 4.3.4). Any water extraction would be monitored in accordance with the *NSW Water Extraction Monitoring Policy* (2007).

3.3.7 Traffic management and access

The proposal would require light and heavy construction vehicle movements mainly associated with:

- Delivery of construction materials including concrete and precast structural components
- Movement of cut and fill materials
- Spoil and waste removal
- Delivery, relocation and removal of construction equipment and machinery
- Workers travelling to, from and within the construction site.

Construction vehicles would access the site via the Newell Highway, Oxley Highway, Purlewaugh Road and River Road. Employee vehicles would park at one of the main compound sites.

Indicative construction traffic movements and timings for the proposal are listed in Table 3-8. Final numbers would be confirmed during detailed design.

Table 3-8 Indicative construction vehicles

Vehicle types and association		Use	Vehicles (daily)		Typical movement pattern
			Average	Maximum	
Trucks	Medium to rigid trucks. Typically, up to 12.5 metres, 30 tonnes general mass limit (GML)	Earthworks (cut and fill) Delivery for: • Aggregate • Road base • Sand • Asphalt • Cement • Fly ash • Precast concrete	80	120	During standard construction hours and outside hours where required.
	Semi-trailers Typically, 19m 42 tonnes GML	Steel Prefabricated units Oversized units	About 60 over construction		
	Incidental vehicles	Various	2	5	
Light vehicles	Workforce/ personnel	N/A	90	260	
	Incidental deliveries	Various	2	5	

Most of the works would be in greenfield areas and would not require road closures. Traffic management measures including temporary access tracks and contraflows would be implemented where required and a Road Occupancy Licence (ROL) obtained prior to any road or lane closures.

Access to properties would be maintained for the full duration of works. Any temporary and permanent adjustments would be carried out in consultation with landholders.

A traffic management plan would be prepared for the proposal in accordance with the *Traffic Control at Worksites Manual* (Roads and Maritime, 2018d), providing details of traffic management to be implemented during construction. Temporary traffic management measures would be implemented at various stages and may include:

- Modifying lane widths to facilitate the safe entry, exit and movement of plant and materials and allow construction staging close to the existing road
- Installing separation barriers to separate live traffic from the work site
- Reducing traffic speed where road conditions are adversely modified by construction work
- Narrowing the road shoulder so that road tie-ins can be completed
- Managing traffic around the construction areas (which would include contraflows)

3.4 Ancillary facilities

A range of ancillary facilities would be required to support construction including:

- Site compounds that incorporate site offices, car parking, sheds, workshops and storage
- Areas for the delivery and storage of prefabricated items such as pits, pipes, culverts, girders, parapets and other structural components
- Concrete and asphalt batch plants
- Pugmills
- Sediment basins
- Stockpiles for materials, spoil and mulch

Ancillary facilities would be temporary and established for the duration of the construction only and secured with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of the construction works, the temporary ancillary facility, construction area and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated in consultation with the land owner.

The locations of the four ancillary facilities are shown in Figure 3-12 and detailed in Table 3-9. The construction contractor would further review these sites for their suitability prior to construction. The locations of the facilities were identified based on the following criteria:

- Located adjacent to the proposal
- Good access to existing roads
- Located on land with low Aboriginal heritage significance
- Located on previously cleared areas

- Located at least 100 metres from residential dwellings
- Located above the 20-year average recurrence interval (ARI) flood level
- Located more than 40 metres from a watercourse
- Located on relatively flat ground.

Should additional or alternative ancillary facilities be identified during detailed design and construction planning, the location of the facilities would need to meet the above criteria. The new location would be subject to further assessment to demonstrate that any environmental impacts have been minimised.

Initial works at these sites would be required in early construction phases (refer to Section 3.3). Stockpile sites would be managed in accordance with *Stockpile site Management Guidelines* (Roads and Maritime, 2015) and *QA Specification R44 Earthworks* (Roads and Maritime, 2013b).

Table 3-9: Ancillary facilities

Characteristic	Site 1	Site 2	Site 3	Site 4
Location	North-east of the Newell Highway / Oxley Highway intersection	North-east of the proposed bridge over Castlereagh River	South-west of the proposed River Road intersection	North of the proposed southern intersection with the Newell Highway
Existing site description	The site is in the existing road reserve comprising grassland, cleared of trees	The site is in a paddock, cleared of trees. It is about 100 metres north of Castlereagh River	The site is in a paddock, cleared of trees. It is about 140 metres east of Chinamans Gully	The site is in a paddock, cleared of trees
Potential use	Satellite compound including offices, sheds, storage and parking	Bridge compound including offices, sheds, storage, parking, delivery and storage of bridge structural elements and stockpiling of materials, spoil and mulch	Stockpiling compound including parking, delivery and storage and stockpiling of materials, spoil and mulch	Main compound site including offices, sheds, storage, parking, delivery and storage of structural elements, stockpiling of materials, spoil and mulch, concrete and asphalt batch plants
Access road	Via Newell Highway / Oxley Highway and the proposed road reserve (construction area)	Via the Oxley Highway and the proposed road reserve (construction area)	Via River Road and the proposed road reserve (construction area)	Via the Newell Highway and existing property access
Approximate area	1.4 hectares	3.8 hectares	1.5 hectares	4.2 hectares

Characteristic	Site 1	Site 2	Site 3	Site 4
Existing land ownership	NSW Government	Private	Private	Private
Distance from nearest sensitive receiver	About 500 metres east of a residential property	About 250 metres north of a residential property	About 150 metres to the north west of a residential property	About 110 metres to the north east of a residential property. However, access traverses immediately adjacent to sensitive receivers.

3.5 Public utility adjustment

Existing utilities have been identified and located as part of the development of the concept design to incorporate utility authority requirements for relocations and/or adjustments. Preliminary investigations identified that some telecommunications utility assets may be affected by the proposal. These utilities may need to be relocated or protected during construction. Confirmation of the relocation of utilities and associated strategies would be carried out in consultation with utility authorities during detailed design.

3.6 Property acquisition and adjustments

The proposal is mostly located on private land but would also impact on existing NSW Government and Crown land.

Land would need to be permanently acquired from the Crown land and private owners to build the proposal. TfNSW would also need to temporary lease or agree access over land for construction. While the final land purchase would be confirmed during the detailed design, it would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991*, the supporting NSW Government Land Acquisition Reform 2016.

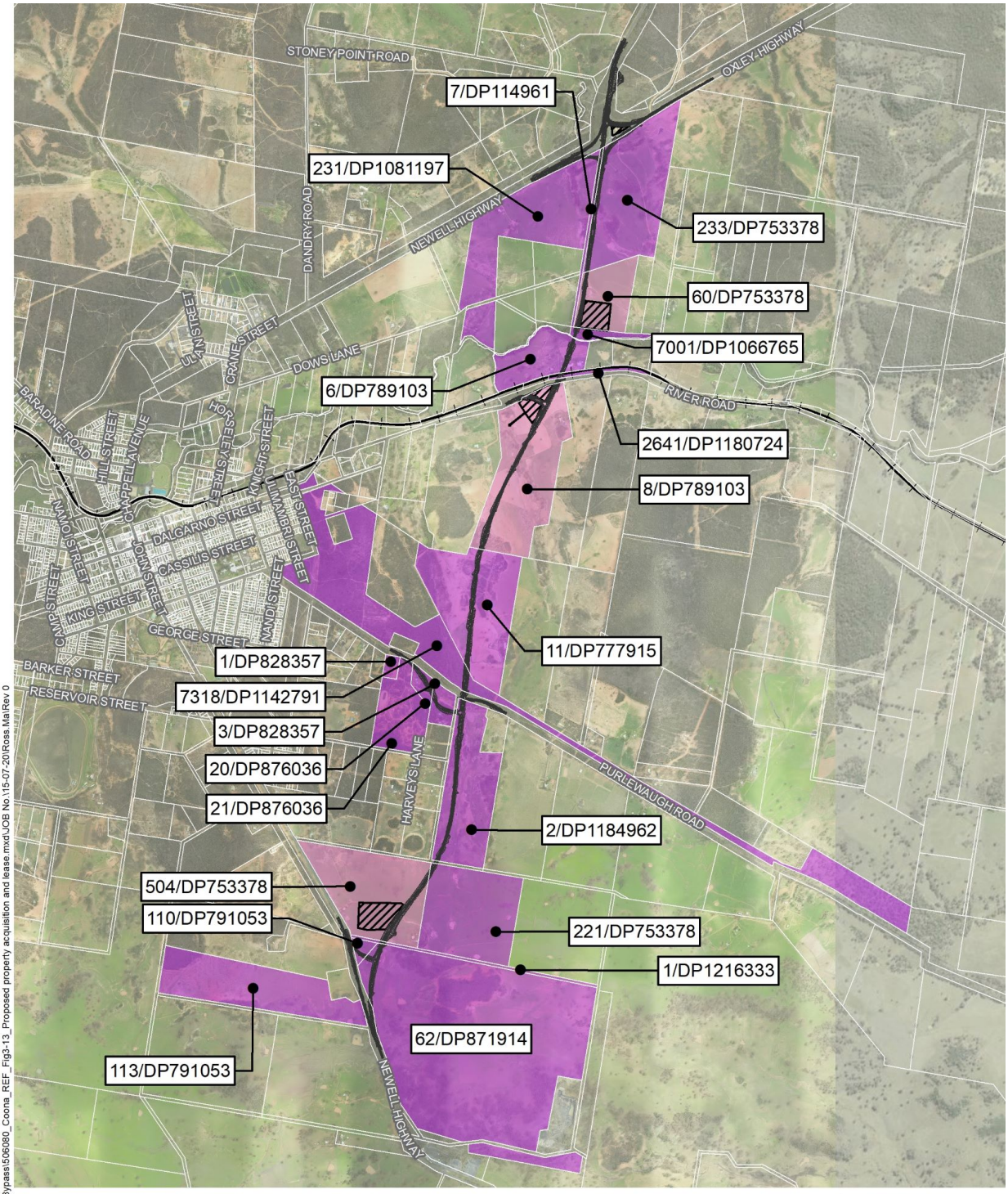
Leased land would be rehabilitated (in consultation with the owner) and returned to the property owner at the end of construction.

Estimated property acquisitions are listed in Table 3-10 and shown in Figure 3-13.

Table 3-10: Property acquisition and leases

Lot/ DP	Minimum area (ha)	Acquisition type	Current owner
1/DP1216333	0.14	Partial acquisition and lease	Private
11/DP777915	3.19	Partial acquisition	Private
113/DP791053	0.01	Partial acquisition	Private
2/DP1184962	3.97	Partial acquisition	Private
20/DP876036	0.91	Partial acquisition	Private
21/DP876036	0.17	Partial acquisition	Private
221/DP753378	0.32	Partial acquisition	Private
231/DP1081197	0.27	Partial acquisition	Private
233/DP753378	3.41	Partial acquisition	Private
2641/DP1180724	0.16	Partial acquisition	NSW Government
1/DP828357	0.01	Partial acquisition	Private
3/DP828357	0.75	Partial acquisition	Private
504/DP753378	9.05	Partial acquisition and lease	Private
6/DP789103	0.97	Partial acquisition	Private
60/DP753378	1.7	Partial acquisition and lease	Private
62/DP871914	1.85	Partial acquisition	Private
7/DP114961	0.61	Partial acquisition	Private
7001/DP1066765	0.22	Partial acquisition	Crown
7318/DP1142791	0.75	Partial acquisition	Crown
8/DP789103	11.79	Partial acquisition and lease	Private

Property acquisition includes a 1.2-hectare section of a Travelling Stock Route (TSR) north of Purlewaugh Road. A stock underpass as described in Section 3.2.3.6 would be implemented under the Newell Highway to enable passage along the TSR. TfNSW would continue to consult with Local Land Services during detailed design to minimise impacts.



Newell Highway Upgrade Coonabarabran Bypass REF

FIGURE 3-13: Proposed property acquisition and lease

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 *Environmental Planning and Assessment Act 1979* (EP&A Act) provides a statuary basis for planning and environmental assessment in NSW. The EP&A Act provides a framework for environmental planning and development approvals and includes provisions to ensure that the potential environmental impacts of a development are assessed and considered in the proposal approval process. The proposal is subject to assessment under Division 5.1 of the EP&A Act.

4.2 State Environmental Planning Policies

4.2.1 State Environmental Planning Policy (Infrastructure) 2007

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

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road bypass and road infrastructure facilities and is to be carried out on behalf of TfNSW, it can be assessed under Division 5.1 of the EP&A Act. Development consent from Council is not required.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under *State Environmental Planning Policy (Coastal Management) 2018*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (State Significant Precincts) 2005*.

Part 2 of ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to starting certain types of development. Consultation, including consultation as required by ISEPP, is discussed in Chapter 5 of this REF.

4.2.2 Koala Habitat Protection SEPP

State Environmental Planning Policy Koala Habitat Protection SEPP (Koala Habitat Protection) became operational in March 2020 to replace the previous State and Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44). The Koala Habitat Protection SEPP encourages the conservation and management of koala habitat to ensure populations remain in their present range and the trend of population decline is reversed.

The SEPP (Koala Habitat Protection) aims to encourage the ‘proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline’.

The proposal is within the Warrumbungle Shire Council LGA which is listed under Schedule 1 of the SEPP (Koala Habitat Protection) as part of the northwest slopes Koala Management Area.

The SEPP (Koala Habitat Protection) only applies to developments under Part 4 of the EP&A Act, specifically excluding Part 5 activities. Therefore, SEPP (Koala Habitat Protection) is not applicable to the proposal. Nevertheless, the potential for koala habitat within the proposal area is discussed in Section 6.1.

4.2.3 Local Environmental Plans

4.2.3.1 Warrumbungle Local Environmental Plan 2013

The proposal is within the Warrumbungle Shire Council local government area, which is subject to the *Warrumbungle Local Environmental Plan 2013* (LEP). Local development control, and land use zoning and planning in the LGA is governed under the LEP and supporting development controls plans (DCPs). As the proposal is permitted without consent under the ISEPP (refer to Section 4.2), the consent requirements of the LEP do not apply to the REF. The proposal would not impact any specific provisions of the LEP which could be considered relevant to the proposal.

Consultation carried out for the proposal as required by the ISEPP is discussed further in Section 5.45.4.

Table 4-1 outlines the land use zones within the study area and the consistency of the proposal with the objectives of each zone. Further details on land use are provided in Section 6.4.

Table 4-1 Consistency of proposal with LEP zones

Zone	Objectives of zone	Consistency of proposal with objectives
SP2 – Infrastructure	• to provide for infrastructure and related uses • to prevent development that is not compatible with or that may detract from the provision of infrastructure • to recognise existing railway land and to enable future development for railway and associated purposes • to recognise major roads and to enable future development and expansion of major road networks and associated purposes • to recognise existing land and to enable future development for utility undertakings and associated purposes.	• The proposal would be consistent with the zone objectives as it is major road infrastructure.

Zone	Objectives of zone	Consistency of proposal with objectives
RU1 – Primary Production	• to encourage sustainable primary industry production by maintaining and enhancing the natural resource base • to encourage diversity in primary industry enterprises and systems appropriate for the area • to minimise the fragmentation and alienation of resource lands • to minimise conflict between land uses within this zone and land uses within adjoining zones.	• the proposal would not be consistent with the zone objectives to maintain and enhance natural resources or to encourage diversity in primary industry. The proposal would partially fragment the existing zone by the construction of a new highway • the proposal would aim to minimise impacts to surrounding primary industry production by minimising the construction impact area and providing intersections with crossroads.
R1 – General Residentials	• to provide for the housing needs of the community. • to provide for a variety of housing types and densities. • to enable other land uses that provide facilities or services to meet the day to day needs of residents.	• the proposal would not be consistent with the zone objectives to provide housing to the community.
RU5 – Large Lot Residential	• to provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality. • to ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future. • to ensure that development in the area does not unreasonably increase the demand for public services or public facilities. • to minimise conflict between land uses within this zone and land uses within adjoining zones.	• the proposal would not be consistent with the zone objectives to provide housing. • this REF assesses the potential impacts on environmentally sensitive areas and scenic quality and provides safeguards to minimise potential impacts.

4.3 Other relevant NSW legislation

4.3.1 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) became operational in August 2017 to replace the *Threatened Species Conservation Act 1995*. The BC Act promotes the maintenance of a healthy, productive and resilient environment. The BC Act focuses on biodiversity conservation through ecologically sustainable development.

The BC Act applies to the proposal through the requirement to avoid, minimise and offset the impacts of proposed development and land use changes on biodiversity. The proposal would consider potential impacts to biodiversity values and biodiversity and the need for any biodiversity offsets.

The biodiversity assessment report (Appendix C) carried out for this assessment is summarised in Section 6.1 and has considered ecologically endangered communities and threatened species that have a likelihood of or were found to be present in the proposal area. The assessment concluded that as there would be no significant impact to any BC Act listed biodiversity.

4.3.2 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. Part 7A, Division 4 of the FM Act prohibits, without a licence or permit, activities that damage habitats or harm threatened species, populations or ecological communities.

The proposal would impact the Castlereagh River which is an identified 'Key Fish Habitat' under the FM Act. If any temporary in-stream structures are required during construction, works may be considered to be 'reclamation work' in accordance with the definition at s198A of the FM Act. However, Section 199 of the FM Act states that an approval is not required for a public authority to undertake dredging or reclamation work. The public authority is required to give the Minister written notice of the proposed work and consider any matters received from the Minister within 21 days after giving the notice.

Should fish passage be obstructed (temporary or permanent) in Key Fish Habitat, a permit would be required under section 219 of the FM Act. While TfNSW would endeavour to maintain fish passage during construction and operation, should this not be possible, DPI Fisheries would be consulted during the detailed design phase.

4.3.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) aims to protect, restore and enhance the quality of the environment in NSW, reduce the risks to human health and prevent degradation to the environment. The POEO Act outlines offences relating to land, water, air and noise pollution and includes a duty to report pollution incidents.

Under the provisions of the POEO Act, TfNSW is required to notify the EPA if a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.

Under Part 3.2 of the POEO Act, an environmental protection licence is required for scheduled activities or scheduled development work as defined in Schedule 1. Schedule 1, Clause 35 (road construction) is relevant to the proposal. Road construction is defined by Clause 35(1) as '…*the construction, widening or re-routing*

of roads, but does not apply to the maintenance or operation of any such road'. Road construction is considered a scheduled activity under Clause 35(3)(a)(ii) where extraction of more than 150,000 tonnes of materials is proposed over the life of the proposal.

The proposal is expected to require extraction of about 313,000 cubic metres of material. This would require the proposal to be carried out under an environmental protection licence, which would be held by the construction contractor.

4.3.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) aims to provide for the sustainable and integrated management of the water sources of the State for the benefit of present and future generations. The proposal is located within the area of the Castlereagh River above Binnaway Water Source.

Section 56 of the WM Act establishes access licences for the take of water within a particular water management area. Under Clause 21(1) of the *Water Management (General) Regulation 2018* (Water Management Regulation) and Schedule 4, Part 1, TfNSW, 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 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).

A water supply work approval is required to construct and use a specified water supply work at a specified location. Therefore, a water supply work approval would be required to construct a new bore if required as a construction water source. However, under Clause 39A of the Water Management Regulation, the Minister can grant a public authority an exemption in conditions of drought. TfNSW would seek a water supply work approval, or exception if a new bore is required. Any water extraction would be monitored in accordance with the *NSW Water Extraction Monitoring Policy* (2007).

'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 41 of the Water Management Regulation, exempts public authorities such as TfNSW from Section 91E(1) of the WM Act in relation to all controlled activities that they carry out in, on or under waterfront land.

Under the NSW Aquifer Interference Policy, the proposal is exempt from requiring an aquifer interference approval. Section 3.3 of the policy states that cuttings, 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.

An assessment of the potential impacts to surface water and groundwater and measures to manage potential impacts are discussed in Section 6.8.

4.3.5 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to promote an understanding and encourage the conservation of state heritage, provide identification and registration of state heritage significance and assist owners with conservation of items of state heritage significance. Heritage conservation includes basic protection against indiscriminate damage, demolition of buildings and sites, and restoration and enhancement of heritage sites.

A heritage assessment (Appendix J) was completed to inform the REF and is summarised in Section 6.8. No items listed on the State Heritage Register or on a register under Section 170 of the Heritage Act were identified within the proposal area.

4.3.6 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the basis for legal protection and management of National Parks estates and Aboriginal sites and objects in NSW. The purpose of the NPW Act is the conservation of:

- Nature, including habitat, ecosystems, biological diversity, landscapes and landforms
- Objects, places or features of cultural value within the landscape including:
    - Places, objects and features of significance to Aboriginal people
    - Places of social value to the people of NSW
    - Places of historic, architectural or scientific significance.

The NPW Act sets out permits and consent requirements should Aboriginal heritage items and/or places be affected. There are a number of Aboriginal heritage items located near the proposal area. A heritage assessment (Appendix J) was completed to inform the REF and is summarised in Section 6.8. The assessment concluded that the proposal would be unlikely to impact Aboriginal cultural heritage values and that an AHIP will not be required.

There are no National Parks or nature reserves within the proposal area.

4.3.7 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) covers all biosecurity risks, including pest animals, plant diseases and noxious weeds and introduces the legally enforceable concept of a General Biosecurity Duty.

As outlined in Section 6.1 of this REF, a number of invasive species are present in the proposal area. Management measures have been recommended to manage these weed species in accordance with the requirements of the Biosecurity Act.

4.3.8 Land Acquisition (Just Terms Compensation) Act 1991

The *Land Acquisition (Just Terms Compensation) Act 1991* (Land Acquisition Act) applies to the acquisition of land (by agreement or compulsory process) by a public authority authorised to acquire the land by compulsory process. It provides a

guarantee that, when a public authority requires the acquisition of land, the amount of compensation would not be less than the market value of the land.

The Land Acquisition Act applies to the acquisition of any land required for the proposal. Property acquisition is further discussed in Section 6.4.

4.3.9 Crown Land Management Act 2016

The *Crown Land Management Act 2016* provides the legislative framework for the administration of land that is vested in the Crown in NSW. Ministerial approval is required to grant a lease, licence, permit, easement or right of way over a Crown Reserve.

Acquisition and leasing of Crown land, including a section of Travelling Stock Route (TSR) would be required for the proposal (land acquisition details are provided in Section 3.6. TfNSW has consulted with Local Land Services regarding impacts to the TSR (refer to Section 5.5).

TfNSW would require approval for the Department of Planning Industry and Environment for the acquisition and leasing of Crown land.

4.3.10 Local Land Services Act 2013

The *Local Land Services Act 2013* (LLS Act) provides a statutory corporation of several organisations (together known as Local Land Services) for the integrated management and delivery of local land services including TSRs. Across NSW there are 11 Local Land Services, the proposal is within the Central West Local Land Service.

The proposal would cross a section of TSR which would require partial acquisition and re-routing of stock passage. The Local Land Service does not have the delegated powers to allow the TSR to be developed as a road. This authority rests with the Department of Planning Industry and Environment under the *Crown Land Management Act 2016.* Nonetheless, the Central West Local Land Service remains a key stakeholder that has been consulted and will continue to be consulted as the proposal is developed (refer to Section 5).

4.3.11 Surveying and Spatial Information Act 2002

The *Surveying and Spatial Information Act 2002* (SSI Act) provides a framework for the integrity, coordination and maintenance of cadastral and spatial data. It also provides for the registration of land and mining surveyors.

The SSI Act applies to the blaze tree identified near the southern intersection (refer to Section 6.8). Section 24(1) of the SSI Act states that a person must not remove, damage, destroy, displace, obliterate or deface any survey mark unless authorised to do so by the Surveyor General. Before the removal of the tree, TfNSW must obtain approval from the Land and Property Information (LPI) Survey Services.

4.3.12 Transport Administration Act 1988

Transport infrastructure and services in New South Wales are governed by the *Transport Administration Act 1988*, including railway lines such as the disused and non-operational Gwabegar railway line.

The Gwabegar rail line passes through Coonabarabran and the proposal area. However, this rail line has not been in use for many years and has been classified as non-operational. It is understood that the likelihood of this rail line becoming operational again is low, particularly following the Deputy Prime Minister's announcement of Federal Government funding of a study to connect the Baradine silos into the Inland Rail project.

Section 99A of the Transport Administration Act confirms that closing and disposing of rail lines can only be carried out by:

- An Act of Parliament,
- Ministerial Gazettal (for rail lines in the Greater Metropolitan Region), or
- By making an order (for construction of State significant infrastructure).

In addition, a railway line is not closed if the rail infrastructure owner has entered into a lease or arrangement for activities within the corridor.

TfNSW consider the proposal could be constructed under an arrangement with the rail infrastructure owner without closing the rail line. Additional discussions will be held with the rail infrastructure owner to clarify the arrangement during later stages of the proposal.

4.3.13 Rail Safety National Law (NSW) No 82a 2012

The Rail Safety National Law (NSW) No 82a 2012 governs safe railway operations in New South Wales. The Rail Safety National Law is a national standard legislation with each state and territory having its own relevant sub legislation and is administered by the Office of the National Rail Safety Regulator (the ONRSR). Design requirements for the rail components have been included to ensure safe operation of any future rail infrastructure.

When works are being carried out in the Gwabegar railway corridor, this legislation may need to be considered and applied.

4.4 Commonwealth legislation

4.4.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and Section 6.1 of the REF.

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

However, potential impacts to these biodiversity matters are also considered as part of Section 6.1 of the REF and Appendix A.

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. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy under the EPBC Act.

4.5 Confirmation of statutory position

The proposal is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of ISEPP, the proposal is permissible without consent. The proposal is not State significant infrastructure or State significant development. The proposal can be assessed under Division 5.1 of the EP&A Act.

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

Licences, approvals and notification required for the proposal are described in Section 4 and summarised in Table 7-2.

5 Consultation

This chapter discusses the consultation that has occurred to date for the proposal and the consultation proposed for the future.

5.1 Consultation strategy

A community consultation and stakeholder engagement plan (Roads and Maritime, 2019b) was prepared and implemented to guide consultation activities. The communications plan identifies key objectives and outcomes of consultation activities with the community, stakeholders and government agencies. The community consultation and engagement objectives for the proposal are to:

- Introduce the proposal to the stakeholders and community and build relationships
- Introduce the proposal team to the stakeholders and community, including a central point of contact
- Explain the need for the upgrade and key features and benefits
- Outline how stakeholders and the community can participate in the proposal and how their input will be used in decision making
- Explain the decision making process from this point onwards, articulate key proposal milestones, and communicate clearly as to when the community will have the opportunity to provide feedback
- Demonstrate an understanding of community concerns and values
- Ensure issues relating to the proposal are identified early and effectively managed
- Ensure stakeholders and the community are kept informed of the proposal as it develops through the timely provision of appropriate and accessible information
- Manage stakeholder and community feedback and complaints in a timely, respectful way
- Monitor and evaluate stakeholder and community feedback to measure success and review planning and delivery as necessary
- Build stakeholder and community confidence in TfNSW and leave a positive legacy to enhance TfNSW's reputation and relationship with the community
- Effectively and sensitively engage with affected property owners, working together to manage proposal impacts satisfactorily.

Consultation was carried out with directly and indirectly affected landowners, interested local individuals, the Aboriginal community, and the wider community. Consultation also included the involvement of local interest groups, Warrumbungle Shire Council and State government agencies. A summary of consultation activities carried out to date is provided in Section 5.2.

5.2 Community involvement

5.2.1 Community consultation activities

5.2.1.1 Previous investigations

A bypass of the Newell Highway at Coonabarabran has been considered since the early 1990s. The following concerns were identified from community and stakeholder feedback at that time and have been considered in the development of the current proposal (Roads and Maritime, 2019b):

- The local community wanted the bypass to improve safety in the town as heavy vehicles are a hazard to other road users and pedestrians
- Given the long history and minimal progress of the Coonabarabran bypass, the community may be distrusting of TfNSW and/or other organisations and withdraw from engagement.

5.2.1.2 Newell Highway Corridor Strategy

The community consultation report for the Newell Highway Corridor Strategy (TfNSW, 2015) summarised the feedback provided by the community in response to the public exhibition of the draft strategy between May 2014 and June 2014. In total, TfNSW received 25 submissions on the draft strategy. Outcomes of this consultation supported the early development of the proposal.

5.2.1.3 Route options

Community consultation was carried out between 13 May and 13 June 2019 to inform the community and stakeholders of the three shortlisted route options, invite feedback and gather local knowledge to help with the selection of a preferred bypass route (Roads and Maritime, 2019b). Community members were encouraged to provide their feedback, leave comments and make submissions through a range of communication channels including information sessions, an online survey, mail, email, Warrumbungle Shire Council office or calling the proposal team.

The key consultation tools used were:

- Community updates
- Community information sessions
- Emails, phone calls and door knocking to key stakeholders
- Print, broadcast and social media advertisements
- Frequently asked questions document
- A5 postcards.

During this period there were 302 submissions received including:

- 282 online submissions
- 18 email and post submissions
- A submission from a Member of Parliament
- A submission from Warrumbungle Shire Council.

Key issues raised are summarised in Table 5-1.

5.2.1.4 Concept design and REF

TfNSW has involved the community during the concept design planning phase and the REF preparation phase of the proposal. Consultation activities have been carried out during the preparation of the concept design and REF, including:

- Community update identifying the outer bypass to the east as the preferred option in October 2019
- Operation of a dedicated proposal phone number and email address to allow the community to ask questions and provide feedback
- Meetings with land owners and local businesses in 2019 and 2020
- Frequently asked questions document in February 2020
- Consultation with government agencies in 2019 and 2020 (refer to Section 5.5).

Key issues raised during this phase are summarised in Table 5-1.

5.2.1.5 Business and shopper survey

Business and shopper surveys were carried out in Coonabarabran between 6 February and 8 February 2020 to understand business and shopper behaviour and the community sentiment towards the proposal. Surveys were provided to:

- 111 businesses
- The Chamber of Commerce
- Warrumbungle Shire Council.

Completed surveys were received from 35 businesses and 25 shoppers. Details of the findings of the business and shopper survey are provided in more detail in Section 6.4 and Appendix G. Key issues raised during this phase are summarised in Table 5-1.

5.2.2 Summary of community consultation activities

A summary of the key issues raised by the community during the community consultation activities is provided in Table 5-1. The summary outlines how they are relevant to the proposal, and how they have been addressed in the REF.

Table 5-1: Summary of issues raised by the community

Category	Issue raised	Response / where addressed in REF
Route options		
Design and proposal scope	Option 1 would keep the town alive with passing traffic and attract tourism Option 2 would divert heavy vehicles from the town centre while still maintain access for travellers to ensure the town attracts business and tourism.	Option 3 was found to be the best performing option across various factors. Refer to Section 2 for analysis of options.

Category	Issue raised	Response / where addressed in REF
Design and proposal scope	An overpass should be built at the intersection of the Newell Highway and Oxley Highway	A grade separated interchange at the Newell Highway / Oxley Highway intersection was considered during the design development, however, traffic volumes did not warrant a grade separated interchange at this stage. Yet, the design does not preclude the development of a grade-separated interchange at a later stage as the construction area is large enough to encompass an interchange. The environmental assessment in Section 6 has considered potential impacts to the whole construction area.
Traffic and road condition	Concern over the road condition in town	The proposal would minimise heavy vehicles in town, thus reducing road damage and improving road safety. Refer to Section 6.5.
Traffic and road condition	Impact on parking and traffic congestion along the main street	The proposal would minimise heavy vehicles in town, improving road safety by removing through and local traffic conflicts. Refer to Section 6.5.
Traffic and road condition	Impacts at intersections at Purlewaugh Road and River Road	The intersections would be upgraded to staggered-T intersections for road safety, while maintaining east-west movements. Refer to Section 6.5.
Safety	Issues for road safety due to railway crossings	A section of the railway would be removed to accommodate the bypass. Refer to Section 6.4.
Safety	Trucks on the in town and passing schools is dangerous	The proposal would minimise heavy vehicle traffic passing Coonabarabran Public School and Coonabarabran High School. Refer to Section 6.4.
Property and land use	Loss of property value	The proposal would result in the acquisition and adjustment of a number of properties. TfNSW would acquire any property in accordance with the *Land Acquisition (Just Terms Compensation) Act.* Property acquisitions are discussed in Section 6.4.
Property and land use	Impacts agricultural land	The proposal would result in some disruption to the use of a number of properties that are used for agricultural purposes. Potential impacts to agricultural properties are discussed in Section 6.4.

Category	Issue raised	Response / where addressed in REF
Property and land use	Increased road ownership and maintenance for Council	The Mary Jane Cain Bridge would be handed over to Council along with the remainder of the existing Newell Highway road and corridor assets in town. TfNSW would work with Council to ensure it is handed over in a fair and reasonable condition. Sections of Purlewaugh and River Road no longer required due to the new intersections with the bypass, would be removed to reduce the maintenance burden on Council. This includes removal of the bank of culverts under Purlewaugh Road. Refer to Section 6.4.
Social and business impacts	Commercial impacts and loss of businesses which are highly dependent on traffic through the town	Construction of the proposal would bring business to the town by temporarily increasing the local population. During operation, impacts to businesses due to a decline in passers-by is expected. Refer to Section 6.5.
Social and business impacts	Requests for further social and economic studies to be completed	A socio-economic impact assessment has been undertaken to assess potential social and economic impacts. A business and shopper survey was also undertaken as part of the socio-economic impact assessment. Refer to Section 6.4.
Social and business impacts	Loss of main street appeal and community events	The improvements of safety and amenity are expected to have offset impacts to tourism and town initiative opportunities Section 6.4.
Social and business impacts	Consider how to get visitors into the town and the tourist attractions in the area	A signage strategy has been developed to promote the town and assist in the identification of the turn off into Coonabarabran. Refer to Section 6.4.
Urban amenity	Impacts of wide loads to the Clock Tower, footpaths and street trees in town	The proposal would minimise heavy vehicles in town, improving road safety and reducing potential impacts on the Clock Tower on Dalgarno Street roundabout, the footpath, the Imperial hotel or street trees. Refer to Section 6.5.

Category	Issue raised	Response / where addressed in REF
Urban amenity	Concerns about noise, fumes, debris and emissions from trucks travelling through town	The proposal would minimise heavy vehicles in town, thus reducing road damage, noise and vehicle emissions. Refer to Sections 6.2, 6.5and 6.8.
Biodiversity	Damage to the environment, impacting local wildlife and fauna	The proposal would result in the clearing of about 46 hectares of native vegetation and potential impacts to flora and fauna. Refer to Section 6.1.
Heritage	Concern about Aboriginal heritage.	The proposal would not impact any known Aboriginal heritage items. Refer to Section 6.8.
Heritage	Impacts of wide loads to the Clock Tower.	The proposal would minimise heavy vehicles in town, thus reducing potential impacts to the Clock Tower at the Newell Highway / Dalgarno Street roundabout.
Concept design and REF		
Social and business impacts	Passing trade is important, especially since the existing economy is declining. The proposal should be designed so that it includes adequate signage and advertising for the town	A signage strategy has been developed to promote the town and assist in the identification of the turn off into Coonabarabran. Refer to Section 6.4.
Social and business impacts	Businesses do not want any new businesses and service centres (especially petrol, food and toilet facilities) constructed on the bypass as this could take away business from town	No service stations or rest stops would be provided on the bypass. Signage would indicate the facilities available in town.
Safety	Taking trucks off the main street would improve safety and amenity of the main street particularly in the form of noise and air pollution	The proposal would minimise heavy vehicles in town. The impacts of noise and air quality are provided in Sections 6.2 and 6.8.

Category	Issue raised	Response / where addressed in REF
Safety	Improved safety for pedestrians and active transport users. Trucks impede their use of active transport, including cycling through town due to safety concerns	The proposal would minimise heavy vehicles in town which would improve road safety. Refer to Section 6.5
Traffic	Time saving benefits do no warrant bypass as it would only save three minutes	The main objective of the proposal is to improve heavy vehicle access along the Newell Highway. The improvement of journey time is a supplementary benefit. Refer to Section 2.4.
Traffic	People are reluctant to reverse angle park on main street when there was a truck behind	The proposal would minimise heavy vehicles in town which would improve road safety and avoid impacts to parking within town. Refer to Section 2.4.

5.3 Aboriginal community involvement

The Aboriginal community has been involved throughout the development of the proposal in accordance with the requirements of DPIE's Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010) and the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime, 2011). The PACHCI is a four staged process for investigating potential impacts to Aboriginal heritage as a result of TfNSW road planning, development, construction and maintenance activities. These four stages are:

- Stage 1 – initial assessment
- Stage 2 – site survey and further assessment
- Stage 3 – formal consultation and preparation of a cultural heritage assessment report (not required for the proposal)
- Stage 4 – implement environmental impact assessment recommendations (not required for the proposal).

Stage 1 was completed as part of the preliminary environmental investigation (Roads and Maritime, 2018b) to determine if the proposal has the potential to harm Aboriginal heritage. The investigation identified three Aboriginal heritage items within the study area and triggered the requirement of Stage 2. No direct consultation with the Aboriginal community was completed during Stage 1.

Stage 2 involved an Aboriginal heritage assessment (OzArk, 2020b) (refer to Section 6.8 and Appendix J) which included a desktop review, field survey and Aboriginal community involvement. Details of the Aboriginal heritage assessment are provided in Section 6.8. Representatives from the Coonabarabran Local Aboriginal Land Council (LALC), the Gomeroi Native Title Claimant Group and the Aboriginal Cultural Heritage Advisor for TfNSW participated in the field survey.

During the field survey, representatives from the Aboriginal groups provided significant input and did not have any objections to the manner in which the survey was competed. The assessment concluded that the proposal is unlikely to impact Aboriginal heritage values, therefore PACHCI Stages 3 and 4 are not required.

5.4 ISEPP consultation

Clauses 13 and 16 of the ISEPP specify requirements for consultation with councils and other public authorities for infrastructure development carried out by or on behalf of a public authority.

The proposal was assessed against the requirements of these clauses (Appendix B).

Warrumbungle Shire Council and Siding Spring Observatory have been consulted about the proposal under clauses 13 and 16 due to:

- Potential impacts on stormwater services
- Excavation of council roads
- Being situated within the dark sky region.

Issues that have been raised as a result of this consultation are outlined below in Table 5-2.

Table 5-2 Issues raised through ISEPP consultation

Agency	Issue raised	Response / where addressed in REF
Warrumbungle Shire Council	The acquisition of land may result in difficulties for new land titles to be administered due to allotment size under the Warrumbungle LEP	Land acquisition would be limited to the smallest extent required. TfNSW would continue to consult with Council and landholders regarding acquisition requirements and any severed or remnant land.
Warrumbungle Shire Council	There should be consideration of slip lanes on and off the highway	Acceleration and deceleration lanes are provided at the intersections with Oxley Highway, River Road, Purlewaugh Road and the Newell Highway southern intersection to increase safety. All intersections allow highway traffic to access Coonabarabran. Refer to Section 6.5.
Warrumbungle Shire Council	A mixed use area to the south and an agricultural produce area to the north are planned. The mixed use zone would encourage travellers to pass through Coonabarabran instead of bypassing it.	The proposal would not preclude the development of surrounding land for Council's purposes. Refer to Section 6.4.

Agency	Issue raised	Response / where addressed in REF
Warrumbungle Shire Council	Concerns of travellers missing the turn off the Coonabarabran at the southern intersection. Installation of signage and entrance statements to showcase the town of Coonabarabran, services and tourism attractions to passing motorists.	A signage strategy has been developed to promote the town and assist in the identification of the turn off into Coonabarabran. Refer to Section 3.2.3.12 and Appendix E.
Warrumbungle Shire Council	Consider locating the southern intersection as close to Coonabarabran as possible and the implementation of a roundabout.	The southern intersection is located near the outskirts of town. A signage strategy has been developed to promote the town and assist in the identification of the turn off into Coonabarabran. Refer to Section 2.3.
Warrumbungle Shire Council	Funding for the promotion of the town through social media and town beautification.	Community consultation for the proposal involves various tools including social media (Section 5.2.1). TfNSW will continue to consult with Warrumbungle Shire Council throughout the development of the proposal. A signage strategy has been developed to promote the town and assist in the identification of the turn off into Coonabarabran. Refer to Section 3.2.3.12
Siding Spring Observatory	Design the proposal in accordance with the Dark Sky Planning Guidelines including the use of LED lighting with warm white colours and effective temperatures of 3,000K or less.	Road lighting on the bypass would only be required at the intersection locations. TfNSW has agreed to adopt lights which meet the Dark Sky Park Guidelines. TfNSW will continue to consult with the Siding Spring Observatory. Lighting during out-of-hours construction activities would also consider the guidelines. The contractor would consult with the Siding Spring Observatory where required. Refer to Section 6.3 and 6.4.

5.5 Government and stakeholder involvement

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

- Warrumbungle Shire Council
- Local Land Services

- John Holland Country Rail Network
- Australian Rail Track Corporation (ARTC)
- Utility providers
- Bus operators
- Property owners.

Consultation has been ongoing since 2018 and has involved face to face meetings, attendance at workshops and ongoing digital correspondence.

5.6 Ongoing or future consultation

TfNSW would continue to consult with the community and relevant stakeholders during the design and construction of the proposal.

5.6.1 Consultation during the public display of the REF

TfNSW is committed to continue the engagement of the community and stakeholders throughout the development of the proposal. The REF will be placed on public display and comments invited. Consultation activities during this display period would include:

- Advertisement in local newspapers
- An online community engagement portal and update to the TfNSW project webpage
- Proposal updates distributed to the community and stakeholders inviting feedback on the proposal.

5.6.2 Consultation following the public display of the REF

Following the public display period, TfNSW will collate and consider the submissions received then determine whether the proposal should proceed as described in the REF, or whether any changes are required. A submissions report would be published which would respond to the comments received. The submissions report would be made available to the public via the TfNSW website. The community would be informed of any major design changes that are required to address concerns raised in submissions.

Following determination, the community would continue to be updated about the progress of construction and provided notification of any road closures or night works in advance of the works occurring. Direct consultation would continue with affected landholders and stakeholders.

To effectively manage consultation during the construction stage of the proposal, a Communication Plan would be developed and implemented by the construction contractor.

6 Environmental assessment

6.1 Biodiversity

This section describes the potential biodiversity impacts associated with the proposal. This section is informed by the biodiversity assessment report (OzArk, 2020a) which is provided in Appendix C.

6.1.1 Methodology

6.1.1.1 Study area

The study area used in the biodiversity investigation is a 1500 metre radius of the construction footprint. This provides context regarding the connectivity and cover of native vegetation in the area affected by the proposal, and to inform the impact assessment of the proposal. Surveys were focused on the construction area.

6.1.1.2 Desktop investigation

A desktop search was carried out to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed migratory species or areas of outstanding biodiversity value previously recorded or predicted to occur within or near the survey area. These results helped to plan the field survey and identify the ecological groups likely to occur. The databases searches included:

- Flora and fauna records and profiles from sources including NSW Threatened Species Database (OEH, 2020a), EPBC Protected Matters Search Tool (DoEE, 2020a) and DPI threatened fish distribution maps (DPI, 2020).
- NSW BioNet Wildlife Atlas and Plant Community Type (VIS) databases (OEH, 2020b)
- Critical habitat register (OEH, 2020c)
- Biodiversity Values Map (NSW Government, 2020)
- Flora of NSW (Harden, 1991-2002)
- Flora NSW Online (PlantNet, 2020)
- Regional Scale State Vegetation Map: Central West Lachlan V1.4 (OEH, 2016)
- NSW Government online aerial imagery.

6.1.1.3 Habitat assessment

A habitat assessment was carried out using information from the background research to determine the likelihood of occurrence of each threatened species, population and community (threatened biodiversity) that had the potential to occur in the survey area. The habitat assessment helped to identify the appropriate targeted surveys that were subsequently carried out.

Tests of significance were completed for this threatened biodiversity in accordance with the relevant legislation and guidelines.

6.1.1.4 Field surveys

The field survey was carried out over two survey periods from 22 to 25 October 2019 and 6 to 9 April 2020. Further targeted threatened species surveys were carried out from 24 to 28 August 2020 The field surveys included:

- Vegetation surveys – 35 vegetation plots which identified vegetation composition and condition and classified native vegetation into PCTs, and where relevant, Threatened Ecological Communities (TECs). Vegetation surveys were undertaken in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2017)
- General fauna surveys – searches for fauna while undertaking vegetation plots. Habitat features including hollow bearing trees were recorded and examined for cryptic species.
- Targeted fauna surveys – to assist to better understand presence and use of the proposal area including live trapping, call playback and bat detectors were carried out
- Aquatic surveys – observation on condition and habitat of riparian areas. Aquatic surveys (eg water quality testing) were not undertaken.

6.1.2 Existing environment

6.1.2.1 Plant community types

The vegetation mostly comprises of a mixture of grasslands with some patches of woodland. Six native plant community types (PCTs) and one non-native vegetation community were recorded within the construction area. These are described Table 6-1.

Table 6-1 Plant community types. E= Endangered, CE= Critically endangered

PCT ID	Plant community type name	TEC	Area (ha)
281	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Yes, BC Act	2.20
379	Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion	No	9.6
393	White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion	No	0.5
401	Rough-barked Apple - Blakelys Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region	No	21.48

PCT ID	Plant community type name	TEC	Area (ha)
417	Black Cypress Pine - Narrow-leaved Ironbark - red gum +/- White Bloodwood shrubby open forest on hills of the southern Pilliga, Coonabarabran and Garawilla regions, Brigalow Belt South Bioregion	No	1.63
434	White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion	Yes, BC Act and EPBC Act	11.37
	Non-native	N/A	40.20
	Total		86.98

Threatened ecological communities

Two TECs are present in the construction area associated with PCTs 281 and 434. The TECs are:

- White Box Yellow Box Blakely's Red Gum Woodland, listed as critically endangered under the BC Act
- White Box Yellow Box Blakely's Red Gum Woodland and derived grasslands, listed as critically endangered under the EPBC Act.

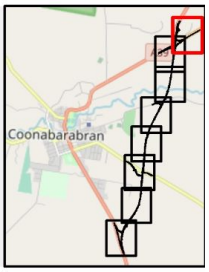
The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

Threatened Species

Grey Crowned Babbler

Vegetation Community

401 - Rough-barked Apple – Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region



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Source: Aurecon, TfNSW, LPI

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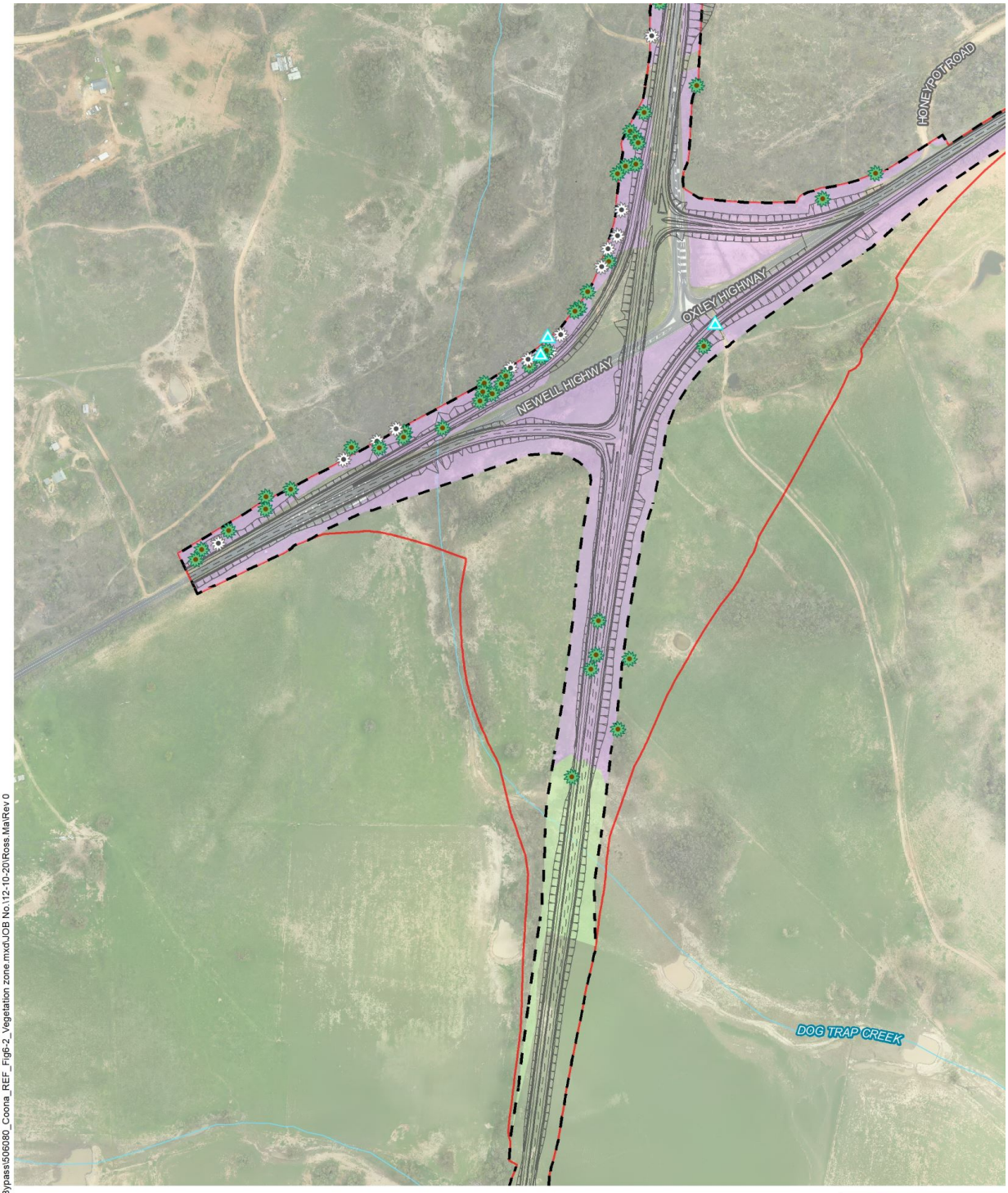
Newell Highway Upgrade Coonabarabran Bypass REF

Projection: GDA 1994 MGA Zone 55

FIGURE 6-1: Vegetation zone



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The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

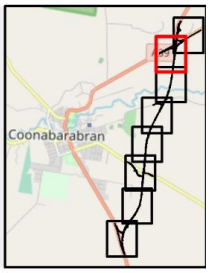
Threatened Species

Grey Crowned Babbler

Vegetation Community

281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

401 - Rough-barked Apple – Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region



Source: Aurecon, LPI

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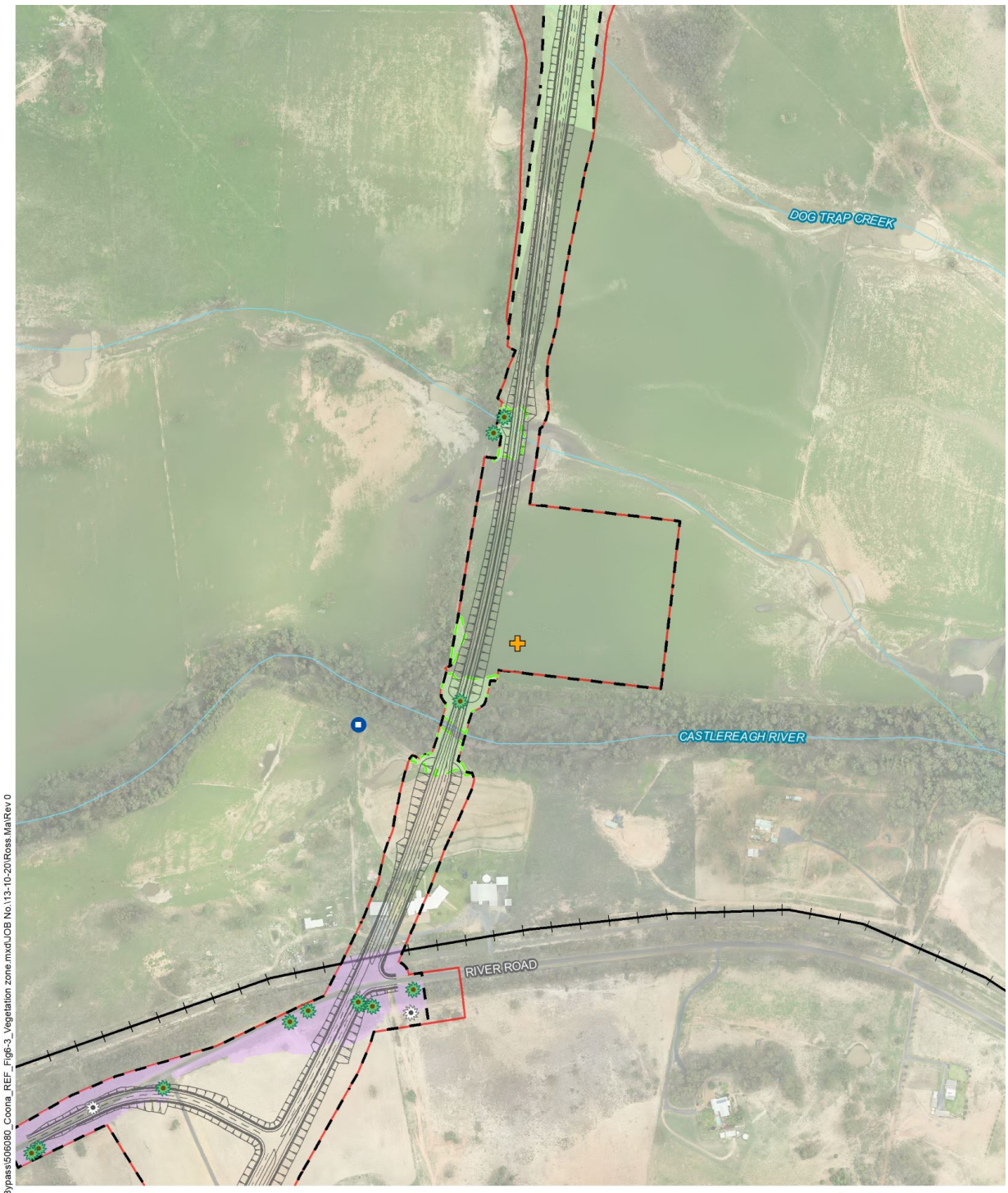
Newell Highway Upgrade Coonabarabran Bypass REF

Projection: GDA 1994 MGA Zone 55

FIGURE 6-2: Vegetation zone



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The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

Threatened Species

Little Lorikeet
White-bellied Sea-eagle

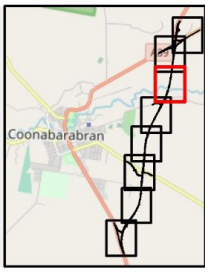
Vegetation Community

281 - Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

401 - Rough-barked Apple – Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region

Threatened Ecological Communities

BC Act



Source: Aurecon, LPI

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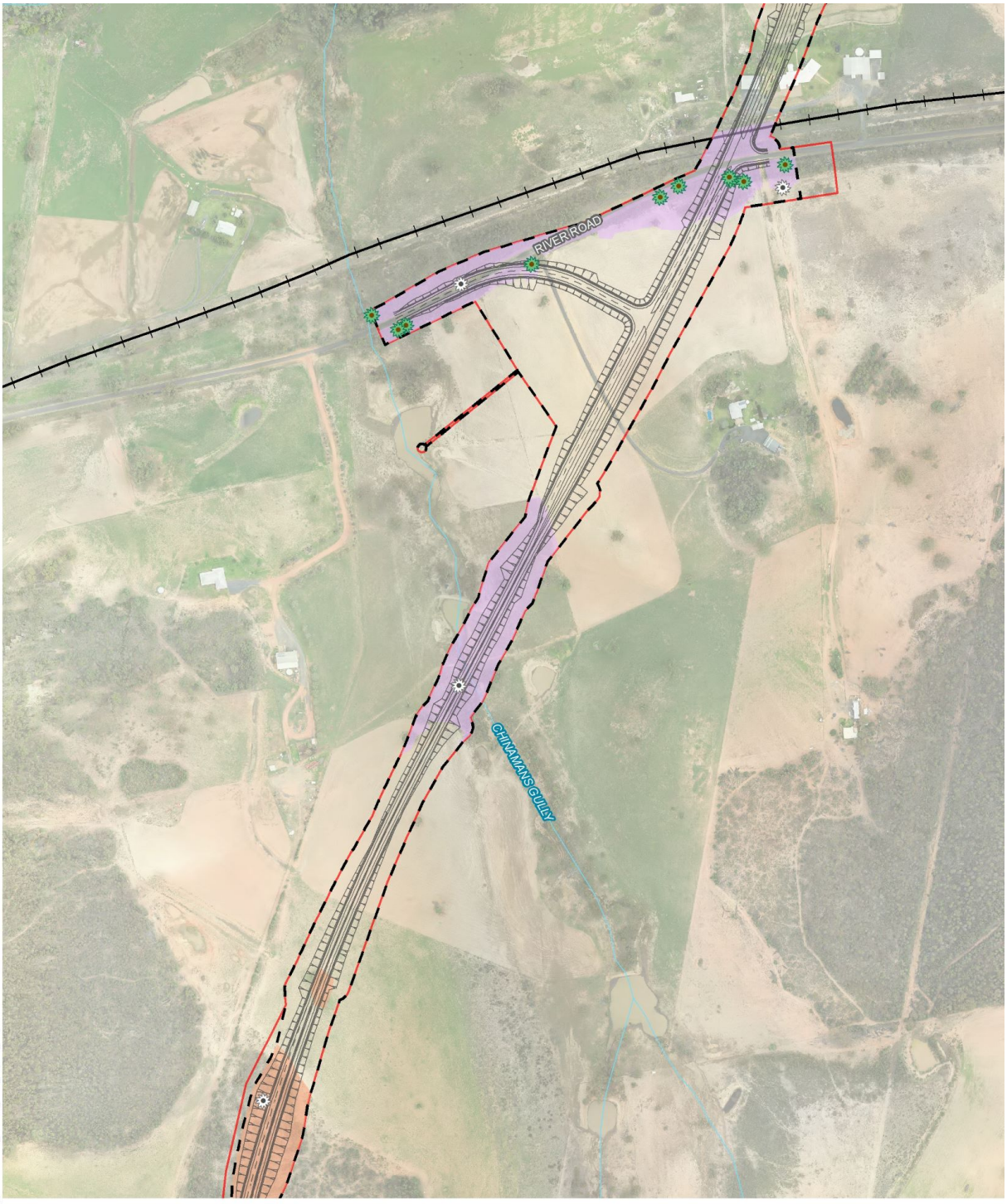
Newell Highway Upgrade Coonabarabran Bypass **REF**

Projection: GDA 1994 MGA Zone 55

FIGURE 6-3: Vegetation zone



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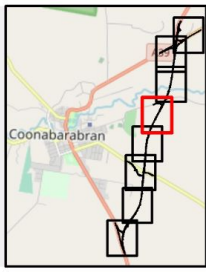
The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

Vegetation Community

379 - Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion

401 - Rough-barked Apple – Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region



Source: Aurecon, LPI

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Newell Highway Upgrade Coonabarabran Bypass **REF**

Projection: GDA 1994 MGA Zone 55

FIGURE 6-4: Vegetation zone

The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

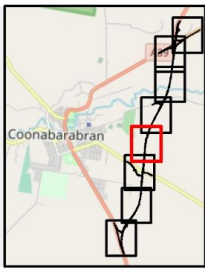
Threatened Species

Hooded Robin
Rainbow Bee-eater
Scarlet Robin, Varied Sittella
Speckled Warbler

Vegetation Community

379 - Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion

401 - Rough-barked Apple – Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region



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Source: Aurecon, LPI

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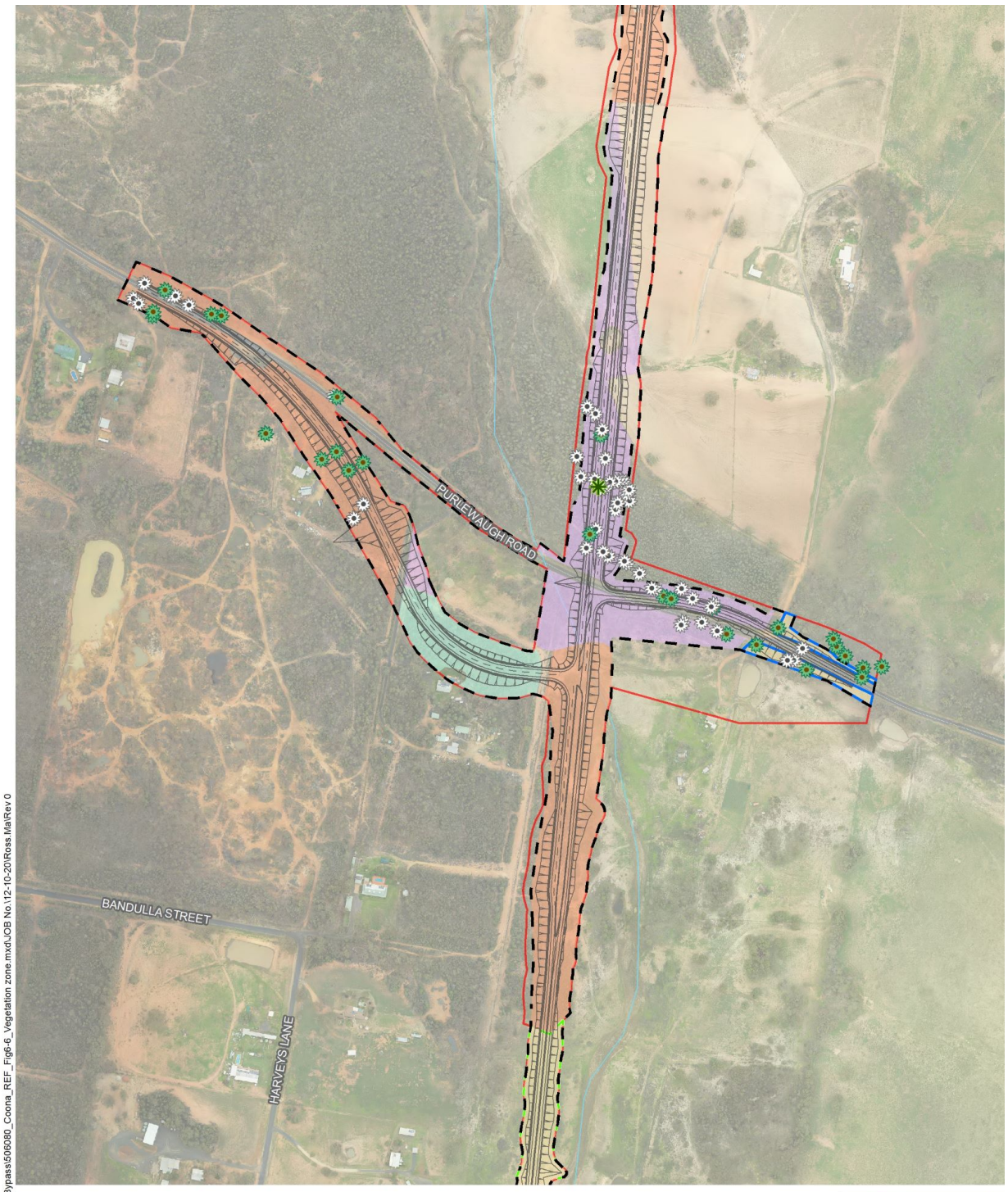
Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-5: Vegetation zone



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The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

Threatened Species

Speckled Warbler

Vegetation Community

379 - Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion

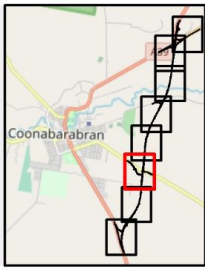
401 - Rough-barked Apple – Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region

417 - Black Cypress Pine - Narrow-leaved Ironbark - red gum +/- White Bloodwood shrubby open forest on hills of the southern Pilliga, Coonabarabran and Garawilla regions, Brigalow Belt South Bioregion

434 - White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion

Threatened Ecological Communities

BC Act
EPBC Act



Source: Aurecon, LPI

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Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

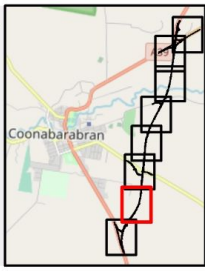
FIGURE 6-6: Vegetation zone

The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees

Threatened Species
Grey Crowned Babbler
Rainbow Bee-eater

Vegetation Community
379 - Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion
393 - White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion
434 - White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion

Threatened Ecological Communities
BC Act
EPBC Act



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Source: Aurecon, LPI

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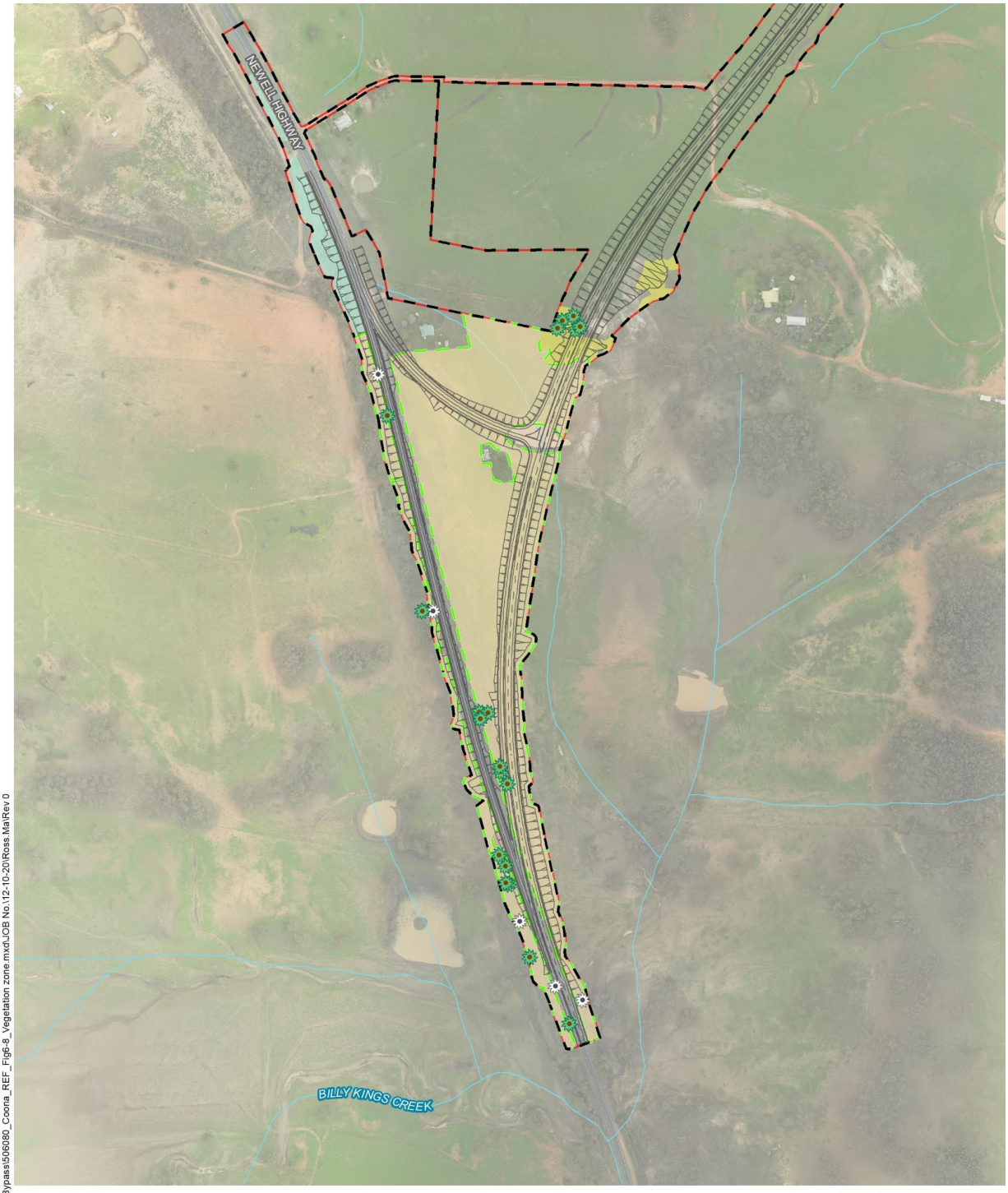
Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-7: Vegetation zone



The design
Vegetation clearing line
Proposed construction boundary
Railway
Watercourse
Hollow bearing trees
Stag trees

Vegetation Community

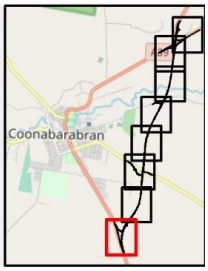
393 - White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion

417 - Black Cypress Pine - Narrow-leaved Ironbark - red gum +/- White Bloodwood shrubby open forest on hills of the southern Pilliga, Coonabarabran and Garawilla regions, Brigalow Belt South Bioregion

434 - White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion

Threatened Ecological Communities

BC Act



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Source: Aurecon, LPI

1:6,560
0 200m

Projection: GDA 1994 MGA Zone 55

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FIGURE 6-8: Vegetation zone

6.1.2.2 Threatened fauna

The desktop investigation identified 35 threatened fauna species listed under the EPBC Act and BC Act considered to have a moderate-high likelihood of occurrence in the proposal area. A number of the threatened fauna species were also identified during field investigations (identified as present in Table 6-2).These species are listed in Table 6-2.

Table 6-2 Threatened fauna likely to occur in the study area

Species name	Common name	BC Act status*	EPBC Act status *	Records within 10 km	Likelihood of occurrence
Ninox connivens	Barking Owl	V	-	Yes	High
Melithreptus gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	No	Moderate
Macropus dorsalis	Black-striped Wallaby	E	-	No	Moderate
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	Yes	High
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Yes	High
Stagonopleura guttata	Diamond Firetail	V	-	Yes	Present
Artamus cyanopterus	Dusky Woodswallow	V	-	Yes	High
Cercartetus nanus	Eastern Pygmy-possum	V	-	No	Moderate
Petroica phoenicea	Flame Robin	V	-	No	Moderate
Pomatostomus temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	Yes	Present
Melanodryas cucullata	Hooded Robin (south-eastern form)	V	-	Yes	Present
Phascolarctos cinereus	Koala	V	V	Yes	High

Species name	Common name	BC Act status*	EPBC Act status *	Records within 10 km	Likelihood of occurrence
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	No	Moderate
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Yes	Moderate
Hieraaetus morphnoides	Little Eagle	V	-	Yes	High
Glossopsitta pusilla	Little Lorikeet	V	-	Yes	Present
Chalinolobus picatus	Little Pied Bat	V	-	Yes	High
Tyto novaehollandiae	Masked Owl	V	-	Yes	High
Grantiella picta	Painted Honeyeater	V	V	No	Moderate
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	No	Moderate
Pseudomys pilligaensis	Pilliga Mouse	V	V	Yes	Moderate
Ninox strenua	Powerful Owl	V	-	No	Moderate
Anthochaera phrygia	Regent Honeyeater	CE	CE	Yes	Moderate
Petroica boodang	Scarlet Robin	V	-	Yes	Present
Chthonicola sagittata	Speckled Warbler	V	-	Yes	Present
Circus assimilis	Spotted Harrier	V	-	No	Moderate
Dasyurus maculatus	Spotted-tailed Quoll	V	E	No	Moderate
Lophoictinia isura	Square-tailed Kite	V	-	Yes	High
Petaurus norfolcensis	Squirrel Glider	V	-	Yes	High
Polytelis swainsonii	Superb Parrot	V	V	Yes	High

Species name	Common name	BC Act status*	EPBC Act status *	Records within 10 km	Likelihood of occurrence
Lathamus discolor	Swift Parrot	E	CE	No	Moderate
Neophema pulchella	Turquoise Parrot	V	-	Yes	High
Daphoenositta chrysoptera	Varied Sittella	V	-	Yes	Present
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	Yes	Present
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Yes	High

**CE = Critically Endangered, E = Endangered, V = Vulnerable*

6.1.2.3 Threatened flora

The desktop investigation identified 12 threatened flora species listed under the EPBC Act and BC Act considered to have a moderate-high likelihood of occurrence in the construction area. These species are listed in Table 6-3.

Table 6-3 Threatened flora likely to occur in the study area

Species name	Common name	BC Act status*	EPBC Act status *	Records within 10 km	Likelihood of occurrence
Thesium australe	Austral Toadflax	V	V	No	Moderate
Dichanthium setosum	Bluegrass	V	-	No	Moderate
Commersonia procumbens		V	V	No	Moderate
Digitaria porrecta	Finger Panic Grass	E	-	No	Moderate
Pterostylis cobarensis	Greenhood Orchid	V	-	No	Moderate
Monotaxis macrophylla	Large-leafed Monotaxis	E	-	No	Moderate
Polygala linariifolia	Native Milkwort	E	-	No	Moderate
Philotheca ericifolia		-	V	No	Moderate

Species name	Common name	BC Act status*	EPBC Act status *	Records within 10 km	Likelihood of occurrence
Diuris tricolor	Pine Donkey Orchid	V	-	No	Moderate
Pomaderris queenslandica	Scant Pomaderris	E	-	No	Moderate
Swainsona sericea	Silky Swainson-pea	V	-	No	Moderate
Tylophora linearis		V	E	No	Moderate

**CE = Critically Endangered, E = Endangered, V = Vulnerable*

No threatened flora species were identified during the field survey. However, due to the timing of the survey (ie when a number of the species were not in flower and the area was impacted by prolonged drought) non-detection cannot be considered as confirmation of their absence.

6.1.2.4 Exotic species

During field investigations, seven priority weeds were recorded including African Lovegrass (*Eragrostis curvula*), Bathurst Burr (*Xanthium spinosum*), Fleabane (*Conyza Spp.*), Spear Thistle (*Cirsium vulgare*), Large-leaved Privet (*Ligustrum lucidum*), Common Olive (*Olea europaea*) and Honey Locust (*Gleditsia triacanthos*). Additionally, an infestation of Rope Pear (*Cylindropuntia Imbricata*) was identified within Lot 11/DP777915. These weeds would be managed during construction of the proposal.

6.1.2.5 Aquatic habitats

Aquatic endangered ecological communities (EEC) are determined by the NSW Fisheries Scientific Committee and listed under the Fisheries Management Act (FM Act) as aquatic systems that have undergone a very large reduction in ecological function, geographic distribution or genetic diversity, and continue to be affected by a threatening process. The Castlereagh River is part of the Lowland Darling River EEC.

The Castlereagh River and an unnamed watercourse are mapped as Key Fish Habitat (KFH). The Castlereagh River, Dog Trap Creek and two unnamed watercourses are mapped as providing habitat for the endangered Purple Spotted Gudgeon (*Mogurnda adspersa*). The Castlereagh River is also mapped as providing habitat for the endangered Eel Tailed Catfish (*Tandanus tandanus*).

6.1.2.6 Groundwater dependent ecosystem

Groundwater dependent ecosystems (GDEs) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. There are mapped areas of low-moderate potential terrestrial GDEs within the construction area. These GDEs are part of the Castlereagh River catchment area.

6.1.2.7 Hollow bearing trees

A total of 148 hollow-bearing trees were recorded in the construction area and are shown in Figure 6-1 to Figure 6-8. The hollow bearing trees comprise:

- 39 trees with large hollows >20 cm
- 109 trees with small hollows <20 cm
- 60 stags (dead trees).

6.1.2.8 Koala Habitat Protection SEPP

The proposal is within the northwest slopes Koala Management Area. The majority of wooded habitat within the construction area is identified on the Koala Development Application Map as 'highly suitable Koala habitat' that is likely to be occupied by Koalas. Seven koala feed tree species were identified. In addition, there are 40 records of Koalas within 10 kilometres of the proposal. Six of these records occur within the study area within connected vegetation. The most recent record from 2016 is about one kilometre away within connected vegetation along Purlewaugh Road.

Legislative requirements of this SEPP are provided in Section 4.

6.1.2.9 Matters of National Environmental Significance

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined in the EPBC Act as Matters of National Environmental Significance (MNES). The EPBC Act protected matters search identified three wetlands of international importance, six TECs, 22 threatened species, 10 migratory species and 17 aquatic species that could possibly occur in the study area.

6.1.3 Potential impacts

6.1.3.1 Construction

Removal of vegetation

Clearing of up to 46.78 hectares of native vegetation would be required. This includes about 12.05 hectares of the BC Act listed TEC and 0.54 hectares of the EPBC Act listed TEC. The majority of the native vegetation that would be cleared is White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion (PCT 434), comprising the BC Act listed TEC and a small section of EPBC Act TEC. A summary of the impacted native vegetation is provided in Table 6-4. An additional area of 40.20 hectares of non-native vegetation (such as grasses) would also be removed.

Table 6-4 Native vegetation requiring removal

Plant community type	Section of TEC removal (ha)	Total removal (ha)
PCT 281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	0.68 (BC Act)	2.20
PCT 379: Inland Scribbly Gum - White Bloodwood - Red Stringybark - Black Cypress Pine shrubby sandstone woodland mainly of the Warrumbungle NP - Pilliga region in the Brigalow Belt South Bioregion		9.60

Plant community type	Section of TEC removal (ha)	Total removal (ha)
PCT 393: White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion		0.50
PCT 401: Rough-barked Apple - Blakely's Red Gum - Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region		21.48
PCT 417: Black Cypress Pine - Narrow-leaved Ironbark - red gum +/- White Bloodwood shrubby open forest on hills of the southern Pilliga, Coonabarabran and Garawilla regions, Brigalow Belt South Bioregion		1.63
PCT 434: White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion	11.37 (BC Act) 0.54 (EPBC Act)	11.37
Total		46.78

Removal of threatened fauna habitat

One hundred and forty-eight hollow-bearing trees would likely be removed. As there are hollows of many sizes, there is potential roosting and breeding habitat for a range of small and large hollow-using species. The proposal would also require the removal of bush rock, dead wood and dead trees which provides primary habitat for a number of threatened species. The removal of these habitat features are key threatening processes under the BC Act.

There is potential for the threatened flora species to be directly impacted during vegetation removal. However, with the observation of the pre-clearance management guidelines, this would be minimised (RTA, 2011).

Removal of threatened flora

Twelve threatened plant species were assessed as having a moderate likelihood of occurrence within the proposal area. The field survey of the site did not detect any of the predicted threatened flora species. However, due to the timing of the survey (ie when a number of the species were not in flower and prolonged drought) non-detection cannot be considered as confirmation of their absence. Pre-clearance surveys and revegetation would be undertaken to minimise these potential impacts to threatened flora.

6.1.3.2 Aquatic habitat

The proposal would require construction in waterways that providing habitat for the endangered Purple Spotted Gudgeon and Eel-tailed Catfish. Construction activities

may impact these species through temporarily blocking fish passage, however management measures would be observed to minimise potential impacts.

6.1.3.3 Injury and mortality to fauna

Fauna injury or death has the greatest potential to occur during construction when vegetation clearing is carried out. The extent of this impact would be proportionate to the extent of vegetation that is cleared. Fauna may become trapped in or may choose to shelter in machinery that is stored overnight. There is potential for these animals to become injured the machinery is in use. A pre-clearance survey would be undertaken to minimise potential impacts to fauna.

6.1.3.4 Indirect impacts

Noise and vibration from construction activities may result in fauna temporarily avoiding habitats adjacent to the construction area. The magnitude of this impact would be substantial but would not lead to local extinctions or a significant reduction in biodiversity values within the study area.

The invasion and spread of weeds and pests may result from earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. Appropriate management would be undertaken to minimise the spread of weeds, peats and pathogens within the construction area and from being brought in and out of the area.

6.1.3.5 Operation

Injury and mortality

During operation of the proposal there would be a chance of fauna mortality through vehicle collision (ie roadkill). Vehicle collision is a direct impact that reduces local population numbers, it is particularly prevalent for macropods and birds.

Habitat fragmentation

The proposal would require the clearing of native vegetation along an alignment about eight kilometres long. The width of the cleared corridor varies between about 35 metres at its narrowest to as much as 1.5 kilometres at road intersections.

The proposal would substantially reduce habitat connectivity east and west of the proposal, increasing fragmentation and further contributing to isolation effects on numerous woodland patches within the study area, as well as reducing the average remaining patch sizes.

The proposal would bisect five large patches of PCT 401 and 379 which would decrease connectivity between the patches and isolate populations of less mobile species. One large patch of PCT 401 will be dissected by the proposal, creating two patches east and west of Purlewaugh Road and creating an isolated patch bordered by Purlewaugh Road, the bypass and unsealed roads. Due to the relatively narrow nature of the proposal, species which are less mobile or are dependent on continuous forest cover would be more greatly impacted. Highly mobile species, such as migratory and far-ranging birds (Superb Parrot, Little Eagle), are likely to be less impacted by the proposal as they are able to more easily access and utilise different

patches within the local and wider region. Wildlife connectivity measures would be implemented to minimise these impacts.

Indirect impacts

The removal and fragmentation of vegetation would increase the perimeter of the patches edges compared to the core habitat ratio. This would increase edge effects and other indirect impacts including increased weed invasion, predation, light spill and noise.

The proposal would likely facilitate the movement of pest species including feral pigs, foxes, rabbits, cats and wild dogs which are known to use road corridors to travers landscapes. Noise and vibration impacts are considered to be minor due to the existing noise levels in the study area.

6.1.3.6 Assessment of significance

Assessments of significance were undertaken for all threatened species with a moderate or high likelihood or recorded on site and the BC Act CEEC White Box Yellow Box Blakely's Red Gum Woodland. These assessments found that the proposal would not have a significant impact on any ecological community or threatened species.

6.1.4 Safeguards and mitigation measures

Table 6-5 Biodiversity safeguards and mitigation measures

ID	Impact	Environmental safeguard	Responsibility	Timing
Bi1	Native vegetation removal	Native vegetation removal will be minimised through detailed design and construction. Vegetation clearing during construction would only be undertaken within the proposed construction boundary as detailed in Figures 6.1-6.8 of the REF.	TfNSW/ Contractor	Detailed design Construction
Bi2		Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011). Particular care should be taken to survey for the following: • Austral Toadflax • Bluegrass • Commersonia procumbens • Finger Panic Grass • Greenhood Orchid • Large-leafed Monotaxis • Native Milkwort • Philotheca ericifolia • Pine Donkey Orchid • Scant Pomaderris • Silky Swainson-pea • Tylophora linearis Additionally, the patch of PCT 417 on Lot/Section/DP 3/-/DP828357, which was unable to be accessed during the second field survey due to landowner concerns regarding Covid-19, should be more thoroughly surveyed for the presence of hollow-bearing habitat trees.	Contractor	Pre-construction
Bi3		Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction
Bi4		Native vegetation will be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity	Contractor	Construction / post construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011). Specifically, strategic habitat restoration will occur within the impact footprint, particularly around wildlife connectivity measures, with a view to both developing vegetation links / corridors, enhancing existing linkages and connecting isolated areas of native vegetation.		
Bi5		Translocate soil and leaf litter from areas to be cleared to degraded areas in the proposal area with better quality Box-Gum Woodland PCTs prioritised.	Contractor	Pre-construction / post construction
Bi6		Appoint a commercial plant propagator to collect and grow on plant material for revegetation, particularly within CEEC areas.	Contractor	Pre-construction
Bi7		Investigation of possible inclusion of more readily propagatable species such as Silky Swainson-pea, Bluegrass, Finger Panic Grass and *Tylophora linearis* in revegetation plantings.	Contractor	Post construction
Bi8		The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction
Bi9	Removal of threatened species, habitat and habitat features	Habitat removal will be minimised through detailed assessment of habitat values of trees in conjunction with road safety requirements.	Contractor	Detailed design
Bi10		The proposal will aim to relocate the viable local population of Diamond Firetail (*Stagonopleura guttata*) in the development footprint into vacant habitat on an area managed in perpetuity for conservation. This will be undertaken in accordance with the NSW DPIE Translocation Operational Policy May 2019.	TfNSW	Pre-construction
Bi11		Habitat removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011). This would include: • Timing vegetation clearing works to occur during the late autumn and/or winter months, outside of the peak times of critical life cycle events for threatened species, where practical and feasible as per the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011). • Conducting a pre-clearing process before clearing begins • Removing habitat in stages • Engaging an ecologist / spotter catcher to be present during habitat removal • Felling habitat carefully • Developing an unexpected threatened species finds procedure		
Bi12		Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock	Contractor	Construction
Bi13		Engage an ecologist to develop a nest box strategy in accordance with Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) considering the following: • The target species • The tree hollow preferences of native hollow-dependant fauna known or likely to occur in the locality • The sizes, types and quantities of potential tree hollows to be removed • The sizes, types and quantities of tree hollows existing in adjacent areas • The design, materials and quantity of nest boxes required • Whether the nest boxes are required to fill a short term gap in the availability of hollows (eg during construction) or to	TfNSW	Post construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		compensate for the long term reduced availability of hollows • Monitoring and maintenance of the nest boxes Habitat boxes and / or artificial hollows should be installed prior to the removal of hollow-bearing trees.		
Bi14		The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) if threatened flora or fauna, not assessed in the biodiversity assessment, are identified in the proposal site.	TfNSW	Post construction
Bi15		Familiarising staff regarding the threatened species and communities that occur on site i.e. through toolbox talks etc.	Contractor	Construction
Bi16	Fragmentation of identified habitat corridors	Identifying linkages and likely corridors important to the local movement of native species at the planning stage of the proposal.	Contractor	Detailed design
Bi17		Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA, 2011). Connectivity measures will be implemented in accordance with the Wildlife Connectivity Guidelines for Road Projects (RTA, 2011). This will include: • Installing large culverts with natural substrates suitable for bats, invertebrates, macropods, reptiles and small-medium sized animals at locations where large wooded patches have been transected and where suitable topography allows. The exact number and substrate of culverts will be considered during detailed design • Installing canopy bridges with avian predator guards and shelter for arboreal mammals including possums and Squirrel Glider at several strategic locations where large wooded patches will be transected i.e. adjacent to Purlewaugh Road and between remnant patches of PCT 379. The exact number of canopy bridges is to be	Contractor	Detailed design, construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		determined during the development of a detailed wildlife connectivity strategy • Developing management plans for each fauna species that require targeted connectivity measures, including the Squirrel Glider and Eastern Pygmy Possum. As per the Spotted-tailed Quoll Management Plan for the Pacific Highway (TfNSW, 2017), the management plans will include performance indicators and a robust adaptive management strategy / monitoring program to gauge the effectiveness of the connectivity measures. • Regular inspection and monitoring of wildlife connectivity measures will be considered during detailed design to make sure they remain safe for motorists and functional for wildlife and to determine if the connectivity goal(s) of the project have been met.		
Bi18		Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction, construction
Bi19	Edge effects on adjacent native vegetation and habitat	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction, construction
Bi20	Injury and mortality of fauna	Install wildlife signage at strategic locations to increase driver awareness of fauna within the local area.	TfNSW	Post construction
Bi21		Conduct site inspections for fauna (e.g. sheltering under vehicles) prior to the daily commencement of works	Contractor	Construction
Bi22	Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction, construction
Bi23		Clean machinery, vehicles and footwear before moving to a new	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		location. Machinery must be clean of all mud, soil and vegetation material.		
Bi24	Invasion and spread of pests	Working areas are to be maintained, kept free of rubbish and cleaned up regularly.	Contractor	Construction
Bi25	Invasion & spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and Bi managing biodiversity on RTA projects (RTA, 2011).	Contractor	Construction
Bi26	Noise, light and vibration	Shading and artificial light impacts will be minimised through detailed design, including limiting lighting to intersections, adhering to the Dark Sky guidelines and reducing unnecessary light sources.	Contractor	Detailed design
Bi27	Aquatic habitats	Avoid activities in aquatic habitats and riparian zones as much as practicable.	Contractor	Construction
Bi28		The sensitivity of aquatic habitats and riparian zones and the measures in place to protect them should be regularly communicated to all staff e.g. during inductions and toolbox talks.	Contractor	Construction
Bi29		Protect aquatic habitats and riparian zones where works are not required with exclusion zones. Exclusion fencing should be used outside sensitive areas.	Contractor	Construction
Bi30		The location of aquatic habitat features within or adjacent to the footprint should be clearly identified on environmental management plans.	Contractor	Pre-construction construction
Bi31		Access the waterway so that riparian vegetation removal is minimised and restricted to the minimum amount of bank length required for the construction activity.	Contractor	Construction
Bi32		Keep vehicles and machinery away from the banks of a waterway where possible.	Contractor	Construction
Bi33		Refuelling of vehicles and plant, and chemical storage and decanting should not take place within 50 metres of aquatic habitats.	Contractor	Construction
Bi34		Avoid clearing within the riparian zone during periods when flooding is likely to occur.	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
Bi35		Ensure that any clearing undertaken does not allow the vegetation/trees to fall into the waterway.	Contractor	Construction
Bi36		Retain the roots of trees on the bank of a waterway in order to maintain bank stability.	Contractor	Construction
Bi37		DPI (Fisheries) must be consulted before works commence where snags require lopping, realignment, relocation and/or removal.	Contractor	Pre-construction, construction
Bi38		During rehabilitation, stabilise the banks of the waterway through revegetation and/or armouring according to available landscape plans.	Contractor	Post construction
Bi39		Maintain fish passage as far as practical during construction of the bridge over the Castlereagh River.	Contractor	Construction
Bi40		Remove all temporary works, flow diversion barriers and sediment control barriers within aquatic habitats as soon as practicable and in a manner that does not promote future channel erosion.	Contractor	Construction
Bi41		Engage an ecologist / spotter catcher to conduct a pre-clearance survey prior to the dewatering of farm dams and ensure an ecologist / spotter catcher is on call during the dewatering process to safely relocate any fauna that may be present.	Contractor	Construction

6.1.5 Biodiversity offsets

The *Guidelines for Biodiversity Offsets* (Roads and Maritime, 2016a) provides guidance as to when offsets should be considered for residual impacts on biodiversity associated with an activity or proposal. The guidelines specify offsetting thresholds in relation to clearing of TECs and threatened species habitat. Given the proposal would impact on 46.78 hectares of native vegetation that contains Commonwealth and NSW listed threatened species habitat, it is considered that biodiversity offsets will be required under the guidelines.

6.2 Noise and vibration

This section describes the potential noise and vibration impacts associated with the proposal. This section is informed by the noise and vibration assessment (SLR, 2020) which is provided in Appendix D.

6.2.1 Methodology

The noise and vibration assessment was prepared in accordance with the following guidelines:

- NSW Noise Policy for Industry (NPI) (EPA, 2017)
- Interim Construction Noise Guideline (ICNG) (DECC, 2009)
- AS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors
- Road Noise Policy (RNP) (DECCW, 2011)
- BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2, BSI, 1993
- DIN 4150: Part 3-2016 Structural vibration – Effects of vibration on structures, Deutsches Institute fur Normung, 1999
- Assessing Vibration: a technical guideline (DEC, 2006)
- Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime, 2016b)
- Noise Criteria Guideline (NCG) (Roads and Maritime, 2015)
- Noise Mitigation Guideline (NMG) (Roads and Maritime, 2015)
- Model Validation Guideline (Roads and Maritime, 2018)
- Environmental Noise Management Manual (ENMM) (Roads and Traffic Authority, 2001)
- Preparing an Operational and Construction Noise and Vibration Assessment Report (Roads and Maritime, 2016)
- At-Receiver Noise Treatment Guideline (Roads and Maritime, 2017).

6.2.1.1 Noise monitoring

Noise monitoring was undertaken to determine the existing background noise environment near the proposal. Unattended noise monitoring was undertaken during October and November 2019. The noise monitoring locations are shown in Figure 6-9 and were chosen to be representative of the different noise catchment areas surrounding the proposal. Ambient noise data was collected over a two week period in 15-minute periods for the duration of the monitoring at each location. Traffic count surveys were carried out concurrently with the long-term unattended noise monitoring surveys to calibrate the road traffic noise volumes.

Short-term attended noise monitoring was also undertaken at each monitoring location. The attended measurements are used to identify specific noise sources and the influence they have on background levels.

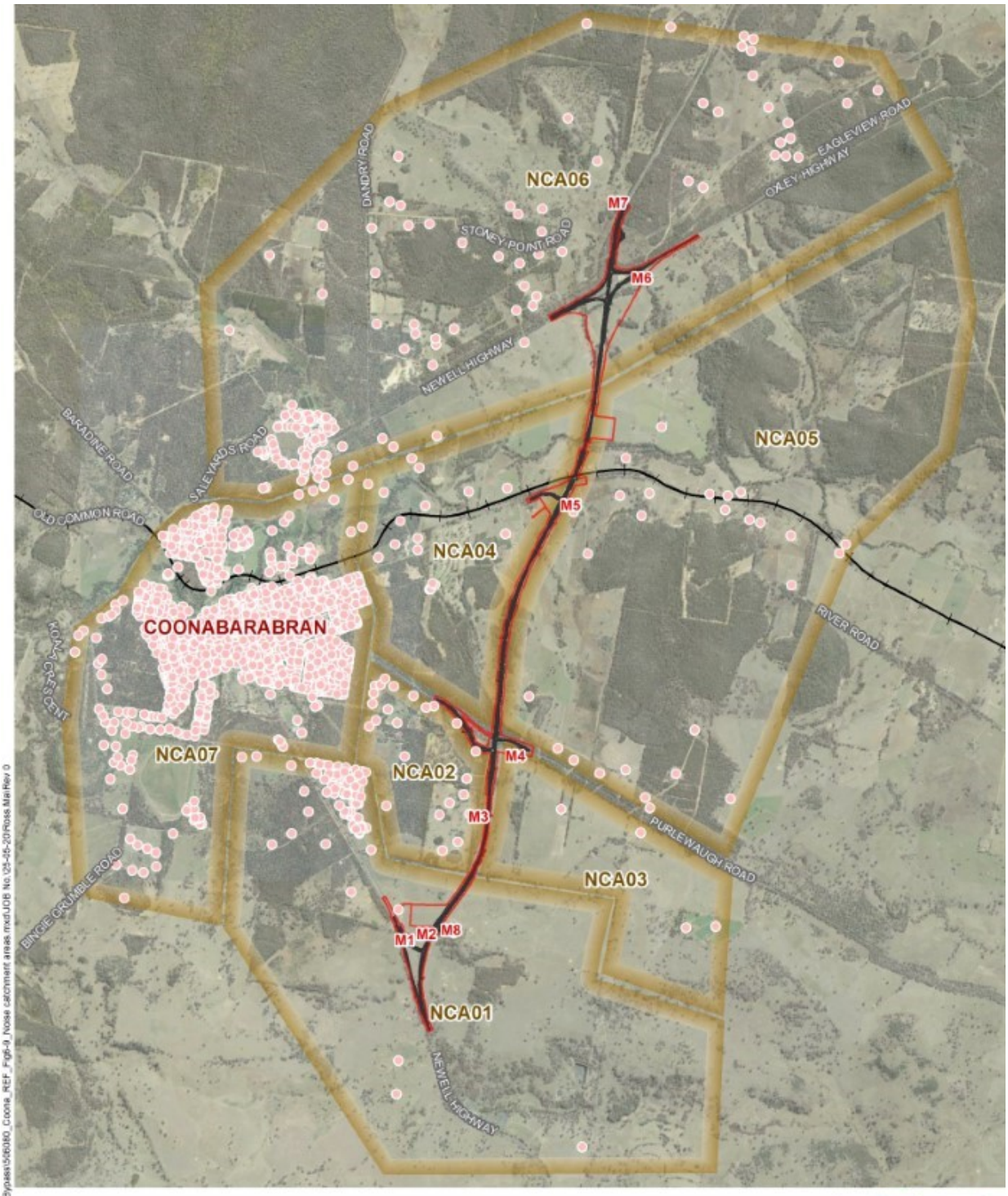

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FIGURE 6-9: Noise catchment areas

6.2.1.2 Construction noise and vibration assessment

Prediction of construction noise at sensitive receivers was modelled using SoundPLAN V8 software using the ISO 9613 algorithms. Scenarios were developed to provide 'realistic worst-case' activity sequences for different construction stages. These scenarios are discussed in detail in Appendix D and are summarised by the following construction activities:

- Pre-construction clearing
- Site compound establishment and demobilisation
- Earthworks
- Bridgeworks
- Utility and drainage works
- Pavement works
- Landscaping and finishing works
- Ancillary facility general operations, stockpiling and batch plant.

Consideration of both standard working hours and out-of-hours works has been applied in the development of scenarios as evening and night time works would be required to minimise impacts on road traffic and safety.

Noise impacts that exceed the NML are assessed by using the perception categories taken from the CNVG as per Table 6-6.

Table 6-6 NML exceedance bands and the corresponding subjective response

CNVG Perception categories	Daytime – standard construction hours	Out of hours periods
	Likely subjective response	NML exceedance
Noticeable	Applicable for noise level of 5-10dB above RBL.	1 dB to 5dB
Marginal to minor	1 dB to 10 dB	6 dB to 15 dB
Moderate	11 dB to 20 dB	16 dB to 25 dB
High	>20 dB	>25 dB

Construction vibration impacts were assessed using the CNVG minimum working distances for cosmetic damage and human response. Construction traffic impacts on public roads were predicted using the Calculation of Road Traffic Noise (CoRTN) algorithm.

6.2.1.3 Operational noise modelling

A noise model was developed to predict noise levels from the operation of the proposal to the surrounding receivers using *Calculation of Road Traffic Noise* (CoRTN) (UK Department of Transport, 1988) algorithms in SoundPLAN software. Operational traffic noise levels were modelled for the following scenarios:

- Year of opening (2026) without the proposal 'no build'

- Year of opening (2026) with the proposal ‘build’
- 10 years after opening (2036) without the proposal ‘no build’
- 10 years after opening (2036) with the proposal ‘build’.

Various inputs and parameters were applied to the model including, ground topography, surrounding buildings, typical vehicle speeds, traffic volumes, vehicle types and road surfaces (refer Section 4.5 in Appendix D). Traffic volumes were derived from 2019 monitored traffic data and traffic modelled data (refer to Section 6.5.1).

Noise modelling was validated using the measured road traffic volumes and background noise measurements. Based on the comparison of measured and predicted road traffic noise levels, the model was considered to perform as expected and was deemed valid for predicting road traffic noise levels for the proposal.

Details of the methodology is provided in Appendix D.

6.2.2 Existing environment

6.2.2.1 Noise catchment areas and sensitive receivers

The existing noise levels in the study area are primarily influenced by road traffic along the Newell Highway. Other noise sources are from the rural activities in the surrounding area.

Sensitive receivers surrounding the proposal, are mostly scattered rural residential properties, with greater density of dwellings located around one kilometre west of the alignment. This greater residential density is associated with the township of Coonabarabran.

Noise catchment areas (NCAs) have been used to characterise areas of the proposal with varying land use and background noise levels. The NCAs used in the assessment are provided in Table 6-7 and shown in Figure 6-9.

Table 6-7 Noise catchment areas and surrounding land uses

NCA	Minimum distance	Description
NCA01	50	NCA01 is located in the southern section of the Newell Highway, east and west of the proposal. The area is primarily residential with a number of accommodation facilities and a childcare centre located to the north, along the existing Newell Highway.
NCA02	20	Bound by Purlewaugh Road to the north, the proposal to the east and the outer boundary of the town of Coonabarabran, NCA02 covers the central area to the south west of the study area. The area contains a small number of residential receivers scattered across the area.
NCA03	100	To the south east of the study area, this catchment covers the central study area and is bound by Purlewaugh Road to the north and the proposal to the west. The area contains a small number of rural residential receivers scattered across the area.

NCA	Minimum distance	Description
NCA04	300	NCA04 covers the central area to the north west of the study area. It is bounded by Purlewaugh Road in the south and 500 metres south of the Newell Highway to the north. The proposal is on the eastern edge and extends to the edge of Coonabarabran. There are a small number of rural residential receivers scattered across the area and the Coonabarabran Golf Course.
NCA05	60	Covering the central area to the north east of the study area, NCA05 extends from Purlewaugh Road in the south to around 500 metres south of the Oxley Highway. The proposal is to the west. There are few scattered rural residential receivers across NCA05.
NCA06	175	NCA06 covers the northern portion of the study area and includes the northern section of the Newell Highway and Oxley Highway intersection. Covering both sides of the Newell Highway and Oxley Highway, the area is primarily scattered rural residential receivers with several commercial buildings to the west towards the town of Coonabarabran.
NCA07	1100	Covering the town of Coonabarabran, NCA07 is set back around one kilometre from the proposal. There are mostly residential areas in NCA07, with other scattered sensitive land uses such as Coonabarabran Public School and Coonabarabran High School.

Sensitive receivers in the study area are shown in Figure 6-9.and include:

- Residential dwellings and commercial buildings
- Hotels and accommodation facilities
- Educational facilities and childcare centre
- A place of worship
- Various outdoor recreation areas
- A hospital/health service centre.

A comprehensive list of other sensitive receivers (non-residential) is provided in Appendix D.

6.2.2.2 Background noise

The existing noise environment is consistent with that of rural areas, with the main sources of noise being local road traffic, residential activities and natural sources such as windblown vegetation and bird song.

The results of the monitoring of existing noise levels is summarised in Table 6-8. The background noise levels are represented as ‘rating background noise levels’ (RBLs) which refer to the median value of background noise levels measured across the monitoring period, the ‘LAeq’. The existing RBLs were considered low, which

indicates the sensitivity of the environment to the introduction of additional noise sources during construction and operation.

Table 6-8 Unattended noise monitoring results

Monitoring location	Background noise levels (RBL)		
	Day	Evening	Night
L01	36	26*	18*
L02	39	27*	18*
L03	28*	24*	19*
L04	26*	22*	18*
L05	30*	21*	18*
L06	33*	28*	18*
L07	32*	32	23*
L08	36*	25*	20*

*The monitored level was less than the minimum assumed RBL specified in the NSW EPA Noise Policy for Industry.

6.2.3 Criteria

6.2.3.1 Construction

Construction noise assessment periods

The assessment time periods that were adopted in the assessment are derived from the CNVG and summarised in Table 6-9.

Table 6-9 CNVG assessment periods

Name	Time periods	Assessment period
Standard hours	Monday to Friday: 7am to 6pm Saturday: 8am to 1pm Sunday/public holidays: no work	Daytime
Out-of-hours work: period 1 (OOHW 1)	Monday to Friday: 6pm to 10pm Saturday: 7am to 8am and 1pm to 10pm Sunday/public holiday: 8am to 6pm	Daytime
		Evening
Out-of-hours work: period 2 (OOHW 2)	Monday to Friday: 10pm to 7am Saturday: 10pm to 8am Sunday/public holiday: 6pm to 7am	Evening
		Night time

Construction noise criteria

The Interim Construction Noise Guideline (ICNG) requires project-specific noise management levels (NMLs) to be established for noise-affected receivers. The residential NMLs for the proposal have been determined based on the RBLs as defined in the *Noise Policy for Industry* (NPI) plus an additional allowance of 10 dB during the standard work hours and 5 dB outside of standard hours. The ICNG also states that where construction noise levels are above 75 dBA at residential receivers during standard hours, they are considered 'highly noise affected' and require additional consideration in terms of noise mitigation and management measures. The NMLs for residential receivers presented in Table 6-10.

Maximum noise levels generated by road traffic noise have the potential to cause disturbance to sleep. Residential sleep disturbance screening criteria has been established for each NCA and is provided in Table 6-10.

Table 6-10 Residential receiver construction noise management levels

NCA	Monitoring location	Noise management level ($L_{Aeq\ (15minute)}$ – dBA)				Sleep disturbance screening criteria (RBL + 15dB)
		Standard construction hours (RBL + 10dB)	Out of hours (RBL + 5dB)			
		Daytime	Daytime	Evening	Night-time	
NCA01	L01	46	41	35	35	35
NCA02	L03	45	40	35	35	45
NCA03	L04	45	40	35	35	45
NCA04	L05	45	40	35	35	45
NCA05	L05	45	40	35	35	45
NCA06	L06	45	41	35	35	45
NCA07	L01	46	41	35	35	45

Note: Daytime out of hours is 7 am to 8 am and 1 pm to 6 pm on Saturday, and 8 am to 6 pm on Sunday and public holidays

The non-residential NMLs have been determined using the ICNG NMLs for 'other sensitive receivers'. The NMLs for non-residential sensitive receivers are presented in Table 6-11. For the non-residential sensitive receivers that are not listed in the ICNG, the assessment has used the *AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors* for criteria (Table 6-10).

Table 6-11 ICNG NMLs for non-residential sensitive receivers

Land use	Noise management level $L_{Aeq\ (15minute)}$ (applied when property is in use)
Classrooms at schools and other education	Internal noise level 45 dBA[1]
Hospital wards and operating theatres	Internal noise level 45 dBA[1]
Places of worship	Internal noise level 45 dBA[1]

Land use	Noise management level $L_{Aeq\ (15minute)}$ (applied when property is in use)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants)	External noise level 65 dBA
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion)	External noise level 60 dBA
Community centres	Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses
Commercial	External noise level 70 dBA

Note: The criteria is specified as an internal noise level for this receiver category. As the noise model predicts external noise levels, it has been conservatively assumed that all schools and places of worship have openable windows and external noise levels are 10 dB higher than the corresponding internal level, which is representative of windows being partially open to provide ventilation.

Table 6-12 AS2107 NMLs for 'Other Sensitive' receivers

Use	Period	AS2107 Classification	NML $_{LAeq\ (15minute)}$
Hotel	Daytime and evening	Bars and lounges	Internal noise level 50dBA1
	Night-time	Sleeping areas: Hotels near major road	Internal noise level 40dBA1
Public building	Daytime and evening	Public building (public space)	Internal noise level 50dBA1
Aged care	Day, evening and night	Considered to be residential	As per NCA
Stables	Day and evening	Considered to be outdoor active	As per table above

Note: These receivers are assumed to have fixed windows with a conservative 10 dB reduction for external to internal noise levels.

Construction traffic noise

The potential impacts from construction traffic associated with the proposal when travelling on public roads have been assessed under the NSW EPA Road Noise Policy (RNP), CNVG and Roads and Maritime Noise Criteria Guideline (NCG) (Table 6-13)

Table 6-13 RNP/NCG criteria for assessing construction traffic on public roads

Road category	Type of project/land use	Assessment criteria	
		Daytime (7am to 10pm)	Night-time (10pm – 7am)
Freeway / arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways/ arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55(external)	$L_{Aeq(1hour)}$ 50(external)

Construction vibration

The effects of construction vibration has been assessed for human comfort, building contents and structural/cosmetic damage.

Human comfort vibration

When construction works are near occupied areas and buildings, people can sometimes perceive vibration impacts when vibration generating works occur. The EPA's Assessing Vibration: a technical guideline (2006) was used to determine the criteria for intermittent vibration based on the Vibration Dose Value (VDV). The 'preferred' and 'maximum' VDVs for human comfort impacts are provided in Table 6-14.

Although construction activities are not expected to result in continuous or impulsive vibration impacts, criteria for the potential occurrence of continuous vibration impacts has also been included in the assessment and is provided in Appendix D. In addition, more information about effects on building contents and structural damage criteria can also be found in Appendix D.

Table 6-14 Vibration dose values for intermittent vibration

Building type	Assessment period	Vibration dose value ($m/s^{1.75}$)	
		Preferred	Maximum
Critical Working Areas (eg operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	.0.40
	Night-time	0.13	0.26

Building type	Assessment period	Vibration dose value (m/s$^{1.75}$)	
		Preferred	Maximum
Offices, schools, Educational institutions and places of worship	Day or night-time	0.40	0.80

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods and is dependent on the level of vibration as well as the duration.

Structural damage criteria

If vibration from construction works is sufficiently high, it can cause damage to structural elements of affected buildings. The levels of vibration required to cause cosmetic damage tend to be at least an order of magnitude (10 times) higher than those at which people can perceive vibration.

The British Standard 7385 is used as a guide to assess the likelihood of building damage from ground vibration such as that caused by piling, compaction, construction equipment and road and rail traffic. The Standard recommends levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur based on the type of structure affected, using the peak particle velocity (PPV) parameter. The criteria are presented in Table 6-15.

Table 6-15 Structural damage criteria for cosmetic building damage, (BS7385-2: 1993)

Group	Type of structure	Peak particle velocity (PPV) - mm/s		
		4Hz to 15Hz	15Hz to 40Hz	40Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50		
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15 to 20	20 to 50	50

6.2.3.2 Operation

Operational noise

To protect the community and the environment from excessive noise and vibration impacts from the long term operation of the proposal, criteria relating to airborne noise has been developed using the guidelines provided in Section 6.2.3. The RNP was used in line with the NCG in the assessment to assess and manage potential airborne noise impacts from the proposal during operation. This criterion is non-mandatory for residential and non-residential (other sensitive) receivers.

To determine potential impact to residential receivers, consideration of the road network is required to understand the existing noise environment. The NCG requires transition zones to be applied at a point where road categories change to provide a smooth transition in noise criteria. The NCG criteria for residential receivers is shown in Table 6-16 and the NCG criteria for non-residential sensitive receivers is shown in

Table 6-17. The NCG does not consider commercial and industrial receivers as being sensitive to operational airborne road traffic noise impacts.

Table 6-16 The NCG criteria for residential receivers

Road category	Type of project/land use	Assessment criteria (Dba)	
		Daytime (7am – 10pm)	Night-time (10pm – 7am)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/ sub-arterial road corridors	$L_{Aeq\ (15\ hour)}$ 55 (external)	$L_{Aeq\ (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/ sub-arterial roads	$L_{Aeq\ (15\ hour)}$ 60 (external)	$L_{Aeq\ (9\ hour)}$ 55 (external)
	4. Existing residences affected by both new roads and the redevelopment of existing freeway/arterial/ sub-arterial roads in a Transition Zone	$L_{Aeq\ (15\ hour)}$ 55-60 (external)	$L_{Aeq\ (9\ hour)}$ 50-55 (external)
	5. Existing residences affected by increase in traffic noise of 12dB or more from new or existing freeway/arterial/ sub-arterial roads	$L_{Aeq\ (15\ hour)}$ 42-55 (external)	$L_{Aeq\ (9\ hour)}$ 42-50 (external)
	6. Existing residences affected by increases in traffic noise of 12 dB or more from redevelopment of existing freeway/arterial/ sub-arterial roads	$L_{Aeq\ (15\ hour)}$ 42-60 (external)	$L_{Aeq\ (9\ hour)}$ 42-55 (external)
Local Roads	8. Existing residences affected by noise from redevelopment of existing local roads	$L_{Aeq\ (1\ hour)}$ 55 (external)	$L_{Aeq\ (1\ hour)}$ 50 (external)

Table 6-17 NCG criteria for non-residential sensitive receivers

Existing sensitive land use	Assessment criteria		Additional considerations
	Daytime (7am to 10pm)	Night-time (10pm – 7am)	
1. School classrooms	LAeq(1 hour) 40 (internal)	-	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000).
2. Hospital wards	LAeq(1 hour) 35 (internal)	LAeq(1 hour) 35 (internal)	
3. Places of worship	LAeq(1 hour) 40 (internal)	LAeq(1 hour) 40 (internal)	The criteria are internal, ie the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what is in these areas that may be affected by road traffic noise.
4. Open space (active use)	LAeq (15 hour) 60 (external)	-	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
5. Open space (passive use)	LAeq (15 hour) 55 (external)	-	Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion (eg playing chess, reading).

Existing sensitive land use	Assessment criteria		Additional considerations
	Daytime (7am to 10pm)	Night-time (10pm – 7am)	
6. Childcare facilities	Sleeping rooms LAeq(1 hour) 35 (internal) Indoor play areas LAeq(1 hour) 40 (internal) Outdoor play areas LAeq(1 hour) 55 (internal)	-	Multipurpose spaces (eg shared indoor play/sleeping rooms) should meet the lower of the respective criteria. Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility
7. Aged care facilities	-	-	The criteria for residential land uses should be applied to these facilities.

6.2.3.3 Noise mitigation criteria

To manage the potential impacts of the proposal, the Roads and Maritime Noise Mitigation Guideline (NMG) provides guidance to control road traffic noise and describes the principles to be applied when reviewing noise mitigation. The NMG provides three triggers where receivers may qualify for considerations of additional noise mitigation. The triggers of additional mitigation are:

- Trigger 1 – the predicted 'Build' noise level exceeds the NCG controlling criterion and the noise level increase due to the proposal (ie the noise predictions for the 'Build' minus the 'No Build') is greater than 2.0 dB educational facilities and childcare centre
- Trigger 2 – the predicted 'Build' noise level is 5 dB or more above the NCG controlling criterion (ie exceeds the cumulative limit) and the receiver is significantly influenced by proposal road noise, regardless of the incremental impact of the proposal
- Trigger 3 – the noise level contribution from the road proposal is acute (daytime LAeq(15hour) 65 dBA or higher, or night-time LAeq(9hour) 60 dBA or higher) even if noise levels are controlled by a non-project road.

6.2.4 Potential impacts

6.2.4.1 Construction noise

The assessment of construction noise impacts has been assessed for both standard construction hours and out-of-hours. However, where practicable, works would be undertaken in standard construction hours. Assessments have been based on both typical and peak scenarios. However, these scenarios are considered to be the worst case, without mitigation and would in most cases be lower and would not last the whole construction period as works move across the alignment.

The assessment has predicted construction noise impacts for the most affected receivers (ie closest to or with direct line of sight of the construction) within the NCAs. A detailed overview of the predicted worst-case noise exceedances is in Appendix D.

Table 6-18 and Table 6-19 provide a summary of the predicted construction noise exceedances per activity during construction during standard daytime hours and out of hours works (evening and night-time). Discussion of the results are in the following sections.

Table 6-18 Predicted construction noise exceedances per activity – residential receivers - Standard daytime hours

Scenario	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
Pre-construction clearing	High	High	High	Moderate	High	Moderate	Minor
Site compound establishment and demobilisation	Moderate	Minor	Noticeable	Minor	Moderate	Minor	Noticeable
Earthworks	High	High	High	Moderate	High	Moderate	Minor
Bridgeworks	Noticeable	Noticeable	Noticeable	Noticeable	Minor	Noticeable	Noticeable
Utility and drainage	High	High	High	Moderate	High	Moderate	Minor
Pavement works	High	High	High	Moderate	High	Moderate	Minor
Landscaping and finishing works	High	High	Moderate	Minor	Moderate	Minor	Noticeable
Ancillary facility	Moderate	Minor	Noticeable	Minor	Noticeable	Noticeable	Noticeable

Table 6-20 Predicted construction noise exceedances per activity – residential receivers - Out of hours works

Period	Scenario	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07
Evening	Pre-construction clearing	High	High	High	High	High	High	Moderate
	Bridgeworks	Noticeable	Noticeable	Noticeable	Noticeable	Minor	Noticeable	Noticeable
	Utility and drainage	High	High	High	Moderate	Moderate	Moderate	Minor
	Pavement works	High	High	High	Moderate	Moderate	Moderate	Minor
	Ancillary facility	Moderate	Moderate	Minor	Minor	Moderate	Noticeable	Noticeable
Night	Pre-construction clearing	High	High	High	High	High	High	Moderate
	Bridgeworks	Noticeable	Noticeable	Noticeable	Noticeable	Minor	Noticeable	Noticeable
	Utility and drainage	High	High	High	Moderate	Moderate	Moderate	Minor
	Pavement works	High	High	High	Moderate	Moderate	Moderate	Minor
	Ancillary facility	Moderate	Moderate	Minor	Minor	Moderate	Noticeable	Noticeable

Standard construction noise impacts

Impacts to the most affected receivers in NCA01, NCA02, NCA03, and NCA05 are classed as high during standard daytime hours for associated noise intensive activities (with exceedances of up to 25dBA):

- Pre-construction clearing (peak)
- Earthworks (peak and typical)
- Utility and drainage works (peak)
- Pavement works (peak and typical)
- Landscaping and finishing works.

Some receivers in NCA02 are the most highly affected overall receivers due to the distance between the receivers and the proposal (minimum distance of about 20 metres from the proposal). The worst-case predicted noise level for the most affected receiver in NCA02 is around 75 to 85dBA. However, this is expected to be experienced by only one receiver in NCA02, with other receivers located greater than 350 metres away. These receivers are predicted to have noise levels less than 45dBA, which is compliant with the daytime NML.

Noise exceedances are also expected to occur as a result of works at ancillary facilities during general operations, stockpiling and batch plant operations. In particular, NCA01 and NCA02 would experience moderately intrusive impacts, with exceedances between 11 to 20 dBA. Ancillary Site 4 is located in NCA01 near the southern intersection, close to sensitive receivers. Noise levels from the use of a batch plant and associated activities are expected to result in moderate impacts to nearby residential receivers.

The assessment of commercial and 'other sensitive' receivers indicated that minor exceedances of between 5dBA and 10dBA are predicted to occur at the Cooinda Coonabarabran Aged Care Centre during the daytime period when noise intensive equipment is in use.

Out of hours works (evening and night time) noise impacts

Out of hours work with the greatest impact and loudest noise levels would occur during:

- Evening pre-construction clearing (peak)
- Evening utility and drainage works (peak)
- Evening pavement works
- Night-time pre-construction clearing (peak)
- Night-time utility and drainage (peak)
- Night-time pavement works (peak).

The worst-case night-time impacts are predicted to be high at the nearest receivers in all NCAs adjacent to the proposal during noise intensive works. Of these works, up to 31 receivers are predicted to be above the night-time NML by greater than 25dB. In particular, pavement works are expected to have a high impact on receivers within 200 metres of the equipment, with more distant receivers experiencing minor to moderate noise impacts.

The residential receivers who are expected to have high night-time noise impacts may also be affected by sleep disturbance impacts. The sleep disturbance screening

assessment identified that the 31 receivers predicted to have exceedance above the night-time NMLs, may also experience sleep disturbance impacts.

During out of hours works, ancillary facilities would result in moderately intrusive impacts, with exceedances of 16dB and 25dB NML. NCA01 and NCA05 would experience the most noise impacts from ancillary facilities during the evening and night-time due to the proximity of residential receivers.

Minor and moderate exceedances of the night-time NML of between 5dBA and 10dBA are predicted at the Cooinda Coonabarabran Aged Care Centre during the night-time period when noise intensive equipment is in use.

The requirements for night time works would be confirmed as the proposal progresses. It is expected that works would be undertaken as much as possible during standard construction hours. Should works be required at night, these are expected to occur for short periods. As such, these construction noise impacts are considered worst case and noise levels outside of standard construction hours would be much lower.

6.2.4.2 Construction traffic

There are expected to be some noise impacts associated with construction related traffic during construction. These impacts would be temporary and would impact receivers closest to haulage and access routes including Newell Highway, Oxley Highway, River Road and Purlewaugh Road.

Daily truck movements would average around 164 movements, with a maximum of 250 movements. Average light vehicle movements would average 184 movements, with a maximum of 530 movements. Based on the predicted movements, there is expected to be a potential increase of 2.1dB when half of the proposed construction traffic travel along the River Road to Ancillary Sites 2 and 3.

The residential receiver adjacent to the access road at Ancillary Site 4 in NCA01 would experience exceedances in the standard daytime NML. Similarly, receivers near the ancillary facilities on River Road would also experience some low noticeable noise increases.

There would be slight increases to traffic due to construction vehicles on the Newell Highway at both intersections (north and south), however numbers would be low compared to existing traffic numbers. As such, this would not be expected to cause any noticeable noise impacts.

6.2.4.3 Construction vibration

The main sources of vibration during construction would be from vibration intensive equipment including vibratory rollers and rock breakers. In the eastern section of the study area (NCA02 and NCA03), some buildings and structures are located closer to the proposal than the recommended minimum working distances from vibration intensive equipment, which may result in some vibration impacts.

Some receivers are also within the human comfort minimum working distance, meaning that vibration impacts may be perceived by residents when vibration intensive equipment is in use.

6.2.4.4 Operation

Traffic noise levels to each NCA were modelled for the two ‘build’ and ‘no build’ scenarios described in Section 6.2.1 and compared against the operational noise criteria presented in Section 6.2.3. This allowed for the identification of receivers that qualify for consideration of operational noise mitigation. Table 6-21 provides an

overview of the operation impacts of the proposal based on the build and no-build scenarios.

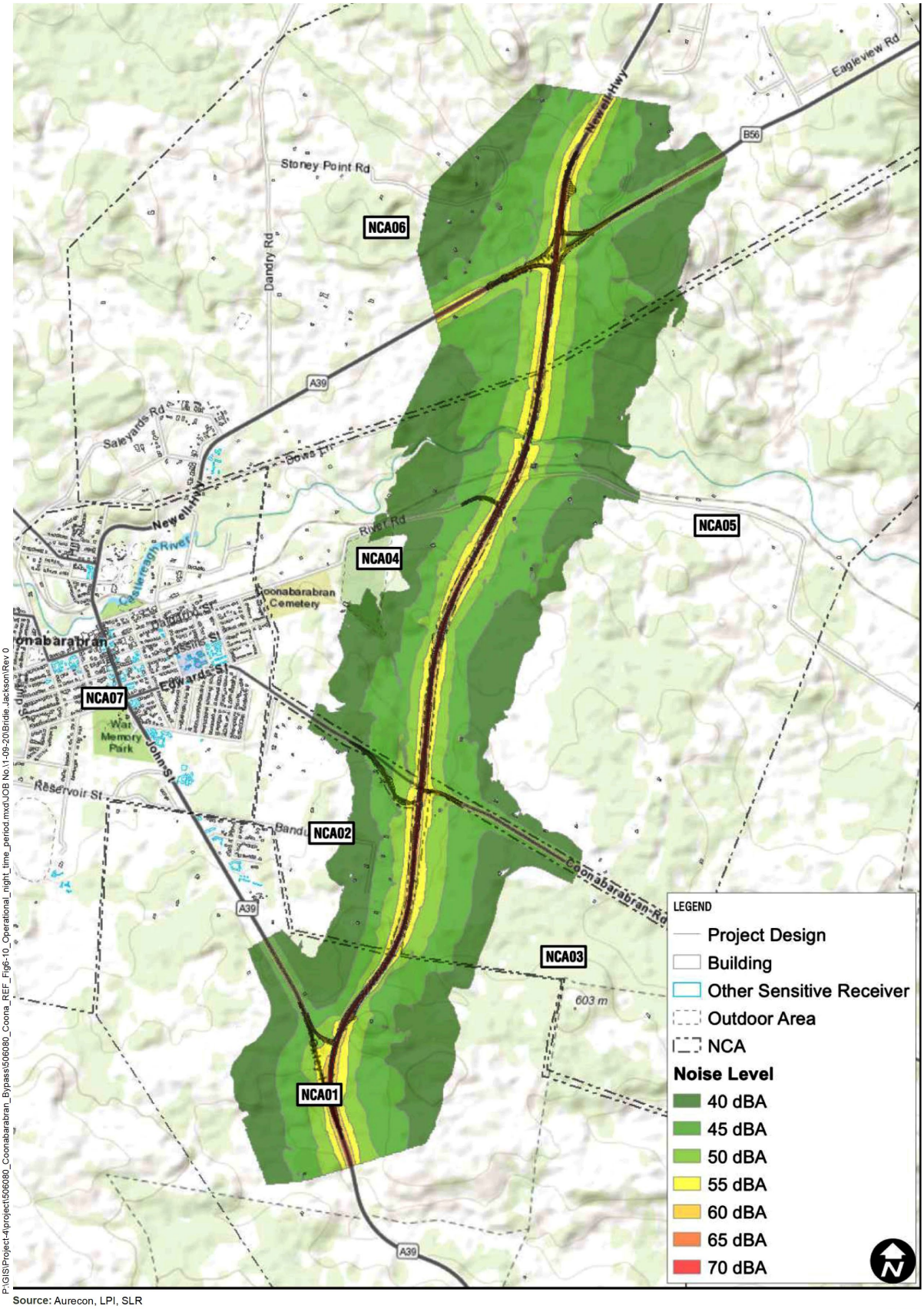
The operational noise predictions indicate there would be a reduction in traffic noise along sections of the Newell Highway entering Coonabarabran and along River Road and Purlewaugh Road due to traffic being diverted onto the bypass. As such, in NCA06, noise levels at sensitive receivers are expected to decrease as a result of the proposal.

However, an increase in road traffic noise is predicted at receivers within NCA01, NCA02, NCA03, NCA04 and NCA05 as receivers are in an area of low existing traffic noise. Worst-case predicted operational noise levels are expected by the proposal in the 2036 night-time scenario which is reflected in Figure 6-10. Other maps indicating the difference in predicted operational noise levels between build and no build scenarios for both 2026 and 2036 are presented in Appendix D.

With the shift of traffic onto the bypass, road traffic noise within Coonabarabran is expected to decrease, particularly heavy vehicle noise impacts.

There are 15 sensitive receivers which would experience noise exceedances and require additional noise mitigation. These receivers are located in NCA01, NCA02, NCA03, NCA04 and NCA05.

Maximum noise levels would increase by 3dB to 20dB. Maximum noise levels would be worst at NCA02 (20dB), NCA01 (16dB), NCA04 (14dB) and NCA05 (14dB) due to proximity to the bypass. However, the changes in the maximum noise levels would not trigger for consideration of additional noise mitigation. The maximum noise levels near intersections with River Road, Purlewaugh Road and the southern intersection ramp would be associated with vehicles breaking in and accelerating out of these intersections. However, the number of heavy vehicles traveling through these intersections would be minor or absent due to the vehicle size classes permitted on these roads and the projected vehicle numbers (refer to Section 6.5.3.2).



Source: Aurecon, LPI, SLR

NOT TO SCALE

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-10: Operational night-time period in the 2036 scenario

Table 6-21 Assessment of receivers during the operational phase of the proposal

NCA	Type	Address*	Predicted Noise Level (dBA)																
			NCG Criteria		At opening (2026)				Future (2036)				> 2 dB(A) Increase		Cumulative Limit		Project Acute		Eligible for Consideration of Mitigation
					No Build		Build		No Build		Build								
			D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	
NCA01	Residential	[redacted]	55	50	64	58	59	49	65	59	59	49	-	-	-	-	-	-	-
NCA01	Residential	[redacted]	55	50	50	43	56	51	50	44	57	52	Y	Y	-	Y	-	-	Y
NCA01	Residential	[redacted]	55	50	54	48	50	42	55	49	50	42	-	-	-	-	-	-	-
NCA01	Residential	[redacted]	55	50	53	46	54	49	53	47	55	50	-	-	-	-	-	-	-
NCA02	Residential	[redacted]	55	50	55	44	53	44	55	44	53	44	-	-	-	-	-	-	-
NCA02	Residential	[redacted]	52	44	40	32	55	51	40	32	56	52	Y	Y	Y	Y	-	-	Y
NCA02	Residential	[redacted]	54	45	42	33	54	50	42	33	55	51	Y	Y	-	Y	-	-	Y
NCA02	Residential	[redacted]	55	50	52	42	56	51	52	42	56	51	Y	Y	-	-	-	-	Y
NCA02	Residential	[redacted]	55	50	51	40	50	42	51	40	51	42	-	-	-	-	-	-	-
NCA02	Residential	[redacted]	55	50	54	43	53	42	54	43	53	43	-	-	-	-	-	-	-
NCA02	Residential	[redacted]	55	48	44	36	45	39	44	36	43	40	-	-	-	-	-	-	-
NCA02	Residential	[redacted]	55	50	49	38	59	54	49	38	59	54	Y	Y	-	-	-	-	Y
NCA02	Residential	[redacted]	53	44	41	32	50	46	41	33	51	47	-	Y	-	-	-	-	Y
NCA02	Residential	[redacted]	52	43	40	31	48	43	40	31	49	44	-	Y	-	-	-	-	Y
NCA02	Residential	[redacted]	51	43	39	31	48	43	39	32	49	44	-	Y	-	-	-	-	Y
		[redacted]	55	49	44	37	50	45	44	37	51	46	-	-	-	-	-	-	-

* Details removed for privacy

NCA	Type	Address*	Predicted Noise Level (dBA)																	
			NCG Criteria		At opening (2026)				Future (2036)				> 2 dB(A) Increase		Cumulative Limit		Project Acute		Eligible for Consideration of Mitigation
					No Build		Build		No Build		Build								
			D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	
NCA02	Residential	[redacted]	52	44	40	32	54	50	40	33	55	51	Y	Y	-	Y	-	-	Y
		[redacted]	55	47	43	35	57	53	43	36	58	53	Y	Y	-	Y	-	-	Y
NCA02	Residential	[redacted]	55	46	44	34	56	51	44	34	57	52	Y	Y	-	Y	-	-	Y
NCA02	Residential	[redacted]	53	45	41	33	44	39	41	34	45	40	-	-	-	-	-	-	-
		[redacted]	54	47	42	35	45	40	43	35	46	40	-	-	-	-	-	-	-
NCA03	Residential	[redacted]	55	50	50	39	58	54	50	40	59	54	Y	Y	-	Y	-	-	Y
NCA03	Residential	[redacted]	54	46	42	34	48	44	43	34	49	44	-	-	-	-	-	-	-
NCA04	(Outdoor Active)	[redacted]	60	-	39	32	45	40	40	33	46	41	-	-	-	-	-	-	-
NCA04	Residential	[redacted]	55	50	49	39	50	45	50	39	51	46	-	-	-	-	-	-	-
NCA04	Residential	[redacted]	55	49	49	37	47	42	49	37	48	42	-	-	-	-	-	-	-
NCA04	Residential	[redacted]	49	42	37	27	50	46	36	28	51	46	Y	Y	-	-	-	-	Y
NCA05	Residential	[redacted]	55	50	51	40	5	44	51	40	52	45	-	-	-	-	-	-	-
NCA05	Residential	[redacted]	55	48	45	36	56	52	45	36	57	53	Y	Y	-	Y	-	-	Y
NCA05	Residential	[redacted]	55	50	47	38	48	43	47	38	49	44	-	-	-	-	-	-	-
NCA05	Residential	[redacted]	55	47	45	35	46	40	45	35	47	41	-	-	-	-	-	-	
NCA05	Residential	[redacted]	55	50	50	40	51	46	50	40	52	47	-	-	-	-	-	-	-

* Details removed for privacy

NCA	Type	Address*	Predicted Noise Level (dBA)																
			NCG Criteria		At opening (2026)				Future (2036)				> 2 dB(A) Increase		Cumulative Limit		Project Acute		Eligible for Consideration of Mitigation
					No Build		Build		No Build		Build								
			D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	
NCA05	Residential	[redacted]	48	42	36	27	48	43	36	27	48	44	-	Y	-	-	-	-	Y
NCA05	Residential	[redacted]	55	50	53	41	49	43	53	41	50	43	-	-	-	-	-	-	-
NCA05	Residential	[redacted]	55	50	50	40	58	54	51	41	59	54	Y	Y	-	Y	-	-	Y
NCA05	Residential	[redacted]	55	50	49	39	53	48	49	39	53	49	-	-	-	-	-	-	-
NCA05	Residential	[redacted]	55	50	49	38	51	44	49	38	51	45	-	-	-	-	-	-	-
NCA05	Residential	[redacted]	55	49	45	37	48	44	45	37	49	44	-	-	-	-	-	-	-
NCA05	Residential	[redacted]	55	50	49	38	50	43	49	38	50	43							
NCA06	Residential	[redacted]	59	54	47	42	48	43	48	43	49	44	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	55	50	52	48	51	47	53	48	52	47	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	56	51	49	44	50	45	49	44	50	45	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	55	50	55	50	54	49	56	51	54	50	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	59	53	47	41	47	42	47	42	48	43	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	58	53	50	45	52	47	51	46	52	47	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	55	50	62	57	59	55	62	58	60	56	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	56	51	51	46	52	47	52	47	53	48	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	55	50	50	45	50	45	50	45	51	46	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	55	50	50	45	51	46	51	46	52	47	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	56	51	50	45	51	47	51	46	52	47	-	-	-	-	-	-	-

* Details removed for privacy

NCA	Type	Address*	Predicted Noise Level (dBA)																
			NCG Criteria		At opening (2026)				Future (2036)				> 2 dB(A) Increase		Cumulative Limit		Project Acute		Eligible for Consideration of Mitigation
					No Build		Build		No Build		Build								
			D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	
NCA06	Residential	[redacted]	55	50	47	42	48	43	48	43	49	44	-	-	-	-	-	-	-
NCA06	Residential	[redacted]	55	50	53	48	52	48	54	49	53	49	-	-	-	-	-	-	-

Note: The results in this table are based on the highest noise level of the triggered facades, per floor. If no facades are triggered, then the highest noise level of all facades is presented for each floor. It is noted that a single receiver may be triggered on multiple facades and for some receivers where a >2 dB increase is shown, this may be on a different facade from where the highest noise level is predicted.

* Details removed for privacy

6.2.5 Safeguards and management measures

6.2.5.1 Noise mitigation options

For the 15 residential receivers that would experience operational noise exceedances and require additional noise mitigation. At-property architectural treatments are considered the most feasible mitigation for the proposal. Details of the mitigation options considered for reducing traffic noise impacts are provided in Table 6-22. These would be further investigated during detailed design.

Table 6-22 Noise mitigation options

Mitigation option	Description	Feasibility
Low noise pavements	Low noise pavements are typically the preferred form of noise mitigation as they reduce source noise levels which benefits both outside areas and internal spaces. Low noise pavements have no associated visual impact and are also likely to provide noise benefits to receivers at greater distances than noise barriers.	They are generally considered feasible to use where there are four or more closely spaced receivers requiring mitigation. As the identified triggered receivers are sparsely separated with the closest five triggered receivers spread out over one kilometre, the use of low noise pavement is not considered a suitable mitigation.
Noise barriers	Noise barriers (in the form of walls or mounds) can provide significant noise reductions and also reduce both external and internal noise levels. Where space allows, raised earth mounds can be used as noise barriers and can be enhanced by placing a low wall on top. Noise barriers can, however, introduce a number of negative aspects, including access to property, aesthetic impacts, daylight access, overshadowing, drainage, graffiti, restriction of line of sight, maintenance access and safety concerns.	The relatively small number of triggered receivers are spread across the proposal area and would require a large portion of the proposal adjacent to the receivers to have barriers installed for this to be effective. As such, the use of noise barriers as a mitigation option for the proposal is unlikely to be feasible.
Architectural treatment	Architectural treatments including at-property mitigation such as window glazing, sealed doors or upgraded façade constructions to achieve appropriate internal noise levels	At-property architectural treatments are considered feasible for the proposal due to the isolated nature of the residences that would be impacted.

6.2.5.2 Mitigation measures

The following section provides a list of mitigation measures that should be applied during the proposal

Table 6-23 Noise and vibration safeguards and mitigation measures

ID	Impact	Environmental safeguards	Responsibility	Timing
NV1	Noise and vibration	A Construction Noise and Vibration Management Plan will be prepared before any works begin and would include: • Identification of nearby sensitive receivers • Description of works, construction equipment and hours works would be completed in • Criteria for the proposal and relevant licence and approval conditions • Requirements for noise and vibration monitoring • Details of how community consultation would be completed • Procedures for handling complaints • Details on how respite would be applied • The NVMP will include standard management measure from the Construction Noise and Vibration Guideline (CVNG) (Roads and Maritime, 2016b)	Contractor	Detailed design / pre-construction
NV2	Construction noise and vibration assessments	Location and activity specific noise and vibration impact assessments should be carried out prior to (as a minimum) activities: • With the potential to result in noise levels above 75 dBA at any receiver • Required outside Standard Construction Hours likely to result in noise levels in greater than the relevant Noise Management Levels • With the potential to exceed relevant criteria for vibration. The assessments should confirm the predicted impacts at the relevant receivers in the vicinity of the activities to aid the selection of appropriate management measures, consistent with the requirements of the CNVG.	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
NV3	Construction noise exceedances	The assessment has identified that high impacts are likely when noise intensive equipment such as rockbreakers or concrete saws are in use, especially during evening and night-time periods. The nearest residential receivers are predicted to have 'high' impacts during the evening and night-time when the noisiest construction works are nearby. Where noise intensive equipment is to be used near sensitive receivers, the works should be scheduled for Standard Construction Hours, where possible. If it is not possible to restrict the works to the daytime then they should be completed as early as possible in each work shift. Appropriate respite should also be provided to affected receivers in accordance with the CNVG and/or the proposal's conditions of approval.	Contractor	Construction
NV4	Compounds with long term works	Hoarding, or other shielding structures, should be used where receivers are impacted near compounds or fixed works areas with long durations. To provide effective noise mitigation, the barriers should break line of sight from the nearest receivers to the works and be of solid construction with minimal gaps.	Contractor	Pre-construction
NV5	Construction noise monitoring	Monitoring should be carried out at the start of new noise and vibration intensive activities to confirm that actual levels are consistent with the predictions and that appropriate mitigation measures from the CNVG have been implemented.	Contractor	Construction
NV6	Construction vibration	Where works are within the cosmetic damage minimum working distances and considered likely to exceed the criteria: • different construction methods with lower source vibration levels should be investigated and implemented, where feasible • attended vibration measurements should be undertaken at the start of the works to determine actual vibration levels at the item. Works should be ceased if the monitoring indicates vibration	Contractor	Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		levels are likely to, or do, exceed the relevant criteria.		
NV7		Certain receivers in the study area are within the human comfort minimum working distance and occupants of affected buildings may be able to perceive vibration impacts when vibration intensive equipment is in use. The potential human comfort impacts and requirement for vibration intensive works should be reviewed as the proposal progresses.	Contractor	Construction
NV8	Construction vibration	Building condition surveys should be completed before and after the works where buildings or structures are within the minimum working distances and considered likely to exceed the cosmetic damage criteria during the use of vibration intensive equipment.	Contractor	Construction
NV9	Construction traffic	Further consideration of the potential impacts from construction traffic should be completed when the final haulage routes are known.	Contractor	Pre-construction / construction
NV10	Operational noise mitigation	Operational noise mitigation requirements will be reviewed during detailed design. At-property treatments will be agreed upon and implemented during construction in consultation with property owners.	TfNSW / Contractor	Detailed design / construction
NV11	Operational noise	Post construction noise monitoring will be undertaken in accordance with *Noise Criteria Guideline* (Roads and Maritime, 2015) and *Noise Mitigation Guideline* (Roads and Maritime, 2015) within two to twelve months of proposal completion, at selected representative locations along the proposal route.	TfNSW	Operation

6.3 Landscape character and visual impacts

This section describes the potential landscape character and visual impacts associated with the proposal. This section is informed by the landscape character and visual impact assessment (LCVIA) (SCAPE, 2020) which is provided in Appendix E.

6.3.1 Methodology

The landscape character and visual impact assessment (LCVIA) was carried out in accordance with the Practice Note: Guidelines for Landscape Character and Visual Impact Assessment V2.1 (Roads and Maritime, 2018c).

The LCVIA assesses the potential impacts to landscape character and visual impacts of the proposal. It identifies the sensitivity of individual landscape character zones and viewpoints and the magnitude of change at each associated with the proposal. The impact is determined by assessing sensitivity and magnitude by using a matrix which is summarised in Table 6-24.

Table 6-24 Landscape and visual impact grading matrix

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

Landscape character impact considers a combination of an area's built, natural and cultural character. Sensitivity refers to the degree to which a particular landscape type or receiver can absorb and accommodate change arising from a proposal and magnitude describes extent and scale of the effects of the development within the landscape. Desktop studies and site analyses were conducted to understand the natural environment as well as human intervention and the shaping of the environment, including settlements and the interaction between place and community in order to identify landscape character zones. Impacts of the proposal were identified and assessed to determine the effects on landscape character. These impacts are based on the sensitivity of the landscape character zone to change and the magnitude of the proposal within that landscape.

Visual impacts assess the unmitigated impact of the proposal at representative viewpoints. Viewpoint sensitivity is dependent on the type or viewer, elements of the proposal that are visible and importance of the view. The magnitude of change is the scale, size and character of the proposal, the extent of visibility and the contrast with the existing view. Viewpoints were chosen to represent vantage points with high numbers of viewers, such as major publicly accessible viewing areas rather than remote locations. Assessment tools used to investigate potential visual impacts included Google Earth in conjunction with plans and site photography taken during the site visit to obtain a more comprehensive understanding of the extent of the proposal from various viewpoints. The application of the TfNSW Guidelines (Roads and Maritime, 2018c) was used to assess the likely changes to landscape composition such as the dominance of form, lines, colours and textures. A visual envelope was generated through desktop analysis and on-site verification to assist

with the identification of areas that would be visible during times of impact. Artist impressions and computer generated (3D) images were used to provide a digital indication of the final design seen at each location.

6.3.2 Existing environment

6.3.2.1 Landscape context

The proposal is located within a rural, agricultural landscape of central western NSW. The landscape is characterised by gently undulating landform which is mostly open agricultural grasslands with pockets of native vegetation and scattered homesteads. The proposal intersects a number of creeks and drainage lines, the most notable being the Castlereagh River, Dog Trap Creek and Chinamans Gully.

The town of Coonabarabran includes low density residential and low to medium density commercial premises centred around the existing Newell Highway.

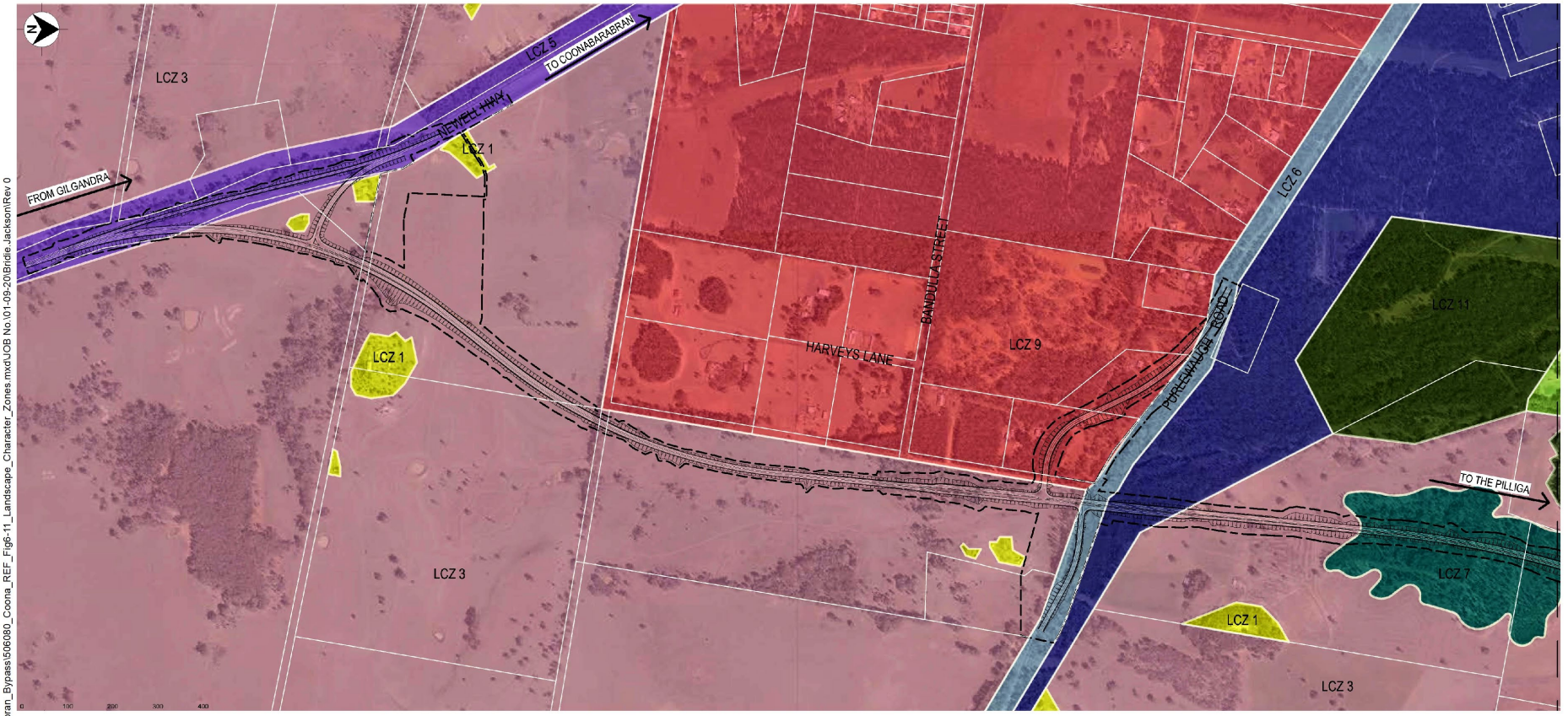
6.3.2.2 Sensitive receivers

Visual sensitive receivers relevant to the proposal include residents, farm workers on surrounding properties and tourists and motorists on the surrounding road network. The experience of these receivers would vary according to duration, field of view and nature of exposure to the proposal. Residents would be the most sensitive to change because of their prolonged duration and heightened nature of exposure. In contrast, motorists would be least sensitive to change as they would have transient views and their focus would be on driving.

6.3.2.3 Landscape character zones

The study area was separated into nine landscape character zones. Landscape character zones are defined as having a distinct, recognisable and consistent pattern of elements including features of soil, vegetation, landform and human built structures.

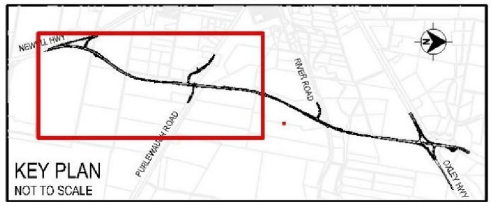
The landscape character zones are shown in Figure 6-11 and Figure 6-12 and are described in Table 6-25.



Road Boundary
Cadastral Boundary
Extent of works
Study area
Compound Sites

Landscape Character Zones

LCZ 1
LCZ 2
LCZ 3
LCZ 4
LCZ 5
LCZ 6
LCZ 7
LCZ 8
LCZ 9
LCZ 10
LCZ 11



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Source: Aurecon, Scape Design

NOT TO SCALE

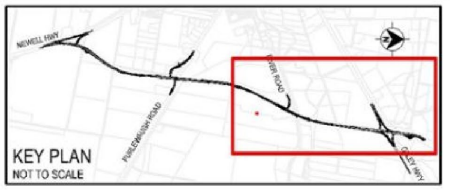
Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-11: Landscape character zones

Road Boundary
Cadastral Boundary
Extent of works
Study area
Compound Sites

Landscape Character Zones

LCZ 1
LCZ 2
LCZ 3
LCZ 4
LCZ 5
LCZ 6
LCZ 7
LCZ 8
LCZ 9
LCZ 10
LCZ 11



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Source: Aurecon, Scape Design

NOT TO SCALE

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-12: Landscape character zones

Table 6-25 Landscape character zones

Landscape character zone	Land use and characteristics	Landscape view
LCZ 1 – Rural residential	This zone comprises of single storey residential dwellings located within medium scale allotments, usually part of a working farm. Boundaries of the zone tend to be planted with exotic or native species in mown lawn areas while the broader landscape is usually comprised of pasture grasses dotted with scattered remnant or regrowth trees. Wide vistas are occasionally interrupted by these trees or by vegetation located along field boundaries, perimeter fences or drainage lines.	
LCZ 2 – Rural agricultural land (cultivating crops)	This zone is typified by flat, open plains with little topographic variation. It is primarily used for cultivating crops which often create a mosaic of agricultural patterning across it. Wider, long range views tend to be open or partially enclosed depending on intervening vegetation commonly located along field boundaries, perimeter fences or drainage lines.	

Landscape character zone	Land use and characteristics	Landscape view
LCZ 3 – Rural pastoral land (grazing livestock)	This zone is typified by gently rolling and undulating topography and is more commonly used for grazing/ cattle farming. Dotted across the landscape are scattered remnant or regrowth plantings most commonly in pasture grasses. This zone could be perceived as being more highly valued due to the scenic qualities of subtle changes in topography. Wider views tend to be open or partially enclosed depending on intervening vegetation	
LCZ 4 – Travelling Stock Reserves (TSR)	This zone is an important network of corridors across NSW. They are believed to have followed pathways used traditionally by Aboriginal people to travel across country. TSR are still important for travelling and grazing stock. They are also widely recognised for playing a key role in landscape connectivity and biodiversity conservation, Aboriginal cultural heritage and recreation across NSW.	

Landscape character zone	Land use and characteristics	Landscape view
LCZ 5 – Existing highway corridor	This zone is an important landscape feature within the study area and encompasses a scenic country highway which is a major interstate transport link for freight and motorists, including tourists. The highway mostly comprises a two-lane undivided bitumen sealed road surface, guard rails and guide posts. The highway journey is characterised by long stretches of straight highway with views alternating between long range vistas across open flat grassland plains or confined to road reserve areas and stands of remnant trees.	
LCZ 6 – Existing local road corridor	This zone tends to comprise of two narrow lanes (one lane in each direction) with a speed limit of 100 km/h outside the Coonabarabran town area. Views tend to be confined to road corridor due to the semi-enclosed remnant woodland or regrowth plantings in the road reserve areas.	

Landscape character zone	Land use and characteristics	Landscape view
LCZ 7 – Native pine forest	This character zone is dominated by White Cypress Pine (*Callitris glaucophylla*) creating a semi-enclosed forest environment that is generally dominated by a herbaceous understorey with a few sparse shrubs	
LCZ 8 – Riparian gully	This character zone is comprised of a vegetated riparian corridor associated with the Castlereagh River water channel. The banks of the river tend to be densely vegetated with established remnant trees and shrub species creating a linear vegetated buffer across the mostly open, rural landscape.	

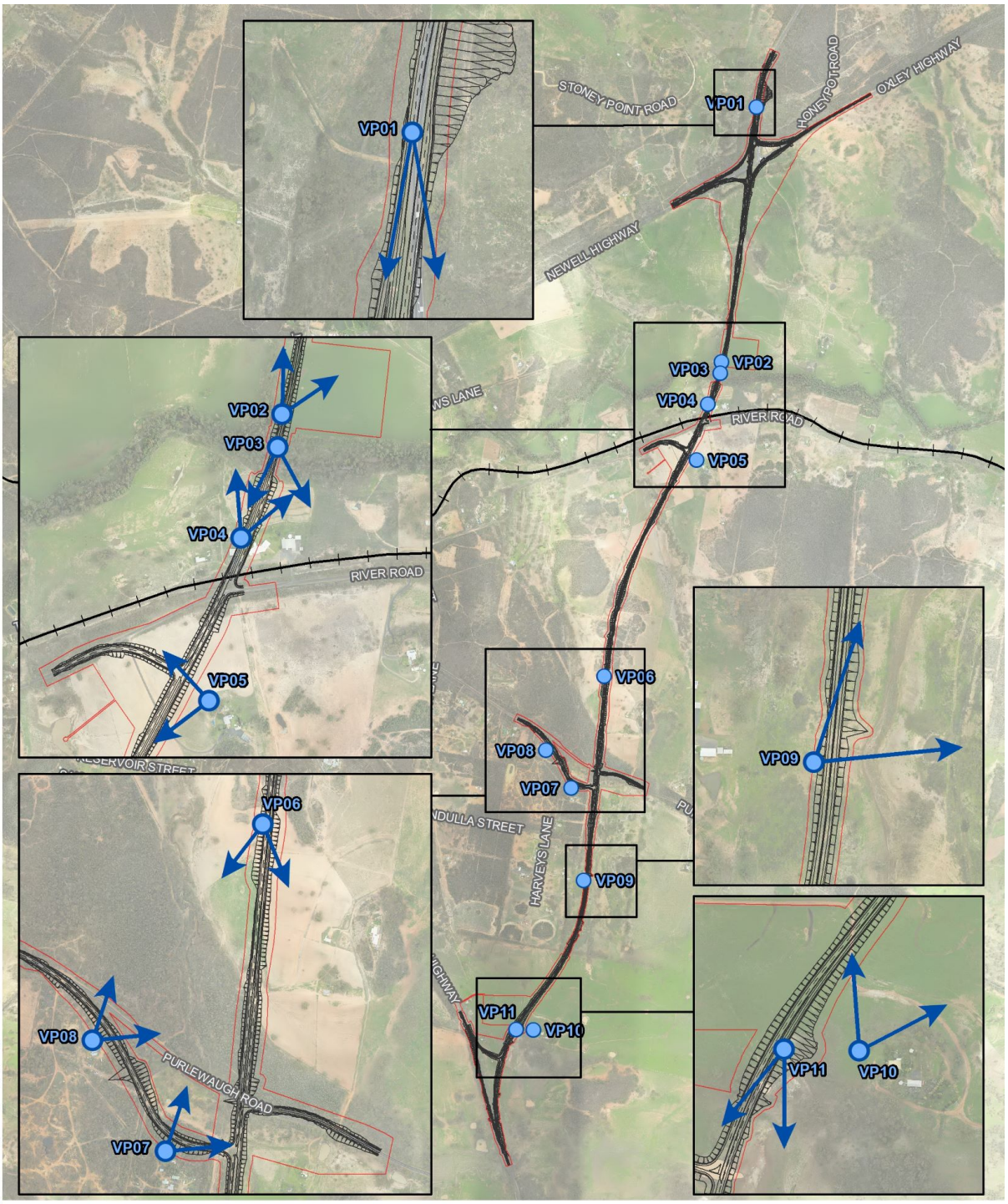
Landscape character zone	Land use and characteristics	Landscape view
LCZ 9 – Large lot residential.	This zone comprises of single storey residential dwellings located within large scale allotments that are not primarily associated with agriculture. Boundaries of the zone tends to be planted with exotic or native species in mown lawn areas while the broader landscape is usually comprised of grassland or remnant bushland with views tending to be constrained by this bushland.	

6.3.2.4 Viewpoints

Eleven key viewpoints were selected from both private and public viewpoints to represent receivers or sites that have potential to be visually impacted by the proposal. These viewpoints are listed in Table 6-26 and shown in Figure 6-13.

Table 6-26 Viewpoints

ID	Location	Receivers
1	Looking south along the Newell Highway, north of northern intersection	Motorists
2	Looking north, north of the Castlereagh River	Residents and rural workers
3	Looking south, north of the Castlereagh River	Residents and rural workers
4	Looking north from property at 415 River Road	Residents and rural workers
5	Looking west from property at 324 River Road	Residents and rural workers
6	Looking south near property at 287 Purlewaugh Road	Residents and rural workers
7	Looking north east at 244 Purlewaugh Road	Residents
8	Looking north east at 214 Purlewaugh Road	Residents
9	Looking north east near 23 Harveys Lane	Residents and rural workers
10	Looking north, near the southern intersection	Residents and rural workers
11	Looking south, near the southern intersection	Residents and rural workers



Source: Aurecon, LPI

1:37,500

0 500 1,000 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-13: Landscape character and visual impacts

6.3.3 Potential impacts

6.3.3.1 Construction

General construction activities would result in temporary visual impacts on views in the vicinity. These include the movement and operation of various machinery, light and heavy vehicles, and the erection of temporary structures such as fencing, lighting and construction compound sites. Visual impacts would be experienced due to clearance of vegetation, excavations and earthworks and the presence of construction areas including ancillary facilities and plant and equipment. The greatest impact would be to residential properties that overlook the construction site due to their prolonged exposure.

The potential impacts would be temporary as construction would take about 20 months to complete. The magnitude of impact would depend on the stage of construction and the location of the work along the alignment. The ancillary facilities would be present for the duration of construction and would be visible from seven viewpoints (1, 2, 5, 7, 8, 10 and 11). It is expected that the greatest visual amenity impacts would occur during stages of major earthworks.

As the proposal falls within the Dark Sky region, lighting used during any night time works has the potential to create ambient glow. Any night time works would consider the Dark Sky Planning Guideline (DPE, 2006) to minimise any interruption to the Dark Sky Region.

There are no anticipated residual landscape or visual impacts resulting from the construction phase of the proposal. Contractors would be required to rehabilitate all work sites prior to and at the end of the construction period. Landscape and visual impacts may arise from these rehabilitation works and would be most evident during the first year of operation. Visual impacts may vary depending on final construction methods and staging identified in later design stages.

6.3.3.2 Operation

Landscape character zones

The proposal spans predominantly rural agricultural and pastoral land and intersects with two existing road corridors, the Castlereagh River, two TSRs and four vegetation communities. The proposal is shown to have the greatest landscape character impact on TSR as a permanent clearing of vegetation and a dissection of the landscape character zone potentially impacts how the zone functions in the longer term. Areas where some impact to the character zone has been foreseen generally relate to zones where screening or the ability to screen is relatively restricted and the introduction of the proposal is at close range.

The proposal would result in varying permanent changes to the rural landscape. The potential impacts typically vary depending on the existing landscape characters, visibility from residences and the elevation of the proposal. The greatest impacts would be on the landscape character zone 1 as the proposal would be directly visible from residential properties. The new road corridor would be clearly visible, at close range, from many of the rural residential zones and in one instance part of the alignment would run through the rural residential property demolishing three large commercial sheds. These changes would result in a dominant change in the adjoining scenic, rural landscape resulting in a noticeable change in the nature of view.

The potential impacts on landscape character are summarised in Table 6-27.

Mitigation measures have been implemented into the concept design and proposed for future design phases. These include providing vegetation screening and using mounds and batter slopes. Details of the mitigation measures are provided in Section 6.3.4 and Appendix E.

Table 6-27 Potential operational impacts on landscape character zones

Landscape character zone	Landscape character impact assessment	Sensitivity	Magnitude	Impact	Impact post mitigation
LCZ 1 – Rural residential	The new road corridor would be clearly visible from many areas within this character zone and three large commercial sheds would be demolished. The introduction of new corridor close by in the adjoining LCZ would result in a dominant change in the adjoining scenic, rural landscape resulting in a noticeable change in the nature of view.	High	Moderate	High / Moderate	Moderate
LCZ 2 – Rural agricultural land (cultivating crops)	The introduction of the new road corridor within this character zone would form a visible and recognisable new element within the agricultural landscape and would affect the overall character. The zone would be split as a result of the new corridor however the gentle rolling topography of the landscape allows it to absorb some change.	Low	Moderate	Moderate-Low	Low
LCZ 3 – Rural pastoral land (grazing livestock)	The introduction of the new road corridor within this character zone would form a visible and recognisable new element within the scenic, grazing landscape and would affect the overall character. The zone would be spatially divided as a result of the new corridor however the rolling topography and vegetated boundaries limits the extent of impacts.	Moderate	Moderate	Moderate	Low
LCZ 4 – Travelling Stock Reserves (TSR)	The introduction of the new road corridor across this character zone would form a visible and recognisable new element within the forest areas however as a result of dense forest vegetation impacts are only likely in those areas directly associated with the upgrade. The zone would be spatially divided as a result of the proposal which would have varying impacts on how the zone functions.	High	Moderate	High-Moderate	Moderate- Low
LCZ 5 – Existing highway corridor	The proposal would be comprised of similar elements to the existing highway corridor and although it would be larger in scale it is unlikely to adversely impact the existing character and would be consistent with similar highway upgrades in the region.	Low	Low	Low	Negligible

Landscape character zone	Landscape character impact assessment	Sensitivity	Magnitude	Impact	Impact post mitigation
LCZ 6 – Existing local road corridor	The landscape zone would be split as a result of the introduction of a new highway corridor that would form a visible and recognisable new element within the landscape. Although the new staggered T-intersections are likely to be of a similar nature to the existing road corridors they will increase the overall scale of infrastructure within the zone. Consequently, there is likely to be some adverse impact the existing character.	Low	Moderate	Moderate / Low	Low
LCZ 7 – Native pine forest	The introduction of the new road corridor within this character zone would form a visible and recognisable new element within the woodland landscape and would affect the overall character.	Moderate	Moderate	Moderate	Low
LCZ 8 – Riparian gully	The introduction of the new road corridor within this character zone would form a visible and recognisable new element across the riparian landscape and would affect the overall character. The linear nature of zone would be dissected as a result of the new corridor and the relatively narrow width of the zone means that the perceived impacts increase.	Moderate	Moderate	Moderate	Low
LCZ 9 – Large lot residential.	The new road corridor would be visible from only a small area of this character zone and in one instance part of a residential property including three large commercial sheds may be demolished. The introduction of new road corridor would result in a dominant change in the adjoining bushland setting resulting in a noticeably change in the nature of view.	Moderate	Low	Moderate / Low	Low

Visual impacts

Activities during the operational phase of the proposal have the potential to create visual impacts on nearby sensitive receivers. Among likely visual and physical impacts on nearby dwellings as a result of operational activities, the quality of the existing rural panoramic views may be degraded with the introduction of main alignment infrastructure.

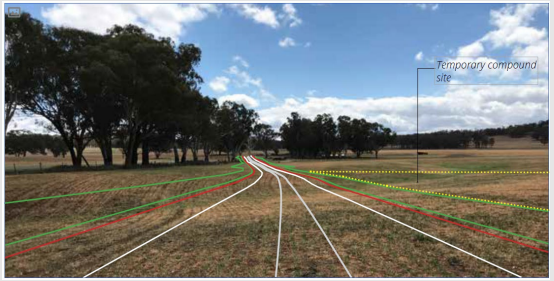
Key receptors with the potential to be visually impacted by some element of the proposal's operation and the potential visual impacts are summarised in Table 6-28. Visualisations of the proposal from each of the assessed viewpoints are provided in Appendix E.

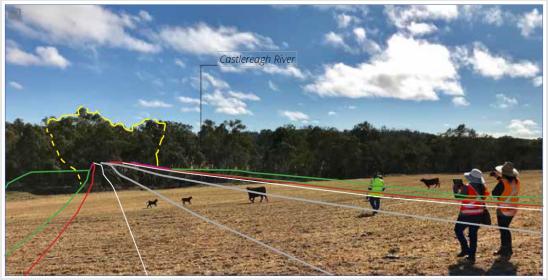
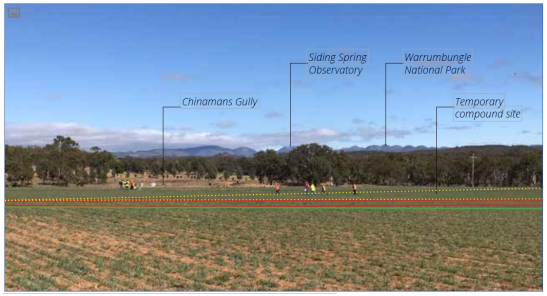
The proposal would introduce built structures into the landscape that would be in contrast the existing natural landform. Visual impacts are limited to a few locations as there is a low density of residential receptors in visual range of the proposal. Nevertheless, visual impacts are fairly consistent along the length of the proposal with impact ratings moderate to high.

Elements of the proposal that are likely to be the most visually intrusive include vegetation removal, embankments and the Castlereagh River bridge. Vehicle headlights and lighting at intersections and the Castlereagh River bridge may also cause visual impacts at night. Lighting would be designed in accordance with the Dark Sky Planning Guideline (DPE, 2006) and in consultation with Siding Spring Observatory, and is not expected to impact the nearby Dark Sky Region.

The greatest visual impacts are expected at residential properties which currently have no view of existing roads. Visual impacts at these locations are primarily influenced by residences being located close to the proposal with limited opportunities for visual screening. Viewpoints 7 and 8 would likely experience visual and physical impacts due to the realignment of Purlewaugh Road close to the properties. Viewpoints two and four are likely to experience some degradation to the quality of the views out across the rural panoramic views with the bypass being visible from these elevated locations.

Table 6-28 Potential operational impacts on viewpoints

ID / Location	Description of impacts	Sensitivity	Magnitude	Impact	3D model views
1 Looking south along the Newell Highway, north of northern intersection	The proposal includes new cut batters either side of the corridor that would be highly visible at this location. The new corridor would veer away from the current road alignment shifting further west and straightening. A small area of vegetation in the western road reserve would need removing to facilitate the construction of the realigned road, drainage and cut batters. Although the proposal would be highly visible at this location, road users would only experience a short duration of view and the presence of existing road infrastructure within the viewframe ensure that a major impact on visual amenity is not expected.	Low	Moderate	Moderate / Low	
2 Looking north, north of the Castlereagh River	The proposal would be highly visible from this location including its associated road batters, vehicular traffic and signage. However, the road users would only temporarily experience the view while traveling on the highway. The new road corridor would run parallel with the existing vegetation in the centre of this view and at this location would sit above the existing ground level. The corridor extends into the distance of the view and would potentially block some of the distant natural features from this property. Vehicular traffic would be a new element introduced to the view and would be in constant flux.	Low	High	Moderate	

ID / Location	Description of impacts	Sensitivity	Magnitude	Impact	3D model views
3 Looking south, north of the Castlereagh River	The new bridge would be highly visible from this location including its associated bridge safety structures, vehicular traffic and signage. The new road corridor would run perpendicular to the river which dissects this view centrally and would necessitate the removal of an area of remnant vegetation.	Moderate	High	High / Moderate	
4 Looking north from property at 415 River Road	The proposal would be highly visible from this location including its associated road batters, vehicular traffic and signage. The new road corridor would stretch across the river which dissects this view in the middle. The road alignment would necessitate the removal of an area of remnant vegetation.	High	High	High	
5 Looking west from property at 324 River Road	The proposal would be highly visible from this location including its associated road batters, vehicular traffic, road furniture and signage. The new road corridor would dissect this view horizontally in the middle of the view and would partially block a portion of the agricultural landscape behind.	High	Moderate	High / Moderate	

ID / Location	Description of impacts	Sensitivity	Magnitude	Impact	3D model views
6 Looking south near property at 287 Purlewaugh Road	The proposal would be highly visible from this location including its associated road batters, vehicular traffic and signage. The new road corridor would sweep through the centre of this view and extend into the distance potentially removing an area of remnant vegetation in the distance.	Low	High	Moderate	
7 Looking north east at 244 Purlewaugh Road	The proposal would be highly visible from this location including its associated cut batters, vehicular traffic, fencing and possibly signage and lighting posts. The new road corridor would sweep through the centre of this view and extend the full width at close range. Existing intervening bushland vegetation between the old road corridor and the dwelling would be removed with a much reduced vegetated buffer screening the road from the dwelling in the future.	High	High	High	
8 Looking north east at 214 Purlewaugh Road	The proposal would be highly visible from this location including its associated cut batters, vehicular traffic, fencing and possibly signage. The adjusted road corridor would sweep through the centre of this view and extend the full width across it at close range. Existing intervening bushland vegetation between the old road corridor and the dwelling would be removed with a much reduced vegetated buffer screening the road from the dwelling in the future.	High	High	High	

ID / Location	Description of impacts	Sensitivity	Magnitude	Impact	3D model views
9 Looking north east near 23 Harveys Lane	The proposal would be highly visible from this location including its associated road batters, vehicular traffic, road furniture and signage. The new road corridor would sweep through the centre of this view and extend into the distance potentially removing an area of remnant vegetation in the middle distance.	Low	High	Moderate	
10 Looking north, near the southern intersection	The proposal would be highly visible from this location including its associated road batters, vehicular traffic, road furniture and signage. The new road corridor would dissect this view horizontally in the middle of the view and would partially block a portion of the agricultural landscape behind. It should be noted that intervening garden planting, surrounding the homestead, would filter views and could potentially reduce the visual impacts of the proposal.	Moderate	Moderate	Moderate	
11 Looking south, near the southern intersection	The proposal would be highly visible from this location including its associated road batters, vehicular traffic and signage. The new road corridor would sweep through the centre of this view and extend into the distance potentially removing an area of remnant vegetation in the middle distance.	Moderate	High	High / Moderate	

6.3.4 Safeguards and management measures

6.3.4.1 Landscape and urban design strategy

The landscape design strategy acknowledges that the bypass would be part of the Newell Highway which stretches from Brisbane to Melbourne. This rural highway is characterised by long stretches of straight road and broad sweeping curves with views alternating between long range vistas across open flat grassland plains and rural pastoral land or confined to road reserve areas by stands of remnant or regrowth trees.

While the landscape strategy aims to ensure that the bypass echoes the existing Newell Highway journey it would also introduce identifiable gateway signage at the northern and southern interchanges to link to the township of Coonabarabran. Treatments along other sections of the bypass would largely focus on reinforcing and reinstating the plant species selected in response to local vegetation communities which currently intersect with the future road corridor.

Key landscape strategies which should be considered in the development of the proposal are:

- Providing gateway signage to Coonabarabran
- Limiting vegetation loss - through revisions to the scale of earthworks
- Providing screening to properties which have been impacted by the introduction of the proposal within the landscape
- Providing interest to the motorist along their journey in an effort to break down the sense of distance and provide a sense of progression and connection to context.

To achieve the objectives of the urban design principles relevant to the proposal, it would be important to reinforce the existing vegetated character of the road corridor with appropriate native planting and revegetation to restore areas within the corridor which are impacted by construction. Equally important would be the use, where possible, of vegetation from local ecological communities in conjunction with carefully selected indigenous species.

Of equal importance is the design of the road corridor for road users and the need to consider visual receptors with views of the road.

The design needs to ensure safe, clear wayfinding, access and connectivity for local residents and all road users and would be readily able to be maintained by the relevant road authority.

Urban design and landscape treatments to reduce the visual impacts of the proposal and integrate the proposal into the existing landscape character were developed in accordance with the proposal's urban design objectives (refer to Section 2.4.1).

6.3.4.2 Signage strategy

Signage along the alignment would be implemented in accordance with the TfNSW Bypassed Town signage initiative. A preliminary signage strategy has been developed to promote Coonabarabran which includes the indicative photo signs shown in Figure 3-11

TfNSW would install photo signs on the Newell Highway near the southern and the northern intersections to promote the town. (Figure 3-11).

More information about the entry signage can be found in Appendix E.

6.3.4.3 Mitigation measures

Table 6-29 Landscape character and visual safeguards and mitigation measures

ID	Impact	Environmental safeguard	Responsibility	Timing

L1	General	An Urban Design and Landscape Plan (UDLP) will be prepared to support the final detailed design and implemented as part of the CEMP. The UDLP will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The UDLP will include:
		• Proposed revegetation plan that will include:
		  • species to be used
		  • procedures for monitoring and maintaining landscaped or rehabilitated areas
		• Design treatments for:
		  • built elements including retaining walls and the bridge
		  • pedestrian and cyclist elements including shared use path locations, paving types and pedestrian crossings
		  • fixtures such as lighting, fencing and signs
		• Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage
		The UDLP will be prepared in accordance with relevant guidelines, including:
		• Beyond the Pavement (2014) urban design policy, process and principles
		• TfNSW Landscape Guideline (Roads and Maritime, 2018c)
		• Newell Highway Urban Design Framework (Roads and Maritime, 2018e)
		• Signage in accordance with Council and the TfNSW Bypassed Town signage initiative (2018a)
			Contractor	Detailed design / pre-construction / construction

ID	Impact	Environmental safeguard	Responsibility	Timing
L2	Lighting	Lighting, including construction lighting, will be designed in accordance with the Dark Sky Planning Guideline (DPE, 2006) and in consultation with Siding Spring Observatory. If requirements in the guideline cannot be met (eg during night construction works) the contractor will consult with the Siding Spring Observatory before undertaking the light emitting activity.	Contractor	Pre-construction/ construction
L3	Signage	Provide clear wayfinding signage for visitors to Coonabarabran. including signage in accordance with the TfNSW Bypassed Town signage initiative.	TfNSW	Pre-construction/ construction
L4	Construction visual impacts	The layout of ancillary facility sites will be designed to limit impact. The design will would consider: • screening of boundaries facing sensitive receivers or views • careful placement of structures and buildings to maintain viewpoints or provide additional screening of site activities.	Contractor	Pre-construction/ construction
L5	Construction visual impacts	Ancillary facilities will be maintained, kept tidy and well-presented including sorting regular removal of excess materials to reduce visual impact.	Contractor	Construction
L6	Construction visual impacts	Ancillary facility sites and temporary construction areas will be progressively restored to at least their pre-construction conditions when no longer required.	Contractor	Construction
L7	Tree management and removal	Any tree removal or pruning will be undertaken by a qualified specialist and in accordance with AS4970: 2009: Protection of Trees on Development Sites (Standards Australia, 2009) and AS4373:2007: Pruning of Amenity Trees and WorkCover Amenity Tree Industry Code of Practice 1998.	Contractor	Pre-construction construction

6.4 Socio-economic, property and land use

This section describes the potential socio-economic impacts associated with the proposal. This section is informed by the socio-economic impact assessment (SEIA) (Aurecon, 2020b) which is provided in Appendix F.

6.4.1 Methodology

The SEIA was carried out in accordance with the Environmental Impact Assessment Practice Note – Socio-economic assessment (TfNSW, 2020c). The study area in the assessment comprises the suburb of Coonabarabran as defined by the Australian Bureau of Statistics. The assessment includes:

- Review of statutory planning and legislative requirements, including a review of existing State and local government strategies relevant to the social and economic environment of the study area
- Description of the existing socio-economic environment of the study area to establish the baseline, including:
    - Review of local policies and strategies, including the Warrumbungle Shire Community Strategic Plan (Reviewed) 2017-2032
    - Analysis of key population and demographic indicators, including data from the 2016 Australian Bureau of Statistics (ABS) Census of Population and Housing and the Community Profile and Economic Profile presented on the Warrumbungle Shire Council website.
    - Analysis of data and information on local business and industry, employment and income, and dwelling characteristics
    - Review of existing land use and property, social infrastructure and community features near to the proposal, including recreation uses, educational facilities, places of worship, public transport and walking and cycling facilities.
- Identification and assessment of the potential socio-economic impacts of the proposal's construction and operation on local amenity, social infrastructure and access
- Determination of the significance of likely negative impacts, based on the sensitivity and magnitude of the impacts.
    - Sensitivity refers to the qualities of the receptor which influence its vulnerability to change and capacity to adapt.
    - Magnitude refers to the scale, duration, intensity and scope of the proposal including how it will be constructed and operated.
- Measures to manage or mitigate potential impacts on the socio-economic environment and maximise potential benefits of the proposal.
- The assessment also includes a review of literature and previous bypass projects to determine themes and similar economic, social and community impacts.

6.4.2 Existing environment

6.4.2.1 Population and demography

In 2016, the population of Coonabarabran was 3290 people, about 35 per cent of the Warrumbungle Shire LGA population. In summary:

- Coonabarabran has a typically older demographic with about 26 per cent of people being over the age of 65
- About 14 per cent of the population in Coonabarabran is indigenous which is high compared to NSW overall (2.9 per cent)
- A small proportion of the population were born overseas (5.9 per cent). The low proportion of people born overseas is relatively common as the study area is located in rural NSW and numbers typically decrease when travelling further out of major cities. The ABS 2016 census revealed that just over one in ten people living in small towns across Australia were born overseas (ABS, 2016).
- The average household size in Coonabarabran was 2.2 people per household in 2016, which comprised mostly of family households (65.2 per cent). This is similar to the greater LGA, but lower than the rest of NSW (2.6 per cent). About 80 per cent of houses are single story detached dwellings which are more typically common in rural areas
- The population of Warrumbungle Shire LGA is expected to decrease by 1,650 people by 2036 (DPIE, 2016). This is in contrast to the wider NSW, where the population is expected to grow by 2,161,050 by 2036.
- In 2016, Coonabarabran had a score of 889 and the greater LGA had a score of 912 based on the Socio-economic Indices for Areas (SEIFA). This indicates the area has lower than average economic and social conditions for people and households. This may be related to location and the ability for residents to access a broader range of goods and services required to satisfy an individual's lifestyle.

6.4.2.2 Economy, industry and businesses

Coonabarabran is the largest town in the Warrumbungle LGA. The Coonabarabran town centre is a main point of activity, comprising of businesses, services and facilities. Businesses within Coonabarabran comprise mostly of shops and restaurants owned by local residents, with limited large chain stores in town. There are also industrial businesses located in the Coonabarabran Industrial Estate, north of the town off the Newell Highway.

The main industries of employment within Coonabarabran are health care and social assistance (16 per cent), public administration and safety (13.6 per cent) and education and training (12.4 per cent). The higher numbers of employment in these industries is reflective of a hospital, education facilities and the Warrumbungle Shire Council Chambers being located in Coonabarabran.

In the greater LGA, agriculture is the largest industry with sheep and cattle farming and cropping accounting for over $104 million of the Warrumbungle Shire economy (Remplan, 2019). In Coonabarabran, the agricultural industry is predominantly based on grazing (87 per cent of land use) and dryland farming (12 per cent of land use), with the total gross value of total agriculture production being $154 million in 2015/16 (Department of Agriculture, 2019).

Tourism contributes about $21.9 million annually to the Warrumbungle Shire economy and is the sixth biggest industry. About 40,000 visitors stop at the information centre in Coonabarabran each year, with particular interest in the

Warrumbungle National Park and the Siding Spring Observatory (Murray-Basin Authority, 2016).

Retail trade comprises about four per cent of the Warrumbungle Shire economy. Based on feedback from the business and shopper survey undertaken for the proposal, retail trade comprises about 29 per cent of the businesses in Coonabarabran. Accommodation and food services also make up about 26 per cent and 10 per cent, respectively.

Other key themes identified in the feedback to the business and surveys include:

- Concerns about the future economy of the town, 57 per cent of survey respondents perceived that Coonabarabran is declining slowly, with 30 per cent indicating it appears to be declining more rapidly
- Passing trade reliability, with about 34 per cent of respondents indicating that there has been a noticeable decline in passing trade. 13 businesses who responded to the survey stated that over 50 per cent of their business was from passing trade or visitors
- Town culture and seasonality, with some respondents indicating that trucks are a part of the town and that trade varies seasonally
- Opportunities for improvements, consideration of positive impacts as a result of the proposal, such as changes to safety, noise, air quality and overall amenity. Refocusing businesses and looking for renewal and reinvention of the town
- Business activity and patronage – 80 per cent of shoppers indicated that their behaviour in town would not change after the opening of the bypass.

6.4.2.3 Land use and property

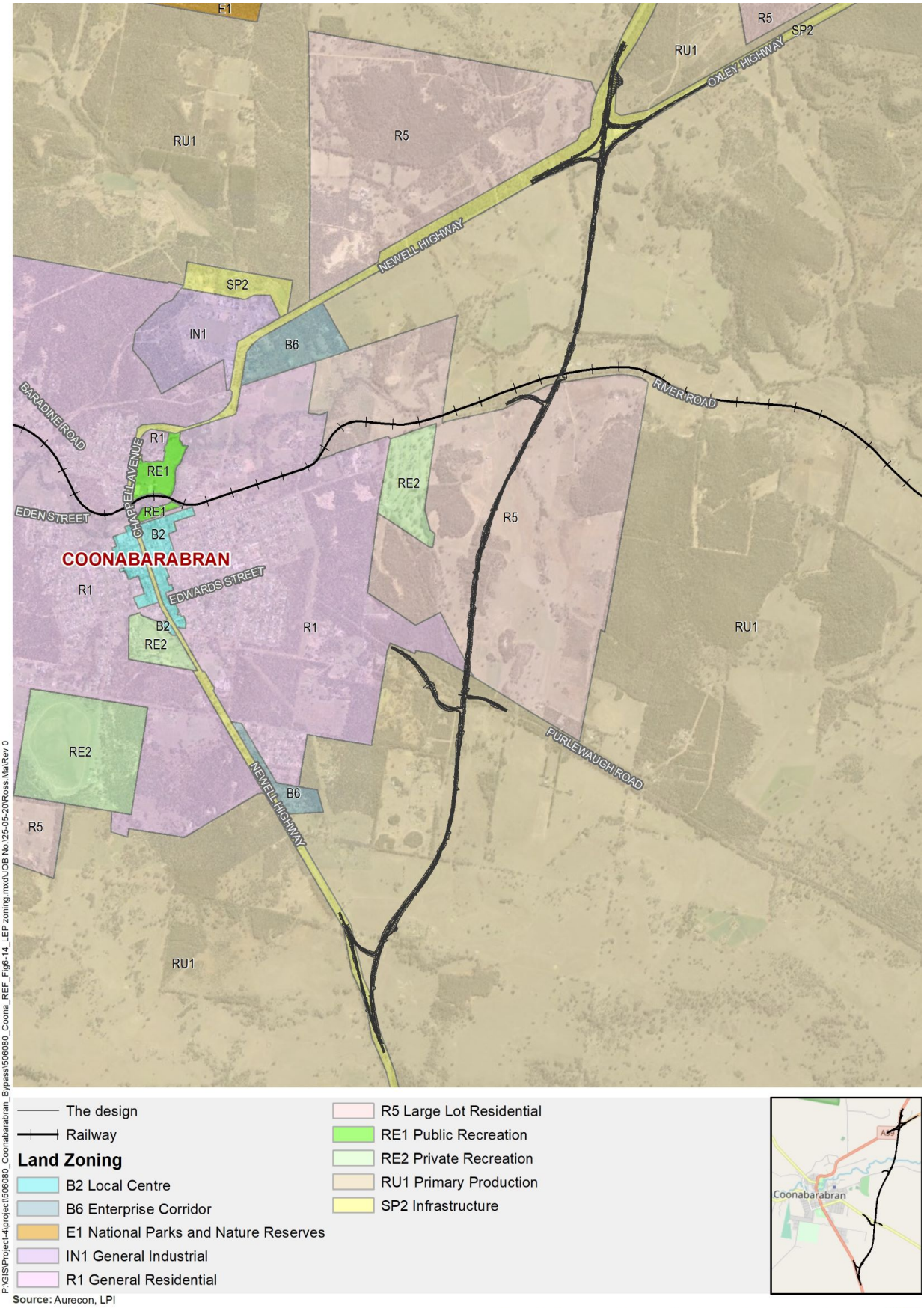
The proposal is within the following land zones under the Warrumbungle Local Environmental Plan 2013:

- RU1 – Primary production
- R1 – General residential
- R5 – Large lot residential
- SP2 – Infrastructure.

The land zoning is shown in Figure 6-14.

Many local facilities and residential dwellings are in the Coonabarabran town centre. The Newell Highway is located through the middle of the town and travels predominately in a north south direction, before turning eastward toward the Oxley Highway. Most town facilities and services are populated around the Highway between Dalgarno Street in the north and Edwards Street in the south. However, north of Dalgarno Street, there are some industrial businesses and accommodation facilities, with accommodation facilities located south of Edwards Street. Local roads through Coonabarabran either side of the existing Newell Highway are mostly residential areas with some community facilities and services scattered throughout.

The proposal is located to the east of the town centre and predominately located within privately owned agricultural land used for livestock farming and crop fields. There are residential dwellings and structures such as sheds and rural storage facilities located within some properties. Most dwellings in this area are located closer to the road network, with some set back within properties.



Newell Highway Upgrade Coonabarabran Bypass **REF**

Projection: GDA 1994 MGA Zone 55

FIGURE 6-14: Land zoning

The proposal traverses sections of Crown land and Travelling Stock Routes (TSR). These TSRs are classified as a Category 2, which indicates that it is used for stock movement, emergency management or biosecurity purposes. The TSR is managed by the Central West Local Land Service.

The proposal also passes over the Gwabegar railway line, however the rail line is disused and non-operational.

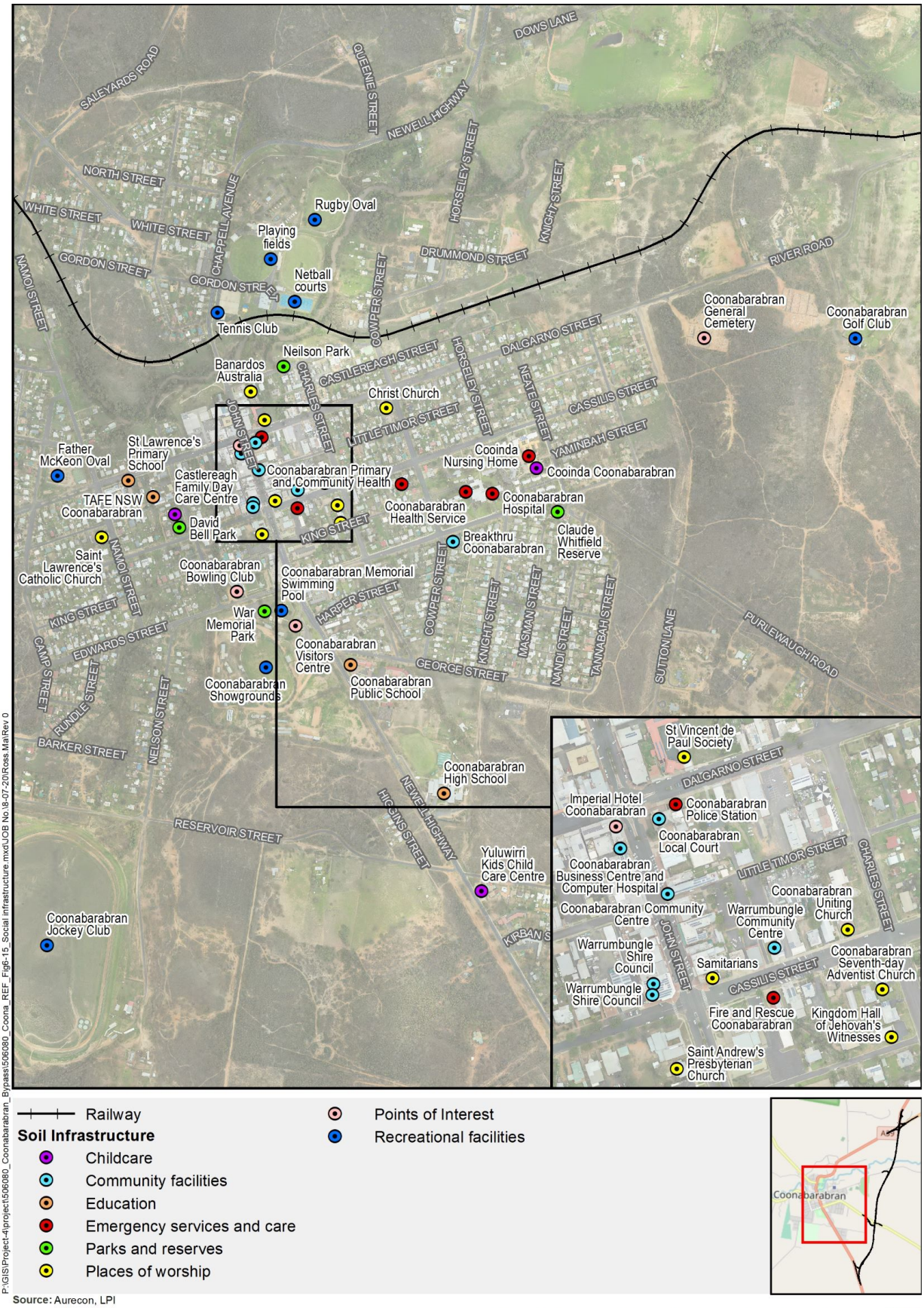
Future land use planning includes a mixed use area to the south of the proposal and an agricultural produce area to the north.

6.4.2.4 Social infrastructure

Coonabarabran contains a high number of social, community and recreational facilities. Social infrastructure within Coonabarabran includes:

- Educational facilities - Coonabarabran High School, Coonabarabran Public School, St Lawrence's Primary School and TAFE NSW Coonabarabran
- Child care centre facilities - Castlereagh Family Day Care Centre, Cooinda Coonabarabran and Yuluwirri Kids Child Care Centre
- Parks and reserves - Neilson Park, David Bell Park and the Warrumbungle National Park
- Recreational facilities - Coonabarabran Golf Club, Coonabarabran Memorial Swimming Pool, Coonabarabran Showgrounds, Coonabarabran Bowling Club and some local sport ovals, playing fields and tennis/netball courts
- Places of worship - Saint Lawrence's Catholic Church, Saint Andrew's Presbyterian Church and Coonabarabran Uniting Church
- Emergency facilities - Coonabarabran Hospital, Fire and Rescue Coonabarabran and Coonabarabran Police Station
- Community facilities - Coonabarabran Public Library, Coonabarabran local court, Warrumbungle Shire Council, Coonabarabran Visitor Centre, Coonabarabran Community Centre, Warrumbungle Community Centre, Breakthru Coonabarabran and Coonabarabran General Cemetery.

Social infrastructure in Coonabarabran is shown in Figure 6-15.



Source: Aurecon, LPI

1:15,000

0 250 500 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-15: Social infrastructure

6.4.2.5 Places and events of community significance

Places and events of community significance contribute to a sense of community identity and the broader social relationships within communities. Places of community significance near Coonabarabran include:

- Siding Spring Observatory is the largest optical observatory in Australia and is known for its research in astronomy, astrophysics and space science. The observatory is located around 25 kilometres west of the Coonabarabran town centre
- Warrumbungle National Park is a National Heritage item and is Australia's only 'Dark Sky Park'. It has Aboriginal heritage significance and provides various opportunities for hiking, camping, birdwatching and stargazing. The National Park is located around 10 kilometres west of the Coonabarabran town centre.

Key events in Coonabarabran include:

- StarFest – held on the October long weekend annually, the Siding Spring Observatory holds and runs astronomy themed events
- Coonabarabran Agricultural Show – held in March and gives the region a chance to showcase its many produce, agricultural and horticulture businesses
- Bunny Bazaar – held on Easter Saturday annually on John Street
- Coonabarabran Cup Race Meeting – held in October and run by the Coonabarabran Jockey Club
- Coonabarabran Townlife Markets – held on the fourth Sunday of every month
- Dark Sky Awakens Festival – annual festival with a focus on Star Wars.

6.4.2.6 Community values

The Warrumbungle Shire Council developed the Community Strategic Plan 2017 to 2032 to provide a framework to achieve outcomes for the community (Warrumbungle Shire Council 2017). These include:

- Natural environment – preservation and enhancement of biodiversity and good health of the environment
- Local economy – having a local economy that is strong, sustainable, with employment opportunities and ease of access to markets, goods and services
- Community and culture – safe, harmonious and supportive communities with vibrant social and cultural interaction and a strong social identity
- Rural and urban development – peaceful rural landscapes with thriving towns and villages and diverse agricultural activities
- Recreation and open space – abundance of opportunities to participate in sporting and recreational interests
- Public infrastructure and services – safe, functional and well-maintained infrastructure with a range of services
- Local governance and finance – recognising the Shire for its strong community leadership, sound financial and asset management, and ethical, accountable and responsive local government.

The Community Strategic Plan identifies what the community values most through the goals established for the future of the Shire. This is discussed further in the SEIA in Appendix F.

Coonabarabran is a close-knit rural community with a small population. The community has a strong dependence on the agricultural industry, with generations of farmers located within Coonabarabran. Some feedback from the business and shopper surveys indicated that respondents believed that heavy vehicles travelling through the town form part of the town's culture. Overall, businesses and residents accept the positive and negative attributes associated with heavy vehicles travelling through the town centre.

6.4.3 Potential impacts

6.4.3.1 Construction

Population and demography

The construction of the proposal would result in a temporary population increases due to some construction workers residing in Coonabarabran. Construction may also have a temporary, positive impact through creation of local short-term employment opportunities.

Given the predominance of family households and higher average age in Coonabarabran, it is possible that construction would result in a minor change to the overall population profile. The profile and scale of the worker population would fluctuate throughout the construction period in response to works being undertaken with up to 260 workers during peak construction stages. The increased population from the construction workforce would result in increased demand for services and facilities. The changes in population are expected to be noticeable to residents in Coonabarabran, but be of short duration, especially during peak construction periods.

It is expected that the town has the facilities required to accommodate the additional temporary construction workers, however, during busier periods such as event periods and festivals, this may impact tourists' ability to stay in certain accommodation facilities if vacancies are limited. Effective construction planning and management, such as the use of a mixture of accommodation facilities, would reduce the pressure on facilities during construction.

The sensitivity of the town and businesses to accommodate the additional population is low. The magnitude of the change, being temporary, is low. This results in the significance of the impact being low.

Land use and property

The proposal would require permanent acquisitions and temporary property leases of some land parcels including private land, Crown land and two TSRs (refer to Section 3.6 and Figure 3-13) to facilitate construction activities. There is anticipated to be around 51 hectares of land required to be temporarily leased and around 27 hectares of land permanently acquired for the proposal. More information about property acquisitions can be found in Section 3.6. The proposal would require the demolition of four buildings and a section of the disused, non-operational Gwabegar railway line. One of the buildings for demolition is a residential property, all others are large commercial sheds. Leases would result in some disturbance of movements within properties and use of the land for the duration of construction. Leased land would be rehabilitated (as agreed to by the owner) and returned to the property owner at the completion of construction.

Property acquisition can result in stress, anxiety and loss of social networks, particularly when residents are required to relocate. There are groups of individuals that are more susceptible to these impacts, including the elderly and those with lower levels of economic resources. Many property occupiers and owners in

Coonabarabran have indicated that they have resided in properties for long periods of time (some their entire life) representing a strong connection to place.

Based on the characteristics of property owners and occupiers, sensitivity of these stakeholders to property impacts is high. The magnitude of both the temporary and permanent changes during construction would be high, resulting in the significance of the impact being high.

Temporary land use changes would occur during construction. The proposal would occupy open space and agricultural land, changing the land use to infrastructure land use. Properties that would be severed by the proposal due to partial acquisitions would be impacted as these changes may restrict current land uses such as agricultural operations and productivity.

The sensitivity of land occupiers, owners and the broader study area to changes in land use is high. The magnitude of the changes would also be high resulting in the significance of the impact to land use changes being high.

Access and connectivity

The temporary changes in access and connectivity would include installation of temporary side tracks, alternative property access arrangements and changes to local street access. Changes to access and connectivity are expected to impact residents and road users, particularly for local residents on River Road and Purlewaugh Road. This is due to the potential traffic delays and traffic controls required during construction. More details about access and changes to the road network are provided in Section 6.5.

Although there are no formal shared use / active transport facilities within or near the proposal area, cyclists and pedestrians use the local road network for active transport. In addition, it is likely that emergency vehicles from Coonabarabran Hospital (located on Edwards Street) would use Purlewaugh Road to the east of the proposal area. Consultation with the hospital prior to construction would be required to ensure access routes are maintained. Consideration of all road users would be required during construction, with mitigation measures implemented to maintain safety and access.

School bus routes may experience slight disruptions due to construction traffic. The population of Coonabarabran that reside outside of the town centre are serviced by these bus services. Consultation would be required prior to the commencement of construction to reduce impacts to pick and drop off periods.

As an important inter-state freight route, the Newell Highway is considered critical to freight operations. The proposal would impact freight movements along the Newell Highway during construction. Temporary access tracks would also be installed on existing roads.

Local farms and movement of cattle in the surrounding area must also be considered, particularly during scheduled business operations. The use of inter-property roads, the TSRs and local road network would need to be managed during construction to reduce potential impacts to agribusinesses.

The sensitivity of road users (both local and regional) to changes in access and connectivity is moderate. The magnitude of the temporary changes during construction would be moderate, resulting in the significance of the impact being moderate.

Social infrastructure and businesses

Coonabarabran Golf Club is located around 300 metres to the west of the proposal area. It is likely that the proposal would be visible from the course during construction.

Although the proposal is not expected to substantially impact patronage to the golf club (being a destination type facility), there may be some visual and noise impacts during construction.

The Coonabarabran Cemetery is located to west of the Coonabarabran Golf Club (around 800 metres from the proposal). Impacts to the cemetery are expected to be minor, however, some noise impacts may disturb visitors during the construction phase of the proposal.

The majority of social infrastructure in Coonabarabran is located within the town centre. The Cooinda Aged Care Centre may experience impacts due to construction noise during the day and occasionally when out of hours works is required. In addition, accommodation facilities and the childcare centre (Yuluwirri Kids Child Care) closest to the southern intersection, would also experience impacts during construction. Visual and noise impacts would occur during construction at these facilities, particularly for accommodation facilities due to the potential sleep disturbance impacts.

There would be some impacts to agricultural businesses, where they are directly affected. This includes loss of productive and farmable land. Construction may also result in additional operating costs due to the potential impacts on the movement of cattle and farm machinery between paddocks, including the use of the TSRs.

The proposal is expected to have a positive impact on the town's economy during construction due to the generation of jobs, locally sourced materials and resources, construction worker expenditure and potentially increased temporary demand in private room and house rentals to accommodate part of the construction workforce.

The overall sensitivity of the non-residential receivers/social infrastructure to visual and noise impacts is moderate. The magnitude of impacts is low resulting in a moderate-low level of significance. The sensitivity of businesses during construction is high. The magnitude is moderate, resulting in the significance of the impact being high-moderate.

Community values and amenity

There would be a reduction of amenity in the proposal area during construction, with receivers near the proposal experiencing the most impacts. There are about 32 sensitive receivers within 600 metres of the proposal area, the majority of them being residential receivers. As discussed in Section 6.2.4, noise intensive works during standard hours and out of hours works would result in impacts to the closest sensitive receivers. However, for Coonabarabran town centre, there are only expected to be minor noise impacts.

Impacts to air quality from dust generated during construction and idling engines is also likely to contribute to the reduction in amenity.

In addition, the vegetation removal for the development of the new road would result in visual impacts to surrounding receivers. Impacts to scenic outlooks by the closest surrounding residential receivers would result in substantial impacts to amenity, altering the existing natural and open area to an area of construction. Passing receivers using the Newell Highway would also experience substantial visual impacts as construction plant and machinery would be visible from the existing road network. Impacts to passing receivers would be temporary and short term.

Light spill would be avoided during periods that require night works to reduce potential impacts to the surrounding properties and the Dark Sky Park. Lighting would be focused on the construction areas so as to not impact private properties and stargazing/astronomy research at the Siding Spring Observatory.

The sensitivity of the community to changes in amenity and values is high. The magnitude of the impacts during construction is moderate, resulting in the level of significance being high.

6.4.3.2 Operation

Land use and property

The proposal would impact land use by changing a portion of land currently used for agricultural and rural purposes to road infrastructure. Land surrounding the proposal would not be altered and temporary ancillary facilities would be restored to their former use or as per arrangements made with landowners. For properties subject to partial acquisition for the proposal, this may result in a change to the lot size that may be lower than the *Warrumbungle Local Environmental Plan 2013* minimum lot size requirements. Future changes in land use or development could be impacted by this change, as the size of any lot resulting from a subdivision of land is not to be less than the minimum size shown on the Warrumbungle LEP (Part 4 and the Minimum Lot Size) Dwelling House and Dual Occupancy Map in relation to that land. The proposal is comprised of land with minimum lot sizes of two hectare and 500 hectare land. This is discussed in more detail in the SEIA in Appendix F.

Permanent changes would be required to property access at River Road, Purlewaugh Road and the Oxley Highway. This would impact property owners and occupiers, who would need to adapt to the permanent changes to access. In addition, the sections of the TSR on Purlewaugh Road that would be impacted by the proposal (1.2 hectares acquired) would result in additional movements around the bypass for livestock. This is likely to impact the efficiency of operations. The establishment of a stock culvert under the bypass to facilitate movements is being investigated to mitigate safety impacts of potential livestock crossing and maintain efficiency.

The proposal would result in the existing section of the Newell Highway in Coonabarabran and the Mary Jane Cain Bridge being handed over to Warrumbungle Shire Council. This would require council to provide the future maintenance of the road and bridge. However, damage to the road is expected to be minimised due to the reduction of heavy traffic. TfNSW would work with Council to ensure it is handed over in a fair and reasonable condition.

Sensitivity of receivers to permanent changes to property is moderate. The magnitude of these changes is low, resulting in the level of significance being moderate-low.

The sensitivity of land occupiers and owners to permanent changes in land use is also moderate. The magnitude of these changes is moderate, resulting in the level of significance being moderate.

Access and connectivity

The proposal would improve local and regional connectivity which would improve freight efficiency and travel time for road users. The proposal would reduce the presence of heavy vehicles within the Coonabarabran town centre, although some heavy vehicles (GML vehicles) from Baradine may continue to travel through the town to access the Newell Highway or Purlewaugh Road. However, as Purlewaugh Road would no longer be a B-Double route, the heavy vehicles above GML would travel north on the existing Newell Highway to access the highway. Overall, the reduction in traffic is expected to improve safety for parking on John Street and active transport use within the town centre. Potential impacts to traffic is further discussed in Section 6.5.

Access to facilities and services would be improved for all road users due to the removal of trucks. Residents and visitors are expected to benefit from these improvements. Some local access to properties and along the bypass would be

permanently altered as a result of the proposal, particularly along Purlewaugh Road, River Road and the Newell / Oxley Highway, however all properties will still be able to access a public road.

The sensitivity of road users to permanent changes in access and connectivity is negligible. The magnitude is negligible and therefore the level significance is negligible.

Social infrastructure and businesses

Some amenity impacts during the operation of the proposal may occur at the Coonabarabran Golf Club. The proposal may be visible and audible from some parts of the course, resulting in some impacts to the quiet amenity of the facility.

Other facilities within the town centre and broader Coonabarabran such as the Siding Spring Observatory, Warrumbungle National Park and local events would not be impacted by the proposal. These features of Coonabarabran would continue to attract visitors, with the proposal potentially attracting more visitors to the town due to the improvements in amenity. The design of the proposal has also considered the Dark Sky Park and developed road lighting for the bypass at the intersections in accordance the Dark Sky Planning Guidelines.

The sensitivity of people using social infrastructure during operation of the proposal is low. The magnitude of the operation of the bypass is low, resulting in a low impact level of significance.

The business and shopper surveys undertaken for the proposal provided an indication of key factors that were of importance and concern to the community of Coonabarabran. Almost 50 per cent of businesses in Coonabarabran indicated that over half their trade was from passing trade or visitors. Thirty four per cent of respondents also indicated that over the past five years there has been a decline in business activity. Access to the town centre would remain open to local and regional travellers and visitors. The proposal is expected to result in a reduction of traffic along the existing Newell Highway through Coonabarabran by around 33 per cent. Patronage is still expected to continue at local businesses and facilities, particularly for essential retail and business facilities such as supermarkets, the post office and supply stores. This is supported by the shoppers surveyed, with 80 per cent of them indicating that the bypass would not change how they shopped. In addition, the bypass is expected to improve road and parking accessibility in the town centre, which may provide opportunities for the community and the council to capitalise on the changed environment. Opportunities such as streetscaping and the installation of town signage could rejuvenate the town. More information about signage initiatives for the town are discussed in Section 6.3.4.2. TfNSW would not establish any service centre (ie rest stop with retail businesses) along the proposal.

Some agricultural land would be impacted by the proposal, resulting in some impacts to agricultural business. Although the proposal is not expected to have an impact on the overall agricultural industry of Coonabarabran, directly affected businesses may experience impacts in productivity due to land acquisitions and access changes. Concerns may also stem from the reduction in agricultural land values and changes to the landscape character, resulting in direct impacts to agribusiness and farming properties. Local and regional agricultural businesses are also expected to benefit from the proposal through increased efficiency to transport agricultural goods. Improved traffic flow and safe travel along the highway to other centres would benefit the agricultural sector.

More information about business and commercial impacts is provided in Appendix F and G.

The sensitivity of businesses to the operation of the proposal is high. The magnitude of the operation of the proposal is high, resulting in the level of significance being high.

Community values and amenity

The community values of Coonabarabran may be impacted beneficially and adversely as a result of the proposal. This includes the value of the natural landscape, businesses, local economy and amenity. The proposal would introduce a new built/structural element to the proposal area, which is predominately an open and rural landscape. This would impact surrounding receivers, due to the visual and noise impacts during the operational phase of the proposal. Landscaping is expected to mitigate some of the visual impacts associated with the vegetation removal required for the proposal.

The establishment of the bypass may also cause feelings of severance for the surrounding community and residential receivers, as the proposal may be viewed as a barrier, generating feelings of separation and disconnection to the surrounding landscape.

The proposal is expected to improve the amenity of the Coonabarabran town centre by the reduction in noise from heavy vehicles such as trucks and road trains that would be diverted onto the bypass (refer to Section 6.5). The proposal is expected to lead to improvements in safety for traffic, parking and active transport use within Coonabarabran. These safety and amenity improvements are also expected to have offset impacts to tourism and town initiative opportunities. The potential to improve Coonabarabran town centre and increase tourism as a result of the proposal would have likely benefits to local economy and local businesses.

During consultation residents and businesses raised concerns about the proposal in reference to previous examples of bypass infrastructure. Conditional factors were a key component of many discussions with businesses and shoppers. These discussions involved the implementation of appropriate mitigation measures in an attempt to offset the negative impacts of the proposal, such as potential impacts to businesses and tourism Mitigation measures in the form of signage, maintaining the visibility of the town from the bypass and developing a bypass that would enable drivers to make a conscious choice to either use the bypass or travel through town were discussed. TfNSW would install photo signs on the Newell Highway near the southern and the northern intersections to promote the town.

A study into the signage strategy (Roads and Maritime, 2018a) found that the following outcomes of the strategy were effective:

- Raising awareness and promoting bypassed towns to travelling road users
- Seeing value in the signs to promote and attract travelling road users to their bypass town by community and businesses
- The photo and size of signs are right and clearly visible
- The signs can be adopted and rolled out across other New South Wales bypassed towns
- Travelling road users have visited the town due to the signs.

From the feedback gathered during consultation activities it was evident that leadership from Warrumbungle Shire Council to capitalise on the potential benefits of the amenity of the town was important to the community. Details of the signage strategy are provided in Section 3.2.3.12.

Sensitivity of the community on amenity and community values is moderate. The magnitude of the operation of the proposal is expected to be moderate, resulting the level of significance being moderate.

6.4.4 Safeguards and management measures

The following section provides a list of mitigation measures that should be applied during the proposal.

Table 6-30 Socio-economic safeguards and mitigation measures

ID	Impact	Environmental safeguards	Responsibility	Timing
SE1	Community consultation	A Communication Plan (CP) would be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP would include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. • The CP would be prepared in accordance with the Community Involvement and Communications Resource Manual (RTA, 2008).	TfNSW	Pre-construction
SE2	Changes in demography and population	The use of a mix of accommodation facilities for the temporary construction workforce should be considered to reduce pressure on facilities. Consultation with the Warrumbungle Shire Council and the Warrumbungle Chamber of Commerce should occur to understand the various accommodation options available.	TfNSW / Construction contractor	Pre-construction / construction
SE3	Property	TfNSW will continue to consult with affected property owners and land occupiers until the completion of the proposal. Discussions including the nature and timing of construction works would be required to identify relevant mitigation measures for noise, traffic and visual impacts.	TfNSW	Pre-construction/ construction
SE4	Property acquisition	Land acquisition will occur in accordance with the Land Acquisition (Just Terms Compensation) Act 1991.	TfNSW	Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
SE5	Property severance	TfNSW would consider each owner's remaining holdings accounting for the impacts of severance and/or the residual functional use of any remaining land. TfNSW would engage an appropriately qualified property and/or agricultural specialist to assess these impacts and to identify alternative opportunities for their remaining holdings. TfNSW would manage any residual land in accordance with its disposal processes. This would involve considering landowner requests for land swaps.	TfNSW	Pre-construction / operation
SE6	Changes in access	Temporary and permanent changes in access will be discussed with impacted land occupiers prior to commencement of construction and during construction activities should arrangements change. TfNSW would confirm any realignment of street access or inter-property access under the proposal, in consultation with property owners.	TfNSW / Contractor	Pre-construction/ construction
SE7	Freight and agricultural access routes	TfNSW will consult with freight and agricultural industries to identify critical times during the year where access reliability is critical on the Newell Highway. Road Occupancy Licences for the highway and with the local roads impacted by the proposal would be obtained. Temporary access tracks will be designed to similar conditions of existing roads to allow for use by the same sort of traffic.	TfNSW	Pre-construction/ construction
SE8	Social infrastructure	Communication and consultation with facilities near to the proposed construction works including the golf course, hospital and Cooinda Aged Care Centre so that potential impacts are managed. This includes maintaining access along Purlewaugh Road and noise mitigation.	Contractor	Pre-construction / construction
SE9	Loss of passing trade	TfNSW would work with Council and the Warrumbungle Chamber of Commerce to maintain	TfNSW	Construction / operation

ID	Impact	Environmental safeguards	Responsibility	Timing
		communication with businesses who may be impacted by the proposal and ensure ongoing concerns are considered.		
SE10	Community values and local amenity	During construction of the proposal, vegetation removal will occur only in areas identified in the REF and biodiversity assessment report for the proposal. Other natural areas will be protected where possible to maintain the landscape and amenity of the surrounding area	TfNSW	Construction
SE11	Initiatives	TfNSW will continue to work together with the Warrumbungle Shire Council to develop initiatives and strategies such as town signage and entry statements.	TfNSW	Detailed design / Pre-construction
SE12	Planning for construction pressures	TfNSW will work with Warrumbungle Shire Council through the construction period to try and minimise impacts during town events, such as StarFest to minimise any adverse impacts on the community and businesses.	TfNSW	Pre-construction / Construction
SE13	Planning for construction pressures – events	TfNSW will work with Council through the construction period to try and minimise impacts during town events, such as StarFest to minimise any adverse impacts on the community and businesses	TfNSW	Pre-construction
SE14	Business and tourism impacts	Proposal to be designed to meet the guidelines of the Dark Sky Planning Guidelines	TfNSW	Pre-construction and construction

6.5 Traffic and transport

This section describes the potential traffic and transport impacts associated with the proposal. This section is informed by the traffic and transport assessment (Aurecon, 2020c) which is provided in Appendix H.

6.5.1 Methodology

The traffic and transport assessment was based on a desktop review of collected and modelled data. The study area in the assessment comprises from the proposal corridor in the east to the Coonabarabran town centre in the west and between the existing sections of the Newell Highway to the north and south. The assessment includes:

- Identifying existing the environment including the existing road network, existing and future key land use changes, traffic counts and origin and destination survey data analysis, road safety and transport data, traffic incident data in the study area
- Analysing traffic data surveys: Traffic surveys were conducted in October 2019 (Matrix, 2019), collecting traffic volumes at five locations over a 10-day period
- Developing a base case model: An Aimsun base model was developed for 2018 traffic conditions and validated using the 2019 traffic data
- Assessing future traffic demand: Forecast traffic volumes and level of service were modelled for the following scenarios:
    - Base year (2018)
    - Year of opening (2026) without the proposal 'no build'
    - Year of opening (2026) with the proposal 'build'
    - 10 years after opening (2036) without the proposal 'no build'
    - 10 years after opening (2036) with the proposal 'build'.
    - Assessing the traffic impacts of the construction and operation of the proposal
- Identifying any reasonable environmental management measures to mitigate construction and operational impacts.

6.5.2 Existing environment

6.5.2.1 Existing road network

The Newell Highway passes north-south through Coonabarabran town centre with one lane of traffic in each direction. The highway has a speed limit of 100 kilometres per hour on the existing highway either side of town and reduces to 50 kilometres per hour through town centre, with school speed zones in force during school hours.

Other key roads within the study area include Oxley Highway, River Road and Purlewaugh Road Details of these roads are provided in Section 2.3.

6.5.2.2 Key intersections

Key intersections within the study area include:

- Newell Highway / Oxley Highway – an unsignalised T-Intersection with priority traffic travelling east-west along the Oxley Highway.
- Newell Highway / Edwards Street – an unsignalised four-way intersection with priority traffic travelling north-south along the Newell Highway.
- Newell Highway / Dalgarno Street – a roundabout with four entries.

Intersection performance

Level of service (LoS) is the standard measure used to assess the operational performance of intersections, with LoS criteria defined in Table 6-31.

Existing intersection LoS for key intersections along the existing Newell Highway were modelled using traffic count data for the AM peak and the PM peak periods (shown in Table 6-32). Across the three intersections, the LoS during peak periods is LoS A, being a free-flowing intersection with limited delay time. This is during a time where it is expected to have the most traffic volumes at the intersections. At other times, the LoS would be better than those modelled.

Table 6-31 Road level of service (LoS) criteria

Delay (s) per vehicle in seconds	LoS
<14	A
15 to 28	B
29 to 42	C
43 to 56	D
57 to 70	E
>70	F

Table 6-32 Existing intersection performance for AM peak (08:00-10:00) and PM peak (16:00-18:00) periods

Intersection	Peak period	2018	
		Delay (sec)	LoS
Newell Highway Bypass / Oxley Highway (Northern Intersection)	AM	6.2	A
	PM	5.7	A
Newell Highway / Dalgarno Street	AM	5.4	A
	PM	5.5	A
Newell Highway / Edwards Street	AM	3.4	A
	PM	3.0	A

6.5.2.3 Traffic volumes

Traffic volumes for the Newell Highway, Oxley Highway and Purlewaugh Road were monitored in 2019 over 24-hour periods. Volumes for the peak as well average daily volumes for weekdays and 7-day averages are shown in Table 6-33.

Table 6-33 Existing traffic volumes

Road	Direction	AM peak	PM peak	Weekday average	7-day average
Oxley Highway, south of Newell Highway	Eastbound	115	111	1509	1445
	Westbound	102	100	1429	1352
Oxley Highway, north of Newell Highway	Eastbound	40	39	442	416
	Westbound	40	39	434	412
Newell Highway, north of Oxley Highway	Northbound	76	78	969	959
	Southbound	62	69	928	890
Newell Highway, at proposed southern intersection	Northbound	135	137	1641	1566
	Southbound	124	125	1639	1527
Purlewaugh Road, east of the proposed Newell Highway intersection	Eastbound	19	28	244	226
	Westbound	37	21	245	229

The traffic volumes show that there is a strong north south direction of travel along the Newell Highway with a lesser volume of traffic travelling along the Oxley Highway. Through Coonabarabran, there are slightly higher traffic volumes during the weekday than the weekend.

6.5.2.4 Heavy vehicles

The Newell Highway forms part of the National Land Transport Network and is the third most significant heavy vehicle route in NSW in terms of freight mass and number of vehicles. The Newell Highway Corridor Strategy (TfNSW, 2015) identifies that freight along the Newell Highway is expected to grow over the next 20 years, with daily truck movements and annual tonnage predicted to grow by 67 to 103 percent between 2009 and 2031.

There are two key heavy vehicle routes that pass though Coonabarabran, being the north-south passage along the Newell Highway and the east-west passage along Purlewaugh Road to Baradine Road. These routes are approved for 25 to 26 metre B-double heavy vehicles that are up to 4.6-metres high. They are also approved Higher Mass Limit (HML) short combination routes. Details on the numbers of heavy vehicles monitored within the study area are detailed in Table 6-34.

Table 6-34 2019 heavy vehicle numbers

Road	Direction	Weekday average	7 day average
Oxley Highway, west of Newell Highway intersection	Eastbound	380	366
	Westbound	255	239
Oxley Highway, east of Newell Highway intersection	Eastbound	43	38
	Westbound	43	37
Newell Highway, north of Oxley Highway	Northbound	339	336
	Southbound	255	234
Newell Highway, at proposed southern intersection	Northbound	352	340
	Southbound	361	334
Purlewaugh Road, east of the proposed Newell Highway intersection	Eastbound	10	8
	Westbound	12	10

The analysis of the 2019 traffic survey data identified the following heavy vehicle volumes:

- Higher heavy vehicle numbers were detected on the northern and southern sections of the Newell Highway indicating that most heavy vehicles follow the Newell Highway through Coonabarabran town centre
- About 18 to 26 per cent of all traffic entering Coonabarabran along the Newell Highway, both northbound and southbound, are heavy vehicles
- Only about four per cent of all westbound traffic entering Coonabarabran from Purlewaugh Road are heavy vehicles
- About two per cent of all eastbound traffic coming from Coonabarabran town centre use Purlewaugh Road
- On all roads there are higher numbers of heavy vehicle movements on weekdays rather than weekends.

6.5.2.5 Road safety

The crash data analysis for the Newell Highway has been undertaken using the incident data provided in the Transport for NSW Crash Map (TfNSW 2020) for a five-year period between 2014 and 2018. There were nine crashes recorded between 2014 and 2018 on the Newell Highway within the study area. Of the incidents, there were no fatalities, one serious injury, six moderate injuries, one minor injury and one non-casualty (towaway). Most of the incidents occurred around the Newell Highway / Oxley Highway intersection and within the Coonabarabran town centre.

6.5.2.6 Modes of travel

Travel characteristics for Coonabarabran are based on travel to work statistics from the 2016 Census (ABS, 2016). The preferred method of travel in Coonabarabran was by car (70.2 per cent), predominantly as the driver. This can be in part attributed to the lack of public transport options in the area but also due to the disperse nature of the rural population and farming industry. About seven per cent of people travelled to work by walking and only 1.2 per cent on bicycles, scooters and motorbikes.

6.5.2.7 Public transport

There are regional coach routes that service the Coonabarabran town centre and surrounds that are operated by NSW TrainLink. There is no local public transport within the town. There are several coach routes that pass through (with one stop located within the town centre) or depart from Coonabarabran town centre and use the Newell and Oxley highways. These routes travel to Lithgow, Baradine, Tamworth and Dubbo.

There are no train services available. The Gwabegar railway line that passes through Coonabarabran is no longer operational.

6.5.2.8 Active transport

The study area has a discontinuous footpath network throughout the town. Footpaths are provided along the Newell Highway and along some of the intersecting roads. Cycle routes are provided in select locations within the study area (Roads and Maritime, 2019) (Figure 6-16). These locations are:

- A small section of shared path running through Coonabarabran High School
- A small section of shared path running parallel to the Newell Highway, north of the town centre
- An on-road cycleway extending along the Newell Highway from Edwards Street finishing after Merebene Street, that uses the asphalt road shoulder
- A shared path mostly running parallel to Newell Highway connecting Crane Street to Neilson Park and Robertson Street.

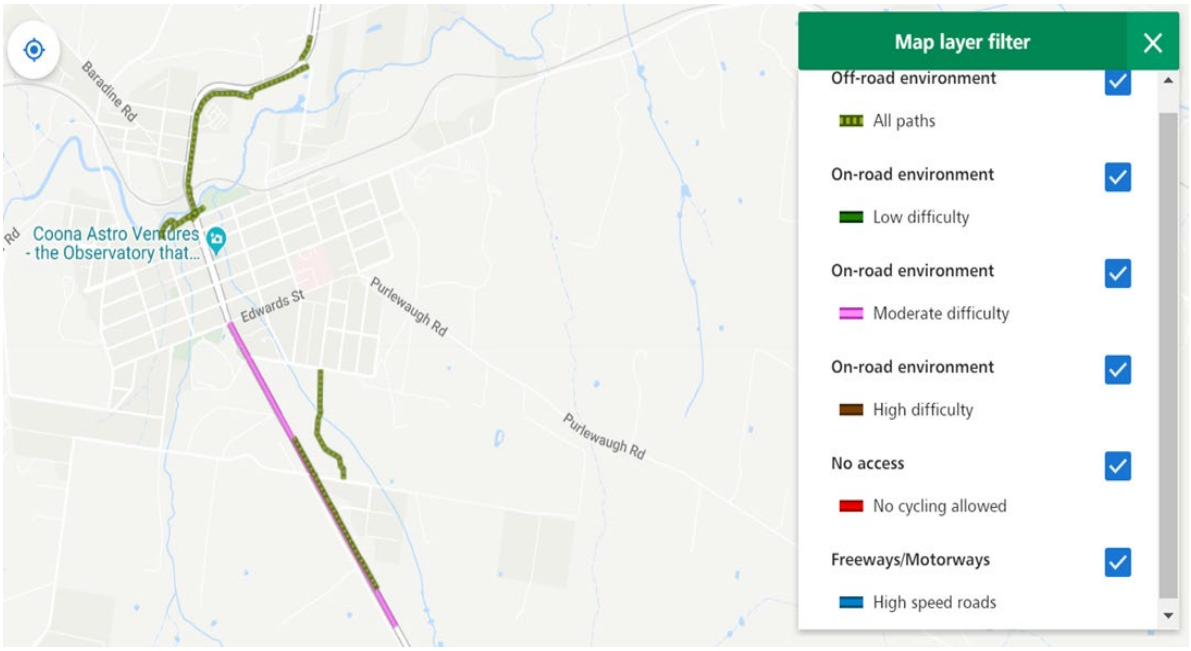


Figure 6-16 Cycling network within the study area

6.5.3 Potential impacts

6.5.3.1 Construction

Traffic movements

Deliveries to the site for materials and pre-cast elements would most likely arrive along Newell Highway and Oxley Highway. Around 120 delivery trucks and 90 light vehicles a day would be expected during construction. These vehicle numbers are a fraction of what the highways carry and this increase in traffic can be readily accommodated.

Some vehicles may be required to access River Road or Purlewaugh Road, which would need to be accessed via the Newell Highway through Coonabarabran. River Road and Purlewaugh Road are two way roads, however, larger heavily vehicles may need to be at a lower speed to provide space for oncoming vehicles to pass. Construction traffic volumes against are able to be accommodated on these roads, however, during peak times may result in some queuing at their intersections with the Newell Highway in town.

A project specific traffic management plan, traffic control plans and vehicle movement plan/s would be developed by the construction contractor prior to construction to confirm access paths and identify the need and extent for additional traffic management measures.

Construction site access and egress would occur from the Newell Highway, Oxley Highway, Purlewaugh Road and River Road with vehicle movement within the construction site and ancillary facilities following the project specific traffic management plan, traffic control plans and vehicle movement plan/s.

To access the construction site, speed reductions and other traffic management measures would need to be in place to allow the safe entry and exit of construction vehicles. The slowing of vehicles to enter site may cause temporary traffic delays of entry to the construction sites from these roads.

In terms of impact to the road network from construction works, as the majority of the works are in greenfield areas, impacts would be limited. However, at the intersection locations, potential impacts include:

- Disruption to Purlewaugh and River Road due to realignment of roads and construction of new intersections. Temporary access tracks would be installed while these new sections of road are constructed. The access tracks would be constructed either north or south of the existing road alignments, with traffic being switched to those access tracks while works are occurring. The establishment of the access tracks would enable traffic to use these roads during construction, therefore minimising impacts to traffic flow, access and connectivity
- Construction of the northern and southern intersection would be complex, but most of the intersection would be able to be constructed offline. Tie-ins where they are connected to the existing highway alignments, may need to be done during periods of low traffic flow to minimise impacts to traffic. Road occupancy licences (ROL) would need to be obtained from the relevant roads authority
- Access to ancillary facilities and the construction site may result in some temporary localised traffic delays, particularly in times of peak arrival or departure times or from deliveries of oversize loads. In addition, some large heavy vehicles that would need to slow on approach to the ancillary facilities or need to take up more or all of the access road may result in traffic delays. As per the traffic management plan, traffic management measures including signage and the use of on-site traffic controllers may be used to manage these impacts.

Within the Coonabarabran town centre, there may be some increase in traffic queuing at the Dalgarno Street / Newell Highway and Edwards Street / Newell Highway intersections to access the Newell Highway through increased construction traffic. These would be expected to be temporary and most noticeable during peak AM and PM periods. However, it is anticipated that these impacts would be minor and not result in substantial travel delays.

Property access

There are a number of accesses that would be disrupted during construction. These include:

- Property street accesses on the Oxley Highway, River Road and Purlewaugh Road
- Inter-property agricultural access where the proposal passes through a property
- Local street access- Honey Pot Road Newell Highway access.

The construction contractor would, where possible, maintain property access during construction. However, where required (and a permanent change to access is required), property accesses may need to be altered. TfNSW would confirm any realignment of street access or inter-property access under the proposal, in consultation with property owners.

Honey Pot Road may also need to have temporary changes to access arrangements when the northern intersection and tie-in works are undertaken.

Public and active transport

There would be minimal impact to public transport as there are no coach/bus stops located in the proximity of the proposal. However, bus routes that pass along areas under construction may experience minor temporary traffic delays.

Traffic management strategies would be implemented to appropriately manage any changes to traffic during construction.

The use of the Newell Highway, Oxley Highway, River Road and Purlewaugh Road by cyclists riding in an on-road environment may be disrupted by works near the where the proposal is located and intersects other roads. Cyclists using these roads would have to follow any implemented traffic management measures.

The construction site would be fully fenced to avoid safety concerns and the potential for members of public and/or unauthorised personnel to enter.

6.5.3.2 Operation

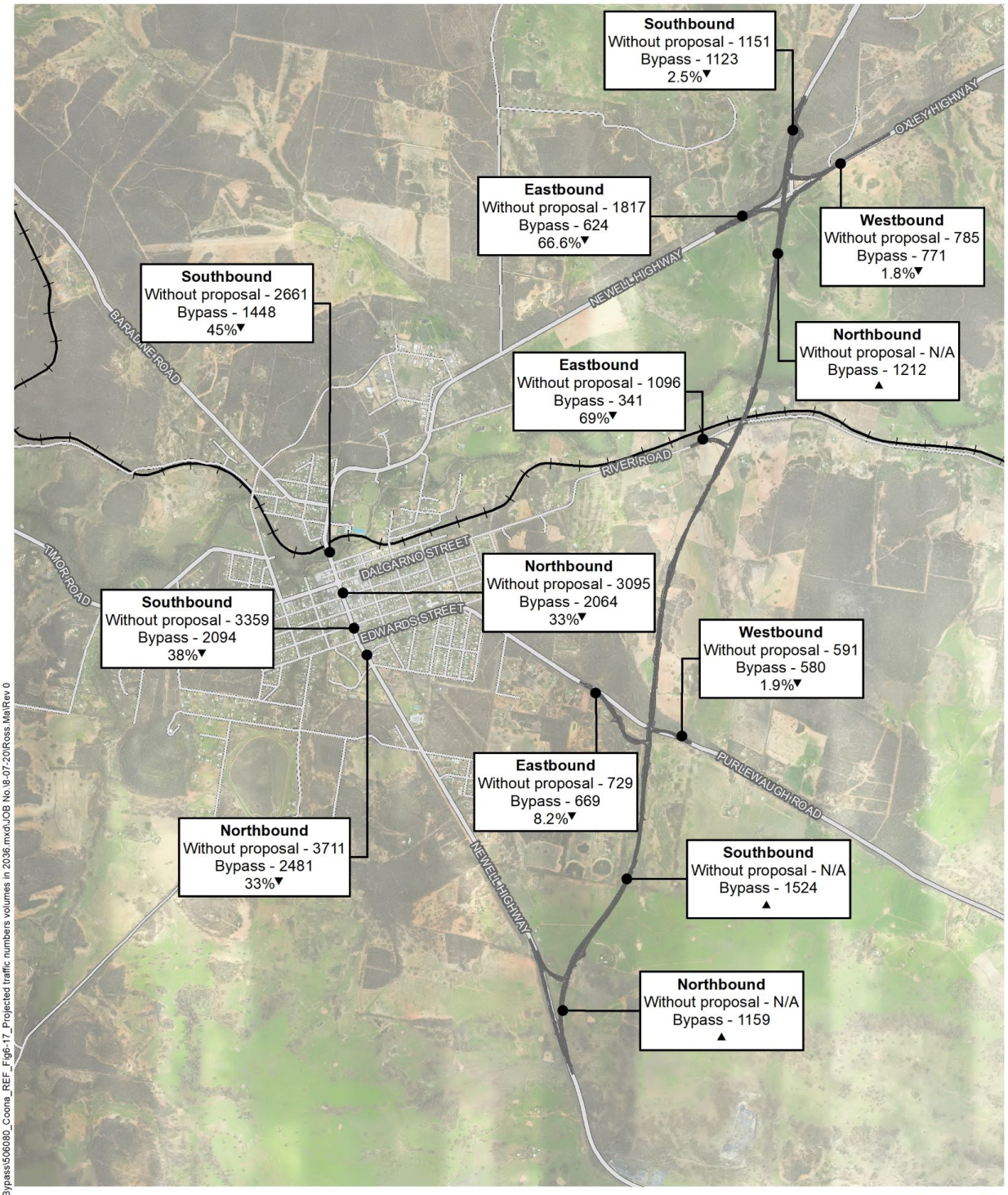
Traffic volumes

Using existing traffic data, traffic and intersection models of the road network were developed and used to predict future traffic volumes in 2026 (bypass opening) and 2036 (10 years after opening) for the “without proposal” scenario and “bypass” scenario.

As per the aim of the bypass, traffic volumes from the existing Newell Highway through Coonabarabran would be diverted onto the bypass. Separate to the proposal, in general, traffic along the Newell Highway, particularly heavy vehicles would increase due to natural traffic growth and increase in freight movement. Traffic volumes (inclusive of both light and heavy vehicles) along the bypass and at key intersection along the intersections through Coonabarabran are detailed in Table 6-35 and shown in Figure 6-17.

Table 6-35: AADT traffic volumes across the bypass and town intersections

Road	Direction	2018	2026		2036	
			Without proposal	Bypass	Without proposal	Bypass
Newell Highway Bypass / Oxley Highway (Northern Intersection)	NB	NA	NA	1097	NA	1288
	SB	874	980	1021	1151	1123
	WB	657	767	794	785	771
	EB	1356	1552	695	1817	747
Newell Highway Bypass / River Road	NB	NA	NA	1067	NA	1287
	SB	NA	NA	1246	NA	1309
	WB	NA	NA	271	NA	280
	EB	1016	1061	323	1096	341
Newell Highway Bypass / Purlewaugh Road	NB	NA	NA	1049	NA	1266
	SB	NA	NA	1582	NA	1647
	WB	NA	NA	539	NA	580
	EB	767	691	595	729	653
Newell Highway Bypass / Existing Newell Highway (Southern Intersection)	NB	NA	NA	1027	NA	1230
	SB	NA	NA	1512	NA	1607
	EB	NA	NA	1883	NA	1873
Newell Highway / Dalgarno Street	NB	2868	2951	2841	2798	2850
	SB	2300	2470	1437	2661	1448
	WB	1307	1220	1119	1319	1181
	EB	2868	2951	2841	2798	2850
Newell Highway / Edwards Street	NB	3272	3394	2419	3711	2481
	SB	3040	3226	2078	3359	2094
	WB	939	885	783	923	791
	EB	957	972	940	961	919



Source: Aurecon, LPI

1:42,250

0 500 1,000 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass **REF**

FIGURE 6-17: Projected traffic volumes in 2036

A review of the traffic volumes found:

- Traffic volumes along the Newell Highway will continue to increase in the future, even without the bypass
- A reduction in east-north traffic movement along the Newell Highway at the northern interchange. This is attributed to the change in location of the Newell Highway, which becomes north south in this interchange, rather than east-north, as in the existing situation
- A reduction in the east-west movement along River Road as some vehicles use the bypass to access further along River Road, rather than going through town and along the local road
- Continuation of the importance of the east-west movement along Purlewaugh Road
- A reduction in most cases in traffic through Coonabarabran in the future models with the bypass. This is attributed to the construction of the bypass enticing traffic to use the new highway for greater efficiency rather than passing through the centre of town.

Future intersection performance

Intersection performance for each future scenario is provided in Table 6-36. The LoS is the same for both AM and PM peak periods. Details on the second delays for these intersections are detailed in Appendix H.

Table 6-36: Projected intersection performance (LoS) for AM peak (08:00-10:00) and PM peak (16:00-18:00)

Intersection	2018	2026 Without bypass	2026 Bypass	2036 Without bypass	2036 Bypass
Newell Highway Bypass / Oxley Highway (Northern Intersection)	A	A	A	A	A
Newell Highway Bypass / River Road	N/A	N/A	A	N/A	A
Newell Highway Bypass / Purlewaugh Road (eastern leg)	N/A	N/A	A	N/A	A
Newell Highway Bypass / Purlewaugh Road (western leg)	N/A	N/A	A	N/A	A
Newell Highway Bypass / Existing Newell Highway (Southern Intersection)	N/A	N/A	A	N/A	A
Newell Highway / Dalgarno Street	A	A	A	A	A
Newell Highway / Edwards Street	A	A	A	A	A

Intersection performance at all key intersections would remain similar under all scenarios. With the bypass operational, there would be a slight increase in the average delay during the peak periods at the northern intersection, however, the increase in negligible and the LoS would remain A. This would be attributed to the changed conditions of the intersection, particularly the east-west movement.

The new intersections with River Road, Purlewaugh Road and the existing Newell Highway (southern intersection) would operates at a LoS A for the peak periods, with minimal delays for vehicles.

The Newell Highway / Dalgarno Street and Newell Highway / Edwards Street intersections in Coonabarabran town centre would both operate at LoS A under all scenarios, with limited changes to delays for vehicles. At the Newell Highway / Dalgarno Street intersection, there would be a reduction in delays by half a second during the PM peak in the future scenarios with the proposal. This can be attributed to the use of the bypass to access River Road to the east, rather than going through Coonabarabran.

Local access

The proposal would permanently alter the access to several private properties including:

- Local private property access from River Road, Purlewaugh Road and Oxley Highway as the new tie-in crosses the existing access pathway
- Local private property access onto the Newell Highway bypass near the southern intersection.

Property access would be relocated by TfNSW in consultation with the property owners. All affected properties will have access to a public road when the bypass is operational.

Heavy vehicles

The aim of the proposal is to improve freight efficiency. As sections of the Newell Highway that are currently restricted to B-Triples are opened to B-Triples, there is anticipated to be a shift in heavy vehicles from B-Doubles to B-Triples. This increase is expected to be 30 per cent from B-Doubles to B-Triples in 2026 and 50 per cent in 2036. However, while there would be a shift in heavy vehicles, there would be minimal change in the overall number of heavy vehicles.

The proposal would provide a higher speed, free flowing traffic environment which would attract heavy vehicles from the existing Newell Highway in the Coonabarabran town centre. The road conditions would also be more conducive to B-Triples as there is no need to navigate through town features such as roundabouts and adhering to school speed limits.

Projected overall heavy vehicle volumes for key intersections in the study area during the AM and PM peaks are provided in Table 6-37 and Table 6-38.

Table 6-37 AM peak period (08:00-10:00) for heavy vehicles across intersections

Road	Direction	2018	2026		2036	
			Without proposal	Bypass	Without proposal	Bypass
Newell Highway Bypass / Oxley Highway (Northern Intersection)	NB	NA	NA	301	NA	451
	SB	260	326	367	316	362
	WB	56	102	69	92	102
	EB	278	439	120	472	89
Newell Highway Bypass / River Road	NB	NA	NA	314	NA	474
	SB	NA	NA	245	NA	265
	WB	NA	NA	13	NA	14
	EB	71	74	5	77	28
Newell Highway Bypass /	NB	NA	NA	324	NA	464
	SB	NA	NA	232	NA	268
	WB	NA	NA	56	NA	69
	EB	66	61	82	99	97

Road	Direction	2018	2026		2036	
			Without proposal	Bypass	Without proposal	Bypass
Purlewaugh Road						
Newell Highway Bypass / Existing Newell Highway (Southern Intersection)	NB	NA	NA	324	NA	469
	SB	NA	NA	245	NA	275
	EB	NA	NA	230	NA	222
Newell Highway / Dalgarno Street	NB	477	668	309	663	293
	SB	449	502	367	510	301
	WB	15	31	41	36	28
	EB	87	110	112	107	82
Newell Highway / Edwards Street	NB	684	867	477	900	495
	SB	370	388	219	439	217
	WB	87	89	38	94	49
	EB	33	46	33	33	20

Table 6-38: PM peak period (16:00-18:00) for heavy vehicles across intersections

Road	Direction	2018	2026		2036	
			Without proposal	Bypass	Without proposal	Bypass
Newell Highway Bypass / Oxley Highway (Northern Intersection)	NB	NA	NA	479	NA	586
	SB	153	211	194	257	219
	WB	47	41	74	68	58
	EB	425	600	90	701	137
Newell Highway Bypass / River Road	NB	NA	NA	477	NA	592
	SB	NA	NA	151	NA	192
	WB	NA	NA	14	NA	14
	EB	52	58	0	68	3
Newell Highway Bypass / Purlewaugh Road	NB	NA	NA	477	NA	594
	SB	NA	NA	145	NA	175
	WB	NA	NA	74	NA	55
	EB	22	11	19	19	41
Newell Highway Bypass / Existing Newell Highway (Southern Intersection)	NB	NA	NA	466	NA	581
	SB	NA	NA	148	NA	186
	EB	NA	NA	331	NA	301
Newell Highway / Dalgarno Street	NB	400	575	79	663	96
	SB	416	468	282	488	307
	WB	36	19	27	58	25
	EB	58	112	85	151	74
Newell Highway / Edwards Street	NB	622	729	290	888	252
	SB	290	356	208	383	181
	WB	47	58	71	71	52
	EB	3	8	5	14	3

Heavy vehicles would not be permitted on River Road. To access the proposal, heavy vehicles would need to go through Coonabarabran to access either the northern intersection or via the Newell Highway / Purlewaugh Road intersection.

The proposal would remove B-double classification for Purlewaugh Road. As such, any B-doubles travelling east -west from Baradine Road to Quirindi would need to travel north on the existing Newell Highway to access bypass and then travel south to access Purlewaugh Road. This would result in a reduction in heavy vehicle movements through the Coonabarabran town centre and along Purlewaugh Road (west of the bypass).

Road safety

The safety of all road users including pedestrians, cyclists and motorists through Coonabarabran would be expected to improve once the bypass is operational. The diversion of traffic, in particular heavy vehicles, to the proposal would reduce the volume of traffic through the Coonabarabran town centre, reducing through traffic and local traffic interaction which would reduce conflicts. In particular, this would benefit the area where vehicles need to reverse into parking spaces on John Street (Newell Highway).

The construction of the bypass would increase the length of the highway where drivers can travel continuously without passing through a town resulting in increased potential for driver fatigue. Passing through towns results in a change in scenery and traffic conditions and provides opportunities for drivers to stop and take a break from driving. To provide opportunity for drivers to stop, the Coonabarabran bypass would have town signage and regional markers to promote and encourage travellers to go into town. Along its length, the bypass would have four opportunities to enter Coonabarabran.

Public and active transport

The proposal would have minimal impact on public transport, pedestrian or cyclist movements. The proposal would not provide any formal cycle path or pedestrian access; however cyclists would be able to use the road shoulder. Cyclists using Purlewaugh Road and River Road would need to give way to the traffic on the bypass. If they are crossing over two lanes of traffic, this could pose an additional layer of risk and a higher potential for more vehicle related incidents to occur. Considerations should be made for cyclists using the highway at the split-intersections at these roads, such as safety features incorporated in the proposal's detailed design, as discussed in Table 6-39.

There will be no impacts to existing coach and bus routes. The routes are still expected to run through the Coonabarabran town centre and follow the existing Newell Highway.

6.5.4 Safeguards and mitigation measures

The following section provides a list of mitigation measures that should be applied during the proposal.

Table 6-39 Traffic and transport safeguards and mitigation measures

ID	Impact	Environmental safeguards	Responsibility	Timing
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 Traffic Control at	Contractor	Detailed design Pre-construction

ID	Impact	Environmental safeguards	Responsibility	Timing
		Work Sites Manual (Roads and Maritime, 2018d) and QA Specification G10 Control of Traffic (Roads and Maritime, 2019e). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain 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.		Construction
TT2	Ancillary facilities	The ancillary facilities would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of the construction works, the temporary ancillary facilities, work area and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated to the landowner's requirements.	Contractor	Pre-construction Construction
TT3	Construction vehicle parking	Construction vehicles, personnel vehicles and plant would be stored within the designated ancillary facilities or in designated areas within the construction site. Vehicle parking needs to follow the Traffic Control at Worksites Technical Manual (Roads and Maritime 2018d).	Contractor	Pre-construction Construction

ID	Impact	Environmental safeguards	Responsibility	Timing
TT4	Coach/bus routes	Coach/bus route operators, including school bus operators, would be notified of the proposed works and potential route impacts prior to works commencing.	TfNSW	Pre-construction Construction
TT5	Property access	Access to private properties would be maintained during construction, wherever possible. Where changes to access arrangements or disruption to access are necessary, owners and occupiers would be consulted regarding alternative access arrangements in accordance with the relevant community consultation processes outlined in the TMP.	Contractor	Construction
TT6	Community notification	TfNSW will consult with the general community regarding changed traffic conditions and will consult with emergency services.	TfNSW	Construction
TT7	Active transport	TfNSW should consider the road safety implications of cyclists using the highway at the River Road and Purlewaugh Road split-intersections and whether any safety features such as signage or crossing points need to be incorporated into the proposal.	TfNSW	Detailed design

6.6 Hydrology and flooding

This section describes the potential hydrology and flooding impacts associated with the proposal. This section is informed by the hydrology and flooding assessment (Aurecon, 2020g) which is provided in Appendix I.

6.6.1 Methodology

The study area in the hydrology and flooding assessment comprises a section of the Castlereagh River catchment (about 181 square kilometres) which generally extends from the proposal corridor in the east to the Coonabarabran town centre in the west and between the existing sections of the Newell Highway to the north and south. The assessment included:

- Reviewing the previous report and hydrological modelling (TUFLOW model) previously undertaken by Opus in 2018
- Updating the hydrological and hydraulic models to in accordance with the proposal design including:
    - Incorporating design changes including culverts and the Castlereagh Bridge length
    - Updating rainfall loss values
    - Updating sub-catchment delineation

- Consideration of climate change impacts with an estimated increase in rainfall intensity of 20 per cent
- Updating inflow boundary condition

- Running the updated model for a range of design events including five per cent, two per cent, one per cent and 0.05 per cent Annual Exceedance Probability (AEP) design events and Probable Maximum Flood (PMF).

6.6.2 Existing environment

The proposal is within the Upper Castlereagh River catchment which is part of Murray-Darling Basin in central-western NSW. The land surrounding the proposal is typically undeveloped agricultural land used for livestock farming and crop fields. There are also some areas of remnant vegetation and few isolated residential dwellings and structures such as sheds and rural storage facilities. To the west of the proposal, closer to the town centre, there are more dense rural residential lots.

The Castlereagh River flows from west to east through the study area. Currently, in the study area, during flood conditions, the Castlereagh River overtops at the western extent, with flood waters moving east. Flooding is compounded by local tributaries overtopping and overland flow that travels to the Castlereagh River. Included in these local tributaries is Dog Trap Creek which flows south east from Dandry Road and confluences with Castlereagh River. Upstream of this is an unnamed creek that flows south-east and discharges into Castlereagh River. Flowing north from Purlewaugh Road, Chinamans Gully also confluences with Castlereagh River. An unnamed creek flowing and discharging into Castlereagh River is located upstream from Chinamans Gully. To the southern end of the proposal is an unnamed tributary to Billy Kings Creek. Castlereagh River and tributaries through the study area are shown in Figure 6-18.

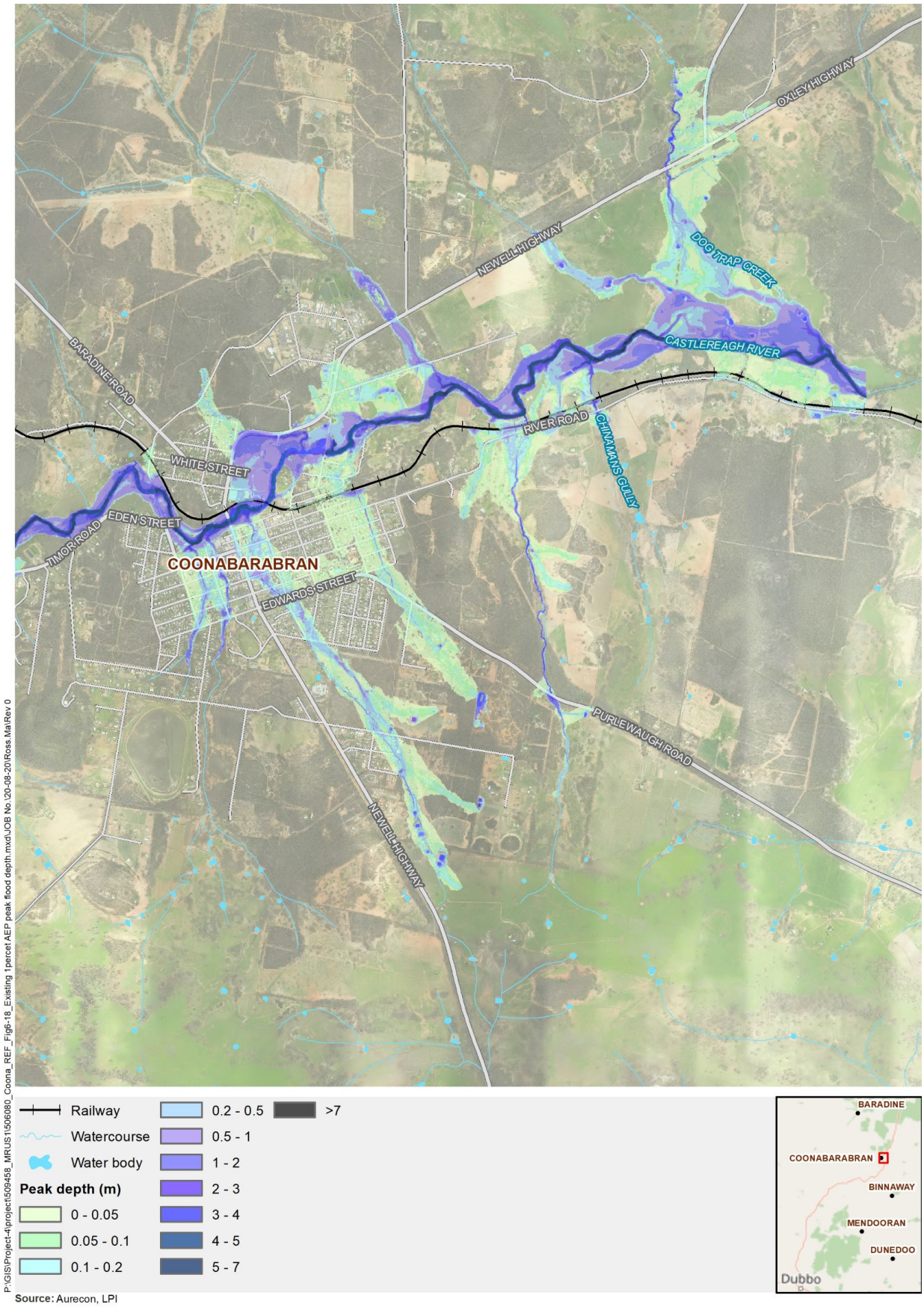
Existing flood behaviour across the study area is complex. This is partially due to Dog Trap Creek, which appears to have limited storage, resulting in overtopping in smaller flood events. This is particularly the case near the confluence with Castlereagh River. Dog Trap Creek and another major unnamed waterway to the west of Dog Trap Creek break their banks and cause flooding across the floodplain, inundating the study area before discharging into Castlereagh River.

Land to the south of Castlereagh River in the study area is mostly characterised with overland flow which is generally caused by the smaller local catchments. This flooding is generally contained within the waterways.

The main flooding feature is represented by Castlereagh River in the study area. In the river in the study area, existing flood behaviour results in flood depths of up to about six metres and flow velocities of up to around two metres per second.

In a one per cent AEP design event (ie there is one per cent chance of the event happening in a year), flooding in the study area is mostly localised around waterways. The Newell Highway floods between Cassilis Street, north across the Castlereagh River to around Jackson Street. There is localised flooding around three waterways in vicinity of the Newell Highway to the east of Jackson Street, including around the Newell Highway / Oxley Highway intersection as a result of Dog Trap Creek overtopping (Figure 6-18).

The existing Newell Highway through Coonabarabran is a key flood evacuation route allowing residents to evacuate from the town. When the Newell Highway is blocked, other local roads may be used for this purpose.



Newell Highway Upgrade Coonabarabran Bypass REF

FIGURE 6-18: Existing 1% AEP peak flood depth

6.6.3 Potential impacts

6.6.3.1 Construction

The potential flooding and hydrology impacts during construction would be:

- Localised flooding impacts from construction works
- Potential flooding of construction and demolition works sites during major flood events

Localised flooding impacts

During construction, impacts to hydrology would be associated with changes in the local topography and changes to the existing drainage patterns near the site. Such impacts would potentially be a result of earthworks, positioning of ancillary facilities (eg compound buildings or stockpiles) or the positioning of plant and equipment. Impacts to drainage patterns would be temporary in nature and would be localised to small areas. Such impacts would be minimised by redirecting flows from offsite around the proposal to ensure that flow paths largely remain intact.

Flooding of construction areas

Flood events during construction could inundate the proposal area and result in loss and/or damage of plant and equipment and impacts to works areas such as substantial erosion of excavated areas. This would particularly be of concern to areas in the north from just south of the Castlereagh River, and could include inundation of ancillary facilities as well as impacts to the Castlereagh River bridge site. Construction areas around Dog Trap Creek and other tributaries could also be inundated. In particular, the construction of new culverts just south of Purlewaugh Road could be affected during a high flood event.

The inclusion of any temporary fill within the floodplain (such as stockpiles) may reduce floodplain storage, which could result in increased flood elevations. Ancillary facilities 1 and 2, which are located in low hazard flood areas of the five percent AEP flood extent, would be at risk of flooding.

Construction of the main road alignment has the potential to alter overland water flows due to blockages caused by large machinery and equipment, along with excavations associated with earthworks. Contractors would monitor the weather for predicted heavy rainfall and potential flooding events. When these are predicted, any potential blockages would be moved out of the potential flow path of flood waters.

A temporary diversion of waterways including Dog Trap Creek and Chinamans Gully may be required during construction of the culverts to allow continuous flow of clean water and prevent possible flooding that could be caused if the creek was blocked by construction equipment. Any temporary localised diversion would be put in place prior to works commencing in the waterways, if required. Standard erosion and sediment control measures would be installed to manage any potential sedimentation and water quality impacts (see Section 6.8). The diversion would be removed, and the water flow would be directed through the new culverts once work is complete.

Further consideration of flooding impacts in relation to the ancillary facilities would be undertaken during detailed design, including identification of any flood mitigation measures required. A construction flood management plan would be developed to make sure that in the event of a flood, measures are in place to minimise any impacts to the construction of the proposal.

6.6.3.2 Operation

The proposal has been designed to provide a 100 year ARI flood immunity (one per cent AEP) for the Castlereagh River bridge and a 20 year ARI flood immunity (five per cent AEP) for the road alignment. The majority of the road alignment would obtain a one percent AEP flood immunity with the exception of a minor overtopping at the northern intersection.

Flood behaviour – Castlereagh River

Across the majority of the study area, the proposal would result in minimal changes to afflux of between -1 and 1 centimetres. An increase in flood levels however would occur at isolated locations. This is primarily due to the bridge at the Castlereagh River and the road alignment (being an embankment across the floodplain) restricting areas of flood flow and resulting in increased upstream flood levels.

The construction of the new crossing at the Castlereagh River would change the flood behaviour associated with the Castlereagh River in the study area. Peak flood depths upstream of the bridge, within the Castlereagh River, would increase, estimated to increase to around 40 centimetres in the one per cent AEP flood event. Downstream of the bridge, flood depths would be around 14 centimetres during a one per cent AEP event.

The bridge would also divert flows resulting in increased afflux to the north west of the bridge. Under a one per cent AEP, the proposal would result in an afflux of up to one metre over an area of about four hectares (Figure 6-19). This area is currently rural / grazing land and would not inundate any buildings, structure or infrastructure. Further optimisation of the design is recommended in the detailed design stage to minimise to the greatest extent possible afflux. Further flood modelling would be undertaken to confirm changes to flooding behaviour.

The peak velocities are not predicted to change significantly in this area as a result of the proposed bypass road in a one percent AEP design event. The flood hazard in this area is predicted to worsen to high, as a result. Optimisation of the drainage design can be undertaken during the detailed design stage to reduce the afflux in this area.

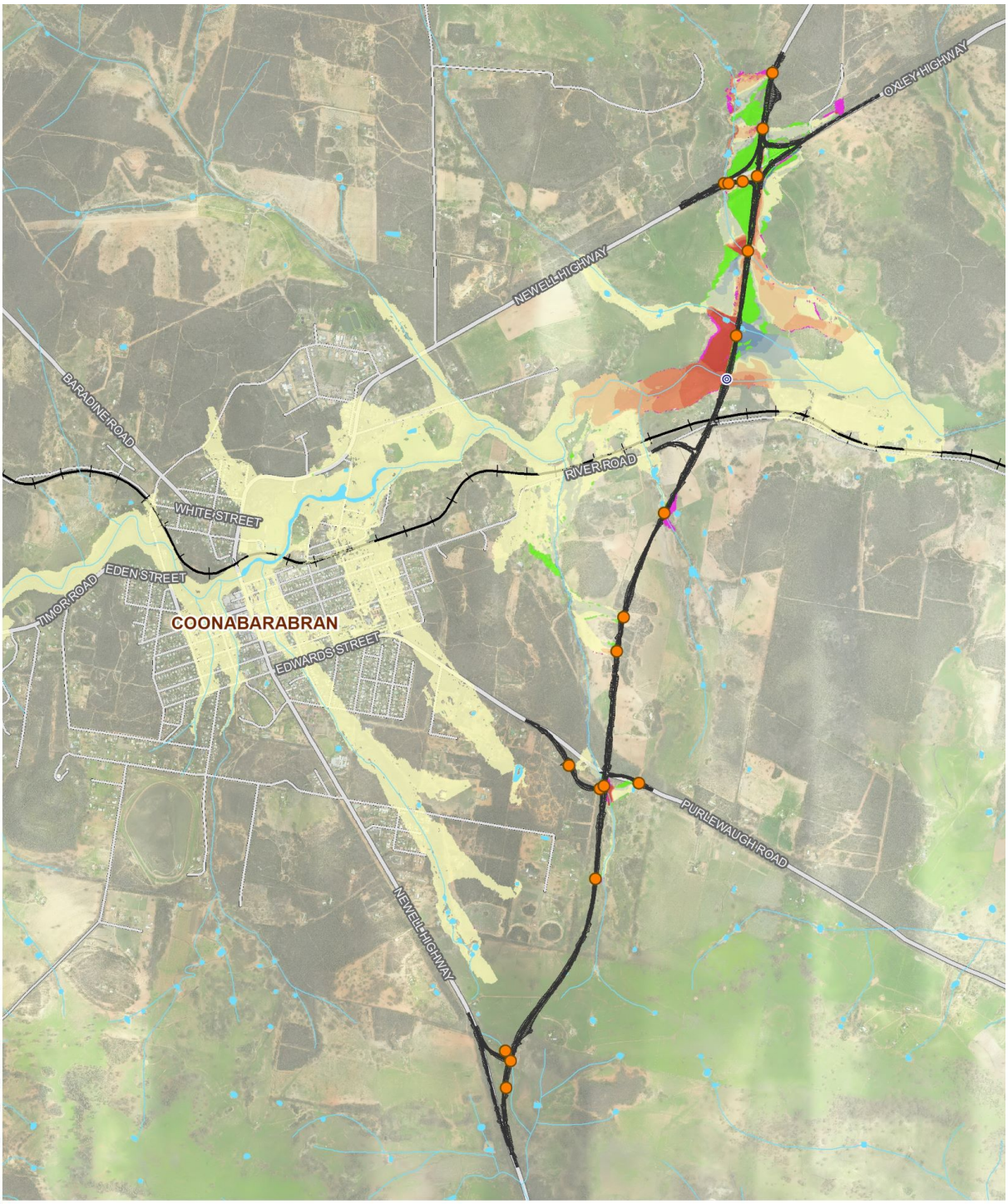
Flood behaviour – northern portion of the road alignment

In the northern portion of the road alignment, the proposal would result in discrete areas that were previously inundated in a one per cent AEP flood event, no longer being inundated. This includes areas close to the alignment and around the Newell Highway / Oxley Highway intersection (Figure 6-19). There is also a pocket of land to the east of the Honey Pot Road intersection with Oxley Highway which would be newly affected by flooding in a one per cent AEP flood event. This area is predominantly road reserve and Crown land.

There are no major areas of afflux upstream of the northern section of the proposed bypass with the exception of a localised area just upstream of the proposed culvert on an Unnamed creekline north of the Castlereagh River, where increases of up to around 50 centimetres are predicted in the one per cent AEP flood event. This predicted afflux is limited to a localised area that is predominantly pastureland. In this area, the flood hazard is predicted to worsen to high.

Peak flood flow velocities in this area are predicted to be reduced by up to about 0.5m/s for a one per cent AEP flood event, due to the obstruction of flows by the proposed culvert at this location.

Further review and optimisation of the proposed culverts will need to be undertaken in the detailed design phase to further reduce impacts.



The design
Railway
Watercourse
Water body
Culvert locations
Bridge location

Afflux (m)

< -0.4	0.01 - 0.05
-0.4 - -0.2	0.05 - 0.1
-0.2 - -0.1	0.1 - 0.2
-0.1- -0.05	0.2 - 0.4
-0.05 - -0.01	> 0.4
-0.01 - 0.01	Was dry now wet
	Was wet now dry

P:\GIS\Project-4\project\506080_Coonabarabran_Bypass\506080_Coona_REF_Fig6-19_Proposed 1percent AEP Afflux.mxd\JOB No.\20-08-20\Ross.Mai\Rev 0

Source: Aurecon, LPI

1:37,500
0 500 1,000 m

Projection: GDA 1994 MGA Zone 55

Newell Highway Upgrade Coonabarabran Bypass REF

FIGURE 6-19: Proposed 1% AEP Afflux

Flood behaviour – southern portion of the road alignment

The Newell Highway / Purlewaugh Road intersection crosses an Unnamed creek. At this location, it is proposed that a new set of culverts is installed under the bypass to carry flows from that creek. The existing culverts under Purlewaugh Road would be removed. This will result in changed to the flow regime of this creek.

Increases in flood levels of up to about 200 centimetres are predicted in limited localised area just upstream of the proposed culverts in a one percent AEP flood event. This area is localised to the existing creekline and would not impact any dwellings or infrastructure. No significant changes in peak flow velocities are predicted. In this limited area, the flood hazard would increase to high. Further optimisation of this culvert will be undertaken in the detailed design phase to reduce the impacts in this area.

The flood impacts along the remainder of the southern section of the proposed bypass are not predicted to be significant as the proposed road and cross drainage culverts resulted in minimal changes in the existing overland flow behaviour in these areas.

Properties and evacuation routes

No existing dwellings or infrastructure are expected to be adversely impacted by flooding as a result of the proposal. However, as indicated above, there are some localised areas which would experience an increase in afflux. This is located on pasture/ grazing land or along riparian creek corridors. Three dwelling on River Road were reviewed in detail as part of the assessment to confirm whether there would be flooding impacts as a result of the proposal. Modelling showed that all three dwellings were not flooded currently during a one per cent AEP flood event and would not be inundated when the proposal was constructed.

As the proposal is expected to achieve a one percent AEP flood immunity along the majority of the alignment, it provides a new evacuation route from Coonabarabran during a flood event. The areas where flooding is predicted from the proposal would not impact on the surrounding road network and therefore would not impact on evacuation potential of local residents.

Climate change impacts

Flooding impacts as a result of climate change are assessed in Section 6.7.

6.6.4 Safeguards and management measures

Table 6-40 Hydrology and flooding safeguards and mitigation measures

ID	Impact	Environmental safeguard	Responsibility	Timing
HF1	Flooding	Further design and optimisation of the drainage design will be undertaken. Further flood modelling will be undertaken during later design stages to limit any afflux increases.	Contractor	Detailed design
HF2	Ancillary facilities	Further consideration will be undertaken for flooding impacts in relation to ancillary facilities	Contractor	Detailed design
HF3	Flooding	A construction flood management plan will be prepared as part of the CEMP to set out processes for monitoring and managing flood risk. The plan will:	Contractor	Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		• Specify the steps taken in the event of a flood warning • Including removal or securing of loose materials, equipment, fuels and chemicals • Procedures for creek diversions, if required.		

6.7 Climate change and greenhouse gas emissions

This section describes the potential climate change and greenhouse gas emission impacts associated with the proposal.

6.7.1 Existing environment

The existing climate in Coonabarabran is characterised by a warm subtropical climate, with hot summers and cool winters and an average annual rainfall of 765mm (BOM, 2020a).

Climate change projections indicate that the Central west and Orana region is expected to experience an increase in all temperature variables (average, maximum, minimum and number of hot days) for the near and far future (OEH, 2014). Rainfall is projected to decrease in spring and increase in autumn. A summary of the projections compared to the existing environment is shown in Table 6-41.

Table 6-41 Existing and projected climate variables

Variable	Existing	Projected change	
		2020-2039 (near future)	2060-2070 (far future
Average annual maximum temperature	23.9°C	0.7°C▲	2.1°C▲
Average annual minimum temperature	7.5°C	0.7°C▲	2.1°C▲
Average rainfall (summer)	89.1mm	15%▼ to 16%▲	10%▼ to 26%▲
Average rainfall (autumn)	62.2mm	11%▼ to 42%▲	9%▼ to 45%▲
Average rainfall (winter)	51.3mm	12%▼ to 3%▲	25%▼ to 34%▲
Average rainfall (spring)	65.3mm	25%▼ to 11%▲	25%▼ to 17%▲
Annual hot days over 35°C	18.4 days	10 to 20 more days	20 to 30 more days
Annual cold nights below 2°C	95.3 nights	5 to 10 less nights	20 to 30 less nights

In 2019, Australia's national GHG emissions were estimated to be 530.8 mega-tonnes of CO_2-e which is down by 1.4 mega-tonnes of CO_2-e from the previous year (DISER, 2019).

The most recently published data for NSW indicates that the State is the second biggest GHG emitting state or territory (DoE, 2019). NSW contributed about 131.5

mega-tonnes of CO_2-e in 2017 with the transport sector contributing about 19 per cent of that total.

6.7.2 Methodology

The climate change and greenhouse gas (GHG) emissions assessment was based on a desktop review and includes:

- Existing climate conditions based on averages between 1991 to 2020 (BOM, 2020)
- Historical GHG emission averages (DISER, 2019; DoE, 2019)
- Forecast climate conditions for the near future (2020-2039) and far future (2060-2070) based the NSW and Australian Capital Territory (ACT) Regional Climate Modelling (NARCliM) project (OEH, 2014)
- An assessment of GHG emissions during construction and operation calculated using the *Greenhouse Gas Assessment Workbook for Road Projects* and the associated Carbon Gauge calculator (TAGG, 2013). The calculations are based on estimated material volumes and construction activities (refer to Section 3.3).
- The sources of GHG emissions categorised into three 'scopes' which relate to whether the emissions are direct or indirect and their origin. These three scopes are:
    - Scope 1: GHG emissions released directly from on-site activities associated with the proposal, such as the combustion of fossil fuels in vehicles and motors and from the removal of vegetation
    - Scope 2: GHG emissions released indirectly from an off-site activity, for example the generation of electricity which is used during the construction and operation of the proposal
    - Scope 3: GHG emissions released indirectly as a result of acquiring and disposing of materials for the proposal, for example the combustion of fossil fuels to transport building materials to a construction site and the consequent break down of building wastes such as vegetation and wood releasing carbon dioxide emissions in the decay process.

The increased potential for flooding during the operation of the proposal due to climate change was provided in the hydrology and flooding assessment (Aurecon, 2020g) (Appendix I). This assessment modelled the expected flooding with an increase in rainfall intensity of 20 per cent.

6.7.3 Potential impacts

6.7.3.1 Construction

It is estimated that construction of the proposal would generate about 25,246 tonnes CO_2-e. The estimated GHG sources and emissions during construction of the proposal are listed in Table 6-42.

Construction would be undertaken for about 20 months with varying GHG emitting activities throughout different construction stages. Details of construction methodology including materials and vehicle movements are provided in Section 3.3.

Table 6-42 Estimated GHG emissions during construction

Source	GHG emissions (tonnes CO_2-e)		
	Scope 1	Scope 3	Total *
Electricity generation	167	13	180
Site vehicles	216	17	233
Plant and equipment	2960	224	3184
Earthworks	1438	109	1547
Vegetation removal (fuel combustion)	230	17	248
Vegetation removal (loss of carbon sink)	3190	-	3190
Aggregate	-	510	510
Concrete	-	11,059	11,599
Bitumen	-	73	73
Steel	-	5022	5022
Total	8202	17,044	25,246

Note: The calculations do not include the transportation of materials to site as the source of materials is currently unknown. No Scope 2 emissions are expected as the construction compounds would likely be powered by generators with no direct electricity supply from the grid.

The primary GHG emission sources during construction would be from construction materials, particularly concrete, and fuel combustion from plant and equipment.

The energy associated with the indirect offsite extraction and production of materials used to build the proposal would contribute the largest proportion of GHG emissions, accounting for 68 per cent of the total emissions. The high proportions of emissions associated with these materials are primarily attributed to the large quantity of concrete required and the emissions-intensive processes involved in the extraction and production of materials.

The use of plant and equipment would generate GHG as a result of fuel combustion. It is assumed that all construction plant and equipment would use diesel fuel. It would contribute about 13 per cent of the total emissions.

Vegetation removal would result in the generation of GHG emissions by the direct removal of vegetation and indirectly by removing the ability for carbon sequestration. The function of a carbon sink is eliminated when the vegetation is removed. The direct and indirect removal of vegetation would contribute to about 14 per cent of the total emissions from the construction of the proposal.

Construction planning would aim to reduce GHG emissions where possible (ie minimising vehicle movements, sourcing materials locally). However, most of the emissions would be largely unavoidable and therefore the proposal would contribute to climate change. The total volume of GHG emissions is expected to be minor on a State level. In comparison to the total NSW GHG emissions in 2017, the proposal would contribute about 0.02 per cent.

6.7.3.2 Operation

Materials and equipment needed for maintaining the road and electricity for intersection lighting would contribute small volumes of GHG emissions. It is estimated that operation of the proposal would generate about 7 568 tonnes CO_2-e over 50 years. This estimate assumes the replacement of five per cent of the asphalt road

surface once every 50 years, with only the top asphalt layer requiring replacement (in accordance with the 'typical' maintenance activities (TAGG, 2013)).

The frequency of maintenance activities would depend on the longevity of materials and consequences of unexpected events such as road accidents and graffiti.

Vehicle GHG emissions would result in a minor reduction in greenhouse gas emissions from vehicles by reducing idling and delays currently experienced through Coonabarabran town centre.

Flooding

The proposal is expected to alter the flooding behaviour in the study area primarily due to the Castlereagh River bridge and the road embankment acting as a flow control (refer to Section 6.6.3). The increase in rainfall intensity due to climate change is expected further increase flooding behaviours due to the additional volume and velocities of water.

The modelling identified that in a one percent AEP design event increases in peak water levels of up to 45 cm upstream and 40cm downstream of the Castlereagh Bridge are expected. Increases in peak water levels of up to 40 cm are also expect along the unnamed waterway near the Purlewaugh Road intersection. Negligible climate change impacts are expected along the rest of the alignment.

6.7.4 Safeguards and management measures

Table 6-43 Climate change and greenhouse gas emissions safeguards and mitigation measures

ID	Impact	Environmental safeguard	Responsibility	Timing
CI1	Greenhouse gas emissions	The procurement strategy developed for the construction phase will demonstrate value for money and consideration for opportunities to procure goods and services: • from local suppliers, if available • that are energy efficient or have low embodied energy • that minimise the generation of waste • that make use of recycled materials.	Contractor	Pre-construction/ construction
CI2	Greenhouse gas emissions	The detailed design and construction planning will demonstrate that the extent of vegetation clearing within the proposal area has been minimised.	Contractor	Detailed design
CI3	Greenhouse gas emissions	Construction equipment, plant and vehicles will be appropriately sized for the task, serviced frequently and will not be left idling when not in use.	Contractor	Construction

6.8 Other impacts

This section summarises the other environmental factors associated with the proposal. The potential impacts associated with these factors are low risk. Mitigation measures to manage these potential impacts are included in Section 6.8.2.

6.8.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Surface and groundwater	A surface and groundwater assessment was prepared for the proposal (Aurecon, 2020d) (Appendix J). The study area in the assessment comprised the construction footprint and receiving water catchments. The proposal is within the Castlereagh River catchment, part of the Murray-Darling basin. The proposal would cross six watercourses, the largest of which is Castlereagh River. Groundwater in the area is used for domestic needs, livestock watering and agriculture. Groundwater was encountered following geotechnical investigations at three borehole locations which identified groundwater at a depth of about seven metres below ground level (Aurecon, 2020e). The proposal is located within a vulnerable groundwater area under the Warrumbungle LEP (2013). As such, the proposal must consider: • the likelihood of groundwater contamination from the proposal (including from any on-site storage or disposal of solid or liquid waste and chemicals)	During construction, activities including vegetation clearing, stockpiling and earthworks have potential to cause the mobilisation of chemicals, sediments and construction waste into nearby watercourses. This poses the following environmental risks: • erosion, sedimentation, turbidity and habitat degradation of nearby waterways • changes to volumes and rates of runoff to watercourses • increased loads of dissolved nutrients and pollutants causing algae growth and contamination • eutrophication and reduced pH resulting from tannin leachate. Through appropriate on-site management, potential risks to surface water quality are expected to be low. Groundwater would likely be used during construction from existing or new bores. Installation of any new boreholes would require a Water Supply Works Approval (Refer to Section 4.3.4). Potential impacts to groundwater during construction include: • temporary changes to the natural drainage and groundwater recharge processes into watercourses • lowering of local groundwater levels • reduction of groundwater quality due to infiltration of contaminated surface waters • impacts to groundwater dependant ecosystems. Due to the characteristic of the local geology, drawdown effects of the water table are unlikely.

Environmental factor	Existing environment	Potential impacts
	• any adverse impacts the proposal may have on groundwater dependent ecosystems • the cumulative impact the development may have on groundwater (including impacts on nearby groundwater extraction for a potable water supply or stock water supply) • any appropriate measures proposed to avoid, minimise or mitigate the impacts of the proposal. The proposal is located within areas of low to moderate and low potential GDEs (refer to Section 6.1.2). The proposal is located in a historical flood area where heavy scouring of creekbanks and sediment deposition has been recorded. Historical flood data indicates peak flood waters of 6.5 metres deep.	During operation, contaminated stormwater runoff has the potential to impact water quality of nearby watercourses. The proposal design would include a number of water quality management features to mitigate potential impacts (Refer to Section 3.2.3.5). The proposal is not expected to alter natural drainage patterns or low flow regimes of nearby watercourses. No groundwater extraction would be required during operation, however groundwater recharge would be restricted beneath the impermeable pavement surface.
Air quality	The air quality in the region is typically 'good' by national standards (BoM, 2020). There are no identified air polluting facilities within 80 kilometres of the proposal (DoEE, 2020b). Local air quality is influenced by emissions and odours from vehicles, agricultural activities and private households including woodfire smoke.	During construction, the following activities would potentially generate air emissions and dust or odour which would impact air quality: • clearing of vegetation • stripping, stockpiling and managing of topsoil • building demolition • earthworks, excavation and landscaping • road sub-grade preparation and road pavement work • transport and handling of soil • use of construction vehicles, machinery and plant • spray painting of the road for line marking. These air quality impacts have potential to impact surrounding residential receivers and construction workers. However, impacts would be localised and largely be dependent on daily weather conditions including wind direction and strength.

Environmental factor	Existing environment	Potential impacts
		During operation, air emissions within Coonabarabran would be improved as heavy vehicles would bypass the town centre. This would relocate the typical air emissions from vehicles currently passing through the town centre to the bypass. Typical emissions including carbon monoxide, oxides of nitrogen and particulate matter (PM^{10}).
Waste and resource use	Existing waste volumes are minor and are limited to sources including private households, agricultural activities, roadside litter, illegal dumping and other waste material associated with roadside maintenance. The resource management hierarchy principles in order of priority as outlined in the Waste Avoidance and Resource Recovery Act 2001 would be applied to the proposal, these are: • avoidance of unnecessary resource consumption • resource recovery (including reuse, reprocessing, recycling and energy recovery) • disposal. By adopting the above principles, TfNSW encourages the most efficient use of resources and reduces cost and environmental harm in accordance with the principles of ecologically sustainable development.	During construction, the proposal would require a number of resources including road base, concrete, steel and landscaping materials. Details of the materials and estimated volumes are provided in Section 3.3.6. Waste generated during construction would be mostly located at compound sites. Waste sources may include: • residual road and building materials including concrete, asphalt and aggregate • packing materials including pallets, crates, plastics • domestic garbage including food waste and general site waste and litter • wastewater from facilities, vehicle wash down and dust suppression • residual chemical including oils, lubricants, waste fuels and batteries • green waste including timber, vegetation and weeds. • hazardous waste including asbestos, oils, lubricants, waste fuels and batteries Inappropriately managed waste has the potential to result in impacts to air quality, human health, water quality contamination and visual impacts which are details in the relevant sections. Waste would be reused and recycled on site where possible, however surplus or contaminated material would be classified and disposed of at a licensed waste facility in accordance with *EPA Waste Classification Guidelines* (EPA, 2014). During operation, waste sources would likely include: • roadside litter • waste material associated with roadside maintenance. • green waste from landscape maintenance • illegal dumping.

Environmental factor	Existing environment	Potential impacts
Aboriginal heritage	An Aboriginal and historic heritage assessment was prepared for the proposal (OzArk, 2020b) (Appendix K) and assessed the construction footprint. The proposal is located on the boundary between the lands of the Wailwan and Kamilaroi people. The desktop assessment identified three known Aboriginal heritage sites listed on the Aboriginal Heritage Information Management System (AHIMS) database, within 50 metres of the proposal including three scar trees (28-2-0031, 28-2-0033, 28-2-0197) and a grinding groove site (28-2-0007). The site card for site 28-2-0031 indicates that it has been destroyed. During the field surveys, two of the sites (28-2-0033 and 28 2-0007) could not be found in or near the study area. This indicates that either they are no longer present, or the location of the record is incorrect. However, from additional information provided on the site card for site 28 2-0007, it was concluded that this site is outside the study area. No additional unrecorded Aboriginal sites were identified. Consultation was undertaken as part of the process and is detailed in Section 5.3.	It is unlikely any known Aboriginal sites would be impacted during construction or operation of the proposal due to their location outside the impact area. However, as site 28-2-0197 and the record of 28-2-0033 are located close the impact area, mitigation measures would be observed to ensure the site is not inadvertently impacted. Although site 28-2-0033 could not be found during the field survey, the record is still valid, and protection of the site should be maintained. There is the potential for discovering additional unexpected Aboriginal items, objects and values during construction.
Non-Aboriginal heritage	An Aboriginal and historic heritage assessment was prepared for the proposal (OzArk, 2020b) (Appendix K) and assessed the construction footprint. There are no National, State or locally listed heritage items within the study area. During the field survey, two historic features were identified within the study area:	The blaze tree is in the construction footprint and would be removed during construction. Although it does not meet the criteria to be listed as a heritage item, it still holds minor historic heritage and community value which would be permanently lost by its removal. The blaze tree is protected under the *Surveying and Spatial Information Act 2002* (refer to Section 4.3.11). Therefore, while the blaze tree may not have heritage values, approval for its removal under the Act must be sought. The remains of the old bridge are located about 85 metres from the construction footprint and would not be impacted due to the distance from

Environmental factor	Existing environment	Potential impacts
	• a blaze tree – a tree with a scar and the carved markings of a circle and a triangle. It is located south of the southern intersection • the remains of an old bridge – several timber beans, the bridge appears to be used to cross a drainage gully. It is located to the south west of the northern intersection. Both items are not considered to be of National, State or local historic significance, however, still hold minor historical value. The blaze tree is significant for surveying purposes.	the works. Construction and operation of the proposal would not impact any listed non-Aboriginal heritage items.
Soils and contamination	The proposal area features gentle undulating hills, with elevations ranging from 490-580 metres Australian Height Datum (AHD). The proposal traverses five geological units including quaternary, tertiary volcanics, pilliga sandstone, purlawaugh formation and garrawilla volcanics formed during the Cenozoic to Mesozoic timeframes. The proposal traverses five soil landscapes including kandosols, sodosols, ferrosols, kurosols and chromosols. The proposal is predominantly in mapped low salinity hazard, with areas of very high salinity hazard near Castlereagh River and Dog Trap Creek and high salinity hazard in the southern section near the intersection with the existing Newell Highway. The proposal is considered low risk for inland acid sulfate soils (ASS). A contamination preliminary site investigation was prepared for the proposal (Aurecon, 2020f) (Appendix L). The study area in the assessment	During construction, moderate alterations to the existing topography of the landscape are anticipated due to areas of cut and fill. Cuts would typically be about one to five metres deep with an estimated volume of 313,321m^3. Ground disturbing activities such as vegetation removal, earthworks, stockpiling and soil transportation have potential to result in erosion, particularly during high wind or rainfall events. Disturbance of saline soils has the potential to result in: • the reduction of plant and microbial diversity, plant growth and production • increased spread of contaminated soil risk • transport of salt to waterways • reduction in construction material lifespan (eg bitumen, concrete, masonry and metal). Through appropriate on-site management, potential risks regarding soils are expected to be low. There is a low to moderate risk of contamination from a range of potential contaminants and sources within the study area. Given the distance from the known contaminated sites, contamination risk associated with these sites is considered to be low. Disturbance of contamination and hazardous materials poses health risks to human and ecological receptors.

Environmental factor	Existing environment	Potential impacts
	comprised a one kilometre buffer around the proposal. There are no EPA or PFAS registered contaminated sites or recorded locations of unexploded ordinance within two kilometres of the proposal. Five contaminate petrol station sites are within the Coonabarabran town centre. There is potential for low to moderate widespread contamination across the proposal due to the historical and current agricultural and rural land uses.	During operation, potential soil erosion would be minor as all areas would be sealed or landscaped. Minor contamination risks including spills from industrial heavy vehicles and accidents from general motorists causing oil and petrol spills are anticipated. However, the drainage system is capable of being partitioned to contain spillage from incidents.

6.8.2 Safeguards and management measures

Table 6-44 Other impacts safeguards and mitigation measures

Number	Impact	Environmental safeguard	Responsibility	Timing
WQ1	Surface and groundwater	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and surface water and groundwater pollution and describe how these risks will be addressed during construction. The SWMP will include: • a water quality monitoring program will be developed and implemented in accordance with *Guideline for Construction Water Quality Monitoring* (RTA, 2003). The monitoring program is to include: – visual monitoring of local water quality (including for turbid plumes and hydrocarbon spills or slicks) – monthly up and down stream water quality monitoring during construction in and over the Castlereagh River. • site-specific discharge criteria for construction phase surface water discharges. Construction phase monitoring parameters should be determined based on the results of the pre-construction monitoring. Sampling parameters and frequency should adhere to the recommendations provided in the *Guideline for Construction Water Quality Monitoring* (RTA, 2003). • baseline conditions (groundwater level and quality) will be established for shallow groundwaters prior to construction • arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas and monitoring during and post-construction	Contractor	Detailed design / Pre-construction

Number	Impact	Environmental safeguard	Responsibility	Timing
		• measures for the protection of surface and ground water resources		
WQ 2	Surface and groundwater	Progressive Erosion and Sediment Control Plans (PESCPs) will be developed and implemented at each construction stage as a part of the Soil and Water Management Plan. The plans would include arrangements for managing wet weather events, including monitoring potential high risk events (such as storms) and specific controls and follow up measures to be applied in the event of wet weather. It will be based upon the preliminary erosion and sedimentation management report (ESMR) prepared as part of the REF.	Contractor	Detailed design / Pre-construction
WQ 3	Surface water	Water flows should be maintained at all times during construction, where possible, along the Castlereagh River.	Contractor	Detailed design / Pre-construction
WQ 4	Water quality	A Spill Management Plan will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. It will be in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The Spill Management Plan will address, but not necessarily be limited to: • management of chemicals and potentially polluting materials • any bunding requirements • Maintenance of plant and equipment • emergency management, including notification, response and clean-up procedures. • showing the location of emergency spill kits.	Contractor	Detailed design / Pre-construction

Number	Impact	Environmental safeguard	Responsibility	Timing
WQ 5	Surface and groundwater	The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed, and in accordance with: • Landcom's Managing Urban Stormwater: Soils and Construction series • RTA Landscape Guideline • Roads and Maritime Guideline for Batter Stabilisation using Vegetation (2015).	Contractor	Pre-construction/ construction
WQ 6	Water quality	Operational water quality treatment and quantity will be identified during detailed design in consideration of the Roads and Maritime Water Sensitive Urban Design Guidelines (2017). Design considerations will include: • Permanent water quality basins and / or swales • spill containment of a minimum of 20,000 litres to be provided to capture spills on the Castlereagh River bridge and approaches scour protection on bridge abutments including rock armouring • scour protection for permanent water quality basins, areas of ground improvement works / embankments within or adjacent to watercourses. • design measures to maintain hydrological regimes. • • If deemed necessary, based on the results of the construction phase monitoring, a surface water quality monitoring schedule for the first year of the operational phase of the Coonabarabran Bypass should be established. A monitoring program should be implemented if analysis of any of the site specific key parameters, selected based on the pre-construction monitoring, are found to increase during the construction phase, between the upstream and downstream monitoring locations.	Contractor	Detailed design

Number	Impact	Environmental safeguard	Responsibility	Timing
WQ 7	Groundwater quality	Groundwater levels and quality are to be monitored periodically throughout the operation of the bypass to monitor potential impacts from operations on groundwater resources.	TfNSW	Operation
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: • 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 • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces.	Contractor	Detailed design / Pre-construction
WA1	Waste management	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the proposal • 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. The WMP will be prepared taking into account the *Environmental Procedure - Management of Wastes on Roads and Maritime Services Land* (Roads and Maritime, 2014) and relevant TfNSW Waste Fact Sheets.	Contractor	Detailed design / Pre-construction

Number	Impact	Environmental safeguard	Responsibility	Timing
WA2	Waste management	Resource management hierarchy principles are to be followed: • avoid unnecessary resource consumption as a priority • avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001).	Contractor	Detailed design / Pre-construction / Construction
WA3	Waste management	If vegetation is to be mulched and transported off site for beneficial reuse, it is to be assessed for the presence of weeds, pest, and other disease and a Mulch Management Plan prepared in accordance with the *Roads and Maritime Technical Procedure: Mulch Management*	Contactor	Pre-construction / Construction
WA4	Waste management	Recycling facilities will be provided at site compounds for recycling paper, plastic, glass and other re-useable materials. Liquid wastes, such as paints and solvents, will be disposed of in accordance with the *Waste Classification Guidelines Part 1: Classifying Waste* (DECCW, 2009) and the POEO Act 1997.	Contactor	Pre-construction / Construction
AH1	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI, Roads and Maritime, 2012) and Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) and implemented as part of the CEMP. The AHMP will: • document the location of Aboriginal heritage sites 28-2-0197 and 28-2-0033 and provide a fenced 'no-go zone' along the construction boundary to ensure the site is not inadvertently impacted (at least 10 metres from each site)	Contractor	Pre-construction

Number	Impact	Environmental safeguard	Responsibility	Timing
		• provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage • The AHMP will be prepared in consultation with all relevant Aboriginal groups.		
AH2	Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, are found during construction. This applies where TfNSW 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
AH3	Aboriginal heritage	Inductions will be provided to all construction personnel including: • the location of the Aboriginal heritage sites 28-2-0197 and 28-2-0033, their 'no-go zones' and their legislative protection under the NPW Act • the identification of Aboriginal objects within the local region, with particular emphasis placed upon stone artefact identification (refer to Appendix K).	Contractor	Pre-construction / construction
HH4	Non-Aboriginal heritage	No impact to the blaze tree is permitted unless approved under the *Surveying and Spatial Information Act 2002.* If impact to the tree is unavoidable, an application must be made for the removal of the tree with NSW Land and Property Information (LPI) Survey Services.	TfNSW	Pre-construction

Number	Impact	Environmental safeguard	Responsibility	Timing
SC1	Soils and contamination	A Contaminated Land Management Plan will be prepared in accordance with the *Guideline for the Management of Contamination* (Roads and Maritime, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: • capture and management of any surface runoff contaminated by exposure to the contaminated land • management of the remediation and subsequent validation of the contaminated land, including any certification required • measures to ensure the safety of site personnel and local communities during construction.	Contractor	Detailed design / Pre-construction
SC2	Soils and 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 TfNSW Environment Manager and/or EPA.	Contractor	Construction
SC3	Soils and contamination	A site-specific emergency spill plan will be developed and include spill management measures in accordance with the TfNSW *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including TfNSW and EPA officers).	Contractor	Detailed design / Pre-construction

6.9 Cumulative impacts

Cumulative impacts can be defined as the successive, incremental and combined impact (both positive and negative) of an activity on society, the economy and the environment. Cumulative impacts are caused by past, present or reasonably foreseeable future activities. The cumulative nature of impact considers both interactions between different impacts within a single project (such as noise and air quality) and interactions between numerous projects.

This section considers the overall environmental effect of the proposal, drawing together the potential impact across environmental factors (as discussed in Section 6) and taking account of other existing or known likely future projects.

6.9.1 Methodology

This assessment was informed by a desktop review of publicly available information. The study area in the assessment focuses on the suburb of Coonabarabran and considers other major projects in the Warrumbungle Shire LGA and the greater Newell Highway upgrade program. The assessment includes reviews of:

- The NSW Major Project Register (DPIE, 2020)
- Warrumbungle Shire Council major projects (Warrumbungle Shire Council, 2020)
- Newell Highway upgrade program (TfNSW, 2020b)
- TfNSW project register (TfNSW, 2020a).

6.9.2 Newell Highway Upgrade Program

The Newell Highway Program includes the improvement of the Newell Highway along its route from Victoria to Queensland. The program commenced following the release of the Newell Highway Corridor Strategy (TfNSW, 2015) and has since resulted in the development of numerous projects to improve the productivity, efficiency and performance of the Newell Highway.

Several other parts of work along the Newell Highway include:

- Town bypasses
- Pavement improvements
- Speed sign reviews
- Lane width improvements
- Intersection improvements
- Improved heavy vehicle rest areas.

These projects have been undertaken in accordance with the priorities outlined in the strategy and are in various stages of completion. Details of the Newell Highway Corridor Strategy are provided in Section 2.2.

The closest active project is the Narrabri to Moree heavy duty pavement works which is about 130 kilometres north of Coonabarabran.

6.9.3 Other projects and developments

Known projects within 100 kilometres of the proposal that may be constructed at the same time of the proposal or have cumulative operational impacts are listed in Table 6-45.

Table 6-45 Relevant projects

Project	Location	Stage	Key impacts
Billy Kings Creek Bridge • 12 m single span bridge	Purlewaugh Road, about 4.5 km south east of the proposal	Construction, to be completed by late 2020	Minor, localised construction impacts including: • dust generation • noise during standard hours.
Inland Rail Narromine to Narrabri • 300 km of new single track rail line	About 50 km west of the proposal	Planning, construction to commence late 2021	Moderate to major construction impacts including: • vegetation removal and biodiversity impacts • noise and vibration • bulk earthworks • Aboriginal heritage. • Moderate operational impacts including: • noise and vibration • visual impacts. • Details on impacts would be known following the preparation of the Environmental Impact Statement in late 2020.

6.9.4 Potential impacts

Potential cumulative impacts may occur as a result of construction of the proposal occurring concurrently with other nearby projects, however these are expected to be short-term and minor. Potential impacts relating to traffic and noise are possible if projects are being undertaken in Coonabarabran during construction of the proposal.

It is expected that the Billy King Creek Bridge project would be complete before construction commencement of the proposal. However, if construction timing overlaps, traffic impacts may occur during tie in works with Purlewaugh Road.

Construction timing is likely to overlap with the Inland Rail project. Potential impacts may arise due to local construction personnel and resource availability. However due to the distance from this proposal; and as both would be predominantly on greenfield land, other impacts are considered unlikely.

During construction, with the increase in temporary construction workers, could limit accommodation availability in Coonabarabran during busier periods, such as event periods and festivals. Effective planning and management, such as the use of a mixture of accommodation facilities by construction personnel, would reduce the pressure on facilities (refer to Section 6.4.3.1). The proposal would likely have a positive cumulative impact to the overall road network. It would contribute to the overall objectives of the Newell Highway Upgrade Program to support freight vehicle movement along the Newell Highway. These improvements would minimise the impact of projected freight increases including increases in traffic volumes and increased travel times along this corridor.

6.9.5 Safeguards and management measures

Table 6-46 Cumulative impacts safeguards and mitigation measures

ID	Impact	Environmental safeguard	Responsibility	Timing
Cu1	Cumulative impacts	The CEMP and all relevant environmental management plans will be prepared, and updated as required, to consider other developments in the area. This will include a process to review and update mitigation measures as new work begins or if complaints are received.	Contractor	Pre-construction/ construction

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 required 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 and social, 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 TfNSW Environment Officer 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 and QA Specification G10 – Traffic Management.

7.2 Summary 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 the following table.

Table 7-1 Summary of safeguards and mitigation measures

ID	Impact	Environmental safeguard	Responsibility	Timing
GEN1	Minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • 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. The endorsed CEMP will be implemented during the undertaking of the activity.	TfNSW / Contractor	Detailed design / pre-construction
GEN2	Notification	All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	TfNSW / Contractor	Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
GEN3	Environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include: • threatened species habitat • adjoining residential areas requiring particular noise management measures	TfNSW / Contractor	Detailed design / pre-construction
GEN4	Utilities	Prior to the commencement of works: • the location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners • if the scope or location of proposed utility relocation works falls outside of the assessed proposal scope and footprint, further assessment will be undertaken	Contractor	Detailed design / pre-construction
Bi1	Native vegetation removal	Native vegetation removal will be minimised through detailed design and construction. • Vegetation clearing during construction would only be undertaken within the proposed construction boundary as detailed in Figures 6.1-6.8 of the REF.	TfNSW/ Contractor	Detailed design Construction
Bi2		Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011). Particular care should be taken to survey for the following: • Austral Toadflax • Bluegrass • Commersonia procumbens • Finger Panic Grass • Greenhood Orchid • Large-leafed Monotaxis • Native Milkwort	Contractor	Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		• Philotheca ericifolia • Pine Donkey Orchid • Scant Pomaderris • Silky Swainson-pea • Tylophora linearis Additionally, the patch of PCT 417 on Lot/Section/DP 3/-/DP828357, which was unable to be accessed during the second field survey due to landowner concerns regarding Covid-19, should be more thoroughly surveyed for the presence of hollow-bearing habitat trees.		
Bi3		Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction
Bi4		Native vegetation will be re-established in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011). Specifically, strategic habitat restoration will occur within the impact footprint, particularly around wildlife connectivity measures, with a view to both developing vegetation links / corridors, enhancing existing linkages and connecting isolated areas of native vegetation.	Contractor	Construction / post construction
Bi5		Translocate soil and leaf litter from areas to be cleared to degraded areas in the proposal area with better quality Box-Gum Woodland PCTs prioritised.	Contractor	Pre-construction / post construction
Bi6		Appoint a commercial plant propagator to collect and grow on plant material for revegetation, particularly within CEEC areas.	Contractor	Pre-construction
Bi7		Investigation of possible inclusion of more readily propagatable species such as Silky Swainson-pea, Bluegrass, Finger Panic Grass and *Tylophora linearis* in revegetation plantings.	Contractor	Post construction

ID	Impact	Environmental safeguard	Responsibility	Timing
Bi8		The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction
Bi9	Removal of threatened species, habitat and habitat features	Habitat removal will be minimised through detailed assessment of habitat values of trees in conjunction with road safety requirements.	Contractor	Detailed design
Bi10		The proposal will aim to relocate the viable local population of Diamond Firetail (*Stagonopleura guttata*) in the development footprint into vacant habitat on an area managed in perpetuity for conservation. This will be undertaken in accordance with the NSW DPIE Translocation Operational Policy May 2019.	TfNSW	Pre-construction
Bi11		Habitat removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011). This would include: • Timing vegetation clearing works to occur during the late autumn and/or winter months, outside of the peak times of critical life cycle events for threatened species, where practical and feasible as per the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011). • Conducting a pre-clearing process before clearing begins • Removing habitat in stages • Engaging an ecologist / spotter catcher to be present during habitat removal • Felling habitat carefully Developing an unexpected threatened species finds procedure	Contractor	Construction
Bi12		Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock	Contractor	Construction
Bi13		Engage an ecologist to develop a nest box strategy in accordance with Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) considering the following: • The target species	TfNSW	Post construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		• The tree hollow preferences of native hollow-dependant fauna known or likely to occur in the locality • The sizes, types and quantities of potential tree hollows to be removed • The sizes, types and quantities of tree hollows existing in adjacent areas • The design, materials and quantity of nest boxes required • Whether the nest boxes are required to fill a short term gap in the availability of hollows (eg during construction) or to compensate for the long term reduced availability of hollows • Monitoring and maintenance of the nest boxes Habitat boxes and / or artificial hollows should be installed prior to the removal of hollow-bearing trees.		
Bi14		The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) if threatened flora or fauna, not assessed in the biodiversity assessment, are identified in the proposal site.	TfNSW	Post construction
Bi15		Familiarising staff regarding the threatened species and communities that occur on site i.e. through toolbox talks etc.	Contractor	Construction
Bi16	Fragmentation of identified habitat corridors	Identifying linkages and likely corridors important to the local movement of native species at the planning stage of the proposal.	Contractor	Detailed design
Bi17		Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA, 2011). Connectivity measures will be implemented in accordance with the Wildlife Connectivity Guidelines for Road Projects (RTA, 2011). This will include: • Installing large culverts with natural substrates suitable for bats, invertebrates, macropods, reptiles and small-medium sized animals at locations where large wooded patches have been transected and where suitable topography allows. The exact number and substrate of culverts will be considered during detailed design	Contractor	Detailed design, construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		• Installing canopy bridges with avian predator guards and shelter for arboreal mammals including possums and Squirrel Glider at several strategic locations where large wooded patches will be transected i.e. adjacent to Purlewaugh Road and between remnant patches of PCT 379. The exact number of canopy bridges is to be determined during the development of a detailed wildlife connectivity strategy • Developing management plans for each fauna species that require targeted connectivity measures, including the Squirrel Glider and Eastern Pygmy Possum. As per the Spotted-tailed Quoll Management Plan for the Pacific Highway (TfNSW, 2017), the management plans will include performance indicators and a robust adaptive management strategy / monitoring program to gauge the effectiveness of the connectivity measures. Regular inspection and monitoring of wildlife connectivity measures will be considered during detailed design to make sure they remain safe for motorists and functional for wildlife and to determine if the connectivity goal(s) of the project have been met.		
Bi18		Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction, construction
Bi19	Edge effects on adjacent native vegetation and habitat	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction, construction
Bi20	Injury and mortality of fauna	Install wildlife signage at strategic locations to increase driver awareness of fauna within the local area.	TfNSW	Post construction
Bi21		Conduct site inspections for fauna (e.g. sheltering under vehicles) prior to the daily commencement of works	Contractor	Construction
Bi22	Invasion and spread of weeds	Weed species will be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Pre-construction, construction
Bi23		Clean machinery, vehicles and footwear before moving to a new location. Machinery must be clean of all mud, soil and vegetation material.	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
Bi24	Invasion and spread of pests	Working areas are to be maintained, kept free of rubbish and cleaned up regularly.	Contractor	Construction
Bi25	Invasion & spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and Bi managing biodiversity on RTA projects (RTA, 2011).	Contractor	Construction
Bi26	Noise, light and vibration	Shading and artificial light impacts will be minimised through detailed design, including limiting lighting to intersections, adhering to the Dark Sky guidelines and reducing unnecessary light sources.	Contractor	Detailed design
Bi27	Aquatic habitats	Avoid activities in aquatic habitats and riparian zones as much as practicable.	Contractor	Construction
Bi28		The sensitivity of aquatic habitats and riparian zones and the measures in place to protect them should be regularly communicated to all staff e.g. during inductions and toolbox talks.	Contractor	Construction
Bi29		Protect aquatic habitats and riparian zones where works are not required with exclusion zones. Exclusion fencing should be used outside sensitive areas.	Contractor	Construction
Bi30		The location of aquatic habitat features within or adjacent to the footprint should be clearly identified on environmental management plans.	Contractor	Pre-construction construction
Bi31		Access the waterway so that riparian vegetation removal is minimised and restricted to the minimum amount of bank length required for the construction activity.	Contractor	Construction
Bi32		Keep vehicles and machinery away from the banks of a waterway where possible.	Contractor	Construction
Bi33		Refuelling of vehicles and plant, and chemical storage and decanting should not take place within 50 metres of aquatic habitats.	Contractor	Construction
Bi34		Avoid clearing within the riparian zone during periods when flooding is likely to occur.	Contractor	Construction
Bi35		Ensure that any clearing undertaken does not allow the vegetation/trees to fall into the waterway.	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
Bi36		Retain the roots of trees on the bank of a waterway in order to maintain bank stability.	Contractor	Construction
Bi37		DPI (Fisheries) must be consulted before works commence where snags require lopping, realignment, relocation and/or removal.	Contractor	Pre-construction, construction
Bi38		During rehabilitation, stabilise the banks of the waterway through revegetation and/or armouring according to available landscape plans.	Contractor	Post construction
Bi39		Maintain fish passage as far as practical during construction of the bridge over the Castlereagh River.	Contractor	Construction
Bi40		Remove all temporary works, flow diversion barriers and sediment control barriers within aquatic habitats as soon as practicable and in a manner that does not promote future channel erosion.	Contractor	Construction
Bi41		Engage an ecologist / spotter catcher to conduct a pre-clearance survey prior to the dewatering of farm dams and ensure an ecologist / spotter catcher is on call during the dewatering process to safely relocate any fauna that may be present.	Contractor	Construction
NV1	Noise and vibration	A Construction Noise and Vibration Management Plan will be prepared before any works begin and would include: • Identification of nearby sensitive receivers • Description of works, construction equipment and hours works would be completed in • Criteria for the proposal and relevant licence and approval conditions • Requirements for noise and vibration monitoring • Details of how community consultation would be completed • Procedures for handling complaints • Details on how respite would be applied • The NVMP will include standard management measure from the Construction Noise and Vibration Guideline (CVNG) (Roads and Maritime, 2016b)	Contractor	Detailed design / pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
NV2	Construction noise and vibration assessments	Location and activity specific noise and vibration impact assessments should be carried out prior to (as a minimum) activities: • With the potential to result in noise levels above 75 dBA at any receiver • Required outside Standard Construction Hours likely to result in noise levels in greater than the relevant Noise Management Levels With the potential to exceed relevant criteria for vibration. The assessments should confirm the predicted impacts at the relevant receivers in the vicinity of the activities to aid the selection of appropriate management measures, consistent with the requirements of the CNVG.	Contractor	Construction
NV3	Construction noise exceedances	The assessment has identified that high impacts are likely when noise intensive equipment such as rockbreakers or concrete saws are in use, especially during evening and night-time periods. The nearest residential receivers are predicted to have 'high' impacts during the evening and night-time when the noisiest construction works are nearby. Where noise intensive equipment is to be used near sensitive receivers, the works should be scheduled for Standard Construction Hours, where possible. If it is not possible to restrict the works to the daytime then they should be completed as early as possible in each work shift. Appropriate respite should also be provided to affected receivers in accordance with the CNVG and/or the proposal's conditions of approval.	Contractor	Construction
NV4	Compounds with long term works	• Hoarding, or other shielding structures, should be used where receivers are impacted near compounds or fixed works areas with long durations. To provide effective noise mitigation, the barriers should break line of sight from the nearest receivers to the works and be of solid construction with minimal gaps.	Contractor	Pre-construction
NV5	Construction noise monitoring	Monitoring should be carried out at the start of new noise and vibration intensive activities to confirm that actual levels are consistent with the predictions and that appropriate mitigation measures from the CNVG have been implemented.	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
NV6	Construction vibration	Where works are within the cosmetic damage minimum working distances and considered likely to exceed the criteria: • different construction methods with lower source vibration levels should be investigated and implemented, where feasible • attended vibration measurements should be undertaken at the start of the works to determine actual vibration levels at the item. Works should be ceased if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria.	Contractor	Construction
NV7	Compounds with long term works	Certain receivers in the study area are within the human comfort minimum working distance and occupants of affected buildings may be able to perceive vibration impacts when vibration intensive equipment is in use. The potential human comfort impacts and requirement for vibration intensive works should be reviewed as the proposal progresses.	Contractor	Construction
NV8	Construction vibration	Building condition surveys should be completed before and after the works where buildings or structures are within the minimum working distances and considered likely to exceed the cosmetic damage criteria during the use of vibration intensive equipment.	Contractor	Construction
NV9	Construction traffic	• Further consideration of the potential impacts from construction traffic should be completed when the final haulage routes are known.	Contractor	Pre-construction / construction
NV10	Operational noise mitigation	Operational noise mitigation requirements will be reviewed during detailed design. At-property treatments will be agreed upon and implemented during construction in consultation with property owners.	TfNSW / Contractor	Detailed design / construction
NV11	Operational noise	Post construction noise monitoring will be undertaken in accordance with *Noise Criteria Guideline* (Roads and Maritime, 2015) and *Noise Mitigation Guideline* (Roads and Maritime, 2015) within two to twelve months of proposal completion, at selected representative locations along the proposal route.	TfNSW	Operation
L1	General	An Urban Design and Landscape Plan (UDLP) will be prepared to support the final detailed design and implemented as part of the CEMP. The UDLP will present an integrated urban design for the proposal, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The UDLP will include: • Proposed revegetation plan that will include:	Contractor	Detailed design / pre-construction / construction

ID	Impact	Environmental safeguard	Responsibility	Timing

		• species to be used
		• procedures for monitoring and maintaining landscaped or rehabilitated areas
		• Design treatments for:
		  • built elements including retaining walls and the bridge
		  • pedestrian and cyclist elements including shared use path locations, paving types and pedestrian crossings
		  • fixtures such as lighting, fencing and signs
		• Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage
		The UDLP will be prepared in accordance with relevant guidelines, including:
		• Beyond the Pavement (2014) urban design policy, process and principles
		• TfNSW Landscape Guideline (Roads and Maritime, 2018c)
		• Newell Highway Urban Design Framework (Roads and Maritime, 2018e)
		• Signage in accordance with Council and the TfNSW Bypassed Town signage initiative (2018a)		

L2	Lighting	Lighting, including construction lighting, will be designed in accordance with the Dark Sky Planning Guideline (DPE, 2006) and in consultation with Siding Spring Observatory. If requirements in the guideline cannot be met (eg during night construction works) the contractor will consult with the Siding Spring Observatory before undertaking the light emitting activity.	Contractor	Pre-construction/ construction
L3	Signage	Provide clear wayfinding signage for visitors to Coonabarabran. including signage in accordance with the TfNSW Bypassed Town signage initiative.	TfNSW	Pre-construction/ construction
L4	Construction visual impacts	The layout of ancillary facility sites will be designed to limit impact. The design will would consider: • screening of boundaries facing sensitive receivers or views • careful placement of structures and buildings to maintain viewpoints or provide additional screening of site activities.	Contractor	Pre-construction/ construction
L5	Construction visual impacts	Ancillary facilities will be maintained, kept tidy and well-presented including sorting regular removal of excess materials to reduce visual impact.	Contractor	Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
L6	Construction visual impacts	Ancillary facility sites and temporary construction areas will be progressively restored to at least their pre-construction conditions when no longer required.	Contractor	Construction
L7	Tree management and removal	Any tree removal or pruning will be undertaken by a qualified specialist and in accordance with AS4970: 2009: Protection of Trees on Development Sites (Standards Australia, 2009) and AS4373:2007: Pruning of Amenity Trees and WorkCover Amenity Tree Industry Code of Practice 1998.	Contractor	Pre-construction construction
SE1	Community consultation	A Communication Plan (CP) would be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP would include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. • The CP would be prepared in accordance with the Community Involvement and Communications Resource Manual (RTA, 2008).	TfNSW	Pre-construction
SE2	Changes in demography and population	The use of a mix of accommodation facilities for the temporary construction workforce should be considered to reduce pressure on facilities. Consultation with the Warrumbungle Shire Council and the Warrumbungle Chamber of Commerce should occur to understand the various accommodation options available.	TfNSW / Construction contractor	Pre-construction / construction
SE3	Property	TfNSW will continue to consult with affected property owners and land occupiers until the completion of the proposal. Discussions including the nature and timing of construction works would be required to identify relevant mitigation measures for noise, traffic and visual impacts.	TfNSW	Pre-construction/ construction
SE4	Property acquisition	Land acquisition will occur in accordance with the Land Acquisition (Just Terms Compensation) Act 1991.	TfNSW	Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
SE5	Property severance	TfNSW would consider each owner's remaining holdings accounting for the impacts of severance and/or the residual functional use of any remaining land. TfNSW would engage an appropriately qualified property and/or agricultural specialist to assess these impacts and to identify alternative opportunities for their remaining holdings. TfNSW would manage any residual land in accordance with its disposal processes. This would involve considering landowner requests for land swaps.	TfNSW	Pre-construction / operation
SE6	Changes in access	Temporary and permanent changes in access will be discussed with impacted land occupiers prior to commencement of construction and during construction activities should arrangements change. TfNSW would confirm any realignment of street access or inter-property access under the proposal, in consultation with property owners.	TfNSW / Contractor	Pre-construction/ construction
SE7	Freight and agricultural access routes	TfNSW will consult with freight and agricultural industries to identify critical times during the year where access reliability is critical on the Newell Highway. Road Occupancy Licences for the highway and with the local roads impacted by the proposal would be obtained. Temporary access tracks will be designed to similar conditions of existing roads to allow for use by the same sort of traffic.	TfNSW	Pre-construction/ construction
SE8	Social infrastructure	Communication and consultation with facilities near to the proposed construction works including the golf course, hospital and Cooinda Aged Care Centre so that potential impacts are managed. This includes maintaining access along Purlewaugh Road and noise mitigation.	Contractor	Pre-construction / construction
SE9	Loss of passing trade	TfNSW would work with Council and the Warrumbungle Chamber of Commerce to maintain communication with businesses who may be impacted by the proposal and ensure ongoing concerns are considered.	TfNSW	Construction / operation
SE10	Community values and local amenity	During construction of the proposal, vegetation removal will occur only in areas identified in the REF and biodiversity assessment report for the proposal. Other natural areas will be protected where possible to maintain the landscape and amenity of the surrounding area	TfNSW	Construction
SE11	Initiatives	TfNSW will continue to work together with the Warrumbungle Shire Council to develop initiatives and strategies such as town signage and entry statements.	TfNSW	Detailed design / Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
SE12	Planning for construction pressures	TfNSW will work with Warrumbungle Shire Council through the construction period to try and minimise impacts during town events, such as StarFest to minimise any adverse impacts on the community and businesses.	TfNSW	Pre-construction / Construction
SE13	Planning for construction pressures – events	TfNSW will work with Council through the construction period to try and minimise impacts during town events, such as StarFest to minimise any adverse impacts on the community and businesses	TfNSW	Pre-construction
SE14	Business and tourism impacts	Proposal to be designed to meet the guidelines of the Dark Sky Planning Guidelines	TfNSW	Pre-construction and construction
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 Traffic Control at Work Sites Manual (Roads and Maritime, 2018d) and QA Specification G10 Control of Traffic (Roads and Maritime, 2019e). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.	Contractor	Detailed design Pre-construction Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
TT2	Ancillary facilities	The ancillary facilities would be securely fenced with temporary fencing. Signage would be erected advising the general public of access restrictions. Upon completion of the construction works, the temporary ancillary facilities, work area and stockpiles would be removed, the site cleared of all rubbish and materials and rehabilitated to the landowner's requirements.	Contractor	Pre-construction Construction
TT3	Construction vehicle parking	Construction vehicles, personnel vehicles and plant would be stored within the designated ancillary facilities or in designated areas within the construction site. Vehicle parking needs to follow the Traffic Control at Worksites Technical Manual (Roads and Maritime 2018d).	Contractor	Pre- construction Construction
TT4	Coach/bus routes	Coach/bus route operators, including school bus operators, would be notified of the proposed works and potential route impacts prior to works commencing.	TfNSW	Pre-construction Construction
TT5	Property access	Access to private properties would be maintained during construction, wherever possible. Where changes to access arrangements or disruption to access are necessary, owners and occupiers would be consulted regarding alternative access arrangements in accordance with the relevant community consultation processes outlined in the TMP.	Contractor	Construction
TT6	Community notification	TfNSW will consult with the general community regarding changed traffic conditions and will consult with emergency services.	TfNSW	Construction
TT7	Active transport	TfNSW should consider the road safety implications of cyclists using the highway at the River Road and Purlewaugh Road split-intersections and whether any safety features such as signage or crossing points need to be incorporated into the proposal.	TfNSW	Detailed design
HF1	Flooding	Further design and optimisation of the drainage design will be undertaken. Further flood modelling will be undertaken during later design stages to limit any afflux increases.	Contractor	Detailed design
HF2	Ancillary facilities	Further consideration will be undertaken for flooding impacts in relation to ancillary facilities	Contractor	Detailed design

ID	Impact	Environmental safeguard	Responsibility	Timing
HF3	Flooding	A construction flood management plan will be prepared as part of the CEMP to set out processes for monitoring and managing flood risk. The plan will: • Specify the steps taken in the event of a flood warning • Including removal or securing of loose materials, equipment, fuels and chemicals • Procedures for creek diversions, if required.	Contractor	Pre-construction
CI1	Greenhouse gas emissions	The procurement strategy developed for the construction phase will demonstrate value for money and consideration for opportunities to procure goods and services: • from local suppliers, if available • that are energy efficient or have low embodied energy • that minimise the generation of waste • that make use of recycled materials.	Contractor	Pre-construction/ construction
CI2	Greenhouse gas emissions	The detailed design and construction planning will demonstrate that the extent of vegetation clearing within the proposal area has been minimised.	Contractor	Detailed design
CI3	Greenhouse gas emissions	Construction equipment, plant and vehicles will be appropriately sized for the task, serviced frequently and will not be left idling when not in use.	Contractor	Construction
WQ1	Surface and groundwater	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and surface water and groundwater pollution and describe how these risks will be addressed during construction. The SWMP will include: • a water quality monitoring program will be developed and implemented in accordance with *Guideline for Construction Water Quality Monitoring* (RTA, 2003). The monitoring program is to include: – visual monitoring of local water quality (including for turbid plumes and hydrocarbon spills or slicks) – monthly up and down stream water quality monitoring during construction in and over the Castlereagh River.	Contractor	Detailed design / Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
		• site-specific discharge criteria for construction phase surface water discharges. Construction phase monitoring parameters should be determined based on the results of the pre-construction monitoring. Sampling parameters and frequency should adhere to the recommendations provided in the *Guideline for Construction Water Quality Monitoring* (RTA, 2003). • baseline conditions (groundwater level and quality) will be established for shallow groundwaters prior to construction • arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas and monitoring during and post-construction • measures for the protection of surface and ground water resources		
WQ 2	Surface and groundwater	Progressive Erosion and Sediment Control Plans (PESCPs) will be developed and implemented at each construction stage as a part of the Soil and Water Management Plan. The plans would include arrangements for managing wet weather events, including monitoring potential high risk events (such as storms) and specific controls and follow up measures to be applied in the event of wet weather. It will be based upon the preliminary erosion and sedimentation management report (ESMR) prepared as part of the REF.	Contractor	Detailed design / Pre-construction
WQ 3	Surface water	Water flows should be maintained at all times during construction, where possible, along the Castlereagh River.	Contractor	Detailed design / Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
WQ 4	Water quality	A Spill Management Plan will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. It will be in accordance with the Roads and Maritime Code of Practice for Water Management (RTA, 1999) and relevant EPA guidelines. The Spill Management Plan will address, but not necessarily be limited to: • management of chemicals and potentially polluting materials • any bunding requirements • Maintenance of plant and equipment • emergency management, including notification, response and clean-up procedures. • showing the location of emergency spill kits.	Contractor	Detailed design / Pre-construction
WQ 5	Surface and groundwater	The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed, and in accordance with: • Landcom's Managing Urban Stormwater: Soils and Construction series • RTA Landscape Guideline • Roads and Maritime Guideline for Batter Stabilisation using Vegetation (2015).	Contractor	Pre-construction/ construction

ID	Impact	Environmental safeguard	Responsibility	Timing
WQ 6	Water quality	Operational water quality treatment and quantity will be identified during detailed design in consideration of the Roads and Maritime Water Sensitive Urban Design Guidelines (2017). Design considerations will include: • Permanent water quality basins and / or swales • spill containment of a minimum of 20,000 litres to be provided to capture spills on the Castlereagh River bridge and approaches scour protection on bridge abutments including rock armouring • scour protection for permanent water quality basins, areas of ground improvement works / embankments within or adjacent to watercourses. • design measures to maintain hydrological regimes. If deemed necessary, based on the results of the construction phase monitoring, a surface water quality monitoring schedule for the first year of the operational phase of the Coonabarabran Bypass should be established. A monitoring program should be implemented if analysis of any of the site specific key parameters, selected based on the pre-construction monitoring, are found to increase during the construction phase, between the upstream and downstream monitoring locations.	Contractor	Detailed design
WQ 7	Groundwater quality	• Groundwater levels and quality are to be monitored periodically throughout the operation of the bypass to monitor potential impacts from operations on groundwater resources.	TfNSW	Operation
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: • 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 • methods to manage work during strong winds or other adverse weather conditions • a progressive rehabilitation strategy for exposed surfaces.	Contractor	Detailed design / Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
WA1	Waste management	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the proposal • 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. The WMP will be prepared taking into account the *Environmental Procedure - Management of Wastes on Roads and Maritime Services Land* (Roads and Maritime, 2014) and relevant TfNSW Waste Fact Sheets.	Contractor	Detailed design / Pre-construction
WA2	Waste management	Resource management hierarchy principles are to be followed: • avoid unnecessary resource consumption as a priority • avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) • disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001).	Contractor	Detailed design / Pre-construction / Construction
WA3	Waste management	If vegetation is to be mulched and transported off site for beneficial reuse, it is to be assessed for the presence of weeds, pest, and other disease and a Mulch Management Plan prepared in accordance with the *Roads and Maritime Technical Procedure: Mulch Management*	Contactor	Pre-construction / Construction
WA4	Waste management	Recycling facilities will be provided at site compounds for recycling paper, plastic, glass and other re-useable materials. Liquid wastes, such as paints and solvents, will be disposed of in accordance with the *Waste Classification Guidelines Part 1: Classifying Waste* (DECCW, 2009) and the POEO Act 1997.	Contactor	Pre-construction / Construction

ID	Impact	Environmental safeguard	Responsibility	Timing
AH1	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI, Roads and Maritime, 2012) and Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime, 2015) and implemented as part of the CEMP. The AHMP will: • document the location of Aboriginal heritage sites 28-2-0197 and 28-2-0033 and provide a fenced 'no-go zone' along the construction boundary to ensure the site is not inadvertently impacted (at least 10 metres from each site) • provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage The AHMP will be prepared in consultation with all relevant Aboriginal groups.	Contractor	Pre-construction
AH2	Aboriginal heritage	The *Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, are found during construction. This applies where TfNSW 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
AH3	Aboriginal heritage	Inductions will be provided to all construction personnel including: • the location of the Aboriginal heritage sites 28-2-0197 and 28-2-0033, their 'no-go zones' and their legislative protection under the NPW Act • the identification of Aboriginal objects within the local region, with particular emphasis placed upon stone artefact identification (refer to Appendix K).	Contractor	Pre-construction / construction
HH4	Non-Aboriginal heritage	No impact to the blaze tree is permitted unless approved under the *Surveying and Spatial Information Act 2002*. If impact to the tree is unavoidable, an application must be made for the removal of the tree with NSW Land and Property Information (LPI) Survey Services.	TfNSW	Pre-construction

ID	Impact	Environmental safeguard	Responsibility	Timing
SC1	Soils and contamination	A Contaminated Land Management Plan will be prepared in accordance with the *Guideline for the Management of Contamination* (Roads and Maritime, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: • capture and management of any surface runoff contaminated by exposure to the contaminated land • management of the remediation and subsequent validation of the contaminated land, including any certification required • measures to ensure the safety of site personnel and local communities during construction.	Contractor	Detailed design / Pre-construction
SC2	Soils and 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 TfNSW Environment Manager and/or EPA.	Contractor	Construction
SC3	Soils and contamination	A site-specific emergency spill plan will be developed and include spill management measures in accordance with the TfNSW *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including TfNSW and EPA officers).	Contractor	Detailed design / Pre-construction
Cu1	Cumulative impacts	The CEMP and all relevant environmental management plans will be prepared, and updated as required, to consider other developments in the area. This will include a process to review and update mitigation measures as new work begins or if complaints are received.	Contractor	Pre-construction/ construction

7.3 Licensing and approvals

TableInstrument	Requirement	Timing
Protection of the Environment Operations Act 1997 (s43)	Environment protection licence (EPL) for the excavation of more than 150,000 tonnes of material from the EPA.	Prior to start of activity
Water Management Act 2000 (s91B)	A water supply work approval from the Department of Primary Industries (Water) to construct a new bore. An exception may be sought in accordance with Clause 39A of the *Water Management (General) Regulation 2018.*	Prior to start of activity
Roads Act 1993 (s138)	A Roads Occupancy Licence from TfNSW for works within the existing State and Regional road corridors and from Warrumbungle Shire Council on local roads.	Prior to start of activity
Fisheries Management Act 1994 (s219)	Permit to obstruct the free passage of fish (temporary or permanent) from the Minister for Primary Industries.	Prior to start of activity (if required)
Fisheries Management Act 1994 (s199)	Provide written notice of any dredging or reclamation works to the Minister for Primary Industries.	A minimum of 21 days prior to starting the works (if required).
Surveying and Spatial Information Act 2002 (s24)	Approval from the Land and Property Information (LPI) Survey Services to remove the blaze tree.	Prior to start of activity
Crown Lands Management Act 2016	Approval from the Department of Planning, Infrastructure and Environment is required to secure the acquisition and leasing of Crown land and the Travelling Stock Route.	Prior to start of 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

The Newell Highway is a major road link for freight travelling between Queensland and Victoria. The freight along the Newell Highway is expected to increase by 67 to 103 per cent between 2009 and 2031 (TfNSW, 2015).The proposal for the bypass of Coonabarabran forms part of the overall Newell Highway Upgrade Program being undertaken to address a number of deficiencies across the highway length. These projects have been identified in the Newell Highway Corridor Strategy and the Infrastructure Australia's Infrastructure Priority List.

The proposal would improve travel efficiency for all vehicles through Coonabarabran. It would also support the efficient movement of heavy vehicle access for PBS3a HPVs, particularly 36.5 metre B-Triples and Type 2 Road Trains. This is consistent with the NSW and Australian governments' strategic priorities of improving the road's safety performance and efficiency needs.

In doing so, the proposal would reduce conflicts between freight, through and local traffic and vulnerable road users in Coonabarabran. In particular, the potential benefits associated with the development and delivery of this proposal would include:

- Removal of around 700 heavy vehicles through traffic from the town centre, the majority of which are B-doubles.
- Improvement of motorist and pedestrian safety.
- Improvement of traffic flow in Coonabarabran, particularly east-west travel.
- Improvement of the amenity of the retail district for shoppers, residents and workers.
- Reduction of heavy vehicle noise and stock created odour.
- Removal of the conflicts between local traffic and heavy through vehicles.

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

8.1.1 Social factors

The proposal would reduce the number of heavy vehicles travelling through the Coonabarabran town centre. This would result in an improvement to amenity including a potential reduction in noise and vehicle emissions from the existing Newell Highway. The proposal would also improve road safety for pedestrians, cyclists and drivers in Coonabarabran town centre.

However, there would also be some negative social impacts. The proposal would cause temporary inconvenience from construction activities associated with equipment noise and visual impacts, route diversion, travel time increases and altered access arrangements. The proposal would also require property impacts to due to the acquisition of land.

The proposal would have permanent visual changes to the rural landscape by the introduction of a new built element. These negative impacts would be minimised where possible, such as by consulting with landowners, landscape design and other mitigation measures during design and construction.

8.1.2 Biophysical factors

The proposal would require the removal of up to 46.78 hectares of native vegetation including hollow bearing trees and about 12.59 hectares of TEC. Removal of this vegetation could lead to loss of threatened fauna habitat. There is also the risk of fauna injury and mortality from construction equipment and operational traffic along the bypass. The proposal would not have a significant impact on threatened biodiversity.

The proposal would also involve a large amount of material to be excavated during construction. Any associated sediment, erosion and soil quality impacts would be temporary and minor. Surface and groundwater quality would be managed by design features and appropriate mitigation measures.

8.1.3 Economic factors

The Newell Highway is the economic backbone for freight and livestock transporters, tourism operators, caravanners and holiday makers, emergency services, media and business owners. The proposal would improve freight efficiency along the Newell Highway by avoiding the need for heavy vehicles to travel through the Coonabarabran town centre and diverting them onto the bypass. Thus, it would improve the interstate transportation of freight and support the wider State and national economy.

The proposal is expected to have a positive impact on the local economy of Coonabarabran during construction due to the generation of jobs, locally sourced materials and resources, construction worker expenditure and increased temporary demand in accommodation for the construction workforce. In addition, the bypass is expected to improve road and parking accessibility in the town centre, which may provide opportunities for the community and the council to capitalise on the changed environment.

There is the potential for a reduction in passing trade for businesses within the Coonabarabran town centre. The proposal provides opportunities such as streetscaping and the installation of town signage to encourage travellers to go

through Coonabarabran. Ongoing consultation would be carried out to understand and act upon concerns relating to business impacts.

8.1.4 Public interest

The proposal is in the public interest as it would improve amenity and safety within the Coonabarabran town centre and provide economic opportunities in the local and regional area. The proposal would be considered complementary to the other Newell Highway upgrade projects and is strongly supported by strategic policies and government strategies.

The proposal has sought to avoid and minimise environmental impacts through community consultation with stakeholders and the community and design refinements. This would continue through later design stages.

8.2 Objects of the EP&A Act

The objects of the EP&A Act provide a framework within which the justification of the proposal can be considered. A summary of this assessment is provided Table 8-1.

Table 8-1 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposal would improve freight efficiency along the Newell Highway resulting in an improvement to interstate transportation of freight and support the State and national economy. It would promote the social welfare of the local community by improving amenity and safety for pedestrians, cyclists and vehicles in the Coonabarabran town centre and diverting heavy vehicles onto a bypass. Socio-economic impacts are assessed in Section 6.4.3. The assessment includes management measures to avoid and/or minimise impacts.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The proposal has considered relevant economic, environmental and social considerations. Ecologically sustainable development is considered in Section 8.3. Potential impacts have been minimised through design development and would be further mitigated using the measures in Section 7.

Object	Comment
1.3(c) To promote the orderly and economic use and development of land.	The proposal promotes the orderly development of land through the provision of improved access and efficiency of freight. The proposal has been developed in consultation with Warrumbungle Shire Council to promote Coonabarabran and develop a proposal that considers land use strategies. The consistency of the proposal with the objectives of current land uses is provided in Section 4.2.3. Potential impacts to the development of the land have been minimised through design development and are discussed in Section 6.4.3.
1.3(d) To promote the delivery and maintenance of affordable housing.	This object is not relevant to the proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposal would require the removal of up to 46.78 hectares of native vegetation including hollow bearing trees and about 12.59 hectares of TEC. Removal of this vegetation could lead to loss of threatened fauna habitat. There is also risk of fauna injury and mortality from construction equipment and operational traffic along the bypass. The proposal would not have a significant impact on threatened biodiversity. Potential impacts and management measures to protect biodiversity are discussed in Section 6.1.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposal would have negligible impact on built or cultural heritage. Management measures to protect heritage are discussed in Section 6.8.2.
1.3(g) To promote good design and amenity of the built environment.	Specific urban design and landscape objectives were prepared for the proposal in line with the Roads and Maritime policy, *Beyond the Pavement* to make sure the proposal integrates physically and visually with the surrounding environment. Refer to Sections 2.4.1 and 6.3.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	This object is not relevant to the proposal.

Object	Comment
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	This object is not relevant to the proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Chapter 5 outlines the community and stakeholder consultation carried out during various stages of the proposal. This REF will be on display and further consultation will be carried out with the community if the proposal is determined to proceed.

8.3 Ecologically sustainable development

8.3.1 The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. This 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.

This REF documents the evaluation of alternative options and the assessment of environmental impacts of the proposal to reduce the risk of serious and irreversible impact on the environment. Through this process, consultation has considered issues raised by the community and stakeholders. A range of specialist studies have been undertaken using conservative scenarios to assess key issues. This provides accurate and independent information to assist in the development process.

The proposal has sought to take a precautionary approach to minimising environmental impact. This has been applied through the development of a range of environmental safeguards, as summarised in Section 7. These safeguards would be implemented during construction and operation of the proposal.

No safeguards have been postponed as a result of lack of scientific certainty. The selected construction contractor would be required to prepare a CEMP before commencing construction. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.3.2 Intergenerational equity

Intergeneration equity is concerned with the distribution of economic, social and environmental costs and benefits into the future. This principle states that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

The proposal has integrated short and long-term social, financial and environmental considerations so that any likely impacts are not left to be addressed by future generations. The proposal would benefit both current and future generations by improving heavy vehicle access for PBS3a heavy vehicles along the Newell Highway near Coonabarabran, and in turn the transportation of freight through NSW. The

proposal would also improve safety and amenity in the Coonabarabran town centre by diverting heavy vehicles to the bypass.

Issues with potential long-term effects such as the noise and access changes, consumption of non-renewable resources, waste disposal, change to landscape character and biodiversity impacts will be avoided and/or minimised through further design development and the application of safeguards and management measures described in Section 7.

8.3.3 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.

The preferred option and design refinements have sought to avoid and minimise biodiversity impacts as far as practical.

The proposal would require the removal of up to 46.78 hectares of native vegetation including hollow bearing trees and about 12.59 hectares of TEC. Removal of this vegetation could lead to loss of threatened fauna habitat. There is also likely to be a risk of fauna injury and mortality from construction equipment and operational traffic along the bypass. The proposal would not have a significant impact on threatened biodiversity.

Potential biodiversity impacts are discussed in Section 6.1 and will be avoided and/or minimised through further design development and the application of safeguards and management measures described in Section 7.

8.3.4 Improved valuation, pricing and incentive mechanisms

This principle states that improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement
- The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Environmental issues and capital cost have been considered through the options assessment and during design development (Section 2). The value placed on environmental resources is demonstrated in the extent of the planning and environmental investigations, and in the design of the mitigation measures and safeguards described in Section 7. Implementation of these mitigation measures and safeguards would result in an economic cost to TfNSW, which would be included in both the capital and operating cost of the proposal.

8.4 Conclusion

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

This has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, wilderness areas, areas of outstanding biodiversity, impacts on threatened species, populations and ecological communities and their habitats in accordance with the BC Act 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.

Several potential environmental impacts from the proposal have been avoided or reduced during the design development and options assessment. The proposal, as described in the REF, best meets the proposal objectives but would still result in some environmental impacts regarding biodiversity, noise and vibration, the visual landscape, property and socio-economic issues, traffic and flooding.

The proposal would improve freight efficiency along the Newell Highway as well as improve amenity and road safety within the Coonabarabran town centre. On balance, the proposal is considered justified and the relevant conclusions are made in the following sections.

8.4.1 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 Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.4.1.1 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 and Energy 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.

Lucia Coletta

Associate

Aurecon Australasia

Date:

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.

Matt Olle

Project Development Manager

Southern and Western Projects Office

Date:

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Appendix A Consideration of clause 228(2) factors and matters of national environmental significance and Commonwealth land

Clause 228(2)

In addition to the requirements of the *Is an EIS required?* guideline (DUAP 1995/1996) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
Any environmental impact on a community? • During construction, the proposal would result impacts to noise and vibration, the visual landscape, traffic, access and localised air quality. However, the proposal would also generate of jobs and local expenditure. • The proposal would result in changes to noise levels, the visual landscape and passing trade for businesses. However, the proposal would improve amenity and safety in the Coonabarabran town centre. Safeguards to minimise impacts are listed in Section 7.	Short term, moderate positive and negative Long term, moderate positive and minor negative
Any transformation of a locality? • Construction equipment and activities would have short term visual impacts. • Operation of the proposal would remove most heavy vehicles from the Coonabarabran town centre resulting in improvements to amenity and safety. The proposal would also transform the rural landscape by the introduction of a new built element and the removal of vegetation. Safeguards to minimise impacts are listed in Section 7.	Short term, moderate negative Long term, moderate positive and negative
Any environmental impact on the ecosystems of the locality? • The proposal would require the removal of up to 46.78 hectares of native vegetation and about 12.59 hectares of TEC. Safeguards to minimise impacts are listed in Section 7.	Long term, moderate negative
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? • During construction, the proposal would have noise and visual impacts to closest sensitive receivers including residential properties and accommodation and aged care facilities. • The proposal would have impact to the environmental and scientific quality of the are through habitat and vegetation loss. The proposal would also transform the rural landscape by the introduction of a new built element. Safeguards to minimise impacts are listed in Section 7..	Short term, moderate negative Long term, moderate positive and negative

Factor	Impact
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? • The proposal would have negligible impacts to Aboriginal or non-Aboriginal heritage. Safeguards to minimise impacts are listed in Section 7.	Short term, negligible negative
Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974)?* • The proposal would require the removal of up to 46.78 hectares of native vegetation including hollow bearing trees which is potential fauna habitat. Removal of this vegetation could lead to loss of threatened fauna habitat. There is also risk of fauna injury and mortality from construction equipment and operational traffic along the bypass. Safeguards to minimise impacts are listed in Section 7.	Long term, moderate negative
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? • The proposal would require the removal of up to 46.78 hectares of native vegetation including hollow bearing trees which is potential fauna habitat. Removal of this vegetation could lead to loss of fauna and flora habitat. There is also risk of fauna injury and mortality from construction equipment and operational traffic along the bypass. Safeguards to minimise impacts are listed in Section 7.	Long term, moderate negative
Any long-term effects on the environment? • The proposal would require the removal of up to 46.78 hectares of native vegetation, increase noise and also result in visual impacts during construction. • The proposal would result in an overall reduction of heavy vehicle movements through the Coonabarabran town centre therefore increasing the amenity and safety of the area. Safeguards to minimise impacts are listed in Section 7.	Short term, moderate negative Long term, moderate positive and negative
Any degradation of the quality of the environment? • The proposal has the potential to degrade the quality of the environment through water quality, erosion and sedimentation during construction, vegetation removal and the construction noise and vibration. • Potential water and visual impacts could degrade the quality of the environment, however design features have been implemented to minimise the impacts. Safeguards to minimise impacts are listed in Section 7.	Short term, minor negative Long term, negligible negative

Factor	Impact
Any risk to the safety of the environment?	
• The construction work has the potential to temporarily decrease safety on the local road network due to construction vehicle movements and tie-in works.	Short term, minor negative
• The proposal would improve amenity and safety in the Coonabarabran town centre. Safeguards to minimise impacts are listed in Section 7.	Long term minor positive
Any reduction in the range of beneficial uses of the environment?	
• The proposal would result in the changed land use from agricultural to road infrastructure. Safeguards to minimise impacts are listed in Section 7.	Long term, minor negative
Any pollution of the environment?	
• During construction, there is the potential for water quality impacts as a result of increased sedimentation, increased soil nutrients, wastes, and fuel and chemical spills and leakages. Noise and air quality impacts may also occur throughout construction. Safeguards to minimise impacts are listed in Section 7.	Short term, minor negative
Any environmental problems associated with the disposal of waste?	
• Waste would be managed in accordance with the resource management hierarchy principles outlined in the *Waste Avoidance and Resource Recovery Act 2001.* It is not anticipated that there would be issues encountered with the disposal of waste.	Nil
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	
• Estimated quantities of materials are presented in Section 3.3. At the time of writing of this REF, the resources required for the proposal construction were not identified as being in short supply.	Nil.
Any cumulative environmental effect with other existing or likely future activities?	
• Cumulative impacts are identified in Section 6.9. Once completed, the proposal would result in improvements in the overall road network.	Long term, moderate positive
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	
• The proposal is not located within a coastal area and would not result in any impact on coastal processes and coastal hazards	Nil

Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Energy.

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

Factor	Impact
Any impact on a World Heritage property?	Nil
Any impact on a National Heritage place?	Nil
Any impact on a wetland of international importance?	Nil
Any impact on a listed threatened species or communities? The proposal would require the removal of up to 46.78 hectares of native vegetation including 0.54 hectares of EPBC Act CEEC. There would not be a significant impact on this CEEC. Safeguards to minimise impacts are listed in Section 7.	Minor
Any impacts on listed migratory species?	Nil
Any impact on a Commonwealth marine area?	Nil
Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

Appendix B Statutory consultation checklists

Infrastructure SEPP

Certain types of developments

Development type	Description	Yes / No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Local council and the occupiers of adjacent land	ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No	Local council and the occupiers of adjacent land	ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Local council and the occupiers of adjacent land	ISEPP cl. 95A

Development within a coastal zone

Issue	Description	Yes / No	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No	Local council	ISEPP cl. 15A

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	Yes	Local council	ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No	Local council	ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system?	No	Local council	ISEPP cl.13(1)(c)

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No	Local council	ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No	Local council	ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Local council	ISEPP cl.13(1)(f)

Local heritage

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No	Local council	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	Yes	Local council	ISEPP cl.15
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	No	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

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

Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	Office of Environment and Heritage	ISEPP cl.16(2)(a)
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Office of Environment and Heritage	ISEPP cl. 16(2)(b)
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	Department of Industry	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998?*	No	Sydney Harbour Foreshore Authority	ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	Yes	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	ISEPP cl. 16(2)(i)

Appendix C Biodiversity Assessment Report

Appendix D Noise and vibration assessment report

Appendix E Landscape character and visual impact assessment report

Appendix F Socio-economic assessment report

Appendix G Traffic and transport assessment report

Appendix H Hydrology and flooding

Appendix I Surface and groundwater assessment report

Appendix J Aboriginal and historic heritage assessment report

Appendix K Preliminary site investigation