ARTC | INLAND RAIL
An Australian Government Initiative

# Summary of findings

## Narrabri to North Star – Phase 2

Environmental Impact Statement

## 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.

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.



*Front cover and back cover: Aerial image showing the Newell Highway and rail bridge over the Mehi River in Moree*

## Narrabri to North Star Phase 2 involves:

**Upgrading approximately 13 kilometres of existing track and building approximately 2km of new track** across the Mehi-Gwydir floodplain at Camurra, north of Moree. Reconstruction of eight underbridges across the Mehi River, Gwydir River, Skinners Creek, Duffys Creek and at four other un-named watercourses.

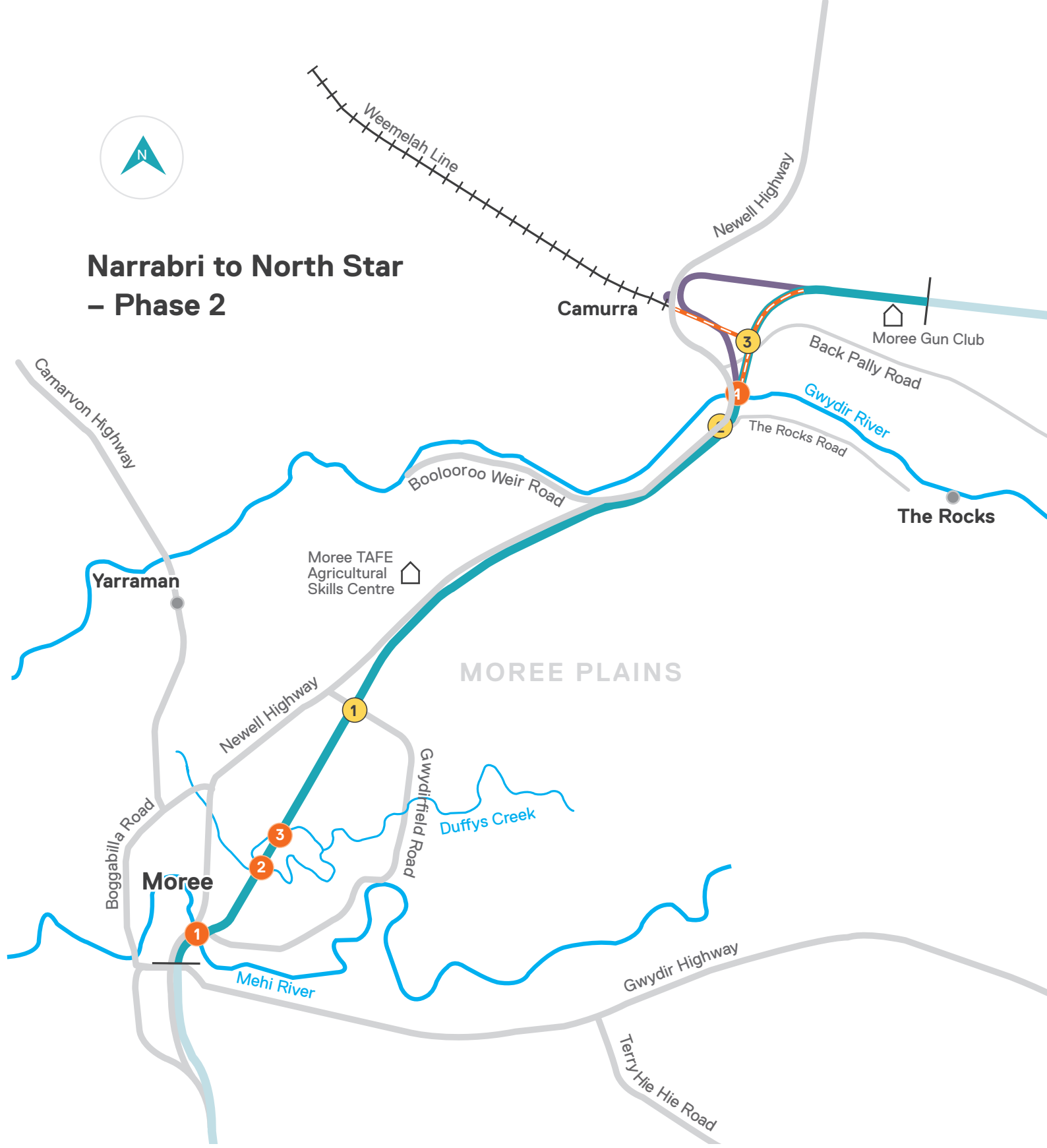
**New and improved east west rail connections** with new turnout between the Gwydir River and Back Pally Road. This will provide a connection to the Inland Rail North Star line to the east and the Weemelah line to the west, and replace the Camurra Hairpin with a newly constructed Camurra Bypass, enabling connections to the existing rail lines to the east and the Weemelah line to the west.

**Changes to six private level crossings** (including realignments and the closure of one private level crossing).

**Three new active level crossings** at Gwydirfield Road, the Rocks Road and Back Pally Road replacing the existing level crossings.

**1,100 new flood relief concrete box culverts** installed along the alignment.

**Associated works** will include installing signalling systems, signage, fencing, drainage and relocation of services and utilities, where necessary.




LEGEND

- N2NS – Phase 2
- N2NS – Phase 1
- New track (inc Weemelah Line spur)
- Old Camurra Hairpin (to be decommissioned)
- Roads
- Waterways
- Weemelah Line

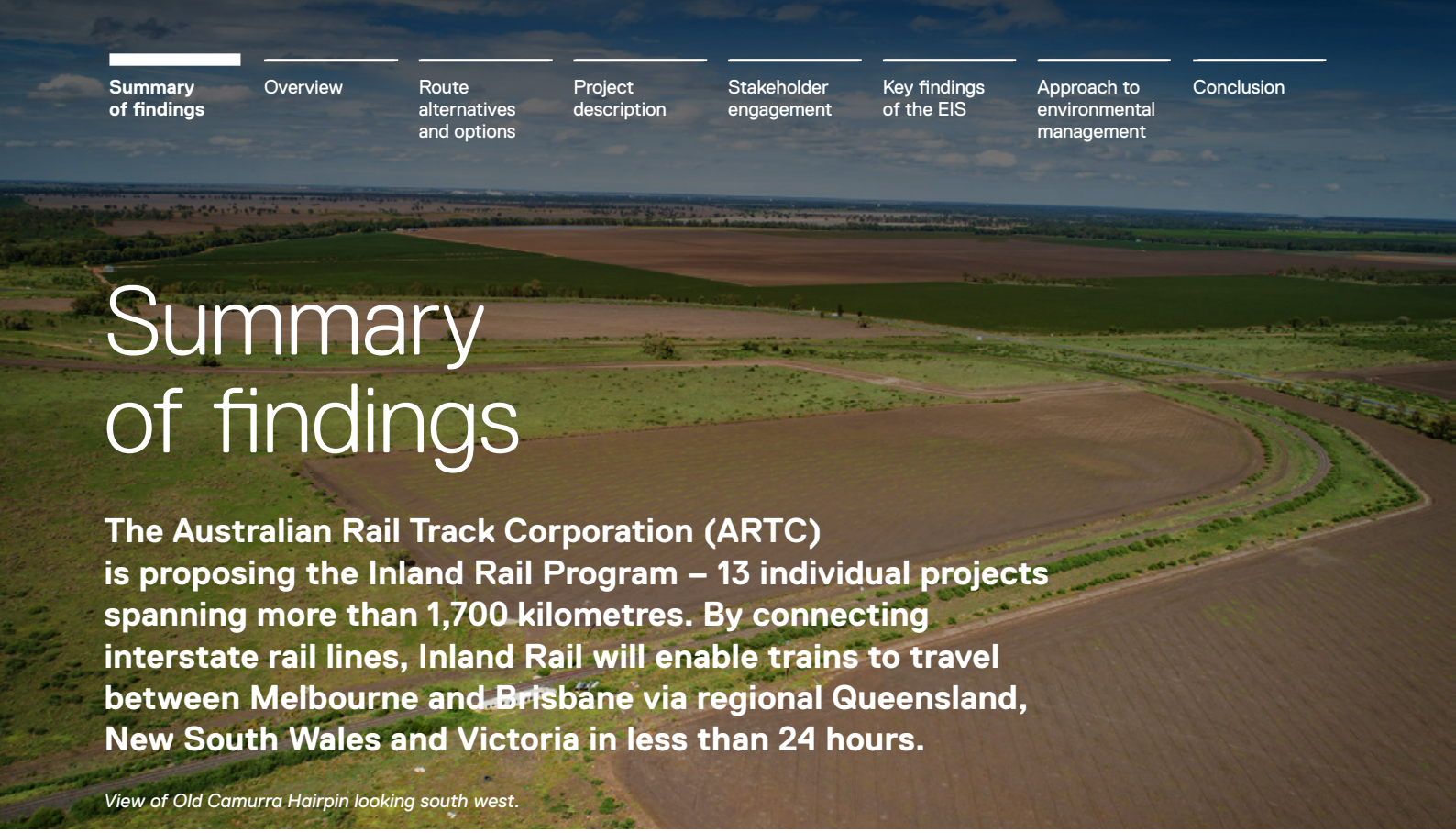
**Bridges**

1. Mehi River Bridge
2. Tributary to Duffys Creek Bridge
3. Skinners Creek Bridge
4. Gwydir River Bridge

Project limits

**New active level crossings**

1. Gwydirfield Road Active Level Crossing (LX0562)
2. The Rocks Road Active Level crossing (LX0563)
3. Back Pally Road Active Level Crossing (LX0564)



# Summary of findings

**The Australian Rail Track Corporation (ARTC) is proposing the Inland Rail Program – 13 individual projects spanning more than 1,700 kilometres. By connecting interstate rail lines, Inland Rail will enable trains to travel between Melbourne and Brisbane via regional Queensland, New South Wales and Victoria in less than 24 hours.**

*View of Old Camurra Hairpin looking south west.*

## Narrabri to North Star section

The Narrabri to North Star section of Inland Rail will include an upgrade of approximately 184km of existing rail corridor and construction of approximately 2km of new track near Moree, New South Wales.

The Narrabri to North Star section crosses the three local government areas of Gwydir, Narrabri and Moree Plains. Due to its scale and complexity, it has been divided into two phases to enable efficient construction and appropriate management of environmental, social and economic impacts of each phase. The two phases are described below:

### Narrabri to North Star Phase 1

Narrabri to North Star Phase 1 includes upgrading 171km of track along the existing rail corridor between Narrabri and Moree, excluding Moree to Camurra.

Construction on this project, which is being delivered by Trans4m Rail (a joint venture comprising John Holland and See Civil), started in November 2020.

### Narrabri to North Star Phase 2

Narrabri to North Star Phase 2 (detailed in this document) includes upgrading approximately 13km of track crossing the Mehi–Gwydir floodplain and building approximately 2km of new track at Camurra, north of Moree and is located within the Moree Plains Shire Council Local Government Area.

When fully operational, the proposal will provide more freight connections to the south and north. Initially, the Inland Rail network will operate 1,800 metre double-stacked freight trains, with future capacity for 3,600m freight trains.

**Want to know more?**

See

- Chapter 0: Executive summary
- Chapter 3: Statutory context

## Purpose of this 'Summary of findings'

An Environmental Impact Statement (EIS) has been prepared for Narrabri to North Star Phase 2 (the proposal). The EIS describes the proposal, considers potential environmental, social and economic impacts of the proposal, and identifies measures to minimise and avoid these impacts.

The EIS is a robust, thorough and comprehensive document with analysis and input from technical and scientific experts to demonstrate the proposal is based on sound environmental principles and practices.

It also captures feedback from landowner consultation and other stakeholders such as councils, industry and the wider community.

This summary document provides a high-level overview of the EIS prepared for the proposal. It summarises the major findings of the EIS technical studies and provides quick reference links to the relevant sections of the mentioned EIS reports, where more detailed information can be found.

It is intended to be read alongside the proposal's Environmental Management Plan (**Chapter 27: Approach to Environmental Management**) that outlines the strategies which will be used to address the identified impacts and recommendations in the EIS. If you did not receive a copy of the Environmental Management Plan, please contact ARTC Inland Rail on **1800 732 761** or visit **planningportal.nsw.gov.au/major-projects/** to access an electronic version.

This summary document also explains how you can make a submission to the Department of Planning and Environment (DPE) about the Narrabri to North Star Phase 2 EIS.

## State Significant Infrastructure and Australian Government requirements

State Significant Infrastructure (SSI) in NSW includes major transport developments which have wide community significance due to their size, economic value or potential impacts. Such projects are assessed via an SSI application and an EIS under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Major projects which could have a significant impact on matters of national environmental significance may also require a referral to the Australian Government's Department of Climate Change, Energy, the Environment and Water (DCCEEW) in addition to Ministerial approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

## Planning and assessment process

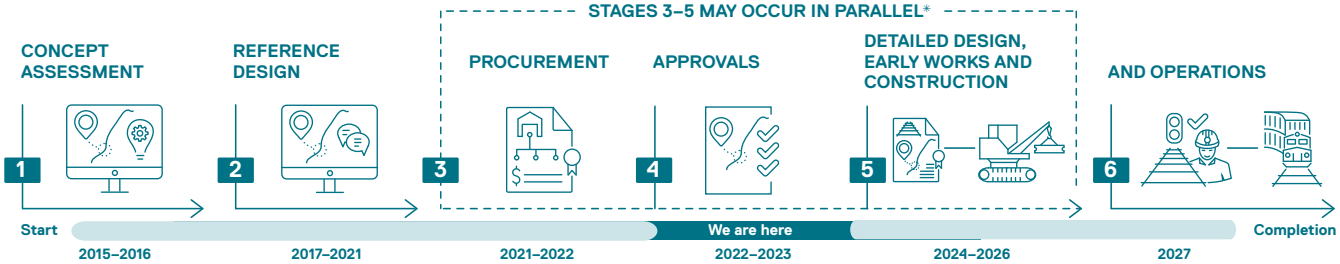
ARTC Inland Rail is seeking approval to construct and operate the Narrabri to North Star Phase 2 section of Inland Rail under the *EP&A Act* and the *EPBC Act*.

The EIS supports an application for approval of the proposal under Part 5 Division 5.2 of the *EP&A Act*. It addresses the environmental assessment requirements of DPE Secretary's Environmental Assessment Requirements (SEARs) dated 14 October 2020. The SEARs are included within the EIS under **Appendix A: Secretary's Environmental Assessment Requirements.**

The proposal is also a controlled action under the *EPBC Act* and requires approval from the Australian Government's Minister for the Environment. The *EPBC Act* assessment requirements are detailed in the SEARs.

The EIS was submitted to DPE as required under the SSI assessment process. It outlines the Propoal's key features, assesses its potential environmental and social impacts during construction and operation, and offers proposed mitigation measures.

The EIS will be on public exhibition for a minimum of 28 days. It is available to view via **planningportal.nsw.gov.au/major-projects.** Community members and other stakeholders can provide feedback and make formal submissions.




*Timeframes are indicative and are subject to change

## How to have your say

The NSW Department of Planning and Environment (DPE) encourages online submissions to ensure public safety, as well as the timely consideration of all issues raised.

To have your say online, during the exhibition period go to **planningportal.nsw.gov.au/major-projects,** find the Narrabri to North Star Phase 2 project and click on 'Make a submission'. You will need to log in or create a user account.

If you cannot lodge online, post or drop your submission to the address below, to arrive before the close of exhibition:

**Director – Transport Assessments**
**Planning and Assessment –Department of Planning and Environment**
**Locked Bag 5022, Parramatta NSW 2124.**

If you choose to send a paper-based submission, it is important both the submission and mailing envelope are addressed to the nominated contact team. DPE advise if you choose to send a paper-based submission and it is not addressed to the correct contact team, the submission may not be received and may be returned.

Your submission must include:

- Your name and address, at the top of the letter only (if you want your personal details to be withheld from publication, please request this in a separate cover letter and do not include personal details in your submission);
- The name of the application and the application number: **Inland Rail – Narrabri to North Star Phase 2 SSI-10054**;
- A statement on whether you 'support' or 'object' to the proposal or if you are simply providing comment
- The reasons why you support or object to the proposal; and
- A declaration of any reportable political donations you have made in the last two years (visit **planning.nsw.gov.au/DonationsandGiftDisclosure** or phone **1300 305 695** to find out more).

For further enquiries, please call ARTC Inland Rail **1800 732 761.**

## What happens after the submission period?

Following the submission period, DPE provides ARTC with submissions received and publishes submissions online. ARTC will respond to submissions through a Submissions Report to DPE.

There may be requirement to prepare a Preferred Infrastructure Report to address project design changes as a result of the public submissions process.

DPE then assesses the proposal and makes a recommendation to approve the proposal or not, including with either conditions of consent or reasons for refusal. The recommendation is referred to the NSW Minister for Planning, or a delegate, for determination.

Under the joint agreement between the NSW and Australian governments for matters governed by state and federal environmental law, DPE's Environmental Assessment Report and Minister's decision is forwarded to Australian Government's Department of Climate Change, Energy, the Environment and Water (DCCEEW) with a recommendation for the relevant federal Minister on whether the controlled action should be approved, with or without conditions.

### ARTC help is available

If you need help with reading, or if English is your second language, please call **13 14 50.** This free service will help you read this document and other relevant Project information.


*Back Pally Road level crossing*

## EIS structure

The main EIS report (chapters 1 – 28) provides a summary of the key findings of the specialist assessments provided by the community and agencies. The EIS also includes supporting technical papers and appendices to aid interpretation of the EIS and provide results or details of issue-specific impact assessments.

| CHAPTER | DESCRIPTION |
|---|---|
| Proposal summary | Provides an overview of the Narrabri to North Star (N2NS) Phase 2 proposal and each of the EIS chapters |
| Chapter 1 | **Introduction**<br>Provides a background to the proposal and an overview of the key features of the proposal. The chapter also outlines the overall structure and content of the EIS. |
| Chapter 2 | **General biophysical and cultural environment**<br>Provides a description of the general biophysical and socio-economic environment within which the proposal would be located, including the regional setting and a description of the proposal site. |
| Chapter 3 | **Statutory context**<br>Provides an overview of the statutory context for the proposal and the approval requirements. |
| Chapter 4 | **Consultation**<br>Provides a summary of the consultation that occurred during the proposal development and environmental assessment process, and the consultation proposed during public exhibition, detailed design, and delivery. |
| Chapter 5 | **Need for the Inland Rail Program and the strategic context of the proposal**<br>Provides an overview of the strategic context and need for the proposal. |
| Chapter 6 | **Inland Rail Program development, alternatives and the proposal**<br>Provides a summary of the alternatives to the proposal as a whole and the options considered during development of the concept design for the proposal. |
| Chapter 7 | **Proposal features and operation**<br>Provides a description of the proposal features and operation (Chapter 7), including the approach to avoiding or minimising impacts, design features and infrastructure proposed, operation, maintenance and other related information. |
| Chapter 8 | **Construction of the proposal**<br>Provides an indicative description of the likely construction process and activities. |
| Chapters 9 to 26 | Describes the results of the assessment of key environmental issues identified by the SEARs, including information on the existing environment, potential construction and operation impacts, and the proposed approach to mitigation and management of impacts. |
| | – Land use and property<br>– Biodiversity<br>– Traffic and transport<br>– Hydrology and flooding impact assessment<br>– Surface water quality impact assessment<br>– Groundwater<br>– Cultural heritage<br>– Noise and vibration<br>– Social impact assessment<br>– Economics<br>– Visual impact assessment<br>– Soils and contamination<br>– Waste<br>– Climate change<br>– Sustainability<br>– Air quality and greenhouse gas<br>– Health and safety (including hazardous materials)<br>– Cumulative impacts |

| CHAPTER | DESCRIPTION |
|---|---|
| Chapter 27 | **Approach to environmental management**<br>Provides a consolidated summary of the key potential impacts, a description of the proposed approach to environmental management, and a compilation of the mitigation measures. |
| Chapter 28 | **Conclusion**<br>Conclusion and justification for the project. |
| References | **Environmental Impact Statement references**<br>Provides a list of references used to inform the EIS. |
| Appendices | **Appendix A** – Secretary's Environmental Assessment Requirements<br>**Appendix B** – Statutory requirements<br>**Appendix C** – Environmental risk assessment<br>**Appendix D** – Community consultation<br>**Appendix E** – Preliminary land requirements<br>**Appendix F** – Construction Environment Management Plan outline<br>**Appendix G** – Rapid Assessment Framework Checklist |
| Technical papers | **Technical Paper 1** – Biodiversity development assessment report<br>**Technical Paper 2** – Post wet aquatic ecology assessment<br>**Technical Paper 3** – Traffic impact assessment<br>**Technical Paper 4** – Hydrology and flooding impact assessment<br>**Technical Paper 5A** – Surface water impact assessment<br>**Technical Paper 5B** – Groundwater impact assessment<br>**Technical Paper 6** – Aboriginal cultural heritage assessment report<br>**Technical Paper 7** – Statement of heritage impact<br>**Technical Paper 8** – Social impact assessment<br>**Technical Paper 9** – Economic impact assessment<br>**Technical Paper 10** – Construction noise and vibration impact assessment<br>**Technical Paper 11** – Operational noise and vibration impact assessment |

# Overview

**Inland Rail will transform the way freight is moved around the country, connect regional Australia to markets more efficiently, drive substantial cost savings for producers and consumers, and deliver significant economic benefits.**

Australia faces increasing pressure to efficiently, effectively and safely transport ever increasing volumes of freight, especially between our major cities. Each year, our infrastructure operators, transport companies and logistics experts deliver about four billion tonnes of goods across Australia – that is 163 tonnes of freight for every person *(source Delivering-on-Freight.pdf (infrastructure.gov.au)*

## Overview of Inland Rail

Inland Rail is a significant piece of national transport infrastructure that will enhance Australia's existing rail network and serve the interstate freight market.

### The Inland Rail route

approximate length – **1,700km**

upgrading or enhancing more than **1,100km of existing interstate rail line** through NSW and Victoria

constructing about **600km of new track** in NSW and south-east Queensland.

Narrabri to North Star (Phases 1 and 2) is one of the **13 Inland Rail projects**

**Want to know more?**

See

- Chapter 1: Introduction
- Chapter 5: Strategic context and need

## Justification for Inland Rail

Currently, there is no continuous inland rail link between Melbourne and Brisbane. Interstate rail travels between Melbourne and Sydney, via Albury and between Sydney and Brisbane along the coast. The existing north–south coastal railway does not have the capacity to meet the future demand for freight due to congestion and the inability to accommodate double-stacked trains, which will impact freight productivity, transport costs and passenger services.

However, to compete with trucks, Inland Rail must deliver freight in times close to those achieved by trucks, cheaper than trucks, and with reliability and predictability comparable to trucks.

Trains running on Inland Rail will be double-stacked freight trains initially up to 1,800m-long, or the equivalent of 110 B-double trucks.

## Consequences of not proceeding with Inland Rail

Not progressing with Inland Rail would potentially hinder the national economy. The continuing growth in freight demand requires urgent attention. Without making a step-change in rail efficiency and performance, pressure on the road networks will increase, freight costs will rise, consumers will pay more for products, and productivity in important sectors could decline.

Without Inland Rail, road would increasingly become the dominant freight transport mode, with rail becoming less relevant. A continued over-reliance on road transport to meet the future east coast freight task will increase the vulnerabilities to demographic changes that are, even today, driving shortages of long-distance truck drivers and increasing costs.

### What Inland Rail will offer

ARTC's service offering is central to the delivery and competitiveness of Inland Rail and reflects the priorities of freight customers. Developed in consultation with key market participants and stakeholders, the key elements to be delivered by Inland Rail for a competitive and complementary service offering compared to other modes include:

- **reliability:** 98% defined as the percentage of goods delivered on time by road freight, or available to be picked up at the rail terminal or port when promised
- **price:** cheaper relative to road transport as a combined cost of access to the rail network, rail haulage, and pick-up and delivery
- **transit time:** less than 24 hours from Melbourne to Brisbane
- **availability:** services available with departure and arrival times that are convenient for customers.

## Benefits of proceeding with Inland Rail

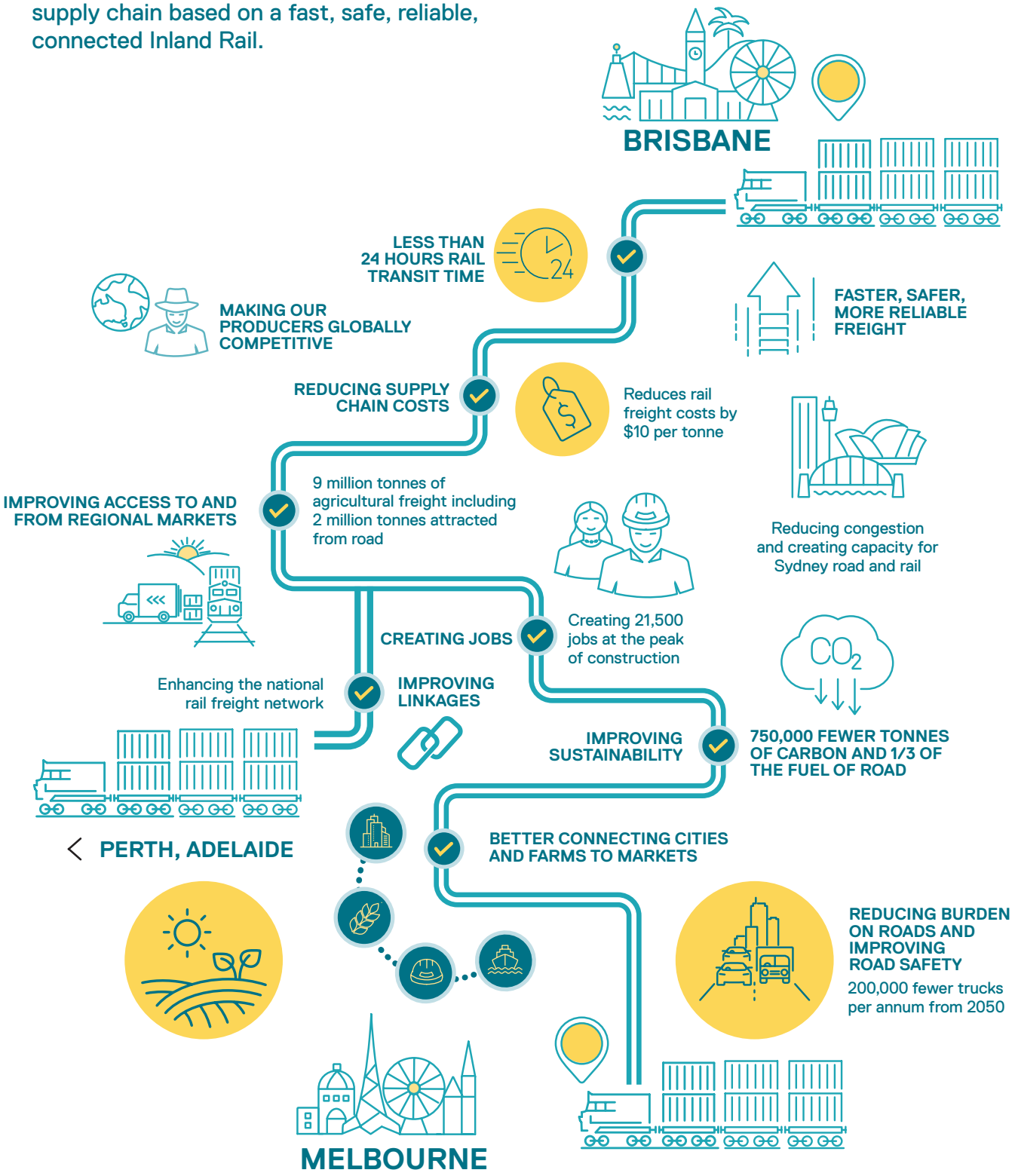
- The key overall benefits of Inland Rail include:
  - **Improved network efficiency and reliability:** transit time between Melbourne and Brisbane of less than 24 hours with 98 per cent reliability, which matches current road transport levels. An alternative north–south freight path will mitigate weather, climatic or other disaster disruption to the transport network.
  - **Safety improvements:** up to 15 serious crashes involving fatalities and serious injuries will be avoided every year. Road congestion on some of Australia's busiest highways, including the Hume, Newell and Warrego, will also be reduced.
  - **Boost to the Australian economy:** Inland Rail is expected to increase Australia's GDP by $18 billion during its construction and first 50 years of operation.
  - **Job creation:** Inland Rail is expected to create up to 21,000 new jobs at the peak of construction, with an additional 700 long-term jobs once it is fully operational.
  - **Improved sustainability:** moving freight by rail is four times more fuel efficient than moving freight by road. Carbon emissions will be reduced by 750,000 tonnes per year and truck volumes will be reduced in more than 20 of our regional towns (based on a 2050 estimate).
  - ARTC's service offering is central to the delivery and competitiveness of Inland Rail and reflects the priorities of freight customers, including:
    - **Improved access to and from regional markets:** by diverting two million tonnes of agricultural freight from road to rail, Inland Rail will support more efficient transport of 8.9 million tonnes of agriculture freight .
    - **Reduced rail costs:** reduced costs for inter-capital freight travelling between Melbourne and Brisbane by $10 per tonne.
    - **Increased capacity of the transport network:**
      - additional rail paths for freight
      - 105% increase on current freight paths on the coastal route alone
      - improved capacity for passenger services in Sydney and Brisbane
      - removing 200,000 truck movements (5.4 billion net tonne kilometres of freight) from roads each year from 2049–50.
      - reduced distances travelled: when Inland Rail is fully operational it will result in a 200km reduction in rail distance between Melbourne and Brisbane, and a 500km reduction between both Brisbane and Perth and Brisbane and Adelaide.
    - **reduced travel time:** reducing the travel time for freight trains by removing the hairpin and creating a rail bypass at Camurra.

Inland Rail will deliver on key national priorities for infrastructure and economic policy, providing a comprehensive rail transport system that links regional manufacturers and producers with consumers, creates jobs and strengthens industry. Better infrastructure and an effective national freight operation are key to delivering efficient supply chains, improving Australia's global competitiveness and lifting our nation's wealth and prosperity.

- The Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) manages the Australian Government's rail investments.
- The Australian Government is investigating the following infrastructure investments that will support the development of Inland Rail:
  - intermodal terminals connecting ports, regional networks and capital cities between Melbourne and Brisbane
  - the Interface Improvement Program, which aims to integrate regional lines into the national freight rail network.

# The benefits of Inland Rail

A more prosperous Australia with a world-class supply chain based on a fast, safe, reliable, connected Inland Rail.



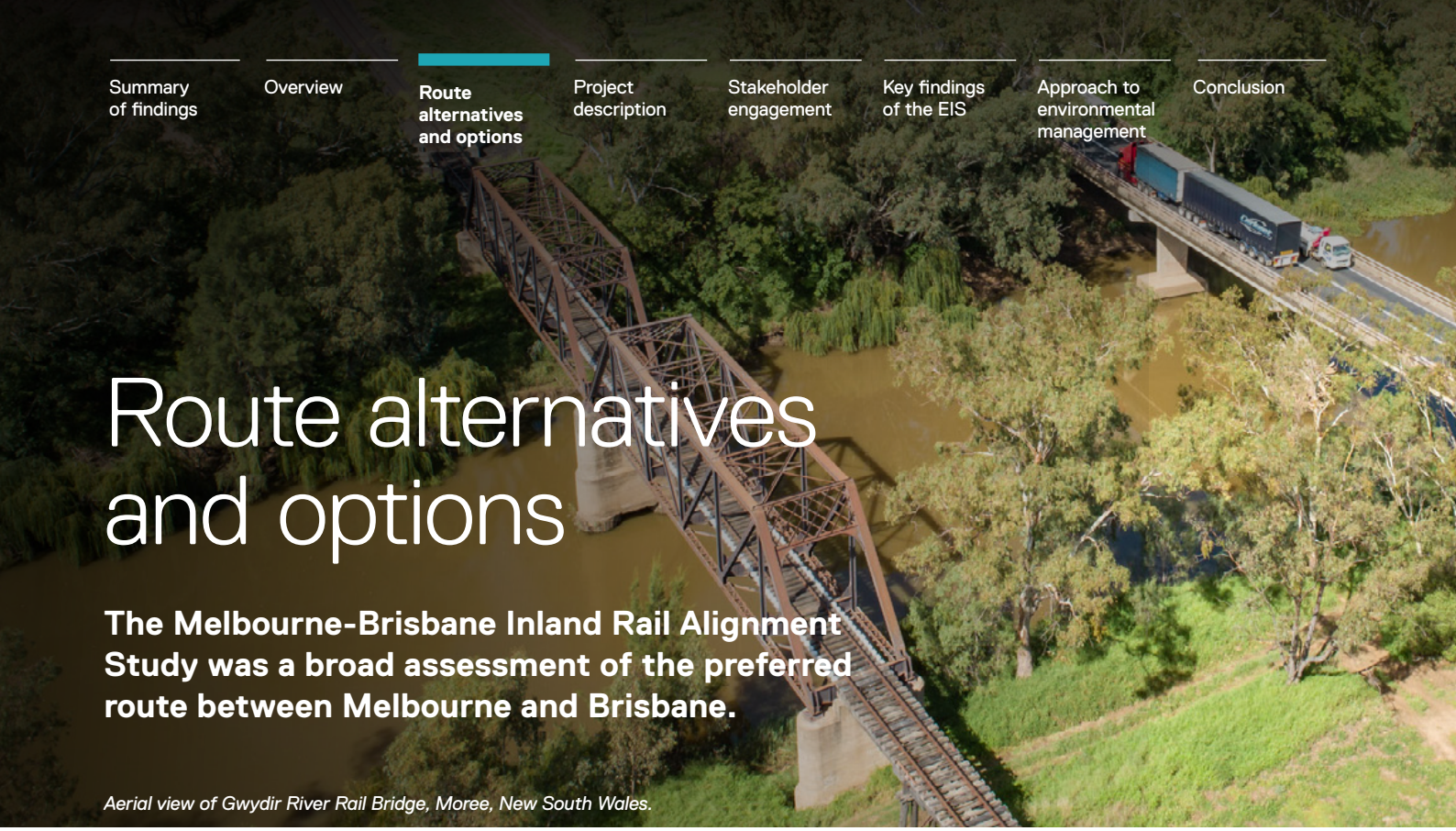
## The Proponent

ARTC was created in 1997 as a 'one stop shop' for all operators seeking to access the national interstate rail network. ARTC plays a critical role in the supply chain by managing and maintaining 8,500km of rail network across five states, investing in building, extending and upgrading the rail network to get freight off the road and onto rail.

As the operator and manager of Australia's national rail freight network, ARTC has successfully delivered more than $5 billion in capital upgrades to the national rail freight network. ARTC has been tasked with developing a program to deliver Inland Rail under the guidance of the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DIRDCA).

The ARTC network moves commodities including general freight, coal, iron ore, other bulk minerals and agricultural products—supporting industries and businesses that are vital to Australia's economy.


Brisbane
Helidon
Calvert
Gowrie
Acacia Ridge
Toowoomba
Kagaru
Bromelton
NSW/QLD Border
North Star
Narrabri to North Star Phase 1
Moree
Narrabri to North Star Phase 2
Narrabri
Gilgandra
Narromine
Dubbo
Parkes
Stockinbingal
Illabo
Junee
Wagga Wagga
Canberra
Albury
Wodonga
Beveridge
Tottenham
Melbourne



# Route alternatives and options

**The Melbourne-Brisbane Inland Rail Alignment Study was a broad assessment of the preferred route between Melbourne and Brisbane.**

*Aerial view of Gwydir River Rail Bridge, Moree, New South Wales.*

## Route selection

Previous studies and investigations have considered alternatives to the Inland Rail Program, including progressive road upgrades for road freight, maritime shipping, air freight, or other rail solutions, such as upgrading the existing east coast railway.

Alternative routes for Inland Rail were considered in:

- *North–South Rail Corridor Study (Department of Transport and Regional Services, 2006)*
- *Melbourne–Brisbane Inland Rail Alignment Study (ARTC, 2010).*

Overall, constructing an inland railway was the preferred option.

## Initial project development for Inland Rail

Inland Rail has undergone a progressive route development and selection process since 2006 with each stage refining the focus on what is required to deliver the Inland Rail Program.

The route selection process began in earnest with the *2006 North–South Rail Corridor Study* (EY, 2006), which identified a broad corridor for a future Melbourne to Brisbane railway.

**Want to know more?**

See

- Chapter 6: Project development and alternatives

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 *Melbourne to Brisbane Inland Rail Alignment Study* (ARTC, 2010) effectively established the Inland Rail route that has undergone some relatively minor changes in the years since.

In November 2013, the Minister for Infrastructure and Regional Development announced that the Australian Government had committed $300 million to enable the development of Inland Rail to commence. In 2015, ARTC produced a strategic Program Business Case (ARTC, 2015) to demonstrate the viability, benefits, costs and risks associated with Inland Rail to the Australian Government for endorsement and further approval to proceed with the delivery of the Inland Rail Program.

In conjunction with the Program Business Case, the Inland Rail Implementation Group in 2015 recommended some variations to the corridor from that previously recommended in the 2010 Inland Rail Alignment Study. That report supported the development of Inland Rail and recommended that the Australian Government commit further funding in the 2016–17 Budget for the Inland Rail Program. The Australian Government has committed $14.6 billion to deliver Inland Rail.

## Initial route selection for the Narrabri to North Star project

From a route selection and rail corridor determination perspective, Inland Rail sections fall into brownfield and greenfield categories. Brownfield refers to sections or projects where there is existing railway that is suitable for upgrading or enhancement.

Greenfield refers to those sections where there is no existing railway in the proposed rail alignment corridor.

The route for the Narrabri to North Star section of Inland Rail was selected, in part, due to the existing rail corridor's suitability. During route development, no alternative options were identified.

While the Narrabri to North Star sections are brownfield, they nonetheless require significant upgrades and capital investment to achieve the higher performance specifications of Inland Rail.

As the project has progressed and more technical studies have been completed, the level of information available and volume of community engagement has increased. Extensive landowner, community and stakeholder consultation for Inland Rail commenced in early 2016 as a preferred alignment started to become clearer following the 2015 IRIG Report. Given this is a brownfield section, the focus was on explaining proposed works and timelines and gaining landowner and community feedback on impacts and designs.

An overview of the development of the proposal is included in the table below with further detail on the options assessment provided in the sections.

### Stages and development of the proposal

| | STAGE | AIM | OUTCOME |
|---|---|---|---|
| 01 | **2010** Inland Rail Alignment | Establish high level requirements for NSNS route | Existing corridor was identified for N2NS as requiring enhancement works, principally clearance improvements to accommodate double-stacked trains |
| 02 | **2015** Alignment refinement | Assess the 2010 alignment for any high risk areas | Highlighted environmental and social benefits in deviating from 2010 alignment |
| 03 | **2016–2017** Alignment refinement | Verify alignment viability through stakeholder consultation and further desktop and rapid field studies to develop additional options | Extensive landowner, community and stakeholder consultation for Inland Rail commenced in early 2016 as a preferred alignment started to become clearer following the 2015 IRIG report |
| 04 | **2018–2019** Intensive one-on-one landowner meetings within the study area | Verify Alternative Route option for N2NS alignment | Highlighted environmental and social benefits in deviating from 2010 alignment |
| 05 | **2019** Preferred alignment (IRDJV 2019a) | Finalise alignment for N2NS Phase 2 | Highlighted environmental and social benefits in deviating from 2010 alignment |

## 2015 alignment refinement

In 2015, ARTC refined the alignment further based on the preferred route selected as part of the *2010 Inland Rail Alignment Study.* The refinement process reviewed the 2010 alignment for any high-risk areas, such as significant engineering and environmental risks, and sought to avoid or minimise impacts on these.

As part of this review, four alternative alignment options in addition to the 2010 preferred alignment were identified with each roughly following the original 2010 alignment. These options were developed and compared as alignment improvements in comparison to the 2010 alignment, to identify any opportunities to further refine the alignment and avoid environmental impacts. This comparison showed that there were benefits in shifting away from the 2010 alignment; however, with no field investigations and limited community and stakeholder consultation undertaken, further design development was required.

In 2015, ARTC produced a strategic Program Business Case (ARTC, 2015) to demonstrate the viability, benefits, costs and risks associated with Inland Rail to the Australian Government, for endorsement and for further approval to proceed with the delivery of the Inland Rail Program.

In conjunction with the Program Business Case, in 2015 the Inland Rail Implementation Group recommended some variations to the corridor from that previously recommended in the 2010 Inland Rail Alignment Study. That report supported the development of Inland Rail and recommended that the Australian Government commit further funding in the 2016–17 Budget for the Inland Rail Program.

## 2016–2017 alignment refinement

In 2016 and 2017, ARTC completed draft EIS studies for the Narrabri to North Star section of Inland Rail. Those studies were supported by extensive community consultation, including information sessions, meetings with councils and other key stakeholders, mailouts and landowner meetings.

## 2018–2019 preferred alignment

The consultation informed the development of options that formed the basis of the design case for the EIS. With regard to the Narrabri to North Star Phase 2 section, within the EIS, five options were considered for the Moree section, and areas to the immediate north of Moree.

The options considered are presented in the image on the opposite page.

During the options analysis, the options were further split into two general themes—provision of connectivity for Moree compared with provision of a bypass of Moree.

These were assessed as follows:

### Moree connectivity options

Three options were assessed to develop an alternative connectivity solution associated with the upgrade of the existing rail corridor. The options considered level crossing upgrades, footbridges, improved access for emergency vehicles, a detour of the Gwydir Highway to the south of the town, a Gwydir Highway bypass and overbridges in the town. The provision of a road bridge over the rail line at Jones Avenue was seen as the best of three options for such a bridge (GHD, 2017).

### Moree bypass options

Five possible bypass alignments were considered (GHD, 2017). At the time of the submission of the EIS, Option 5 was considered the preferred alignment as it was the shortest of all proposed alignments and closest to Moree township.

Additionally, options were considered in the selection of a route at the Camurra Hairpin, with the following objectives:

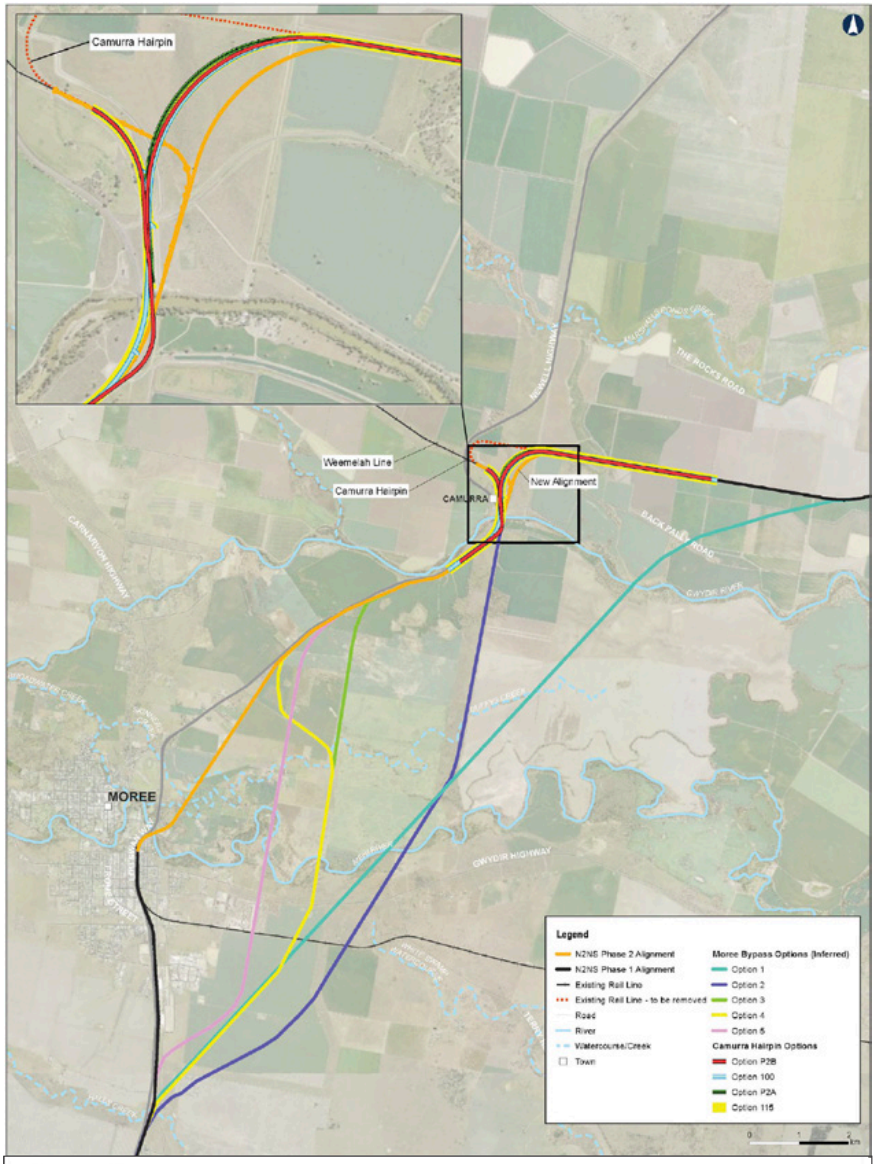
- improvement of the alignment to achieve desired design speeds
- minimisation of environmental impacts
- minimisation of property impacts
- minimisation of infrastructure impacts.

Four options were assessed:

- retention of the existing route, using the current bridge position and hairpin
- retention of the current bridge with a turn radius of 800m through the travelling stock route (TSR)
- a revised alignment linked with the Moree bypass options
- a revised alignment and new bridge east of the current bridge.

The figure on the right shows the location of the five Moree bypass options and the four options for Camurra Hairpin, relative to the final alignment chosen.

## Bypass options for Moree (GHD, 2017)




*Moree Bypass and Camurra Hairpin options*

### Option 1

An approximately 20km alignment of new track following a direct route across the floodplain, bypassing approximately 26km of the existing alignment, including the existing Camurra Hairpin curve.

### Option 2

A 17km alignment of new track, including the Camurra Bypass. It provides a relatively direct route across the floodplain crossing the Mehi and Gwydir Rivers at its narrowest point, and bypasses approximately 18km of the existing alignment.

### Option 3

An approximately 14km alignment of new track, including the Camurra Bypass. It provides a direct route across the floodplain and bypasses approximately 15km of the existing alignment.

### Option 4

A derivative of option 3, it is approximately 13km alignment of new track, including the Camurra Bypass. It follows a similar alignment to option 3 but provides a less direct alignment, to minimise property severance.

### Option 5

An approximately 12km alignment of new track, including the Camurra Bypass. Of all proposed alignments, it is the shortest in length and the closest to the Moree township.

### Multi-criteria analysis

The conclusion of the Multi-Criteria Assessment (MCA) of the options in the EIS identified that the Moree connectivity option was the preferred solution based on technical viability, safety considerations, operational approach, constructability and schedule, environmental impacts, community and property impacts, approvals and stakeholder engagement, and construction costs.

## Options for key features of the proposal

### Camurra Hairpin decommissioning

Options to retain or remove the Camurra Hairpin were considered. It was determined that design realignment of the track between chainages (Ch) 675.800 and 678.200 would result in the existing Camurra Hairpin no longer being required as part of the rail infrastructure. By removing the hairpin formation, it would allow the land to be freed up and it could then be used for other purposes, such as returning it to agricultural land or rehabilitation.

At present, the formation works of the Camurra Hairpin serve as a flood mitigation measure, protecting the Newell Highway from effects of flooding. The proposal design has provided a large number of additional culverts compared with the existing rail line to allow for the removal of the Camurra Hairpin. A flood balance could be achieved so that removal of the Camurra Hairpin would not result in increased flood risks to the Newell Highway and surrounding rural land.

Detailed flood management outcomes may require the retention of parts of the existing rail embankment as part of the flood balance outcomes. Removal of the hairpin would result in more structural material being available for the construction of the new formation, resulting in reduced requirements to import structural material. Additionally, the removal of the Camurra Hairpin would also reduce long-term maintenance obligations for ARTC for infrastructure that is not beneficial to rail operations.

### Country Rail Network (CRN) connection line turnout

Due to the highly sensitive flooding constraints in the northern section of rail near Back Pally Road, the positioning of the rail culverts is constrained. This constraint, as well as curve radius, directly impacts where the turnout for the CRN connection line can be installed. Options to move the turnout north of the proposed culvert were found to have adverse impacts, by excessively decreasing the curve radius to tie into the existing Weemelah line. The turnout position for the CRN connection line was therefore shifted further south immediately north of the Gwydir River underbridge (approximately 400m south of Back Pally Road) to allow maximum train storage length between the turnout and level crossing at Back Pally Road. The turnout has been situated in the safest location possible, while still allowing the activated signals at Back Pally Road to be activated in a safe manner for vehicles at the level crossing.

### Level crossings

In line with the Transport for NSW (TfNSW) Level Crossing Closures Policy (TfNSW, n.d.), options were also considered to reduce the overall number of level crossings, to provide safer crossings of the rail line across the network. To minimise the number of level crossings, an assessment of each crossing was undertaken to identify crossings suitable for potential closure/consolidation.

Final decisions on level crossings and further risk assessments will be made in consultation with affected stakeholders during the detailed design process.

## Mehi and Gwydir River bridges

The proposal design has also considered options for the Mehi and Gwydir River bridges.

The Mehi River Bridge is an 11-span bridge, constructed in approximately 1913 after the existing line terminated in Moree in 1897. The Mehi River Bridge comprises a single truss span and two through girder spans over the main channel of the river, with timber girder approach spans.

The Gwydir River Bridge is an eight-span bridge, also constructed in approximately 1913, comprising two truss spans over the river channel, with timber girder approach spans. Both bridges are listed on the State Heritage Inventory, and the ARTC's section 170 Heritage Register. The Mehi River and Gwydir River Bridges are considered to have local significance due to their early twentieth century construction and visual form in the landscape.

*Gwydir River Bridge*

*Mehi River Bridge*

## Gwydir River Bridge

The Gwydir River Bridge is positioned in an area where a new section of track is being constructed. As such, the design is being progressed on the assumption that the Gwydir River Bridge will be demolished and be replaced with a new bridge carrying the upgraded Inland Rail alignment over the river.

It should be noted that the current design sites the new bridge to the east of the current bridge, providing for the possibility of part retention of the Gwydir River Bridge.

Part retention of the bridge would require careful consideration as it may provide additional obstructions within the waterway and would require ongoing maintenance.

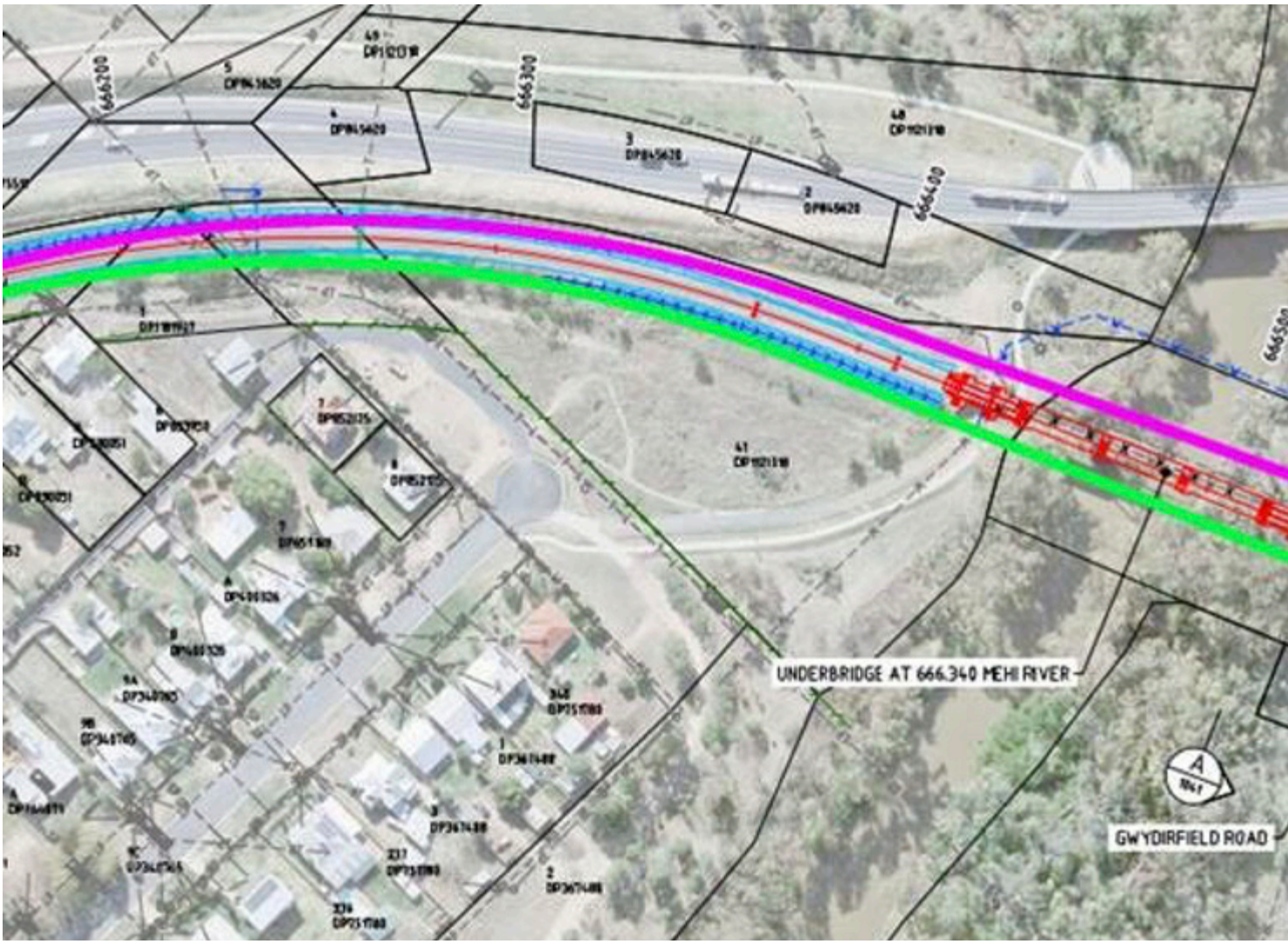
Retention of heritage elements of the bridge or part retention of the bridge in place will be assessed during detailed design.

## Mehi River Bridge

During the design phase, options were explored to avoid impacting the Mehi River Bridge by diverting the alignment to the north or south of the current alignment.

### *Northern alignment*

If the proposal was moved to the north (shown in purple in the figure below), the rail line would move closer to the Newell Highway, which would have resulted in the need for additional property acquisitions, placed limits on the potential for future upgrades to the Newell Highway and led to potential safety issues due to the rail formation being closer to the highway.



### *Southern alignment*

If the proposal was moved south (shown in green in the figure below), the rail line would move closer to nearby properties and require a sharper turn resulting in additional noise impacts to multiple residential properties, additional acquisitions, a change in bridge design and possible impacts to the Alice Street level crossing due to horizontal geometry changes.

Options to divert the alignment either north or south were considered not to be feasible. The decision was made to retain the Mehi River crossing on the existing alignment due to it being the safest and most efficient option for the design.

### Options to retain the Mehi River Bridge

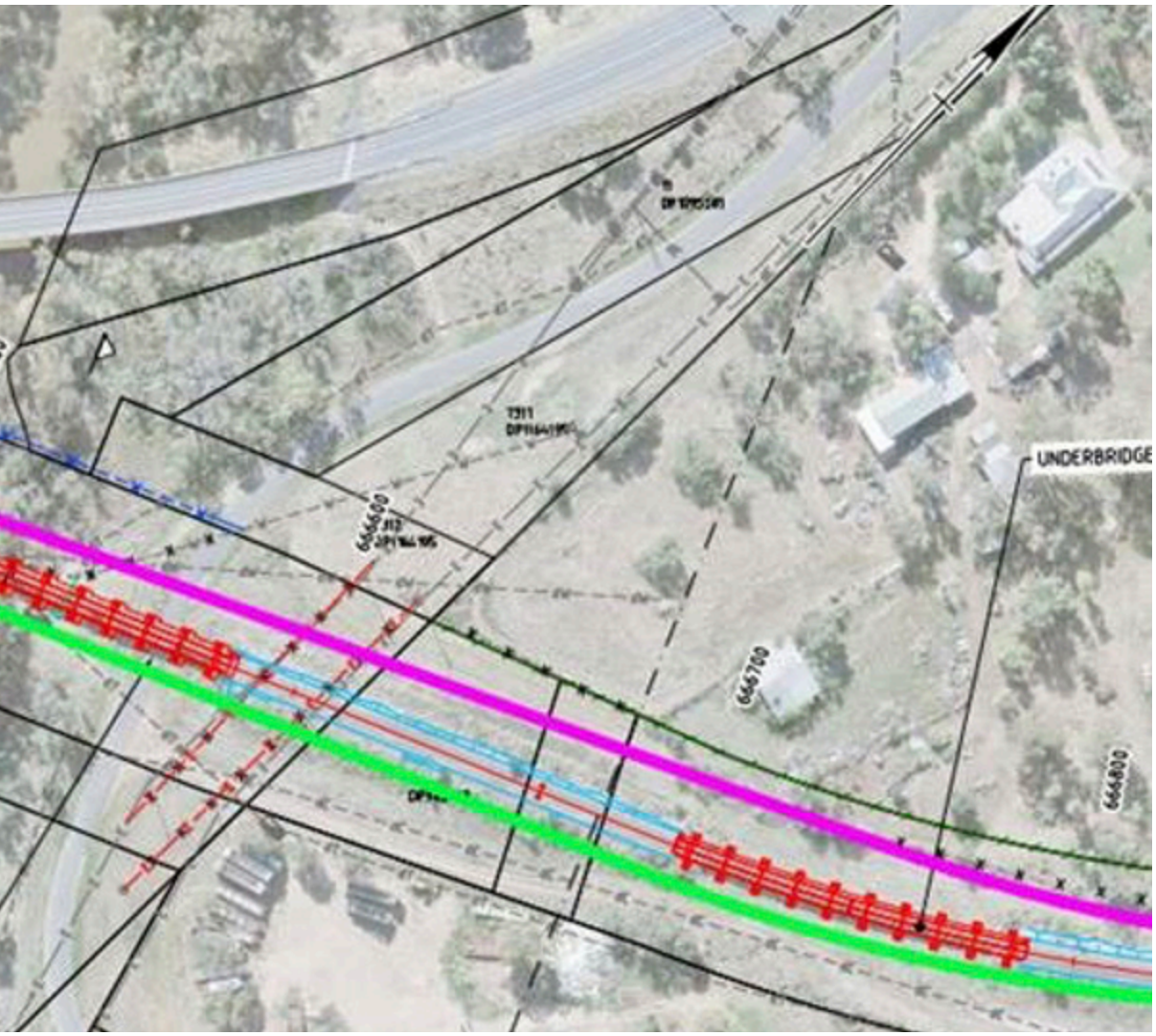
Options to retain or utilise all or parts of the existing Mehi River Bridge were also investigated during the design phase. Options were explored for full retention of the bridge or partial retention of the piers only. Full retention of the bridge would result in non-compliances for clearances, residual life and loading of the bridge and design life.

If only the piers were retained, this would also result in non-compliances for the residual life and loading of the bridge as well as the bridge's design life.

Due to the location of the Mehi River Bridge within the existing alignment, it is not feasible to retain any components of the bridge in order to comply with ARTC design and structural requirements. The design is being progressed on the assumption that the Mehi River Bridge will be demolished, including the main truss spans, and be replaced with a new bridge carrying the upgraded Inland Rail alignment over the river. Retention of heritage elements of the bridge will be considered during detailed design.

## Refinement of the proposal

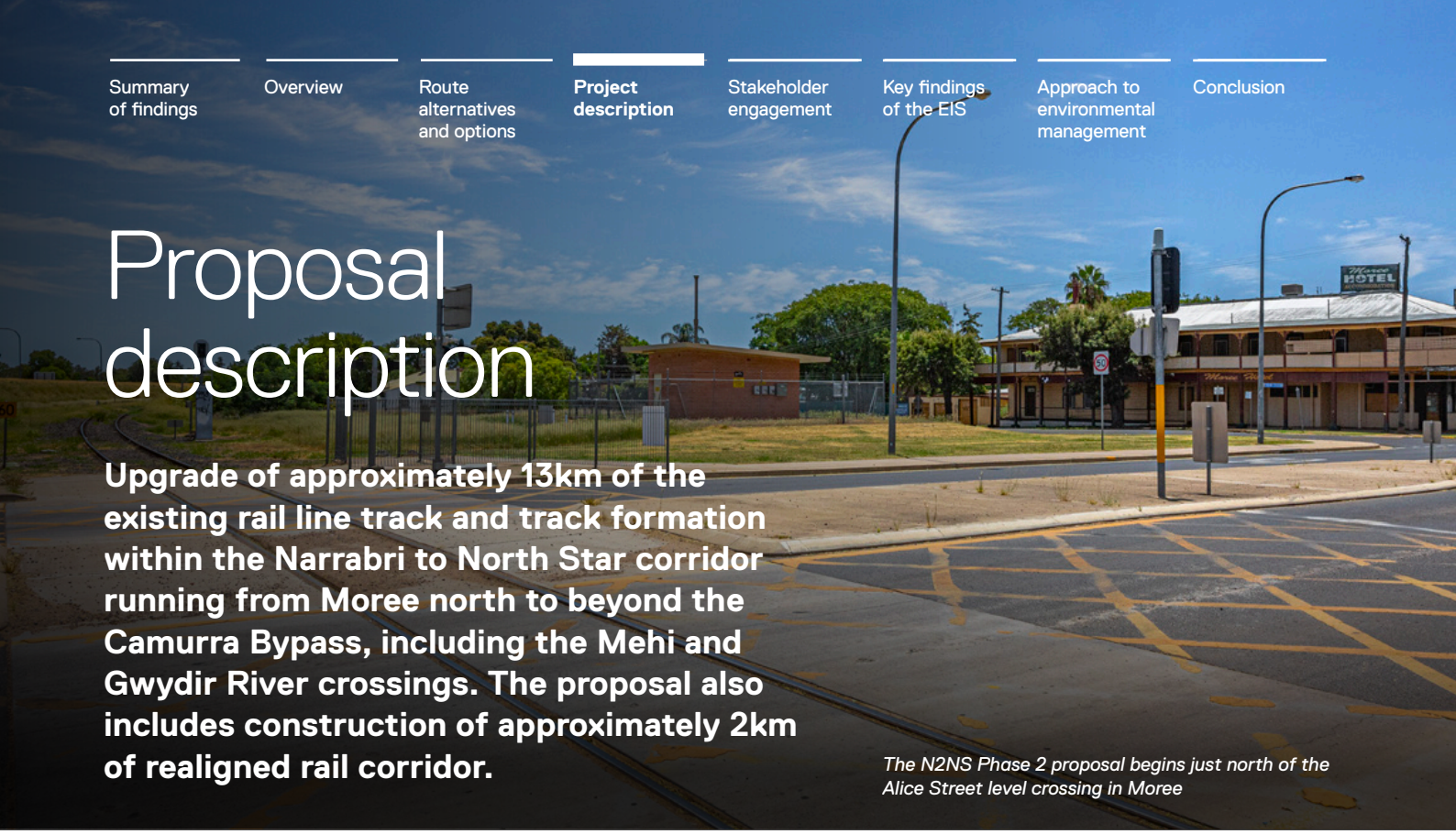
The proposal is based on the outcomes of the current draft design. Detailed design would consider the outcomes of the current design phase; the findings of the EIS, potential mitigation measures and any conditions of approval (if the proposal is approved).




*Considerations for alignment changes at Mehi River Bridge*

# Proposal description

**Upgrade of approximately 13km of the existing rail line track and track formation within the Narrabri to North Star corridor running from Moree north to beyond the Camurra Bypass, including the Mehi and Gwydir River crossings. The proposal also includes construction of approximately 2km of realigned rail corridor.**



*The N2NS Phase 2 proposal begins just north of the Alice Street level crossing in Moree*

## The proposal

ARTC is seeking approval to construct and operate the Narrabri to North Star Phase 2 section of Inland Rail.

Key features of the proposal are:

- enhancement of approximately 13km of existing track through minor adjustments to the vertical and horizontal alignment, and the construction of approximately 2km of new rail corridor, including rail embankments
- demolition and reconstruction of eight underbridges at Mehi River, Gwydir River, Skinners Creek, Duffys Creek and at four other un-named water courses
- installation of approximately 1,100 new flood relief concrete box culverts along the formation
- three new signalised level crossings at Gwydirfield Road, the Rocks Road and Back Pally Road to replace existing level crossings
- realignment and changes to six private level crossings (including closure of one private level crossing)
- 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
- decommissioning and removal of the Camurra Hairpin and the 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
- reconstruction of a new rail spur for the Weemelah line.

Associated works would include installation of signalling systems, signage, fencing, drainage, the relocation of services and utilities where necessary and the formation of rail maintenance access roads (RMARs) within the rail corridor adjacent to the line.

The construction and operation of the proposal would also require the following ancillary facilities:

- construction access and haul roads linking to the surrounding public road network
- construction storage and laydown areas
- associated earthworks for the construction of pads for piling rigs and cranes at underbridge locations.

Additional ancillary facilities could also include mobile batch plant, accommodation for construction workers and construction water supply and storage.

The proposal would require temporary occupation and permanent acquisition of land along the alignment. A total of 18 lots would be impacted by permanent land acquisition, including approximately 4 hectares (ha) of private land within 9 lots and 9 ha of Crown Land within 9 lots.

**Want to know more?**

See

- Chapter 7: Proposal features and operation

## Operation

Once commissioned, the proposal would form part of the national rail network managed and maintained by ARTC, with trains driven by a variety of operators. Inland Rail is anticipated to be completed from 2027. However, this is an indicative timeframe only and is subject to ongoing community consultation, detailed design refinements, environmental approval processes and unforeseen weather events.

Prior to this, the Narrabri to North Star Phase 2 section would form part of the existing network serving grain operations on currently active rail lines to North Star and Weemelah. Therefore, use of the proposal section could occur prior to operation of Inland Rail. This activity would recommence following the completion of construction of the proposal and Narrabri to North Star Phase 1 section.

The Project is designed to support double-stacked, 21–25 tonne axle load intermodal (container) trains up to 1,800 metres long and 6.5 metres high. Depending on the tonne axle load, train speeds would range from 80 to 115 kilometres per hour (km/h), except through Moree, where the maximum train speed would be 60km/h due to track geometry and safety. In addition, the proposal footprint is future-proofed to accommodate 30-tonne axle load intermodal trains up to 3,600 metres long and 6.5 metres high, travelling at 80km/hr.

Based on current demand forecasting, Narrabri to North Star Phase 2 is expected to have an average of about 11 trains per day travelling between Camurra and Moree upon completion of the entire Inland Rail Program. This is forecast to increase to about 20 trains per day in 2040.

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. Total annual freight tonnages would be about 11.8 million tonnes in 2025, increasing to about 19 million tonnes in 2040 (from the existing two million tonnes of grain per year).

*Harvesting on Weebollabolla Farm, Moree*

## Location

The Narrabri to North Star Phase 2 proposal site consists of single-track standard gauge rail line located predominantly within an existing rail corridor. The proposal site starts immediately north of the Alice Street level crossing at chainage (Ch) 666.000, and ends at Camurra north, Ch 681.000 just past the Moree Gun Club.

Approximately 2km of the rail line consists of new rail corridor through a 'greenfield' area. The proposal traverses the Mehi–Gwydir floodplain between the Mehi and Gwydir Rivers and includes the bridges at both these locations.

The proposal will include the replacement of the Mungindi connection to the existing rail line.

The Narrabri to North Star Phase 2 proposal site consists of single-track rail line located predominantly within an existing rail corridor. The proposal site starts immediately north of the Alice Street level crossing at chainage (Ch) 666.000, and ends at Camurra North, Ch 681.000 just past the Moree Gun Club.

## Fencing

New boundary fencing is proposed to provide physical separation of the railway corridor from the adjoining land. A boundary fence is intended to protect the rail corridor and mitigate the risks associated with individuals or livestock accessing the rail corridor or traversing the rail line.

New fencing would be installed along the majority of the proposal boundary.

The minimum standard for rural fencing along the alignment adjacent to grazing properties will be 7/90/30 prefabricated woven wire. The minimum standard for cropping land fencing will be plain or barbed wire fence (4–6 strand). The minimum standard for urban fencing will be a standard chain link boundary fence.

In certain circumstances, the minimum standard of fencing described above may be adjusted to ensure a fit-for-purpose solution, but only where agreed by ARTC.

This may include recognition of different topography and aligning fencing with land use.

ARTC will be responsible for ongoing maintenance of rail corridor fencing once each section of Inland Rail is operational. If shared rail corridor fencing is damaged by a landowner, the landowner will be responsible for any repairs.

Existing fencing along the rail corridor would be replaced as required.

Fencing would extend to the boundary of private landowners adjoining the rail line and would delineate the boundary of the rail corridor from residential and rural property areas. Where the rail corridor already exists, if it is currently fenced, it would be retained or replaced.

If no fencing presently exists, a risk assessment would be undertaken on a site by site basis to determine if boundary fencing is required.

During detailed design, the approach to fencing and any replacement fencing materials may need to be revised as further consultation with stakeholders is undertaken.

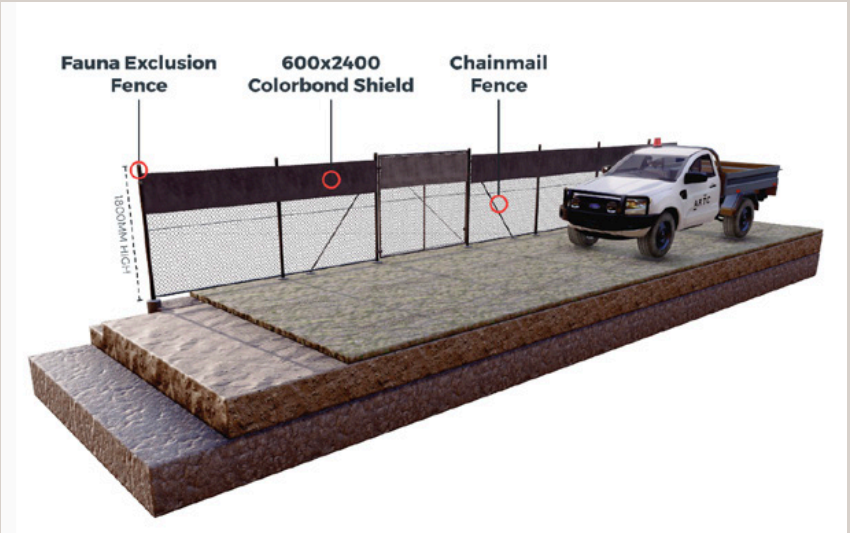
## Fauna fencing

Fauna fencing can be an effective way of preventing fauna species from accessing rail corridors, minimising potential injury and mortality. Fencing would be used in conjunction with other crossing structures to exclude animals from sections of infrastructure corridors and to direct animals towards a safe crossing location – usually a bridge, a culvert, or an at-grade crossing.

Typically, fauna fencing suitable to deter medium-sized mammals would generally be about 1.8 to 2 metres in height and buried 30 centimetres deep to prevent fauna species from digging under the fence.

Koala fencing would also be required in the southern section of the proposal site as well as areas immediately surrounding the crossing of the Gwydir River. The location and design of koala fencing would be confirmed during detailed design.

The figure on the right provides a representation of a standard fauna exclusion fence.

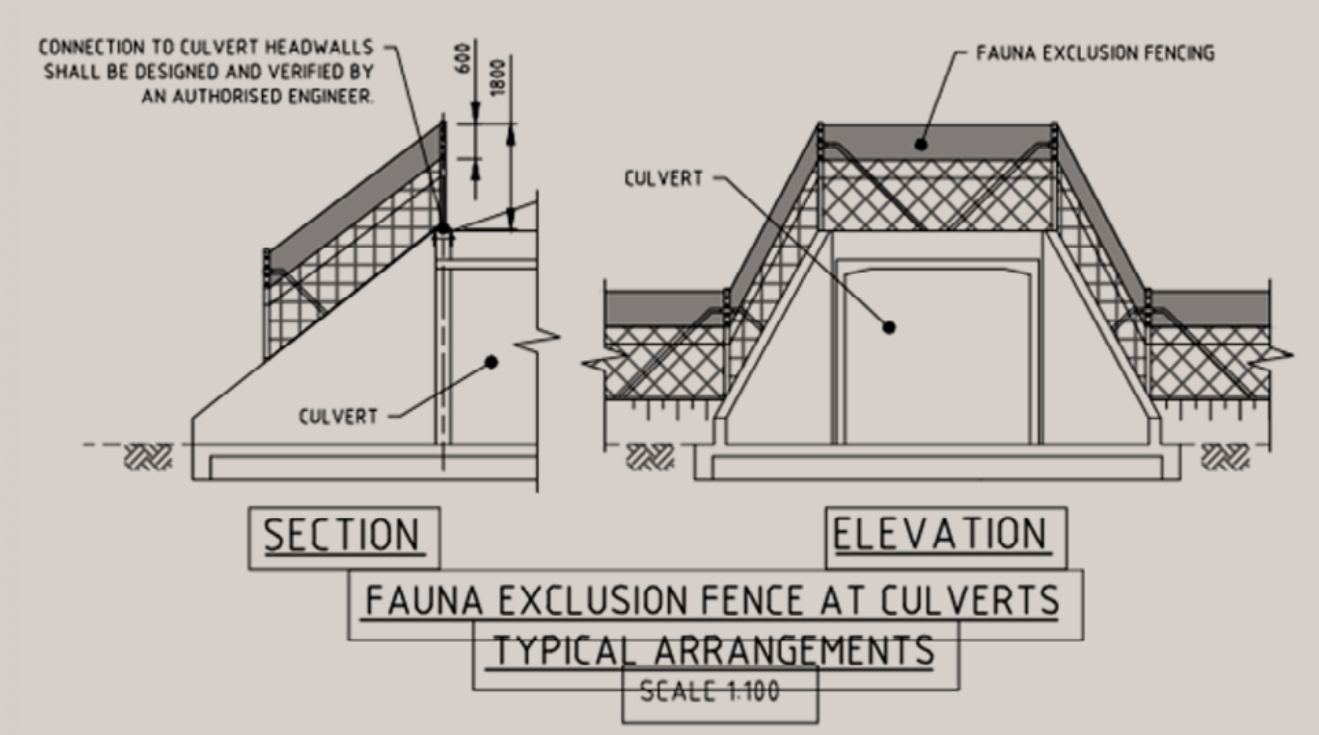


## Fauna crossings

Fauna crossings can provide connectivity of habitats for arboreal and land-based animals and may be constructed over or underneath a connectivity barrier (in this instance the railway line). Approximately 1,100 new concrete culverts would be included in the project and would provide passage for fauna in varying degrees from one side of the track alignment to the other. A Flora and Fauna Management Plan would be developed prior to construction which would include a fauna crossings sub-plan detailing designs of specific fauna crossing structures, including within culverts if large enough/where allowable.

The figure below shows a typical fence arrangement over culverts.

*Spotted-tailed Quoll (Dasyurus maculatus)*



# Construction key points

### Site establishment and preliminary activities

- installing site environment management and traffic controls
- erecting temporary site delineation fencing
- clearing and removing vegetation, where required
- establishing construction infrastructure, including borrow pits, construction compounds and temporary workforce accommodation
- utility diversions and adjustments.

### Main construction works

- earthworks
- rail infrastructure including track works, crossing loops, level crossings, bridges and culverts
- road infrastructure including culverts, drainage, pavement and operational access roads
- testing and commissioning.

### Finishing and rehabilitation

- demobilising or relocating construction compounds and facilities
- removing all materials, waste and redundant structures
- removing temporary fencing and establishing permanent fencing
- decommissioning site access roads that are no longer required
- restoring and revegetating disturbed areas where required.

**Want to know more?**

See

- Chapter 8: Construction of the proposal

## Proposed construction hours

To shorten the duration of construction as much as practicable and minimise associated disruptions to the community, the following construction hours are proposed:

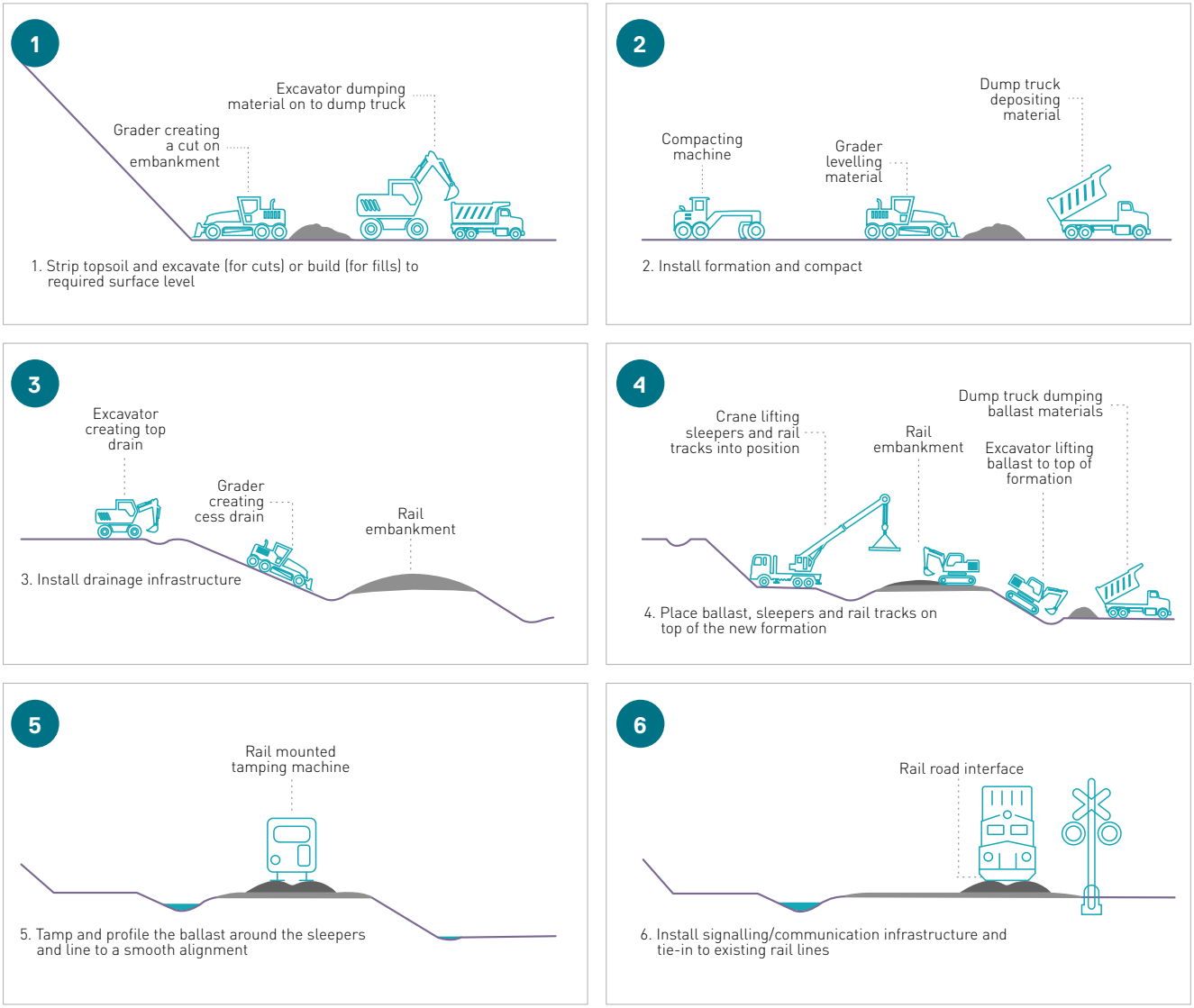
6:00am to 6:00pm, Monday to Sunday, with respite provided every second weekend. Respite hours will to be 6:00am to 6:00pm, Monday to Friday and 6:00am to 1:00pm on Saturday with no work occurring on Sunday.

Construction hours will be subject to the project's Conditions of Approval, once received.

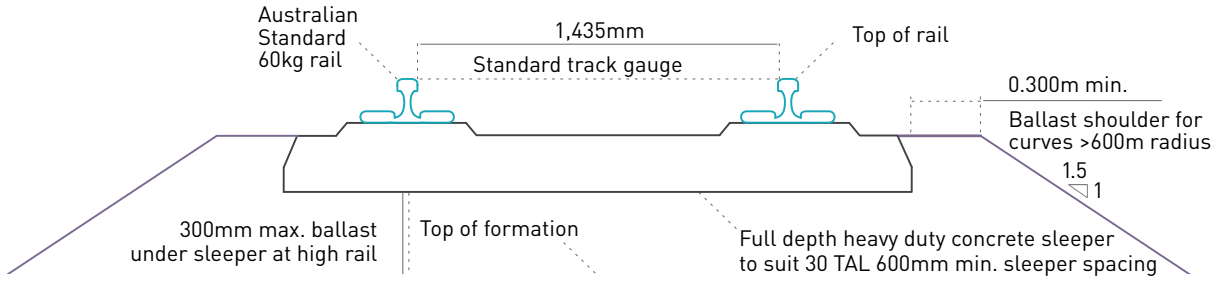
## Construction workforce

A peak construction workforce of approximately 150 people is anticipated.

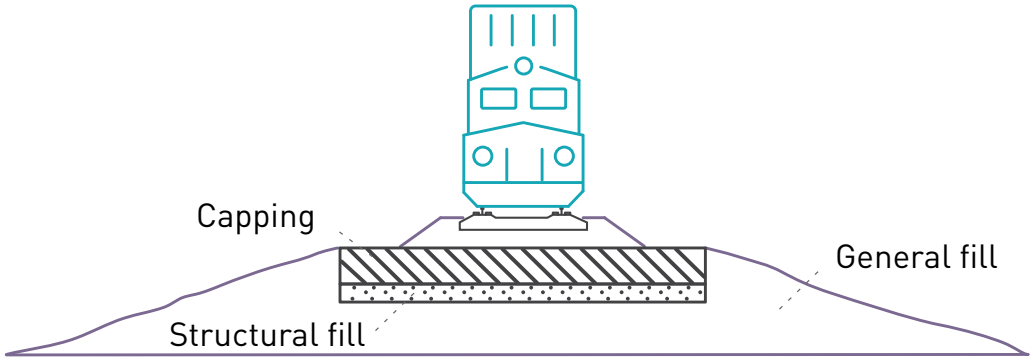
## Stages of construction




1. Strip topsoil and excavate (for cuts) or build (for fills) to required surface level
2. Install formation and compact
3. Install drainage infrastructure
4. Place ballast, sleepers and rail tracks on top of the new formation
5. Compact and reshape the ballast around the sleepers and line to a smooth alignment
6. Install signalling communication infrastructure and tie-in to existing rail lines




*Indicative design for new track*



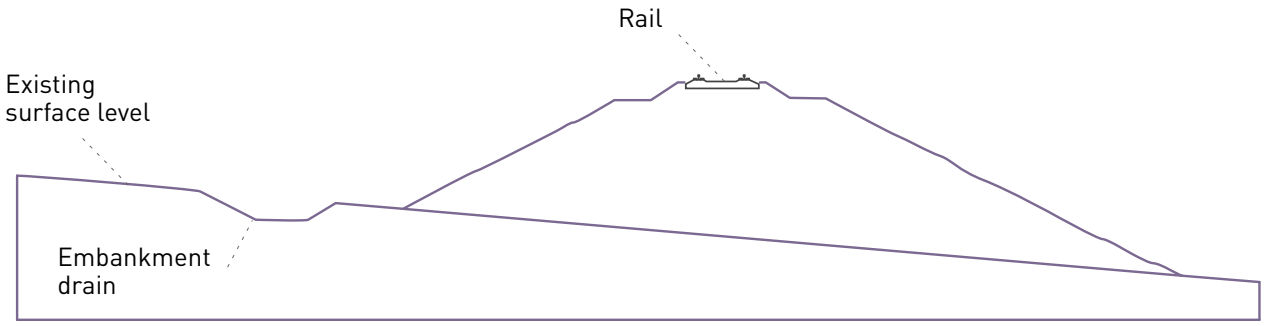

*Structure of the formation and embankment*

Two types of track drainage are currently proposed:

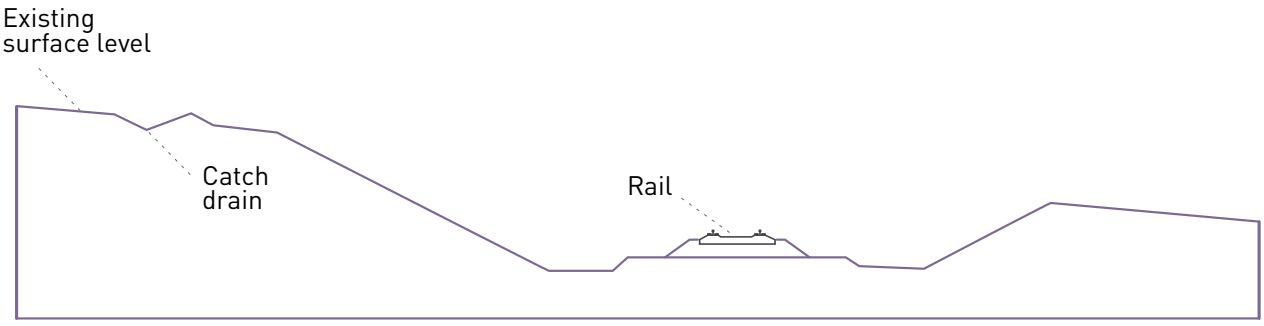
- embankment drains are proposed within the permanent footprint, adjacent to the track
- catch drains are proposed within the permanent footprint, on the uphill side of cuttings.

Both types of track drainage will be lined with grass to prevent erosion.

Due to topographical constraints, track drainage is not feasible along the entire length of the alignment. Rather, track drainage is proposed at specific locations along the proposed alignment where the gradient is steep enough to divert surface runoff to the nearest bridge or culvert location. As with culverts, the design and location of track drainage will be refined during the detailed design phase in order to minimise potential impacts.




*Indicative embankment drain design*



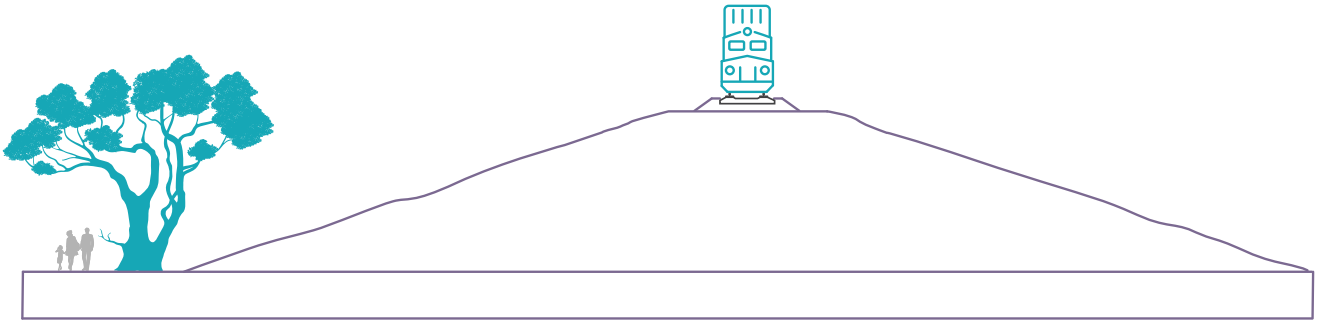

*Indicative catch drain design*

## Embankment design

The track will be supported by an earth embankment made up of general fill and engineered gravels.

In some cases, where low strength or highly reactive soils exist below the proposed embankment, some earth may need to be removed and replaced with better material or suitably treated to ensure the rail is built on a sound foundation. The embankments for the proposal are mostly two metres high, but can be up to 7.5 metres high due to site environmental requirements.

*Representative embankment height (2 metres high with six metre wide base)*



*Representative embankment height (7.5 metres high with 52 metre wide base)*

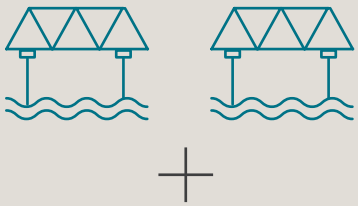
*Mehi River Bridge*

*Gwydir River Bridge*

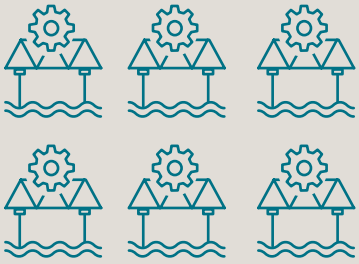
## Bridges

The proposal includes the construction of two new bridges over the Mehi and Gwydir Rivers, and the upgrades of six other bridges to cross various creeks and other areas of the floodplain. Construction of new bridges would generally be along the existing alignment, except at the Gwydir River Bridge, which would be undertaken upstream to suit the proposed new realignment.

2 x new bridges



6 x upgraded bridges



# Stakeholder engagement

**Consultation with individuals and groups has assisted in highlighting issues and identifying potential impacts and benefits to inform the EIS.**

## Stakeholder engagement

The Secretary's Environmental Assessment Requirements (SEARs) set the requirements for a comprehensive consultation program to identify broad issues of concern from local and regional community and interest groups, and address issues from proposal planning through to construction, commissioning and operation.

Consultation with individuals, groups and organisations across the Narrabri to North Star Phase 2 alignment has assisted in highlighting issues and identifying potential impacts and benefits to inform the EIS. These interactions have also helped to shape the proposal design and inform proposed mitigation measures for implementation in future stages of design, construction, commissioning and operation.

**Want to know more?**

See

- Chapter 4: Consultation
- Appendix D: ARTC consultation summary


*Members of the Inland Rail Stakeholder Engagement team at the Moree Show*

## Engagement approach

ARTC Inland Rail implemented a flexible and proactive engagement approach for the proposal. The focus was on creating and sustaining meaningful relationships that meet the expectations of the diverse range of stakeholders, to be applied throughout planning and construction of the Project. A variety of communication and engagement activities have been, and will continue to be, implemented to ensure all members of the community have access to up-to-date information and feel involved throughout all stages of the proposal.

ARTC identified and carried out the following engagement approach using the International Association of Public Participation (IAP2) guiding principles outlined below:

### 1 Identify

The key stakeholders for Inland Rail have been identified as:

- elected members of parliament of NSW and Australia
- local councils
- government agencies
- landowners and residents with potential to be directly impacted
- community and environmental groups
- traditional owners
- utility providers
- representatives of neighbouring and related projects.

A range of potential impacts, both positive and negative, were identified including the potential for property acquisition, land-use and property impacts and access to properties.

### 2 Design and prepare

Four levels of engagement were tailored to each stakeholder group; they follow the IAP2 guiding principles:

1. **Inform:** create awareness amongst stakeholders and communicate progress
2. **Consult**: proactively seek feedback through formal and informal channels
3. **Involve:** consistently involve stakeholders and seek feedback
4. **Collaborate:** actively seek and incorporate all stakeholder feedback into the design.

## 3 Engage

The following engagement activities have been undertaken by Inland Rail:

- community drop-in sessions
- feedback surveys
- doorknocks
- one-on-one meetings
- e-newsletters
- project factsheets
- regular website updates
- media releases
- meetings
- presentations
- ongoing consultation with key stakeholders
- letterbox drops.

## 4 Feedback

- Inland Rail maintained relationships to consistently seek feedback at all stages of the proposal
- the purpose to capture feedback during stakeholder engagement and to identify issues by stakeholder category is addressed throughout the chapter
- opportunities for future feedback will include the exhibition period for the N2NS proposal.

## 5 Review

The intent of this phase is to enable Inland Rail to implement a continuous improvement loop to assess the adequacy and effectiveness of engagement and where required, change the nature of the engagement. This is evident through the implementation of drop-in sessions.

## Consultation

Consultation with the community commenced in 2015 and included discussion of the whole Narrabri to North Star project prior to the project being split into two phases.

Significant, detailed and tailored consultation has occurred in the lead up to the development of the Environmental Impact Statement, a summary of which is included below:

### Major themes

Throughout the consultation process it emerged that there were three key issues of concern:

- Hydrology
- Noise and vibration
- Property related matters: including desire for acquisition and property devaluation

Extensive consultation has been held with N2NS communities during each stage of the proposal's development, including prior to the separation of Phase 2 from Phase 1.

The following sections are an overview of consultation carried out from 2016 to April 2021. Phase 2 Specific consultation commenced in August 2019.

## Narrabri to North Star

**Phase 2 community engagement since August 2020**

**14**
**Community events**
(e.g. community information sessions)

**13,459**
**Electronic newsletters sent**

**2,392**
**Online interactive map views**

**39**
**Council conversations**

**40**
**Targeted First Nations engagement**
(e.g. meetings, workshops)

**823**
**Individual conversations**
(e.g. 1:1 meetings and site visits)

**15**
**Industry briefings**
(e.g. business capability workshops)

**66,380**
**Narrabri to North Star project page views on Inland Rail website**

## Overview of consultation activities (August 2020 – February 2021)

### What we said

Consultation for the purposes of informing the EIS was conducted from August 2020 until December 2021. Prior to undertaking planning for consulting with the community, ARTC Inland Rail analysed the results from previous engagement and assessed that it was likely that hydrology would be the key area of interest, but this needed to be confirmed. It was also deemed essential that the community participated in the development of the hydrology model used to predict the effect of the preliminary design. As such early consultation in this period focused on hydrology as well as understanding other areas of interest to this community.

A tiered, targeted consultation approach ensured consultation sought feedback in a timely manner to inform the EIS.

Noting that hydrology had been identified as a key concern in earlier consultation, ARTC Inland Rail decided to gather feedback from a wider group of stakeholders, including any landowners and community members potentially impacted by changes in hydrology.

A key objective of the first round of consultation was to ensure landowners and community were aware of the removal of the proposal from the wider Narrabri to North Star project and the differences in both project timelines and focus.

This first round of consultation also provided general information about a range of factors associated with the proposal, including but not limited to visual impact, level crossings and biodiversity.

### What we heard

This initial round of consultation identified three primary issues: hydrology, noise and the potential for land acquisition from a small number of stakeholders which has informed later periods of consultation.

## Hydrology model and project overview: August – September 2020

### What we said

In August and September of 2020, the Stakeholder Engagement Team met with approximately 40 landowners, as well as a range of other stakeholders including Moree Plains Shire Council, Transport for New South Wales, the Moree Local Aboriginal Land Council and the Gwydir Valley Irrigators Association to introduce the Phase 2 Environmental Impact Statement process. This was delivered via several forums including individual meetings, and both an online and face-to-face information session.

We sought feedback about the hydrology model to determine if it was consistent with landowners' personal experiences. Key materials presented as part of consultation included historic flood imagery and flood modelling showing existing water flow and interaction with the rail line.

The objectives of these sessions were to:

- provide a project update to the wider community who are further from the project area and therefore haven't participated in a one-on-one meeting with the project team
- provide the wider community an opportunity to interact with technical specialists, including hydrology, noise and environmental
- provide an opportunity to ask questions and give feedback to the project team.

### What we heard

Landowners consulted were generally supportive of the proposal and appreciated the opportunity to review the hydrology modelling. During consultation sessions, it was apparent from mapping and flood modelling that most landowners in the project area would be protected by measures such as mounds and levees. All landowners did however reiterate the importance of ensuring sufficient culverts were part of the preliminary design.

It was clear through this initial round of consultation that hydrology and noise were the key areas of interest, and this informed the following two rounds of consultation.

Other points of interest included fencing, potential temporary occupation, air pollution and traffic disruption. Initial views were sought on the replacement of several bridges, however it was noted that the majority of stakeholders consulted were unconcerned by their removal and replacement. Some did however, express a desire for some form of bridge memorial. This will be further explored in the detailed design phase.

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

### What we said

In November and December 2020, the team again met with identified stakeholders. The primary objective of these meetings was to present and seek feedback on the proposed reference design, including rail alignment, level crossing design and trafficking requirements, culvert size and placement and flood impact.

Key materials presented as part of consultation included flood modelling showing the proposed rail design to minimise both the possibility of water topping the rail line and any effect of changed flood conditions on properties and infrastructure.

It was also important that the team understood how any potential increase in hydrology impacts would affect properties and residences. The team ensured they gained a good understanding of where recent flood events had impacted and the distance flood waters peaked in proximity to houses.

During this period, the team informed the community about potential construction impacts and sought their feedback on how these might impact farming and cropping operations.

The team also provided information on the project approval process as well as explained how to make a submission.

In December, a further online session as well as a drop-in information session was conducted to give the wider community the opportunity to review the reference design and raise any other concerns.

### What we heard

Landowners were generally supportive of the reference design and provided positive feedback in relation to the large number of culverts. The hydrologist presented flood model mapping showing anticipated impacts and, with limited exceptions, landowners were generally comfortable with the level of change. Landowners were made aware that areas such as the Camurra Hairpin will continue to be subject to refinement during detailed design.

Landowners indicated acceptance of potential construction noise and impacts, noting that most simply wanted the construction period to be finished as soon as possible. There were some requests for measures to alleviate some impacts and these have been recorded and will be explored in detailed design.

The majority of residents residing in close proximity to the alignment expressed significant concern regarding operational noise and the number of trains predicted to be in use. This was the focus of the third round of consultation.

## Operational train noise and its impact: February 2021

### What we said

The Stakeholder Engagement team met with a smaller number of stakeholders in February 2021 who would be eligible for noise mitigation treatment and those who, although would be noise affected, would not be eligible for treatment. Key materials presented as part of consultation included construction and operational noise modelling, and visualisations of proposed mitigation measures (e.g. noise wall).

Discussion included a detailed explanation of rail noise impacts, noise mitigation protection triggers in the NSW Rail Infrastructure Noise Guideline and available mitigation measures that will be explored during detailed design.

The team also sought to explain noise impacts during construction, including potential work hours. It was also deemed important to understand, in particular, the needs of shift-workers to ensure construction planning minimises any impacts.

A community information session was also held for the Yarraman community after a full assessment of potential hydrology impacts to that area.

### What we heard

Concern was raised by stakeholders around operational noise impacts, particularly given the current rail line is used infrequently.

There was a strong perception that a greater number of residences would have been potentially eligible for noise mitigation measures. ARTC Inland Rail clarified that noise mitigation would likely not be required for those north of the Mehi River, but those south of the Mehi River crossing would require noise mitigation and a noise wall may be considered during detailed design.

Community views on noise walls differed depending on location, with those closest to the rail line opposing it and those further away being generally more supportive. ARTC acknowledged these concerns and intends to consult extensively with the community during detailed design.

## Construction hours: October 2021 to November 2021

### What we said

The Stakeholder Engagement team dropped flyers and door knocked residents in areas most likely to be affected by construction noise to inform them of the proposal to seek a seven-day working week.

A community survey inviting feedback on the proposal was also emailed to a wider audience, which was followed up with phone calls to stakeholders who had not provided feedback through online or face-to-face channels.

### What we heard

Some residents expressed their concern for the proposed seven-day working roster due to the ongoing construction noise and activity associated with this schedule.

Others noted that it was best to get the job completed quickly. Stakeholders located outside the noise impact zone, indicated they supported or had no opinion on the proposal of a seven-day working roster.

## Flood water velocity and soil testing: December 2021

### What we said

In November 2021, the Stakeholder Engagement team facilitated meetings between six landowners and members of the Inland Rail Environment Team to discuss soil testing which was carried out at 10 locations along the proposal alignment.

Soil results were presented to each of the stakeholders and the impact of flood water velocity was presented in the form of mapping which clearly showed the impacts on each property in a 1% Annual Exceedance Probability (AEP) event.

Stakeholders were advised there would be a velocity change at each of the locations tested, but the full extent of the change would not be known until the detailed design phase. Each stakeholder was advised that mitigation could occur in two ways – if Inland Rail expanded its footprint now or addressed the impacts in detailed design when the full impact was known.

### What we heard

The majority of the six landowners advised they were reasonably comfortable with the impacts shown and were willing to wait until the full velocity impacts were known before proceeding with mitigation discussions.

One very concerned landowner raised the option of selling his property to Inland Rail as a proposed mitigation measure, rather than mitigating the issue once the full extent of the impact was known during detailed design.

### Noise wall

Much of the discussion with Morton Street and Oak Street residents in Moree focused on whether or not a noise wall was preferred. The Stakeholder Engagement team presented visualisations of how a wall might look in-situ in order to promote discussion – see images below. A decision on whether or not to proceed with a noise wall will be further explored in the detailed design phase.

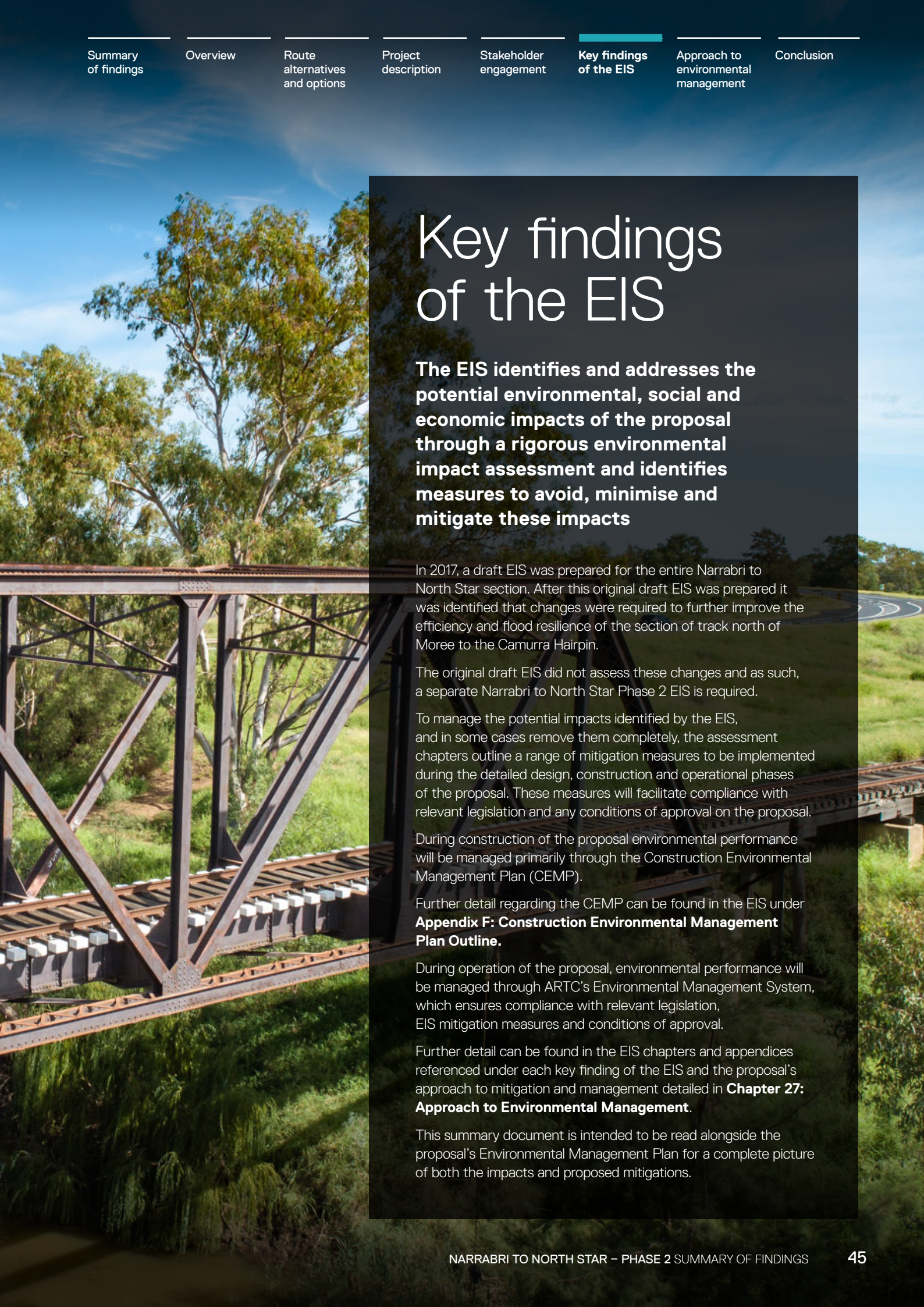



## Other areas of interest are detailed below and will be further considered as the project progresses.

| Topic category | Issues raised for consideration | EIS reference |
|---|---|---|
| **Land use/ properties** | – Process and timing of property acquisition and temporary land leases<br>– Concerns about property devaluation<br>– Impact of proposal on future property plans (subdivisions, selling property)<br>– Fencing of rail corridor needs to reflect land use (crop, livestock)<br>– Impact on irrigation channels and operations during construction. | Chapter 9: Land Use and Property |
| **Traffic/access** | – Safety at level crossings<br>– Wait times at level crossings<br>– Ensuring emergency access clearance is maintained<br>– Design allowance for farming machinery and trucks at level crossings<br>– Improved road safety by freight moving on rail once operational<br>– Detour routes and lengths during construction<br>– Impacts on heavy vehicle movements during construction, particularly during harvesting and planting times<br>– Impacts of construction and operation on travelling stock routes<br>– Interaction with the Newell Highway<br>– Safety concerns regarding road width and sight lines at Gwydirfield Road (underbridge)<br>– Maintaining access to irrigation channels within rail corridor<br>– Maintain access to rail corridor for weed management<br>– Maintaining access across the rail line for Indigenous communities. | Chapter 11: Traffic and Transport |
| **Hydrology** | – Concern around interfaces with highway upgrades and floodplain management programs<br>– Culvert location and heights<br>– Changes to flow duration, depth and velocity<br>– Impacts of flooding related to levee bank heights in the area<br>– Maintaining water flow through rail line. | Chapter 12: Hydrology and Flooding |

| Topic category | Issues raised for consideration | EIS reference |
|---|---|---|
| **Noise and vibration** | – Impact of noise and vibration during operation<br>– Concern about vibration impacts to property during piling as part of bridge construction<br>– Noise mitigation measures available to nearby landowners<br>– Nature of noise carrying along the Mehi River and across from the rail line<br>– Concern about operational noise modelling results and lack of mitigation measures required according to the NSW Rail Infrastructure Noise Guideline<br>– Concern about graffiti/crime associated with noise wall mitigation option<br>– Concern about sleep disturbance for shift workers during construction. | Chapter 16: Noise and Vibration |
| **Social and economic impacts** | – Opportunities for local jobs and bringing people to the area<br>– Increased connectivity for farmers and new industries<br>– Better pricing of grains to more competitive and broader markets<br>– Opportunities for community partnerships, grants and sponsorship. | Chapter 17: Social Impact Assessment<br>Chapter 18: Economic Assessment |
| **Visual amenity** | – Impacts of operation on visual amenity. | Chapter 19: Landscape and Visual |
| **Air quality** | – Concern about air quality and negative health impacts associated with increased use of the rail line. | Chapter 24: Air Quality and Greenhouse Gas |

*Gwydir River Bridge, Moree*



# Key findings of the EIS

**The EIS identifies and addresses the potential environmental, social and economic impacts of the proposal through a rigorous environmental impact assessment and identifies measures to avoid, minimise and mitigate these impacts**

In 2017, a draft EIS was prepared for the entire Narrabri to North Star section. After this original draft EIS was prepared it was identified that changes were required to further improve the efficiency and flood resilience of the section of track north of Moree to the Camurra Hairpin.

The original draft EIS did not assess these changes and as such, a separate Narrabri to North Star Phase 2 EIS is required.

To manage the potential impacts identified by the EIS, and in some cases remove them completely, the assessment chapters outline a range of mitigation measures to be implemented during the detailed design, construction and operational phases of the proposal. These measures will facilitate compliance with relevant legislation and any conditions of approval on the proposal.

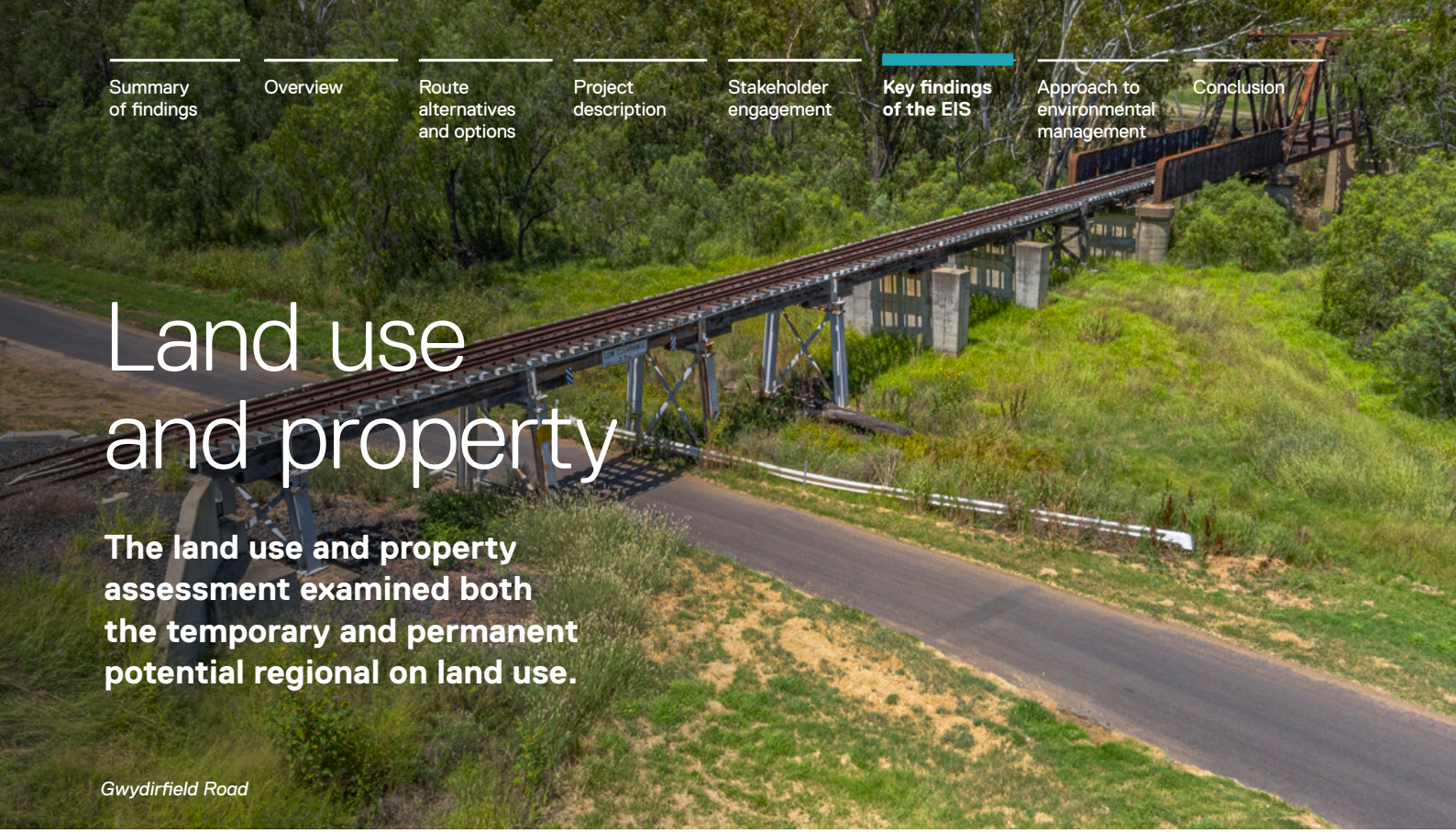
During construction of the proposal environmental performance will be managed primarily through the Construction Environmental Management Plan (CEMP).

Further detail regarding the CEMP can be found in the EIS under **Appendix F: Construction Environmental Management Plan Outline.**

During operation of the proposal, environmental performance will be managed through ARTC's Environmental Management System, which ensures compliance with relevant legislation, EIS mitigation measures and conditions of approval.

Further detail can be found in the EIS chapters and appendices referenced under each key finding of the EIS and the proposal's approach to mitigation and management detailed in **Chapter 27: Approach to Environmental Management**.

This summary document is intended to be read alongside the proposal's Environmental Management Plan for a complete picture of both the impacts and proposed mitigations.



# Land use and property

**The land use and property assessment examined both the temporary and permanent potential regional on land use.**

*Gwydirfield Road*

The proposal deliberately minimises the potential for direct impacts to land use and properties by optimising the use of the existing rail corridor, wherever possible. This existing rail corridor is owned by Transport for NSW (TfNSW) and currently leased to ARTC for railway use.

Outside the existing rail corridor, the majority of land affected by the proposal is currently either:

- Crown land (about 8.78 hectares); or
- Agricultural land (about 3.94 hectares).

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

The proposal will require land both temporarily (during construction only) and permanently (for the proposal's operational infrastructure).

**Want to know more?**

See

- Chapter 9: Land use and property and Appendix E

## Temporary land use

Approximately 107 hectares will be required temporarily to enable construction, including land required for access tracks and construction compounds.

Temporary construction land requirements are estimated to include about 70 hectares of privately-owned land and 37 hectares of publicly-owned land, mainly owned by the NSW Government.

## Permanent land use

Permanent land requirements will include use of land within three properties and includes about four hectares of privately-owned land and nine hectares of publicly-owned land, mainly owned by the NSW Government. ARTC Inland Rail's preliminary consultation with potentially affected landholders to understand key issues and concerns has informed design development and proposed mitigation measures.

### Potential land use and property impacts include:

- Change in tenure and loss of property
- Disruption to land over which Native Title claims have been made
- Change in land use, including the permanent loss of agricultural land and temporary disruption to agricultural practices, and alterations to Travelling Stock Reserves (TSRs) and informal stock routes
- Temporary impacts to accessibility including the road network and property access
- Impacts on utilities.

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

- Property acquisitions and adjustments, where required, undertaken in consultation with landowners and in accordance with all relevant statutory requirements
- Rehabilitation of land required during the construction phase in accordance with a Reinstatement and Rehabilitation Plan
- A Traffic Management Plan, which will 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
- Developing access arrangements for affected properties in consultation with landowners during detailed design
- Liaising with Local Land Services during detailed design to understand how and when the TSRs are used, and how impacts can be avoided.


*View of proposed alignment through the stock reserve (highlighted in pink).*

# Biodiversity

**Native vegetation within the proposal area has been extensively modified as a result of agricultural land use activities, with the majority cleared for grazing and/or cropping.**

The majority of the proposal area has been cleared of native vegetation, and largely consists of existing rail corridor and land cultivated for agriculture, which is the dominant land use in the area. Existing vegetation mostly consists of natural grassland, native trees and exotic weeds.

Biodiversity impacts have been assessed through comprehensive landscape assessment, including a land category assessment, targeted field surveys, impact assessment and biodiversity 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* including Matters of National Environmental Significance (MNES).

Three EPBC listed threatened ecological communities were confirmed as present within the proposal site including Weeping Myall Woodland, Natural Grasslands and Poplar Box Woodland.

Three EPBC listed species were recorded during the field surveys, including the Murray Cod, Koala and Grey-headed Flying-fox.

The following EPBC listed species were not recorded during the field surveys but are considered to have potential to occur due to the presence of suitable habitat within the subject land and may be impacted:

- Belson's Panic
- Painted Honeyeater
- Five-clawed Worm-skink
- Superb Parrot
- Corben's Long-eared Bat
- Winged Peppercress
- Satin Flycatcher.

**Want to know more?**

See

- Chapter 10: Biodiversity

An *EPBC Act* assessment of significance was completed for each of the above-mentioned EPBC listed threatened ecological communities or species. An *EPBC Act* referral was undertaken for the Koala, Murray Cod and Five-clawed Worm-skink due to unknown impacts or a perceived significant impact. A significant impact for the remaining species was not considered likely, however, *EPBC Act* referral for the species was undertaken for legal certainty.

The biodiversity assessment did not identify any Serious and Irreversible Impacts to TECs or threatened species associated with the proposal.

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

- Habitat loss and degradation from vegetation clearing/removal (99.74 ha of native vegetation and 43.31ha of non-native vegetation) including impacts to riparian and aquatic habitat
- Fauna species injury or mortality including from train strikes during the operational phase of the proposal
- Displacement of flora and fauna species leading to a decline in local populations
- Disruption to landscape/habitat connectivity
- 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.

## Mitigation measures

The key mitigation measures identified in order to reduce the significance of potential impacts of the proposal on ecological receptors include:

- Timing works to avoid critical life cycle events
- Implementing clearing protocols, including pre-clearing surveys, daily surveys and staged clearing, with the presence of a trained ecological or wildlife handler
- Rehabilitation in areas of retained vegetation to enhance connectivity
- The relocation of habitat features (e.g. fallen timber, hollow logs) from within the proposal area to adjacent areas
- Dust monitoring programs to control air quality
- Temporary fencing to protect significant environmental features and threatened species habitat
- Hygiene protocols to prevent the spread of weeds or pathogens.

During detailed design, a Flora and Fauna Management Plan will be developed to ensure key mitigation and management techniques are implemented. The area of direct impact will also be further refined during detailed design to reduce the amount of vegetation clearing required as far as practicable.

To mitigate the potential impacts on biodiversity, a comprehensive biodiversity offset strategy is being prepared. This includes consideration of potential offset sites and/or opportunities to purchase biodiversity credits to offset any unavoidable impacts of the proposal.

*Aquatic ecologists undertaking biodiversity assessments*

# Traffic and transport

**Constructing and operating new rail and road infrastructure may affect existing traffic, transport and access arrangements and impact the local and regional community. It is important these potential impacts are identified and understood prior to construction.**

**The overall aim during construction and operation of the proposal is to:**

- maintain the safety and efficiency of all affected transport modes for the workforce and other transport system users
- avoid or mitigate impacts to the condition of transport infrastructure
- ensure any required works are compatible with existing infrastructure and future transport corridors.

**Want to know more?**

See

- Chapter 11: Traffic and transport

## Construction

A Traffic, Transport and Access Management Plan would be prepared as part of the Construction Environmental Management Plan. Construction of the proposal would be undertaken in accordance with this plan. It would include measures to minimise the potential for impacts on the community and the operation of the surrounding road and transport environment. It would address all the aspects of construction relating to the movement of vehicles, pedestrians and cyclists, and the operation of the surrounding road network.

Access to the construction sites would be from Moree via the Newell Highway, Gwydirfield Road and Back Pally Road.

Construction of the proposal would result in temporary impacts to traffic and access within the proposal area, and a small increase in both heavy and light vehicle movements on the local road network during the construction period.

Peak-hour traffic movements of the workforce are likely to be minimal as construction workers would be traversing the roads outside of peak hours. Existing rail operations would be suspended throughout the construction period.

Access for emergency vehicles would be maintained along key emergency access routes throughout the construction period.

Temporary road closures, where required, would be manged via the construction of temporary detours in order to maintain public access.

## Operation

During operation, some maintenance/operational traffic will be generated although this is not expected to be significantly higher than current volumes.

Travel times along the Newell Highway are likely to remain at existing levels, with no impact as a result of the operation of the proposal. 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 proposal is expected to have a positive impact on the road network by relocating some of the road freight to rail.

All operational activities would be undertaken in accordance with ARTC's standard operating procedures and the environment protection license relevant to the proposal.

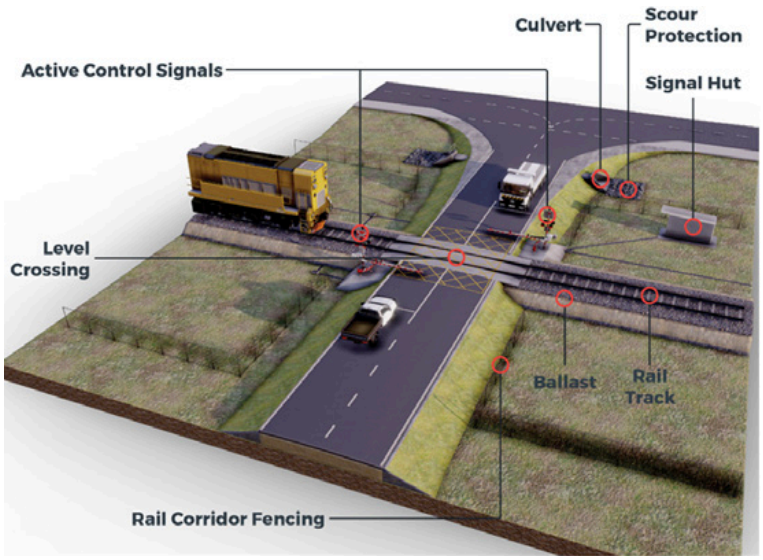
## Level crossings

All level crossings within the study areas have been assessed for safety and compliance.

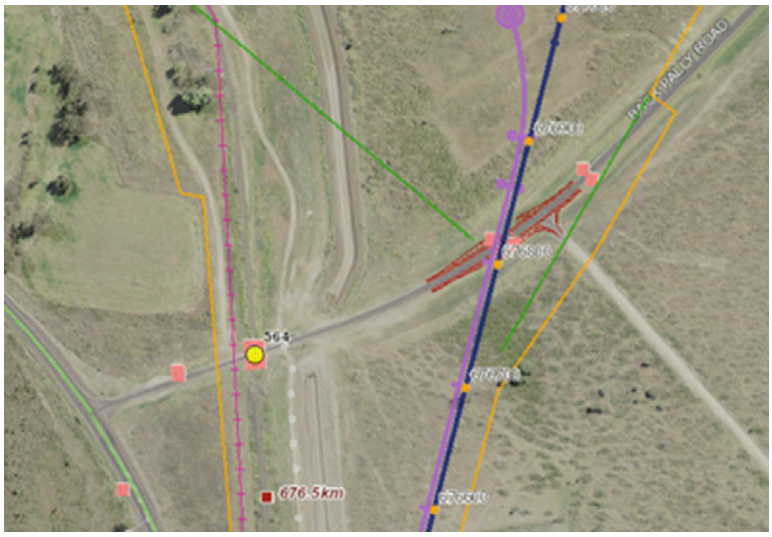
All level crossings would be upgraded to comply with the relevant Australian and ARTC standards. The three public level crossings, at Gwydirfield Road, The Rocks Road and River (Back Pally) Road, would be upgraded to active controls, including flashing lights and booms.

Active controls generally make the road network more efficient because they only require vehicles to stop when the crossing is activated (boom gates and flashing lights). It is anticipated that traffic would continue to use the level crossings while they are being upgraded, with traffic movements managed through the provision of suitable traffic control measures.

Additionally ARTC Inland Rail has located the alignment to provide sufficient space at all level crossings to eliminate the possibility of short stacking. Short stacking occurs when there is insufficient space for vehicles (typically longer vehicles such as trucks) to stop at a level crossing without blocking either the tracks or a nearby intersection on the road.




*Active level crossing*




*Back Pally Road proposed active level crossing*

## Traffic and intersection impacts

As a result of the proposal, only the Gwydir Highway/Moree Bypass intersection would be impacted due to increased queuing. This particular intersection is outside this proposal, however construction vehicles accessing the site would be required to travel through this intersection.

As such, impacts of crossing closures on the Gwydir Highway/Moree Bypass intersection, have been modelled as part of the EIS. 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 would be 158 seconds.

Council, local residents and emergency services have indicated concerns about the potential blocking of the Alice Street level crossing due to train breakdowns and increased waiting times for trains to pass. This may result in longer journey times to cross the rail line (for both vehicles and pedestrians) due to the need to divert to southern crossing points.

The Narrabri to North Star Phase 1 project is assessing potential impacts relating to train breakdown, through additional traffic movement studies and by implementing further mitigation measures, where considered necessary.

This proposal does not alter the impacts being considered by Phase 1, as it is situated to the north, and therefore would not contribute to any potential cumulative impacts.

# Hydrology and flooding

**The proposal incorporates design measures to avoid or minimise potential impacts on flooding and watercourses.**

The proposal is located on a sensitive floodplain within the Gwydir catchment, in northern New South Wales and intersects numerous rivers and creeks, including the Mehi River, Gwydir River, Skinners Creek, and Duffys Creek.

Detailed flood modelling has been undertaken to ensure that potential flooding issues are identified and managed appropriately. 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 developed from a major flood study undertaken in 2016. The methodology establishes the baseline, or existing flood conditions and behaviour, and is used to test the impact of the proposal on the flood regime within the rail corridor and the adjacent land.

Existing flooding patterns for the Gwydir–Mehi system around the proposal are extensive. The floodplain approaches 9km in total width through the area for the 5%, 2% and 1% AEP events, with a significantly reduced extent to approximately 5km for the 10% AEP event. Extensive areas of deep floodwaters occur, with flood depths exceeding one metre over most of the floodplain in large events. Under these conditions the Newell Highway, most local roads, Moree township, surrounding farmland and properties east and west of the rail corridor experience significant flooding. Most residences in the floodplain are elevated on mounds, which prevents above-floor flooding in large events.

During major events, flood damage of the rail also occurs with washout of rails and ballast and scouring of the rail embankment down to ground level at some locations.

Washout of the rail line at approximately 15 locations occurred in the last major flood of February 2012. The photo at the top of page 55 shows the February 2012 flood event around the Gwydirfield Road level crossing, approximately two kilometres north of Moree. The photo shows washout of the rail over a distance of approximately 120m around the level crossing.

When this section of the Inland Rail project is built, it is important to ensure that it will not be adversely affected by flooding and that the infrastructure does not negatively alter existing flooding behavior, as far as possible. The design developed for the EIS achieves this through raising the level of the rail by approximately half a meter above existing levels, with a reconstructed rail formation and provision of approximately 1,100 new cross-drainage structures—primarily flood relief concrete culverts, to allow passage of overland flow on the floodplain between the Mehi and Gwydir Rivers.

One of the key objectives of the cross drainage design is to preserve existing flooding patterns as closely as possible as development and farming practices upstream and downstream of the rail corridor have adapted to the existing flood behaviour and are sensitive to any change to this behaviour.

**Want to know more?**

See

– Chapter 12: Hydrology and flooding

The new and upgraded cross drainage infrastructure consists of large clusters of Reinforced Concrete Box Culverts (RCBCs), with some structures set higher in the rail embankment than the surrounding ground levels to replicate the previous rail overtopping behaviour, as shown in the figure below. All existing culverts within the rail corridor will be removed and upgraded.

To assess potential impacts to flooding from the EIS design, both the existing and design cases have been modelled in a range of flood events and compared using GIS mapping software.

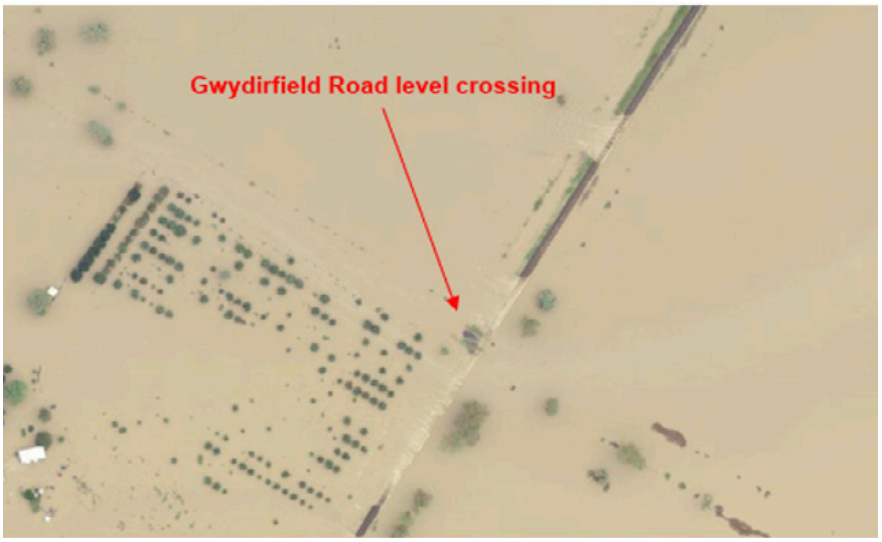
The following flood events have been modelled as part of the EIS:

- 20% AEP – equivalent to 1 in 5-year event
- 10% AEP – equivalent to 1 in 10-year event
- 5% AEP – equivalent to 1 in 20-year event
- 2% AEP – equivalent to 1 in 50-year event
- 1% AEP – equivalent to 1 in 100-year event
- 1% AEP / 1 in 100-year event with climate change allowance – equivalent to a 1 in 100-year event with 20% increased flow
- Probable Maximum Flood (PMF) – defined by applying a factor of 3 to the 1% AEP flow hydrograph

The outputs of these models have then been assessed on the basis of the following four key flooding parameters:

- flooding level (afflux)
- flooding velocity
- flooding duration
- flooding hazard ratings/level

Changes in these four parameters over the range of events modelled have been compared to a set of flooding impact criteria and the EIS design refined and optimised until the impact criteria were met as far as reasonably practical.




*2012 flood showing washouts of the rail line*

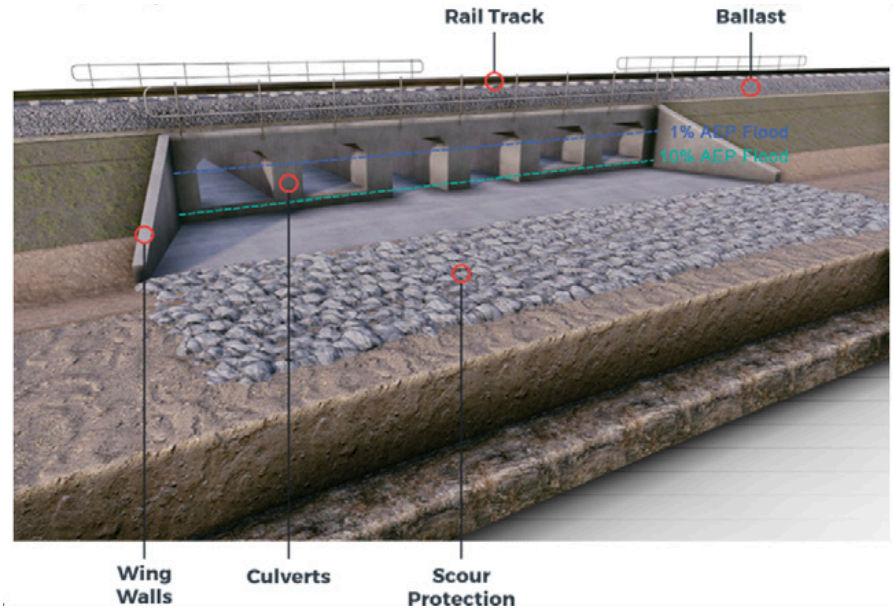



*Illustration of typical cross drainage infrastructure*

The flood modelling suggests the following key outcomes with respect to the EIS design:

- 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 20mm 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 20mm
- 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
- Flood levels in the 1% AEP event would likely increase upstream of the corridor in proximity to the rail line by less than 100mm. 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 flood levels as a result of the proposal
- Impacts to the Newell Highway showed a number of quantitative design limit exceedances. The results also demonstrate that portions of the highway are no longer flooded for the 10%, 5%, 2% and 1% AEP events, with an increase in flooded portions predicted for the 20% AEP event. Consultation with TfNSW is ongoing and more detailed information on the impacts will be provided as required by TfNSW.

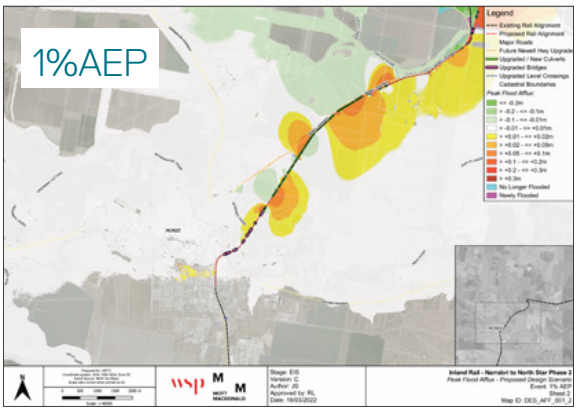
Mitigation measures would be implemented to avoid impacts to the surrounding environment as far as practicable. Further refinement of the cross-drainage design would occur at the detailed design stage, to reduce exceedances of the currently adopted impact criteria. This may involve some repositioning and reconfiguration of the cross drainage structures in the current design and provision of additional structures.

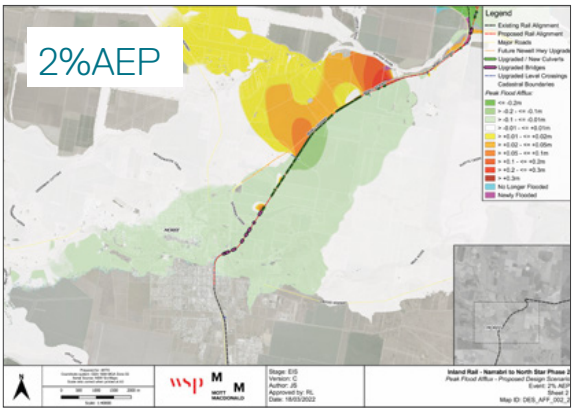
Ongoing consultation with landowners affected by minor flood level increases at properties would also be required at the detailed design stage to confirm any reductions in impact achieved and confirm whether any at-property mitigation measures are required to manage residual impacts.

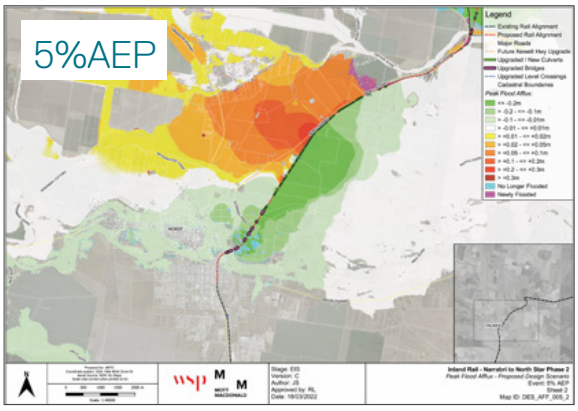
Detailed design phase flood modelling refinements would also inform planning of the works such that construction-phase flood impacts would be identified and managed accordingly.

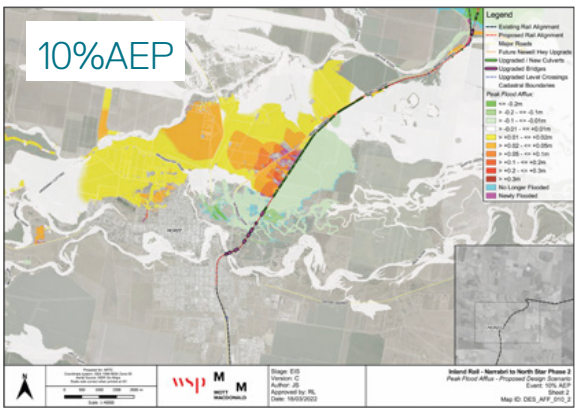
A Flood Emergency Response Plan and flood warning system would also be established, for the construction period, to ensure construction areas are managed appropriately prior to, during and after flood events.

*Shown here are maps of flooding depth (afflux) changes for four of the modelled flood events. These maps show the predicted increases/ decreases of peak flooding levels associated with the EIS design. Additional mapping is provided within the EIS.*



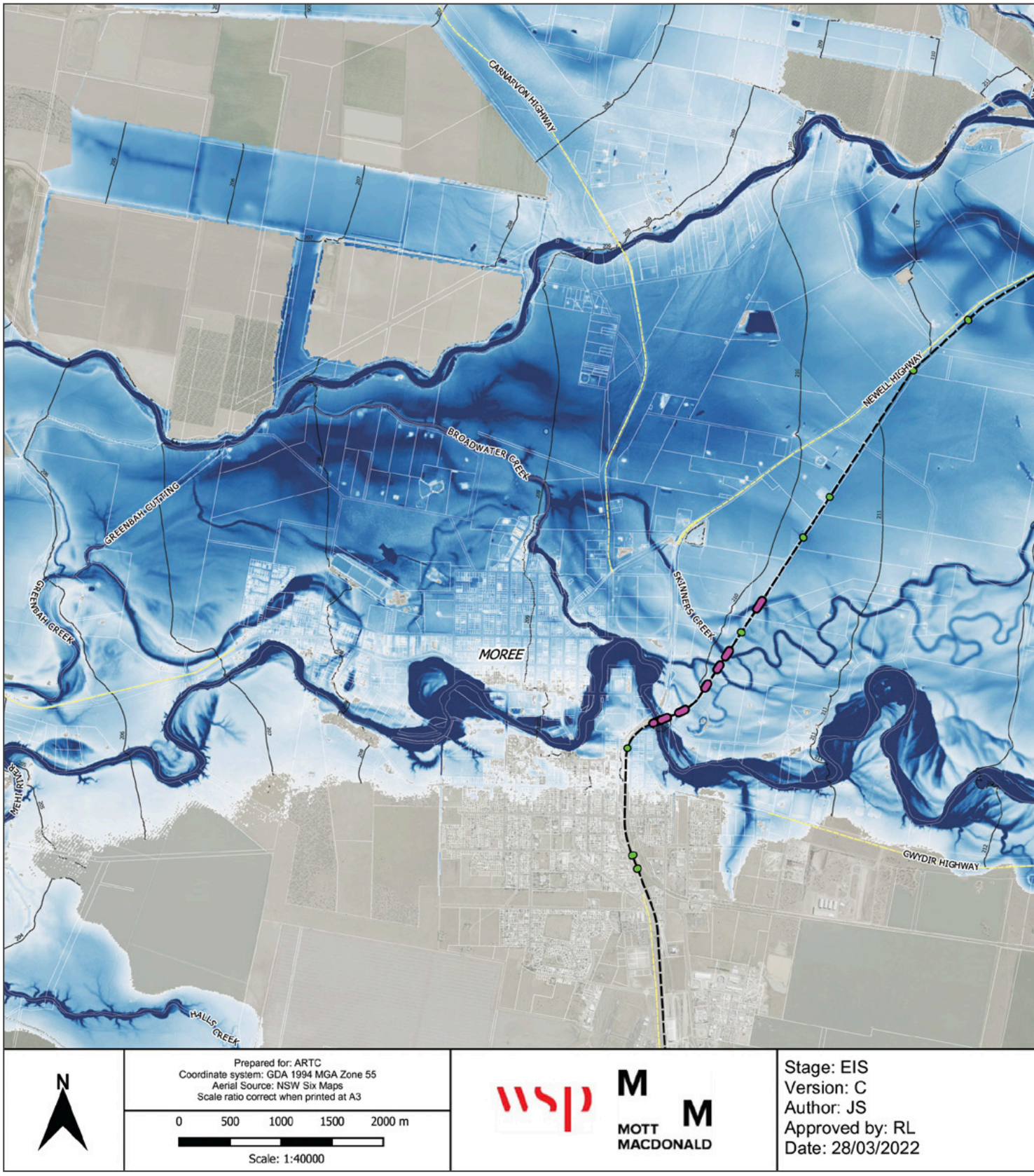



*2012 flood event looking south at Gwydir River (photo taken on 4 February 2012)*

*Looking southeast over the Gwydir River towards Moree TAFE Agricultural Skills Centre (photo taken on 4 February 2012)*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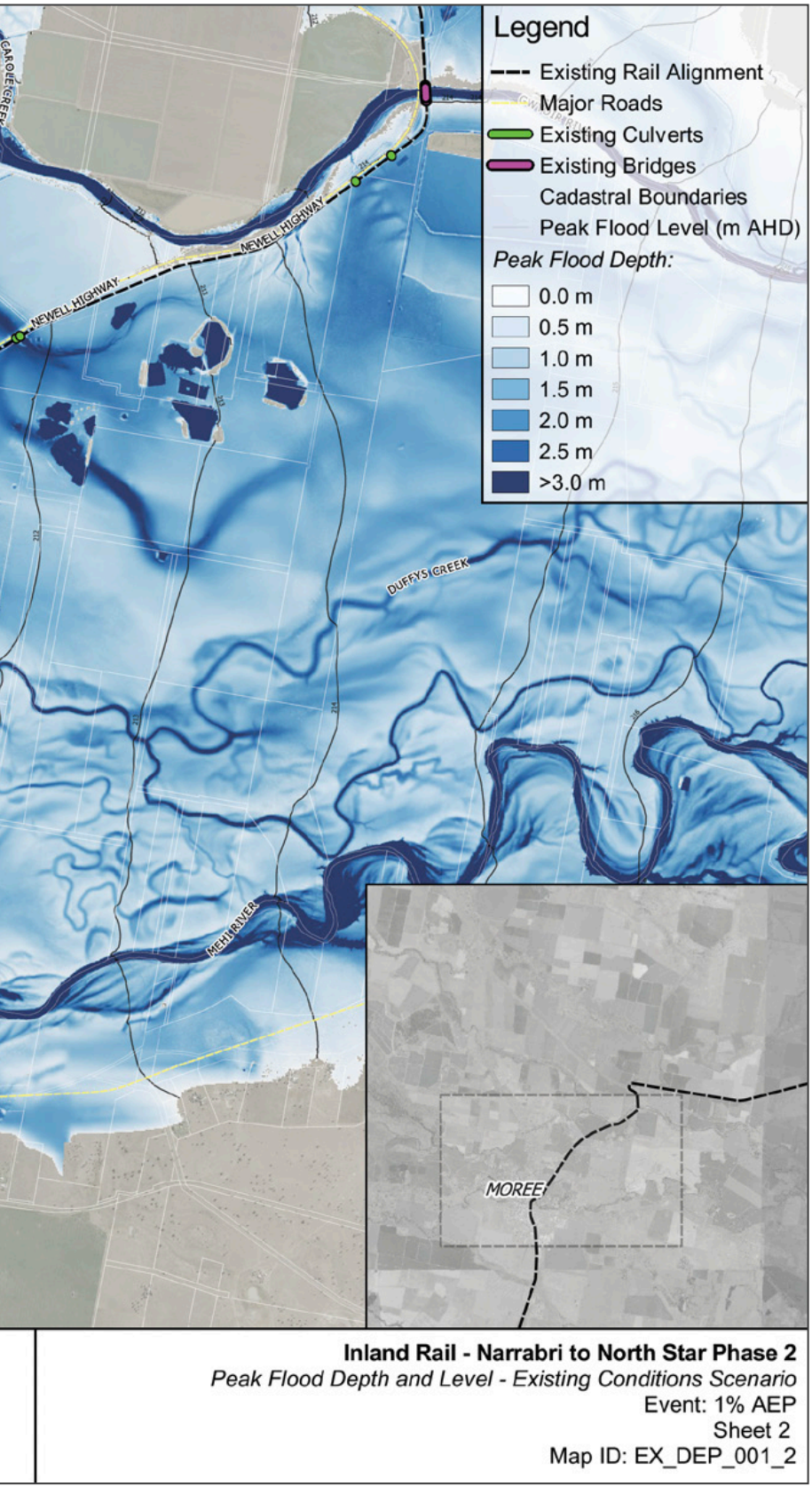
Version: C
Author: JS
Approved by: RL
Date: 28/03/2022

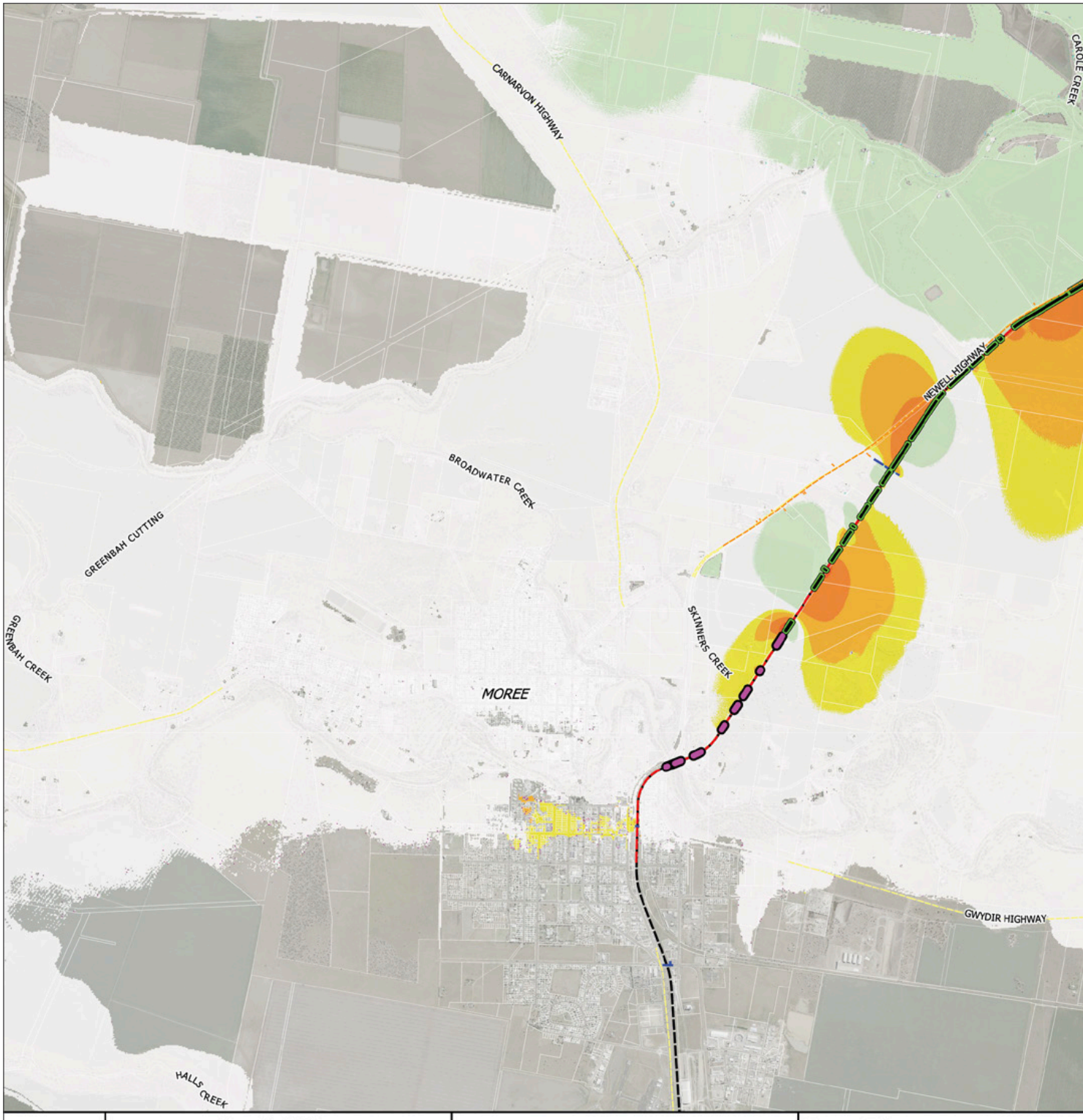



**Inland Rail - Narrabri to North Star Phase 2**
*Peak Flood Depth and Level - Existing Conditions Scenario*
Event: 1% AEP
Sheet 2
Map ID: EX_DEP_001_2

This map describes the existing conditions scenario as it does not include the proposed infrastructure.

It shows the extent of the floodplain and flood model developed and the predicted peak water levels of a 1% AEP Annual Exceedance Probability (AEP) flood event.

The flows from the 1% event have been overlaid onto the existing topography of the flood plain and surrounds, including the town of Moree.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Version: C
Author: JS
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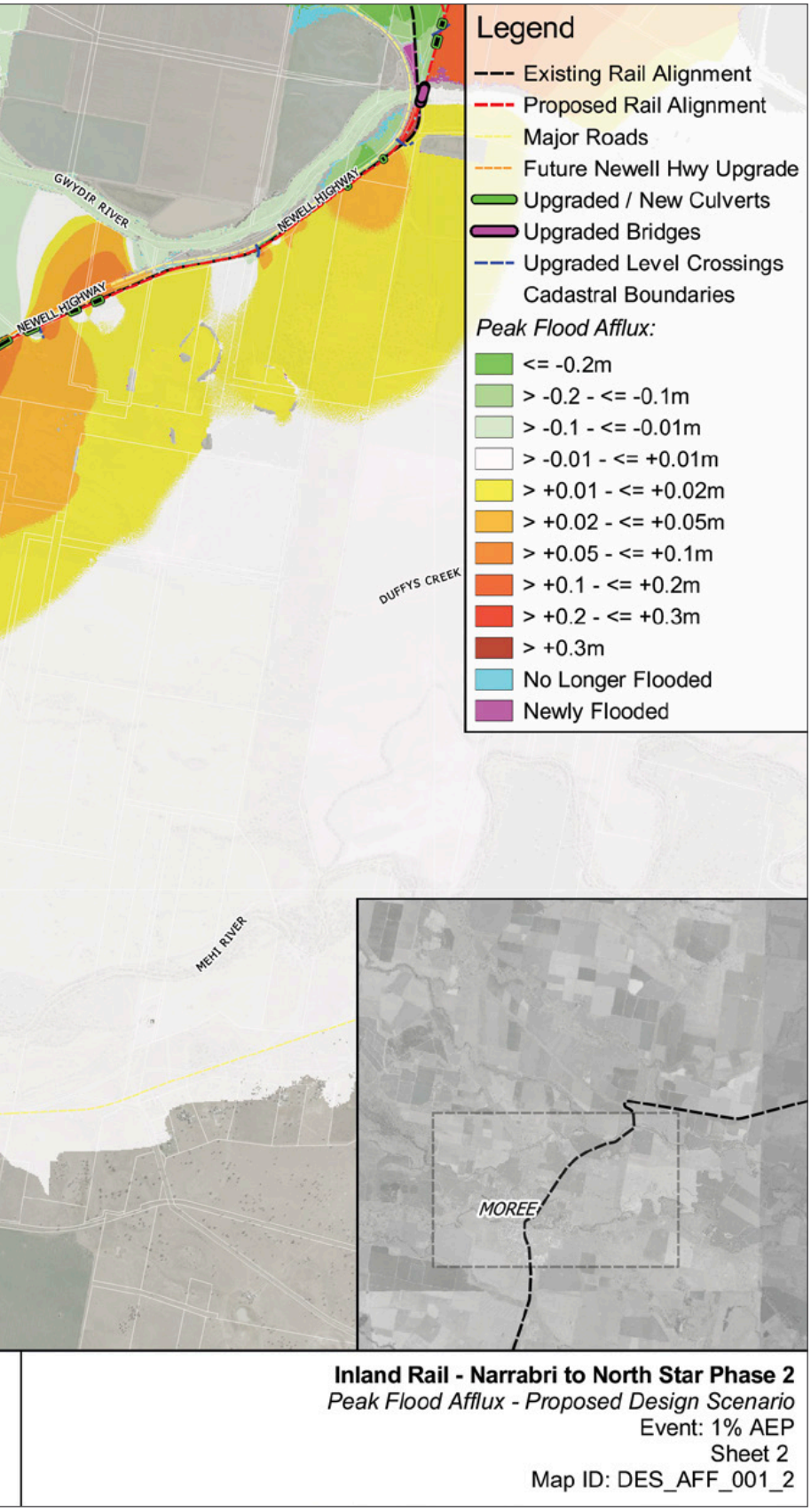
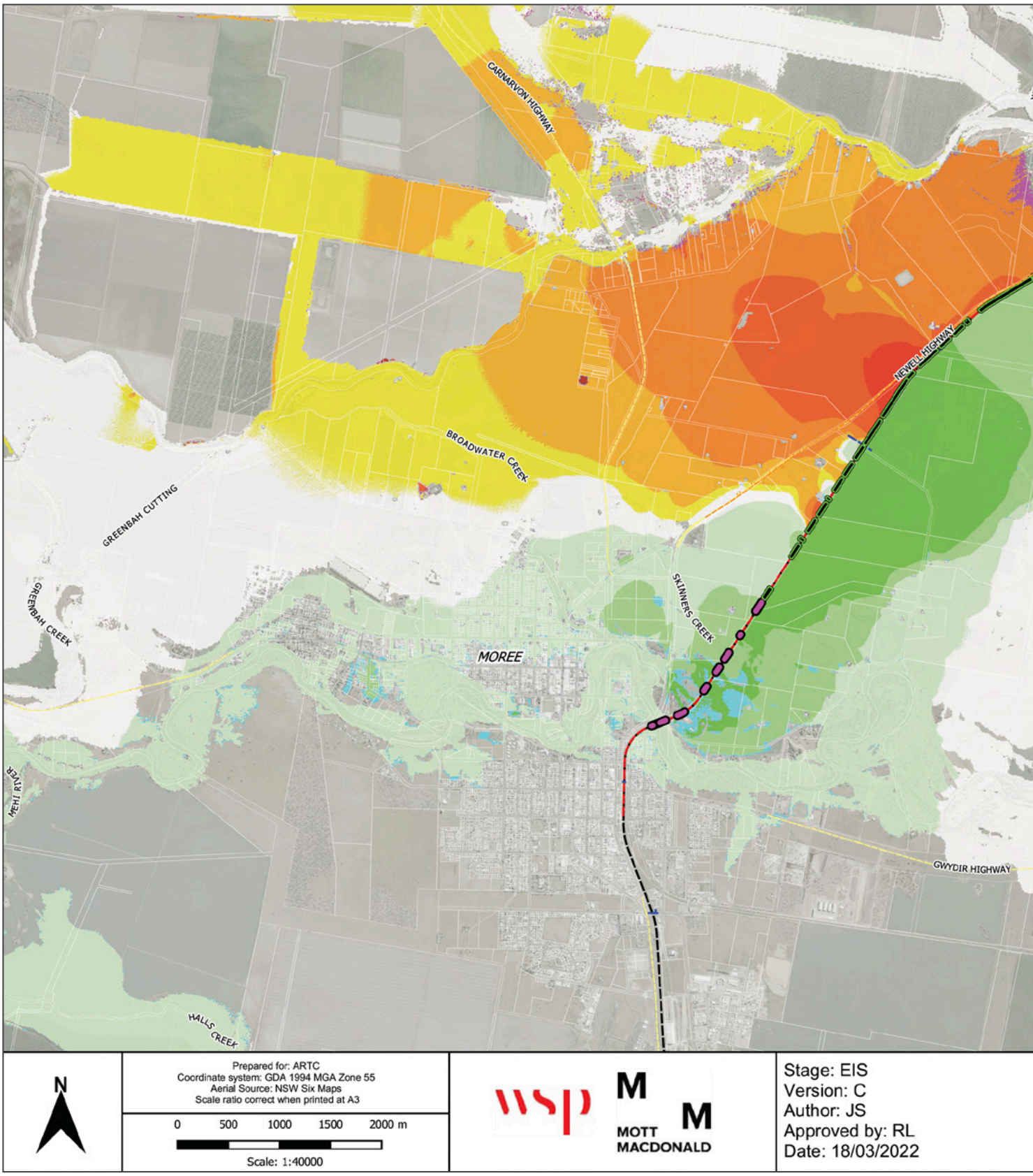



This map describes the proposed design scenario as it includes the alignment of the proposed infrastructure.

It shows the predicted change in peak water levels for a 1% AEP event as a result of the infrastructure.

Of note is the occurrence of flood level changes to the east of the infrastructure.

The flows from the 1% event with the proposed infrastructure present have been overlaid onto the existing topography of the flood plain and surrounds, including the town of Moree.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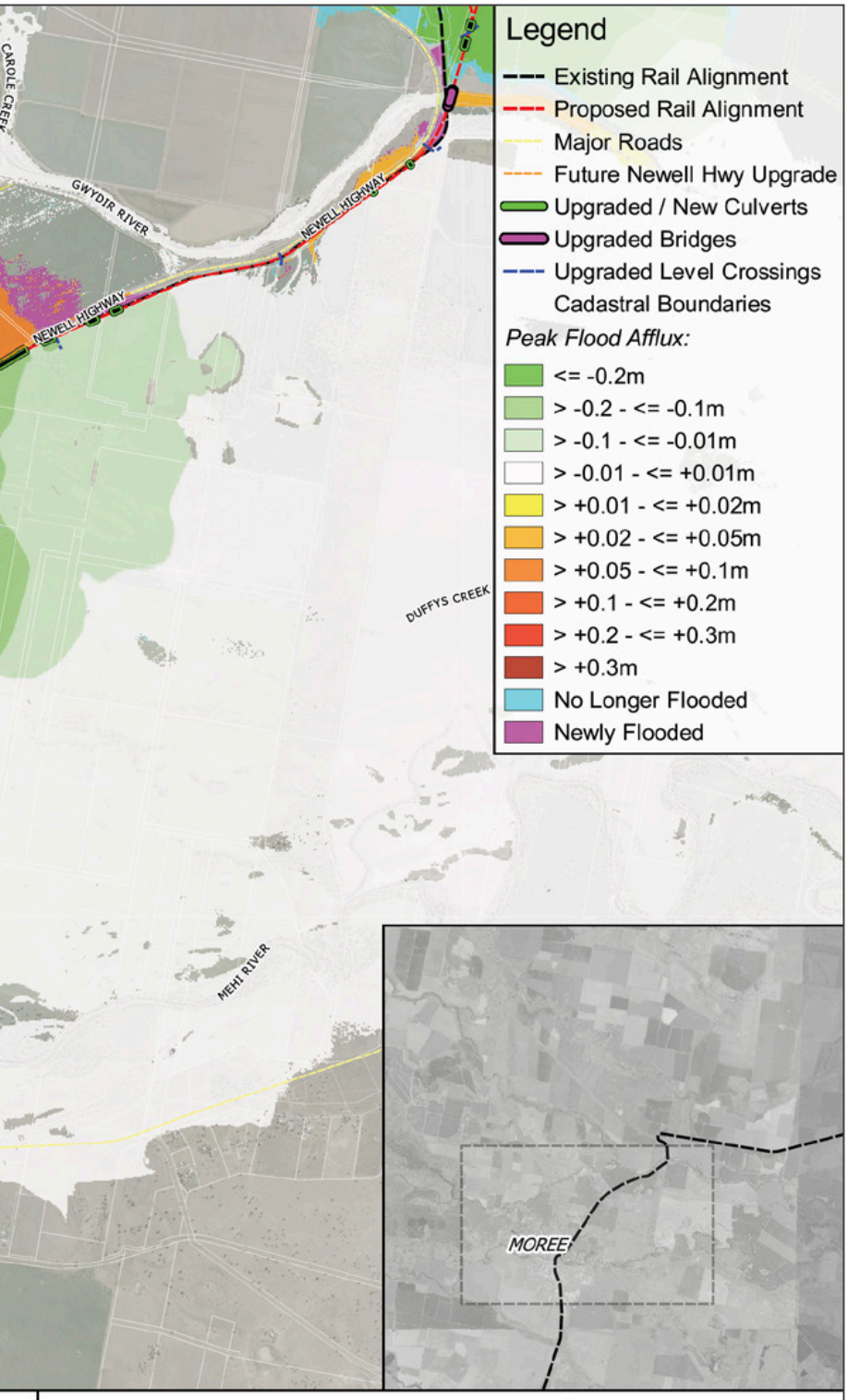


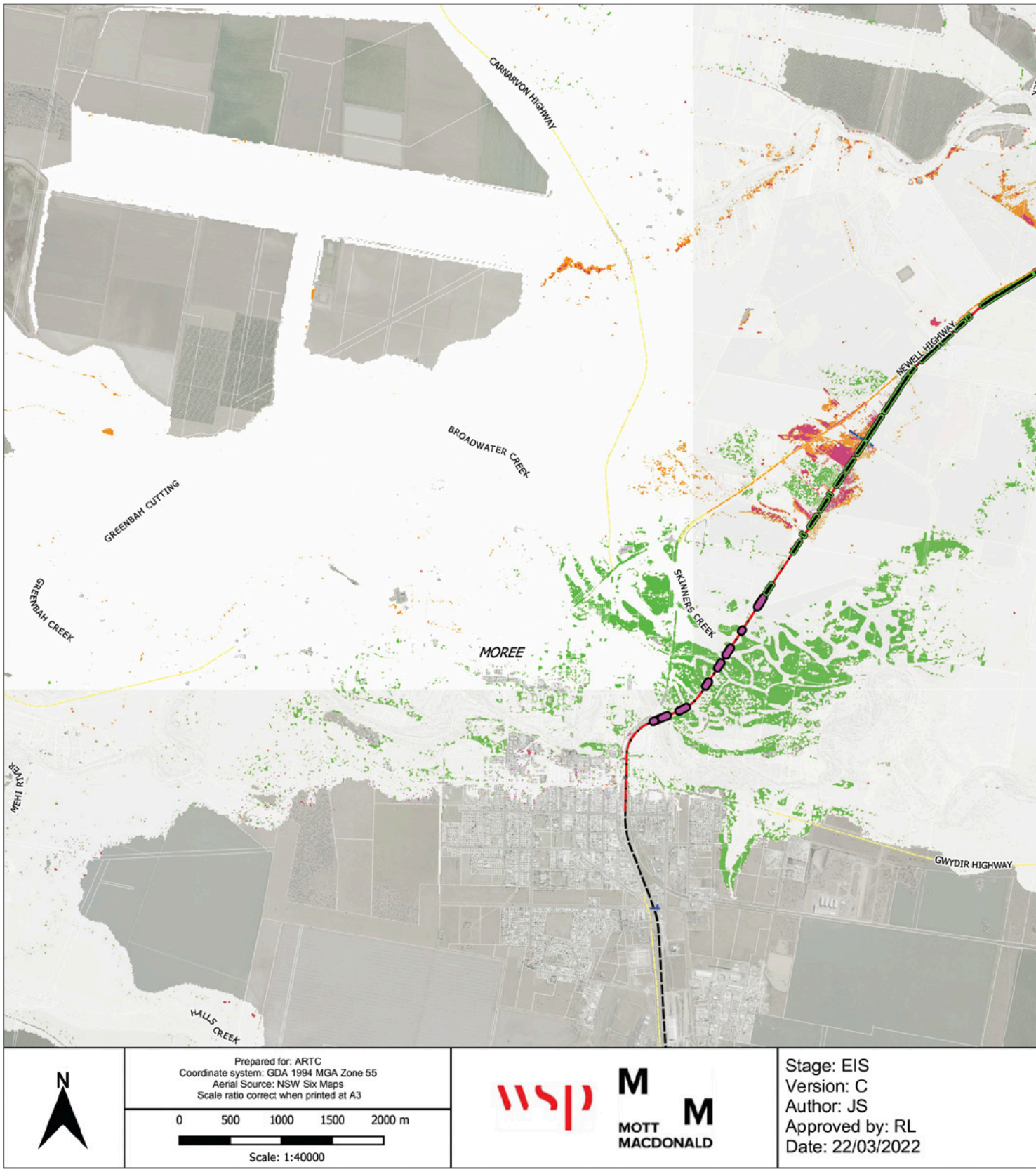

**Inland Rail - Narrabri to North Star Phase 2**
*Peak Flood Afflux - Proposed Design Scenario*
Event: 5% AEP
Sheet 2
Map ID: DES_AFF_005_2

This map describes the proposed design scenario as it includes the alignment of the proposed infrastructure.

It shows the predicted change in peak water levels for a 5% AEP event as a result of the infrastructure.

Of note is the occurrence of flood level changes to the west of the infrastructure. This behaviour also occurs in the 10% and 20% AEP events and highlights the significance of the design of the cross drainage infrastructure.

The flows from the 5% event with the proposed infrastructure present have been overlaid onto the existing topography of the flood plain and surrounds, including the town of Moree.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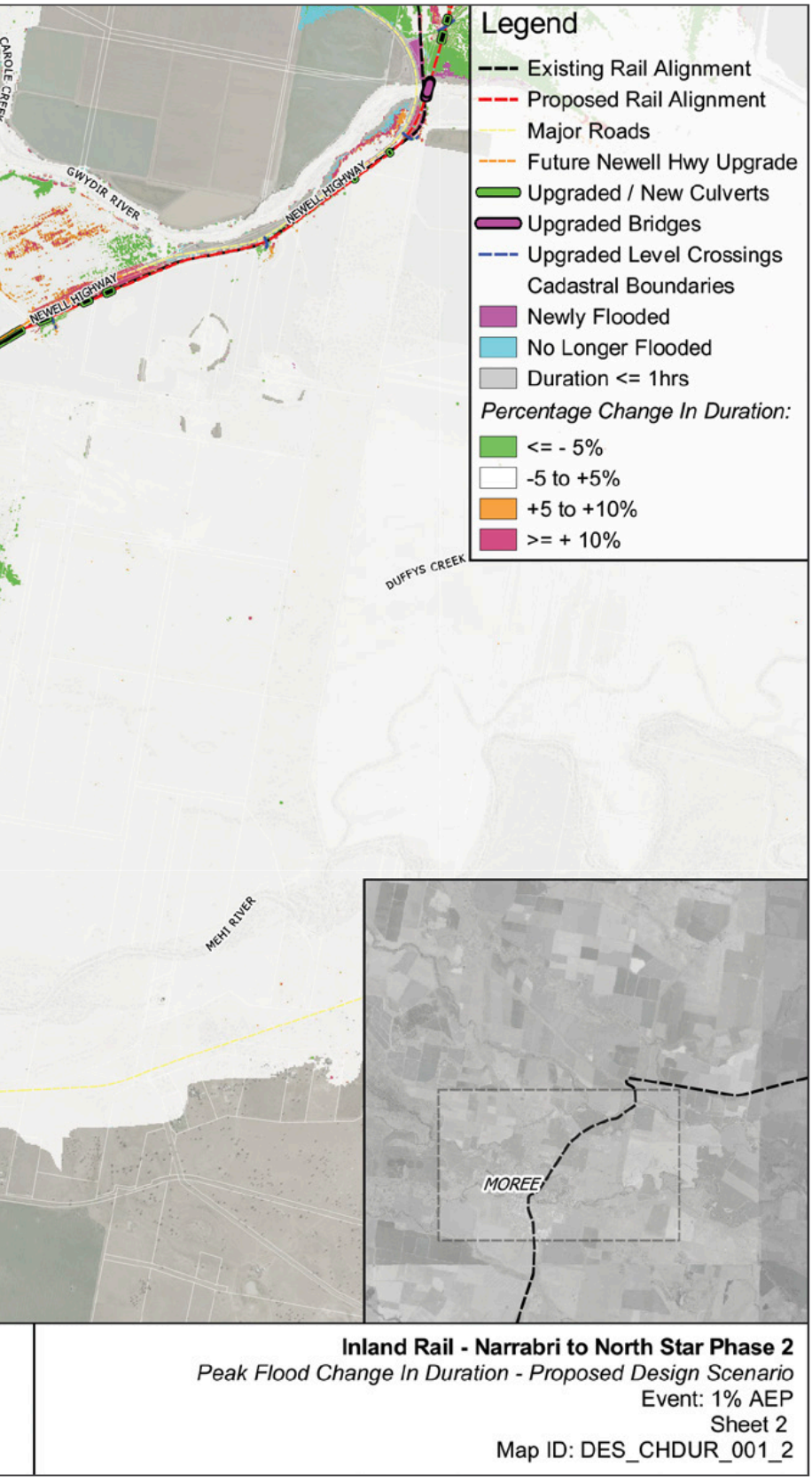


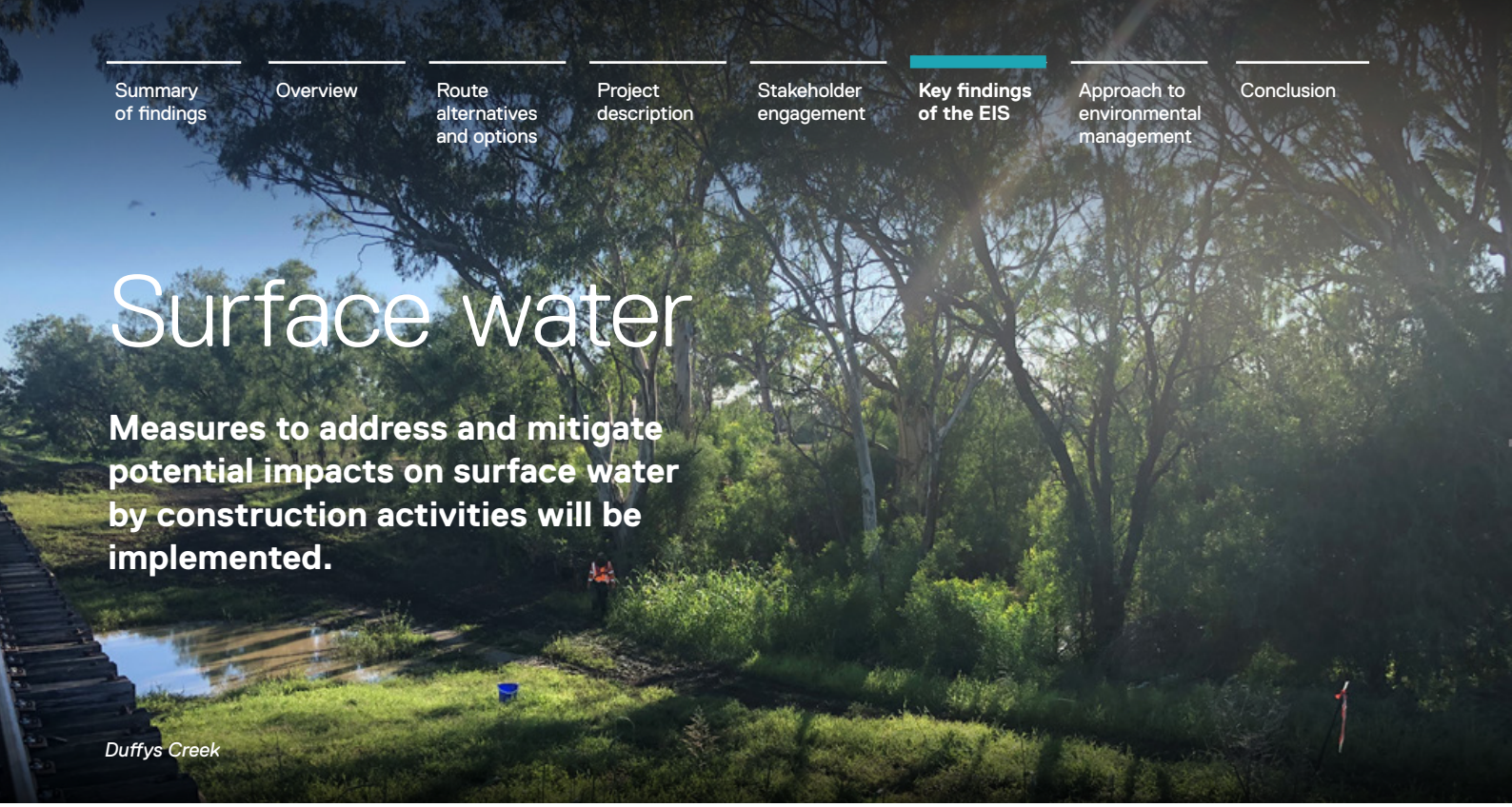

This map describes the proposed design scenario as it includes the alignment of the proposed infrastructure.

It shows the predicted change in peak flood duration for a 1% AEP event as a result of the infrastructure.

The flood duration from the 1% event with the proposed infrastructure present have been overlaid onto the existing topography of the flood plain and surrounds, including the town of Moree.

# Surface water

**Measures to address and mitigate potential impacts on surface water by construction activities will be implemented.**



*Duffys Creek*

The proposal area comprises a small component (<0.1%) of the overall Gwydir catchment; however, it crosses two major waterways — Gwydir River and Mehi River — and several tributaries of these rivers. The existing water quality in the area is generally poor and does not meet the NSW Water Quality Objectives (WQOs) for the catchment. Construction of the proposal is not anticipated to significantly impact water quality in the immediate area and construction activities can be effectively managed through implementation of appropriate water quality management measures, such as erosion and sediment controls.

Notwithstanding this, identified risks that would be managed 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 and agricultural soil 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, and increase exposure of soils to erosion.

To mitigate these risks, an Erosion and Sediment Control Plan (ESCP) 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.

Additionally, a surface water quality monitoring program will be established prior to construction and will continue post construction until the works area is adequately stabilised to monitor for any changes to local water quality. During construction, results of surface water quality monitoring will be compared to the key WQOs to monitor for any adverse impacts.

During operation, water quality impacts to waterways due to the proposal are not anticipated. All culverts and bridges would be located to maintain existing drainage characteristics and minimise impacts on drainage and flooding patterns around the proposal site.

Runoff from the rail corridor is filtered by the rocks and material in the ballast and, typically, also through grass-lined cess drains prior to discharge. All operational maintenance activities would be conducted in accordance with ARTC's standard operating procedures.

**Want to know more?**

See

- Chapter 13: Surface water quality

# Groundwater

**During construction, the risk to groundwater quality from hazardous chemicals (e.g. fuel) that may leach through surface infiltration can be appropriately mitigated and managed, making it low risk. During the operational phase, the consequence to contamination arising from rail incidents remains the same as current rail line operations.**

The proposal area is largely flat and is associated with the broad flood plains of the Gwydir River and its tributaries. The Lower Gwydir Alluvium underlies the entire study area and is a developed groundwater resource with a high density of groundwater bores that support agricultural irrigation and provide town water supply. Numerous household and irrigation bores are also within the study area, reflecting the high quality of the resource.

Drawing on groundwater resources to supply construction water may result in short-term, localised impacts on existing users of groundwater. However, no significant long-term impacts on groundwater volumes, groundwater quality or existing groundwater uses are anticipated as a result of the proposal.

The Lower Gwydir Alluvium has the potential to be impacted by certain construction activities and operation of the proposal via:

**Changes to groundwater quality from contamination resulting from:**

- Storage, spillage and leaks of hazardous substances used during construction. These substances, including waste-water discharge, can interact with groundwater through surface infiltration
- Presence of reactive natural soils that may undergo changes associated with construction activities (i.e. lowering and rewetting of reactive soils).

**Changes to groundwater availability and quality including:**

- Changes to groundwater availability as a result of piling impeding groundwater flow, or increased recharge associated with ponding of groundwater due to inadequate drainage
- Reduced recharge to aquifers that may occur due to drainage diversions
- Changes to groundwater flow paths that 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.

**Want to know more?**

See

- Chapter 14: Groundwater

# Aboriginal heritage

**Aboriginal heritage assessment is an important component of the proposal infrastructure planning and assessment.**

ARTC Inland Rail has undertaken extensive consultation with representatives of Aboriginal stakeholders and is respectful of the cultural knowledge they hold. Native Title claimant groups and the Local Aboriginal Land Council (LALCs) were involved in field surveys, focus groups and the development of mitigation measures to minimise potential impacts on Aboriginal heritage items and sites.

Nine Aboriginal archaeological sites, comprising five scattered artefact sites and four potential artefact deposits (PADs) were identified within or immediately adjacent to the proposal area.

These archaeological sites included:

- Two sites previously registered under the Aboriginal Heritage Information Management System
- Five new isolated artefacts
- Two new areas of Aboriginal archaeological potential.

The two previously recorded sites include:

- An artefact scatter adjacent to Duffys Creek – located to the south-east of the existing rail corridor containing 50–100 artefacts and burnt clay nodules
- The Steel Bridge camp – later updated on the Aboriginal Heritage Information Management System database to 'not a site' as no Aboriginal objects were identified.

Of the nine sites identified, seven will be directly impacted by the proposal, including three of the isolated artefacts and four areas of Aboriginal archaeological potential. 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, primarily due to clearing.

Aboriginal cultural heritage values across the proposal site were identified though background research and consultation with the Registered Aboriginal Parties (RAPs).

These include:

- The Steel Bridge camp
- Waterways including the Mehi and Gwydir rivers;
- Remnant native vegetation including bush tucker and medicine trees
- The availability of resources in the area between the Mehi and Gwydir rivers.

Detailed design would aim to minimise the potential impacts on these sites and areas where possible. Where impacts are unavoidable, the significance of impacts would be minimised through mitigation measures including preparing and implementing an Aboriginal Cultural Heritage Management Plan and undertaking archaeological investigations, assessment and salvage as appropriate.

**Want to know more?**

See

- Chapter 15: Cultural heritage and Technical paper 7: Statement of heritage impact.

## Analyses of Potential Archaeological Deposit (PAD) sites

### Mehi River terraces PAD

The Mehi River terraces PAD is located predominantly within the proposal site and extends into private farmland. The PAD adjoins the Steel Bridge camp and was originally identified as an alluvial terrace landform in close proximity to the Mehi River. Initial assessment (Umwelt Australia, 2017) identified that the existing depth of flood disturbance and infrastructure disturbance may not have been sufficient to remove the areas archaeological potential, with the possibility of intact deposits below the depth of current disturbance noted. Results of test excavation reduced the PAD extent to an area of deeper sandy alluvium within a high terrace landform immediately east of the Mehi River Rail Bridge.

Current survey identified the PAD extent was located within an area of open grassland with minimal evidence of historical disturbance.

### Gwydir River terraces PAD

The Gwydir River terraces PAD is located predominantly within the proposal site and extends slightly into private farmland. The PAD was originally identified as an alluvial terrace landform near the Gwydir River. Initial assessment identified a possibility of intact deposits below the depth of current disturbance. Results of test excavation reduced the PAD extent to more elevated portions of the terraces landform and excluded areas in the rail corridor.

Current survey identified that the PAD extent was located within an area of scrubland with minimal evidence of historical disturbance.

### Duffys Creek PAD

Duffys Creek PAD is located predominantly within the proposal site and extends slightly into private farmland. The PAD was identified as a series of raised terraces immediately adjacent to tributaries of Duffys Creek. The area of potential was dissected by both the existing tributaries and the rail corridor. Disturbance within the area of PAD was limited to land clearance and agricultural ploughing.

### DC-OS-1

DC-OS-1 is located predominantly within the proposal site and extends into private farmland. DC-OS-1 was originally recorded as an artefact scatter and an area of archaeological potential to the south-east of the existing rail corridor. At the time of recording, the site contained 50–100 artefacts and burnt clay nodules within the terrace landform adjacent to Duffys Creek.


# Non-Aboriginal heritage

**Non-Aboriginal heritage features of the proposal relate to exploration, grazing and agriculture, travelling stock reserves and forestry. Detailed design and construction planning will minimise potential impacts.**

An assessment of heritage significance has been undertaken for all heritage items identified within the proposal's visual assessment boundary. The assessment of heritage significance considers the historical significance, associative significance, aesthetic significance, social significance, research potential, rarity and representativeness of each heritage listed item identified.

The listed heritage items identified within the assessment boundary include:

- Mehi River Bridge
- Gwydir River underbridge
- Moree Railway Station
- Victoria Hotel.

The Mehi and Gwydir River bridges are within the proposal site and are listed on both the NSW State heritage register and the ARTC's NSW Heritage and Conservation Register (Section 170 register).

These two bridges will be subject to significant direct impacts during construction, as the proposal requires the full demolition and reconstruction of both bridges. The required works would remove all fabric of the original bridges and, as such, permanently alter views to and from the bridges.

The removal of the Mehi River and Gwydir River Bridges would be guided by a salvage strategy. The salvage strategy would include an assessment of the condition, significance, storage requirements and the potential reuse of each of the elements of the bridge 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.

Both the Moree Railway Station and Victoria Hotel are outside the construction footprint and would only experience negligible indirect (i.e. visual) impacts.

While the majority of the alignment is a brownfield construction project, the proposed alignment may be further refined during detailed design to optimise performance, including flood, safety and operation. Detailed design and construction planning would also aim to minimise the potential impacts on listed and potential heritage items as far as possible. Where impacts to heritage values occur, including those detailed above, impacts will be mitigated through:

- Designs that are sensitive to heritage values
- Undertaking salvage, where required
- Undertaking photographic archival recordings
- Preparing interpretive materials for any value impacted.

**Want to know more?**

See

- Chapter 15: Cultural heritage and Technical paper 7: Statement of heritage impact.

## Listed Heritage items

| Item | Listing | Location relevant to the proposal site | Assessment of significance |
|---|---|---|---|
| Mehi River Bridge<br>ARTC s170 Register<br>SHI no. 4281692<br>Built: c.1910-1913 | ARTC s170 Register<br>SHI no. 4281692 | Within proposal site | Meets the threshold for local significance |
| Camurra, Gwydir River underbridge<br>ARTC & CRN s170 Registers SHI no. 4281693<br>Built: c.1910-1913 | ARTC s170 Register<br>CRN s170 Register<br>SHI no. 4281693 | Within proposal site | Meets the threshold for local significance |
| Moree Railway Station<br>LEP no. I025; RailCorp s170 Register SHI no. 4801208<br>Built: 1904 | LEP no. I025<br>RailCorp s170 Register<br>SHI no. 4801208 | Outside of proposal site. Within 300m visual assessment area. | Meets the threshold for local significance |
| Victoria Hotel<br>LEP no. I022<br>Built: 1897 | LEP no. I022 | Outside of proposal site. Within 300m visual assessment area. | Meets the threshold for local significance |

# Noise and vibration

**Criteria established by NSW statutory guidelines are used to determine acceptable levels of noise and vibration that should not be exceeded by construction and operational activities. Where these criteria are exceeded, feasible and reasonable mitigation measures will be implemented.**

When the proposal is operational, it will have the potential to generate noise which may be experienced by residents in their homes or by other sensitive receivers including schools, places of worship and hospitals.

Some residents may not have experienced rail noise before and may be concerned about potential noise impacts from the proposal. Some residents currently living in areas where there are existing noise impacts from rail or the Newell Highway may be concerned about additional noise impacts from the proposal.

In assessing noise and vibration levels, criteria established by NSW statutory guidelines is utilsed to determine acceptable levels of noise and vibration that should not be exceeded by construction and operational activities. Where these criteria are exceeded, the proposal must implement measures to mitigate the impacts to bring the noise and vibration levels to within acceptable levels.

## Construction noise and vibration

Construction typically requires the use of heavy machinery, which can generate high noise and vibration levels at nearby locations. The potential impacts may vary greatly depending on the intensity and location of construction activities, the type of equipment used, existing background noise levels, intervening terrain, and prevailing weather conditions.

The construction noise and vibration assessment undertaken for the proposal considered reasonable, worst-case scenarios related to:

- Site establishment
- Utility relocations
- Earthworks
- Structures e.g. bridges
- Rail infrastructure works
- Road infrastructure works
- Construction compound operations.

Overall, earthworks and rail infrastructure works are likely to result in the highest noise levels during construction. Sensitive receivers, or locations, mostly in residential dwellings along Moreton and Oak Street in the township of Moree, may experience noise levels in excess of the relevant noise management levels.

Due to the linear nature of the proposal, noise levels experienced by sensitive receivers will decrease as construction progresses along the proposed alignment, moving further away from these locations.

As some construction activities are likely to occur outside recommended standard hours, the assessment also considered potential impacts during non-standard working hours.

**What is a sensitive receiver?**

People in the community who may be impacted by noise are called 'sensitive receivers'.

**Want to know more?**

See

- Chapter 16: Noise and vibration and Technical Paper 10: Construction noise and vibration impact assessment and Technical Paper 11: Operational noise and vibration impact assessment

Certain construction activities have been assessed as vibration intensive. This includes the use of piling rigs, tampers and vibratory rollers. Dilapidation surveys, vibration monitoring, vibration trials and detailed assessment of structures would be undertaken before construction, where required, to monitor and manage construction-related vibration impacts.

Prior to commencement of works, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared with the aim of minimising construction noise and vibration impacts.

Where noise is above the noise criteria for the proposal, all feasible and reasonable work practices to minimise noise will be implemented. Affected residences would be contacted in advance to explain the duration and noise levels of the works and any respite periods that would be provided.

Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. A notification process would be included in the Community Engagement Plan to advise of works with potential for significant noise or vibration at sensitive receivers and surrounding residences/premises.

## Operational noise and vibration

The key potential operational impact is the predicted exceedances of the noise criteria for train movements, as outlined by the NSW Rail Infrastructure Noise Guideline.

Noise modelling predicts that, for the year of full operations (2040), noise levels could exceed the noise criteria at 12 sensitive receivers predominantly along Moreton and Oak Streets in Moree. These receivers are eligible for consideration of feasible and reasonable noise mitigation, which may include at-property treatments or other noise mitigation measures such as the construction of noise walls. Further community consultation and assessment of affected residential receivers along Morton and Oak Streets would be undertaken during detailed design to determine the preferred mitigation measure.

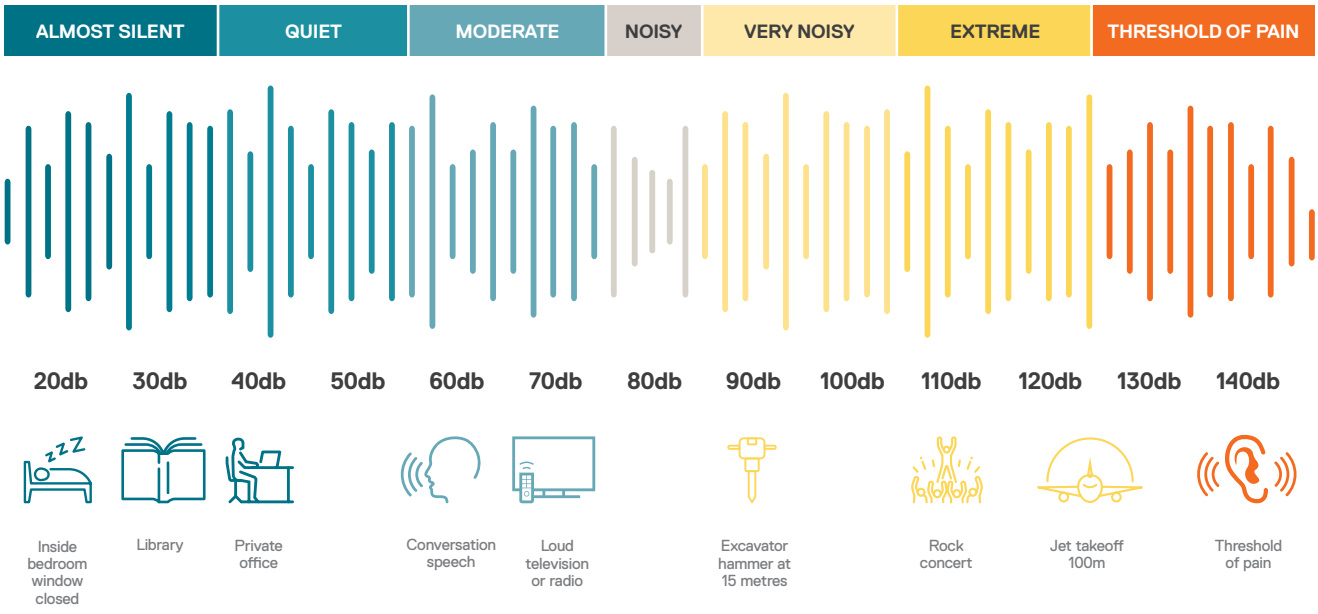
Vibration levels during operation at the most affected receivers are predicted to comply with the vibration criteria.

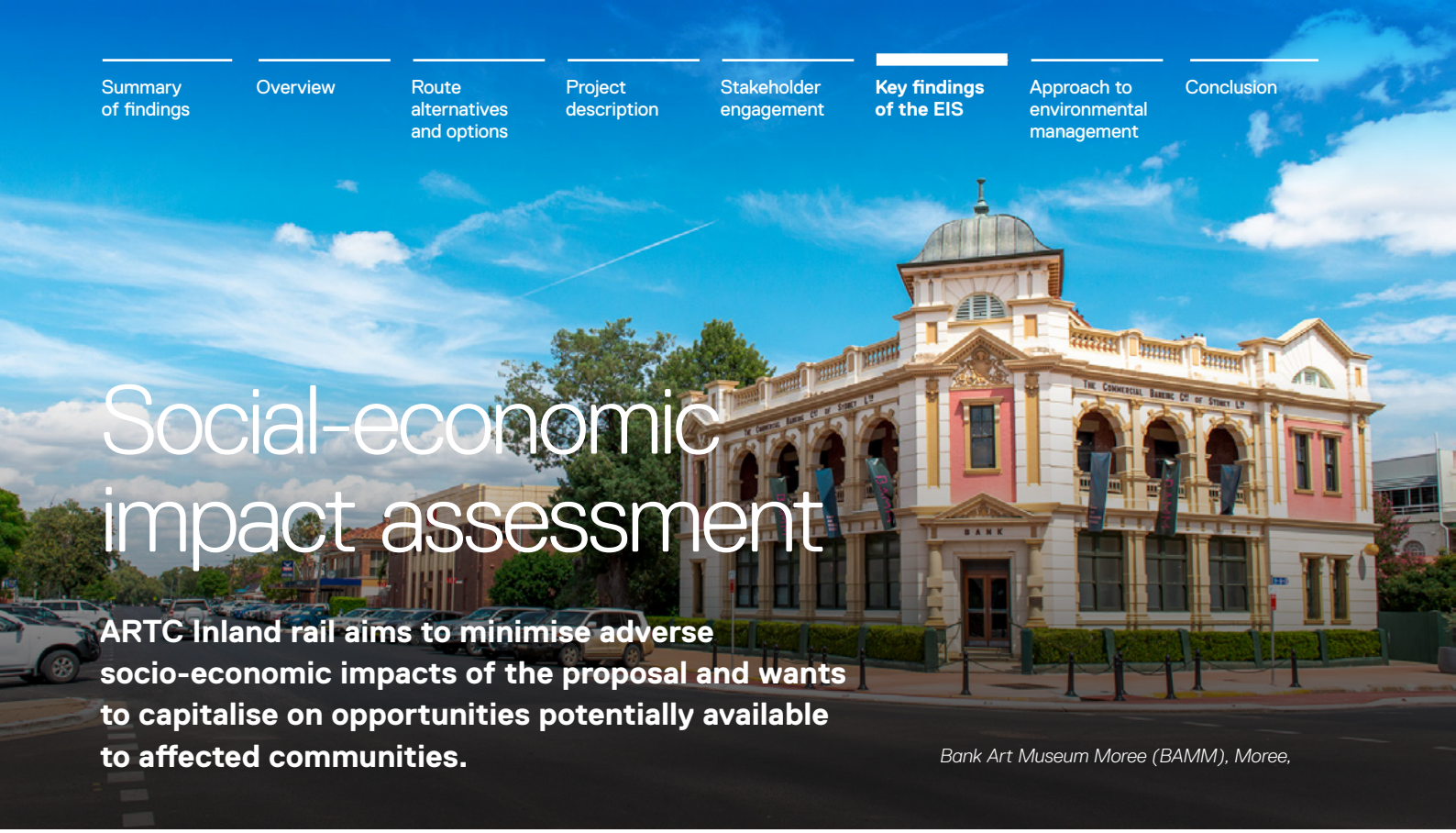
As the design progresses, the proposal will continue to be refined to minimise the potential for operational impacts. Mitigation options have been identified and will be refined in consultation with affected receivers.

Once Inland Rail has commenced operation, operational noise and vibration compliance monitoring will be undertaken to ensure noise and vibration levels are consistent with those predicted in the EIS. If required, the need for additional mitigation measures will be identified as an outcome of the monitoring.

NOISE LEVEL COMPARISONS

People's perception of noise is strongly influenced by their environment. A noise level that is perceived as loud in one situation may appear quiet in another.





# Social-economic impact assessment

**ARTC Inland rail aims to minimise adverse socio-economic impacts of the proposal and wants to capitalise on opportunities potentially available to affected communities.**

*Bank Art Museum Moree (BAMM), Moree,*

The Moree Plains Shire (17,927 km²) Local Government Area 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.

The proposal has been designed to minimise impacts to local business, industry and the housing market as far as practicable. As with any major project located near human settlement, adverse social and economic impacts may be experienced by nearby residents.

Potential impacts include:

- An influx of non-resident workers, placing pressure on available services
- Temporary impacts to short term accommodation availability during construction
- Temporary disruptions on the local road network, resulting in longer journeys
- Alterations to access and internal movement patterns on rural agricultural properties
- Impacts on First Nations 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.

**Want to know more?**

See

- Chapter 17: Social impact assessment and Chapter 18: Economic assessmentt

## Social impact

These impacts would be mitigated through the preparation of a Social Impact Management Plan (SIMP) and a Construction Environmental 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.

The Social Impact Management Plan will include:

- Community and stakeholder engagement
- Workforce management
- Housing and accommodation
- Local business and industry content
- Health and community wellbeing.

ARTC Inland Rail has committed to working with local and First Nations businesses, where possible, and would work with the preferred contractor to improve local economic outcomes by providing local employment opportunities where possible and developing local suppliers' capacity to engage in the procurement process.

On the Narrabri to North Star Phase 1 project, more than 1827 people have so far worked on the project (between September 2020 and July 2022), of whom 162 are local and Indigenous. more than $72m spent with local businesses (of which more than $5.8m has been spent with Indigenous businesses). More than $166m has been spent with local businesses and $12.5m spent with Indigenous businesses Australia-wide as of July 2022.

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.

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.

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 and communication plans would be developed to ensure stakeholder relationships are maintained, roles and responsibilities between ARTC, the construction contractor and other key stakeholders are clear and stakeholders are provided with opportunities to receive information and provide feedback in a timely and comprehensive manner.

## Economic impact

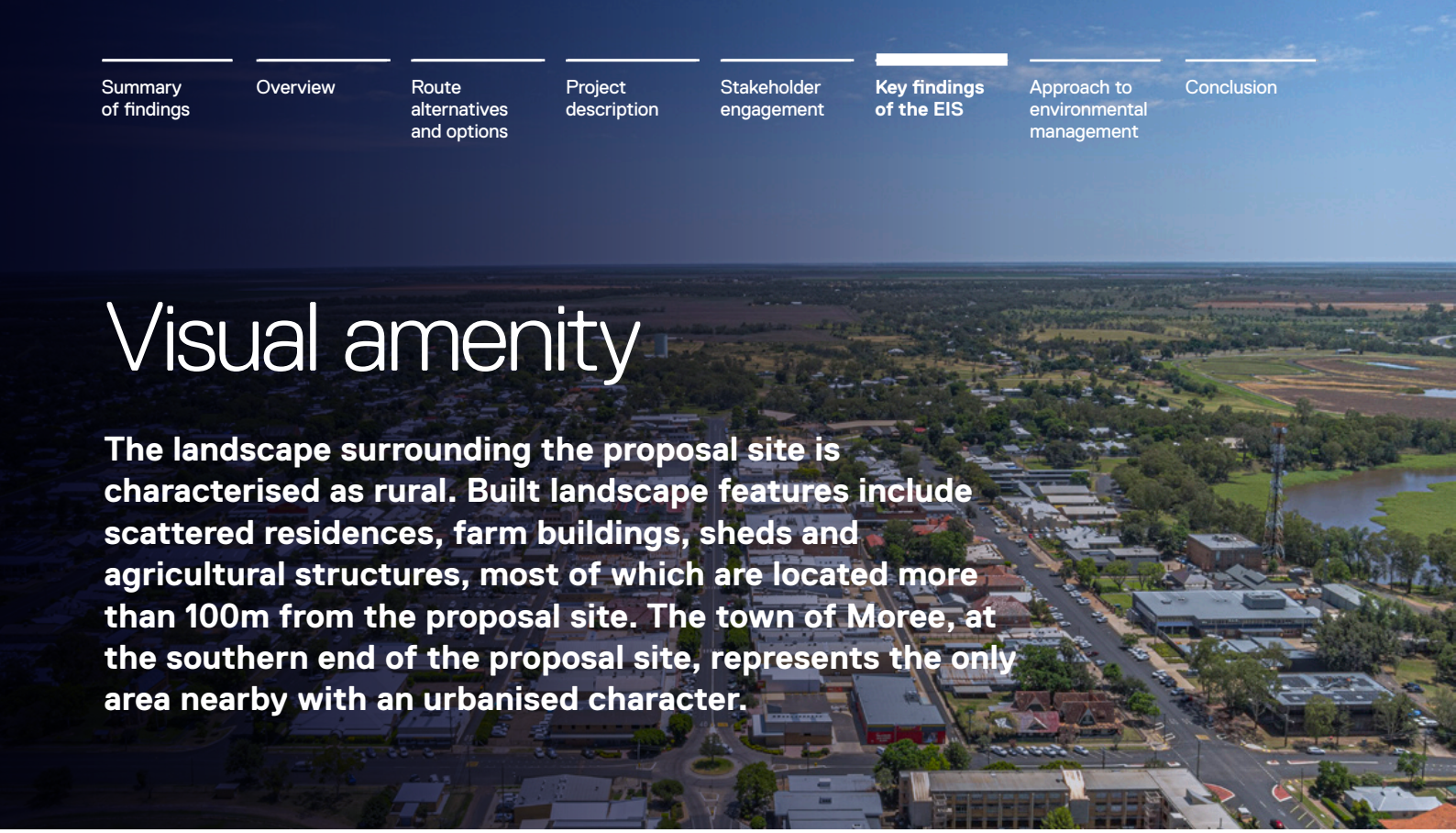
At a local level, the economic impact of the proposal will promote community development by supporting local and regional employment, businesses and industries.

The proposal will support regional development through:

- Opportunities to promote First Nations, local, and youth employment through jobs offered by the construction of the proposal
- Opportunities to encourage, develop and grow First Nations, local, and regional businesses through the supply of resources and materials for the construction and operation of the proposal
- Opportunities in secondary service and supply industries (such as retail, hospitality and other support services) for businesses near the construction footprint. The expansion in construction activity is also likely support additional flow-on demand and additional spending by the construction workforce in the local community
- Potential to act as a catalyst for further private sector investment in the study area, particularly for freight and logistics operations (by providing efficient transport access to intrastate and interstate markets).

The economic benefits assessment estimates the proposal is expected to provide a total of $14.73 million in incremental benefits (at a seven per cent discount rate). These benefits result from improvements in freight productivity, reliability and availability, and benefits to the community from crash reductions, reduced environmental externalities and road decongestion benefits.

ARTC Inland Rail is committed to enhancing the economic benefits of the proposal while avoiding, mitigating or managing any adverse economic impacts. Accordingly, there are a range of actions detailed within the EIS that ARTC Inland Rail would undertake or require its construction contractor to undertake to manage the social and socio-economic impacts of the proposal, and to enhance proposal benefits and opportunities.



# 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 100m from the proposal site. The town of Moree, at the southern end of the proposal site, represents the only area nearby with an urbanised character.**

The proposal has been designed to minimise potential impacts, through careful siting of construction elements and by minimising clearing as much as possible.

The extent to 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 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.

Moderate to high visual impact is anticipated at areas surrounding the Mehi River and the Gwydir River Bridges, which would result in distinct visual modifications. During construction, the proposal may impact visual amenity in the following ways:

- Removal of vegetation
- Construction machinery and equipment
- Temporary stockpiling and spoil mounds
- Site compounds
- Temporary accommodation
- Partially constructed features.

During construction, the management of visual impacts would occur through the CEMP. Measures to reduce visual impacts would include selecting laydown areas and other ancillary sites. Site fencing, or barriers, and other visual screening methods would also be considered. Lighting that reduces light spill would be used during night work. Construction impacts would be temporary and limited to the construction period.

Works notifications would be provided to residents and landowners adjacent to these activities to provide information on the nature, duration and mitigation measures to be employed, as required.

During operation, the introduction of new and upgraded rail infrastructure would impact visual amenity for a limited number of private receptors.

This infrastructure would include:

- Culverts
- Embankments
- Bridges
- Signalled level crossings
- Passing of double-stacked container trains.

**Want to know more?**

See

- Chapter 19: Visual impact assessment

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

A rehabilitation strategy will also be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas. The strategy will include measures to provide for the long-term rehabilitation of areas disturbed by construction to assist in minimising the potential for visual impacts as a result of construction.

*Mehi River and Gwydirfield Road crossing – before*

*Mehi River and Gwydirfield Road crossing – after*

*View from Gwydirfield Road level crossing – before*

*View from Gwydirfield Road level crossing – after*

*View towards Gwydir River at Back Pally Road level crossing – before*

*View towards Gwydir River at Back Pally Road level crossing – after*

# Soils and contamination

**Railway corridors have the potential to contain various contaminated materials from historical and operational sources. Such sources relate to the long-term operation of the railway and the history of nearby contaminating activities. Possible sources of contamination may include fill materials, hazardous materials from structures, leaks and spills of fuels or chemicals, historical use of pesticides and asbestos dust from train brake pads. Mitigation measures will minimise these risks.**

The potential soil and contamination risks 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
- Contamination of land and waterways due to existing contaminated material within the rail corridor and 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.

A search of NSW Government records did not identify any known contaminated sites in, or within 250m of, the proposal area. The ARTC Contaminated Sites register identified three sites within the construction footprint for the proposal. During detailed design, a site-specific contamination investigation would be undertaken to assess these three sites.

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 NSW Environmental Protection Agency guidelines.

**Want to know more?**

See

- Chapter 20 Soils and contamination

# Waste management

**The approach to waste management will be guided by the waste management hierarchy, with a focus on reducing resource use and minimising waste generation as the highest priority.**

Waste generation will occur throughout construction, operation and maintenance of the proposal. Estimated waste types and quantities are indicative and have been identified to determine potential impacts, and waste and resource management options.

The majority of potential waste material would 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).

The proposal represents a small portion of the overall Inland Rail Program alignment and includes approximately 13km of existing rail track and construction of approximately 2km of 'greenfield' realigned rail track. It is therefore unlikely to produce significant amounts of waste, during both construction and operation.

For example, approximately 106,000 m³ of spoil is expected to be generated within the proposal including Camurra Hairpin excavation, with an estimated 82,000 m³ of the material to be reused within the proposal as fill.

The remaining topsoil (approximately 24,000 m³) will be used for rehabilitation and general site profiling at the end of construction, including in the area of the Camurra Hairpin. Therefore, it is expected that all spoil and topsoil generated from the proposal will be reused onsite.

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 (WMP) 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.

**Want to know more?**

See

- Chapter 21: Waste

# Climate change

**A climate change risk assessment was undertaken to inform the design and operation of the proposal. The assessment considered short-term risks (to 2030) and long-term risks (to 2090) using two climate projection scenarios.**

A climate change risk assessment was undertaken to consider climate change risks, opportunities and adaptations to inform the design process. Extreme rainfall events, flooding, increased periods of drought, extreme heat and increase in bushfire and fire weather conditions are expected to present the highest risks in the future. Risks associated with these events involve:

- Changing flood patterns and behaviour
- Increased flooding, resulting in:
  - inundation of rail infrastructure, drainage systems and water sensitive assets (such as electrical equipment)
  - structural scouring
  - wash out of foundations
- Increased incidents of extreme events (heat, rainfall and bushfire) resulting in:
  - impacts on power supply
  - network interruption
  - track buckling
  - disruption of service
- Increase in incidence of dangerous fire weather conditions and, possibly, uncontrollable fires resulting in:
  - damage to infrastructure
  - increased operational costs
  - power failure
  - stoppage of freight
  - associated impacts.

Further consideration of the potential for climate change risks will be undertaken to support detailed design. This will include a detailed climate change risk assessment, considering both direct and indirect risks.

> As the proposal lifecycle progresses, risks will be regularly reviewed to ensure that potential climate impacts are reduced so far as is reasonably practicable.

**Want to know more?**

See

- Chapter 22: Climate change

# Sustainability

**By providing long-haul freight that is time and cost-competitive compared to road freight, Inland Rail will result in reduced road congestion and fewer vehicular carbon emissions.**

Sustainability is an important consideration for the proposal, especially regarding maximising resource efficiency, enhancing local economic activity, and mitigating potential environmental and social impacts, especially for climate change resilience.

ARTC Inland Rail publishes an annual sustainability report, tracking environmental, social and economic benefits realised each financial year and progress against key sustainability objectives and targets.

The opportunities that freight rail provides – reducing the environmental and social impacts associated with promoting economic advancement; and connecting connecting the producers and manufacturers of agricultural and industrial goods to their markets – is at the heart of the Inland Rail Program.

The *Inland Rail Sustainability Strategy (ARTC 2019)* and *Environment and Sustainability Policy (ARTC 2018)* outline sustainability objectives, targets and commitments for the proposal.

Sustainability principles have been incorporated throughout the design development process.

ARTC is committed to achieving a minimum Infrastructure Sustainability Council of Australia (ISCA) rating of 'Excellent' for the proposal and across the Inland Rail Program. This requires implementing identified sustainability initiatives during the detailed design, construction and operation stages.

In November 2020, the Narrabri to North Star Phase 1 project achieved an 'excellent' design rating.

> It is estimated that transporting freight on Inland Rail will use one-third of the fuel compared to transporting the same volume via the existing routes.

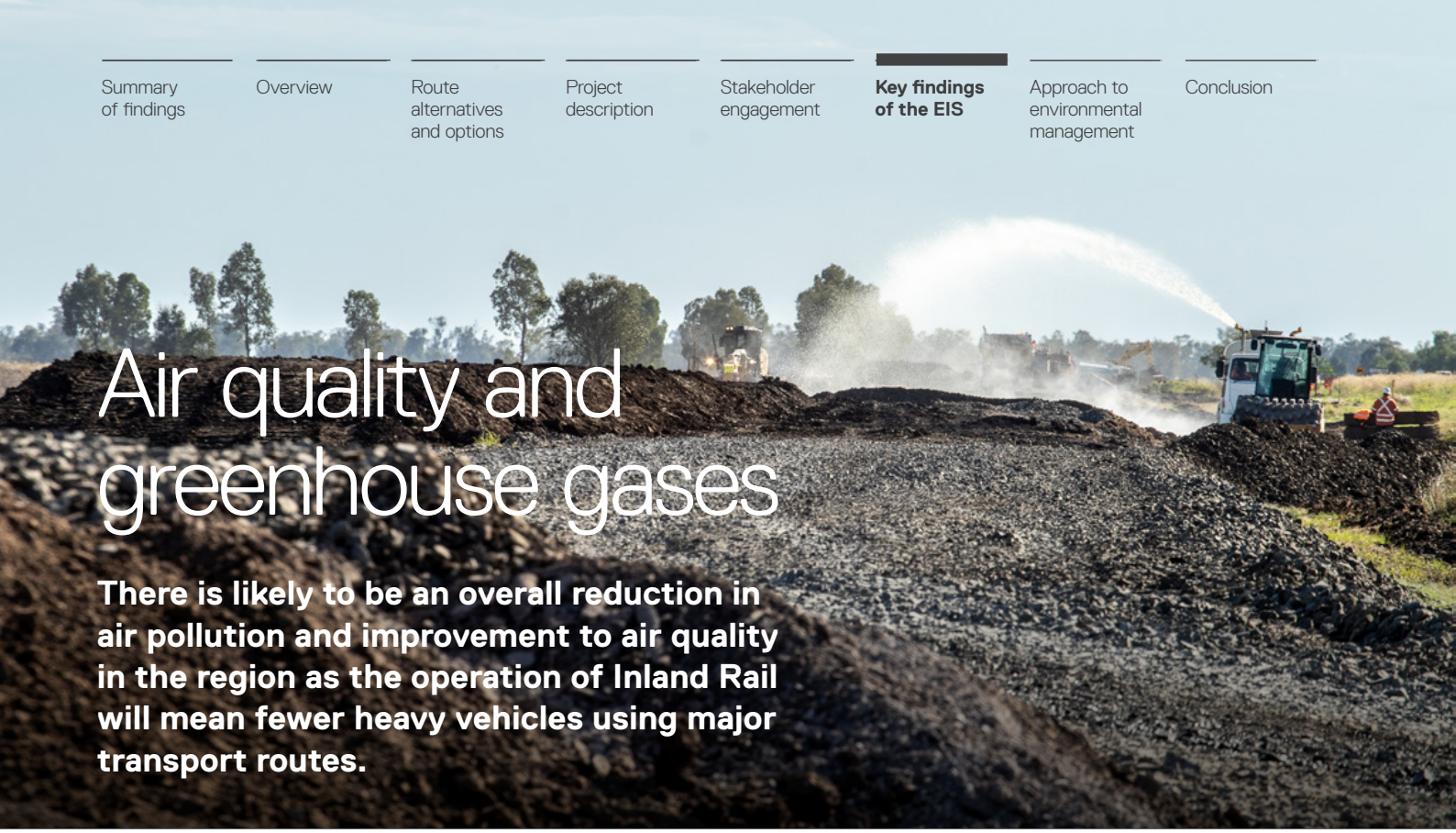
**Want to know more?**

See

– Chapter 23: Sustainability

**Sustainability** is an important consideration for the Narrabri to North Star Phase 2 proposal. As part of the wider Inland Rail Program, the proposal provides opportunities to:

- **maximise resource efficiency**
- **enhance local economic activity**
- **mitigate potential environmental and social impacts**



# Air quality and greenhouse gases

**There is likely to be an overall reduction in air pollution and improvement to air quality in the region as the operation of Inland Rail will mean fewer heavy vehicles using major transport routes.**

Regional air quality along the proposal route is mainly influenced by rural activities, vehicle emissions, mining and exploration activities. The development of Inland Rail may produce an overall improvement to air quality in the region as fewer heavy vehicles will need to use major transport routes.

## Construction

Air quality impacts are likely to be transient and short-term as construction progresses along the alignment.

Potential impacts to local air quality include:

- Dust generated from bulk earthworks, 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, and mobile plant.

Of these potential construction air quality impacts, the potential for 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).

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. The project team will engage with potentially impacted residents and landowners. Notification of upcoming works and mitigation measures would be implemented.

Combustion of diesel fuel is expected to be the most significant construction phase source of greenhouse gas emissions.

**Want to know more?**

See

- Chapter 24: Air quality and greenhouse gas

## Operation

During operation, the increase in diesel operated freight trains using the corridor has the potential to increase levels of pollutants, such as nitrogen oxides and particulate matter.

The air quality impact assessment considered these potential increases and concluded that the emissions are expected to be below the relevant criteria. The majority of the study area traverses a rural area with few sensitive receivers and low background emission levels compared to other transport corridors in NSW.

Regardless, ARTC must manage operational air quality impacts in order to achieve compliance with the relevant operational environment protection license.

As there are no identified significant sources of air pollutants within 20m of the proposal (e.g. factories or industries likely to emit significant quantities of air pollution, or facilities producing emissions exceeding the reporting threshold) cumulative impacts from operational activities are not expected.

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

The proposal may result in an overall improvement to air quality within the study area as decreasing the number of heavy vehicles using major nearby transport routes, such as the Newell Highway, would reduce greenhouse gas emissions and air pollution for receivers along these routes.

# Health and safety

**An assessment of potential health and safety impacts to humans from the construction and operation of the proposal was completed.**

Health, safety and environmental hazards and risks have been assessed in the context of the proposal.

Hazards relating to the construction and operational phases of the proposal have been evaluated to identify those that are likely to give rise to risks requiring further assessment or management strategies.

There are no potential hazards or risks to on-site workers during construction and operation requiring further assessment as these are regulated, instead, by workplace health and safety legislation.

Some of the potential risks or hazards include the storage and handling of dangerous goods; contamination; extreme weather events (such as bushfire and flooding); disruption to utilities; workplace and community safety hazards.

Potential impacts will 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, managing and evaluating the effectiveness of mitigation measures.

During construction, an emergency response sub-plan would be prepared to manage emergency responses.

A positive impact on the safety of the surrounding road network is expected to occur once the proposal is operational owing to a reduction of heavy vehicle traffic on local roads and improvements in safety associated with level crossings.

A community safety awareness program would be developed and implemented during the construction phase to educate landowners and the broader community regarding safety around trains. This would focus on community and rural property operators who cross the rail corridor to access their properties.

**Want to know more?**

See

- Chapter 25: Health and safety (including hazardous materials)

# Cumulative impacts

**Cumulative impacts consider the residual impacts of the proposal and assess these impacts against other coordinated/major projects.**

Existing projects within the study area are considered a part of the existing environment and have therefore been included within the impact assessment of the proposal. Accordingly, the cumulative impact chapter of the EIS deals only with:

- Projects that have been approved, but where construction has not yet commenced
- Projects that have commenced construction, but have not been completed
- Projects only recently completed but not yet operational
- Projects that are currently being assessed as SSI within the proposal's local government areas.

For projects currently under construction, consideration has been given to whether relevant impacts have already been accounted for in baseline scenarios in the impact assessments within this EIS.

The following projects qualify to be further assessed in terms of determining the significance of cumulative impacts:

- 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 (SSI MP06_0286)
- 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 given a risk rating of low, medium or high. Generally, the potential for cumulative impacts resulting from the interaction of the proposal with other projects, either existing or proposed, in the surrounding area were rated as low to medium, with only one cumulative impact considered to be high risk. Medium and high risk potential cumulative impacts are described on the following page.

**Want to know more?**

See

- Chapter 26: Cumulative impacts

**Key cumulative impacts are likely to relate to:**

- Hydrology and flooding
- Biodiversity
- Traffic and transport
- Socio-economic factors

## Medium impact significance

The cumulative impact assessment identified that biodiversity, traffic and transport, social and economic impacts may result in a cumulative impact with a significance rating of medium. This is largely due to:

- **Biodiversity:**
  - Habitat clearing for permanent and temporary construction facilities causing direct loss of native flora and fauna habitat
  - Displacement, injury or death of resident fauna, causing a decline in local fauna populations
  - Removal of habitat features e.g. hollow bearing trees, causing a direct loss of native fauna habitat
  - Disruption to connectivity, causing a direct loss of native fauna habitat
  - Work in waterways, causing a direct loss of riparian habitat and disturbance of aquatic habitat.
- **Traffic and transport:**
  - Increased traffic on the Newell Highway, which is a major thoroughfare and haul route for the five assessed projects (traffic associated with construction staff, transport of materials and machinery, and use of local quarries)
  - Increased traffic on local roads due to dependence on services such as accommodation out of Moree.
- **Social and economic impacts:**
  - Increased demand for skilled construction workers from Moree and surrounds
  - Increased demand for workers' accommodation in Moree, subsequently increases overall accommodation prices
  - Increase in economic returns for local businesses due to workforce population residing in/near Moree, as well a more efficient and secure freight transport system.

## High impact significance

The cumulative impact assessment identified that hydrology and flooding would likely result in a cumulative impact with a significance rating of high.

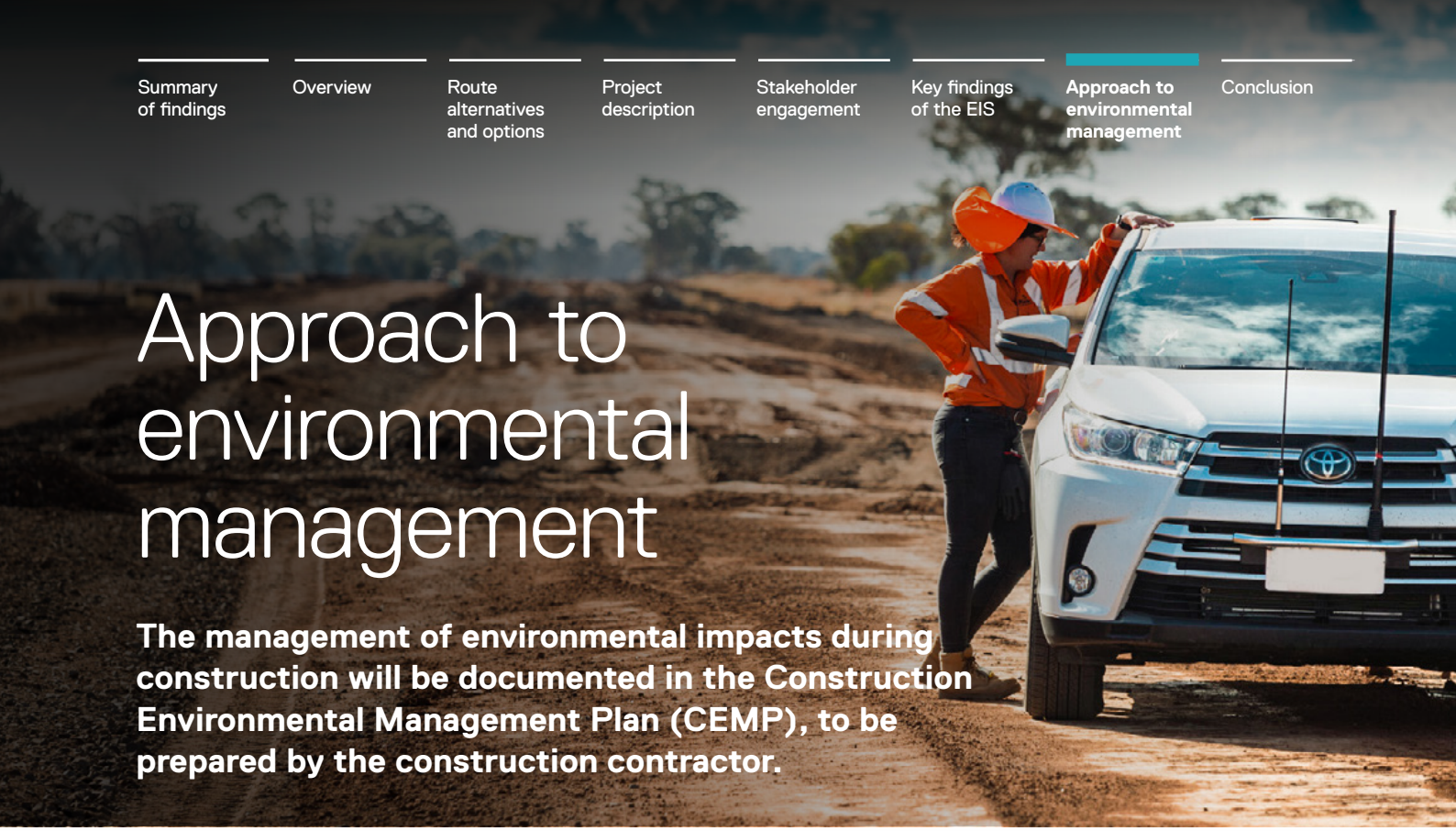
This is largely due to:

- **Hydrology and flooding:**
  - Potential for interaction with the proposed Newell Highway Upgrade project which may result in impacts to landowners in the southern portion of the proposal
  - Additional surface flows originating from the proposal topping a portion of the new rail in Narrabri to North Star Phase 1.

## Mitigation and management:

The following management measures would be applied to the proposal to mitigate for potential cumulative impacts:

- **Biodiversity:**
  - Avoiding impacts to native vegetation where possible by minimising the construction footprint, conducting pre-clearing surveys and implementing an approved Flora and Fauna Management Plan under the CEMP
  - Utilising biodiversity offsets to compensate for permanent and unavoidable removal of native vegetation.
- **Traffic and transport:**
  - Implementing a Traffic and Transport Management Plan under the CEMP to mitigate increased traffic volumes on the Newell Highway and local roads.
- **Social and economic impacts:**
  - Construction accommodation facilities (i.e. workers' accommodation) would be provided for workers in and around Moree to minimise any impact to accommodation around Moree where possible. This would reduce artificial rises in rental prices due to workers being housed in nearby residential accommodation
  - Continuing to consult with the affected communities throughout the detailed design, construction and operation of the proposal.
- **Hydrology and flooding:**
  - Hydrology and flooding is the most significant and complex cumulative impact identified in the EIS. Chapter 12: Hydrology and flooding and Technical Paper 4: Hydrology and flooding impact assessment have identified a range of mitigations to manage cumulative impacts.



# Approach to environmental management

**The management of environmental impacts during construction will be documented in the Construction Environmental Management Plan (CEMP), to be prepared by the construction contractor.**

The detailed design stage of 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, considering the input of stakeholders.

The CEMP will define how specific environmental issues are to be managed during construction in accordance with the mitigation measures provided in the EIS and the conditions of approval.

The purpose of the CEMP is to set out the proposal's commitments to environmental management, including the identification of environmental aspects to be managed, and how environmental values will be protected and enhanced. It also identifies mitigation measures relevant to the detailed design of the proposal.

The CEMP will be prepared in consultation with relevant agencies and in accordance with the Environmental Management Plan Guideline for Infrastructure Projects (DPE, 2020) and the Inland Rail Construction Environmental Management Framework.

An outline of the CEMP, including the required sub-plans and a guide to the general construction management measures required in each is provided in Appendix F: Construction Environment Management Plan outline.

The CEMP must be endorsed by ARTC and submitted to DPE for approval no later than one month prior to the commencement of any works, including early works and demolition.

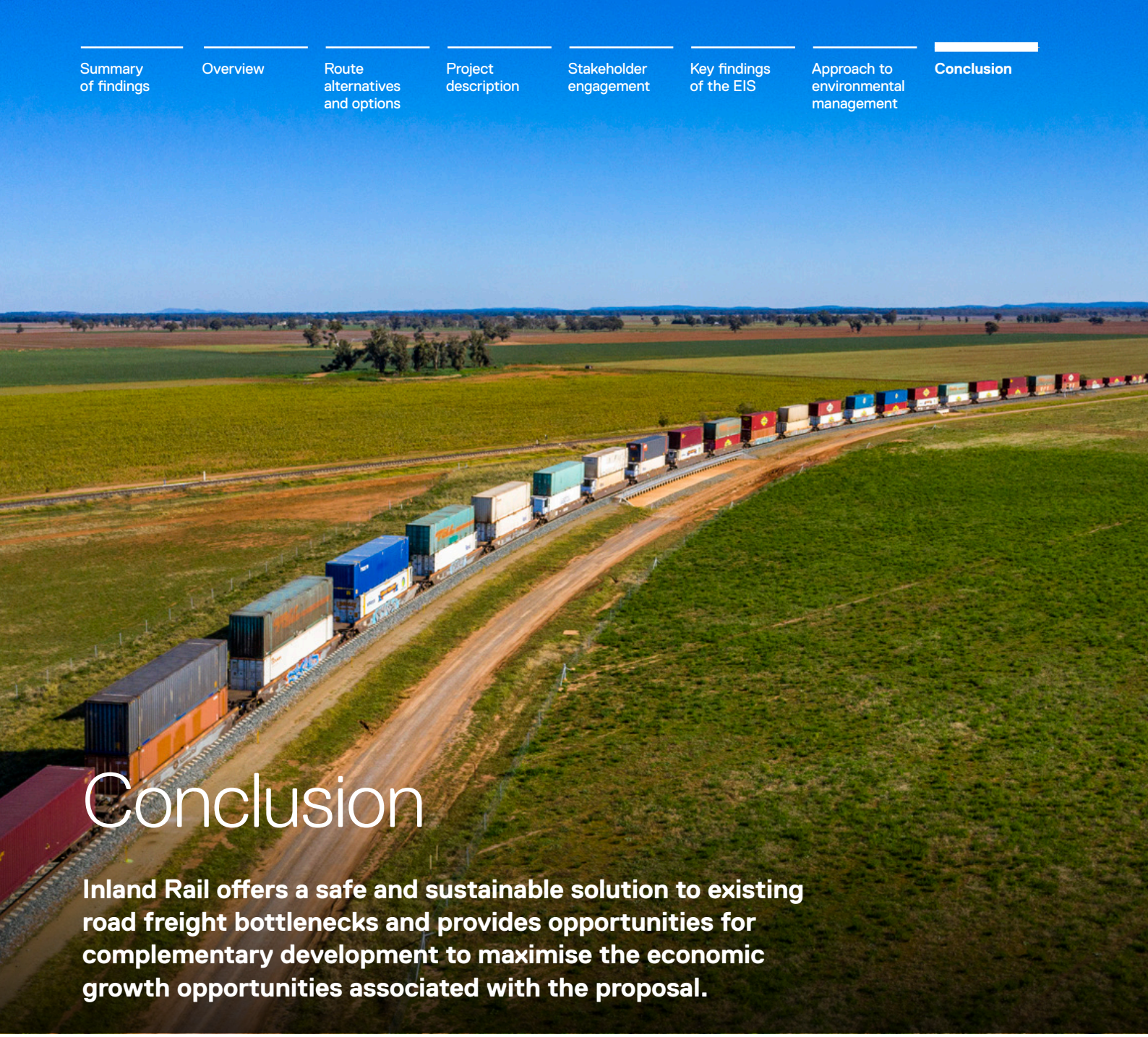
During operation of the proposal, environmental performance will be managed through ARTC's Environmental Management System, which ensures compliance with relevant legislation, EIS mitigation measures and conditions of approval.

> Once in place, the CEMP will be a dynamic document, revised to address community concerns and reflect changes in environmental management procedures, new techniques and relevant legislative requirements.

**Want to know more?**

See

- Chapter 27: Approach to environmental management and Appendix I: Outline construction environmental management plan



# Conclusion

**Inland Rail offers a safe and sustainable solution to existing road freight bottlenecks and provides opportunities for complementary development to maximise the economic growth opportunities associated with the proposal.**

Australia's freight task is set to experience significant growth over the coming decades. Existing freight infrastructure cannot support this projected growth, with increasing pressure on already congested roads and rail lines through Sydney and increasing use of heavy trucks such as B-doubles and B-triples along the Hume, Pacific and Newell Highway corridors.

Inland Rail will address the growing freight task by helping to move freight off the congested road network and shifting interstate freight off the congested Sydney suburban rail network. It provides a reliable road-competitive solution to the freight task and enables the commercial and social benefits of rail to be leveraged to meet Australia's long-term freight challenge.

**Want to know more?**

See

– Chapter 27: Conclusion

Inland Rail will:

- Connect key farming and manufacturing regions in Queensland, NSW and Victoria with export ports in Brisbane and Melbourne
- Provide national freight linkages between Melbourne, Brisbane, Sydney, Adelaide and Perth
- Reduce freight transit times between Brisbane and Melbourne to less than 24 hours
- Reduce congestion on rail and road networks
- Enable the movement of larger freight volumes via rail, by making the movement of longer and double-stacked trains possible and developing complementary integrated intermodal freight infrastructure at strategic regional locations adjacent to the Inland Rail alignment.

Inland Rail will provide the backbone infrastructure necessary to significantly upgrade the performance of the east coast rail freight network to better serve future freight demands, while also diverting demand from the constrained road freight and rail passenger network.

The Narrabri to North Star Phase 2 proposal is justified in terms of its strategic need and its anticipated economic and social benefits, considering the matters of ecologically sustainable development. The proposal best meets the objectives when compared to all other alternatives considered.

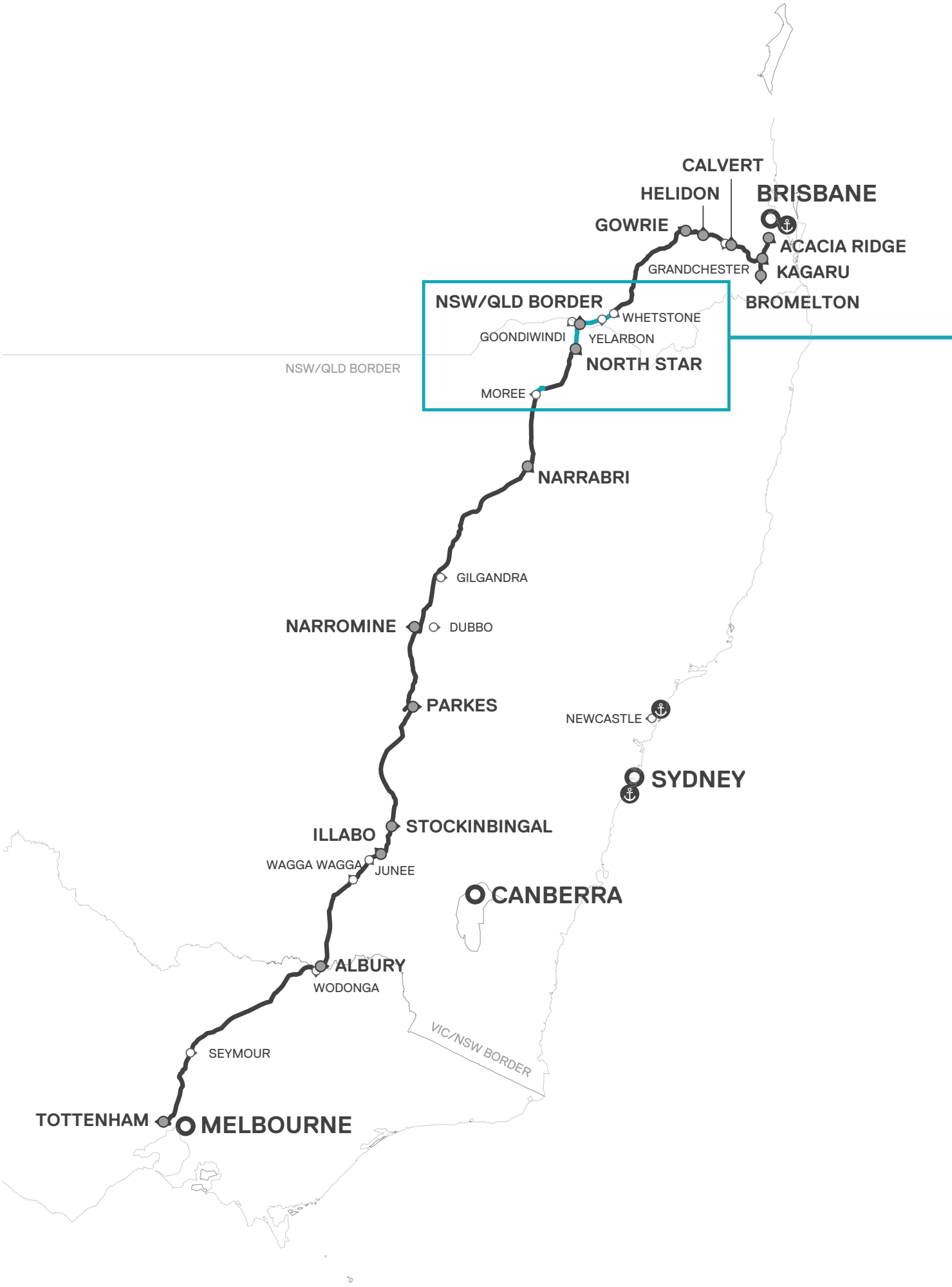
The proposal's EIS has been prepared in accordance with the provisions of Part 5.2 of the *EP&A Act* and addresses the Secretary's Environmental Assessment Requirements. It also includes consideration of the issues raised by the community and stakeholders during the development of the proposal.

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 and will continue to be managed and refined during the detailed design, construction and operation phases.

Consultation with directly impacted residents and landowners and wider local communities has been carried out with affected stakeholders to identify key potential impacts early . Where possible, the proposal is using this feedback to implement initiatives which eliminate or mitigate potential 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.


CALVERT
HELIDON
BRISBANE
GOWRIE
ACACIA RIDGE
GRANDCHESTER
KAGARU
NSW/QLD BORDER
BROMELTON
WHETSTONE
GOONDIWINDI
YELARBON
NSW/QLD BORDER
NORTH STAR
MOREE
NARRABRI
GILGANDRA
NARROMINE
DUBBO
PARKES
NEWCASTLE
SYDNEY
ILLABO
STOCKINBINGAL
WAGGA WAGGA
JUNEE
CANBERRA
ALBURY
WODONGA
VIC/NSW BORDER
SEYMOUR
TOTTENHAM
MELBOURNE

**The Narrabri to North Star Phase 2 (N2NS P2) project** will be delivered as part of the Central Civil Works Program. As well as the Phase 2 section, the Central Civil Works Program comprises 85km of rail corridor between North Star in New South Wales and Whetstone in Queensland.

## CENTRAL CIVIL WORKS PROGRAM

**MOREE & NORTH STAR TO WHETSTONE**