# Proposal summary

**INLAND RAIL**
**NARRABRI TO NORTH STAR—PHASE 2**
ENVIRONMENTAL IMPACT STATEMENT

ARTC | INLAND RAIL
An Australian Government Initiative

**COVER IMAGE**
Aerial image showing the Newell Highway and rail bridge over the Mehi River in Moree.

## ACKNOWLEDGEMENT OF COUNTRY

Inland Rail acknowledges the Traditional Custodians of the land on which we work and, pay our respect to their Elders past, present and emerging.

# Certification

This environmental impact statement (EIS) has been prepared under Part 5, Division 5.2 of the *Planning and Assessment Act 1979* (NSW) and in accordance with Part 3 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (NSW).

EIS prepared by:

| **Project** | **Inland Rail (Narrabri to North Star—Phase 2)** |
|---|---|
| Name | Butch Rossouw on behalf of WSP Australia Pty Ltd |
| Qualifications | N.H.Dip Conservation. CEnvP #395 |
| Address | 900 Ann Street,<br>Fortitude Valley, Qld 4006 |
| Proponent Name and address (the proponent) | Australian Rail Track Corporation<br>Level 16, 180 Ann Street,<br>Brisbane, QLD 4000 |
| Proposed development | Enhancement works to approximately 13.7 kilometres (km) of existing track and construction of 1.6 km new rail line between Moree and Camurra to accommodate double-stack freight trains up to 1,800 metres (m) long and 6.5 m high. The project would require the installation of approximately 1,100 flood-relief culverts and involves the demolition and reconstruction of eight bridges, three new signalised level crossings and realignment of six private level crossings. Decommissioning and removal of the Camurra hairpin and construction of a new rail spur for the Weemelah line will complete the proposed works. |
| Land to be developed | Land generally within the existing rail corridor between Moree and Camurra, as described in this EIS. |
| Environmental impact statement | This EIS addresses all matters specified in accordance with Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) and Schedule 2 of the (NSW) Environmental Planning and Assessment Regulation 2000. |
| Declaration | I certify that I have prepared this EIS in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (SSI 10054) dated 14 October 2020 and the relevant provisions of Schedule 2 of the (NSW) Environmental Planning and Assessment Regulation 2000.<br>This EIS contains all available information that is relevant to the environmental assessment of the infrastructure to which the statement relates. To the best of my knowledge, the information contained in the EIS is neither false nor misleading. |
| Signature(s) |  |
| Name | Butch Rossouw |
| Date | 31/08/2022 |

# Proposal summary

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via regional Victoria, central-west New South Wales (NSW) and Toowoomba in Queensland. Inland Rail is a major national project that would enhance Australia's existing national rail network and serve the interstate freight market. Inland Rail has been divided into 13 projects, seven of which are located in NSW.

The Inland Rail route, which is about 1,700 kilometres (km) long, includes:

- using the existing interstate rail line through Victoria and southern NSW
- upgrading about 400 km of existing track, mainly in western NSW
- providing about 600 km of new track in northern NSW and south-east Queensland.

ARTC was created in 1997 after the federal and state governments agreed to the formation of a single integrated service provider for all operators seeking access to the national interstate rail network. Across its network, ARTC is responsible for:

- providing access to train operators
- developing new business
- capital investment in the corridors
- managing the network
- infrastructure maintenance.

## Objectives

The overall objectives of Inland Rail are to:

- provide a rail link between Melbourne and Brisbane that is inter-operable with train operations to Perth, Adelaide, and other locations on the standard-gauge rail network, to serve future rail freight demand, and stimulate growth for inter-capital and regional/bulk rail freight
- provide an increase in productivity that will benefit consumers through lower freight transport costs
- provide a step-change improvement in rail service quality in the Melbourne to Brisbane corridor and deliver a freight rail service that is competitive with road
- improve road safety, ease congestion, and reduce environmental impacts by moving freight from road to rail
- bypass bottlenecks within the existing metropolitan rail networks, and free up train paths for other services along the coastal route
- act as an enabler for regional economic development along the Inland Rail corridor.

## Need for Inland Rail

The need for Inland Rail is driven by an increasing growth in freight demand, exacerbated by factors such as population growth, environmental (greenhouse gas) considerations, and the economic and safety costs associated with road congestion, as well as the emerging recognition of the need to build efficient supply chains to ensure a productive and competitive Australian economy. The transition of freight from road to rail is an increasingly important issue, due to road congestion significantly affecting the country's economic productivity as well as impacting the quality of life for Australians.

At present, there is no continuous inland rail link between Melbourne and Brisbane. Interstate rail freight travels between Melbourne and Sydney via Albury, and between Sydney and Brisbane, generally along the coast. About 70 per cent of the freight between Melbourne and Brisbane is carried out by road—principally the Newell Highway in NSW and connecting highways in Victoria and Queensland. Inland Rail would bypass the Sydney metropolitan area, substantially reducing the overall journey time and increasing the reliability of services between Melbourne and Brisbane. This would subsequently increase the competitiveness of rail transport relative to road transport.

Infrastructure currently supporting the movement of land freight, such as road, rail and ports, must be sufficient for the significant projected growth in demand for freight transport. Additional investment in rail infrastructure (e.g. Inland Rail) is therefore necessary to avoid the repercussions associated with increased traffic congestion at a regional, state and national level. In summary, Inland Rail is needed to:

- respond to the growth in demand for freight transport
- address existing freight capacity and infrastructure issues
- meet the demand for transport of non-bulk manufactured products
- improve sustainability, as moving freight by rail is found to be four times more fuel efficient than moving freight by road.

### Growth in freight demand

As the demand for regional and interstate freight transport grows, the existing rail and road infrastructure in the north-south corridor along the Australian east coast will be placed under progressively increasing pressure. Increased pressure is anticipated, particularly on freight capacities between capital cities, and from regional towns to urban freight destinations and export ports.

The Melbourne to Brisbane corridor is one of the most important general freight routes in Australia, supporting key population and employment precincts along the east coast and inland NSW. It is estimated that 21 million tonnes of non-bulk and complementary freight moves along this corridor each year (Infrastructure Australia, 2016). This tonnage is expected to grow to over 40 million tonnes per year by 2050.

With the population of the eastern states forecast to increase by 60 per cent over the next 40 years, the need for efficient and effective freight transport would continue to increase (Infrastructure Australia, 2016). Strong forecast population growth, accompanied by comparable growth in employment, is likely to place significant pressure on existing infrastructure and services.

### Existing freight capacity and infrastructure issues

Without the increased use of rail, the growth in freight demand is likely to result in increasing pressure on the road network and associated issues, increased freight costs, and a loss of economic opportunity. The current road connection between Melbourne and Brisbane via inland NSW offers faster transit times than rail via Sydney; however, the existing national infrastructure network cannot support projected growth. This will place increasing pressure on already congested roads through Sydney, and increased use of heavy trucks such as B-doubles and, potentially, B-triples along the Hume–Pacific and Newell highway corridors.

Rail is generally the most productive and efficient mode for freight travelling from regional areas to ports and urban destinations. Freight trains travelling along the Melbourne to Brisbane corridor currently travel through the Sydney metropolitan rail network, often experiencing significant delays. Travel time reliability is poor, as a result of the priority given to passenger services, freight transit curfews in the Sydney metropolitan area, and substandard rail alignments elsewhere. Limited capacity during morning and afternoon passenger peaks restricts freight movements at these times.

## Key benefits of Inland Rail

Inland Rail will be pivotal in shaping and sustaining long-term economic growth and prosperity in the regions along the corridor. Inland Rail would result in the following local, regional, state and national benefits:

- reduced transport costs—Inland Rail can reduce the cost of freight transport and deliver savings to businesses and consumers in getting goods to and from markets
- greater access to suppliers, customers and markets—Inland Rail will provide direct or indirect connections to five ports and provide businesses with viable alternative options for both importing and exporting goods
- increased reliability—Inland Rail will provide a reliable transport option with improved resilience to environmental factors such as flooding. Inland rail would reduce transit time between Melbourne and Brisbane terminals to less than 24-hours
- direct value-added opportunities—these include investments in value-added opportunities that have a direct interface with Inland Rail, such as intermodal terminals and logistics, packaging, sorting, consolidating and warehousing
- indirect value-added opportunities—these are investments in value-added opportunities, such as food processing or advanced manufacturing, that do not directly interface with Inland Rail but benefit from proximity to operations that do directly interface with Inland Rail
- hub formations—these are a group of investments in value-added opportunities with similar or related businesses situated within a geographic area that share common markets, inputs, technologies and/or workers
- long-term cost ratio—the cost to build Inland Rail was revised in 2020 to be an estimated $15 billion over 10 years; however, the long-term benefit to Australia is an economic benefit–cost ratio of 2.62 at a 7% discount rate
- boost the Australian economy—Inland Rail is expected to boost Australia's GDP by about $16 billion ($2015) over the next 50 years
- create jobs—Inland Rail is expected to create up to 16,000 new jobs at the peak of construction, with an additional 700 long-term jobs once operational
- improve connections within the national freight network—Inland Rail enhances the National Land Transport Network by creating a rail linkage between Parkes in NSW and Brisbane, providing a connection between Queensland and the southern and western states
- provide better access to and from our regional markets—it would make it easier to connect our farms, mines, cities and ports to domestic and international markets. Two million tonnes of agricultural freight would switch from road to rail, with a total of 8.9 million tonnes of agricultural freight more efficiently diverted to Inland Rail
- reduce costs—the CSIRO Supply Chain Mapping Pilot Project estimated an average saving of $76 per tonne when shifting from other freight options (for horticulture and post processed foods), as per CSIRO supply chain mapping, Parks to Narromine Pilot (March 2019)
- offer better transit time and reliability—Inland Rail offers less than 24-hour transit time between Melbourne and Brisbane terminals and 98% reliability matching current road levels
- increase the capacity of the transport network—Inland Rail would increase capacity for freight and passenger services by reducing congestion along the busy coastal route and allow for growth in passenger services. It would particularly free-up capacity on Sydney's rail network for more passenger and freight services
- reduce distances travelled—with Inland Rail, the rail distance between Melbourne and Brisbane is reduced by 200 km and the distance between Brisbane and Perth and Brisbane and Adelaide is reduced by 500 km
- improve road safety—up to 15 serious crashes, involving fatalities and serious injuries, are estimated would be avoided every year
- improve sustainability—carbon emissions would be reduced by 750,000 tonnes per year as a result of transferring freight from road to rail, as moving freight by rail is four times more fuel efficient than moving it by road
- improve amenity for the community—truck volumes would be reduced in more than 20 regional towns. Road congestion on some of Australia's busiest highways would be reduced, including the Ipswich Motorway, and the Hume, Newell and Warrego Highways
- provide an alternative north-south freight link—Inland Rail would provide a second link between Queensland and the southern states, making Australia's national freight rail network more resilient and less vulnerable to disruptions, e.g. from extreme weather events and flooding
- promote complementary supply chain investments—Inland Rail would be a catalyst for complementary private sector investments, such as fleet upgrades, new metropolitan and regional terminals, and integrated freight precincts.

Figure I provides an overview of the entire Inland Rail alignment.


Figure I Inland Rail alignment

Data Sources: ARTC

Paper size: A3
Date: 7/15/2021
Map 1

N2NS_SP2_EIS_F05_01_NetworkMap_r2v1.mxd

## Proposal overview

ARTC is seeking approval to construct and operate the Narrabri to North Star (N2NS) Phase 2 Moree to Camurra North section of Inland Rail ('the proposal').

The N2NS section of Inland Rail was declared a Critical State Significant Infrastructure (CSSI) project (SSI 7474) under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). Phase 1 of N2NS was approved by the (then) Minister for Planning and Public Spaces under the EP&A Act on 13 August 2020 (SSI no. 7474). Initially, the whole of N2NS was referred to the (then) Commonwealth Department of Agriculture, Water and the Environment under the *Environment Protection and biodiversity Conservation Act 1999* (Cth) (EPBC Act) and was declared to be a 'controlled action'. The referred proposal was then varied to relate only to Phase 1 of N2NS, and Phase 1 was approved by the Commonwealth Minister for the Environment under the EPBC Act on 1 October 2020.

The proposal was referred to the (then) Department of Agriculture, Water and the Environment on 3 June 2020, and was declared a controlled action on 20 July 2020.

In 2017, an Environmental Impact Statement (EIS) was prepared for the entire N2NS section. Since then, the alignment within what is now N2NS Phase 2 has changed (IRDJV, 2019a); specifically, modifications are required to upgrade approximately 13 km of the existing rail track and formation, from Moree north to the Camurra North hairpin, including the Mehi–Gwydir river crossings, and the construction of 1.6 km of new track and formation to bypass the Camurra hairpin on the Weemelah line at Camurra (the Camurra bypass).

The track upgrade involves changes to the vertical and horizontal alignment, to improve the flood immunity of the rail line, as well as a new greenfield section in the north to allow for a bypass of the current hairpin turn. The original N2NS EIS did not assess these changes. Consequently, this section of the N2NS alignment was removed from the original project and, therefore, requires separate assessment under the EP&A Act and the EPBC Act. The Phase 2 component of N2NS (that is, the proposal) is the subject of this EIS, and the original N2NS project (excluding the section from Moree to Camurra North) is referred to as N2NS Phase 1.

This EIS considers the potential impacts of the construction and operation of the N2NS Phase 2 section of Inland Rail. The EIS addresses the environmental assessment requirements of the Secretary of the Department of Planning, Industry and Environment (the SEARs) (refer to Appendix A: Secretary's Environmental Assessment Requirements) issued on 14 October 2020.

The objectives of the proposal are to:

- provide upgraded rail infrastructure that meets the Inland Rail specifications, to enable trains using the Inland Rail corridor to travel between Narrabri and North Star, connecting with other sections of Inland Rail to the north and south
- revise the horizontal alignment of the N2NS Phase 2 section of Inland Rail corridor and undertake extensive curve easing analysis for the alignment, to produce the best outcome for the proposal and the most efficient operational requirements, particularly at the Camurra hairpin
- minimise the potential for environmental and community impacts by maximising use of the existing rail corridor.

## Location

The proposal is primarily an upgrade of the existing rail corridor between Moree and Camurra North, with a small portion (approximately 1.6 km) of greenfield re-alignment. ARTC is seeking approval under Division 5.2 of the EP&A Act to construct and operate the N2NS Phase 2 section of Inland Rail.

Figure II shows the location of the proposal.

Figure III is an overview of the proposal.


Figure II Location of the proposal

Data Sources: ARTC, IRDJV, LPI

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:450,000
Paper size: A3
Date: 9/22/2021
Map 1 of 1

N2NS_SP2_EIS_F01_01_LocationOfProject_r3v4.mxd

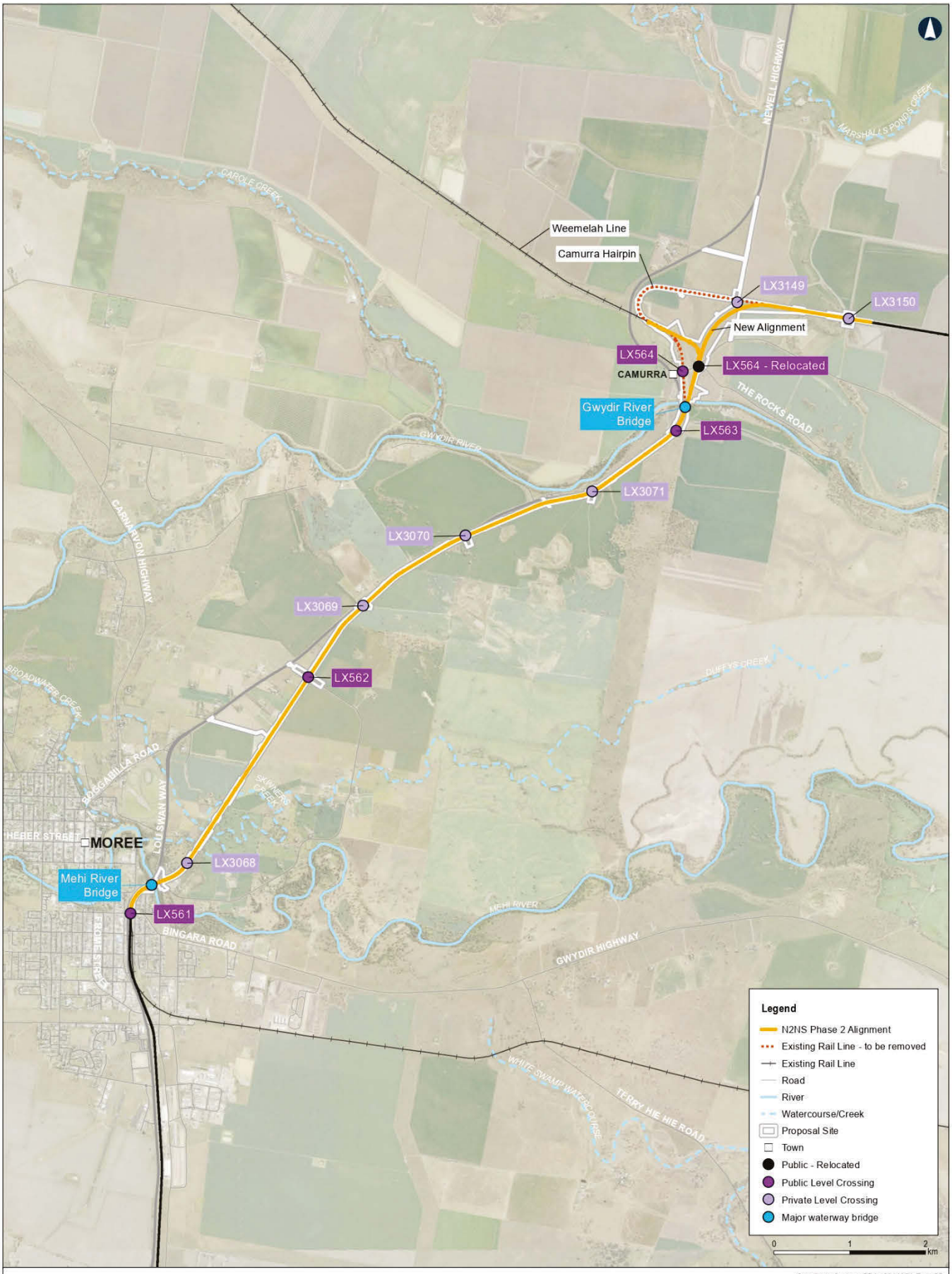


Figure III Proposal overview

Data Sources: ARTC, IRDJV, LPI

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:45,000
Paper size: A3
Date: 9/22/2021
Map 1 of 1

N2NS_SP2_EIS_F01_02_ProjectOverview_r2v2.mxd

## Key features of the proposal

The key features of the proposal are outlined in Table I below.

**TABLE I KEY FEATURES OF THE PROPOSAL**

| Proposal element | Description of Proposal | Figure Ref |
|---|---|---|
| **Operations** | | |
| Description | Once operational, the proposal would form part of the rail network managed and maintained by ARTC, with trains operated by a variety of operators. Inland Rail, in its entirety, would be operational when all 13 sections between Melbourne and Brisbane are complete. Prior to the completion of the entire Inland Rail project, N2NS Phase 2 would form part of the existing network serving grain operations on currently active rail lines to North Star and Weemelah.<br>The new rail line would be a faster, more efficient route that bypasses the Sydney rail network and would enable the use of double-stacked trains along its entire length. The Inland Rail trains would be a mix of grain, bulk freight, and other general transport trains. | Figure 7-2 |
| Operational footprint | The proposal site consists of single-track rail line located predominantly within the existing rail corridor. The N2NS Phase 2 corridor is considered to have a nominal width of 30 to 40 metres (m), providing a 15 m buffer on each side of the alignment centreline. Most of the works associated with the proposal would be undertaken within the existing corridor between Moree and Camurra. It is anticipated that the existing corridor is generally of sufficient width to accommodate the infrastructure currently proposed for the construction of the proposal as well as potential future expansion. The proposal site starts immediately north of the Moree Gwydir Highway level crossing at chainage (Ch) 666.000, and ends at Camurra north, Ch 681.000. Approximately 13.7km of existing track would be upgraded, and approximately 1.6 km of proposed alignment would consist of a new rail corridor through a 'greenfield' area.<br>The current alignment will be amended to included:<br>▸ a new turnout between the Gwydir River and Back Pally Road, immediately north of the new Gwydir underbridge, to provide a connection to the Inland Rail/North Star line to the east and the Weemelah line to the west<br>▸ the decommissioning and removal of the Camurra hairpin and associated formation through the construction of the greenfield Camurra Bypass, providing connections to the existing rail lines to the east and the Weemelah line to the west<br>▸ the reconstruction of a new rail spur for the Weemelah line. | Figure 1-1<br>Figure 1-2 |
| Rail operations | Based on current demand forecasting, N2NS Phase 2 is expected to have an average of about 11 trains per day travelling between Camurra and Moree in 2027. This would increase to about 20 trains per day in 2040.<br>Maximum train speeds would range from 80 to 115 km per hour (km/h), except through Moree, where the maximum train speed would be 60 km/h due to track geometry and safety. | Chapter 7: Proposal features and operation |
| Level crossings | The proposal involves relocations and upgrades to three existing public level crossings, and works to six existing private level crossings, one of which would be removed at Ch 666.730.<br>A variety of treatments for existing and new level crossings have been proposed to maintain the connectivity of the existing road network, both public and private. Treatments for level crossings (where the road and rail cross each other at the same level) are categorised as:<br>▸ passive—have static warning signs, including stop and give-way signs for motorists, and 'Look for trains' signs for pedestrians. This signage is unchanging with no mechanical aspects or light devices. All private level crossings would have passive controls. The realignment and upgrade to six private level crossings (including closure of one private level crossing) is included in the proposal<br>▸ active—have flashing lights, alarms, and whistles, with or without boom barriers for motorists, and automated gates for pedestrians. These devices are activated prior to, and during, the passage of a train through the level crossing. All three public level crossings would have active controls. Three new signalised level crossings at Gwydirfield Road, the Rocks Road and Back Pally Road, replacing the existing level crossings, are included in the proposal. | Figure 7-6<br>Figure 7-7 |
| Bridge structure/creek crossings | The proposal traverses the Mehi–Gwydir floodplain between the Mehi and Gwydir Rivers. The proposal includes the demolition and reconstruction of eight underbridges at the Mehi River, Gwydir River, Skinners Creek, Duffys Creek and at four other un-named water courses. | Figure 7-4<br>Table 7-2 |

| Proposal element | Description of Proposal | Figure Ref |
|---|---|---|
| Existing rail transport | Moree is currently serviced by the Weemelah (North West) rail line, which branches from the Main North Line at Werris Creek and runs north–west through the towns of Gunnedah and Narrabri to Moree. North Star is located on the Boggabilla line, which branches from the Weemelah line at Camurra to the north-east. This line is still used occasionally but has been closed to regular operations since 2013.<br>Passenger trains operate to Moree from as far as Sydney. Moree Station is outside, on the southern boundary, of the N2NS Phase 2 study area. There are no rail passenger services in the study area, which is north of Moree station. A map showing the passenger rail network and other public transport services operating to Moree is provided in Chapter 11.<br>Occasional grain/goods trains operate on an as-needs basis through the study area. Train count data between January 2014 and December 2015 shows an average of 1.8 freight trains per day, with up to seven trains on a peak day. The majority of these services finish at Moree, and the line to North Star is used only occasionally. | Chapter 11, section 11.2.5.<br>Figure 11.3 |
| Local road network | The existing traffic and transport environment surrounding the proposal site includes a network of road and rail infrastructure. The Newell Highway, Gwydir Highway, Back Pally Road and Gwydirfield Road are the major roads within the study area defined in Chapter 11. Local roads in the Moree township are typical of those in a rural town and traffic levels are generally low. The Newell Highway is the primary thoroughfare within the study area, running generally parallel to the rail line.<br>The proposal involves the crossing of local government roads, Gwydirfield Road, The Rocks Road and Back Pally Road. The preferred options for the three public road crossings for the proposal are summarised in Table 7-3 and shown in Figure 7-1.<br>Modifications to local and arterial roads would be required where the track needs to be realigned and where new or upgraded crossings are installed. The following roads would require modification where they cross the rail track:<br>▸ Gwydirfield Road (south crossing)<br>▸ The Rocks Road<br>▸ Back Pally Road.<br>Gwydirfield Road south rail bridge would be demolished and replaced on the existing alignment, with a new concrete bridge suitable to carry the proposed locomotives and carriages. The current underpass would largely remain unaffected with a rail clearance of 3.66 m above the road. | Table 7-3<br>Figure 7-1<br>Figure 8-4 |
| Ancillary facilities | Ancillary facilities that form part of the proposal include:<br>▸ track drainage through the provision of swale drains<br>▸ a rail maintenance access road (RMAR) to provide access to the rail corridor for maintenance of critical infrastructure, emergency recovery, and access to crew change and train stowage.<br>▸ signalling and communications structures would be newly installed as part of the level crossing works at the Gwydirfield Road, Rocks Road and Back Pally Road level crossings.<br>▸ new fencing—new boundary fencing is proposed to provide physical separation of the railway corridor from the adjoining land and includes fauna fencing in the southern sectors where fauna presence is more likely<br>▸ signage such as kilometre posts, creep markers, and track geometry and control markers. | Figure 7-8<br>Figure 7-9 |
| Permanent water management | Surface drains (swale drains) would be installed within the rail corridor adjacent to the track. These surface drains would be located to the side of the tracks and would remove water that percolates through the ballast and flows along the capping layer towards the outside of the track formation. The surface drains protect the track formation by keeping it dry. All drains would be positioned to ensure water runoff is directed to the drain and not the surrounding land. | |

| Proposal element | Description of Proposal | Figure Ref |
|---|---|---|
| Flood management | The proposal would involve the installation of approximately 1,100 culverts of varying types and sizes in about 32 locations along the proposal site in order to mitigate overland flow impacts from the construction of the proposal. The design and location of culverts would be refined through further flood modelling during detailed design.<br>The indicative design of new/replacement culverts has been informed by a hydrologic and hydraulic assessment of the proposal site and geotechnical assessment. An assessment of flooding events has been undertaken for each structure. The proposed structures have been designed to provide the rail line a one per cent annual exceedance probability (1% AEP) flood event immunity. Further details of the flooding immunity are described in Chapter 12 and Technical Paper 4.<br>The culverts would be constructed of concrete and have been designed to:<br>▸ take into account local constraints and flooding/hydrological conditions<br>▸ permit an appropriate flow and minimise the potential for adverse flooding impacts<br>▸ meet ARTC design standards.<br>To meet the hydrological challenges experienced within the Gwydir Mehi floodplain, the culvert design has required the installation of culverts across two vertical arrangements so that the culverts placed higher in the formation only activate in rare flood events. The purpose of this design is to aid in balancing impacts from all flood events, from frequent to infrequent. | Figure 7-5<br>Chapter 12<br>Figure 12-5<br>Figure 12-7<br>Figure 12-8<br>Technical Paper 4: Hydrology and flooding impact assessment |
| **Construction** | | |
| Construction footprint | The proposal site is the area of land directly impacted by the construction of the proposal. This includes the existing rail footprint, new rail realignment, replacement bridges and associated temporary construction areas (i.e. compounds, stockpiles). The development footprint is approximately 174.7 ha.<br>Temporary occupation of land will be required to facilitate the construction of bridges, culvert banks and level crossings. | Figure 1-1<br>Figure 1-2<br>Figure 7-1 |
| Workforce | The proposal would seek to hire a workforce within the region to add local knowledge and support during construction.<br>The construction workforce would peak at about 150 people. For some limited items of work, an additional short-term workforce maybe required. | |
| Construction activities | Track reconstruction would involve replacing the existing track and formation. Between Ch 672.600 and 675.800, a minor horizontal realignment (10 metres (m)) of the track, to the east, is required to solve short-stacking issues between the Newell Highway and existing level crossings. Minor curve easing is also required. This would require permanent land acquisition along the rail corridor to account for the changes.<br>The proposal also involves the realignment of the existing track between Ch 675.800 and Ch 678.200 along the Camurra North section. The realignment would replace the existing Camurra hairpin loop. The realignment would involve the construction of about 2.4 km of new, single-track standard-gauge railway, within a maximum grade of 1:100. About 1.6 km of the new track is within a greenfield site. | Figure 7-2<br>Figure 7-3<br>Figure 8-1<br>Figure 8-2 |
| Ancillary works | Associated works would include:<br>▸ installation of signalling systems and signage at level crossings<br>▸ fencing and fauna fencing<br>▸ erosion and sediment controls at work sites<br>▸ relocation of services and utilities where necessary<br>▸ formation of rail maintenance access roads (RMARs)<br>▸ construction access and haul roads linking to the surrounding public road network<br>▸ construction storage and laydown areas<br>▸ associated earthworks for the construction of pads for piling rigs and cranes at underbridge locations<br>▸ installation of construction erosion and sediment measures. | Figure 8-1<br>Figure 8-4 |

| Proposal element | Description of Proposal | Figure Ref |
|---|---|---|
| Temporary facilities | Temporary ancillary facilities may include a mobile batch plant, an accommodation camp for construction workers and construction water supply and storage.<br>Construction compounds would be created at major activity sites along the proposed route to provide an enclosed work site, not open to the public and used to support construction. A typical construction compound would include portable site offices, lunchroom and self-contained ablution facilities.<br>Material laydown areas for the proposal would be required at bridge construction locations. All other material laydowns would be contained within the corridor. | Figure 8-1<br>Figure 8-4 |
| Bridge structures/creek crossings | The proposal involves the demolition and reconstruction of eight underbridges, located at the Mehi River, Gwydir River, Skinners Creek, Duffys Creek and at four other un-named water courses | Table 7-2<br>Figure 7-4 |
| Property and land | Property acquisition would be required for areas along the existing rail corridor where additional land is required, as well as areas between Ch 675.800 and Ch 678.200 along the Camurra North section for construction of the Camurra bypass. The area required under the current design for the proposal is summarised in Table 7-5. Further details of acquisition are provided in Chapter 9: Land use and property.<br>The proposal would require temporary occupation and permanent acquisition of land along the alignment. A total of 27 lots is currently estimated and would likely be impacted by permanent land acquisition, including approximately 4 hectares (ha) of private land within 12 lots and 9 ha of Crown land within 15 lots. | Table 7-5<br>Section 7-4<br>Chapter 9: Land use and property<br>Table 9-6<br>Figure 9-4 |
| Hydrology/flooding | Mitigation measures against potential flooding impacts during construction may consider, among other things, the following:<br>▸ preparation of an emergency evacuation plan<br>▸ assessment of previous flood and historical rainfall data, in order to highlight a time of year to focus or avoid certain activities (EIS Technical Paper 4: Hydrology and flooding impact assessment)<br>▸ construction of all-weather access and egress<br>▸ undertake a flood/drainage assessment to inform the siting and scale of temporary construction areas (including stockpiles, construction compounds, fuel storage and laydown areas). Locate these areas on land that is not subject to flooding or in a manner that minimises external impacts, as far as practicable<br>▸ mobile plant and equipment that can demobilise and move in the event of evacuation notice<br>▸ construction or identification of existing elevated areas for equipment/material refuge in a flood event<br>▸ maintaining clear ways to access/egress points<br>▸ development of recovery plans for post flood events. | Chapter 12: Hydrology and flooding impact assessment<br>Technical Paper 4: Hydrology and flooding impact assessment<br>Figure 12-1<br>Figure 12-5<br>Figure 12-7 |

Figure IV depicts the key features of the proposal.

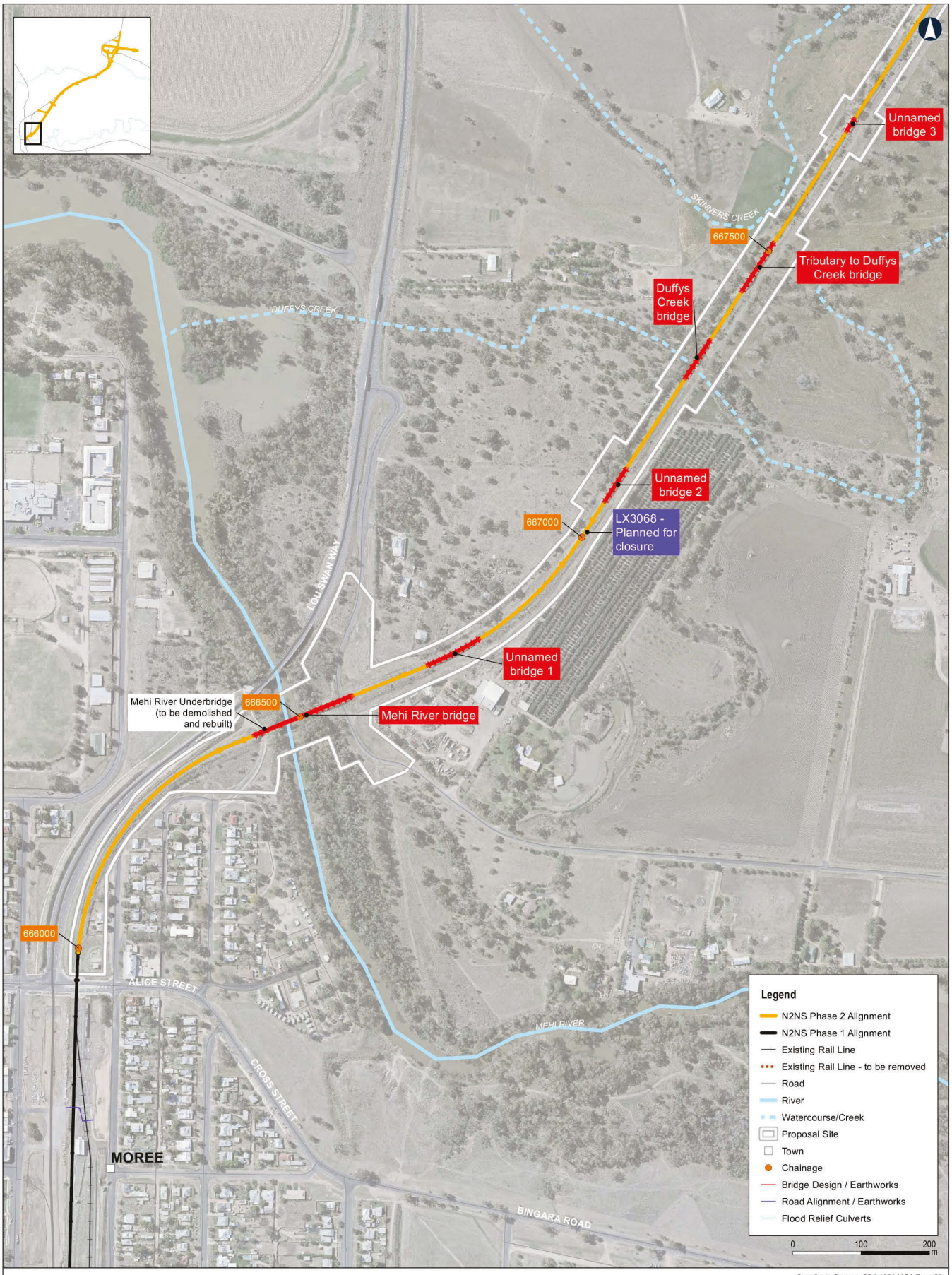


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021
Map 1 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021

Map 2 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021
Map 3 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021
Map 4 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021
Map 5 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021

Map 6 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd

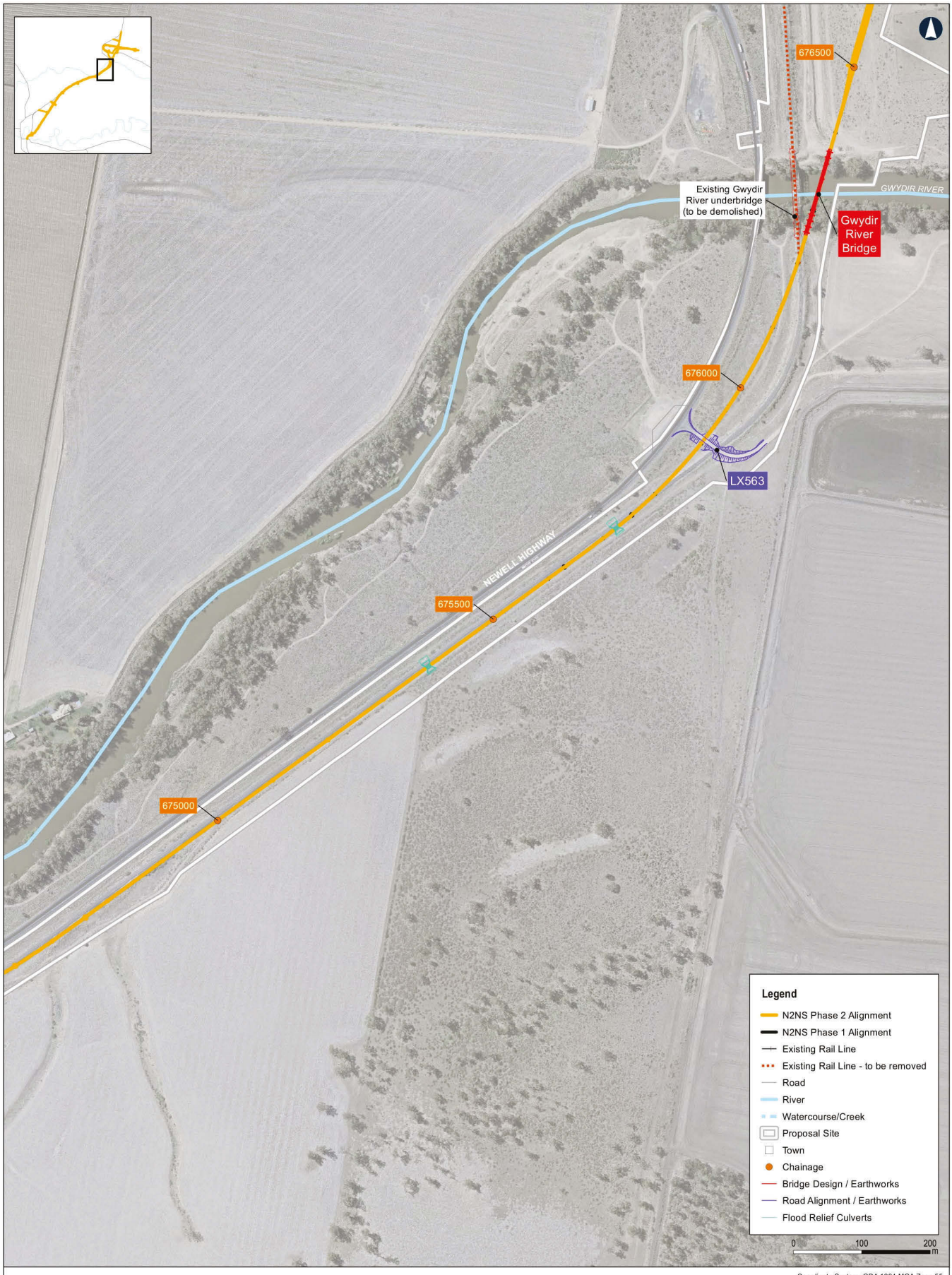


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:5,000
Paper size: A3
Date: 9/22/2021
Map 7 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd


Figure IV Key features of the proposal

Data Sources: ARTC, IRDJV, LPI, ARTC Aerial (2018)

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:12,500
Paper size: A3
Date: 9/22/2021
Map 8 of 8

N2NS_SP2_EIS_F07_01_ProposalFeatures_r3v3.mxd

## Need for the proposal

The proposal is integral to the Inland Rail between Melbourne and Brisbane, as N2NS Phase 2 forms one of the 13 projects required to deliver the program of works. N2NS Phase 2 has been designed to improve flood immunity and re-align the track to maximise train-speed efficiency. The existing bridges do not have the structural integrity or capability to carry larger axle loads of the intended rolling stock. Similarly, the track does not meet Inland Rail flood immunity or operational parameters The curves and alignment of the current track do not allow for greater train speeds and, therefore would not be able to provide the efficiencies needed for the new trains.

These changes have been implemented to provide for a faster and more efficient connection, and one that is less prone to delays from flooding in the local area. This is critical to the Inland Rail program achieving an average Melbourne to Brisbane transit time (terminal to terminal) of less than 24 hours.

The proposal provides for the following major benefits:

- it reduces the risk of disruption/closure of the rail line through the provision of improved flood immunity, particularly through the Gwydir floodplain
- it reduces the risk and impacts of washouts and embankment failures on adjacent land during flood events, thereby reducing the risk of property damage to landowners
- it avoids the need for trains to slow down by constructing a new section of track to eliminate the need to use the Camurra hairpin curve
- it provides jobs during construction and operation to the town of Moree and surrounds
- it upgrades two bridges, which will allow heavier loads and enable trains to travel at increased speeds
- it provides a safer rail line with the addition of a fence.

The proposal is a 'missing link' of the Inland Rail route between Melbourne and Brisbane; therefore, Inland Rail cannot proceed if the proposal does not proceed, which means the benefits of Inland Rail would not be realised if the proposal does not proceed.

## Timing

Construction is anticipated to commence in 2024 and is expected to take about 24 months to construct. The proposal is forecast to be operational in 2027.

## Construction hours

Proposed construction hours would be from 6.00 am to 6.00 pm, Monday to Sunday, with respite provided every second weekend with works ceasing at 1 pm on Saturday and not occurring on Sunday. Work undertaken outside the *Interim Construction Noise Guideline* (DECC, 2009) standard hours (7.00 am to 6.00 pm Monday to Fridays, 8.00 am to 1.00 pm Saturdays, and at no time on Sundays or public holidays) would be in accordance with the *Inland Rail NSW Construction Noise and Vibration Management Framework* (ARTC, 2017). Under the framework, proposed construction hours have been developed to accommodate the remote location of worksites and efficient use of the workforce and minimise disruption to commuters and freight operators using existing operational rail lines. If approved, the proposed working hours would be:

- Monday to Friday 6:00 am to 6:00 pm
- Saturday 6:00 am to 6:00 pm
- Sunday and public holidays 6:00 am to 6:00 pm (occurring on every second Sunday).

## Operation

The proposal would form part of the rail network managed and maintained by ARTC. Train services would be provided by a variety of operators. Current train services run 24 hours per day on this part of the rail network, and trains can be up to 1,800 m long.

The N2NS section of Inland Rail is currently forecast to have an average weekly demand of up to 11 trains per day in 2027 and up to 20 trains per day in 2040. The new rail line will be a faster, more efficient route that bypasses the Sydney rail network, enabling the use of double-stacked trains along its entire length.

Standard ARTC maintenance activities would be undertaken during operations. Typically, these activities include minor maintenance works, such as bridge and culvert inspections, rail grinding and track tamping, through to major maintenance, such as reconditioning of track and topping up of ballast as required. Maintenance activities would continue in accordance with the existing environment protection licence (EPL) that applies to the rail corridor (EPL 3142).

Further information on the construction and operation of the proposal is provided in Chapter 7: Proposal features and operation and Chapter 8: Construction of the proposal.

## Alternatives considered

The inland rail route selection process began with the 2006 *North–South Rail Corridor Study* (Ernst and Young, 2006), which identified a broad corridor for a future Melbourne–Brisbane railway. The study examined four broad alternatives between Melbourne and Brisbane, ranging from a far western sub-corridor via western New South Wales through to a coastal sub-corridor via Sydney and the North Coast. The main finding of the study was that a far western sub-corridor (via Albury and Parkes) would have the lowest capital cost, fastest transit time and the best economic cost-benefit performance.

The far western sub-corridor identified in the *North–South Rail Corridor Study* Ernst and Young, 2006) formed the starting point for the *Inland Rail Alignment Study* (ARTC, 2010) completed in 2010. The 2010 *Inland Rail Alignment Study* analysed a large number of alternatives within the Far Western Sub-Corridor. It identified a detailed alignment that sought to minimise construction and operational costs and maximise the economic benefit. This drove identification of key greenfield sections such as Narromine to Narrabri.

The *Inland Rail Alignment Study* (ARTC, 2010) considered two key route options from Melbourne to Parkes via Albury, using existing track from Melbourne to Parkes with a possible new direct line from Junee or Illabo to Stockinbingal. The options were differentiated based on capital cost and journey time. The options with the lowest capital cost per minute saved were considered the most cost-effective options. Analysis showed many of the options to be less favourable because of negative environmental impacts and land use constraints; significant capital expenditure; the upgrading of track did not give significant journey time improvement (due to curves and grades still constraining the speed of the train); and options to remove speed constraints were costly for little time saving.

The study found that the far western sub-corridor (via Albury and Parkes) had the lowest capital cost, fastest transit time and best economic cost benefit, considering capital and operating costs, access revenue and external factors (environmental, congestion benefits, etc.).

For N2NS it was identified that the existing railway contains a rail corridor that is largely suitable for Inland Rail, based on grade and minimal curvature.

The 2006 *North–South Rail Corridor Study*, *Inland Rail Alignment Study* (ARTC, 2010) and the Inland Rail Implementation Group report (ARTC, 2015) were high-level studies with consultation focused on Australian Government, state and local governments, and industry stakeholders. Extensive landowner, community and stakeholder consultation for Inland Rail commenced in early 2016 as a preferred alignment started to become clearer following the Inland Rail Implementation Group report (ARTC, 2015). The focus of consultation for N2NS was on explaining proposed works and timelines and gaining landowner and community feedback on impacts and designs.

The N2NS Phase 2 alignment consists predominantly of existing rail corridor from Moree north to beyond the Camurra Bypass, including the Mehi and Gwydir river crossings. Phase 2 incorporates enhancement of existing track, replacement of two bridges and construction of approximately 1.6 km of realigned rail corridor.

An overview of the development of the proposal is included in Figure V.

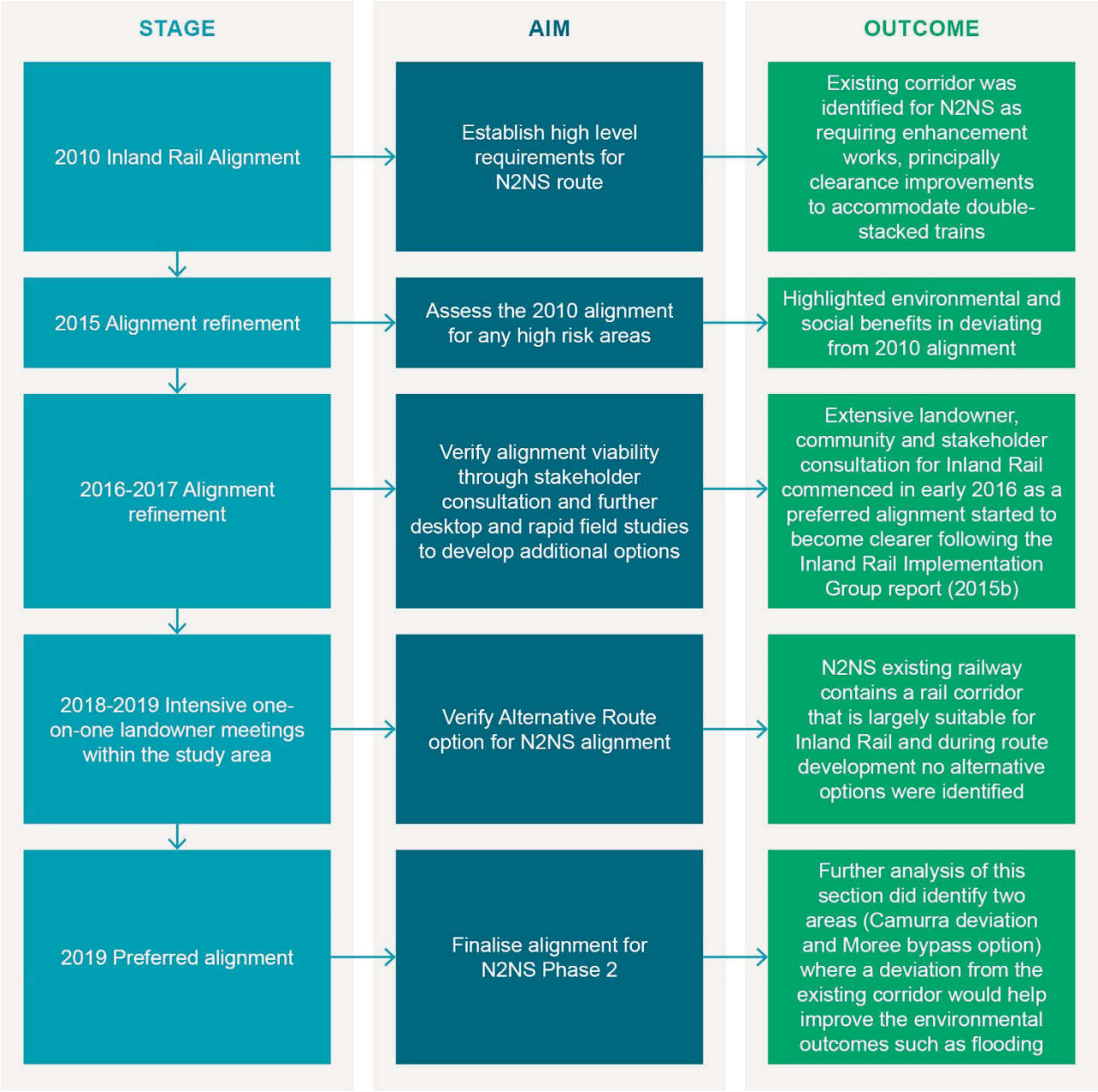


**FIGURE V STAGES AND DEVELOPMENT OF THE PROPOSAL**

## Consultation undertaken

A targeted consultation approach has been undertaken for the EIS to ensure feedback was obtained in a timely manner to inform the EIS.

Key stakeholders were identified and consultation with them was undertaken throughout the EIS—stakeholders included:

- elected members of the New South Wales and Australian parliaments
- Moree Plains Shire Council
- state and Australian government agencies
- landowners and residents with the potential to be directly or indirectly impacted by the proposal
- community, industry and environment groups
- Traditional Owners and local Aboriginal community groups
- emergency services
- utility providers
- representatives of neighbouring and related projects.

Three separate sessions were undertaken with stakeholders during the EIS and centred on three different themes being:

1 Hydrology model and proposal overview: August to September 2020

2 Understanding impacts, feedback on design: November to December 2020

3 Noise and what it means: February 2021.

Key issues raised during the consultation rounds included the following:

- property impacts
- traffic and access to properties
- hydrology and flooding concerns including flow duration, depths and velocities
- noise and vibration during construction and operations of the trains
- job creation and opportunities for locals
- visual impacts and amenity during operation
- negative health impacts from air quality.

As part of the EIS development, ARTC has responded to the feedback obtained during the consultation process such as:

- modification of the construction impact zone/construction footprint to minimise impacts to properties
- utilisation of local, commercial sources rather than setting up specific borrow sites for the proposal
- installation of additional culverts on the floodplain to assist mitigations of flooding onto private properties
- further consideration during detailed design of widening of bridge piers to allow for widening of Gwydirfield Road under the Mehi River bridge
- access under bridges and for the travelling stock route to be maintained to ensure farmers are able to move livestock from one side of the rail line to the other.

Ongoing consultation will be undertaken during the development of the detailed design and issues raised, will be carried into the detailed design phase to be further developed.

This EIS will be placed on public exhibition by the Department of Planning and Environment (DPE) for a minimum of 28 calendar days. During this period, stakeholders and the community will be able to review the EIS and are invited to make submissions.

The EIS will be made available for viewing on the DPE and Inland Rail websites. Anyone who wishes to make a submission will be able to review the EIS and send submissions to DPE for consideration.

## Key findings of the EIS

### Land use and property

The proposal minimises the potential for direct impacts to land use and properties by optimising the use of the existing rail corridor for the majority of the proposal alignment. This existing rail corridor is owned by Transport for NSW (TfNSW) and is currently leased to ARTC for railway use. Outside the existing rail corridor, the majority of land which would be affected by the proposal is currently either Crown Land (about 8.78 hectares) or agricultural land (about 3.94 hectares).

The proposal would intersect regional roads, local roads, private access roads and utilities. The proposal would also intersect numerous rivers and creeks, including the Mehi River, Gwydir River, Skinners Creek, and Duffys Creek.

The proposal would require acquisition of land both temporarily (during construction only) and permanently (for the proposal's operational infrastructure). Approximately 107 hectares of land would be temporarily occupied to facilitate construction, access tracks and construction compounds. Temporary construction land requirements are estimated to include approximately 70 hectares of privately-owned land and 37 hectares of publicly owned land, mainly owned by the NSW Government.

Permanent land acquisition would be required within three properties, comprising a total of approximately four hectares of privately-owned land and nine hectares of publicly owned land, mainly owned by the NSW Government. ARTC's preliminary consultation with potentially affected landowners has informed design development and proposed mitigation measures.

Potential land use and property impacts include:

- change in tenure and loss of private property including 2 residential dwellings
- temporary impacts to accessibility to both the road network and property access
- impacts on other infrastructure during construction including utilities and access to facilities and properties
- biosecurity risks, particularly during earthworks and construction vehicle movement
- disruption to farming operations, and agricultural vehicle and stock movements on the local road network, access onto the local road network and within properties
- impacts on TSRs.

Where impacts cannot be avoided, they would be carefully managed and mitigated through:

- property acquisitions in accordance with the relevant statutory instruments and in consultation with landowners
- rehabilitation of land required during the construction phase in accordance with a Reinstatement and Rehabilitation Plan
- a Traffic Management Plan would be developed and implemented during the construction phase to address key impacts to accessibility
- consultation with utility providers regarding requirements for relocation or protection of services impacted by the proposal would be undertaken
- access arrangements for affected properties would be developed in consultation with landowners during detailed design
- liaison with Local Land Services would occur during detailed design to understand how and when the Travelling Stock Routes are used, and how impacts can be avoided.

## Biodiversity

The majority of the proposal site has been cleared of native vegetation and cultivated for agriculture, which is the dominant land use in the area north of Moree town. The proposal would intersect some areas of native vegetation, including the Mehi and Gwydir Rivers and tributaries (riparian areas), travelling stock routes, road reserve and urban areas on the outskirts of the Moree township.

As determined by GIS mapping from available aerial imagery and Namoi/Border Rivers Gwydir NSW Vegetation Mapping, about 599 ha of native vegetation occurs in the 500 metre (m) linear buffer area used in the biodiversity assessment (see Chapter 10: Biodiversity). The vegetation in the buffer area includes riparian areas, grassy woodland communities and natural grassland communities in varying condition classes. Of this, approximately 100 ha of native vegetation and 43 ha of non-native vegetation would be cleared as a direct result of the construction of the proposal.

Four rivers and streams within 100 m of the proposal site, are listed as areas of high biodiversity value under the Biodiversity Conservation Regulation 2017 (Biodiversity Conservation Regulation). These include the Mehi River, Gwydir River, Duffys Creek and Skinners Creek. The nearest important wetland listed under the EPBC Act is the Gingham and lower Gwydir Wetlands, which occur 30 to 40 km downstream of the proposal site. Significant regional connectivity features occur within or adjacent to the proposal site. Being a largely cleared and fragmented landscape, vegetated corridors, including the riparian zones of the Mehi and Gwydir Rivers, are fundamental to the movement of fauna in the region.

Biodiversity impacts have been assessed through comprehensive landscape assessment, including a Land Category Assessment, multiple targeted field surveys, impact significance assessment and offset obligation calculations. The biodiversity impact assessment included a terrestrial biodiversity assessment, an aquatic biodiversity assessment, and an assessment of the potential impacts on matters listed under the EPBC Act. Three EPBC listed species were recorded during the field surveys, including the Murray cod, Koala and Grey-headed flying-fox. The following species were considered to have potential to occur due to the presence of suitable habitat within the subject land and may be impacted:

- Belson's Panic (*Homopholis belsonii*)
- Painted Honeyeater (*Grantiella picta*)
- Five-clawed Worm-skink (*Anomalopus mackayi*)
- Superb Parrot (*Polytelis swainsonii*)
- Corben's Long-Eared Bat (*Nyctophilus corbeni*)
- Winged Peppercress (*Lepidium monoplocoides*)
- Satin Flycatcher (*Myiagra cyanoleuca*) (Migratory Species).

Three threatened ecological communities were also confirmed as present within the proposal site, including endangered and critically endangered habitats. These include Weeping Myall Woodland, Natural Grasslands and Poplar Box Woodland.

A Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the NSW Biodiversity Assessment Method 2020 (BAM) established under the *Biodiversity Conservation Act 2016* (NSW) (BC Act).

The biodiversity impact assessment identified the following key impacts that would occur as a direct result of the construction of the proposal:

- habitat clearing for permanent and temporary construction facilities, resulting in the direct loss of native flora and fauna habitat, and the potential injury and mortality of fauna during clearing
- displacement of resident fauna causing a decline in local fauna populations
- injury or death of fauna causing a direct loss of native fauna and a decline in local fauna populations
- disruption to connectivity reducing the ability for fauna to move across the landscape and breed
- removal of habitat features, e.g. hollow bearing trees, causing the direct loss of fauna habitat and the potential injury and mortality of fauna during clearing
- work in waterways, causing the direct loss of riparian habitat and the disturbance of aquatic habitat.

During operation, the main impact to biodiversity would be through train strikes.

Mitigation measures proposed to manage impacts are provided in detail in the BDAR and Chapter 10: Biodiversity. Key mitigation strategies include:

- detailed design would refine the area of impact, to reduce the amount of vegetation clearing so far as reasonably practicable
- clearing protocols would be implemented during clearing, including pre-clearing surveys, daily surveys and staged clearing, with the presence of an ecologist or wildlife handler
- scheduling of clearing activities would avoid breeding seasons as far as reasonably practical. Where this is not practical and where breeding sites are identified within the corridor during pre-clearance surveys, a suitably qualified person would provide mitigation measures for exclusion zones/relocation requirements relevant to the specific species identified.
- a survey report would be prepared detailing fauna species identified during pre-clearing surveys, number of each species, and proposed relocation and/or other actions undertaken
- where practicable, species would be relocated to suitable nearby habitat outside of the proposed alignment
- an unexpected finds procedure would be implemented during construction
- vegetation would be rehabilitated to increase habitat availability
- artificial fauna connectivity structures would be implemented
- habitat features (fallen timber, hollow logs) would be relocated (where possible) from within the development site to an adjacent area
- temporary fencing would be erected to protect significant environmental features and threatened species habitat
- sediment barriers and spill management protocols would be implemented to control the quality of water runoff from site into the receiving environment
- staff training and site briefing would be conducted to communicate environmental features to be protected and measures to be implemented.

A flora and fauna management plan would be developed during detailed design to ensure key mitigation and management techniques are implemented, and offsets would be delivered in accordance with the BAM calculations outlined in the BDAR in accordance with the BC Act.

## Traffic and transport

Moree is located on the Mungindi (North West) railway line. Currently, occasional grain/goods trains operate on an as-needs basis through the study area. Train count data between January 2014 and December 2015 shows an average of 1.8 freight trains per day. Existing rail operations would be suspended throughout the construction period, as construction may require full possession of the existing rail line.

The Newell Highway, Gwydir Highway, River Road and Gwydirfield Road are the major roads within the study area. There are also a number of local roads and private rural roads. Low traffic volumes are characteristic of the region, due to its rural setting and relatively low population density. The traffic impact assessment found that all roads within

the study area, including the Newell Highway, operate at good levels of service, even at peak periods. If the peak hourly volume on the Newell Highway were to increase due to seasonal variation by around 50 per cent, the addition of 70 construction vehicles per hour would mean the highway would still remain operating at a high level of service.

The traffic and transport impact assessment study area included a network of both road and rail infrastructure. The impacts associated with possession of the existing rail line are not likely to be significant due to the low number of freight trains that use the existing line. Construction of the proposal would result in temporary impacts to traffic and access. It is estimated that construction would generate a total of 252 vehicles per day including 52 heavy vehicles. Construction vehicle movements would be generated by the workforce commuting to and from site and the transport of materials. Peak-hour workforce traffic movements are likely to be minimal as construction workers would be traversing the roads outside of peak hours (8:30–9:30 am and 4:30–5:30 pm).

Proposed works on level crossings and bridges may result in disruptions to local traffic and pedestrians. It is anticipated that traffic would continue to use the level crossings while they are being upgraded and their movements would be managed through the provision of suitable traffic control measures. The shared pathway at River Street and under the rail line near the Mehi River would need to be closed for the duration of construction works on the Mehi River bridge. This would impact pedestrians and cyclists using this path to cross from the east side of the rail line to the west side to access the town centre of Moree. These impacts would be managed through the traffic, transport and access management plan prepared by the appointed contractor of works.

During operation, there would be some maintenance/operational traffic generated; however, this is not likely to significantly alter the existing traffic levels. The main impact of the proposal during operation would be localised impacts on travel time as a result of increased train activity at level crossings. The frequency of trains, and therefore the likelihood of delays, is likely to increase over time as the number of trains using Inland Rail increases. Performance of the Gwydir Highway/Moree Bypass intersection in particular was assessed to determine the impact of crossing closure due to train movements. Modelling indicates only minor delays would be experienced, ranging from an average of 48–49 seconds in 2027 to 55 seconds in 2040. This is a 5–10 second increase (on average) from the current delay. The total maximum delay at the Gwydir Highway/Moree Bypass intersection is 158 seconds.

Figure VI below depicts the layout of a typical active level crossing.

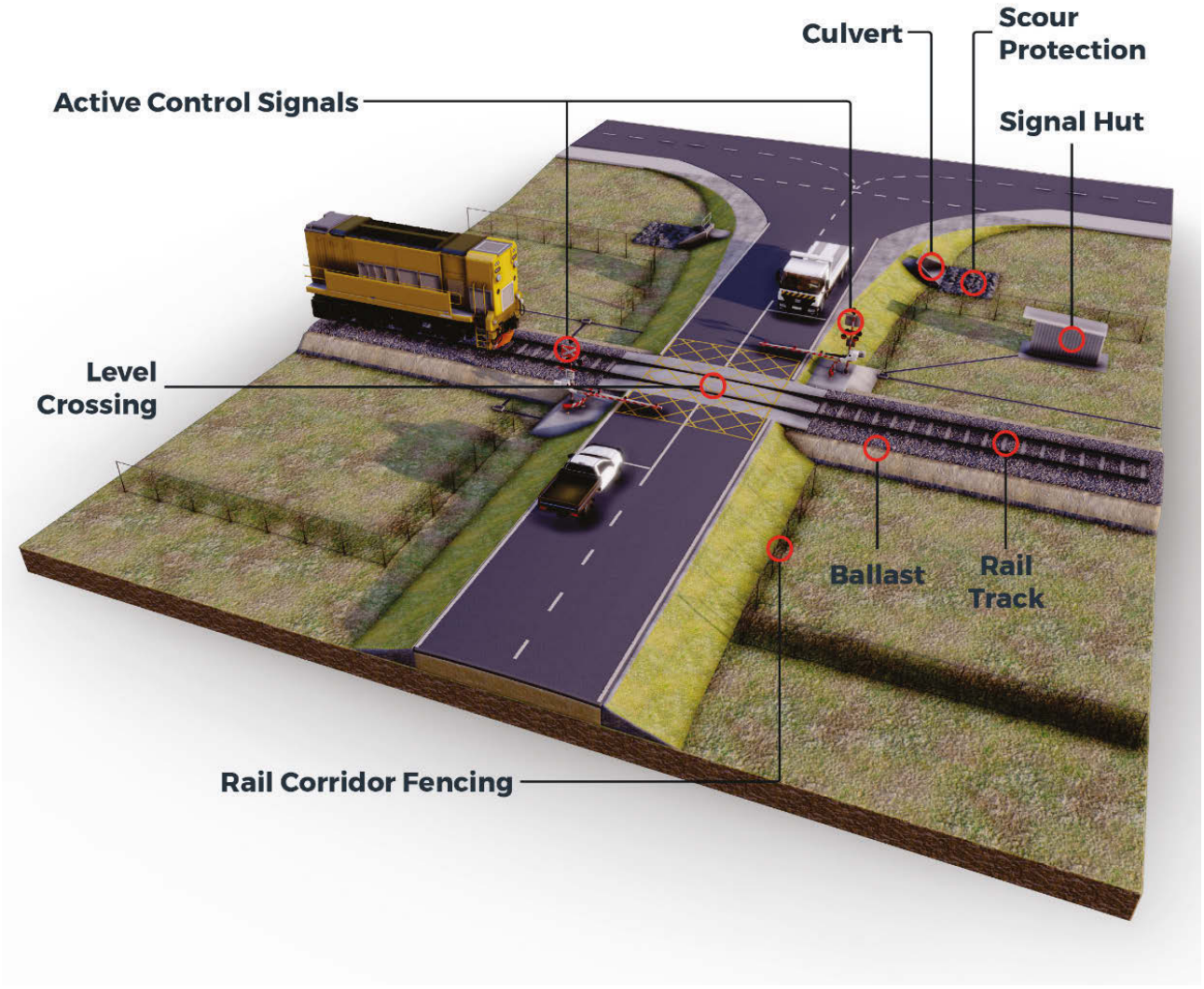

FIGURE VI ACTIVE LEVEL CROSSING

Movements on the Newell Highway are not likely to be adversely affected; rather, the proposal is expected to have a positive impact on the road network by relocating some of the road freight to rail. Similarly, the upgrades would not have any negative impacts on train paths when in operation.

An indicative representation of the design and cross-section of the proposal on the existing alignment close to the Newell Highway is shown in Figure VII.

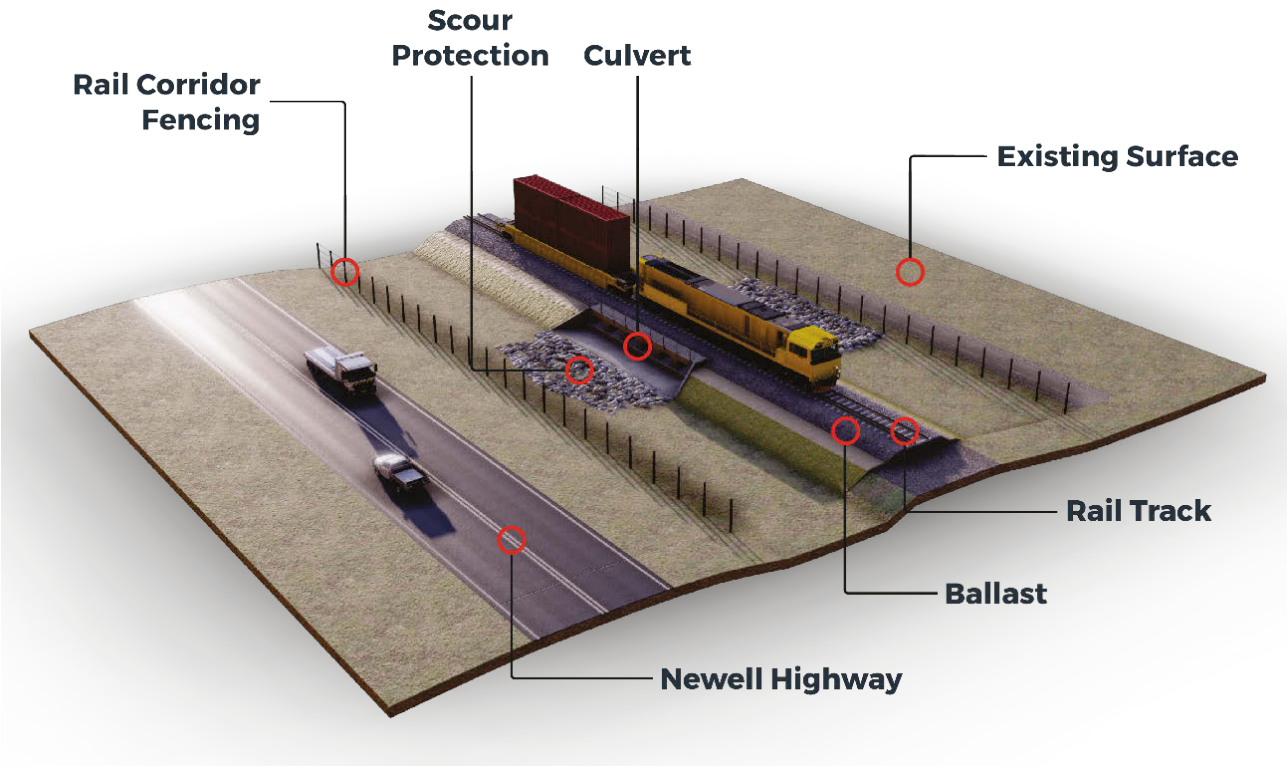


FIGURE VII REPRESENTATION OF THE EXISTING RAIL CORRIDOR IN PROXIMITY TO THE NEWELL HIGHWAY

Key mitigation measures associated with managing traffic and access impacts include:

- detailed design would aim to minimise the potential for impacts to the surrounding road and transport network, and property access
- a road dilapidation report for local public roads to be used by haulage vehicles would be prepared
- all necessary and appropriate warning signage, line marking and other traffic controls would be provided in accordance with ARTC and Australian Standards
- the community and relevant stakeholders would be notified in advance of any proposed road, pedestrian or TSR network changes through consultation, signage, the local media, and other appropriate forms of communication
- where changes to property access is required, ARTC would advise property owners/occupants and consult with them in advance regarding alternative access arrangements.

## Hydrology and flooding

The proposal is located within the Gwydir catchment, which is a sub catchment of the Murray–Darling Basin. The Gwydir catchment is in northern NSW and covers 26,600 square kilometres ($km^2$) from the Great Dividing Range (GDR) in the east to the Barwon River in the west. The proposal is located within a sensitive floodplain, and intersects numerous rivers and creeks, including the Mehi River, Gwydir River, Skinners Creek, and Duffys Creek. There are a number of farm dams located along either side of the proposal site. These dams intercept overland flow and are used as water supply for agriculture in the region.

Existing flooding patterns for the Gwydir–Mehi system around the proposal on the floodplain are extensive. The floodplain approaches 9 km in total width through the area for the 5%, 2% and 1% annual exceedance probabilities (AEP) events, with a significantly reduced extent of approximately 5 km for the 10% AEP event. Extensive areas of deep floodwaters occur, with flood depths exceeding 1 m over most of the floodplain in large events. Under these conditions, the Newell Highway and most local roads are flooded and untrafficable. A

significant area of Moree township experiences flooding in flood event of 5% AEP and greater, as evidenced in the March 2021 flood event, and most of the farmland and properties east and west of the rail corridor are susceptible to flooding.

The methodology for the initial EIS stage flooding assessment was based on the adaptation and use of the Moree Plains Shire Council's flood model of Moree and environs from the 2016 flood study (WRM, 2017) to establish the baseline, or existing flood conditions and behaviour, and to test the impact of the proposal on the flood regime within the rail corridor and the adjacent land. The model was used to simulate flood event AEPs of 20%, 10%, 5%, 2% and 1% and Probable Maximum Flood (PMF) levels. A soil sampling program was undertaken to determine the susceptibility of soils to erosion in areas where the proposal would alter the flood velocity.

A key design objective of the proposal is to deliver a more resilient and reliable rail corridor with improved flood immunity and increased resilience to the effects of flooding. Based on ARTC's assessment of reliability and resilience requirements for this section of Inland Rail and the wider network, the following Flood Planning Levels (FPLs) have been adopted:

- FPL for top of formation (TOF): Minimum of 5% AEP
- FPL for top of rail (TOR): Minimum of 1% AEP.

The EIS rail design currently achieves these FPLs through raising the level of the rail by approximately 500 mm above the existing rail levels, with a reconstructed rail formation and provision of approximately 1,100 cross-drainage structures—primarily flood relief culverts, to allow passage of overland flow on the floodplain between the Mehi and Gwydir Rivers. The additional cross drainage structures (box culverts) help to mitigate the risk of increasing flooding on the upstream (eastern) side of the rail corridor due to the obstruction of floodwater that previously overtopped the rail.

For events between the 5% and 1% AEP, floodwaters would rise above the TOF and inundate the ballast and sub-layers, but would not destroy the formation. A technical review of flood depths, velocities and durations at the formation has been undertaken to confirm that the risk of damage to the rail assets is acceptable to ARTC for all events up to and including the 1% AEP.

The flood model results suggest that flood levels in the 20% AEP event may increase locally upstream of the rail corridor. There would be no increase in flood levels greater than 20 mm within urban areas. A localised increase in flood levels downstream of the rail corridor may occur in a 10% AEP event; however, flood levels would likely be reduced upstream. There would be no increase in flood levels within urban areas greater than 20 mm. In the 2% and 5% AEP flood events, a general decrease in flood levels is predicted upstream of the corridor and localised increases in flood levels may occur downstream of the corridor. Impacts on cropping land are likely. Flood levels in the 1% AEP event would likely increase upstream of the corridor in proximity to the rail line by less than 100 mm. Flood level increases in the urban area of Moree south are likely but are unlikely to exceed 20 mm. Cropping land is likely to be the most affected by changes in afflux as a result of the proposal.

The impact on the Newell Highway is considered to be positive overall due to a net reduction in flood hazard along the highway. There are, however, numerous QDL exceedances and time of closure impacts along the highway. These impacts will be subject to further investigation at the detailed design stage to refine the design to better balance impacts east and west of the rail corridor and reduce impacts on the Newell Highway and land to the west of the proposal for this event.

While the flooding impacts associated with the proposal alone would be considered relatively minor, the cumulative flooding impacts associated with the proposal and the N2NS Phase 1 section of Inland Rail and the Newell Highway upgrade, are considered more significant. As per Technical Paper 4: Hydrology and flooding impact assessment, the combined impacts from the construction of both the proposal, N2NS Phase 1 and the Newell Highway upgrade would likely result in increases in afflux around the rail corridor and on properties located in the area between the road and rail corridor. Chapter 12: Hydrology and flooding impact assessment, Chapter 26: Cumulative impacts and Technical Paper 4 provide further detail on these cumulative impacts.

Due to the proposal being located within a flood plain, mitigation measures would be implemented to avoid impacts to the surrounding environment as far as practicable. The detailed design phase flood modelling would be iterated through sufficient scenarios and culvert design arrangement, to inform planning of the works such that construction-phase flood impacts would be identified and managed accordingly. The outcomes of the modelling would be used to inform the construction-phase flood emergency response plan. Flood model results would be used to identify areas free from flooding in a 10% AEP event and construction facilities would be located in these areas where required. Prior to construction, a flood warning system would be established that monitors real time and forecast rainfall data and real time streamflow gauge data. Ongoing consultation with landowners affected by minor flood level increases at properties would be required at the detailed design stage to confirm any reductions in impact achieved at the detailed design stage and confirm whether any at-property mitigation measures are required to manage residual impacts.

Further refinement of the cross-drainage design would occur at the detailed design stage, to reduce exceedances of the currently adopted impact criteria. This may involve some repositioning and reconfiguration of the cross-drainage structures in the current design and provision of additional structures.

## Water quality

The proposal site makes up a small component of the overall Gwydir catchment; however, it crosses two major waterways; Gwydir River and Mehi River, and several tributaries of these rivers. The Ramsar declared Gwydir Wetlands, located 10 km west of Moree, are also downstream of the Gwydir River crossing.

Water quality sampling was undertaken at the proposal site in March 2020. Samples were subject to in-situ testing of physical parameters and subsequent laboratory testing of chemical parameters. The testing found that existing surface water quality in the vicinity of the proposal is varied, but generally did not meet NSW Water Quality Objectives.

Construction of the proposal is not anticipated to significantly impact water quality in the immediate area, due to the nature and extent of the construction activities that can be effectively managed through implementation of appropriate water quality management measures such as sediment and erosion controls.

Identified potential impacts to water quality during construction include:

- increased run-off into receiving waterways due to use of water for construction activities, such as dust suppression
- increased run-off volumes across exposed areas and increased pollutant, sediment load or organic matter entering receiving waterways due to vegetation clearing and stockpiling, resulting in exposed soils
- disturbance of agricultural land and land within the existing rail corridor for construction, resulting in the disturbance of soils (potentially contaminated) and the release of contaminants such as herbicides and pesticides
- preparation and use of concrete, which, in the event of a spill, may enter waterways
- construction of culverts and bridges in waterways, which may disturb waterway beds and banks, increase exposure of soils to erosion.

No impacts to water quality are anticipated during operations.

An erosion and sediment control plan and a soil and water management plan (SWMP) would be prepared as part of the construction environmental management plan (CEMP). The SWMP would comply with the proposal conditions of approval and be in accordance with best practice for erosion and sediment control, guided by *Managing Urban Stormwater* (Landcom, 2004) (the Blue Book).

## Groundwater

For the purposes of the groundwater assessment, the study area consists of a 2 km buffer encapsulating the linear proposal site. The 2 km buffer area is considered sufficient to capture all or any potential impacts associated with the proposal and encompass sensitive environmental receptors such as registered groundwater bores as well as aquatic and terrestrial groundwater dependent ecosystems. The main source of groundwater in the study area is the Lower Gwydir Alluvium.

Water quality in the Lower Gwydir Alluvium is of a high quality, supplying the town of Moree with potable water, with only minor treatment. Numerous household and irrigation bores are also within the study area, reflecting the high quality of the resource.

The impact assessment characterised potential changes to the existing condition of the groundwater environment associated with the construction and operation of the proposal. Potential impacts identified from the construction and operational phases of the proposal include:

- reduction in groundwater levels as a result of dewatering (construction and operational) resulting in reduced groundwater availability to existing groundwater users, groundwater dependent ecosystems or baseflow to creeks or river systems. Dewatering may also cause settlement
- change to groundwater quality from contamination may occur from the storage, spillage and leaks of hazardous substances, during construction activities or spillage during maintenance and transport activities post construction. These substances, including wastewater discharge, can interact with groundwater through surface infiltration. The presence of reactive natural soils may undergo changes associated with construction activities (i.e. lowering and rewetting of reactive soils)
- changes to groundwater availability due to an increase in groundwater levels, as a result of piling impeding groundwater flow, or increased recharge associated with ponding of groundwater due to inadequate drainage. Reduced recharge to aquifers may also occur as a result of drainage diversions. Changes to groundwater flow paths may mobilise salts, increasing the salinity of the water quality for downgradient receptors
- changes to surface infiltration (ponding), evaporation or evapotranspiration, due to alteration of the existing vegetation coverage or surface topography, may either increase or reduce groundwater availability.

A groundwater mitigation and management plan (GWMMP) would be prepared as part of the CEMP. The GWMMP would comply with the proposal conditions and be implemented to monitor the effectiveness of mitigation and management measures applied during the construction phase of the proposal. Groundwater monitoring would be implemented for the proposal during construction and operation, using existing and additional bores, to monitor potential contamination.

## Cultural heritage

### Aboriginal heritage

The proposal site falls within the boundaries of the Gomeroi Nation (also known has Kamilaroi, Gamilaroi, or Gamilaraay). The Gomeroi Nation is comprised of various smaller clans. Gomeroi Country extends from today's Queensland border, west to Coonabarabran and south to the Upper Hunter Valley.

A search of the Aboriginal Heritage Information Management System identified two registered Aboriginal sites within the proposal site: an artefact scatter and the Steelbridge Camp. The artefact scatter is located to the south-east of the existing rail corridor and contains 50–100 artefacts and burnt clay nodules with the terrace landform adjacent to Duffys Creek. The Steelbridge Camp was later updated on the database to 'not a site' as no Aboriginal objects were identified. No Aboriginal places as declared under section 84 of the *National Parks and Wildlife Act 1974* (NSW) were located within the proposal site. No Aboriginal places of heritage significance were identified within the *Moree Plains Local Environmental Plan (LEP) 2011*.

Archaeological survey of the proposal site was undertaken using pedestrian survey in conjunction with representatives of the Registered Aboriginal Party. The survey identified five new isolated artefacts within the proposal site. The cultural heritage values identified include: the Steelbridge Camp; waterways including the Mehi and Gwydir Rivers; remnant native vegetation including bush tucker and medicine trees; and the availability of resources in the area between the Mehi and Gwydir Rivers.

The Aboriginal cultural heritage risk assessment concluded that construction of the proposal would directly impact one previously recorded aboriginal site—the artefact scatter adjacent to Duffys Creek. Three of the five isolate artefacts identified during archaeological survey of the proposal site would also be directly impacted by the construction of the proposal resulting in a partial or total loss of value. Potential archaeological deposits identified at the Gwydir River terrace, Mehi River terrace and Duffys Creek may also be impacted by construction, resulting in a partial loss of value. Identified areas of Aboriginal cultural heritage value, such as the Mehi and Gwydir Rivers and native vegetation containing bush tucker within the proposal site, would also likely be impacted by construction of the proposal due to clearing. No additional direct impacts are anticipated during operation of the proposal.

Detailed design would aim to minimise the potential impacts on these sites and areas as far as possible. Where impacts are unavoidable, the significance of impacts would be minimised by implementing the mitigation measures provided. Measures include preparing and implementing an Aboriginal cultural heritage management plan to manage Aboriginal heritage and minimise the potential for impacts during construction, archaeological investigations, archaeological assessment and salvage methodology.

### Non-Aboriginal heritage

The majority of the proposal site is located to the north-east of the town centre of Moree. Moree was established during the early 1800s and falls within the boundary of the adjacent parish of Mia Mia.

Several listed heritage items where identified within the 300 m boundary area for the proposal. These include the Mehi River bridge, the Gwydir River underbridge, the Moree Railway Station and the Victoria Hotel. The Mehi and Gwydir River bridges are within the proposal site and are listed on both the State heritage register and the ARTC s170 Register. These two bridges would be subject to significant direct impacts during construction, as the proposal requires the full demolition and reconstruction of both bridges. Works would remove all fabric of the original bridges and permanently alter views and vistas to and from the item.

The Moree Railway Station and Victoria Hotel are outside the construction footprint; however, the Railway Station is listed as locally significant and included on both the State heritage register and the RailCorp s170 Register. The Victoria Hotel is locally significant under the *Moree Local Environmental Plan 2011* (LEP). Both of these items would be indirectly impacted by both the construction and operation of the proposal, with impacts limited to negligible visual impacts.

The overall guiding principle for cultural heritage management is that, where possible, cultural heritage should be conserved. If conservation is not practical, measures would be taken to mitigate impacts to items of heritage significance. Detailed design and construction planning would therefore aim to minimise the potential impacts on listed and potential heritage items as far as possible. The removal of the Mehi River and Gwydir River bridges would be guided by a salvage strategy. At a minimum, the salvage strategy would include an assessment of the condition, significance, storage requirements and the potential reuse of each of the elements of the structures. This would be prepared in conjunction with a heritage interpretation strategy to identify the fabric for possible reuse in interpretation or as part of the design of the new bridges.

## Noise and vibration

The existing noise environment surrounding the proposal is characteristic of a rural landscape. The acoustic environment consists predominantly of natural sounds, with the majority of the study area also experiencing background traffic noise associated with the Newell Highway.

The study area for the construction noise and vibration assessment consists of a 2 km buffer around the proposed rail alignment. The noise model used is representative of the highest potential noise levels, as it assumes the loudest volumes emitted from the plant item at the closest point within the work area to the receivers and assumes continuous operation over the 15-minute assessment period. Meteorological conditions that are conducive to the propagation of noise from the source to the receiver were also adopted in the model.

Key construction activities that may impact receivers include site establishment, track upgrade, drainage formation, level crossing upgrades, culvert installation, bridge demolition and bridge construction. Exceedances of noise management levels (NMLs) during construction are predicted for all noise catchment areas (NCAs), including residences, classrooms at schools, places of worship and/or recreation areas in at least one modelled scenario. Residential receivers located in Moree are expected to experience the greatest number of NML exceedances, with an exceedance occurring in all modelled scenarios. However, as works would progress along the alignment of the proposal over time, the predicted noise levels would not be expected to occur continuously for individual sensitive receivers over the duration of the construction of the proposal.

Construction works outside of working hours defined in the *Inland Rail NSW Construction Noise and Vibration Management Framework* would comply with the *Interim Construction Noise Guideline* (DECC, 2009). No noise generating activities would be conducted to the south of the first access to the rail corridor from the Newell Highway and only non-construction activities (such as toolbox talks, staff arrival and refuelling) would be undertaken between 6 am and 7 am in Moree, where feasible.

Certain construction activities would require the use of vibration-intensive equipment that may affect the nearest sensitive receivers. The most vibration-intensive plant nominated as part of the work would be the use of vibratory rollers. Other equipment would include excavator, tamper and regulator, piling rigs and breaker mounted on excavator. A total of 37 residential and 4 commercial receivers would be located within the human response minimum working distances when the vibratory roller would be used, and one residential receiver when the excavator would be used. No receivers, residential or non-residential would be within the minimum working distances when other vibration generating equipment such as the tamper and regulator, piling rog (bored) and breaker mounted on excavator would be in use.

Potential noise emissions during the operation of the proposal were modelled for years 2025 and 2039. It should be noted that when this modelling was conducted Inland Rail was forecast to be operational in 2025. This forecast operational date is now 2027. Please note that the noise levels predicted under the 2025 noise model remain applicable for the 2027 forecast operational date. For clarity, this will be highlighted in this section as ‘2025 (2027)’ to indicate the use of the 2025 model, which remains applicable for 2027.

The noise model predicted no operational exceedances of NMLs during the day for residential receivers during either 2025 (2027) or 2039. During the night (10 pm–7 am), operational NML exceedances would be experienced by a total of 6 and 12 receivers for 2025 (2027) and 2039, respectively.

All potentially affected receivers are located within the township of Moree, specifically within the Morton and Oak Street area. The potential installation of a 5 m noise barrier to reduce operational noise impacts to residents in Moree would be subject to further assessment during detailed design.

Vibration levels during operation at the representative most affected receivers are predicted to comply with the most stringent vibration dose value and cosmetic building damage criteria.

Prior to commencement of works, a Construction Noise and Vibration Management Plan would be prepared and implemented in accordance with the requirements of the *Interim Construction Noise Guideline* (DECC, 2009) and *Construction Noise and Vibration Management Framework* (ARTC, 2017). The plan would take into consideration all reasonable and feasible measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable. If no quieter work method is feasible and reasonable, consultation with occupants of affected residences would be undertaken to explain the duration and noise levels of the works and any respite periods that would be provided.

## Socio-economic impact

Moree Plains Shire is a 17,927 km$^2$ local government area in the north west of NSW. The shire adjoins the Queensland–NSW border to the north and the Gwydir, Narrabri and Walgett local government areas to the east, south and west, respectively. Moree is the shire's largest town as well as an administrative and economic centre.

Critical considerations for the social and economic impact assessments include the large Indigenous population in the region (relative to other areas in NSW), indicating potential cultural heritage and workforce participation considerations; low rates of owner-occupiers indicating a higher reliance on the rental market; and a rapid upswing in residential property prices during 2021 due to a strong agricultural season, upward regional migration and the N2NS Phase 1 project, suggesting potential future housing provision impacts.

At a local level, the proposal would support regional economic development through opportunities for local and regional employment, businesses and industries. Specifically, the proposal offers:

- opportunities to promote Indigenous, local and youth employment through jobs offered by the construction of the proposal
- opportunities to engage Indigenous, local and regional businesses in proposal construction through the supply of resources and materials.

Opportunities for businesses in secondary service and supply industries (such as retail, hospitality and other support services) have the potential to act as a catalyst for further private sector investment in the study area, by providing efficient transport access to intrastate and interstate markets. ARTC has committed to working with local and Indigenous businesses, where possible, and would work with the preferred contractor to improve local economic outcomes by developing local suppliers' capacity to engage in the procurement process. Skills and training opportunities would deliver positive economic and social benefits during construction by increasing the local employment pool. Further, safety and amenity benefits are expected for road users as a result of the reduction of road freight transport on major road corridors.

Dedicated workers' accommodation would be provided close to the proposal at suitable locations. As per the ARTC Inland Rail Accommodation Principles, contractors would be required to prepare a workforce housing and accommodation plan to manage the impacts of non-resident workforces on local housing and accommodation markets.

The proposal alignment has been designed to minimise impacts to local business, industry and the housing market as far as practicable; however, the proposal may result in the following negative socio-economic impacts:

- an influx of non-resident workers, which places pressure on available services
- temporary disruptions to the local road network, which would result in longer journeys
- temporary impacts to short term accommodation availability during construction
- alterations to access and internal movement patterns on rural agricultural properties
- impacts on Indigenous cultural heritage sites, including changes to native landscapes and the destruction of historical meeting places
- changes to amenity in the local area, including community open space and facilities
- short-term impacts to tourism due to visual impacts (loss of scenic amenity) and noise during construction
- temporary and permanent changes to landscapes in urban and rural areas (loss of agricultural land)
- interactions with new rail infrastructure and increased train movements, which may pose an ongoing safety risk for residents, as well as impacts to amenity due to noise from increased train movements
- changes to hydrological flows, which would alter the flood risk for dwellings and community spaces during major flood events.

These impacts would be mitigated through the preparation of a social impact management plan (SIMP) and a construction environment management plan (CEMP). Targeted management measures would be developed for all social impacts assigned a medium or high-risk rating and included in the SIMP.

A number of temporary positive impacts will also result during construction including:

- local employment opportunities
- stimulation of the local economy through the provision of general goods and services
- skills development for workers employed during construction.

Community and stakeholder engagement would continue to be undertaken with all identified stakeholders during detailed design and pre-construction, construction, and post-construction. Stakeholder and community engagement plans, as well as a communication plan, would be developed to ensure stakeholder relationships are maintained, roles and responsibilities between ARTC, contractor and other key stakeholders are clear, and stakeholders are provided with opportunities to receive information and provide inputs in a timely and comprehensive manner.

## Visual amenity

The landscape surrounding the proposal site is characterised as rural. Built landscape features include scattered residences, farm buildings, sheds and agricultural structures, most of which are located more than 100 m from the proposal site. The town of Moree, at the southern end of the proposal site, represents the only area with an urbanised character. For the majority of the proposal site, the existing rail track and associated rail infrastructure forms one of the main visual aspects in the landscape.

During construction, the proposal would impact visual amenity as a result of visible elements such as construction works, removal of vegetation, construction machinery and equipment, stockpiling and spoil mounds, compounds, temporary accommodation and partially constructed features. Construction impacts would be temporary and limited to the construction period.

The extent from which the proposal would be visible from adjoining areas varies along the length of the proposal site due to vegetation, topography, land uses (rural and residential), and associated buildings. The number of sensitive receivers that have visual access to the proposal is generally limited due to the proposal's location predominantly within agricultural land. The largest concentration of sensitive receivers that would experience a visual impact during construction are located in Moree (southern end of the alignment), particularly along Oak Street and Morton Street.

During operation, the introduction of new and upgraded rail infrastructure, such as culverts, embankments, bridges, signalled level crossings and the passing of double-stacked container trains, would impact visual amenity for a limited number of private receptors. There would generally be a low level of visual impact in locations where the proposal consists mainly of upgrading existing rail track and culvert banks. However, moderate to high visual impact are anticipated at areas surrounding the Mehi River and the Gwydir River bridges, which would result in distinct visual modifications.

Figure VIII and Figure IX below provide indicative depictions of rail infrastructure from viewpoints along the alignment.


**FIGURE VIII MEHI RIVER AND GWYDIRFIELD ROAD SOUTH CROSSING**


**FIGURE IX GWYDIRFIELD ROAD NORTH CROSSING**

Detailed design would continue to be refined to minimise visual impacts. Landscape and rehabilitation for the proposal would be guided by the ARTC Inland Rail Landscape and Rehabilitation Strategy. During construction, the management of visual impacts would occur through the CEMP. Measures to reduce impacts would include selecting laydown areas and other ancillary sites to reduce visual impacts. Hoarding and other visual screening methods would also be considered. Lighting would be selected to reduce light spill during night work.

During operation, measures would be implemented such as using appropriate construction materials, built form articulation and colours for bridges and level crossings, to ensure that these new built elements have as minimal visual impact as possible and integrate as sympathetically as possible with the surrounding landscapes.

## Soils and contamination

The regional geology of the Moree region is generally alluvial, associated with the large floodplains between the Mehi River, Carole Creek and Gingham watercourses. Desktop studies did not identify any risks of acid sulfate soils or soil salinity within the proposal site. Similarly, a search of the NSW Environment Protection Authority (EPA) record of notices, under section 58 of the *Contaminated Land Management Act 1997* (NSW) and a list of notified sites, did not identify any sites in, or within 250 m of, the proposal area. Eight sites were identified in proximity to the proposal on the ARTC Contaminated Sites register. Three of these sites fall within the construction footprint for the proposal.

The potential soil and contamination impacts associated with the construction and operation of the proposal include:

- disturbance and erosion of soils during earthwork activities
- changes to the soil surface as a result of earthwork activities, vegetation clearing or creating embankments, resulting in erosion and sedimentation down-gradient
- contamination of land and waterways due to existing contaminated material within the rail corridor, leaks and spills during construction, maintenance and operational train activities
- uncovering hazardous materials during construction and maintenance activities
- inappropriate management and disposal of contaminated waste material
- diversion of existing contamination due to construction activities.

During detailed design, a site-specific contamination investigation would be undertaken to assess the three sites listed on the ARTC Contaminated Site Register. Prior to construction, both an erosion and sediment control plan and a contaminated land and hazardous materials management plan would be prepared as part of the CEMP in accordance with relevant guidelines. Excavated materials from the corridor would be assessed for beneficial reuse in construction, or appropriate disposal. If contaminated areas are encountered during construction, appropriate control measures would be implemented to manage the immediate risks of contamination. A site-specific emergency spill plan would also be developed and implemented during construction and operation and would include spill management measures in accordance with the relevant EPA guidelines.

## Waste

The waste assessment provides an indicative quantity of waste and potential waste and includes management strategies to reduce waste generation to consequently minimise disposal to landfill. ARTC has identified waste commitments within the *Inland Rail Sustainability Strategy* (ARTC, 2019), which are to be used as guidance within the design, construction and operational waste considerations.

An environmental risk assessment prepared for the proposal found that the proposal was generally unlikely to produce significant amounts of waste during operation, with the majority of potential waste material to be produced within the construction phase. Potential impacts associated with waste include:

- excessive use of natural resources (disposal as waste)
- waste to be disposed to landfill
- uncontrolled release of waste (may cause contamination of land, surface or ground waters and dependent ecosystems)
- controlled release of waste (may cause contamination of land, surface or ground waters and dependent ecosystems, where not correctly managed).

Avoidance, mitigation and management of potential waste would be applicable during the design, construction and operation of the proposal, in line with regulatory requirements and existing ARTC policy. A waste management plan would be developed as part of the CEMP and would place emphasis on the beneficial re-use of material, with disposal to landfill as a final measure if no other alternatives are available. Waste would be segregated to reduce cross contamination and promote re-use and recycling of materials. Alternative approaches to construction, operation and maintenance to ensure resource efficiencies would be considered in accordance with relevant design standards.

## Climate change

The proposal is located within the New England North West region, which is generally dry and hot, with much of the region being semi-arid. The average rainfall is 585 mm per year and is generally higher in summer due to the incidence of thunderstorms. Average maximum temperatures range from 17°C–19°C in the winter to 33°C in the summer months. Average minimum temperatures range from between 4°C and 5°C in the winter to between 18°C and 20°C in the summer. In winter, the minimum is below 0°C on an average of 10.4 days.

A climate risk assessment was undertaken to inform the design and operation of the proposal. The assessment considered short-term risks (out to 2030) and long-term risks (out to 2090) using two climate projection scenarios. There were 45 climate change risks that were identified as part of the risk assessment process for the proposal. Of these risks, two were identified as relevant to the construction process, while the remaining 43 were considered relevant to design as the impacts would be realised during the operation of the proposal.

The key impacts of climate change relevant to the proposal include increased frequency and intensity of extreme weather events, increased extreme rainfall events, increased bushfire risk and rising temperatures. The effect of these impacts on rail infrastructure during construction and operation, as identified in the climate risk assessment, may include physical damage, delays in schedule and potential risks to the health and safety of the workforce. Extreme rainfall events, flooding and extreme heat would likely present the highest risk in both the near and distant future for the operation of the proposal.

Mitigation measures would include a stop-work temperature threshold, scheduling outdoor work activities around times of extremely high temperatures, and ensuring an early flood warning system is in place. Longer-term mitigation measures would include climate change allowances in design criteria, implementing flood mitigation measures along the rail corridor, incorporating solar PV and battery storage as built in redundancy to power failures, and engaging with local emergency services to coordinate emergency response procedures.

## Sustainability

Sustainability is an important consideration for the N2NS Phase 2 proposal. Particular emphasis during the planning phase has been placed on maximising resource efficiency, enhancing local economic activity, mitigating potential environmental and social impacts and promoting climate change resilience.

The *Inland Rail Sustainability Strategy* (ARTC, 2019) and *Environment and Sustainability Policy* (ARTC, 2018) outline sustainability objectives, targets and commitments for the proposal, including the implementation of a Sustainability Management Plan, and the pursuit of a Program 'Excellent' rating against version 1.2 of the Infrastructure Sustainability Council of Australia's Infrastructure Sustainability (IS) rating scheme for detailed design and as-built (construction) phases.

Sustainability has been assessed for the proposal using the framework, which underpins the IS Rating Scheme. The scheme, which considers whole-of-life impacts and benefits, has typically been used for the assessment of sustainability performance throughout the design and construction phases, and is evaluated by ISCA at the end of each of these stages. By adopting the IS rating framework during the planning phase, it has enabled the assessment of anticipated performance against defined benchmarks considering governance, environmental social and local economic aspects. This will assist with the monitoring and reviewing of performance during delivery and to stimulate the culture of continuous improvement.

## Air quality and greenhouse gas

### Air quality

The air quality impact assessment considered the potential risks to air quality during both the construction and operation phases of the proposal. The assessment results guided the development of mitigation measures to minimise adverse air quality impacts on the surrounding environment and sensitive receivers.

Air quality impacts directly resultant from the construction of large, linear infrastructure projects are difficult to estimate due to the broad range and transitory nature of construction activities. Similarly, in assessing potential air quality impacts, it is important to acknowledge the transient, short-term nature of construction-phase emission sources. At any given assessment location, only criteria for short-term averaging periods (1-hour and 24-hour) are relevant for potential construction air quality impacts.

Impacts to local air quality during construction may occur as a result of:

- dust generation from bulk earthwork, exposed soil and temporary stockpiles
- operation of construction plant, equipment and machinery
- increased vehicle movements associated with transport of construction materials (on sealed and unsealed roads)
- odour and emissions from disturbance of contaminated soils if present
- relocation of utility services
- construction and installation of infrastructure (e.g. new tracks, roads, culverts and bridges)
- demolition and removal of existing track, culverts and bridges
- combustion of fuel in both light and heavy commercial vehicles (HCVs), and mobile plant.

Of these potential construction air quality impacts, the potential for PM (dust) generation is considered the highest risk. Exhaust emissions produced by construction vehicles and plant are expected to be less significant due to their nature (discontinuous, transient and mobile).

During operation, the highest risk impacts to air quality would occur from rail exhaust emissions due to increased train movements. Inland Rail will substantially increase the number of trains operating between Camurra and Moree, with 11 trains per day in 2027 increasing to 20 trains per day in 2040. Locomotives operating in the corridor will be diesel-fuelled, meaning the main emissions for consideration include oxides of nitrogen ($NO_x$) and particulate matter.

An air quality and dust management sub-plan would be prepared as part of the CEMP and implemented during construction to ensure that air quality impacts are minimised so far as practicable. This would include dust suppression methods such as water carts, sealing haulage routes and implementing wind breaks. Monitoring of construction dust would be undertaken at sensitive receiver locations during construction. During operation, air quality would be managed to achieve compliance with the operational environment protection licence.

### Greenhouse gas

The greenhouse gas (GHG) emission assessment included the identification and impact assessment of whole-of-life greenhouse gas emissions for the proposal, including site preparation, construction and operation phases.

Construction GHG emissions would include all sources of fuel and electricity use associated with both site preparation and construction of the proposal. Estimates of construction-phase energy use and associated GHG emissions are indicative only, based on current proposal information, specialist advice, industry experience and best practice.

GHG emissions generated by the proposal would include:

- loss of carbon sequestration (vegetation clearance)
- combustion of diesel fuel (construction plant, generators, equipment and vehicles)
- electricity use (largely site compounds).

The combustion of diesel fuel is expected to be the most significant construction-phase source of GHG emissions.

Operational GHG emissions include all sources of fuel and electricity use associated with operation of the proposal. Maintenance activities, waste removal from site, embodied GHG emissions from materials and Scope 3 emissions (indirect emissions generated from sources that are not owned to controlled by ARTC), and Traction power (i.e. fuel use by rolling stock) have been excluded from the scope of the GHG assessment. Operational energy use and associated GHG emissions based on a 120-year design life found that level crossings would be the most significant energy use and source of GHG emissions in operation.

Once operational, Inland Rail as a whole is predicted to reduce current net carbon emissions by 750,000 tonnes per year, as a result of transferring road freight to rail.

The *Inland Rail Sustainability Strategy* (ARTC, 2019) and *Environment and Sustainability Policy* (ARTC, 2018) outline sustainability objectives, targets and commitments for the proposal, which includes minimisation of GHG emissions. These commitments include the implementation of a sustainability management plan, and the pursuit of a Program 'Excellent' rating against version 1.2 of the Infrastructure Sustainability Council of Australia's rating scheme for the proposal.

## Health and safety

A desktop assessment was completed for a 2 km buffer of the proposal site (the study area) to assess potential health and safety impacts to humans from the construction and operation of the proposal.

Potential risks to onsite workers are regulated by workplace health and safety legislation, including the *Work Health and Safety Act 2011* (NSW), and are not relevant to approval of the proposal. Site management would be the responsibility of the construction contractor and operator, who would be required, under the *Work Health and Safety Act 2011* (NSW), to manage and operate the site in accordance with relevant regulatory requirements.

The health and safety risk assessment identified the following key risks during construction and operation:

- impacts from the transport, storage and use of hazardous substances and dangerous goods (such as spills or accidents)
- emission from construction vehicles or plant, and trains during operation, and associated health impacts from air and noise pollution
- reduced safety for road users and pedestrians during construction due to increased traffic, and increased risk of severe incidents due to increased heavy vehicle movements
- rupture of, or interference with, underground utilities and services during construction
- potential for the proposal to exacerbate bushfire risk (as a result of the storage of dangerous goods, construction site issues, such as smoking or hot works, and sparks generated from train movements).

Impacts to pedestrians and cyclists would be minor given the generally low volumes within the majority of the proposal site. Pedestrians and cyclists using the Alice Street and Moree Station pedestrian crossings may experience some additional delay during operation as a result of increased frequency and length of trains.

Potential impacts would be avoided through:

- managing construction and operation activities in accordance with relevant legislative and policy requirements
- designing, constructing and operating the proposal to minimise impacts to health and safety
- implementing the management and mitigation measures.

## Cumulative impacts

Projects included within the cumulative impact assessment were chosen as a result of their spatial and/or temporal influence on the proposal, as determined for each of the environmental, social and economic issues identified.

The five projects considered to meet the temporal and spatial requirements to qualify for assessment include:

- Narrabri to North Star Phase 1 (ARTC) (SSI-7474)
- Narromine to Narrabri—Inland Rail (ARTC) (SSI-9487)
- Newell Highway upgrade north of Moree
- Queensland–Hunter Gas Pipeline
- Narrabri Gas Project.

The likely impacts from the development of each of these projects was considered with respect to the proposal, to establish if any potential overlap of impacts could materialise. The potential for cumulative impacts was afforded a cumulative risk rating of Low, Medium or High. Overall, the potential for cumulative impacts resulting from the interaction of the proposal with other projects, either existing or proposed, in the surrounding area is considered medium to low. Key cumulative impacts are likely to relate to hydrology and flooding, biodiversity, traffic and transport, and socio-economic factors.

Of particular significance are cumulative impacts to hydrological flows and flooding patterns from the N2NS Phase 1 project and the Newell Highway upgrade project. Cumulative hydrological impacts for these projects can be summarised as follows:

**Cumulative impacts of N2NS Phases 1 and 2**

- up to a 2% annual exceedance probability (AEP) event, there are no adverse impacts on flooding as a result of the combined effects of both projects
- the 1% AEP afflux map shows that the combined effects of both projects produce adverse flood impacts in Moree, west of Moree Station, with afflux values of between 10 mm and 40 mm occurring at 86 residential properties. The cause of this impact is an increase in the 1% AEP flood level east of Moree Station of up to 10 mm, which is sufficient to divert significant quantities of additional floodwater around the station and into the centre of Moree, potentially resulting in damage to, or flooding of, residential properties. Flood model testing has shown this impact can be mitigated through localised adjustments to the rail level and the provision of a low bund within the rail corridor. Further information regarding these mitigations is provided withing section 6.6.1 of Technical Paper 4: Hydrology and flooding impact assessment.
- the 1% AEP impact in Moree is mainly an increase in flood level. There are no widespread or significant changes in velocity, duration and hazard for the 1% AEP event.

Flood model tesing has shown that this impact

Flood impact maps for the cumulative impact assessment that considers the combined effects of N2NS Phases 1 and 2 are in Appendix B of Technical Paper 4: Hydrology and flooding impact assessment.

**Cumulative impacts of N2NS Phase 2 and Newell Highway Upgrade**

Cumulative impacts for Phase 2 and the Newell Highway upgrade are likely to result in the following impacts.

Regarding impacts to the highway:

- The upgraded section of the highway has greater than 20% AEP flood immunity, and impacts of the proposal on this section of the highway are significantly reduced for all events up to the 1% AEP event.
- The number of points no longer flooded increases, particularly for the low to medium events, due to the raised pavement levels of the highway (which improves its flood immunity).
- There are increased hazard impacts on the highway in the upgrade case. This is due to localised increases in water level and velocity (i.e. water flowing across lower areas of the highway) generated by the raised highway embankment for events that overtop the upgraded section of the highway (i.e. the 5%, 2% and 1% AEP events).

Regarding impacts occurring around the highway and rail corridor:

- For the 1% and 2% AEP events, the cumulative impact results are generally consistent with the design scenario results, with some minor increases in afflux around the rail corridor.
- In both events, the properties located in the area between the road and rail corridor are subject to new impacts from increased flood levels. The increase in flood level is generally less than 100 mm, with some localised increases up to 200 mm. There are also impacts noted immediately downstream of new cross-drainage structures under the highway.

- No exceedances of the afflux QDLs for buildings located in this area occur in the cumulative case (i.e. with both projects in place).
- The unprotected areas surrounding these buildings including property accesses (i.e. driveways) are affected by the additional afflux. It should be noted that this additional afflux is most pronounced in the 10% and 5% AEP events.
- It is considered that the contribution of the proposal to the cumulative afflux impacts does not generally alter the materiality of the impacts due to the relatively lower contribution of the proposal to the total cumulative afflux in this area.
- The Newell Highway Upgrade Review of Environmental Factors sets flood impact criteria for the highway upgrade and, where these criteria are exceeded, TfNSW has undertaken consultation with affected landowners. In areas where the cumulative impacts of both projects occur, ARTC will undertake further consultation with TfNSW and affected landowners to determine the potential for design modifications or other mitigation measures to address the cumulative impacts attributable to the rail project scope.
- Velocity impacts remain similar to the 1% AEP event impact.
- An increase to the duration of flooding with exceedances of the duration criteria (duration increase greater than 10 per cent) across all events both upstream and downstream of the proposed highway changes.
- Hazard impacts are similar to the non-cumulative design case impacts, with some increased hazard impact upstream of the rail corridor in the cumulative case.

Flood impact maps for the cumulative impact assessment that considers the combined effects of N2NS Phase 2 and the Newell Highway upgrade are in Appendix B of Technical Paper 4.

Measures to mitigate these cumulative impacts are provided in Chapter 26: Cumulative impacts.

### Environmental mitigation and management

Potential impacts resulting from the proposal are considered manageable through the implementation of the proposed mitigation and management measures. The detailed design for the proposal would be developed with the objective of minimising potential impacts on the local and regional environment and the local community. The design and construction methodology would continue to be developed, taking into account the input of stakeholders. To manage and/or mitigate the potential impacts identified in the EIS, the assessment chapters outline a range of mitigation measures that would be implemented during construction and operation. The environmental performance of the proposal would be managed as described in Chapter 27: Approach to environmental management, including the implementation of mitigation measures, construction and operation environmental management plans, Inland Rail policies and procedure, and state and federal laws and regulations including compliance with conditions of approval.

## Concluding statement

The proposal involves upgrading the existing rail line between Moree and the Camurra North, with a 1.6 km section of new track to replace the Camurra hairpin.

The proposal is justified in terms of its strategic need and its anticipated benefits, taking into account the matters of ecologically sustainable development. The proposal is considered to best meet the objectives compared to all other alternatives considered.

This EIS has been prepared in accordance with the provisions of Part 5.2 of the EP&A Act and addresses the Secretary's Environmental Assessment Requirements (SEARs). It also includes consideration of the issues raised by the community and stakeholders during the development of the proposal.

It is inevitable that a proposal of this scale and location in a rural environment would have some adverse impacts, particularly during construction. These adverse impacts should be considered within the context of the overall objectives of the proposal and the significant benefits it would provide over the medium to longer term, and particularly for future generations.

Key environmental issues have been examined throughout the design development process. Consultation has been carried out with affected stakeholders to identify key potential impacts at an early stage and, where possible, avoided or appropriate mitigation measures developed. This has resulted in a number of design changes that have minimised many of the potential significant impacts.

Provided the measures and commitments specified in the EIS are applied and effectively implemented during the design, construction and operational phases, the identified environmental impacts are considered to be acceptable and manageable.