PART B
Impact assessment
proposal infrastructure

INLAND RAIL

CHAPTER B11
Traffic and transport

Narromine to Narrabri
Environmental Impact Statement

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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B11. Traffic and transport

This chapter provides a summary of the potential impacts of the Narromine to Narrabri project (the proposal) on traffic, transport and access. A full copy of the assessment report is provided as Technical Report 10—Traffic and transport assessment.

B11.1 Approach

A summary of the approach to the assessment is provided in this section, including the legislation, guidelines and/or policies driving the approach, and the methodology used to undertake the assessment. A more detailed description of the approach and methodology is provided in Technical Report 10.

B11.1.1 Legislative and policy context to the assessment

Relevant legislation, policies and guidelines

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- The EP&A Act and the *Roads Act 1993* (NSW)
- *Guide to Traffic Management— Part 3 Traffic Studies and Analysis (*Austroads, 2007)
- *Guide to Traffic Generating Developments Version 2.2* (RTA, 2002)
- *Construction of New Level Crossing Policy* (Transport for NSW, n.d.)
- *Level Crossing Closures Policy* (Transport for NSW, n.d.)
- *Australian Level Crossing Assessment Model (ALCAM): Level Crossing Assessment Handbook* (National ALCAM Committee, 2017).

A detailed description of the legislative and policy context for the assessment is provided in chapter 2 of Technical Report 10.

Secretary's Environmental Assessment Requirements

The SEARs relevant to traffic and transport, together with a reference to where they are addressed in the EIS, are provided in Appendix A.

B11.1.2 Methodology

Study area

The study area for the assessment comprises the proposal site together with transport facilities that have the potential to be impacted by the proposal.

Key tasks

The assessment involved:

- Reviewing the concept design for the proposal
- Reviewing existing road features, traffic, transport services, pedestrian and cyclist facilities
- Reviewing available traffic survey data
- Assessing the potential impacts of construction, including impacts on the operation of the local rail and road network, pedestrians, cyclists and public transport
- Assessing the potential impacts on the road network during operation
- Assessing the potential travel time impacts at level crossings based on the expected train lengths, travel speeds and closure times
- Assessing the impacts on the wider transport network, including implications for access, cyclists, pedestrians and public transport
- Providing mitigation measures to manage the potential impacts on traffic, transport and access.

Traffic modelling, using specialist traffic modelling software (SIDRA Intersection), was undertaken to determine the impacts from construction traffic at three key roads. Operational traffic modelling was also undertaken for level crossings and key intersections. The level crossing model was based on the train characteristics (length and speed) and the volume of road traffic from which road traffic delays at level crossings could be identified.

B11.1.3 Risks identified

The environmental risk assessment for the proposal (see Appendix E) included consideration of potential traffic and transport risks. Traffic and transport risks with an overall assessed risk rating of medium or above, identified by the environmental risk assessment, included:

- Construction traffic impacts, including temporary delays to local and regional traffic due to road closures and diversions
- Impacts on rural roads unsuitable for construction traffic
- Increase in travel times due to introduction of new level crossings, resulting in wait times associated with length and frequency of trains.

The traffic and transport assessment considered the potential risks identified by the environmental risk assessment, in addition to potential risks and impacts identified by the scoping report (see section A9.1), the SEARs and relevant guidelines and policies (as appropriate).

B11.1.4 How potential impacts have been avoided/minimised

The option development and assessment process for Inland Rail as a whole is summarised in chapter A6. As noted in section A6.2, the shortlist of route options was subject to a detailed assessment and the proposed alignment was refined based on evaluation of key considerations, including environmental impacts.

Potential traffic and transport impacts have been avoided/minimised, where possible, by:

- Providing rail-over-road bridges where the proposal site intersects with the two busiest classified roads
- Locating borrow pits so that haulage distances are minimised and truck movements through town centres are reduced
- Providing construction haul roads within the construction footprint to enable materials to be transported within the proposal site (as far as possible) and minimise the amount of material transported on the public road network.

B11.2 Existing environment

B11.2.1 Road network

The road network within the study area consists mainly of local and private rural roads. There are also some arterial and sub-arterial roads located near the proposal site. The road network is described below and shown in Figure B11.1. Further detail is provided in the maps in Part E.

Main roads (highways)

Newell Highway

The Newell Highway, which runs generally in a north–south direction through the study area, stretches 1,060 kilometres (km) through NSW between the Victorian border town of Tocumwal and the Queensland border town of Goondiwindi. The Newell Highway, which is managed by Transport for NSW, is part of the national highway network. The importance of this highway is recognised by the *Newell Highway Corridor Strategy* (NSW Government, 2015a).

Within the study area, the Newell Highway runs generally to the east of the proposal site and the proposal site does not cross the highway.

Outside of built-up areas, the Newell Highway has a posted speed limit of 110 km per hour, except between Tooraweenah and Coonabarabran, where it has a speed limit of 100 km per hour. It generally comprises a single lane of travel in each direction on a single carriageway. Overtaking lanes are provided in some locations.

Mitchell Highway

The Mitchell Highway runs generally north–south through the study area and connects the Great Western Highway at Bathurst to the Landsborough Highway at Augathella, Queensland. It passes through a number of regional towns in north-western NSW, including Orange, Dubbo and Bourke. The proposal site crosses the Mitchell Highway about 6.5 km east of Narromine. At this location, the Mitchell Highway comprises a single lane of travel in each direction on a single carriageway, with a posted speed limit of 110 km per hour.

Oxley Highway

The Oxley Highway is a rural highway that runs generally east–west through the study area, between the Mitchell Highway at Nevertire and Port Macquarie. It passes through Gilgandra, Coonabarabran, Gunnedah and Tamworth. Between Gilgandra and Coonabarabran the highway shares the same physical route as the Newell Highway. The proposal site crosses the Oxley Highway about 18 km west of Gilgandra. At this location, the Oxley Highway comprises a single lane of travel in each direction on a single carriageway, with a posted speed limit of 110 km per hour.

Castlereagh Highway

The Castlereagh Highway runs generally north–south through the study area and connects the Great Western Highway at Marrangaroo (near Lithgow) to the Carnarvon Highway at St George in Queensland. It passes through a number of towns, including Gilgandra and Walgett. The proposal site crosses the Castlereagh Highway about 18 km north-west of Gilgandra. At this location, the Castlereagh Highway comprises a single lane of travel in each direction on a single carriageway, with a posted speed limit of 110 km per hour.

Kamilaroi Highway

The Kamilaroi Highway runs generally in an east–west direction through Narrabri. It connects Walgett in the west to Gunnedah in the east. It joins the Newell Highway in the north of Narrabri as Wee Waa Road and continues from the south of Narrabri via a roundabout off the Newell Highway. The proposal site crosses the Kamilaroi Highway about 1.2 km north-west of the Newell Highway at Narrabri. Within Narrabri the highway has a single lane in each direction, with a 50-km per hour speed limit. Outside of Narrabri the speed limit ranges from 80–100 km per hour.

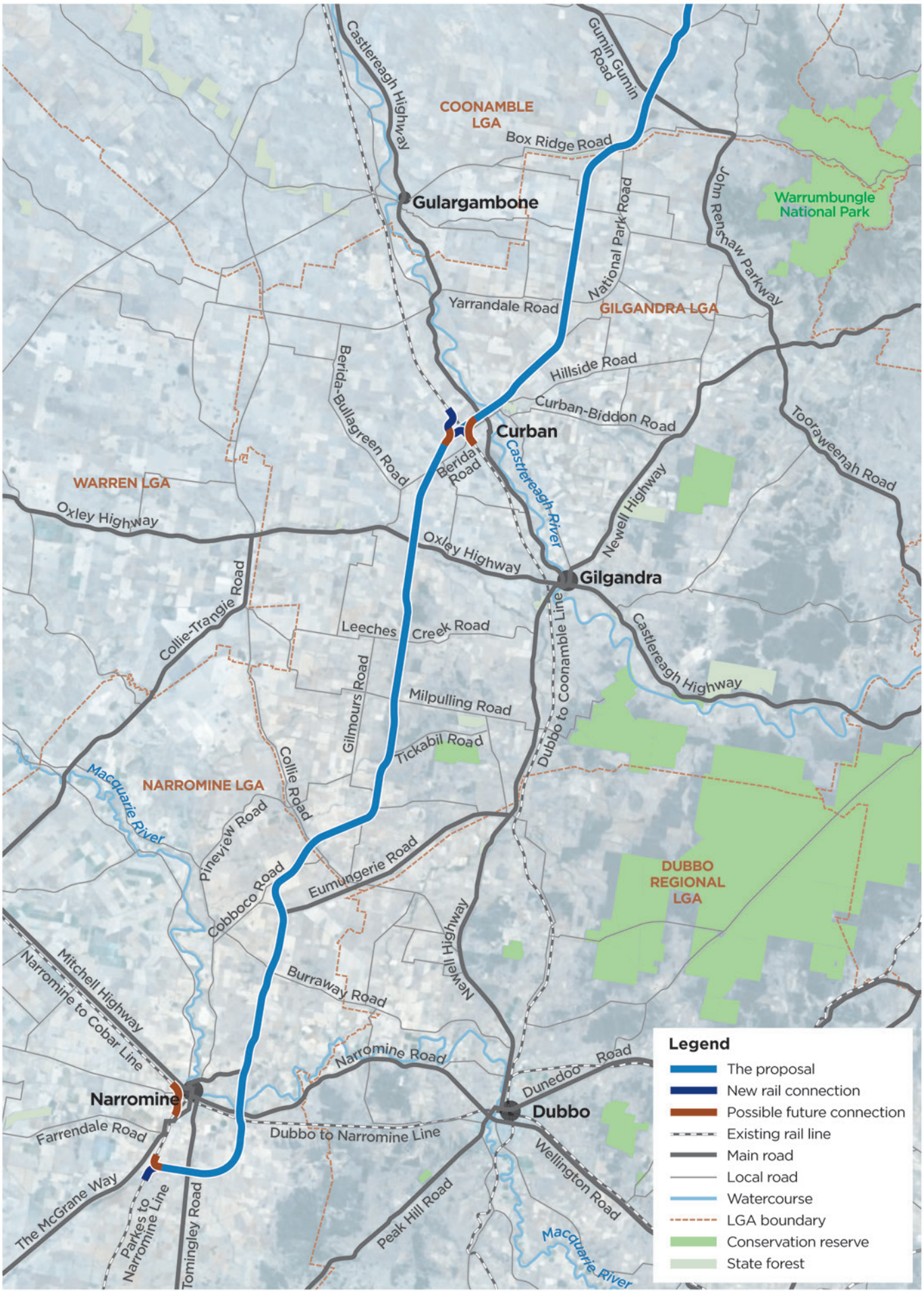

Figure B11.1 **Road network (map 1)**

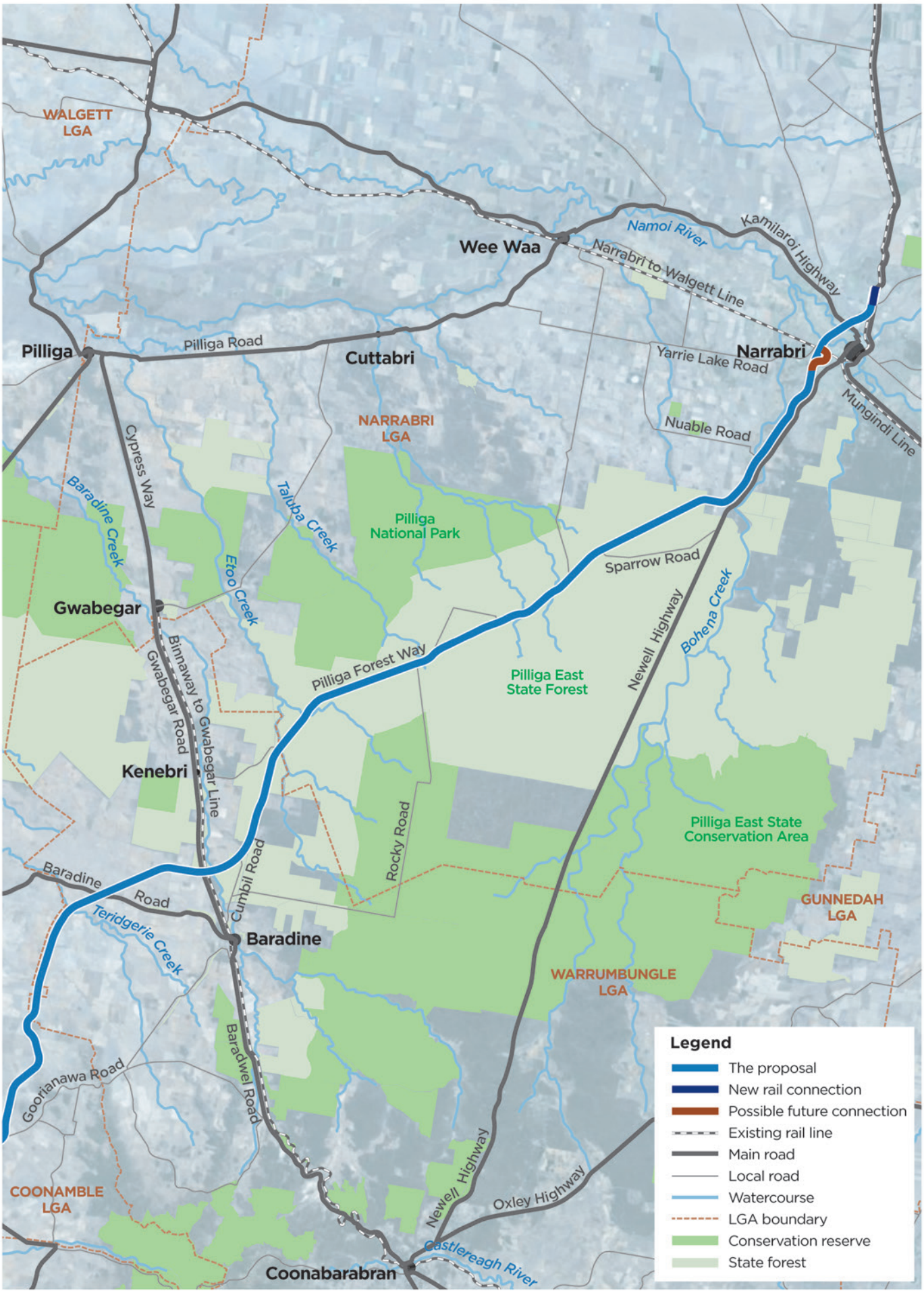

Figure B11.1 **Road network (map 2)**

Other main (regional) roads

Tomingley Road

Tomingley Road runs generally in a north–south direction, connecting the Newell and Mitchell highways and providing a direct link between Tomingley and Narromine. The proposal site crosses Tomingley Road immediately north of Pinedean Road, about 7.5 km south of Narromine. At this location, Tomingley Road comprises a single lane in each direction on a single carriageway, with a posted speed limit of 110 km per hour.

Eumungerie Road

Eumungerie Road runs generally north–south and provides a link between Narromine and Eumungerie. The proposal site crosses Eumungerie Road about 6.4 km north-east of Narromine. At this location, Eumungerie Road comprises a single lane in each direction on a single carriageway, with a default speed limit of 100 km per hour.

Gwabegar Road

Gwabegar Road runs generally north–south and provides a direct link between Baradine and Cuttabri via Gwabegar. North of Gwabegar, Gwabegar Road deviates to the north-east toward Cuttabri, through the Pilliga National Park. The proposal site crosses Gwabegar Road about 8 km north of Baradine. At this location, Gwabegar Road comprises a single lane in each direction on a single carriageway, with a posted speed limit of 100 km per hour.

Killarney Gap Road

Killarney Gap Road runs in a north-easterly direction and provides a direct link between Narrabri and Bingara. The proposal site passes to the west of Killarney Gap Road where it intersects with the Newell Highway, about 3.4 km north of Narrabri. At this location, Killarney Gap Road comprises a single lane of travel in each direction on a single carriageway, with a default speed limit of 100 km per hour.

The McGrane Way

The McGrane Way runs generally north–south and provides a link between Tullamore and Narromine. The proposal site connects with the Parkes to Narromine Line to the east of The McGrane Way near Narwonah, about 10 km south of Narromine. At this location, The McGrane Way comprises a single lane in each direction on a single carriageway, with a posted speed limit of 100 km per hour.

Local roads

The study area includes a network of local roads and forestry access tracks. The local road network provides direct access to properties and to the main road network. Sealed local roads that cross the proposal site are listed (from south to north) in Table B11.1. In addition, 35 unsealed local roads cross the proposal site. Intersections in the vicinity of the proposal site are described below.

Within the Pilliga East State Forest and associated state forest areas, 11 unsealed forestry access tracks cross the proposal site.

There are also a number of Crown or 'paper' roads in the study area. Further information on Crown roads, together with an assessment of the potential impacts on Crown land in general, is provided in chapter B12.

TABLE B11.1 LOCAL ROADS INTERSECTED BY THE PROPOSAL SITE

Road name	Sealed shoulder?	Line marking?	Surface type	No of lanes
Dappo Road	No	No	Partially sealed	2
Webbs Siding Road	No	Yes	Sealed	2
Euromedah Road	No	No	Sealed	2
Dubbo-Burroway Road	No	No	Sealed	2
Leeches Creek Road	Yes	No	Sealed	1
Yarrandale Road	No	No	Sealed	2
Box Ridge Road	No	No	Sealed	1
Baradine Road	No	Yes	Sealed	2
Yarrie Lake Road	No	No	Sealed	2
The Island Road	No	No	Sealed	1

Intersections

The proposal site is located near three highway intersections with the potential to be impacted by the proposal, including the operation of level crossings.

Newell Highway and Cains Crossing Road

The Newell Highway/Cains Crossing Road intersection is give-way controlled, with gravel shoulders provided on the Newell Highway to facilitate left-turning movements to Cains Crossing Road, clear of through traffic movements. Regular and frequent gaps in Newell Highway traffic flow allow traffic to turn into and out of Cains Crossing Road with generally minimal delay. The intersection is located about 160 m east of the proposal site.

Newell Highway and Glenwood Lane

The Newell Highway/Glenwood Lane intersection is give-way controlled, with gravel shoulders provided on the Newell Highway to facilitate left-turning movements to Glenwood Lane, clear of through traffic movements. Regular and frequent gaps in Newell Highway traffic flow allow traffic to turn into and out of Glenwood Lane with generally minimal delay. The intersection is located about 90 m east of the proposal site.

Oxley Highway and Nancarrows Road

The Oxley Highway/Nancarrows Road intersection is give-way controlled, with gravel shoulders provided on the Oxley Highway to facilitate left turning movements to Nancarrows Road, clear of through traffic movements. Regular and frequent gaps in Oxley Highway traffic flow allow traffic to turn into and out of Nancarrows Road with generally minimal delay. The intersection is located about 60 m east of the proposal site.

Other intersections

Traffic volumes throughout the study area are generally sufficiently low that there are minimal delays at the existing intersections. Turning traffic is typically able to find a gap in the opposing traffic flow without waiting for a long period.

Table B11.2 lists the intersections within each LGA that are in the vicinity of the proposal site.

TABLE B11.2 INTERSECTIONS IN THE VICINITY OF THE PROPOSAL SITE

Locality	Intersecting Roads	
Narromine LGA	Tomingley Road	Pinedean Road
	Dappo Road	Wallaby Road
	Eumungerie Road	Euromedah Road
	Rocky Point Road	Eumungerie Road
	Merrits Lane	Eumungerie Road
	Burroway Road	Eumungerie Road
	Greenvale Road	Eumungerie Road
Gilgandra LGA	Collie Road	Old Mill Road
	Old Mill Road	Gilmours Road
	Oxley Highway	Nancarrows Road
	Gumin-Gumin Road	Weenya Road
Coonamble LGA	Mungery Road	Goorianawa Road
	Mungery Road	Quanda Road
Warrumbungle LGA	Baradine Road	Carmel Lane
	Baradine Creek Road	Quiet Road
	Pinchams Road	Cumbil Road
	Omega Road	Cumbil Road
	Sixteen Foot Road	Cumbil Road
	Aloes Road	Pilliga Forest Way Road

Locality	Intersecting Roads	
Narrabri LGA	Coxs Road	Windup Road
	Neds Road	Pilliga Forest Way Road
	Country Line Road	Pilliga Forest Way Road
	Sixteen Foot Road	Pilliga Forest Way Road
	Jack Scott Road	Pilliga Forest Way Road
	Twenty Foot Road	Pilliga Forest Way Road
	Zot Road	Billy Reed Road
	Pilliga Forest Way Road	Kuhners Bore Road
	Glenwood Lane	Newell Highway
	Cains Crossing Road	Newell Highway
	Yarrie Lake Road	Bohena Lane

Level crossings

There are five existing level crossings located within the proposal site adjacent to the proposed connections with existing rail lines. These are located on:

- Old Backwater Road, on the Parkes to Narromine Line near the proposed Narromine West connection
- Dandaloo Road, on the Parkes to Narromine Line near the proposed Narromine West connection
- Berida Road, on the Dubbo to Coonamble Line
- Yarrie Lake Road, on the Narrabri to Walgett Line
- Narwonah Siding Road, on the Parkes to Narromine Line.

All of these level crossings have passive forms of control, consisting of give way or stop signs. No changes to these level crossings are proposed.

Parking

There is no formal on-street or off-street parking provided along or near the proposal site. On-street and off-street parking opportunities are provided in most towns within and near the site.

Rest areas are provided at various locations along the highways in the study area (Mitchell Highway, Newell Highway, Oxley Highway and Castlereagh Highway) in the study area. There are 24 rest areas designated for heavy and light vehicles located along the major highways in the study area (Mitchell Highway, Newell Highway, Oxley Highway and Castlereagh Highway), and an additional four that are suitable for light vehicles only.

B11.2.2 Traffic volumes, level of service and safety

Traffic volumes

Limited traffic volume data is available for most roads in the study area. Traffic count information sourced from Transport for NSW data for 2017 was supplemented by traffic survey data collected between November 2018 and February 2019. Surveyed volumes ranged from 3,581 vehicles per day on the Mitchell Highway to as few as five vehicles per day on Pilliga Forest Way. Average annual daily volumes for key roads in the study area with greater than 300 vehicles per day are provided in Table B11.3.

Based on the dominant rural/agricultural land uses, and the seasonal variations noted in the traffic volumes sourced from Transport for NSW for Newell Highway, traffic volumes on the road network are likely to increase during harvesting season. For the Newell Highway, traffic was busiest in September and quietest in February. Generally, harvest of winter crops in the study area can begin in late October and continue through to January in higher rainfall areas (Australian Grain, 2020). Key winter crops in the study area include wheat, barley, oats and cereal rye. During this season, heavy vehicle usage on local and main roads in the study area increases as trucks transport grain and tractors and harvesters move between properties. Farming machinery is generally much larger and slower than other vehicles using the roads.

TABLE B11.3 TRAFFIC VOLUMES ON KEY ROADS

Road name	Location	Average Daily Volume (two way)	percentage of Heavy vehicle traffic (%)	Peak Hour Volume (two way)
Mitchell Highway	East of High Park Road	3,581	15	418
Eumungerie Road	South of Euromedah Road	451	48	62
Oxley Highway	East of Berida-Bullagreen Road	369	20	50
Castlereagh Highway	North of Berida Road	856	15	101
Yarrie Lake Road	West of Williams Drive	1,421	14	149
Kamilaroi Highway	East of Logans Lane	1,648	15	195
Tomingley Road	South of Craigie Lea Lane	565	36	64
Newell Highway	North of Cains Crossing Road	1,926	34	191
Newell Highway	South of Cains Crossing Road	1,771	37	187

Level of service

The performance of the road network is largely dependent on the operating performance of intersections that form critical capacity control points in the road network. On highways performance is measured by the expected speed of travel and the opportunities available to overtake a slower vehicle. Level of service is the standard measure used to assess the operational performance of the network and intersections. There are six levels of service, ranging from level of service A, which represents the best performance, to level of service F, which represents the worst, as listed in Table B11.4.

TABLE B11.4 LEVEL OF SERVICE CRITERIA

Level of service	Traffic signals and roundabouts	Class 1 highway[1]
A	Good operation	Motorists experience high operating speeds and little difficulty in passing
B	Good with acceptable delays and spare capacity	Passing demand and passing capacity are balanced
C	Satisfactory	Most vehicles are travelling in platoons (groups of vehicles in close proximity) and speeds are curtailed
D	Operating near capacity	Platooning increases significantly. Passing demand is high but passing capacity approaches zero.
E	At capacity, incidents will cause excessive delays at signals	Demand is approaching capacity and passing is virtually impossible. Speeds are seriously curtailed.
F	Signals exceed capacity, roundabouts require other control mode	Operating conditions are unstable and heavy congestion exists.

Note:

1. As defined in the *Guide to Traffic Management—Part 3 Traffic Studies and Analysis* (Austroads, 2007), a class 1 highway is a two-lane highway on which motorists expect to travel at relatively high speeds.

A level of service assessment was undertaken for key roads in the study area, using the methodology outlined in the *Guide to Traffic Management—Part 3 Traffic Studies and Analysis* (Austroads, 2007) for two-lane, two-way roads. All of the analysed roads are currently operating at a level of service A, with the exception of the following roads:

- Mitchell Highway, east of High Park Road near Narromine, which has a peak volume of 481 vehicles per hour and currently operates at a level of service B
- Kamilaroi Highway, east of Logans Lane near Narrabri, which has a peak volume of 195 and currently operates at a level of service B.

Road safety

Five-year crash history data (2013 to 2018) for key roads in the study area is provided in Table B11.5.

The majority of crashes occurred on the Newell and Mitchell highways, which is to be expected, given the higher volumes of traffic along these roads. The high proportion of serious and moderate injury crashes is also noted and is likely to be a factor of higher vehicle speeds on rural roads.

TABLE B11.5 CRASH HISTORY 2013 TO 2018

	Degree of crash				
Location	**Fatal**	**Serious**	**Moderate**	**Minor**	**Total**
Kamilaroi Highway	6	11	10	15	42
Mitchell Highway	6	25	50	66	147
Newell Highway	17	73	106	180	376
Castlereagh Highway (Gilgandra to Coonamble)	0	2	4	8	14
Oxley Highway (Gilgandra to Nevertire)	1	7	4	15	27

B11.2.3 Other transport facilities

Existing rail infrastructure and train movements

Two main rail networks operate in the study area:

- Country Regional Network—carries passengers and some freight
- NSW Interstate, Hunter Valley and Metropolitan Freight Networks—carries mainly freight, with limited passenger services in some areas.

Existing rail infrastructure and train movements are described in section A2.3.

Public transport

In addition to the limited passenger train services (see section A2.3) some buses operate within the study area. Regional coach services operate between Dubbo and Nyngan, Dubbo and Lighting Ridge, Lithgow and Baradine, and Narrabri and Burren Junction. There are also a number of local passenger and school bus routes that operate in the study area, as shown in Table B11.6.

TABLE B11.6 BUS ROUTES ON ROADS INTERSECTING THE PROPOSAL SITE

Route	Route type	Operator	Number of services (bi-directional)	Road used that intersects the proposal site
Narromine to Dubbo	Regular passenger	Ogden's Coaches	Weekday—12	Mitchell Highway
Narromine to Dubbo	Regular passenger	Dubbo Bus Lines	Weekday—2	Mitchell Highway
Gulargambone to Uluma	School	Ogden's Coaches	Weekday—2	Castlereagh Highway
Gulargambone to Eureka	School	Ogden's Coaches	Weekday—2	Box Ridge Road
Gilgandra to Kickabil	School	Ogden's Coaches	Weekday—2	Collie Road
Gilgandra to Collie	School	Ogden's Coaches	Weekday—2	Oxley Road
Gilgandra to Innisfail	School	Ogden's Coaches	Weekday—2	Leeches Creek Road
Narrabri to Wee Waa	Regular passenger	Forest Coach Lines	Weekday—2	Kamilaroi Highway

Pedestrians and cyclists

Pedestrian and cyclist activity is low, adjacent to the proposal site, with no facilities for pedestrians or cyclists provided along the main and local roads in the study area. Cycling is catered for in road shoulders, where these exist.

Travelling stock reserves

Travelling stock reserves are parcels of Crown land that were originally reserved for the use of travelling stock but are now used for a range of purposes, including:

- Travelling stock, emergency stock refuge and transport of stock to market
- Providing biodiversity corridors
- Providing access and connection to country for Aboriginal peoples
- Maintaining heritage.

In the study area, the majority of travelling stock reserves are to the west of Narromine, Gilgandra and the Pilliga and the proposal site crosses about nine travelling stock reserves in Narromine, Kickabil, Curban, Gilgandra, Bohena Creek and Narrabri.

B11.3 Impact assessment—construction

B11.3.1 Rail infrastructure

The traffic and transport impacts associated with construction of the rail infrastructure are described in this section. Traffic and transport impacts associated with construction of the road infrastructure are described in section B11.3.2.

Traffic and road network impacts

Traffic impacts

Construction would generate additional vehicle movements, including light and heavy vehicles. Light vehicles would generally be used by construction workers moving to and from the construction work areas and/or compounds. Heavy vehicle movements would generally be associated with trucks delivering materials and would also include buses delivering workers from the temporary accommodation facilities.

As described in chapter A8, construction would be undertaken concurrently in four construction areas and the majority of traffic would be generated during the main construction activities in these areas. It is estimated that within each construction area the following traffic volumes would be generated daily during the main construction activities:

- Narromine—up to 98 light vehicle movements and 326 heavy vehicle movements per day
- Gilgandra—up to 150 light vehicle movements and 379 heavy vehicle movements per day
- Baradine—up to 46 light vehicle movements and 55 heavy vehicle movements per day
- Narrabri—up to 82 light vehicle movements and 336 heavy vehicle movements per day.

Further information about the estimated amount of traffic that would be generated is provided in section A8.11. Heavy vehicle traffic movements would be distributed across various public roads in the vicinity of each construction area depending on the activity being undertaken.

It is expected that construction vehicle movements, particularly delivery trucks, would be spread out across the day. This would also assist in minimising any additional delays for vehicles turning from side roads at intersections along the construction access routes.

Some construction transport would require the use of oversize and over-dimension vehicles. Movement of these vehicles would be subject to route-specific planning, with approvals obtained as required from Transport for NSW and the relevant local council. Minor delays to travel may be experienced by drivers due to the use of these vehicles; however, deliveries by these vehicles would generally be undertaken outside of standard construction hours. Given this, and the low volumes of traffic on the majority of roads within the study area, the potential impact on the road network is considered minor.

Installing girder/bridge deck components over the following public roads would require temporary short-term closure of these roads for safety reasons:

- Webbs Siding Road
- Mitchell Highway
- Old Mill Road
- Kickabil Road

- Cains Crossing Road
- Yarrie Lake Road
- The Island Road
- Kamilaroi Highway.

To minimise the potential for traffic and access impacts, short-term closures would be undertaken during the night over a maximum two-day period. Where required, detours would be established. Closures would be managed in accordance with a traffic, transport and access management plan. This plan would define the traffic management measures and communication required to manage traffic through, or adjacent to, work areas to ensure that access and road functionality is maintained (see section B11.5.1).

In the event of an emergency during construction there is the potential for impacts to emergency vehicles, in the form of minor to moderate delays and longer travel times, as a result of road diversions and 'stop and go' traffic control arrangements.

Where the proposal site intersects with public roads, access to these roads would be maintained. There may be minor delays to traffic (about one to two minutes) as a result of 'stop and go' traffic control arrangements.

No upgrades or improvements are expected to be required for any public roads as a result of heavy vehicle movements for the proposal. Potential pavement damage would be managed by undertaking a dilapidation survey prior to and following construction and undertaking pavement condition monitoring during works as required.

Measures to manage the potential for traffic impacts are provided in section B11.5.2.

Road network impacts

The Mitchell and Newell highways are the busiest of the roads likely to be used for construction access. With regard to the Mitchell Highway, an additional four vehicles per hour are anticipated during construction in peak periods, bringing the total two-way peak hour traffic volume to about 422 vehicles per hour. This would be a 0.2 per cent increase. At this volume, the Mitchell Highway is forecast to continue to operate at level of service B.

For the Newell Highway, an additional 41 vehicles per hour are anticipated during construction in peak periods, bringing the total two-way traffic volume to about 232 vehicles per hour. This would be a 21 per cent increase, noting that trucks have a disproportionate impact compared to light vehicles. At this volume, the Newell Highway is forecast to continue to operate at a level of service A.

The remainder of the surrounding road network is not expected to be significantly impacted by construction traffic. This is because the roads have sufficient capacity to absorb the increased traffic, and delays at intersections would have a localised impact only due to low traffic volumes on affected roads. During peak construction activity, a level of service A is expected to be maintained on all other key roads in the study area, with the exception of the Kamilaroi Highway, which would continue to operate at a level of service B.

Measures to manage the potential for impacts on the road network are provided in section B11.5.2.

Parking impacts

Buses would generally be used to transport the majority of the construction workers from the temporary accommodation facilities to the construction work areas. Bus parking would be provided within construction compounds. Specialist contractors and some senior staff may use private vehicles for more flexible mobility and light vehicles may also be used to move within construction areas. Parking for these vehicles would be provided within the construction footprint, including within compounds and the rail corridor. Parking would be adequate to accommodate the peak demands associated with construction and would not impact surrounding roads or properties. Parking locations would be detailed in the traffic, transport and access management plan.

Access impacts

A description of the indicative construction methodology is provided in chapter A8. Construction would be undertaken concurrently in four construction areas. Given the length of the proposal site, the access routes used for construction traffic would vary depending on the origin of construction vehicles and the location of each construction work site.

Construction vehicle access routes to the proposal site, including borrow pits, are shown in the maps in Part E. Construction vehicle access to the construction work areas would be by means of the existing road network and the construction haul road that would be constructed within the proposal site. Construction traffic access routes have been developed to minimise the impact to the road network and major population centres.

Access points from the public road network would be selected such that adequate sight distance and a safe access path are available. Further investigation of access locations would be undertaken during detailed design. All construction site access points would be designed in accordance with relevant standards and the requirements of the road owner, with adequate sight lines provided to ensure they operate in a safe and efficient manner. In addition, access would be provided from secondary roads where practicable to minimise potential disruptions on the arterial road network.

Interactions between vehicles on the road network would continue to be defined by road rules and the physical configuration of the road. In most cases all construction activities would be located clear of the existing road network. Any short-term impacts associated with construction vehicle access or works at particular sites would be managed by implementing appropriate measures in the traffic, transport and access management plan.

Constructing the rail corridor within the areas of State forest near the northern end of the proposal site has the potential to affect access along existing forestry access tracks where these cross the rail corridor. Alternative access arrangements would be provided in consultation with the Forestry Corporation of NSW, and these would be defined in the traffic, transport and access management plan.

Access to some properties may be affected by the construction activities. This could be either through the loss of existing access arrangements or alterations to access arrangements. Works would be managed such that access to properties would be maintained. Where this is not possible, alternative access would be provided in consultation with affected landholders. Potential property impacts associated with access changes during construction are considered in chapter B12.

Emergency vehicle movements

As described above, construction of the proposal would result in temporary impacts to traffic and access within the study area and an increase in both heavy and light vehicle movements on the local road network. This could cause delays and/or potential access restrictions to emergency vehicle movement in the vicinity of the proposal site; however, as road network performance would not decline as a result of construction, any delays are expected to be minor.

Measures to manage the potential for impacts to emergency vehicle movements are provided in section B11.5.2.

Other transport impacts

Public transport impacts

As with other traffic, public and school buses may be affected by the increase in traffic on the road network. However, given the relatively small number of bus services in the area combined with the limited potential for traffic impacts generally, this would be a minor impact.

There is only one formal timetabled passenger service operated on the Country Rail Network that would have the potential to be affected by the proposal – the Northern Tablelands Xplorer, which operates on the Mungindi Line. Construction of the connection between the proposal and the Inland Rail Narrabri to North Star Line (currently the Mungindi Line) would involve the temporary closure of this line. These works would be undertaken during programmed weekend rail possession periods, in accordance with standard operating procedures for Country Rail Network. Possession periods typically occur four times a year for a 72-hour period.

Impacts on freight train paths

There would be the potential for temporary impacts on existing rail freight operations where connections to existing rail lines are proposed (see section A7.3). These works would generally be undertaken during programmed weekend rail possession periods, in accordance with standard operating procedures for ARTC.

Pedestrian and cyclist impacts

The main locations where pedestrian and cyclist safety issues may arise include:

- Construction site or temporary accommodation facility access and egress points where construction vehicles would interface with pedestrians using surrounding footpaths
- Locations where footpath widths are reduced around construction sites or along haul roads.

Given the low volume of pedestrian and cyclist activity in and around the majority of the proposal site, there is not expected to be any significant impacts on pedestrian and cyclists. The introduction of additional heavy vehicles to the network has the potential to increase safety risks for pedestrians and cyclists, particularly where there is an increased likelihood for interaction.

Travelling stock reserves

Constructing the rail corridor in proximity to existing travelling stock routes has the potential to affect access along these routes where these cross the proposal site. Works would be managed such that necessary access on the travelling stock routes would be maintained or, where this is not possible, alternative access arrangements would be provided in consultation with the NSW Local Land Services and would be defined in the traffic, transport and access management plan.

B11.3.2 Road infrastructure

Traffic, road network and access impacts

As described in section A7.4, the proposal includes a number of road realignments and some closures of public roads. This has the potential to result in changed access arrangements during construction (see below) and operation (see section B11.4.2).

The proposed road realignments would be constructed off-line to minimise impacts on traffic during construction. There would be some minor delays (one to two minutes) during tie-in work to the existing road as a result of 'stop and go' traffic control arrangements. The proposed road works include realigning Pilliga Forest Way in the Pilliga East State Forest for a distance of about 6.7 km to avoid the new rail corridor. Given the low traffic volumes along this road (about five vehicles per day—see section B11.2.2) these works are expected to result in minimal impacts on existing traffic during construction. Detours and/or diversions would be provided as required to maintain access, including access for forestry operations (see chapter B12).

Proposed road closure works may result in minor disruptions/delays to local traffic and temporary access restrictions to private property. Where this occurs, alternative access arrangements would be provided and/or appropriate traffic controls implemented.

Changes or realignment of public roads would be undertaken in accordance with the minimum safe standard of the existing road, unless otherwise agreed with the responsible road authority.

Other traffic, road network and access impacts during construction of the road infrastructure would generally be consistent with those described in section B11.3.1.

Measures to manage the potential for impacts on access during construction are provided in section B11.5.2.

Other transport impacts

Table B11.6 identifies the bus routes that operate on roads that intersect the proposal site. There are no bus routes that operate on roads proposed for realignment or closure. The proposed road infrastructure works would not impact on existing freight or passenger line services within the study area.

Pedestrian and cyclist impacts during construction of the road infrastructure would generally be consistent with those described in section B11.3.1.

B11.4 Impact assessment—operation

B11.4.1 Rail infrastructure

Traffic and road network impacts

Traffic impacts

Some maintenance/operational traffic would be generated during operation; however, this traffic would be minimal and is estimated to comprise about two to three trips to the proposal site per week. Occasionally, there may be larger maintenance efforts required. The potential for significant traffic impacts is unlikely.

As described in chapter A6, the need for the proposal has been driven by continued growth in both road and rail freight volumes. Operation of the proposal would have a positive impact on the road network, particularly along major transport routes such as the Newell Highway, by decreasing the amount of heavy freight vehicles on the road. This has the potential to reduce travel times for road users and improve road safety.

Overall, the proposal is expected to have a positive impact on traffic, by relocating some of the road freight task to rail, thereby reducing the number of heavy vehicles on main roads.

Level crossings

The proposal involves providing 51 new public level crossings where the proposal interacts with existing roads, the majority of which would be passive. Active crossings would be provided on the following public roads:

- Tomingley Road
- Eumungerie Road
- Burroway Road
- Collie Road
- Oxley Highway
- Wyuna Road
- Castlereagh Highway
- Yarrandale Road
- Tooraweenah/Gumin Gumin Road
- Mungery Road
- Baradine Road
- Gwabegar Road.

The main potential traffic impact would be impacts on travel time due to the presence of a level crossing. There would be no impacts on traffic where the proposal passes above public roads by means of a bridge.

An assessment of potential delays noted that at Castlereagh Highway, which is the busiest location at which a level crossing is proposed, there would be a maximum delay of 96 seconds and a maximum queue length of about 39 m (about six vehicles, consisting of five light vehicles and one heavy vehicle) during the proposal's opening year. In 2040, the delay would still be 96 seconds; however, due to anticipated growth in traffic volumes, the maximum queue length would be about 46 m (about seven vehicles, consisting of six light vehicles and one heavy vehicle). The frequency of trains, and therefore the likelihood of delays, is also likely to increase over time as the number of trains using Inland Rail increases. Given the local nature of most affected roads, this impact would only affect a small number of cars and would have a localised affect only.

The potential for queued vehicles to affect adjacent intersections is considered to be low, given the distance to these intersections and/or the low volumes of traffic on roads that intersect near the proposal site.

The presence of level crossings may present safety risks to motorists due to potential collisions with trains. In accordance with the safety measures outlined within the ALCAM assessment process, the proposed level crossings have been designed to ensure that all crossing points would have adequate safety measures to mitigate the likelihood of incidents between passing trains and passenger vehicles. At passive crossings, ARTC standard signage would be provided. At active crossings, boom gates and bells would ensure passenger vehicles are aware of the passing train.

The operation of public level crossings constructed as part of the proposal would be reviewed following the commencement of operation to confirm that the level of protection and the proposed infrastructure is appropriate for the traffic conditions. In addition, in accordance with National and State Rail Safety Law requirements, public level crossings would be subject to an interface agreement with the relevant road manager to ensure that safety risks are identified and minimised as far as reasonably practicable.

The potential for safety impacts to the community due to the presence of rail infrastructure, including level crossings, and measures to manage these potential impacts, is considered in chapter B14.

Parking impacts

The proposal does not require removal of any existing parking provision. It is not expected to generate any demand for parking around existing stations given that no change is forecast to passenger train services; therefore, no impacts on parking are expected.

Other transport impacts

Public transport impacts

There would be no negative effects on passenger train services as a result of the proposal.

Bus services that cross the new rail corridor may experience a small increase in delays at level crossings where there were none previously, in line with other road users on these roads.

Impacts on operation of freight trains

The proposal is not expected to affect existing freight train paths. It may allow for freight train movements to be optimised as a result of the connections proposed with existing lines. All train movements along Inland Rail, and between Inland Rail and existing lines, would be managed in accordance with existing operational procedures.

Pedestrian and cyclist impacts

Given the low volume of pedestrian and cyclist activity in the study area, there is not expected to be any significant impacts on pedestrian and cyclists.

B11.4.2 Road infrastructure

Traffic and road network impacts

To facilitate construction and operation some changes to the local public road network are proposed, as described in section A7.4. The proposal includes a number of road closures and/or realignments, with corresponding adjustments to road reservations. Road changes are proposed where the road is not made; height differences between the rail corridor and road prevent a safe level crossing; or, where there is a suitable alternative crossing point within a reasonable distance such that an additional crossing is not required.

The potential effects of these changes on the public road network are considered below.

Changes to public roads

The proposal would require public road realignments in the following cases:

- Horizontal and vertical realignment—typically involves relocating the road within a new road corridor to improve the angle of crossing for safety reasons (i.e. line of sight) at a level crossing or to direct a road to a new level crossing
- Vertical realignment—typically involves raising the road on its approach and departure at a level crossing to match the height of the rail line within the existing road corridor. In some instances, this may require minor adjustments to the existing road corridor.

Generally, public roads would be retained wherever practicable; however, some public roads would need to be closed in the following instances:

- The road exists only as a road reserve and is not being used as a road (i.e. no road exists)
- Grade separation and raising/lowering the road is not feasible due to the level of the rail line
- There is a nearby grade separation or level crossing enabling diversion of the road.

Roads would only be closed where the impact of diversions or consolidations is considered acceptable, or where continuing to provide access at the existing location is not considered safe and cannot be reasonably made safe. Approval for public road closures (where required) would be progressed in accordance with the relevant requirements and in consultation with the responsible road authority.

The council-managed made roads that would be closed, and the proposed alternative access arrangements, are listed in Table A7.3. Of the roads listed, only Dappo Road would be completely closed.

Road closures may result in additional travel distance for road users; however, at the majority of locations where road closures and realignments are proposed, the impacts would be minor (about 1 to 2 km) due to the length of detour proposed.

For those roads where only road realignments are proposed, including realignment of Pilliga Forest Way, no significant changes to travel distance are expected. New sections of road would be more or less the same length as the existing roads.

Further information about proposed road changes is provided in section A7.2. Maps showing the location and arrangements for changes to the public road network are provided in Part E.

Changes to roads would be undertaken in accordance with the minimum safe standard of the existing road, unless otherwise agreed with the responsible road authority/landowner. The new sections of road would provide a similar level of service and no effects on the overall operation of the road network are expected.

Access impacts

Where creation of the rail corridor would sever a lot that currently has legal access to a public road, access would continue to be provided to both parts of the lot from a public road (or roads). Access across the rail corridor to the severed part of a lot can be provided by a level crossing; however, minimising the number of new level crossings provided as part of the proposal is desirable for safety reasons (see section A6.3.3). Access would continue to be maintained, and/or potential impacts managed, by:

- Providing alternative access from a public road, where available
- Considering acquiring severed land (if rendered unusable) in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW)
- Providing common access points to serve multiple lots or properties (i.e. consolidation)
- Providing a stock underpass under the rail corridor.

The proposal seeks to maintain access to properties by a reasonable public road route. This approach minimises the potential for private access impacts.

Alternative access, generally in the form of a level crossing and/or access road, would be provided at a number of private properties where the proposal would sever the existing access to a public road. This may affect private landholders, with potential effects including increased travel distances and/or changes to the movement of equipment and stock. Affected landholders would continue to be consulted during detailed design to refine proposed access arrangements and minimise the potential for impacts.

The provision and design of level crossings would be determined in accordance with relevant design requirements, including ARTC and Australian Standards, and in consultation with landowners.

The potential for private property impacts, and measures to manage these potential impacts, is considered in chapter B12.

Measures to manage the potential for impacts on access are provided in section B11.5.2.

Other transport impacts

There would be no impacts on other transport due to the proposed road realignments or closures.

B11.5 Mitigation and management

B11.5.1 Approach

Approach to mitigation and management

Approach to managing the key potential impacts identified

The proposal has the potential to affect private and public access during construction, and private access arrangements during operation. The proposal would introduce changes to the local road network through the introduction of new level crossings at numerous local roads, changes to public roads (including road realignments and closures) and changes to private property access along the rail alignment.

A traffic, transport and access management plan would be prepared and implemented as part of the CEMP. The plan would detail processes, relevant requirements and responsibilities to minimise potential traffic, transport and access impacts during construction. Further information on the CEMP is provided in chapter D5. The requirements for the traffic, transport and access management plan are provided in Appendix I.

Consultation with the responsible road authority, landowners/landholders would be ongoing during detailed design and construction to identify appropriate measures to minimise the potential for access impacts during construction and operation, as far as reasonably practicable.

Approach to managing other impacts

The operation of all level crossings would be reviewed after the proposal commences operation to confirm that the level of protection is appropriate and that the infrastructure is appropriate for the traffic conditions.

Other measures are provided in section B11.5.2.

Expected effectiveness

ARTC and its contractors have experience managing potential traffic and transport impacts associated with the construction and operational phases of rail development projects.

The traffic, transport and access management plan would be prepared in accordance with the relevant parts of the Austroads *Guide to Road Design* (2017), *Traffic control at work sites* (Roads and Maritime Services, 2018b) and *AS 1742.3–2009: Manual of uniform traffic control devices—Traffic control for works on roads* (Standards Australia, 2016).

While access arrangements would be outlined in the traffic, transport and access management plan, the effectiveness of those arrangements and the requirements for any alternative and/or temporary arrangements would be agreed with the affected landholders.

The proposed mitigation measures are expected to be effective in providing satisfactory amenity and safety, and ensuring that the road and transport network operations would be retained at an acceptable level of service.

Interaction between measures

The approach to managing potential property impacts, including the effects of changed access arrangements both to and within properties, would involve developing property-specific measures to manage the requirements at individual properties. This would involve determining requirements, in consultation with individual landholders, for property-level responses during construction and operation. These measures would inform detailed design and construction planning. Further information is provided in section B12.6.

B11.5.2 List of mitigation measures

Measures that will be implemented to address potential impacts from traffic and transport are listed in Table B11.7.

TABLE B11.7 TRAFFIC AND TRANSPORT MITIGATION MEASURES

Stage	Ref	Impact/issue	Mitigation measures
Detailed design/ pre-construction	TT1	*Impacts on existing infrastructure and access*	Detailed design and construction planning would avoid or minimise the potential for impacts on the surrounding road and transport network, and property accesses, as far as reasonably practicable.
	TT2	*Impacts on existing roads*	Input would be sought from relevant stakeholders (including local councils and Transport for NSW) prior to finalising the detailed design of those aspects of the proposal that affect the operation of road and other transport infrastructure under the management of these stakeholders.
	TT3	*Road user safety at changes to the road network*	Road safety audits would be undertaken where changes to the road network are required, in accordance with relevant Austroads guidelines, to ensure the safety of all road users is considered during detailed design and construction planning.
	TT4	*Road user safety at level crossings*	Public level crossings would be designed in accordance with relevant guidelines and standards, including *AS 1742.7:2016*: *Manual of uniform traffic control devices*, *Part 7: Railway crossings* (Standards Australia, 2016) *and Guide to Road Design*; *Part 4: Intersections and Crossings* (Austroads, 2017) and ARTC standards, including provision of warning signage, line marking and other relevant controls. Public level crossings with active controls would include boom gates and flashing lights. Where level crossings would provide access for travelling stock routes, consultation would be undertaken with Crown Lands and Local Land Services to determine appropriate controls.

Stage	Ref	Impact/issue	Mitigation measures
Construction	TT5	*General impacts of construction activities on traffic, transport, access, pedestrians and cyclists*	A traffic, transport and access management plan would be prepared and implemented as part of the CEMP. The plan would include measures, processes and responsibilities to minimise the potential for impacts on the community and the operation of the surrounding road and transport environment during construction. The plan would be developed in consultation with local councils, Transport for NSW and public transport/bus operators.
	TT6	*General impacts of construction activities on traffic, transport, access, pedestrians and cyclists*	Consultation with relevant stakeholders would be undertaken regularly to facilitate the efficient delivery of the proposal and to minimise impacts on road users and landholders. Stakeholders would include the relevant local council/s, bus operators, Transport for NSW, emergency services, the Forestry Corporation of NSW (in relation to access within State forests), Crown Land, Local Land Services and other affected property owners/occupants. The community would be notified in advance of any proposed road and pedestrian network changes through signage, the local media, and other appropriate forms of communication. Any additional measures identified as an outcome of consultation would be implemented during construction.
	TT7	*Emergency vehicle access*	Emergency vehicle access routes that may be impacted by the proposal would be identified, and appropriate control measures would be implemented, in consultation with the relevant emergency services providers.
	TT8	*Heavy vehicles damaging local roads*	A dilapidation survey would be undertaken of the made public roads within the proposed haulage routes, prior to and following completion of construction, and provided to the relevant road authority. Pavement condition monitoring would be carried out during works, as required.
Operation	TT9	*Road user safety at level crossings*	The operation of all level crossings on classified roads constructed as part of the proposal would be reviewed after Inland Rail commences operation to confirm that the: ▸ Level of protection is appropriate ▸ Proposed infrastructure is appropriate for the traffic conditions.
	TT10	*Road user safety at level crossings*	In accordance with National and State Rail Safety Law requirements, public road crossings would be subject to an Interface Agreement with the relevant road manager to ensure that safety risks are identified and minimised as far as practicable during operations.

B11.5.3 Managing residual impacts

Residual impacts are impacts of the proposal that may remain after implementation of:

- Design and construction planning measures to avoid and minimise impacts (see sections A7.2 and A8.1)
- Specific measures to mitigate and manage identified potential impacts (see sections B11.5.1 and B11.5.2).

The key potential traffic and transport issues and impacts originally identified by the environmental risk assessment (see section A9.1) are listed in Table B11.8. The (pre-mitigation) risks associated with these impacts, which were identified by the environmental risk assessment, are provided. Further information on the approach to the environmental risk assessment, including descriptions of criteria and risk ratings, is provided in section A9.1.

The potential issues and impacts identified by the environmental risk assessment were considered as part of the traffic and transport impact assessment, summarised in sections B11.3 and B11.4. The mitigation and management measures (listed in Table B11.7) that would be applied to manage these impacts are also identified. The significance of potential residual impacts (after application of these mitigation measures) is rated using the same approach as the original environmental risk assessment. The approach to managing significant residual impacts (considered to be those rated medium or above) is also described.

TABLE B11.8 RESIDUAL IMPACT ASSESSMENT—TRAFFIC AND TRANSPORT

Assessment of Pre-mitigated risk (see section A9.1 and Appendix E)					Mitigation measure Ref (see Table B11.7)	Residual impact assessment			
Phase	**Potential impacts**	**Likelihood**	**Consequence**	**Risk rating**		**Likelihood**	**Consequence**	**Risk rating**	**How residual impacts will be managed[1]**
Construction	Construction traffic impacts, including temporary delays to local and regional traffic due to road closures and diversions	Likely	Minor	Medium	TT1, TT3, TT5 and TT6	Unlikely	Minor	Low	n/a
	Impacts on rural roads unsuitable for construction traffic	Possible	Moderate	Medium	TT1 and TT8	Rare	Moderate	Low	n/a
Operation	Increase in travel times due to introduction of new level crossings, resulting in wait times associated with length and frequency of trains	Likely	Minor	Medium	TT1, TT4, and TT8	Possible	Not significant	Low	n/a

Note:
1. For residual impacts with a risk rating of medium or above.