INLAND RAIL

MELBOURNE TO BRISBANE

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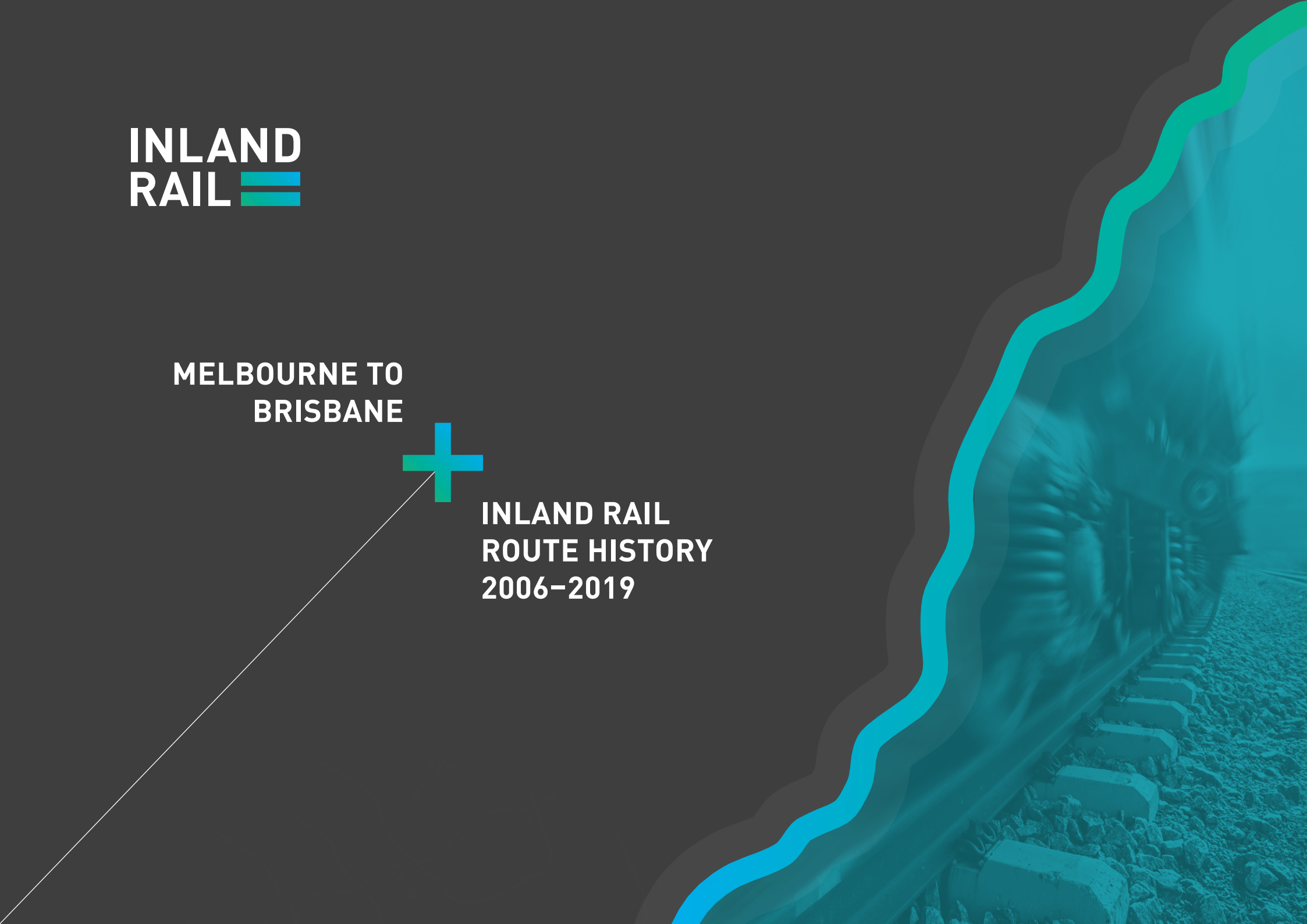
INLAND RAIL ROUTE HISTORY 2006–2019



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

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Introduction

This document summarises decisions that have informed the current route for Inland Rail between Melbourne and Brisbane via regional Victoria, New South Wales and southeast Queensland. This document is intended to provide the reader with an understanding of these decisions and the reasoning behind them.

The information provided in this document is primarily drawn from information available on the Inland Rail website and other publicly accessible sources. The information relating to assessment of the freight volumes on the Coonamble line, and the potential for reduced operating costs, that appears in Appendix 1–3 (pages 98 to 104) of this document have been prepared by the Australian Rail Track Corporation (ARTC) specifically for this document.

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

Introduction

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

The Melbourne to Brisbane Inland Rail Alignment Study (IRAS 2010) effectively established the Inland Rail route that has undergone some relatively minor changes in the years since. In developing IRAS 2010, ARTC was assisted by a number of this country's leading business and engineering consultancies.

A critical component in developing the route in 2010 was work undertaken to understand the factors that freight firms and customers took into account when determining whether to send freight by road, rail or sea. These factors of price, reliability, availability and transit time were subsequently reaffirmed in 2014 by ARTC following consultation with freight forwarders, rail operators and customers, including supermarkets and others requiring timely transportation of manufactured and packaged goods. As a result of this consultation, ARTC formalised the Inland Rail Service Offering. When fully operational, Inland Rail will effectively and measurably enhance the national supply chain.

The Inland Rail Service Offering provides for a transit time between Melbourne and Brisbane of less than 24 hours for the "Inland Rail intermodal reference train" (which is a freight train up to 1,800m in length, 40% double-stacked) while achieving 98% reliability and providing for freight availability when the market requires at a cost that is competitive with road.

To be as competitive as possible with road, it is desirable that the Melbourne to Brisbane transit time for express trains should allow for freight delivery in a time as close to road transit time as feasible.

The Inland Rail Service Offering can only be achieved by routing Inland Rail across significant sections of greenfield areas where there is currently no existing rail line or rail corridor.

As at 31 December 2019, the planned Inland Rail route is approximately 1,725 kilometres (km) between Melbourne and Brisbane.

The Inland Rail route comprises:

- 1,118km of track upgrades, enhancements or construction of new track within existing rail corridors (brownfield)
- 607km of track in new rail corridors (greenfield).

What this means is that along the entire route, track upgrades or enhancements or use of existing rail corridors account for 65% of the route.

The longest section requiring a new rail corridor, and offering the greatest opportunity to save time and distance lies between Narromine and Narrabri in New South Wales (approximately 300km). The section between the NSW/QLD border and Gowrie in Queensland (approximately 224km) requires 146km of new rail corridor and utilises 78km of existing rail corridor within which Inland Rail will be constructed.

The route development process is now reaching its later stages as the rail design is progressed and planning approvals are progressively obtained for each component section in the Inland Rail Program.

This document provides a general overview of the key reports and decisions that shaped the development of Inland Rail between 2006 and late 2019. It is a synthesis of information that is largely publicly available in a number of reports.

Further information on Inland Rail and each section (or project) can be found at inlandrail.com.au

A short glossary of terms is included at the end of this document together with a list of publicly available documents related to the development of the Inland Rail route.

Inland Rail Program

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Overview and development

Inland Rail: Program overview

Listed below are the 13 sections (or projects) that collectively comprise the Inland Rail Program. Each section is defined geographically and commonly identified by the accompanying acronym.

T2A:	Tottenham (Melbourne) to Albury
A2I:	Albury to Illabo
I2S:	Illabo to Stockinbingal
S2P:	Stockinbingal to Parkes
P2N:	Parkes to Narromine
N2N:	Narromine to Narrabri
N2NS:	Narrabri to North Star
NS2B:	North Star to New South Wales / Queensland Border
B2G:	New South Wales / Queensland Border to Gowrie
G2H:	Gowrie to Helidon
H2C:	Helidon to Calvert
C2K:	Calvert to Kagaru
K2ARB:	Kagaru to Acacia Ridge (Brisbane) and Bromelton

The three projects between Gowrie and Kagaru are sometimes collectively referred to as G2K. They are largely within protected transport corridors and are to be delivered by a single Public Private Partnership.

The Inland Rail route as at December 2019 is shown in the map on page 6. This map illustrates the route in its general location. Specific section alignments may vary slightly due to the narrowing of areas of investigation within those sections.

INLAND RAIL ALIGNMENT MAP

01 KAGARU TO ACACIA RIDGE AND BROMELTON

Comprises 49km of existing track.

Clearances will be increased to allow for double-stacked container trains.

02 CALVERT TO KAGARU

Comprises 53km of new dual gauge track in the protected Southern Freight Rail Corridor.

Using 1.1km of tunnelling this section will connect Inland Rail with the Sydney to Brisbane coastal line.

03 HELIDON TO CALVERT

Comprises 47km of new dual gauge track predominantly within the Gowrie to Grandchester protected corridor.

This track will cross the Lockyer Valley floodplain and the Little Liverpool Range with a 1.1km tunnel.

04 GOWRIE TO HELIDON

Comprises 26km of new dual gauge track in the Gowrie to Grandchester protected corridor.

This route will traverse the steep terrain of the Toowoomba Range and will include a 6.4km tunnel.

05 NSW/QLD BORDER TO GOWRIE

Comprises 224km of new dual gauge track – 146km in new greenfield corridors and 78km within existing corridors from the NSW/QLD border near Yelarbon, to Gowrie Junction, north-west of Toowoomba.

06 NORTH STAR TO NSW/QLD BORDER

Comprises 37km of new track, using 23km of existing rail corridor.

This will complete one of the key missing links of track between NSW and QLD, using disused rail corridor or new track to connect to the operating line running to Yelarbon.

07 NARRABRI TO NORTH STAR

Comprises 188km of upgraded track and 1.6km of new track in new greenfield corridor.

This track will be upgraded to allow Inland Rail traffic to travel at mainline speed.

08 NARROMINE TO NARRABRI

Comprises 300km of new track in new greenfield corridor.

This new track will reduce the overall journey time and complete one of the missing links between Melbourne, Adelaide, Perth and Brisbane.

09 PARKES TO NARROMINE

Comprises 98.4km of existing track and 5.3km of new track in a new greenfield corridor.

This track will be upgraded to improve transit times.

10 STOCKINBINGAL TO PARKES

Comprises 169km of existing track. Inland Rail will benefit from the track upgrades ARTC has already completed to this section. Additional works will be undertaken to allow for double-stacked trains.

11 ILLABO TO STOCKINBINGAL

Comprises 37km of new track.

The route bypasses the winding section of track called the Bethungra Spiral.

12 ALBURY (VIC/NSW) BORDER TO ILLABO

Comprises 185km of existing track.

Clearances will be increased to allow for double-stacked container trains.

13 TOTTENHAM TO ALBURY (VIC/NSW BORDER)

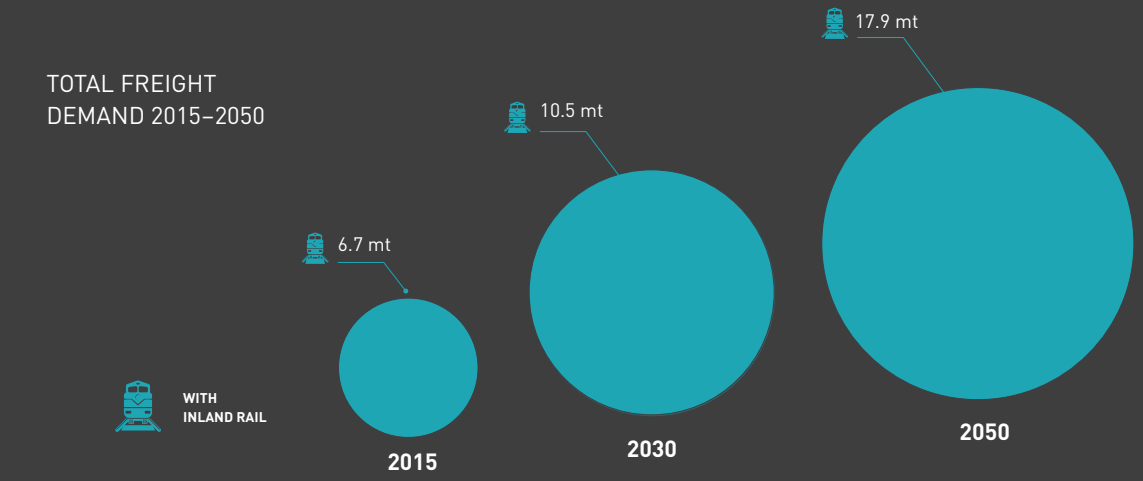
Comprises 305km of existing track.

Clearances will be increased to allow for double-stacked container trains.

Meeting Australia's freight challenge

Australia faces increasing pressure to efficiently, effectively and safely transport ever increasing volumes of freight, especially between our major cities. The east coast comprises 18 million residents (79% of Australia's total population) and export trade through east coast ports is estimated to contribute approximately $260 billion annually[1]. The growing freight task is summarised in the diagram on this page.

[1] Inland Rail Programme Business Case 2015, pages 59-60



The 2015 Inland Rail Business Case identified the following key deficiencies in existing freight transport networks with flow-on impacts to freight supply chains and the broader community.

- **Capacity:** Existing infrastructure between Melbourne and Brisbane has insufficient capacity to meet future freight demand.
- **Productivity:** Current north–south freight infrastructure (road and rail) is constrained by both geography (old rail lines with numerous curves and inability to take double-stacked freight trains) and the priority given to passenger rail services (particularly through the greater Sydney urban area where curfews are in place on freight trains during peak commuting hours).
- **Social and environment:** The continued reliance on road for freight transport will result in increasing safety, environmental and community impacts with associated costs to the economy.
- **Regional and growth:** Existing north–south freight infrastructure is impacting access to efficient supply chain networks for regional producers and industries, inhibiting productivity and economic growth.
- **Resilience:** Lack of resilience on existing north–south freight infrastructure exposes supply chains to disruptions and greater unreliability.

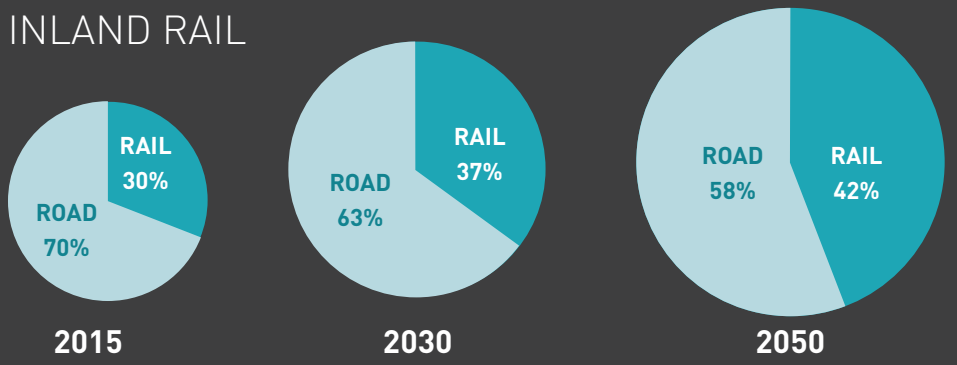
Meeting Australia's freight challenge

Inland Rail will provide the catalyst for moving freight from road to rail by delivering a greater supply of faster, more reliable rail freight paths that offer significantly lower operating costs than either road transport or existing rail via the coastal route.

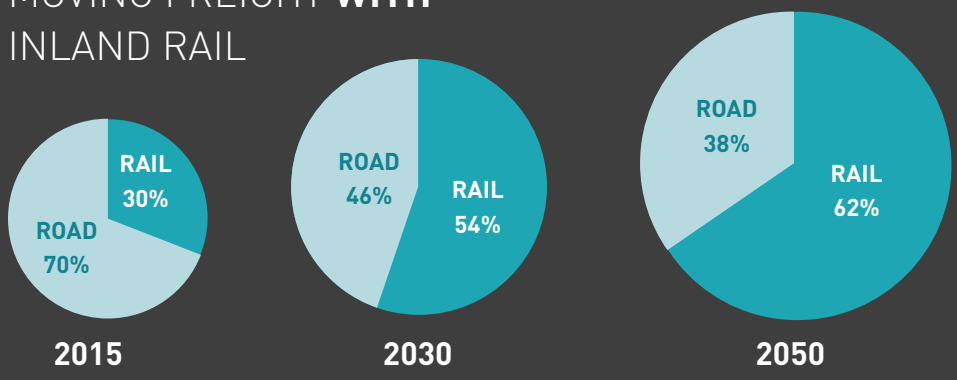
Inland Rail will encourage and facilitate the shift of more freight from road to rail. This modal shift will help to significantly reduce the economic cost to Australia from road congestion, forecast to be as much as $37 billion a year by 2030.[1]

The accompanying graphics on this page illustrate the difference that Inland Rail will make.

MOVING FREIGHT **WITHOUT** INLAND RAIL



MOVING FREIGHT **WITH** INLAND RAIL



[1] Traffic and congestion cost trends for Australian capital cities, Bureau of Infrastructure, Transport and Regional Economics 2015

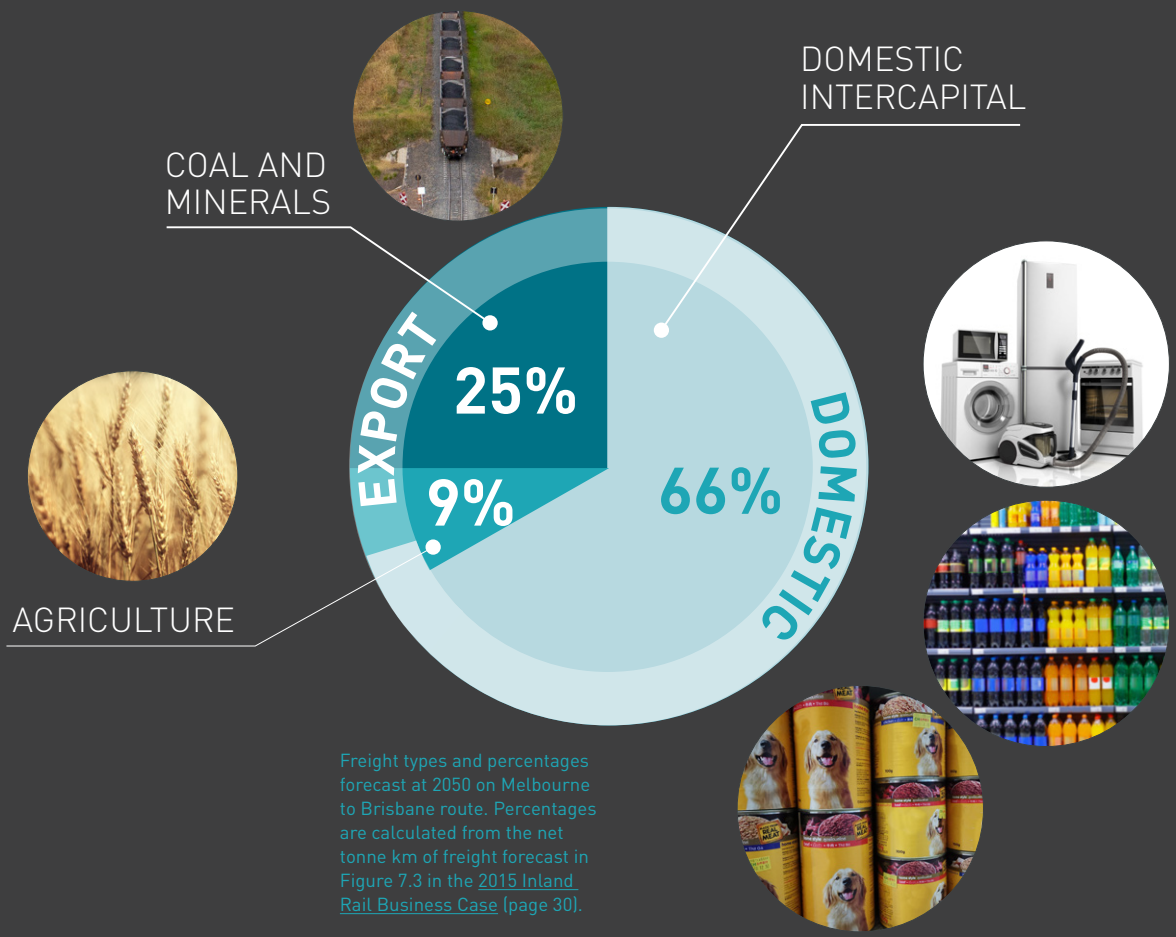
Meeting Australia's freight challenge

An efficient freight transport system in the east coast domestic and export markets is critical to Australia's future prosperity. The accompanying graphic illustrates the general nature of freight that will be carried by Inland Rail once it is operational, as well as the proportions destined for domestic and export markets.

Almost 70% of freight carried on Inland Rail is destined for domestic markets with the majority comprising inter-capital non-bulk freight such as white goods and beverages. Approximately 70% of Australia's agricultural production is exported and 30% consumed domestically.[1]

By providing greater flexibility across multiple supply chains, Inland Rail will enhance both national productivity and regional economies as businesses become more competitive through a greater ability to deliver products to more markets faster and at lower cost.

MOVING FREIGHT FOR DOMESTIC AND EXPORT MARKETS



Freight types and percentages forecast at 2050 on Melbourne to Brisbane route. Percentages are calculated from the net tonne km of freight forecast in Figure 7.3 in the 2015 Inland Rail Business Case (page 30).

[1] Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) forecast for 2019–20 agricultural production

Connecting Melbourne, Brisbane and the rest of Australia

Inland Rail is a once-in-a-generation project that will complete the backbone of the national freight rail network, enabling Australia to have world-class supply chains and meet the objectives of the 2015 Inland Rail Business Case.

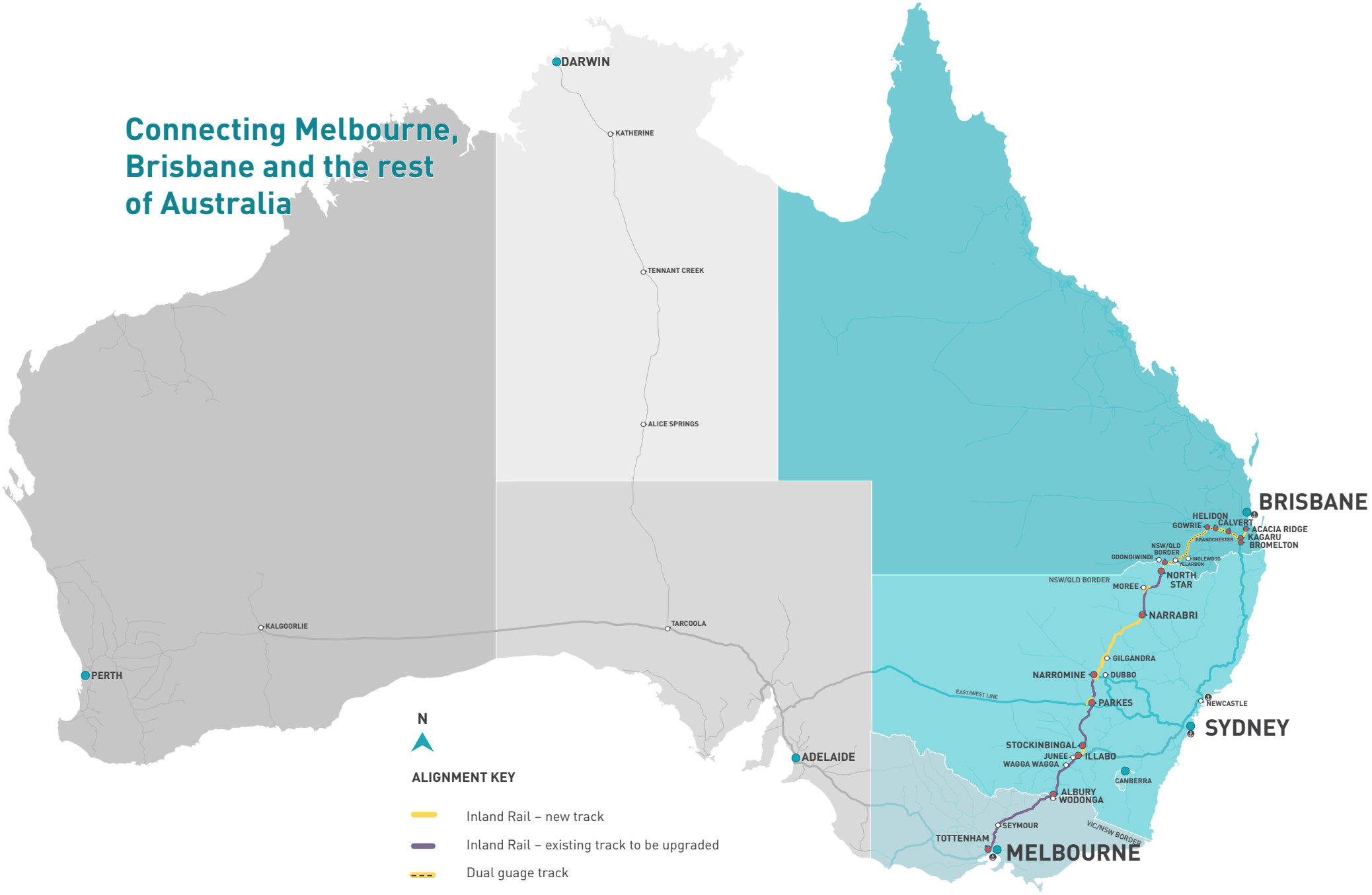
To achieve these objectives Inland Rail has to meet the driving needs of customers for a line that enables trains to carry freight between Melbourne and Brisbane:

- in a comparable timeframe to that achieved by trucks
- at less cost than provided by trucks
- with reliability and predictability comparable to that provided by trucks.

The construction of a fast, safe, reliable and connected Inland Rail will benefit not only customers and freight forwarders but also generate social and economic benefits for regional towns, businesses and primary producers.

As an efficient supply chain backbone, Inland Rail will enable connections with regional and national rail lines. These connections will reduce costs and provide greater flexibility in the way producers are able to transport goods and freight to markets throughout Australia, including to ports in Queensland, New South Wales, Victoria, South Australia and Western Australia.

Connecting Melbourne, Brisbane and the rest of Australia



The development of Inland Rail

2006 North-South Rail Corridor Study

- The route selection process began in earnest with the 2006 North-South Rail Corridor Study which identified a broad corridor for a future Melbourne-Brisbane railway.
- The study examined four broad alternatives between Melbourne and Brisbane ranging from a far western sub-corridor via western New South Wales through to a coastal sub-corridor via Sydney and the North Coast.
- The study identified 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.

2010 Inland Rail Alignment Study

- The Far Western Sub-Corridor identified in the North-South Rail Corridor Study formed the starting point for the Inland Rail Alignment Study (IRAS) completed in 2010.
- The 2010 IRAS analysed a large number of alternatives within the Far Western Sub-Corridor. It identified a detailed alignment that sought to minimise construction and operational costs and maximise the economic benefit – in particular, freight user benefits flowing from operating cost savings, time savings and improved reliability. This drove identification of key greenfield sections such as Narromine to Narrabri.

2011–2013 Initial $300m funding allocation

- Following the completion of the 2010 IRAS, the Australian Government approved an initial $300 million allocation in the 2011–12 Federal Budget forward estimates for Inland Rail pre-construction activities spanning the 2014/5–2018/9 period.
- Following the 2013 Federal Election, the incoming Government committed to this $300 million funding, in conjunction with announcements regarding the formation of the Inland Rail Implementation Group.
- The $300 million funded the initial work on Inland Rail through to 2018/19, establishing the basis for the development of Inland Rail in the lead up to project delivery.

2013 Inland Rail Implementation Group established (reported in 2015)

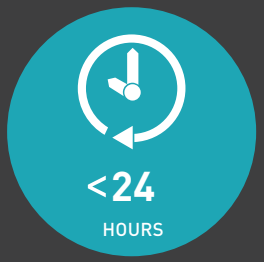
- In late 2013, the then Deputy Prime Minister Warren Truss announced the formation of the Inland Rail Implementation Group (IRIG), chaired by the Hon John Anderson AO, with senior representatives from relevant Infrastructure departments of Australia, Queensland, New South Wales and Victorian infrastructure departments, and the ARTC CEO.
- IRIG was tasked with preparing a 10-year delivery strategy and business case for Inland Rail.

The development of Inland Rail

2014 Inland Rail Service Offering formalised

- During 2014, ARTC worked with a Stakeholder Reference Group comprising key representatives from across the transport and logistics industries to understand if the factors affecting the ability of rail to attract freight that were developed as part of the 2010 IRAS remained valid.
- The Stakeholder Reference Group work validated the work undertaken in 2010 and culminated in the formal development of the Inland Rail Service Offering.
- The Service Offering specified the key outputs Inland Rail would offer to the market – transit time, reliability, pricing and availability. Achievement of the Service Offering (in particular transit time and reliability) has been a critical consideration in route selection. This is covered in more detail on pages 21–23.

INLAND RAIL SERVICE OFFERING



TRANSIT TIME

Requires a transit time between Melbourne and Brisbane of less than 24 hours and an express capability that is competitive with road.

RELIABILITY

Requires 98% reliability for freight customers.

PRICE

Requires competitive pricing for freight customers.

AVAILABILITY

Requires suitable train paths at the times that meet the needs of the market.

The development of Inland Rail

2015 IRIG Report

- The Inland Rail Implementation Group (IRIG) Report was delivered to the Australian Government in August 2015.
- The IRIG Report largely adopted the 2010 IRAS recommended alignment, with certain variations and recommendations for further assessment, as explained later in this document.

2015 Inland Rail Programme Business Case

- The ARTC 2015 Inland Rail Programme Business Case was the key supporting document for the IRIG Report. The Business Case demonstrated that Inland Rail could drive a significant shift in rail's share of freight transported and also drive an increase in the total volume of freight moved.
- On receiving the IRIG Report, the Australian Government referred the Business Case to Infrastructure Australia for assessment.
- Following assessment of the Business Case, Infrastructure Australia added Inland Rail to the Australian Infrastructure Priority List as a Priority Project in May 2016.

2016–17 Federal Budget

- In the 2016–17 Federal Budget, the Australian Government announced that Inland Rail would be delivered through ARTC in partnership with the private sector, and that it would undertake market testing for private sector involvement in the project.
- The Budget allocated an additional $593.7 million, as an equity injection to ARTC, towards land acquisition, the continuation of pre-construction work and due diligence activities.

2016–17 Market Testing for private sector involvement

- Flowing from the 2016–17 Federal Budget announcements, the Department of Finance led a market testing process in late 2016 and early 2017 to inform the Australian Government's consideration of the delivery and financing of Inland Rail.
- The outcomes of the market testing were considered by the Government in the identification of a delivery model for Inland Rail in the context of the 2017–18 Federal Budget.

The development of Inland Rail

2017–18 Federal Budget

- In the 2017–18 Federal Budget, the Australian Government committed to finance Inland Rail with a combination of an additional $8.4 billion equity investment in ARTC and a Public Private Partnership for the Gowrie to Kagaru section in Queensland.
- The 2017–18 Budget allocation brought total Australian Government financing of Inland Rail to $9.3 billion.

2018 Construction commencement

- A historic milestone was achieved on 13 December 2018 when the Deputy Prime Minister, Hon Michael McCormack MP, turned the ceremonial first sod on the Parkes to Narromine (P2N) section of Inland Rail, accompanied by the ARTC Chairman, ARTC Managing Director and CEO, Inland Rail CEO and other dignitaries.
- The commencement of construction followed the receipt of planning approvals in September 2018 and the appointment of INLink as construction contractor in October 2018 (INLink is a joint venture between BMD Group and Fulton Hogan).

Parkes community attending the Inland Rail sod turn event on 13 December 2018

The development of Inland Rail post IRIG

Since the delivery of the IRIG Report in 2015, ARTC has been working to deliver an Inland Rail that meets the Service Offering, which requires a route that is flat, safe and as fast as possible, while mitigating impacts to landowners and communities as much as feasible.

This has led to prioritising identification of appropriate study areas within which the final rail line will be built in the following greenfield sections of Inland Rail:

- Illabo to Stockinbingal (New South Wales)
- Narromine to Narrabri (New South Wales)
- North Star to New South Wales /Queensland Border
- North Star to New South Wales /Queensland Border to Gowrie (Queensland)
- Gowrie to Kagaru (Queensland).

In each of the greenfield sections, the process has involved:

- undertaking initial technical studies and stakeholder consultation to help inform decision-making on the section's study area, generally between 2km and 5km wide, within which detailed alignment refinement can proceed

  In the Queensland Gowrie to Kagaru section, ARTC has focused its studies within study areas largely defined by the existing corridors protected by the Queensland Government
- narrowing the study area to a focus area of investigation of about 100–250m wide, after further studies and consultation has been undertaken
- undertaking further refinement of the rail corridor which is typically approximately 40m wide but can be up to 65m wide in places to allow trains to pass safely or where deep cuts into hills are required.

  As at 1 November 2019, across the greenfield projects in the Inland Rail Program, ARTC is continuing to narrow the investigation corridor from the initial 2 to 5km wide study areas to focused areas of investigation within which a final 40 to 60m corridor will be identified

  The final rail corridor is subject to state planning approval processes and will be specified in the relevant planning approval instrument of the relevant state. These planning approval processes require open consultation with the affected communities as a condition of approval.

Finalising the Inland Rail route: 2019 onwards

From a route selection and rail corridor determination perspective, Inland Rail sections essentially fall into two categories: Brownfield and Greenfield.

Brownfield projects

Brownfield (or predominantly brownfield) projects utilise sections of ARTC's existing leased network. The brownfield projects are:

- Tottenham to Albury
- Albury to Illabo
- Stockinbingal to Parkes
- Parkes to Narromine
- Narrabri to North Star
- Kagaru to Acacia Ridge and Bromelton.

The alignment for these brownfield sections is predominantly settled, by virtue of the fact that these projects use ARTC's leased network. Any minor deviations or small greenfield sections outside the existing corridor (such as the Camurra deviation on the Narrabri to North Star project) are being finalised through the feasibility design and Environmental Impact Statement (EIS) processes.

While these sections are brownfield, they nonetheless require significant upgrades, and consequently capital investment, to achieve the higher performancce specifications of Inland Rail.

Greenfield projects

Greenfield projects that involve the construction of new track are listed below. These are predominantly in new corridors but in some cases include new track construction in existing rail corridors (such as North Star to Border and various sections in Queensland that will utilise sections of Queensland Rail corridor):

- Illabo to Stockinbingal
- Narromine to Narrabri
- North Star to NSW / Queensland Border
- NSW / Queensland Border to Gowrie
- Gowrie to Helidon
- Helidon to Calvert
- Calvert to Kagaru.

For each of these greenfield projects a study area was identified that will help determine the location of a detailed final rail corridor (typically 40m wide but in places up to 65m wide). Primarily the rail corridor will be determined through initially narrowing the study area to focus area of investigation (typically down to 100–400m width) and the processes of reference design and EIS preparation and assessment. Preferred final rail corridors have been identified for the North Star to Border and Border to Gowrie projects and the three projects between Gowrie and Kagaru.

Finalising the Inland Rail route: 2019 Onwards

For all projects, technical investigations are accompanied by a consultation process comprising both individual landowner meetings and community information sessions. Ten Community Consultative Committees have been progressively established along the alignment to provide a formal mechanism for input to the process.

As at 1 November 2019, there were five Community Consultative Committees in Queensland and five in New South Wales.

For each project, the mechanism for final approval of the detailed alignment is the relevant planning approval instrument (which varies from state to state). ARTC is progressing all projects, other than Parkes to Narromine, through the planning approval processes and anticipates that these planning approvals will be received progressively from 2019/20 to 2021/22.

For greenfield sections, protection of the final rail corridor will flow from the planning approval process, involving the Ministerial project determination in New South Wales, and through a separate gazettal process by the Department of Transport and Main Roads in Queensland.

Acknowledging the significant contributors and partners

The alignment development process has been assisted by a wide range of professional advisors to provide technical analysis and support to facilitate robust decision making in alignment and corridor selection.

The list on this page is not exhaustive, however it highlights the principal firms engaged to assist ARTC and government in development for Inland Rail.

Economic, financial and professional services:

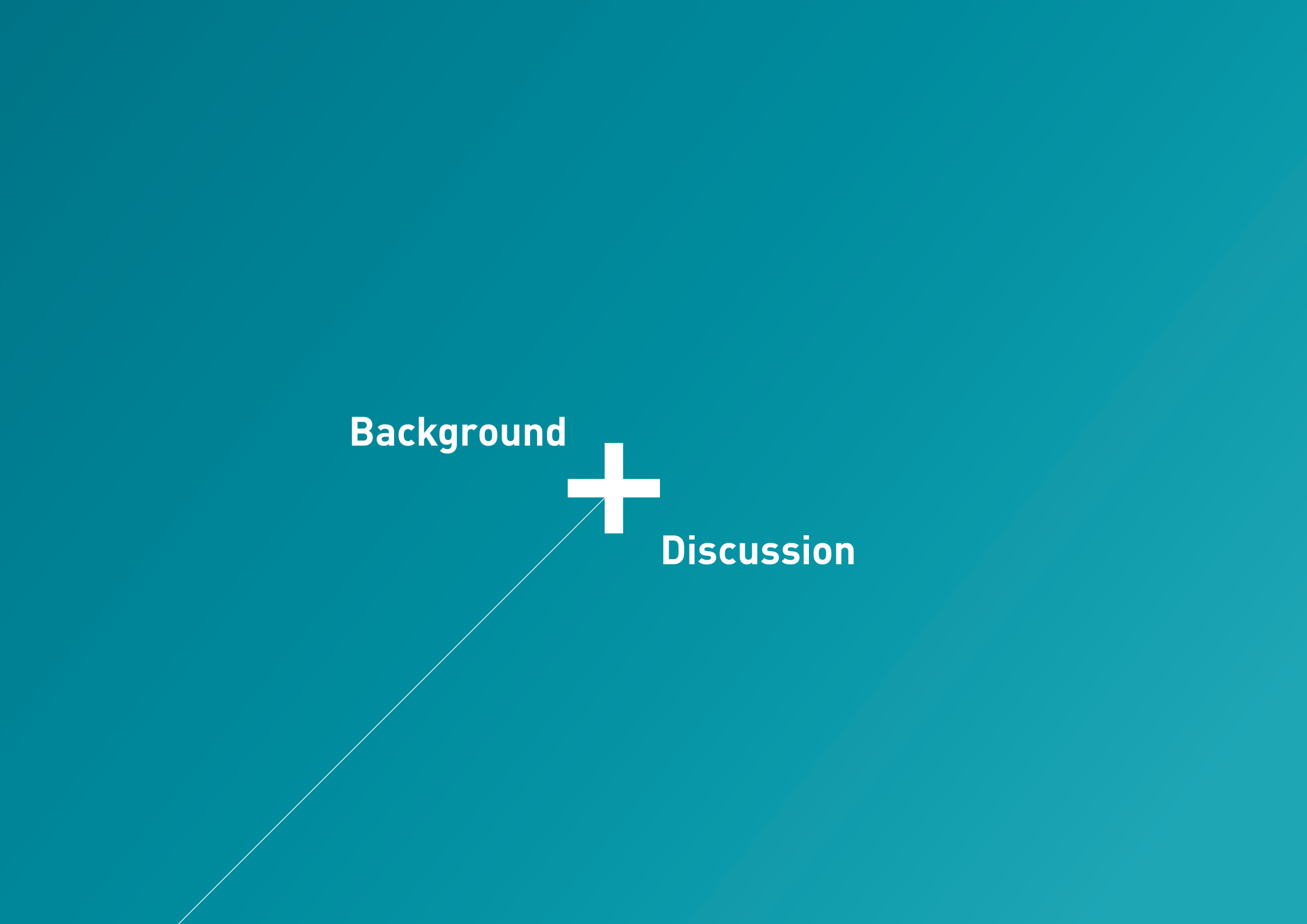
- ACIL Allen (previously ACIL Tasman)
- Deloitte
- Ernst and Young
- KPMG
- PricewaterhouseCoopers
- Turner & Townsend
- SNC Atkins.

Engineering, design and environmental services:

- AECOM
- Aquenta
- Arup
- Aurecon
- GHD
- Hatch
- Halcrow
- Hyder Consulting
- Jacobs
- Kellogg Brown Root
- Lycopodium Infrastructure
- Mott Macdonald
- Parsons Brinckerhoff
- SMEC
- WSP.

2018+ Parkes to Narromine construction contractors:

- BMD Constructions
- Fulton Hogan.


Background
Discussion

Why transit time and distance are critical to route selection

Adopting a route that is as direct as possible has been a critical consideration in route selection. The length of the route and overall transit time between Melbourne and Brisbane drive key economic benefits that underpin the Inland Rail Business Case.

Transit time and distance drive operating costs, which in turn determines the price that Inland Rail can offer against road.

- Reduced transit time drives lower labour costs (as faster services lower the hourly crew requirements) and improves rolling stock utilisation (meaning a smaller rolling stock fleet can service the total demand), significantly reducing the unit cost per tonne of freight transported.
- Reduced distance also directly reduces fuel consumption and rolling stock maintenance, which together constitute around 30% of rail operating costs.
- Together with improved operating parameters (train length and double stacking), these factors drive the cost saving per tonne for moving freight from road to Inland Rail. The 2015 Business Case estimated that Inland Rail will offer a price to the market giving a one-third saving against road.
- The 2015 Business Case estimated that freight operating cost savings represented nearly 50% of the total economic benefits provided by Inland Rail.

Lower transit time generates 'value of time' savings for freight customers.

- This relates to the value placed by freight customers on having time sensitive freight delivered earlier than delivery times offered by alternative options.
- Market consultation during the development of the Inland Rail Service Offering highlighted the need to offer a range of transit times to meet market needs, with a Melbourne to Brisbane transit time of under 24 hours necessary to compete with road in the time sensitive express market for intercapital city freight.
- The 2015 Business Case estimated the 'value of time' savings represent a further 25% of the total economic benefits provided by Inland Rail.

Why transit time and distance are critical to route selection

Lower transit time is critical for improved reliability.

- Shorter transit times are critical for improved reliability, as a reduced transit provides a buffer time between train arrival and the advertised availability (pick up time) of freight at the terminal.
- This is essential to the achievement of the 98% reliability target in the Inland Rail Service Offering making rail highly competitive with road for freight transport.
- The Business Case assumed a reliability buffer of 3.7 hours between train unloading and the advertised pick-up time, allowing rail operational delays to be recovered within the 98% reliability target.

Lower transit time improves availability.

- 'Availability' refers to the ability of rail to offer services with departure and arrival times that meet customer requirements to dispatch and receive freight
- Availability is directly linked to transit time, as reducing the transit time increases the range of the feasible arrival and departure times to meet customer needs
- A transit time of less than 24 hours provides for a very wide range of feasible arrival and departure times in the Melbourne to Brisbane market
- A terminal to terminal transit time of less than 24 hours allows the inclusion of the 3.7 hour buffer while meeting customer preferences for despatch and receiving of freight.

Shorter distance encourages a greater volume of freight to rail.

- The 2010 IRAS examined the impact of distance on preliminary forecast freight volumes by comparing forecast freight volumes on an Inland Rail route of 1,730km (achieved by a new greenfield line between Narromine to Narrabri) with forecast volumes on an 1,880km Inland Rail route (via Dubbo and Werris Creek).
- As part of 2010 IRAS, ACIL Tasman developed a logit model to calculate estimated future rail tonnages based on a range of factors. The model was developed from a questionnaire and interviews with key freight companies and customers to aid understanding of how modal choices are made in respect of transporting freight.
- The below table is taken from the ACIL Tasman model showing per annum intercapital freight volumes for the two route scenarios expressed in million tonnes (MT) per annum.

Year	1880km	1730km	Difference
2030	4.1MT	5.1MT	1.0MT
2040	5.9MT	7.2MT	1.3MT
2050	8.4MT	10.3MT	1.9MT
2060	12.1MT	14.7MT	2.6MT
2070	17.4MT	21.0MT	3.6MT
2080	24.8MT	29.8MT	5.0MT

Source: IRAS 2010, Appendix E, page 64

Why transit time and distance are critical to route selection

Distance is a key driver of capital costs – upgrading an existing line is not always the best option.

- Capital cost is directly influenced by the length of the route. A shorter and more direct greenfield route will generally be less expensive than upgrading a longer brownfield route to meet the full Inland Rail performance specifications.
- The decisions around where to construct greenfield versus redevelop existing lines were based on a wide range of factors that included considerations of length, transit time, constructability, construction cost, environmental impact, geotechnical considerations as well as impacts on privately and publicly owned properties (including the number of properties impacted).
- ARTC has direct experience in the upgrading of existing low volume railway lines to meet Inland Rail mainline standards in the Parkes to Narromine project, which is currently well advanced into construction. ARTC's practical experience is that very little of an existing low volume line is salvageable. Rail, sleepers, ballast and load-supporting structures (such as underbridges) require complete replacement to meet the performance standards required for Inland Rail, and in fact even much of the underlying formation needs to be excavated and replaced to meet main line speed and axle load requirements and the much higher annual tonnages that will traverse Inland Rail.
- As a result, there are few if any savings to be made in seeking to upgrade an existing low-volume line relative to the cost of greenfield construction, and in fact the upgrade option can be more expensive when the costs of removal and disposal of the pre-existing infrastructure are taken into account.
- Furthermore, routes that seek to re-use existing lines are often longer (and sometimes significantly so) than the direct greenfield routes and can also require significant greenfield connecting lines to be built.

Because of the significance of these factors, route selection has a major bearing on the overall performance of the ARTC 2015 Inland Rail Programme Business Case.

- It is the principal reason why Inland Rail includes significant greenfield sections – the greenfield sections underpin the improved economic performance driven by the reduced distances and transit time.
- The 2010 IRAS examined the greenfield Narromine to Narrabri section in comparison with a circuitous route using existing corridors via Werris Creek.
- The IRAS found that a direct greenfield Narromine to Narrabri route would be 150km shorter and five hours 30 minutes quicker, with significantly improved economic performance flowing principally from the decreased above-rail operating costs of the shorter and faster route.
- The improvements in speed, reductions in transit time and resulting reductions in operating costs flowing from the greenfield sections of Inland Rail are central to achieving the economic outcomes in the ARTC 2015 Inland Rail Programme Business Case.

Key technical characteristics supporting the service offering

Train Length	1,800m with future proofing for ultimate 3,600m train length
Axle Load / Max Speed	21 tonnes @ 115km/h, 25 tonnes @ 80km/h, with future proofing for 30 tonnes @ 80km/h
Double Stacking	7.1m clearances for double-stack operation
Interoperability	▸ Full interoperability with the interstate mainline standard gauge network ▸ Dual-gauging in Queensland to provide for connectivity to the Queensland narrow gauge regional network ▸ Connections to the regional and national networks providing standard gauge connections to the ports of Melbourne, Port Kembla, Sydney, Newcastle, Brisbane, Adelaide and Perth.

Inland Rail: Early origins

Early 20th Century

- Inland Rail, in one form or another and along one route or another, has been discussed for more than 100 years.
- Proposals for a Melbourne-Queensland-Darwin railway were first mooted soon after Federation (the map on the right dates from 1909).
- In 1915, Prime Minister Andrew Fisher proposed a railway from the Riverina to Queensland.

1970s – 1980s

- In the late 1970s and 1980s a number of parties revived proposals for a Melbourne-Brisbane inland railway.
- In the mid-1980s, a Queensland Government proposal for a new Toowoomba Range tunnel was first raised.

1990s – 2000s

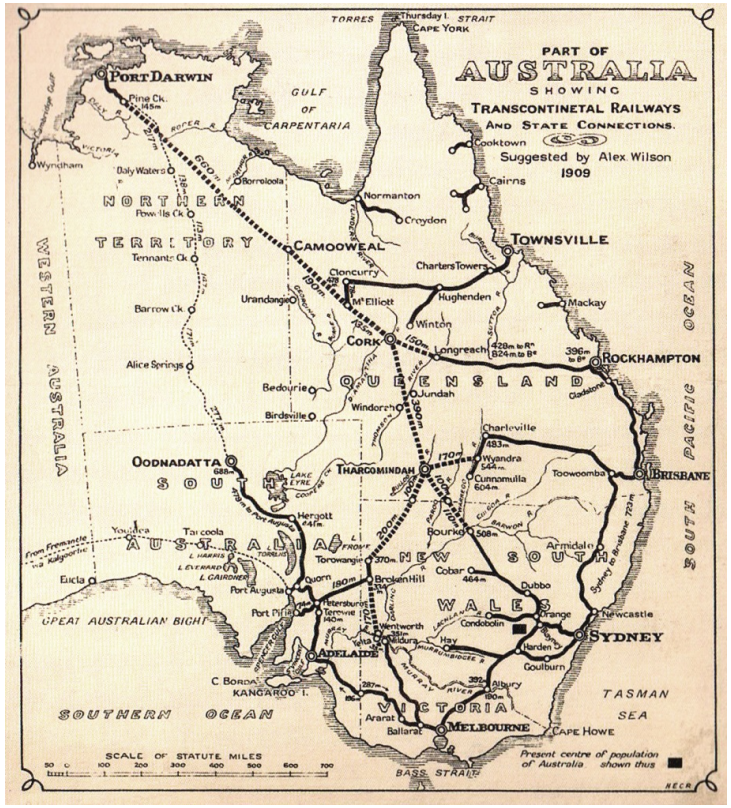
- Building on some of the work undertaken in the 1980s, various papers proposing an inland railway emerged during the early 1990s.
- In 1996, a Queensland Rail proposal for an inland railway was subject to a study by the Bureau of Transport and Communications Economics.
- By the early 2000s, there were at least two significant private sector proposals for an inland railway.

2004

- When ARTC took up the lease of the Interstate and Hunter main lines in NSW in 2004, the sections between Melbourne and Illabo, Stockinbingal to Narromine and Narrabri to near Boggabilla were included in the lease on the basis that they could form part of a future Melbourne-Brisbane inland railway.

2005

- In 2005 the Australian Government committed funding for the 2006 North-South Rail Corridor Study.



First proposed Melbourne-Queensland-Darwin railway in 1909

North-South Rail Corridor Study 2006

Detailed consideration of Inland Rail by the Australian Government began with the North-South Rail Corridor Study in 2006

Purpose

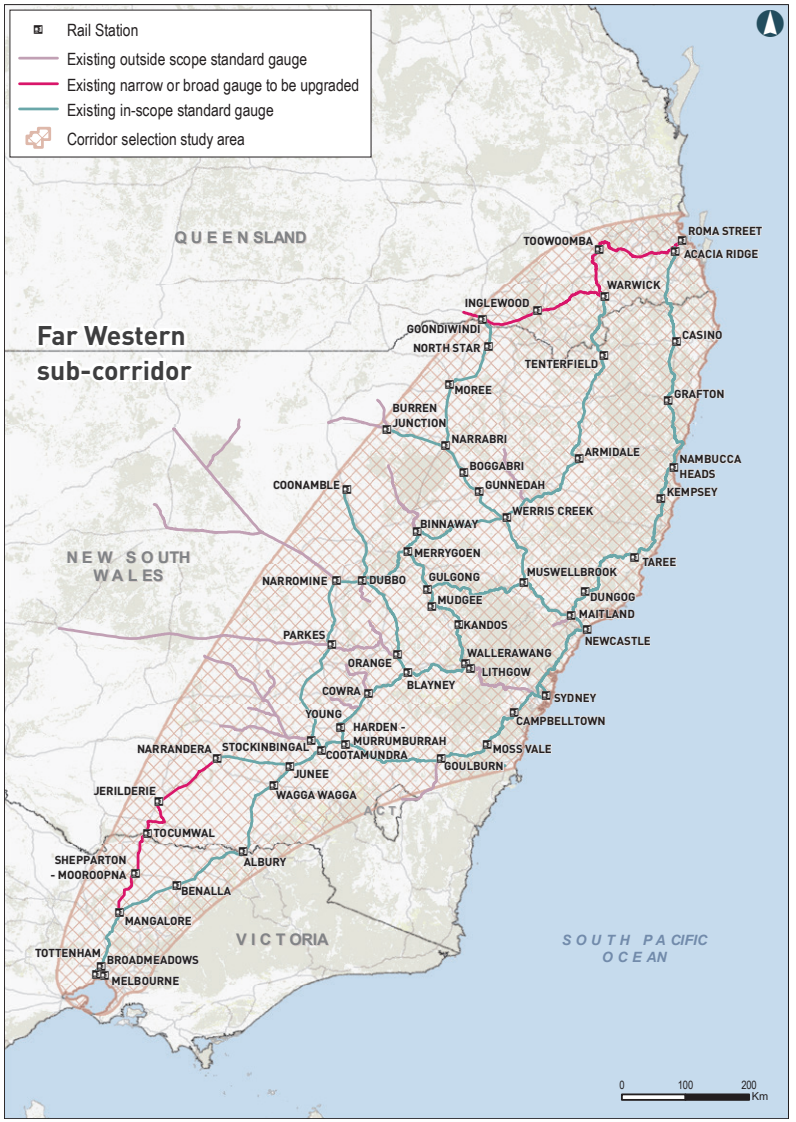
To examine freight demand, capacity and route options for the Melbourne-Sydney-Brisbane rail corridor.

Report prepared by:

- Ernst and Young (Lead); ACIL Tasman; Hyder Consulting
- Commissioned and managed by The Department of Transport and Regional Services
- Report dated 30 June 2006.

Responsible Minister

- The Hon Warren Truss MP, Minister for Transport and Regional Services.



2006 North-South Rail Corridor study area

North-South Rail Corridor Study 2006

Report Considered

- Route options – 136 route options were considered, grouped into four sub-corridors:
  - + Far Western sub-corridor
  - + Central Inland sub-corridor
  - + Coastal sub-corridor
  - + Hybrid sub-corridor.

  (Each sub-corridor had options via Albury and via Shepparton)
- Market assessment.
- Projected demand.
- Environmental issues.
- Other transport infrastructure requirements.
- Financial and economic impacts.

Key Results

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

2006 North-South Rail Corridor Study Area – Far Western Sub-Corridor

Inland Rail Alignment Study (IRAS) 2010

Purpose

To determine the optimum alignment for an inland railway within the Far Western Sub-Corridor identified in the 2006 North-South Corridor Study.

Report prepared by:

- PricewaterhouseCoopers (financial lead); ACIL Tasman; Parsons Brinckerhoff (technical lead); Halcrow, Aurecon
- Commissioned and managed by ARTC
- Report finalised July 2010.

Responsible Minister

- The Hon Anthony Albanese MP, Minister for Infrastructure, Transport, Regional Development and Local Government.

Report considered:

- Market take-up
- Route development and high-level costings
- Capital cost vs transit time
- Financial and economic appraisal.

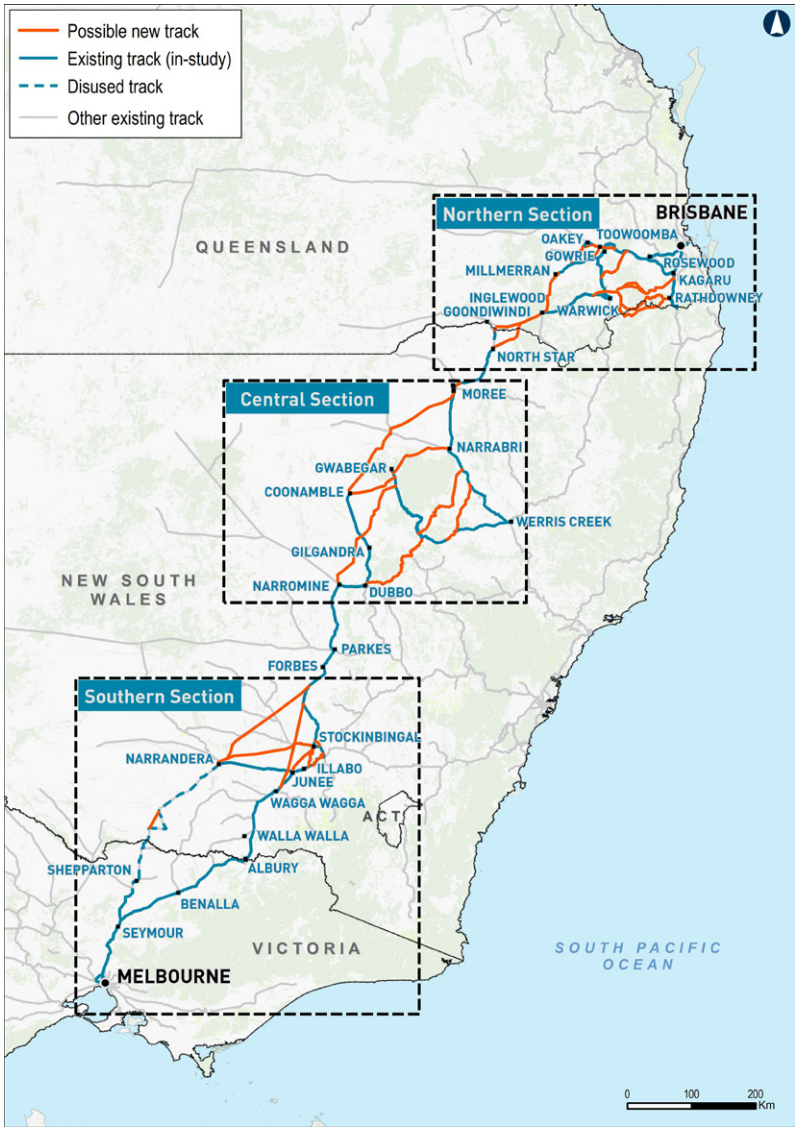
Report Finding Overview

Southern Section offered the greatest opportunity to save money as Shepparton route estimated to cost $900 million more than Albury route (2010 dollars not updated).

Central Section offered greatest opportunity to save time, saving more than 5 hours 30 minutes by not going via Dubbo and Werris Creek.*

Northern Section offered the greatest opportunity to utilise existing protected rail corridors in greenfield sections.

**Source: IRAS 2010, Appendix A, page 63*



Study Area for the Inland Rail Alignment Study 2010

Inland Rail Alignment Study (IRAS) 2010

Route assessment methodology

A large number of route options were evaluated in the southern, central and northern sections of the Far Western Sub-Corridor.

Evaluation considered:

- Capital cost vs transit time
- Impacts on demand
- Financial and economic performance.

Optimal economic performance was a key decision criterion in the choice of the overall route and, in the key central sector, led to the recommendation of a shorter, faster Narromine to Narrabri direct greenfield route rather than using existing corridors via Werris Creek.

The above routes were assessed on the basis of their ability to attract contestable freight. Freight firms and customers were surveyed to understand how modal choices on contestable freight were made. For express and other just-in-time freight, minimum transit time and high reliability were identified as essential.

This work was later reaffirmed in the work undertaken in 2015 by the Inland Rail Implementation Group and formalised in the Inland Rail Service Offering.

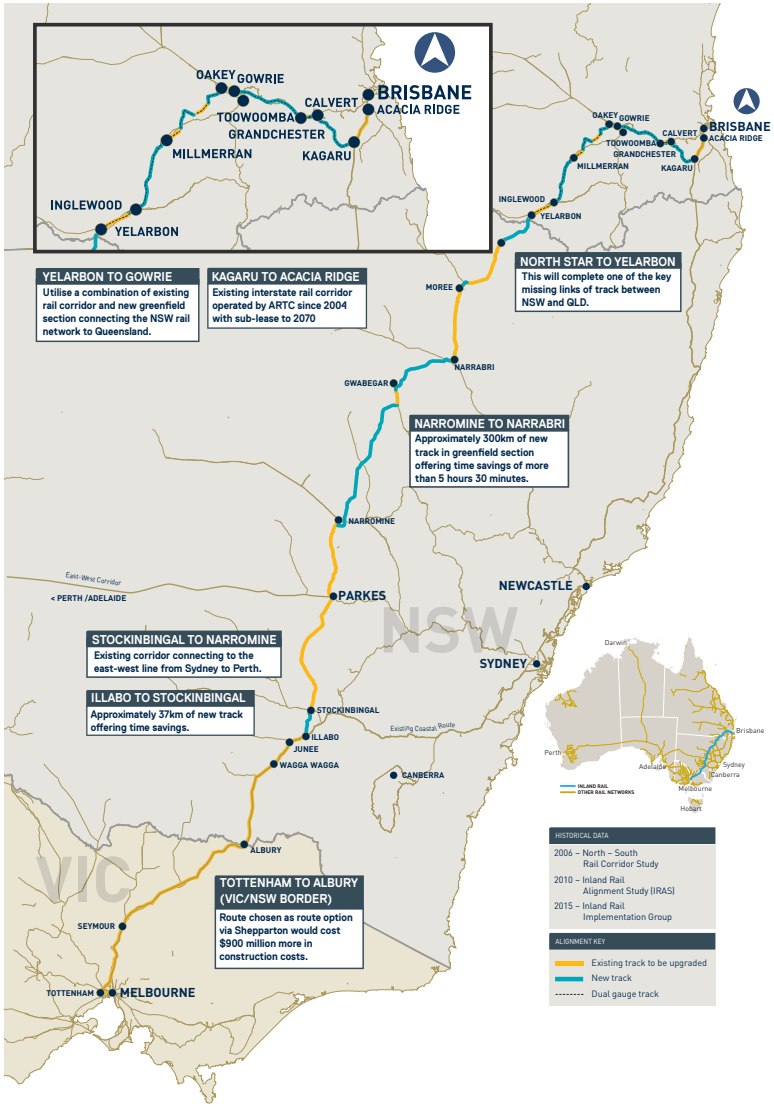
Route conclusions

Detailed alignment recommended:

- Tottenham – Albury – Illabo (existing corridor)
- Illabo – Stockinbingal (greenfield)
- Stockinbingal – Parkes – Narromine (existing corridor)
- Narromine – Narrabri (greenfield)
- Narrabri – North Star (existing corridor)
- North Star – Yelarbon (greenfield)
- Yelarbon – Gowrie – Kagaru (greenfield plus existing corridors)
- Kagaru – Acacia Ridge (existing corridor).

Some sections of the existing corridor were identified as requiring enhancement works, principally clearance improvements to accommodate double-stacked trains, while others were secondary lines requiring upgrading to full main line standards.

The classification of each section (project) is shown on page 17.



Inland Rail Alignment Study Route Map 2010

Inland Rail Implementation Group (IRIG) 2015

Purpose

Recommendations to Government:

- To meet the future national freight challenges by proceeding with Inland Rail
- Broad alignment to follow 2010 Inland Rail Alignment Study
- 10-year delivery program for Inland Rail from 2015.

IRIG Report prepared by:

- Inland Rail Implementation Group – Chair The Hon John Anderson AO, with Secretary DIRD, ARTC CEO and senior Queensland, New South Wales and Victoria Government representatives
- Report preparation managed by Inland Rail Implementation Group secretariat (DIRD)
- Letter of transmittal from IRIG Chair to the Australian Government, 24 August 2015.

Report funded by:

- The Australian Government.

Responsible Minister

- The Hon. Warren Truss MP, Deputy Prime Minister and Minister for Infrastructure and Transport.

ARTC 2015 Inland Rail Programme Business Case

ARTC Inland Rail Programme Business Case 2015 was the key supporting attachment to the IRIG Report:

- PricewaterhouseCoopers (lead)
- ACIL Allen
- Commissioned and managed by ARTC.

Documents associated with the IRIG Report:

- 2010 IRAS study
- Department of Infrastructure and Regional Development (DIRD) / Deloitte study – Economic Analysis of the Shepparton option.

Supporting consultancies:

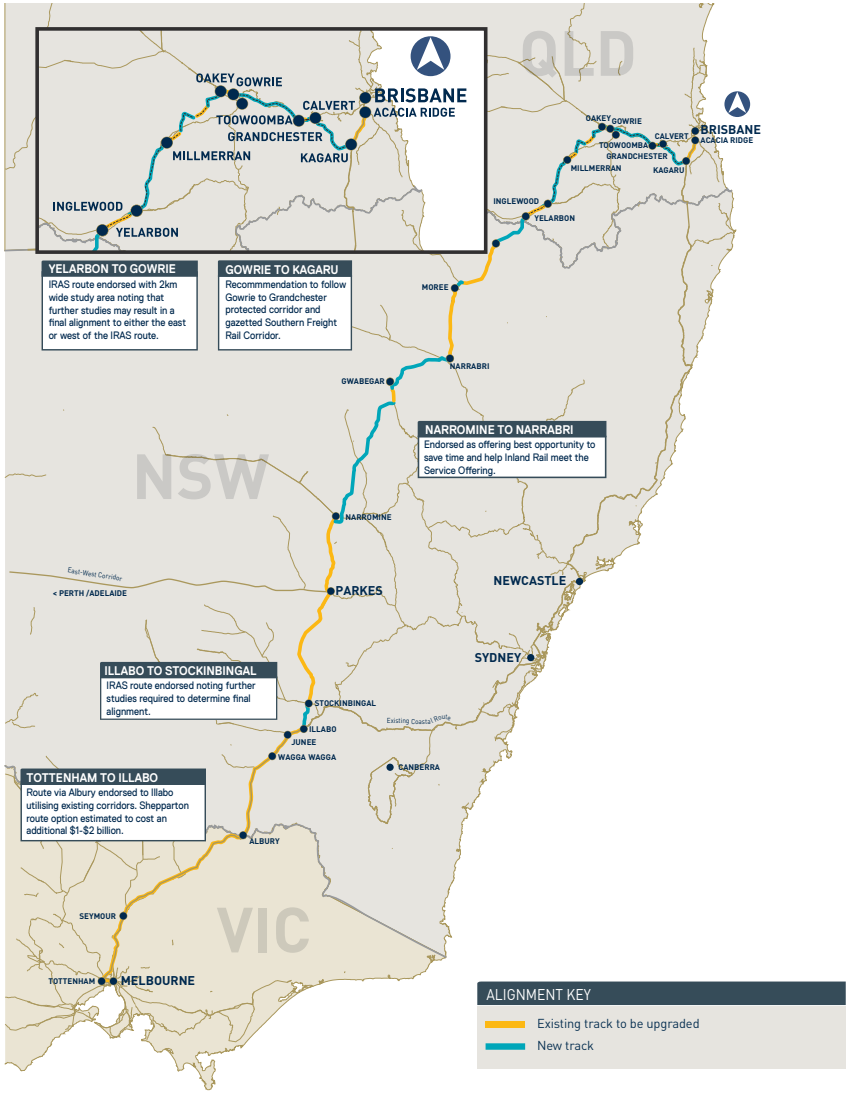
- Parsons Brinckerhoff
- Aquenta.

Inland Rail Implementation Group (IRIG) 2015

Findings in relation to the route

IRIG agreed broadly with the alignment identified in the 2010 IRAS, but considered three sections in more detail.

- **Albury vs Shepparton:** IRIG endorsed the route via Albury (as per the 2010 IRAS) rather than Shepparton because freight values coming from Shepparton did not justify the added cost of between $1 billion and $2 billion (2015 dollars not updated).
- **North Star to Toowoomba:** IRIG noted that further hydrological and geotechnical assessments were needed between North Star and Toowoomba which may result in a final alignment to the east or west of the 2010 IRAS alignment.
- **Toowoomba Range**: IRIG endorsed adoption of Queensland Transport's 2003 alignment between Gowrie and Grandchester.
- The route endorsed by IRIG is shown in the map on this page.



Inland Rail Implementation Group (IRIG) 2015 Route

Inland Rail route development since 2016

Following from the IRIG Report, ARTC has classified the Inland Rail route into 13 sections (projects) that could be described broadly as either brownfield (utilising existing rail track or corridors) or greenfield (sections requiring completely new corridors or track).

From 2016, ARTC's task as the delivery agent for Inland Rail was to examine whether there were cost-effective opportunities to improve upon the 2015 IRIG alignment in order to improve outcomes beyond the Inland Rail Service Offering. An option was assessed to the point where it was determined that it was either too expensive or degraded the Service Offering.

The greenfield sections required assessment of options to determine alignment study areas within which the final rail corridor will be located.

The alignment included in the IRIG Report has undergone further refinement in a number of sections since 2015.

In early 2017 the process for evaluating route options in greenfield sections was agreed. The process and key evaluation factors are highlighted in the diagram on page 34 and has been available on the Inland Rail website since 2017.

Outputs from this process have guided route option decisions.

There are three key considerations in selecting any route:

- Ability to enhance the Inland Rail Service Offering
- Construction and operating costs
- Multi-Criteria Analysis.

Inland Rail route development since 2016

The Multi-Criteria Analysis (MCA) framework seeks to ensure recommendations take into account a wide range of criteria including:

- engineering and technical factors
- social and community impacts
- number of properties directly impacted
- environmental impacts
- geotechnical and constructibility related issues.

The MCA process is led and managed by ARTC* and factors taken into consideration are set out in the graphic on page 34.

Within a particular MCA workshop, the agreed weightings are applied uniformly across all options considered in that workshop.

The outcome of any MCA workshop is just one factor in choosing between competing route options and not a determining factor in its own right.

An MCA indicates whether a route option warrants further consideration which is then assessed for its ability to enhance the Service Offering and whether its estimated construction and operating costs are appropriate for any perceived benefits.

This route evaluation process is represented in the diagram on page 35 titled "Process for assessing route options leading to a final rail corridor".

This diagrammatic representation is used throughout this document to illustrate specific route alignment decisions.

* The exception to this was the MCA conducted by AECOM and Aurecon as part of the assessment of four route options in the Border to Gowrie section, the results of which are contained within the Corridor Options Report. Further detail is provided in pages 89–96 of this document

Factors affecting route selection since 2016

IS A ROUTE VIABLE?

MULTI-CRITERIA ANALYSIS *

TECHNICAL VIABILITY (17%)
considers the alignment, impact on public utilities, geotechnical conditions, impacts on existing road and rail networks, flood immunity and hydrology and future proofing.

ENVIRONMENTAL IMPACTS (12.5%)
considers the ecological impacts (flora, fauna and habitats), visual impacts, noise and vibration impacts, flooding and waterway impacts and the effect on air quality and greenhouse gas emissions.

OPERATIONAL APPROACH (16.5%)
considers the impact on travel time, reliability and availability, and network interoperability and connectivity including interfaces with rail terminals and network.

SAFETY ASSESSMENT (16.5%)
considers construction safety, operational safety, public safety, road safety interfaces and emergency response response.

COMMUNITY AND PROPERTY IMPACTS (12.5%)
considers property impacts, Indigenous and non-Indigenous heritage, heritage, impact on community, community response and current and future land use and links to economic impacts.

APPROVALS AND STAKEHOLDER ENGAGEMENT (12.5%)
considers planning and approval requirements, State and Federal agency buy-in, Local government buy-in, other statutory and regulatory approvals and service authorities, such as utilities etc.

CONSTRUCTABILITY & SCHEDULE (12.5%)
considers construction duration, access and complexity, resources, interface with operational railway and staging opportunities.

This is a broad range of qualitative and quantitative criteria that is considered as part of the Multi-Criteria Analysis (MCA). The MCA process is recognised as an industry standard and is widely used in Australia and internationally.

DOES IT ENHANCE THE SERVICE OFFERING?

Alternatives are compared on their ability to enhance the

SERVICE OFFERING

TRANSIT TIME
requires a transit time from Melbourne to Brisbane of less than 24 hours.

RELIABILITY
requires 98% reliability to freight customers.

COMPETITIVE PRICING
requires competitive pricing for freight customers .

AVAILABILITY
requires suitable train paths at the times that suit the needs of the market.

This is the minimum level of service required by rail operators and freight customers.

IS IT VALUE FOR MONEY?

Alternatives are compared on basis of

COSTS

CONSTRUCTION ESTIMATE

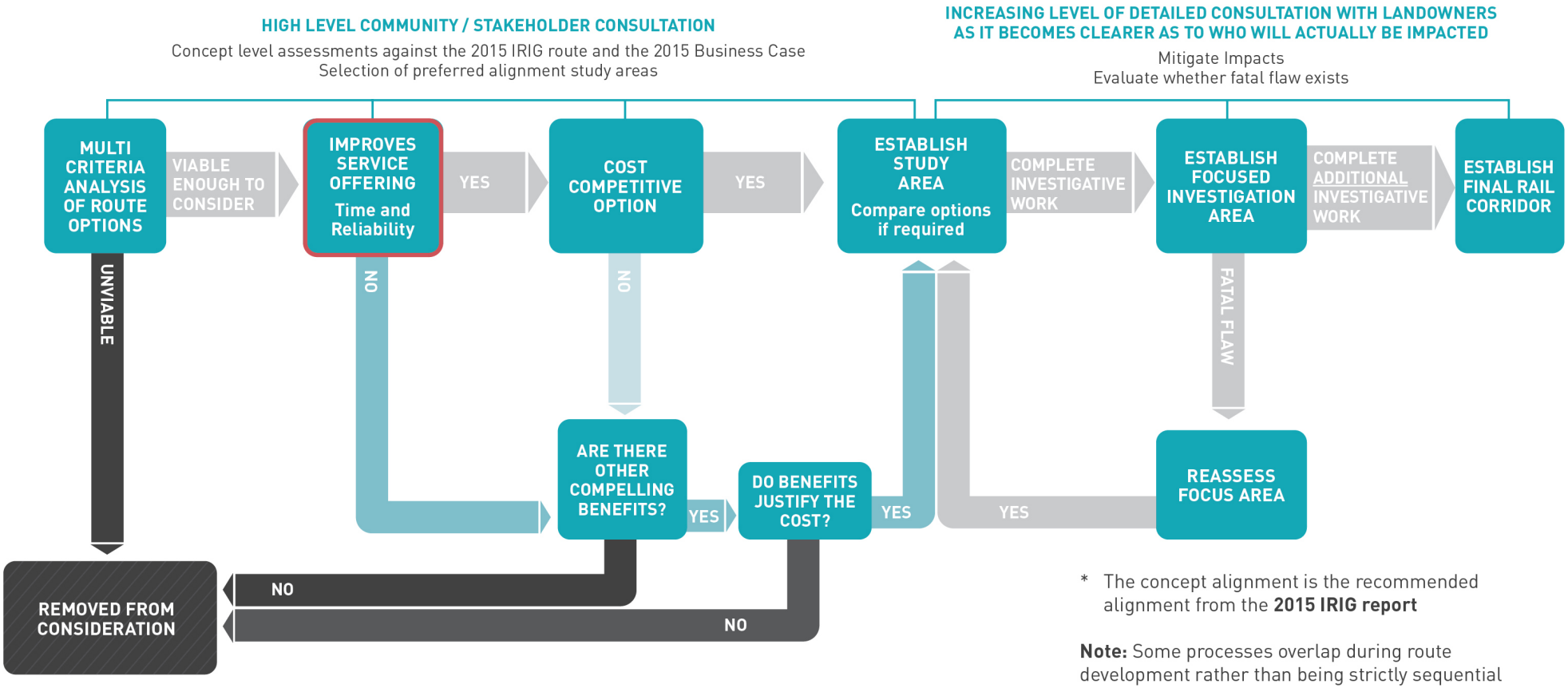
OPERATING COSTS

This is the construction estimate, and track maintenance and train operating costs for customers.

The final step in the process is that ARTC makes a recommendation to the Minister for Infrastructure and Transport through the Inland Rail Sponsors Group (Previously the Inland Rail Steering Committee).

* The criteria are weighted to reflect relative importance in decision making. However, different MCAs can have slightly different weightings reflecting the specifics of the options under assessment and taking into account any previous MCA results or other assessments undertaken in respect of the options being considered.

Process for assessing route options leading to a final rail corridor



* The concept alignment is the recommended alignment from the **2015 IRIG report**

Note: Some processes overlap during route development rather than being strictly sequential as per this representative diagram.

Engagement on route options 2016–2019

Engagement on route options 2016–2019

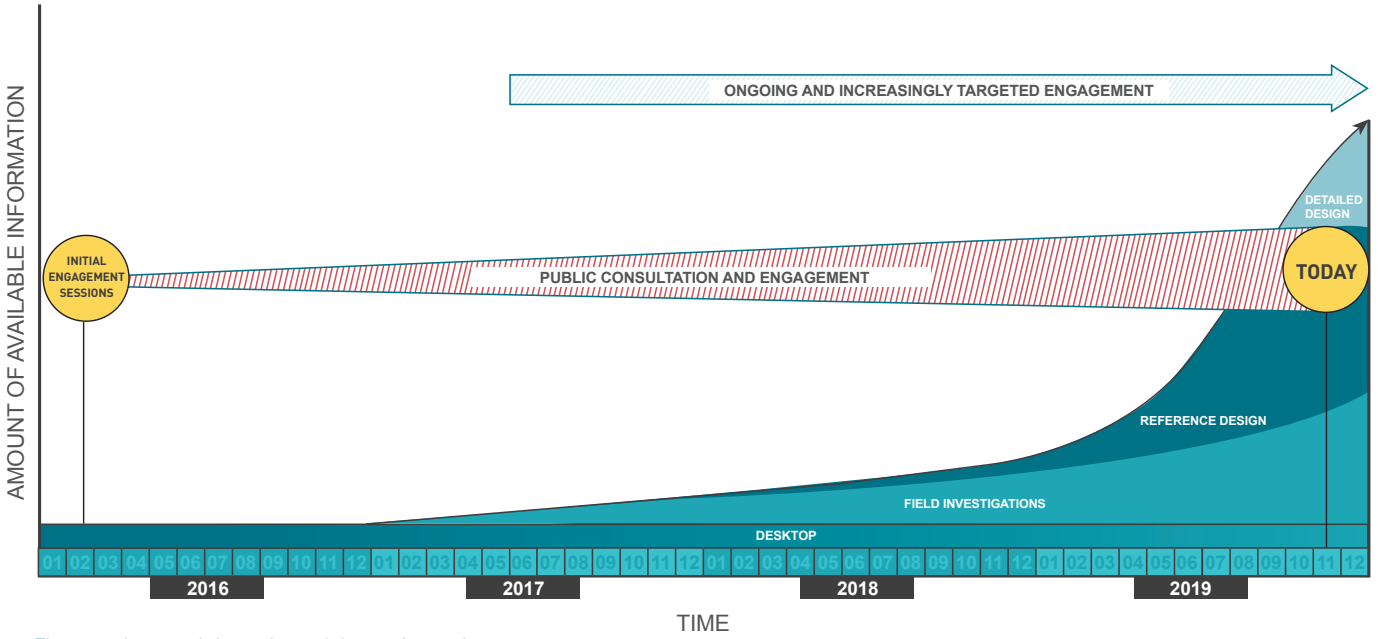
The 2006 North-South Rail Corridor Study, 2010 IRAS and 2015 IRIG study were high-level studies with consultation focused on federal, state and local governments and industry stakeholders. This was appropriate given the very high-level nature of the decisions being made about route and alignment during this period.

At this stage of the process our engagement was focused very much on informing people and communities.

To progress from engagement that informs to engagement that provides for effective consultation with landowners and communities it is necessary to recognise the level of information able to be provided at the relevant time.

As the project progressed and more technical studies were completed, the level of information available and community engagement possible increased. In the early life of the Inland Rail project, the information available often did not, nor could it, meet the expectations of landowners and the community

In the early life of the Inland Rail project the information that was available often did not, nor could it, meet the expectations of landowners and the community.



The nexus between information and time as factors in engagement

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.

Consultation on route options 2016–2019

Extensive landowner, community and stakeholder consultation for Inland Rail commenced in early 2016 as a preferred alignment started to become clearer.

The focus of consultation during 2016 and 2017 in the greenfield sections was to progress route option comparisons where appropriate and understand relative potential impacts, both on the Inland Rail Service Offering and local landowners and communities.

In the brownfield sections the focus was on explaining proposed works and timelines and gaining landowner and community feedback on impacts and designs.

Between July 2016 and December 2019 ARTC increased its program of briefings and information sessions along the alignment.

These included meetings with Councils, Federal and State MPs, community consultation via public meetings and drop-in sessions, and exhibitions at agricultural shows.

Most importantly, ARTC increased its meetings with individual affected landowners.

These face-to-face interactions have enabled ARTC Inland Rail project delivery and engagement staff to gain a much deeper understanding of potential effects on landowners and their properties and help ARTC Inland Rail to avoid these effects or develop mitigation measures.

In addition to landowner and stakeholder meetings, from 1 January to 31 December 2019 ARTC Inland Rail staff delivered presentations and/or supported an Inland Rail presence at 50 conferences or major events.

As at 31 December 2019, ARTC Inland Rail had 799 Land Access Agreements in place with landowners enabling ARTC Inland Rail and its consultants to undertake the studies and investigations necessary to refine a study area or determine the optimum location for the final rail corridor.

ARTC Inland Rail has engaged with Traditional Owners, Elders and community leaders in Queensland, NSW and Victoria, including in relation to the planned route for greenfield projects.

Indigenous groups along the Inland Rail alignment include the Wurundjeri, Taungurung, Yorta Yorta, Wiradjuri, Wailwan, Gomeroi, Bigambul, Western Wakka Wakka, Yuggera, Ugurapul and Jagera peoples.

Consultation on route options 2016–2019

As work progressed on identifying a preferred alignment and study areas within greenfield sections, ARTC increased its level of community and landowner consultation in order to understand local preferences and identify opportunities for route optimisation.

Between 1 July 2016 and 31 December 2019, across Victoria, New South Wales and Queensland, there were close to 16,800 direct interactions with multiple community members across multiple forums.

These forums included landowner meetings, community information sessions and Community Consultative Committee meetings. They do not include ARTC-hosted industry briefings, addresses at conferences or attendance at conventions.

The graphs on page 40 illustrate the above on a state-by-state basis in six-monthly periods from 1 July 2016 to 31 December 2019.

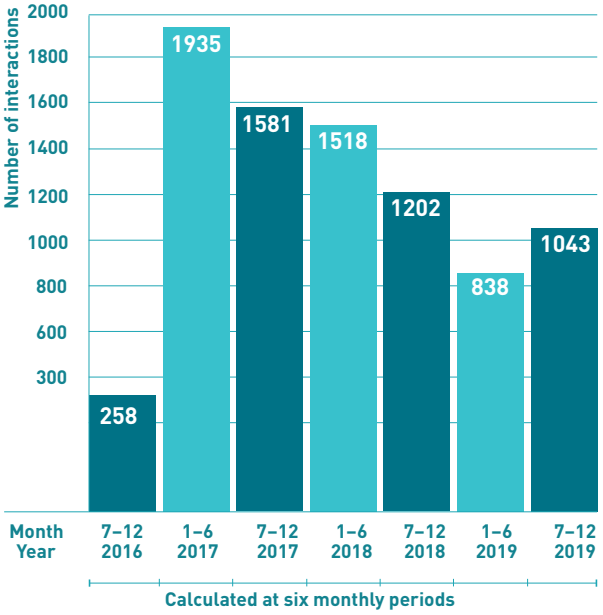
From the consultation, Inland Rail learned a number of things, including:

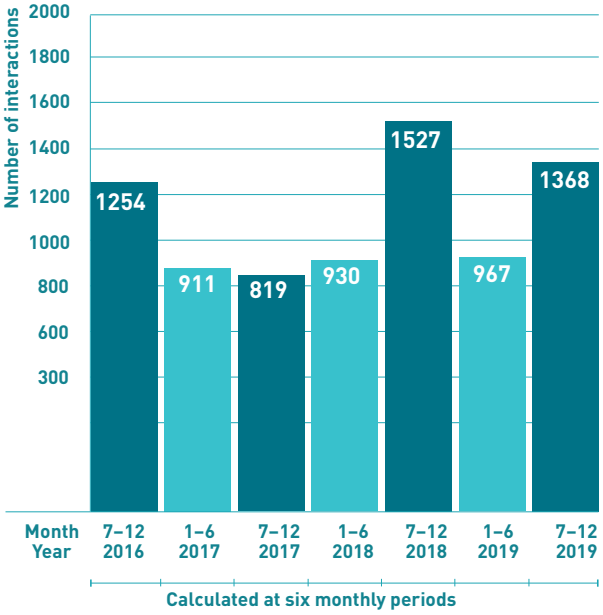
- Landowners had a preference that the rail line follow lot boundaries as much as practical
- Property severances should be minimised as much as possible, having regard to the nature of farming and other operations undertaken on the property
- The number of new properties impacted should be kept as low as possible
- As much use as possible should be made of existing rail tracks and corridors
- A number of communities wanted Inland Rail to be routed through or near to them in order that they could maximise opportunities from Inland Rail.

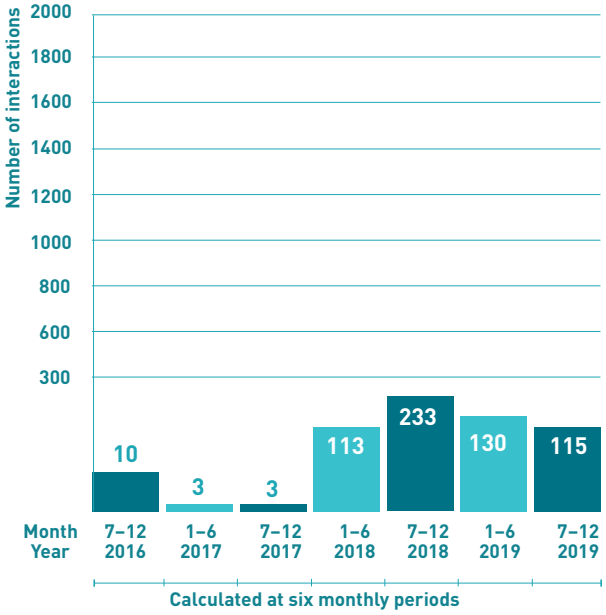
The learnings from consultation, coupled with technical and economic impact assessments, resulted in the following route alignment changes:

- Within the Narromine to Narrabri section a changed route that went through a part of the Pilliga State Forest and reduced the number of private landowners impacted
- A decision to go east rather than west around the town of Narromine reflecting community concerns about flooding impacts of the route option to go west
- Within the North Star to Border section, a decision to use more of the Boggabilla line rather than go east through high conservation value land.

Consultation on route options 2016–2019: Number of interactions by State







Route status as at November 2019 – Victoria and New South Wales

Since 2010 there has been consistency in the general route of Inland Rail, allowing for refinements primarily in the greenfield sections in New South Wales. The table on this page summarises this consistency across sections in Victoria and New South Wales, indicating areas or ways in which the route changed or evolved in the IRIG Report 2015 and in subsequent greenfield section Study Areas.

State	Section	Km	Type	Alignment Development			
				IRAS 2010	*IRIG 2015*	*Present Day Study Area*	*Inland Rail Bilateral Agreement signed by Australian Government and State Government.*
VIC	Tottenham (Melbourne) to Albury	305	Brownfield	Route via Albury chosen on basis of cost vs route via Shepparton	✓	✓	16 March 2018
NSW	Albury to Illabo	185	Brownfield	Existing rail line to build on previous investment	✓	✓	4 May 2018
	Illabo to Stockinbingal	37	Greenfield	Opportunity to save time and avoid Bethungra Spiral	✓	✓	
	Stockinbingal to Parkes	169	Brownfield	Existing rail line to build on previous investment	✓	✓	
	Parkes to Narromine	103	Brownfield	Existing rail line to build on previous investment	✓	✓	
	Narromine to Narrabri	300	Greenfield	Narromine to Narrabri via Gwabegar, not Dubbo and Werris Creek, saved 5:30hrs	✓	Route via Pilliga Forest plus localised variations Narromine-Baradine	
	Narrabri to North Star	190	Brownfield	Existing rail line to build on previous investment	✓	✓	
	North Star to NSW/Qld Border	37	Greenfield	Eastern alignment North Star to Yelarbon	✓	Western alignment via disused Boggabilla line	

Route Status as at November 2019 – Queensland

Since 2010 there has been consistency in the general route of Inland Rail, allowing for refinements primarily in the greenfield sections in Queensland. The table on this page summarises this consistency across sections in Queensland, indicating areas or ways in which the route changed or evolved in the IRIG Report 2015 and in subsequent greenfield section Study Areas.

State	Section	Km	Type	Alignment Development			
				IRAS 2010	*IRIG 2015*	*Present Day Study Area*	*Inland Rail Bilateral Agreement signed by Australian Government and State Government.*
QLD	NSW/Qld Border to Gowrie*	224	Greenfield/ Brownfield	Inglewood-Gowrie via Millmerran and Oakey	✓	2010 IRAS route modified via Wellcamp-Charlton	29 November 2019
	** Gowrie to Helidon	26	Greenfield	Alignment via Murphys Creek	2003 Qld Govt G2G alignment	✓	
	** Helidon to Calvert	47	Greenfield/ Brownfield	Existing QR operating corridor	2003 Qld Govt G2G alignment	✓	
	**Calvert to Kagaru	53	Greenfield	2010 Qld Govt SFRC alignment	2010 Qld Govt SFRC alignment	✓	
	Kagaru to Acacia Ridge & Bromelton	49	Brownfield	Kagaru to Acacia Ridge only	✓	Project extended to Bromelton in 2017	

*The IRIG Report endorsed the 2010 IRAS route but noted potential for other options either east or west of that alignment.
** The Gowrie/Helidon/Kagaru sections are being delivered through a single Public/Private Partnership (PPP) and follow the protected Gowrie to Grandchester Corridor and Southern Freight Rail Corridor, allowing for some minor variations.

Inland Rail project route selection summaries

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Overview

Overview

The following pages provide a summary of the route development for each of the component sections of Inland Rail.

The Inland Rail route was essentially established by the 2015 IRIG Report which broadly adopted the findings of the 2010 IRAS Report. ARTC's role from 2016 onwards was to assess route options that would improve the ability of the Inland Rail route to improve the Inland Rail Service Offering.

A colour key is used to define the favourability of various characteristics of a route as shown in the table on this page.

The colour key is used in relation to the greenfield project route selection summaries.

KEY CHARACTERISTICS					
		Transit Time	Construction Cost	Distance	MCA Score
	Favourable	>4min reduction	>$20 million saving	>5km saving	>+0.5
	Neutral	+/–4min variation	+/-$20 million variation	+/–5km	0 to +/–0.5
	Unfavourable	5–10min increase	$20–40 million increase	5–10km	–0.5 to –1.0
	Highly unfavourable	>10min increase	>$40 million increase	>10km increase	-1.0 or worse

In the above diagram, MCA Score refers to the scoring of route options during or as the result of a Multi-Criteria Analysis (MCA) workshop.

Inland Rail project route selection summaries

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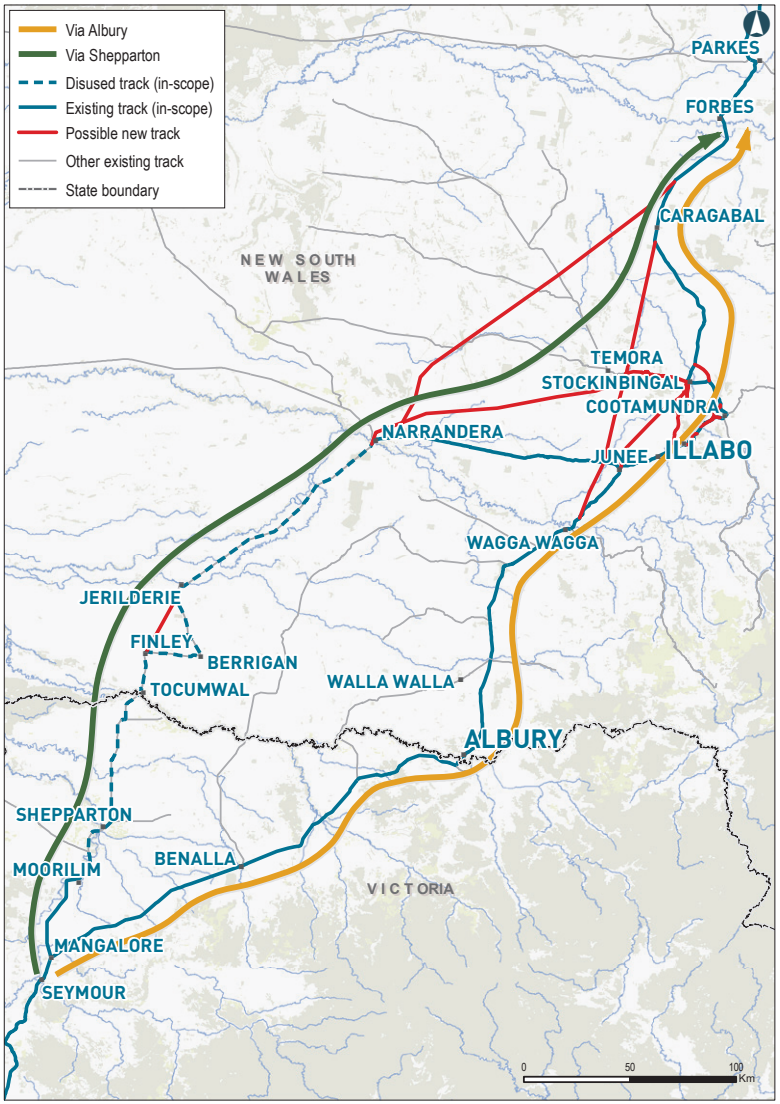
Melbourne to Illabo

Wangaratta, Victoria

Melbourne to Illabo

A key issue considered in the 2006 North-South Corridor Study, the 2010 IRAS and the 2015 IRIG Report was whether Inland Rail should adopt a route via Albury or via Shepparton.



Albury vs Shepparton options from the 2010 IRAS

Melbourne to Illabo

2006 North-South Rail Corridor Study

- The 2006 North-South Corridor Study favoured the Albury route as having better economic performance (NPV) than options via Shepparton.

2010 Inland Rail Alignment Study (IRAS)

- The 2010 IRAS took the 2006 study into account, as well as studies commissioned by proponents of the Shepparton route.
- The 2010 IRAS concluded that the route via Albury offered a far superior capital cost outcome. Although the Shepparton route offered a 30 min quicker transit time, it attracted a significant extra capital cost – in 2010 adding $900 million to the project cost relative to the Albury route.

2015 Inland Rail Implementation Group (IRIG)

- IRIG considered a further study commissioned by DIRD in response to representations by key stakeholders in the 'food bowl' region of northern Victoria and southern New South Wales.
- This study, undertaken by Deloitte, again compared a route via Shepparton and Narrandera with a route via Albury.
- The study concluded that the Shepparton option had a Benefit Cost Ratio of 0.3 at a 4% discount rate, equating to a negative net present value of -$629 million.
- The analysis highlighted that demand estimates for the region are substantially below those that would be required for the Shepparton-Narrandera option to be economically viable. It estimated that 5.5 million tonnes per annum (MTPA) of regional freight would be required to economically justify the Shepparton option, over three times the 1.8 MTPA identified by regional group the Food Bowl Inland Rail Alliance (a gap of 3.7 MTPA).
- Based on the work undertaken in 2014–15, the IRIG independently estimated that the extra capital cost of the route via Shepparton and Narrandera would be between $1 – $2 billion at that time.
- Sensitivity testing of key variables indicated it was unlikely any scenario exists where the Shepparton option would provide a net economic benefit.
- Accordingly, the IRIG Report (24 August 2015) re-affirmed that the route via Albury was preferred.
- IRIG also noted that adoption of the Albury route does not preclude future development of an additional route linking Shepparton with Narrandera and through to Parkes, if demonstrated to be economically justified at some future time.

Melbourne to Illabo

- All subsequent work by ARTC since 2015 has adopted the IRIG recommended route from Melbourne to Illabo via Albury.
- As at November 2019, ARTC was progressing Feasibility (Reference) Designs for the proposed works along the Melbourne to Illabo corridor.
- ARTC conducted community and stakeholder consultation in relation to current design thinking, through the latter months of 2018, to inform the process of finalising Feasibility Design.
- This involved:
  - one-on-one meetings with neighbours in the areas where enhancements will be undertaken
  - neighbourhood conversation booths and catch-ups at community events to share information and hear local feedback
  - engaging with councils, industry and road and rail agencies to facilitate design solutions that support wider community outcomes where practicable.
- When complete, the Feasibility Reference will provide a sufficiently developed level of design to allow environmental assessment to be undertaken, planning approvals to be sought, and (when approved) tenders for final design and construction to be sourced.
- A key issue that requires finalisation is the location of any new intermodal freight terminal in or close to Melbourne as this will have impacts on the final route for Inland Rail.

Inland Rail project route selection summaries

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Illabo to Stockinbingal

Stockinbingal, New South Wales

Illabo to Stockinbingal

Flowing from the choice of the route via Albury, there was a need to determine a route to connect the main southern line between Junee and Cootamundra to the Stockinbingal to Parkes line.

2006 North-South Corridor Study

- The 2006 Study noted the potential for sub-corridor route options in the Junee-Stockinbingal sector.

2010 IRAS

- The 2010 IRAS examined a number of options, illustrated on the map on the right.
- **Option A** (Junee-Stockinbingal direct) and **Option B** (Illabo-Stockinbingal) had comparable capital costs and similar transit times. Option B was favoured because it offered a better mix of greenfield and brownfield development that reduced environmental and property impacts.
- The Base Case (existing corridor without upgrading) was discounted because it would not provide for double-stack container operations, a key service objective of the 2010 IRAS (and subsequently included in the Inland Rail Service Offering by IRIG).
- **Option C** (upgrading the existing corridor to Inland Rail standards) was discounted because of the very high capital costs (estimated at around $680 million) in 2010 due to the extensive deviations in often difficult terrain.
- It should be noted that the 2010 IRAS was a high-level study and that the Multi-Criteria Analysis (MCA) framework for Inland Rail had not yet been developed at the time of the 2010 IRAS. MCA scores did not form part of the 2010 IRAS evaluation.

2015 IRIG

- IRIG adopted the 2010 IRAS recommended route (Option B on the right).

Illabo to Stockinbingal: Illustrative summary as per the 2010 IRAS recommendations

	BASE CASE Junee-Cootamundra-Stockinbingal existing corridor		OPTION A Junee-Stockinbingal Direct Greenfield		OPTION B Illabo-Stockinbingal (plus Junee-Illabo Brownfield)		OPTION C Junee-Cootamundra-Stockinbingal existing corridor with extensive deviations	
Distance	95km		60km 35km shorter		67km 28km shorter		87km 8km shorter	
Transit Time	79 min		39 min 40 min saving		45 min 34 min saving		62 min 17 min saving	
Double stack	No		Yes		Yes		Yes	
Construction Cost	$0m (for relativity)		+$150m		+$140m		+$680m	
Environmental and Land impact	Base Case		Major – 60km of greenfield		Moderate – 39km of greenfield		Moderate – 32km of deviations	
Overall								
Recommended					✓			

- Favourable
- Neutral
- Unfavourable
- Highly unfavourable

Illabo to Stockinbingal route refinement: 2016–2017

- Over the 2016–2017 period, further assessment work was undertaken on the recommended route, with an emphasis on gaining additional input from potentially impacted landowners, councils and the wider community.
- As part of this process, a major focus was engaging with individual landowners. Over 90% of potentially affected landowners were met with and consulted during this period.
- For assessment purposes, the route in this section was divided into southern, central and Stockinbingal sections as outlined in the three accompanying maps on page 53.

Southern section:

- Three route options were identified, including the 2010 IRAS Base Case.
- Option B (Illabo to Stockinbingal) was preferred as it:
  - scored a marginally preferable MCA result (+0.4)
  - offered a better connection to the main southern line
  - addressed landowner concerns further north by shifting the route to the west to minimise property impacts .

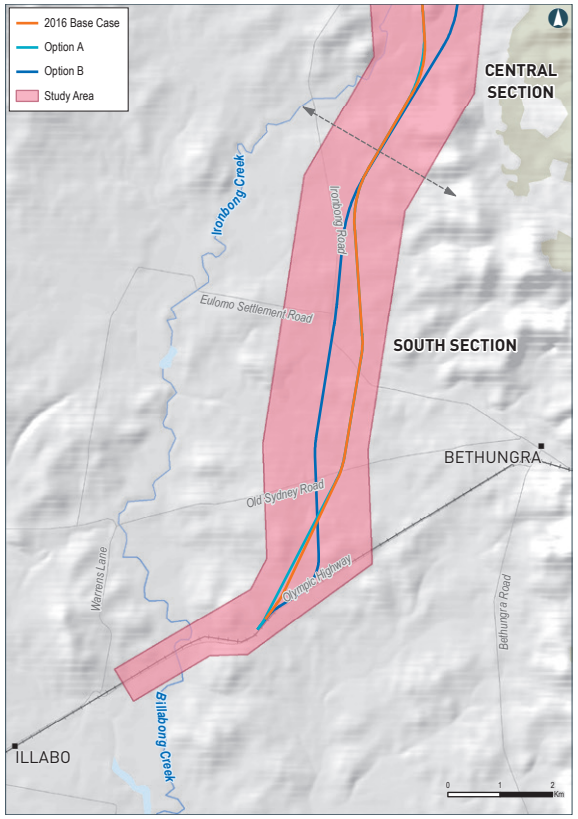
Central section:

- This section is heavily constrained by topography and interface with properties.
- As a result of this complexity, seven options were investigated.
- MCA results did not indicate a clearly preferred option.
- It was decided that the investigation corridor should be widened to capture all the options and provide design flexibility in the Feasibility Design phase.

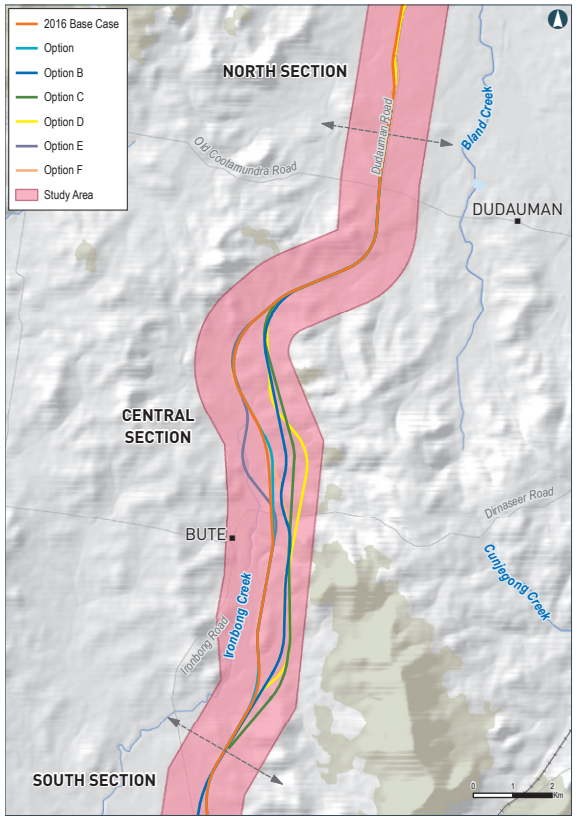
Stockinbingal section:

- Landowners raised concerns regarding land impacts in South Stockinbingal.
- Three options were investigated to address these concerns, but there was no clearly preferred option.
- It was decided that the investigation corridor should be widened to capture all three options and provide design flexibility in the Feasibility Design phase.

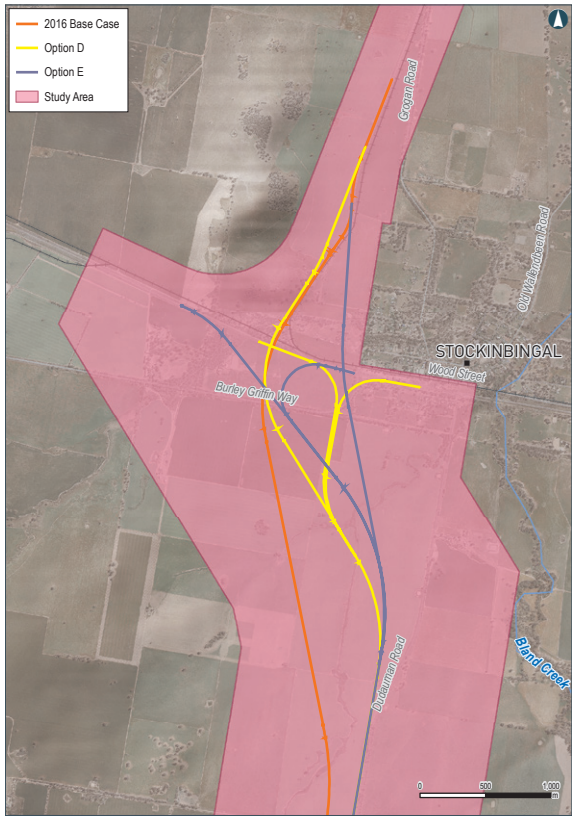
Illabo to Stockinbingal route refinement: 2016–2017



Southern section

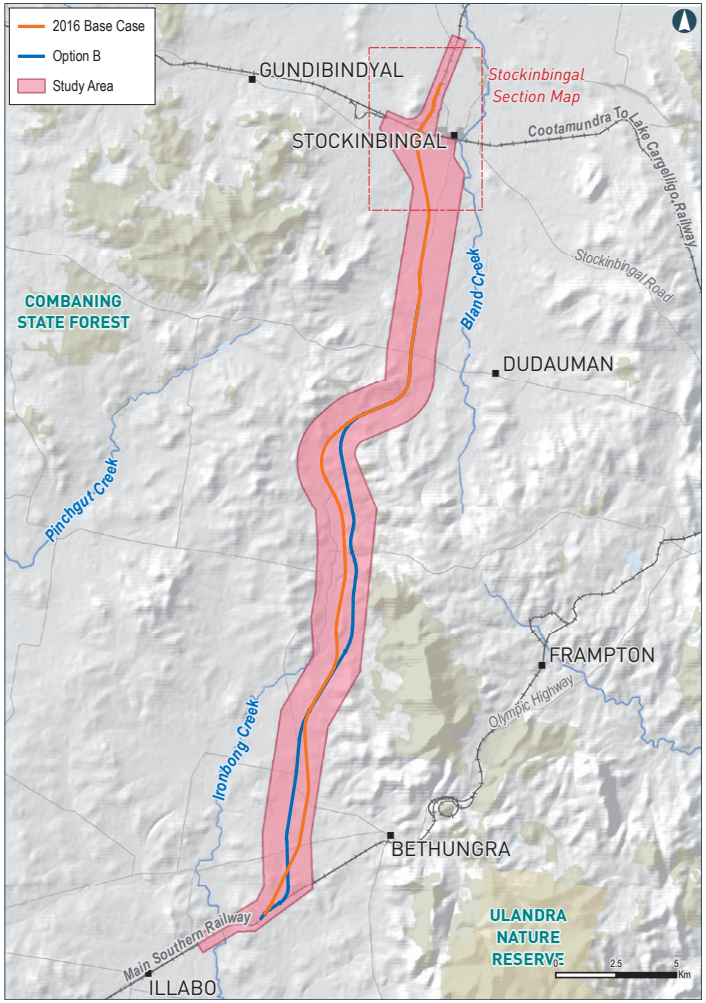


Central section



Stockinbingal section

Illabo to Stockinbingal route refinement: 2017–2018



Broad overview of study area with main route options shown

- The alignment assessment work in the 2016–17 period did not identify a single preferred alignment for the Illabo to Stockinbingal project.
- A study area approximately 2km in width (map, left refers) was taken forward into the Feasibility (Reference) Design phase to keep all options open for further evaluation.
- In June 2018, ARTC submitted a State Significant Infrastructure application for the Illabo to Stockinbingal project to the New South Wales Department of Planning and Environment. In response to this application, the NSW Department of Planning and Environment issued the Secretary's Environmental Assessment Requirements which initiated the formal planning approval process.
- ARTC commenced further community and stakeholder consultation in relation to the current design thinking (including a potential preferred corridor) in September 2018, to better inform the Feasibility Design process.
- The 250m-wide focused area of investigation for the Illabo to Stockinbingal project was announced on 30 July 2019. A subsequent seven-week consultation period included one-on-one meetings with directly impacted landowners, as well as community information sessions.
- A preferred final 40 to 60m-wide rail corridor will be identified as part of the Environmental Impact Statement for the project.

Inland Rail project route selection summaries

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Stockinbingal to Narromine

Parkes, New South Wales

Stockinbingal to Parkes

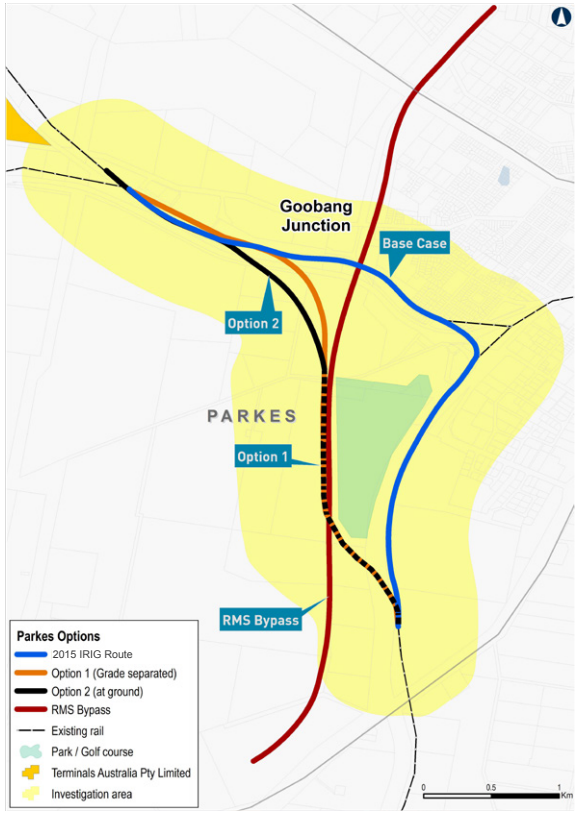
With the decision from the 2010 IRAS Study to adopt the route via Albury rather than via Shepparton, the existing railway from Stockinbingal to Parkes was incorporated into Inland Rail's route.

- No alternative options were identified as the Stockinbingal to Parkes alignment was suitable for Inland Rail due to its grade and relative straightness.
- This section is an existing main line requiring enhancement to increase its capacity by an additional crossing loop to enable trains travelling in opposite directions to pass safely and clearance improvements to accommodate double-stacked trains.

Stockinbingal to Parkes utilises the existing rail line via Forbes.

Parkes Bypass Proposal 2015

- In response to stakeholder feedback seeking to separate Inland Rail from the existing rail services operating through Parkes and generally aligning with a planned road bypass for heavy vehicles, an Alignment Development and Assessment Review was undertaken in September 2015 of possible Inland Rail bypass options, passing west of Parkes.
- While a rail bypass was considered to have some benefits (most significantly a transit time saving of 2 minutes and 30 seconds), the review identified that there would be significant additional implementation costs in the order of $80–100 million compared to an upgrade of the existing line.
- The alignment through Parkes achieves the requirements of the Service Offering when considered on an end-to-end basis, and as a result of the significant capital costs associated with the bypass option, further investigation of the bypass option was not progressed after 2015.



Route options considered in 2015 to bypass Parkes. Ultimately, no bypass options were progressed.

Parkes to Narromine

This part of the Inland Rail route was defined in the 2006 North-South Rail Corridor Study.

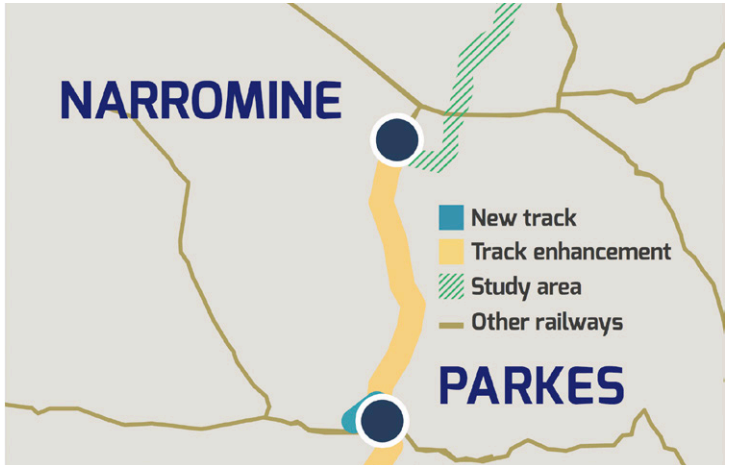
- No alternative options were identified to the existing rail line between the towns of Parkes and Narromine.
- The alignment's grade and minimal track curvature made it generally suitable for Inland Rail. However, as the Parkes to Narromine line is currently a secondary line, it requires a major track upgrade to meet Inland Rail mainline standards.

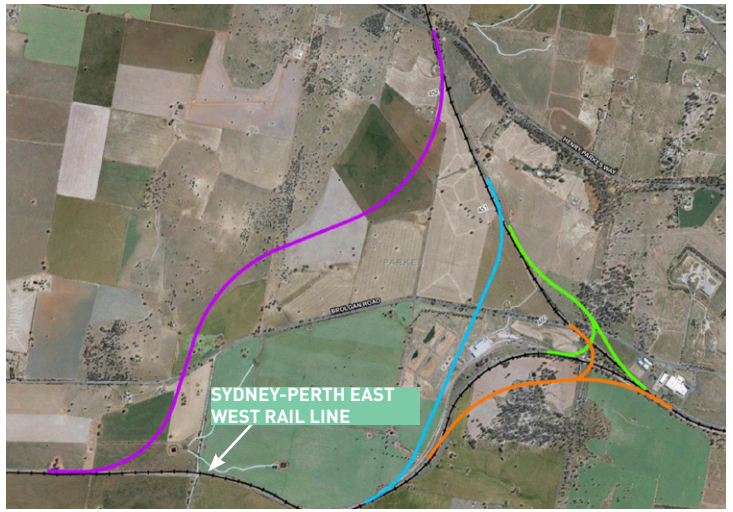
Parkes North-West Link

- A later addition to the project in 2015 (during the Feasibility Assessment stage) was the new 5km greenfield link at Parkes – the Parkes North-West Link.
- The new link connects the Parkes to Narromine line to ARTC's main East-West line which runs east to Sydney and west towards South Australia and Western Australia (the existing Trans Australia line).
- This link will facilitate the operation of trains directly from Brisbane to Adelaide and Perth. This was identified in the ARTC 2015 Inland Rail Programme Business Case as a major component of the future traffic base for Inland Rail, representing over 15% of the total forecast traffic (by net tonne km) on Inland Rail in 2040.

Construction commences on Parkes to Narromine

- In September 2018 the Parkes to Narromine project received the necessary primary project approvals from the Australian and New South Wales Governments, after which ARTC signed a construction contract with INLink, a joint venture between BMD Group and Fulton Hogan, to build this section of track.
- On 13 December 2018, the Deputy Prime Minister, the Hon Michael McCormack MP, turned the ceremonial first sod to mark the commencement of construction of Inland Rail in Parkes. This historic occasion was celebrated by ARTC staff, farmers, landowners, local government, the construction contractor INLink and the community.





Parkes North-West Link Options from 2016 Feasibility Assessment (**purple** = favoured) The other route options (coloured **blue**, **green** and **orange**) were discounted

Inland Rail project route selection summaries

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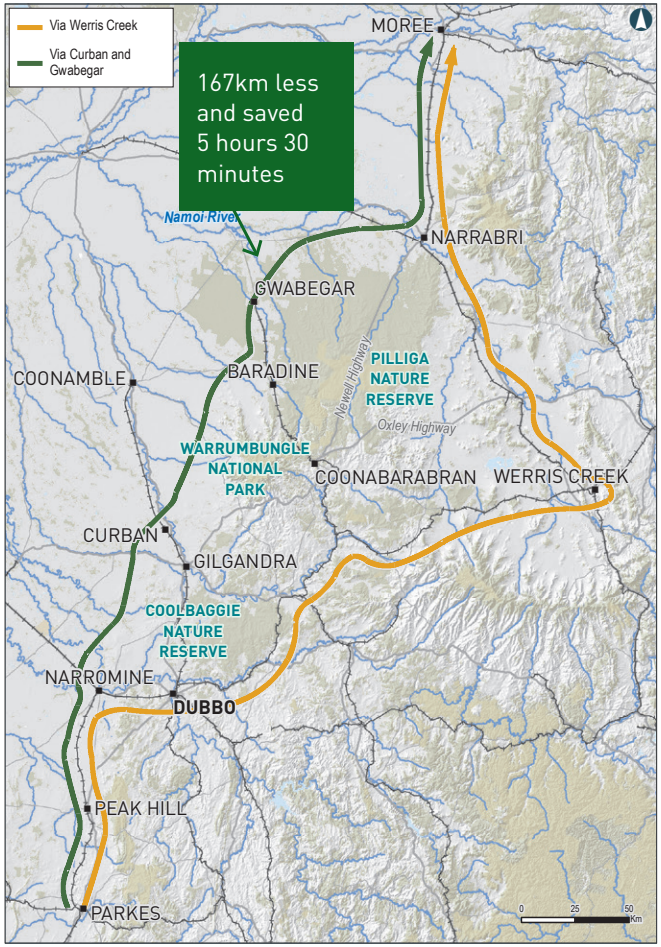
Narromine to Narrabri

Narrabri, New South Wales

N2N Route Option Analysis: Narromine to Narrabri



Narromine to Narrabri Options – 2010 IRAS

The 300km Narromine to Narrabri (N2N) section is the longest greenfield section in Inland Rail. Route selection for the N2N section was the focus in the 2010 IRAS and numerous community consultation efforts from 2016–2018.

2006 North-South Rail Corridor Study

- The 2006 North-South Rail Corridor Study identified a number of route options for this section, over a wide area ranging from Werris Creek in the east to Burren Junction in the west.

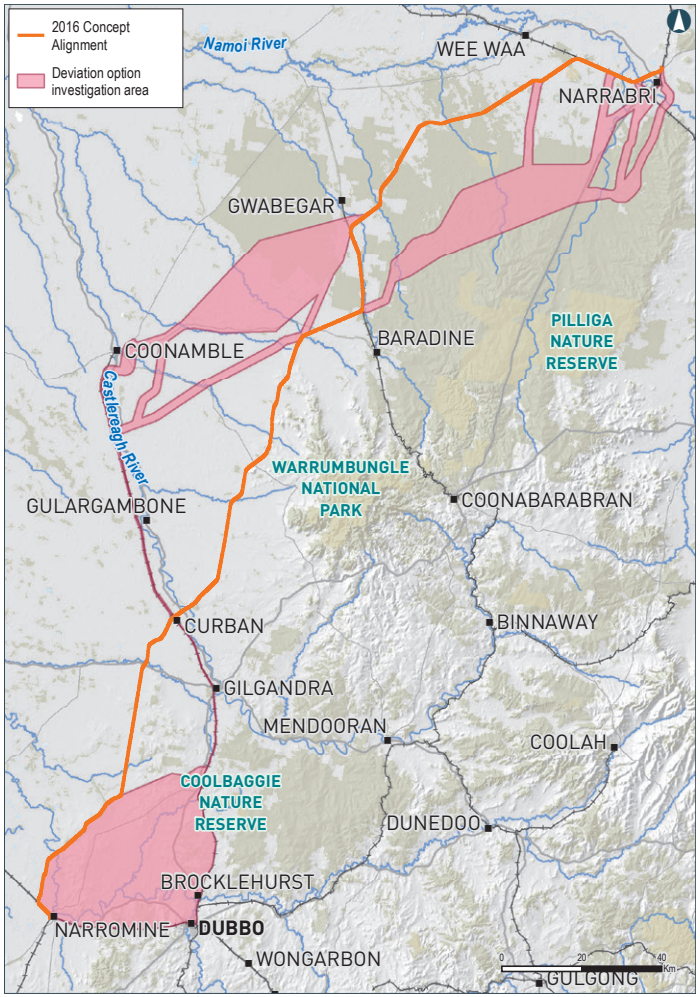
2010 IRAS

- Following technical, financial and economic analysis in the 2010 IRAS, numerous route options were refined down to two scenarios:
  - existing railway lines via Werris Creek to Narrabri
  - a more direct greenfield route between Narromine and Narrabri.
- The direct Narromine to Narrabri greenfield option had increased capital cost, but at 307km was 167km shorter than the route via Werris Creek (474 km).
- The standard and alignment of the rail lines that would be used for a route via Werris Creek reduced average train speed to 53km/h compared with the reference speed of 88km/h on the shorter greenfield route (ARTC's train modelling in late 2019 shows that the 88km/h assumed in the IRAS remains valid). The combination of shorter distance and higher speed on the greenfield route reduced transit time by 5 hours and 30 minutes.
- The 2010 IRAS recommended ultilising the greenfield route on the following bases:
  - Narromine to Curban – as it was more cost effective than an upgraded route via Dubbo
  - Curban to Gwabegar – as it required less capital expenditure than the upgrade from Curban to Coonamble and new track from Coonamble to Gwabegar
  - Narrabri bypass – because of the significant speed constraints in Narrabri and the cost of upgrading the existing bridge and track.
- The adoption of a shorter greenfield route between Narromine and Narrabri increased the forecast demand and revenue of the total Inland Rail project and enhanced the economic benefits of the project.

2015 IRIG

- The 2015 IRIG adopted the 2010 IRAS alignment.

N2N Route Option Analysis: Narromine to Narrabri 2016 concept alignment



Narromine to Narrabri 2016 concept alignment Map

The more narrowed concept alignment for Inland Rail in the Narromine to Narrabri section was developed in 2016 as the basis for assessing options that would improve upon the 2010 IRAS alignment endorsed by IRIG in 2015.

- From mid-2016, ARTC commenced broader community consultation about the 2016 concept alignment.
- Two key themes arose from the consultation:
  - an amount of community support for use of the Coonamble line as an alternative to the concept alignment
  - there was broad support for a more direct route through the Pilliga Forest as an alternative to the concept alignment.
- A number of route options were considered as alternatives to the concept alignment but all added significant time and/or costs, except the option through the Pilliga State Forest that reduced impact on private landowners and saved both time (6–12 minutes) and money ($83 million).
- The alternative route options that were subject to consultation with landholders and communities are addressed later on in this section.
- The results of the route option assessments have been made publicly available on the Inland Rail website primarily through publication of:
  - reports of Multi-Criteria Analysis (MCA) workshops held in October 2016, December 2016 and May 2017
  - the Narromine to Narrabri Options Report (November 2017)
  - the Narromine to Narrabri Route and Alignment Development Summary (March 2018)
  - ARTC responses to questions from the NSW Farmers Association about the Narromine to Narrabri route (October 2018).

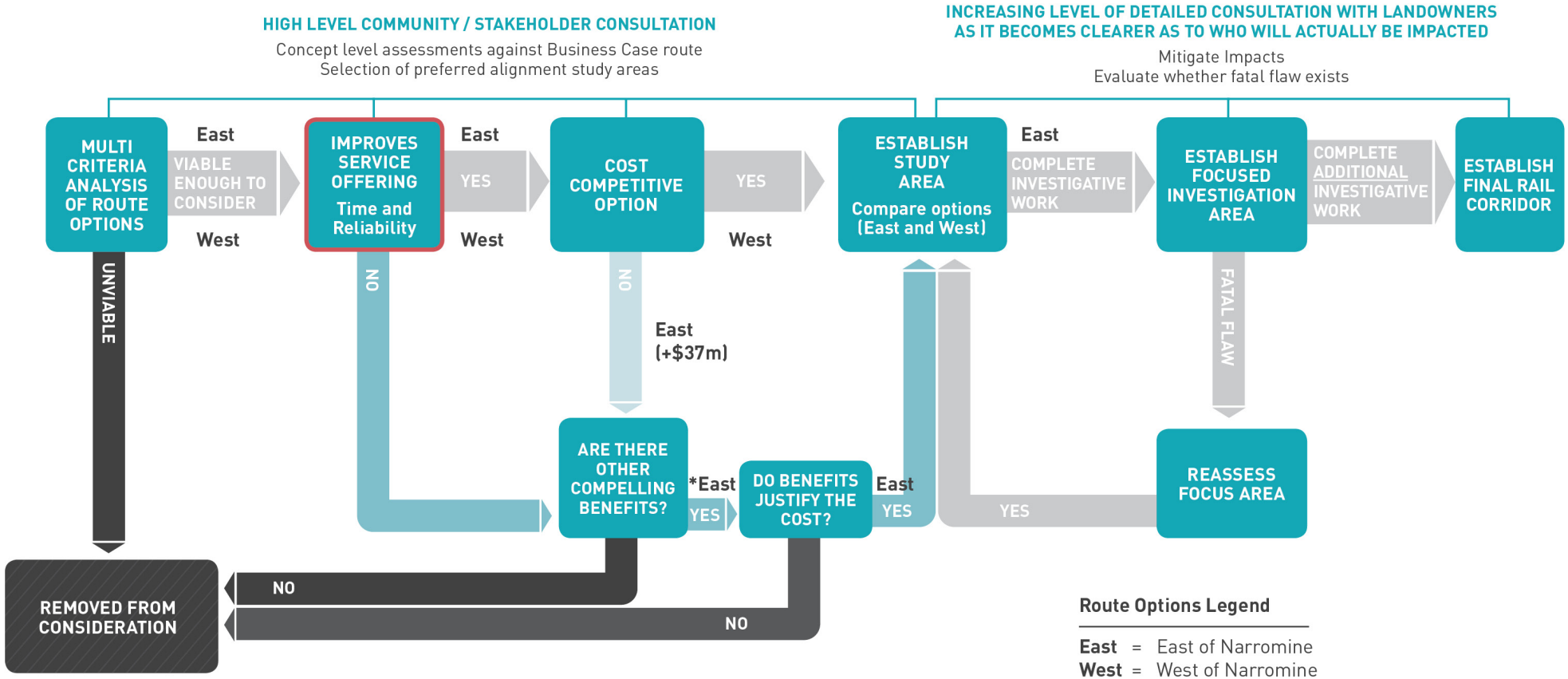
N2N Route Option Analysis: East or West around Narromine

An eastern route around Narromine (via Eumungerie Road before re-joining the concept alignment at Burroway) was compared with the concept alignment which took a route to the west of Narromine.

The eastern route was ultimately recommended and incorporated into the current Inland Rail alignment.

- While the eastern option added 1.02km and 24 seconds in transit time, this was not considered significant enough to outweigh the advantages that the eastern option offered.
- Factors relevant to the decision to go east rather than west around Narromine include:
  - traversing land with better geotechnical conditions allowing structural material to be sourced on site, therefore improving safety outcomes by reducing the volume of material moved the site by road
  - savings in the order of $12.2 million compared with the earthworks requirements of the western option
  - the opportunity to get to higher ground quicker than going west with lesser flooding and hydrology impacts, with approximately 10km in the floodplain in the eastern option compared with about 21km for the western option, and with the length of track needing designed man-made structures (viaducts and bridges and extensive use of culverts) to meet 1% AEP (1:100 year) flood impacts totalling 1.6km in the eastern option compared with 15.9km for the western option
  - fewer private level crossings (seven for the eastern option compared with 13 for the western option)
  - a higher MCA score (driven primarily by better technical viability, constructability and safety outcomes)
  - the eastern option means that Inland Rail trains will not go through Narromine.
- While the eastern route added an apparent $37.1 million to the construction cost, this amount included a contingency amount of $11.3 million for a possible grade-separation at Tomingley Road which as at December 2019 was no longer considered a requirement. The effect of this is to reduce the notional additional cost of going east of Narromine to $25.8 million (which represents about 1.7% of the estimated section capital cost).
- The western option had a greater risk of a latent risk of flooding and/or poor geological conditions increasing the cost of structures to cross the floodplain which, if realised, would likely have reduced or even fully negated the apparent comparative cost advantage.
- The eastern option also offered the opportunity to have an expanded study area (out to 5km) which would maximise the opportunity to have an alignment that avoided or minimised the flooding effects of the Backwater Cowal and target a better crossing point of the rail line from Dubbo, the Mitchell Highway and the Macquarie River.

N2N Route Option Analysis: East or West around Narromine



***Better hydrology**
Less track in flood areas.

Route Options Legend

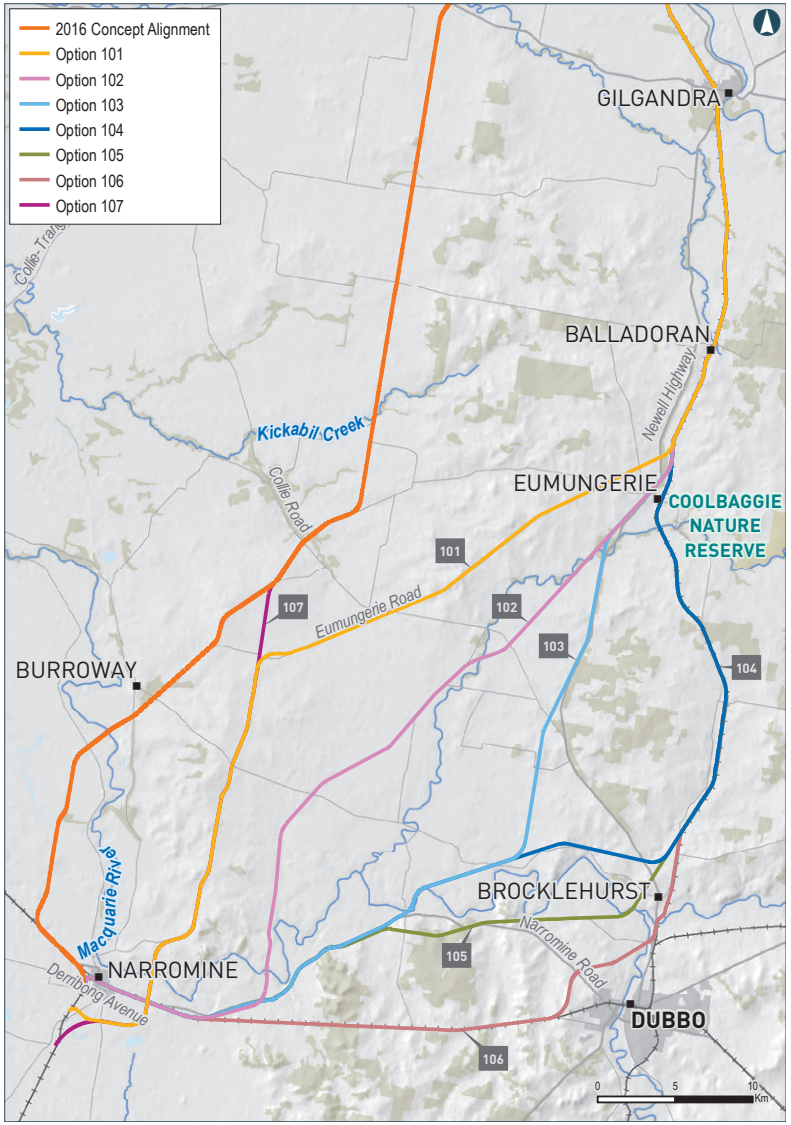
East = East of Narromine
West = West of Narromine

Note: Some processes overlap during route development rather than being strictly sequential as per this representative diagram.

N2N Route Option Analysis: Narromine to Curban via Gilgandra?

Use of the southern section of Coonamble line via Gilgandra

- A number of options (101 through 107 in the map on this page) were assessed against the concept alignment (shown in red on the map) that utilised various lengths of the Dubbo-Coonamble line south of Curban.
- During the first two MCA workshops (October 2016 and December 2016) all of these options were considered inferior to the 2016 concept alignment due to longer distances, higher construction costs, operational interface issues and noise/ vibration issues through Gilgandra.
- Accordingly, as none of the options improved the Inland Rail Service Offering or presented other compelling reasons to be considered further, all of these options were discounted in December 2016 and not considered in the final MCA workshop (May 2017).
- The decision was, having gone east of Narromine, the best option was to get back to the 2016 concept alignment as quickly as possible rather than proceed further east towards Gilgandra.
- Full reports of the MCA workshops held in October 2016 and December 2016 are available on the Inland Rail website.

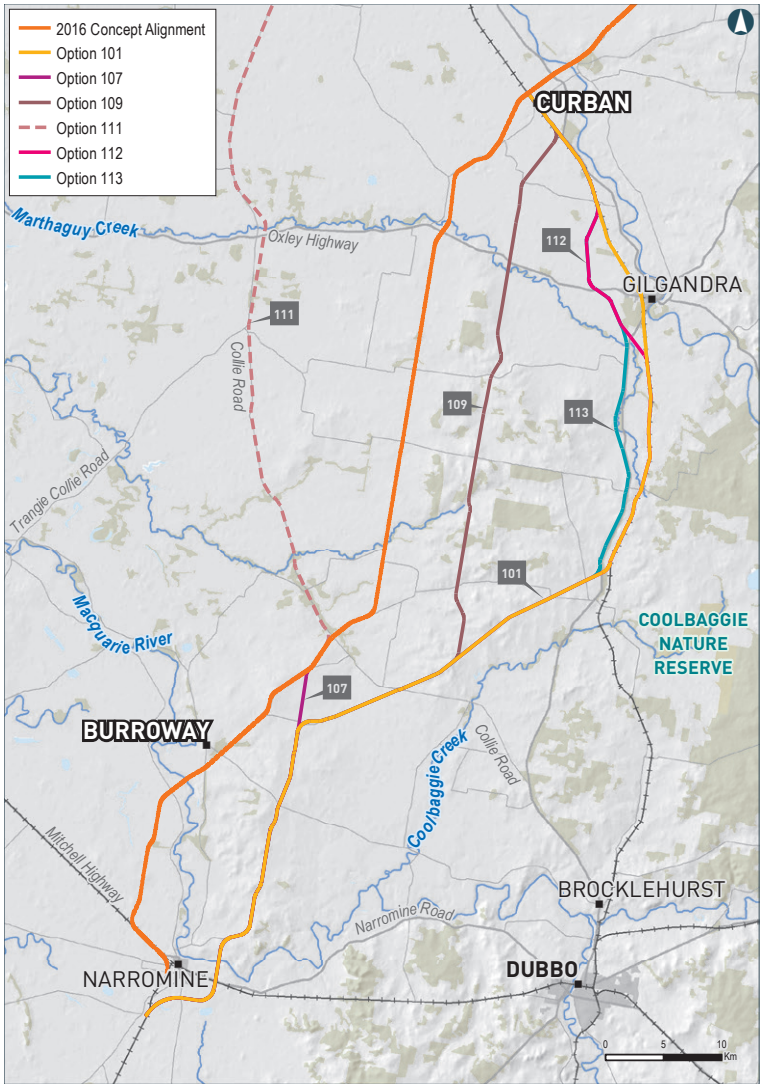


Narromine to Curban
– October 2016 MCA workshop map

N2N Route Option Analysis: Narromine to Curban route options

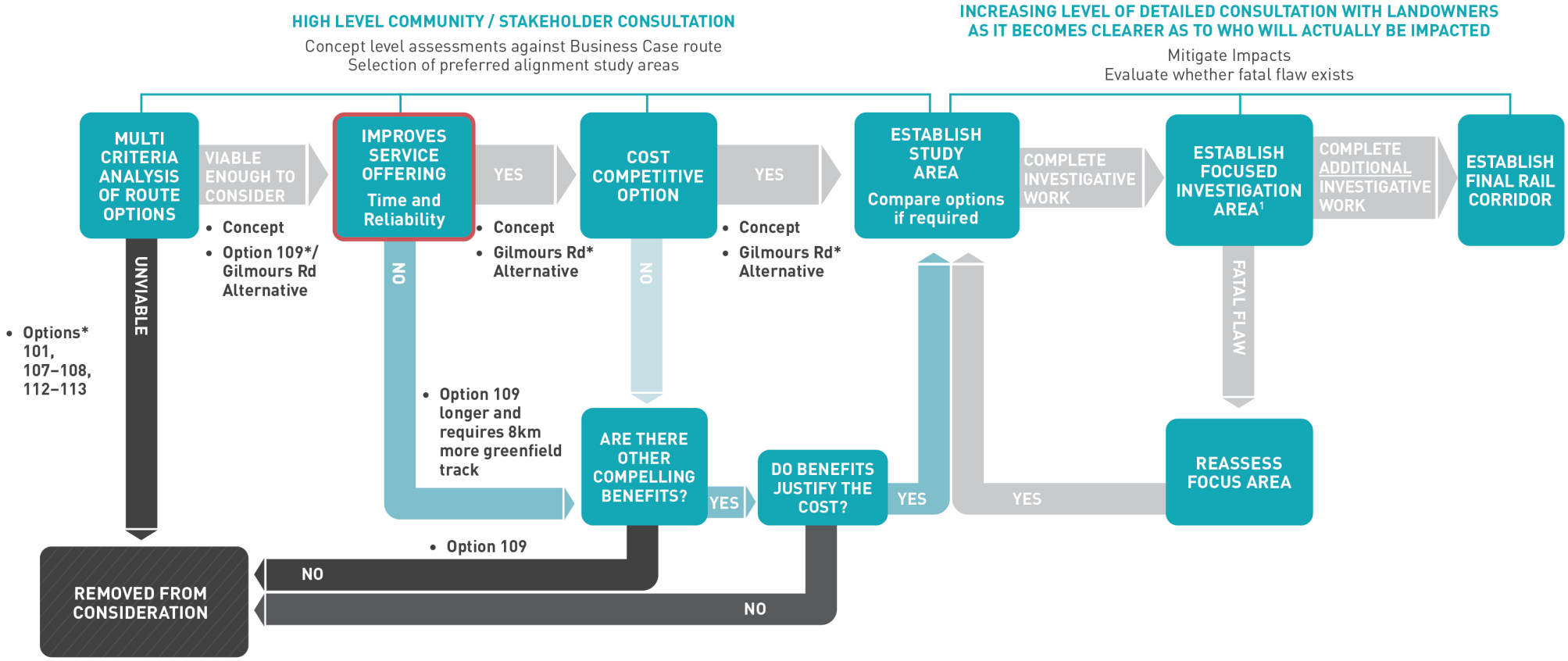
Gilmours Road alternative option

- The decision to go east rather than west of Narromine brought into focus additional route options in the Burroway to Curban section as an alternative to the concept alignment along Gilmours Road, given that the decision had already been made not to go to Curban via Gilgandra.
- Based on community input near Burroway, a new option further to the east (Option 109 on the map to the right) was considered in the December 2016 MCA as an alternative that would potentially reduce property impacts by following property boundaries and 'paper' roads. This was one of two options (the other being the concept alignment) progressed for further consideration.
- The analysis found that Option 109 was longer than the concept alignment, and required a total of 94km of greenfield development compared with 86km required for the concept alignment, and presented more issues relating to constructability and environmental impacts. Therefore, the concept alignment remained the preferred option.
- Accordingly, ARTC and its technical consultants GHD proposed a refinement of Option 109 (Gilmours Road Alternative) that maintained many of the advantages of Option 109 while being shorter and hence had a higher potential as a reasonable alternative to the concept alignment (shown in orange on the map to the right).
- The Gilmours Road Alternative (refer to map on page 66), was discussed with landowners and the community in March 2017 and April 2017 and assessed in the May 2017 MCA workshop.
- While landowners did not support either the concept alignment or the Gilmours Road Alternative option, ARTC and its technical consultants considered the latter offered several benefits when compared with both Option 109 and the 2016 concept alignment even though it is slightly longer than the 2016 concept alignment.
- ARTC considered that if a superior alignment to the concept alignment were to be found in this section it would more likely be to the east rather than the west of the concept alignment. Accordingly, the concept alignment and Gilmours Road Alternative were subsequently used as the western and eastern boundaries of the Narromine to Narrabri study area endorsed by the Australian Government, so that more detailed investigations in this area could be done.



December 2016 MCA workshop report

N2N Route Option Analysis: Narromine to Curban



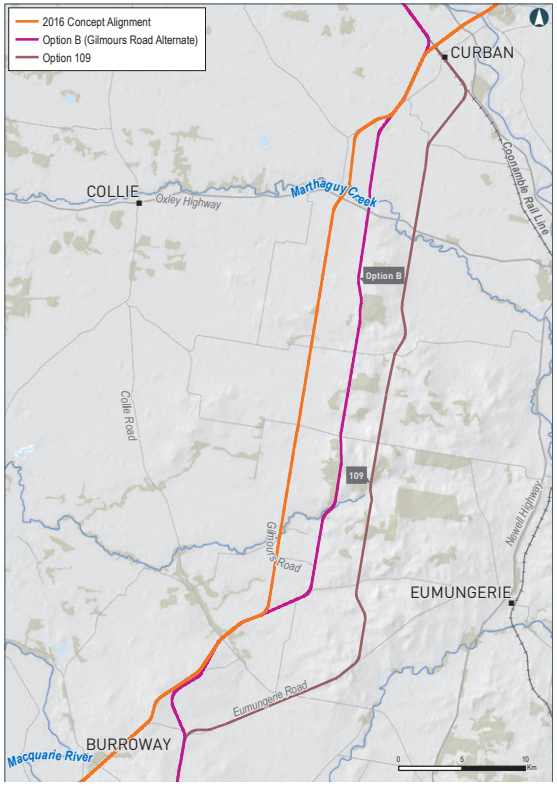
***Refer to the map legend on the preceding page**

Note: Some processes overlap during route development rather than being strictly sequential as per this representative diagram.

[1] As at November 2019 this was still being studied to determine a focused area of investigation within which the final rail corridor will be located.

N2N Route Option Analysis: Narromine to Curban

Given that a route from Narromine to Curban via Gilgrandra was not considered feasible, different alternative routes were then evaluated between Narromine and Curban as outlined on pages 64 and 65, and the comparative results are summarised in the table below.



This map is from the May 2017 MCA workshop report showing the Gilmours Road Alternative option. The table graphic to the right reflects the outcome of the May 2017 MCA workshop

	Concept Alignment Narromine to Curban (west around Narromine)		Narromine to Curban via Gilgandra		Eumungerie Rd / Gilmours Rd Alternative option (east around Narromine)	
Distance	89km	○	105km 16km longer	●	90km 1km longer	○
Service Offering / Transit time	66km	○	78 min 12 min longer	●	67 min <1 min longer	○
Construction Cost	$0m (for relativity)	○	+$64m	●	+$37m	●
MCA Score (relative to Concept Alignment)	-	○	−3.56	●	+0.43 (Eumungerie Rd) +0.55 (Gilmours Rd Alternative)	●
Overall		○		●		○
Recommended						✓

- ● Favourable
- ○ Neutral
- ● Unfavourable
- ● Highly unfavourable

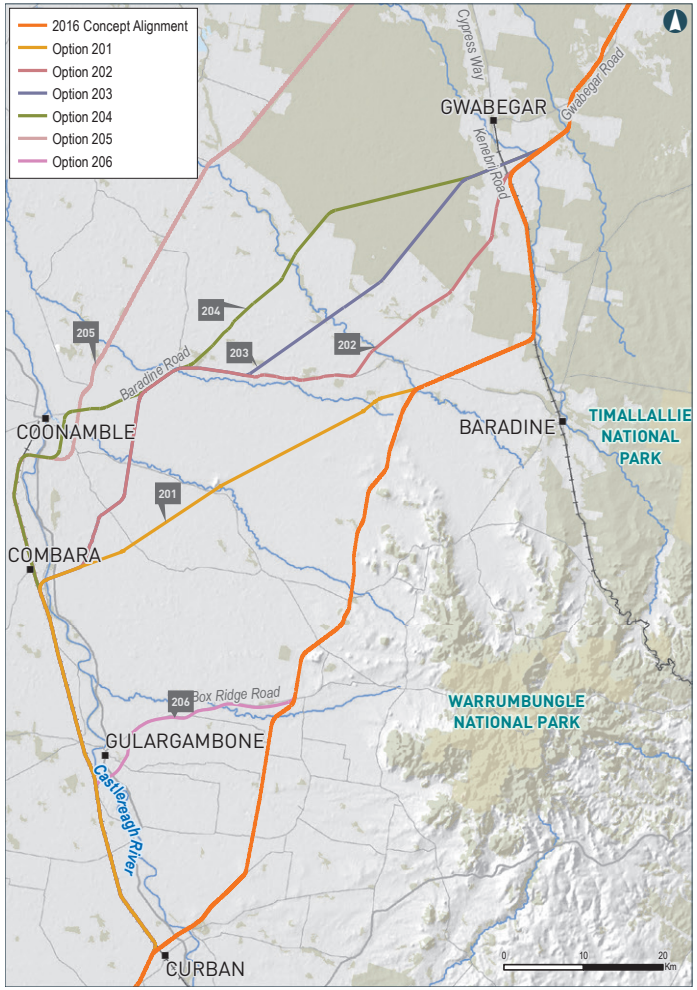
N2N Route Option Analysis: Should the alignment go from Curban via Coonamble?

Use of northern section of Coonamble line via Combara / Coonamble

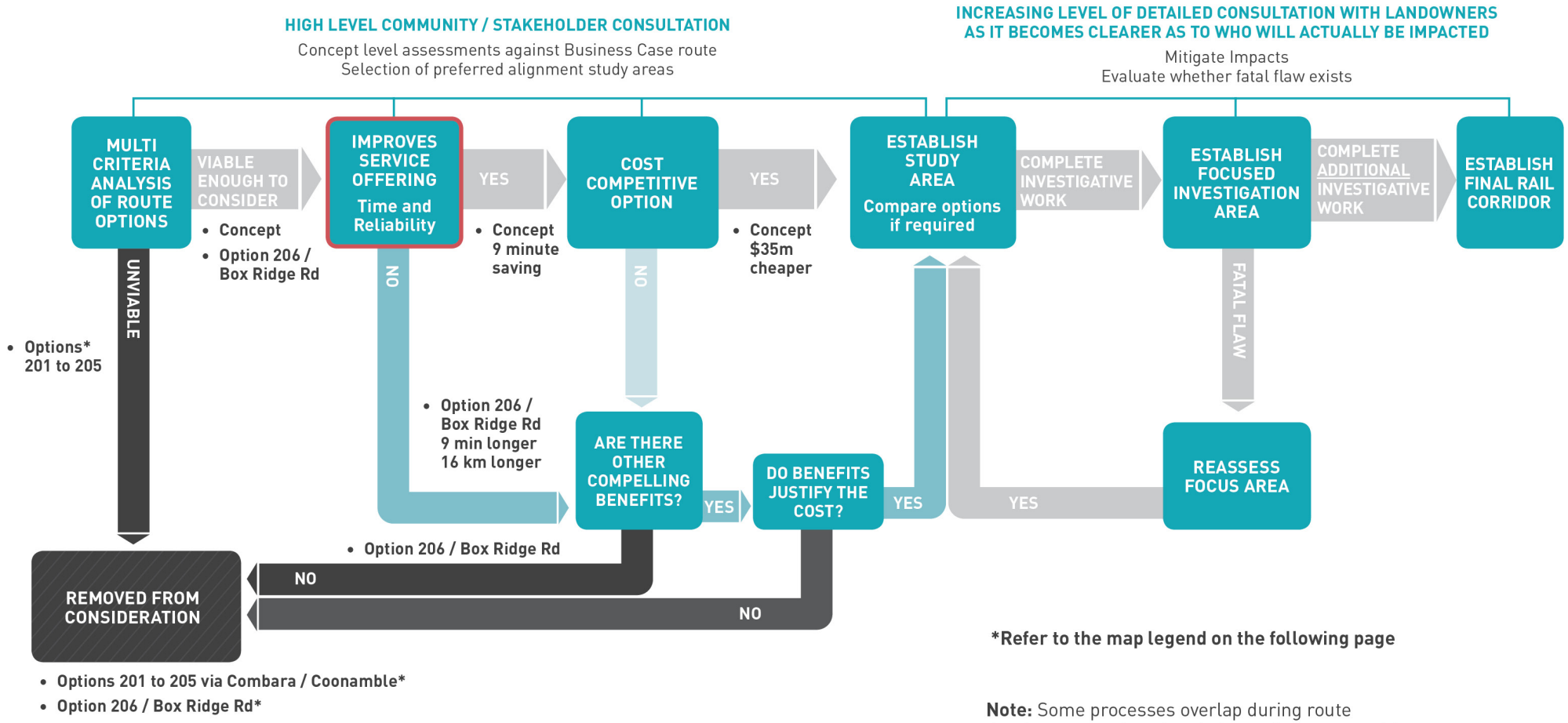
- The MCA workshop in October 2016 considered a number of options that utilised the northern section of the Coonamble line (refer to the map on this page).
- An option that used the Coonamble line as far as Combara was assessed during the MCA workshop but was ruled out as being inferior to the concept alignment largely because of increased time and cost (as illustrated in the figure on page 68). On this basis, other options that were nearer to Coonamble were also regarded as inferior to the concept alignment and were therefore not assessed in detail.
- Each of these options also included a need for new greenfield sections in order to get back to the concept alignment somewhere north of Curban.
- Accordingly, the majority of these options were discounted after the first MCA workshop in October 2016.

Option via Gulargambone and Box Ridge Road vs Concept Alignment

- An option that used a shorter section of the Coonamble line as far as Gulargambone (Option 206 – the Box Ridge Road option) remained under evaluation until the final May 2017 MCA workshop (refer to the map on this page).
- While the Box Ridge Road option performed better than options that used a greater length of the Coonamble line, the transit time benefit (9 minutes) and capital cost saving ($35 million) of the concept alignment were still significant, and the MCA score in the final May 2017 MCA workshop favoured the concept alignment.
- Accordingly, the concept alignment was the recommended option for the Curban-Baradine section.



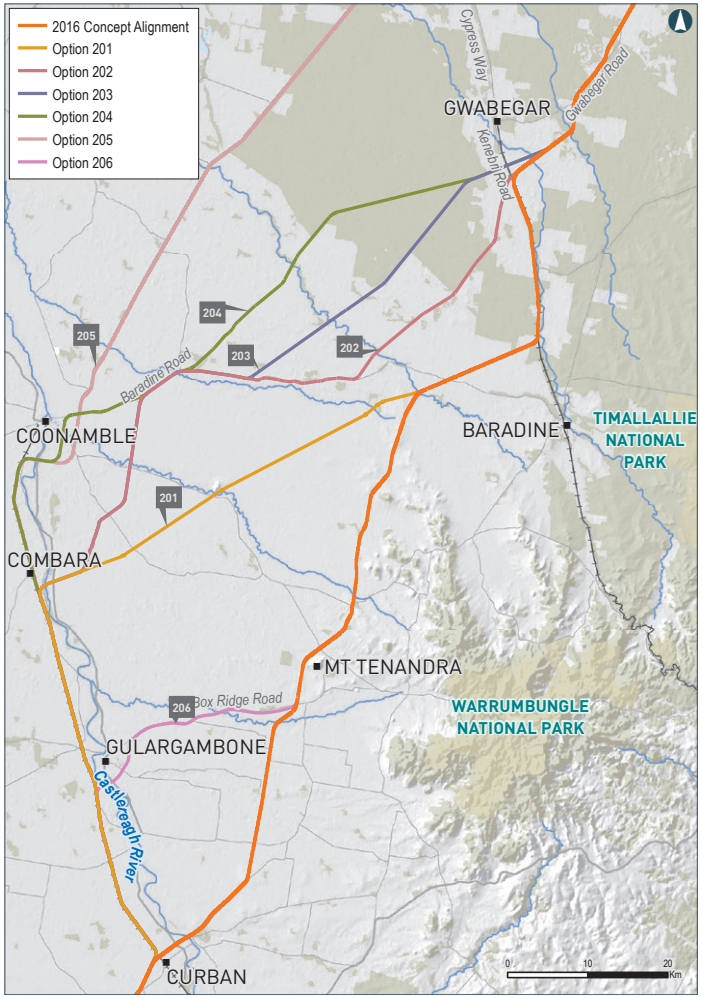
N2N Route Option Analysis: from Curban via Coonamble?



***Refer to the map legend on the following page**

Note: Some processes overlap during route development rather than being strictly sequential as per this representative diagram.

N2N Route Option Analysis: from Curban via Coonamble?



	2016 Concept Alignment Curban to Baradine		Via Combara (Option 201)		Via Gulargambone and Box Ridge Rd (Option 206)	
Distance	82km		104km 21km longer		98km 16km longer	
Service Offering / Transit time	61 min		77 min 16 min longer		70 min 9 min longer	
Construction Cost	$0m (for relativity)		+$48m		+$35m	
MCA Score (relative to Concept)	-		–1.32 (at best)		-0.27	
Overall						
Recommended		✓				

- Favourable
- Neutral
- Unfavourable
- Highly unfavourable

Curban to Gwabegar/ Baradine Map

N2N Route Option Analysis: Economic costs versus benefits of going via Coonamble

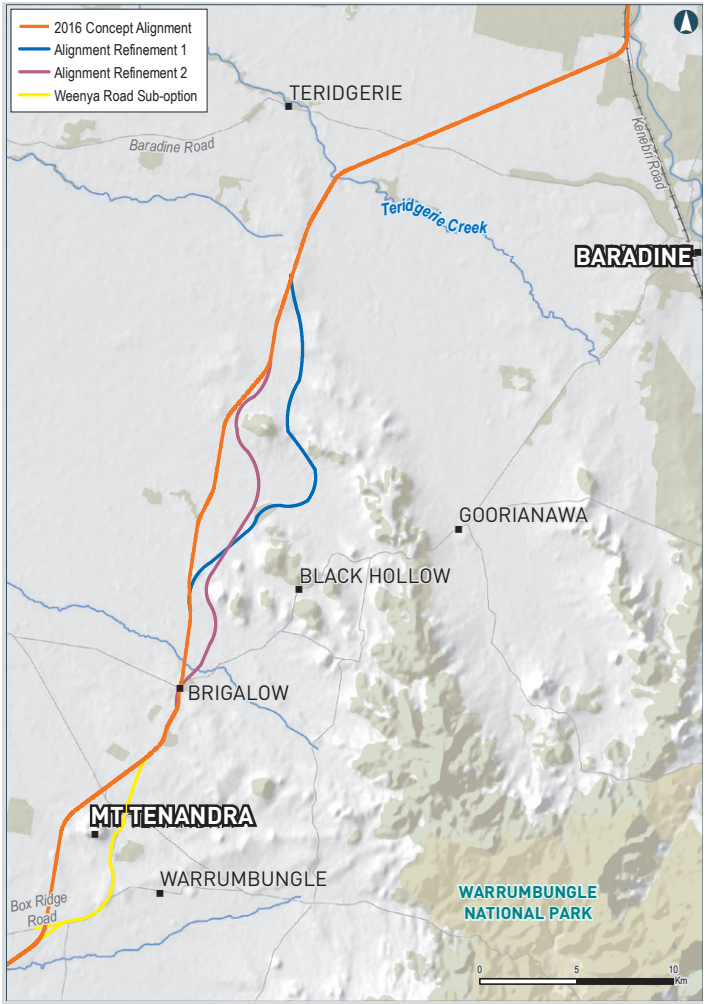
Even relatively small increases in transit time and distance translate into significant economic disbenefit.

- In November 2017, the Australian Government announced the Inland Rail route in this section would run on a direct alignment from Curban to near Baradine.
- In July 2018, an alternative route for this section was proposed for Inland Rail to use the Coonamble line and go via or close to Coonamble.
- ARTC analysis of the Coonamble proposal indicated it would add 24 minutes in transit time and 39 kilometres in distance relative to the 2017 Concept Alignment.
- ARTC undertook an assessment of the proposed alternative route using a benefit-cost approach to examine the incremental capital costs versus the direct economic benefits or disbenefits of the change in scope to Inland Rail.
- The assessment estimated that the additional 39km in distance would produce an economic disbenefit of approximately $450m relative to the 2017 Inland Rail route, over an evaluation period to 2080 (Present Value at a 4% discount rate, being the core discount rate in the 2015 Inland Rail Program Business Case).
- This represents a benefit cost ratio of -8.2 meaning there is an economic loss of more than 8 times the value of the investment in construction.
- This assessment is covered in greater detail in Appendix 1 on page 98.
- It has been suggested that the volume of grain and other freight moved on the Coonamble line warrants Inland Rail following the existing Coonamble line, particularly as doing so would result in (potentially significant) freight cost savings to farmers and others in the region.
- Currently the Coonamble line is used by trains on a seasonal basis to transport grain.
- ARTC undertook an analysis of utilisation of the Coonamble line in the period 01 January 2015 through to 31 December 2019.
- This analysis is covered in greater detail in Appendix 2 on page 100
- In response to a request from some stakeholders, ARTC has modeled the potential impact on train operating costs (and potential freight rates) of the Coonamble line being upgraded to 25TAL (the Inland Rail standard) compared with the current stated capability of 20.25TAL.
- The ARTC modeling shows that upgrading the line to 25TAL provides potential cost savings per tonne.
- The modelling and results are covered in greater detail in Appendix 3 on page 102.

N2N Route Option Analysis: Curban to Baradine via Mt Tenandra

Mt Tenandra to Baradine

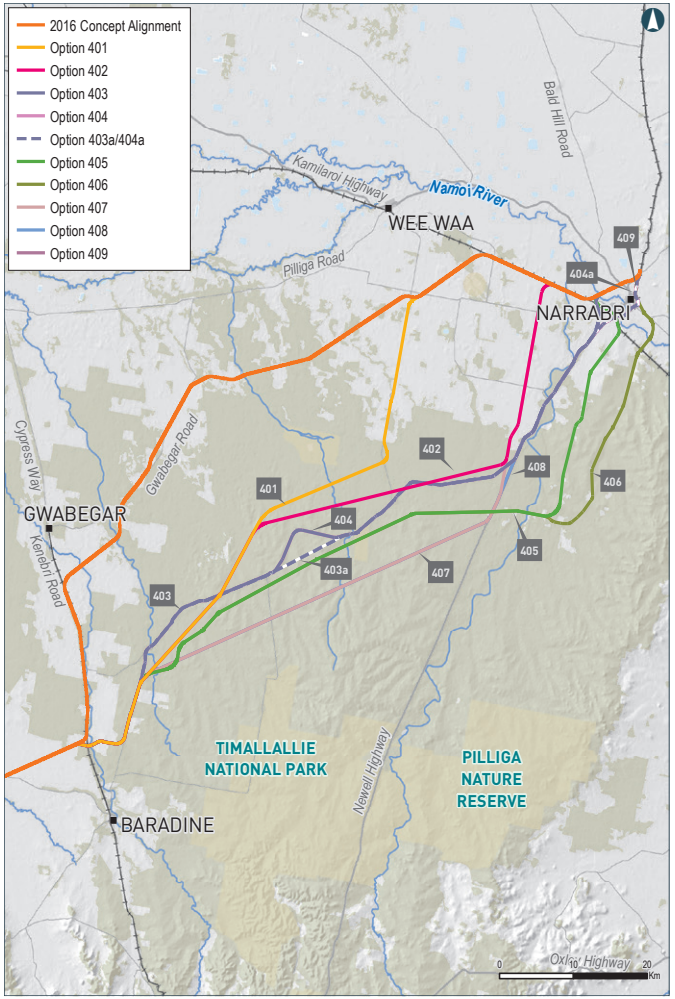
- Once the option of going via or close to Coonamble had been discounted, the question remained as to how best to get from Curban to north of Baradine. A route via Mt Tenandra was considered the most appropriate.
- The alignment between Mt Tenandra and Baradine is constrained by the foothills of the Warrumbungle Range to the east and poor draining areas to the west.
- Consequently there are few practical corridor options in this section and all of those identified broadly followed the concept alignment.
- Several alignment refinements on this section were assessed within this section to target better geological conditions. The refinements are shown in the map on this page.
- The work to identify a Focused Area of Investigation continued through to the second half of 2019. This work included consultation with landowners.



N2N Route Option Analysis: Gwabegar/Baradine to Narrabri route options

A key outcome of initial community consultation during 2016 was community support for routes through the Pilliga Forest, as an alternative to the concept alignment which traversed prime farm land further to the north-west.

- The three MCA workshops held between October 2016 and May 2017 demonstrated that the Pilliga Forest options performed strongly relative to the concept alignment, with shorter distance, reduced transit times and significant cost savings.
- Accordingly, a Pilliga Forest option was recommended as part of the overall Narromine to Narrabri route alignment.
- As at 31 December 2019, community support for the Pilliga option remained strong.



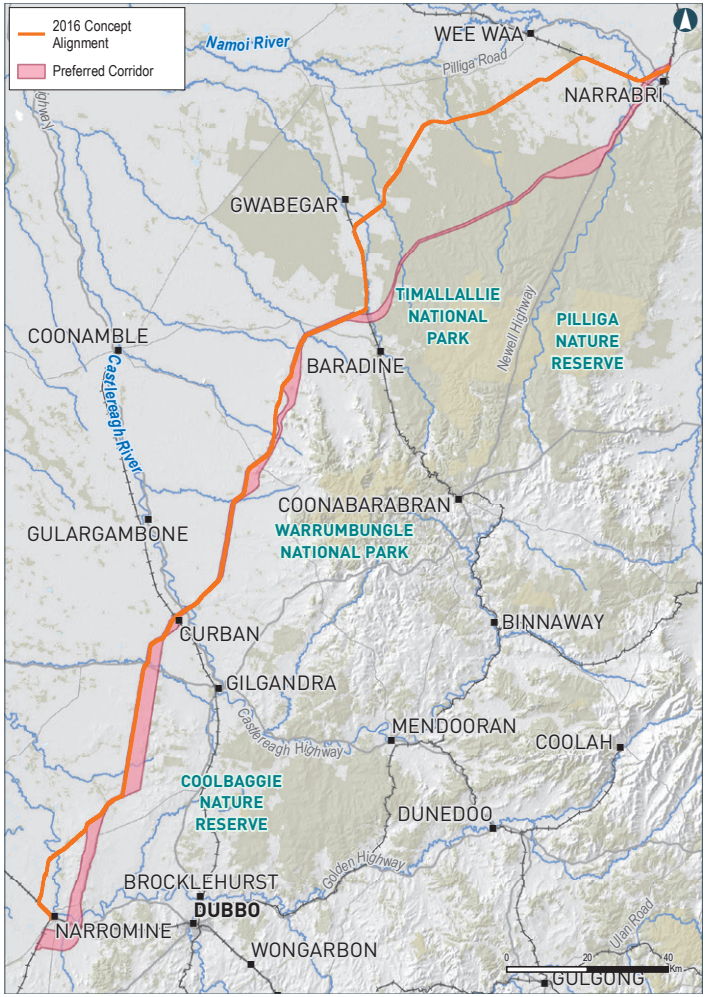
	Concept Alignment		Via Pilliga Forest	
Distance	113km	○	97km 16km shorter	●
Service Offering / Transit time	79 min	○	67–73 min 6–12 min quicker	●
Construction Cost	$0m (for relativity)	○	-$83m	●
MCA Score (relative to Concept Alignment)	-	○	range +2.62–3.72	●
Overall		○		●
Recommended				✓

● Favourable ● Unfavourable
○ Neutral ● Highly unfavourable

Gwabegar/Baradine to Narrabri Map

N2N Route Option Analysis: Summary of Narromine to Narrabri study area 2017

- The Narromine to Narrabri Inland Rail study area was jointly announced by the then Minister for Infrastructure and Transport, the Hon Darren Chester MP, the Minister for Finance, Senator the Hon Mathias Cormann, and the Federal Member for Parkes, Mark Coulton MP, on 30 November 2017.
- The study area is shown in red on the map to the right in comparison with the concept alignment which is shown in orange.
- The study area uses a combination of the 2016 concept alignment and various alternative options, as outlined in the tables on previous pages.
- The most significant variations from the concept alignment are that the study area uses the eastern option around Narromine and the Pilliga Forest (Newell Highway) option between Baradine and Narrabri.
- The study area is generally around 2km wide but, in parts, can be as narrow as 500m while in the areas south and east of Narromine, it was extended to approximately 5km.



Narromine to Narrabri Study Area 2017 (red)

N2N Route Option Analysis: Narromine to Narrabri alignment consultation 2016–2019

ARTC conducted extensive rounds of public consultation in the Narromine to Narrabri section, particularly in the periods March – May 2017 and December 2017 – November 2018 and ongoing from August 2019. The consultation which focused significantly on understanding landowner and community concerns about the 2016 concept alignment and route options proposed, is summarised on the right.

JUNE 2016	ARTC Inland Rail staff were asked to attend an annual meeting of local farmers in Coonamble – the meeting passed a resolution stating Inland Rail should travel via Coonamble.
JUNE 2016 TO JULY 2016	ARTC Inland Rail held workshops on the alignment options with selected stakeholders (councils, community organisations, state agencies).
NOV 2016	ARTC Inland Rail held three information sessions in Gilgandra, Narromine and Narrabri regarding the October 2016 MCA outcomes and as input into the December 2016 MCA workshop.
MARCH 2017 TO MAY 2017	ARTC Inland Rail met with >400 landowners (one-on-one and in small meetings) with concentrated effort between February and April 2017.
NOV 2017	ARTC Inland Rail mailed out >17,000 flyers advertising community meetings held in December and wrote to >600 landowners along the various alignment options considered in the May 2017 MCA advising of the December meetings.
DEC 2017	ARTC Inland Rail held four information meetings in Gilgandra, Narrabri, Narromine and Coonamble, reaching between 500 and 600 attendees in total.
FEB 2018 TO JUNE 2018	ARTC Inland Rail resumed intensive one-on-one landowner meetings within the study area. By the end of June 2018, ARTC Inland Rail had met with more than 300 landowners in the study area.
SEP 2018	ARTC Inland Rail held four public meetings and four information sessions were held, attended by approximately 580 people.
NOV 2018	At the request of ARTC Inland Rail, three Community Consultative Committees for the Narromine to Narrabri project were established by the NSW Department of Planning and Environment, one each for the areas generally around Narromine, Gilgandra and Narrabri.
AUG 2019 TO DEC 2019	Landowner and community consultation on the 150 to 400m-wide focused area of investigation for the Narromine to Narrabri project commenced in August 2019. Landowners are being individually consulted and, given the scale of the project, the consultation process was ongoing as at the end of December 2019.

Inland Rail project route selection summaries

Narrabri to North Star

North Star, New South Wales

Narrabri to North Star

The existing railway contains a rail corridor that is largely suitable for Inland Rail and during route development no alternative options were identified.

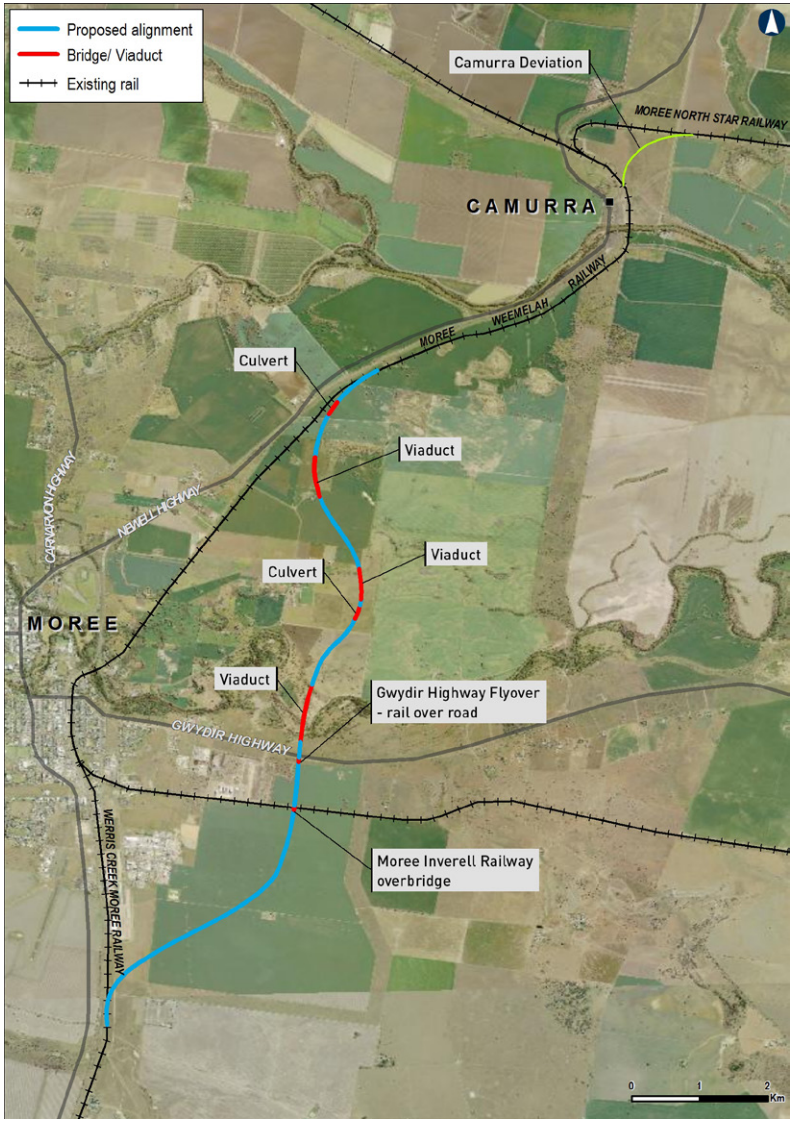
- Its alignment, based on grade and minimal curvature, is suitable for Inland Rail. The track is currently a combination of secondary and branch line standard, requiring upgrading to full Inland Rail mainline standards.
- Further analysis of this section did identify two areas where a deviation from the existing corridor would help improve the overall Inland Rail Service Offering.
- The two areas are summarised on this page.

Camurra deviation

- This section includes a short length of greenfield construction at Camurra, near Moree, to bypass a tight curve.

Moree bypass option

- During the Feasibility Assessment stage, the potential for a bypass of Moree was assessed, principally as a means to address connectivity and severance issues on the existing railway through the Moree urban area.
- The Feasibility Assessment recommended that the existing alignment through Moree be retained. While route assessment results indicated that the bypass would function similarly to the line through Moree on non-cost criteria, the cost assessment indicated that the bypass option would have a major additional capital cost of approximately $70 million.



Inland Rail project route selection summaries

+

North Star to Gowrie

Yarranlea, Queensland

North Star to the NSW/QLD Border

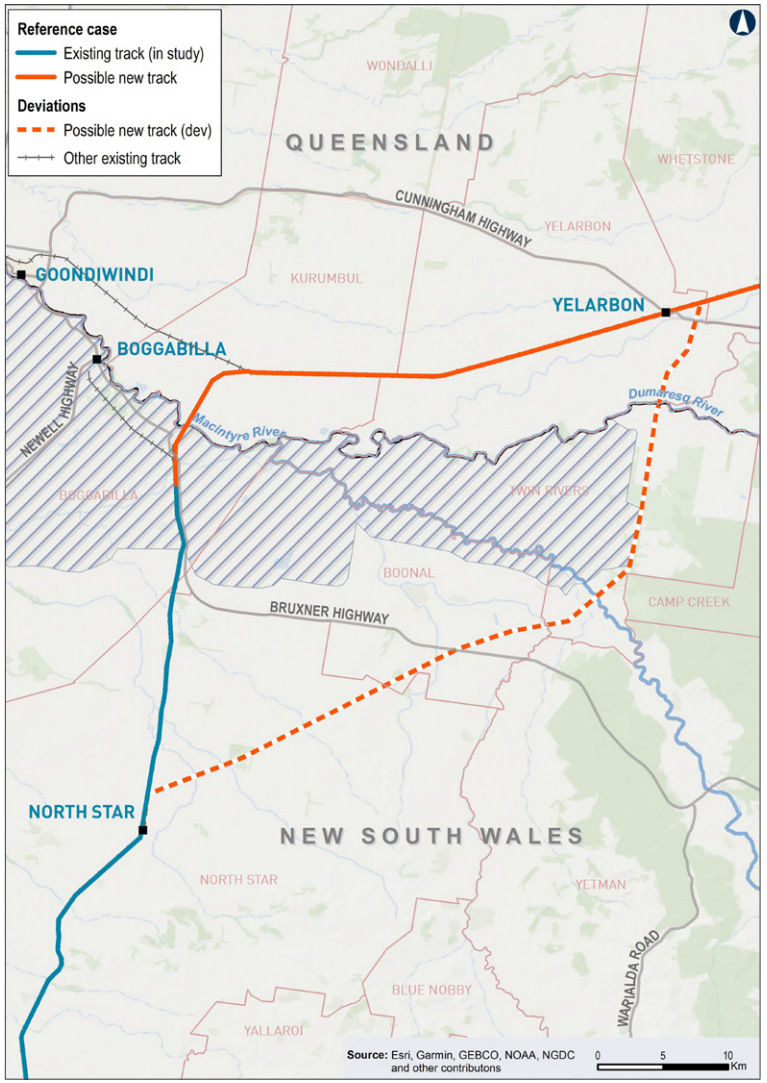
The cross-border connection from New South Wales to Queensland has complexities given the existence of railway corridors on both sides of the border and the need for a crossing of the Macintyre River floodplain. A significant portion of the existing rail corridor south of the border is not operational.

2010 IRAS

- During the 2010 IRAS, two alternatives were examined. One was a greenfield route direct from North Star towards Yelarbon, crossing the Macintyre River into Queensland and joining the existing Queensland Rail South Western Line close to Yelarbon.
- The second alternative was to use the existing disused railway extending north from North Star towards Boggabilla, diverging from that line for a much shorter greenfield section crossing the Macintyre River into Queensland, and then joining the existing Queensland Rail South Western Line.
- The 2010 IRAS concluded that the direct greenfield route was preferred.

2015 IRIG

- The 2015 IRIG identified the North Star to Toowoomba segment as requiring further investigation, including specifically the crossing of the Macintyre floodplain.

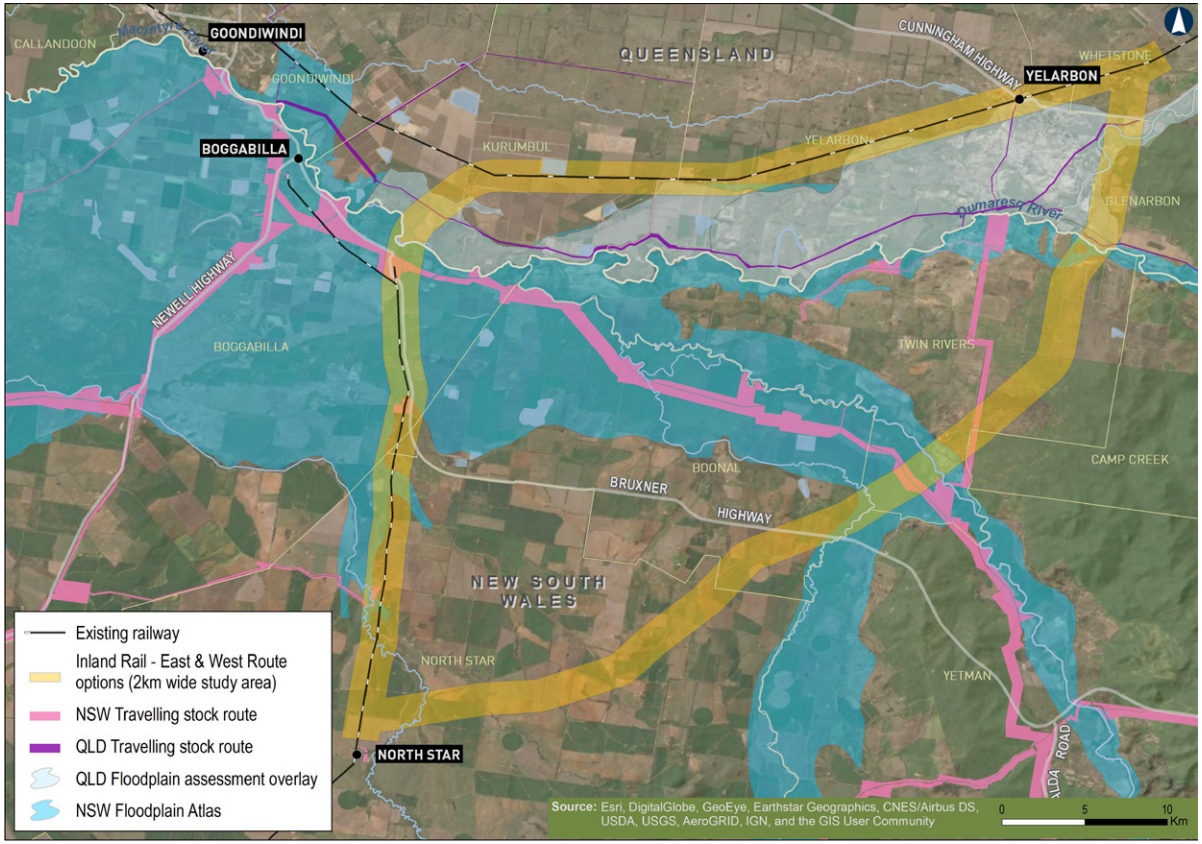


North Star to Border options 2010 IRAS

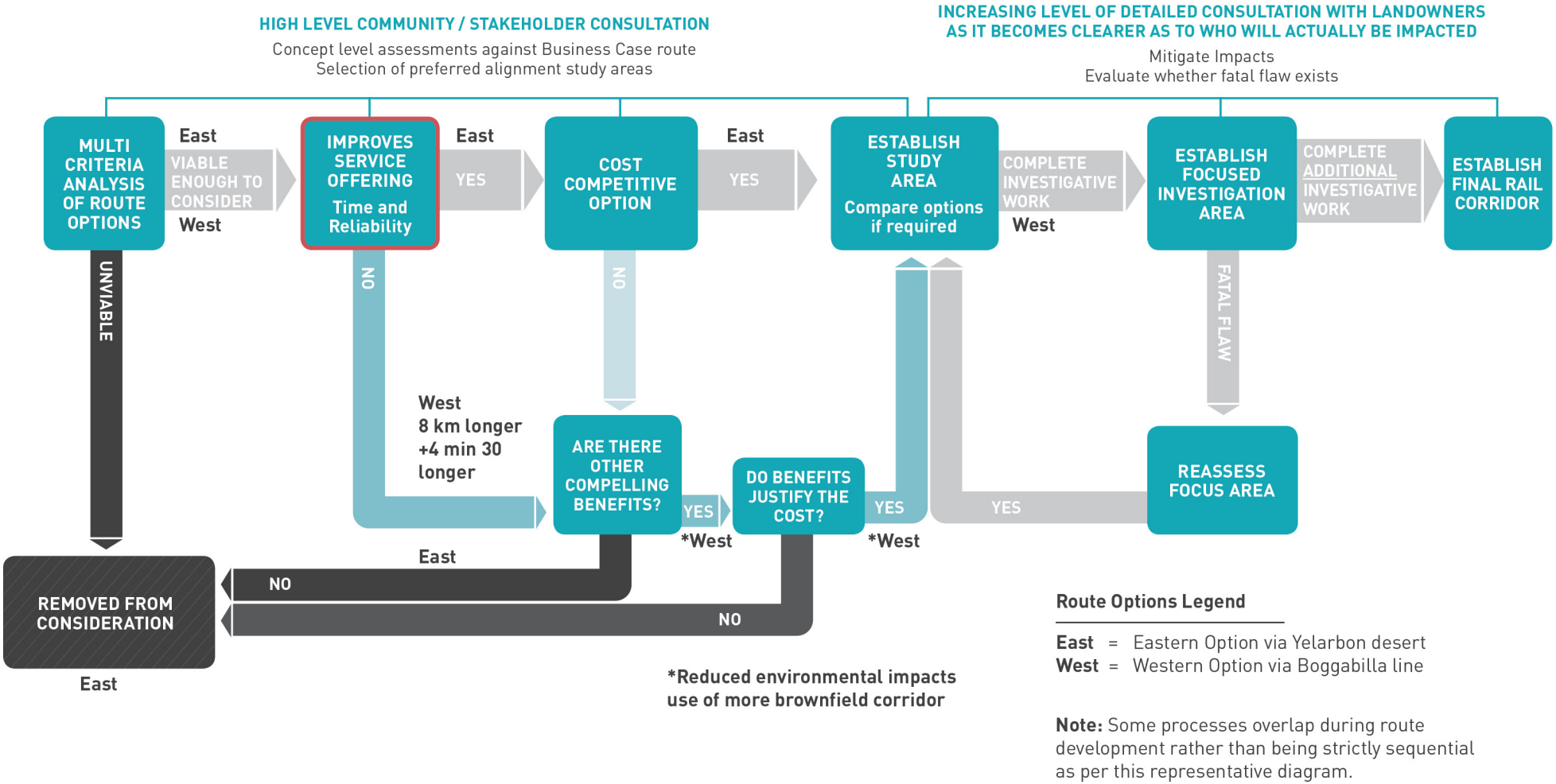
North Star to the NSW/QLD Border: East versus west route decision

Since 2015

- During 2015/16, both eastern and western options were progressed for the purposes of undertaking a more informed assessment of the two distinctly different route options.
- In order to determine a preferred route, all of the findings from the Feasibility Phase and subsequent and investigations were incorporated into an MCA assessment of the eastern vs western options.
- The western route was recommended as a result of this analysis (refer to the map on this page and the summary diagrams on pages 80-81).
- On 14 February 2017, the Australian Government announced that the western option was the preferred study area for Inland Rail.
- During that time, a widened 7km study area was retained for crossing the Macintyre River.
- The study for the Macintyre River crossing was further refined in an MCA workshop in May 2017.
- The western option potentially directly impacts 12 landowners with a sub-option impacting 11.
- Reference design, further technical work and community consultation continued during 2018 and 2019, particularly in relation to defining the optimum crossing of the Macintyre River, as an input to the Environmental Impact Statement (EIS) for the project.



North Star to the NSW/QLD Border: east versus west route options



Route Options Legend

East = Eastern Option via Yelarbon desert
West = Western Option via Boggabilla line

Note: Some processes overlap during route development rather than being strictly sequential as per this representative diagram.

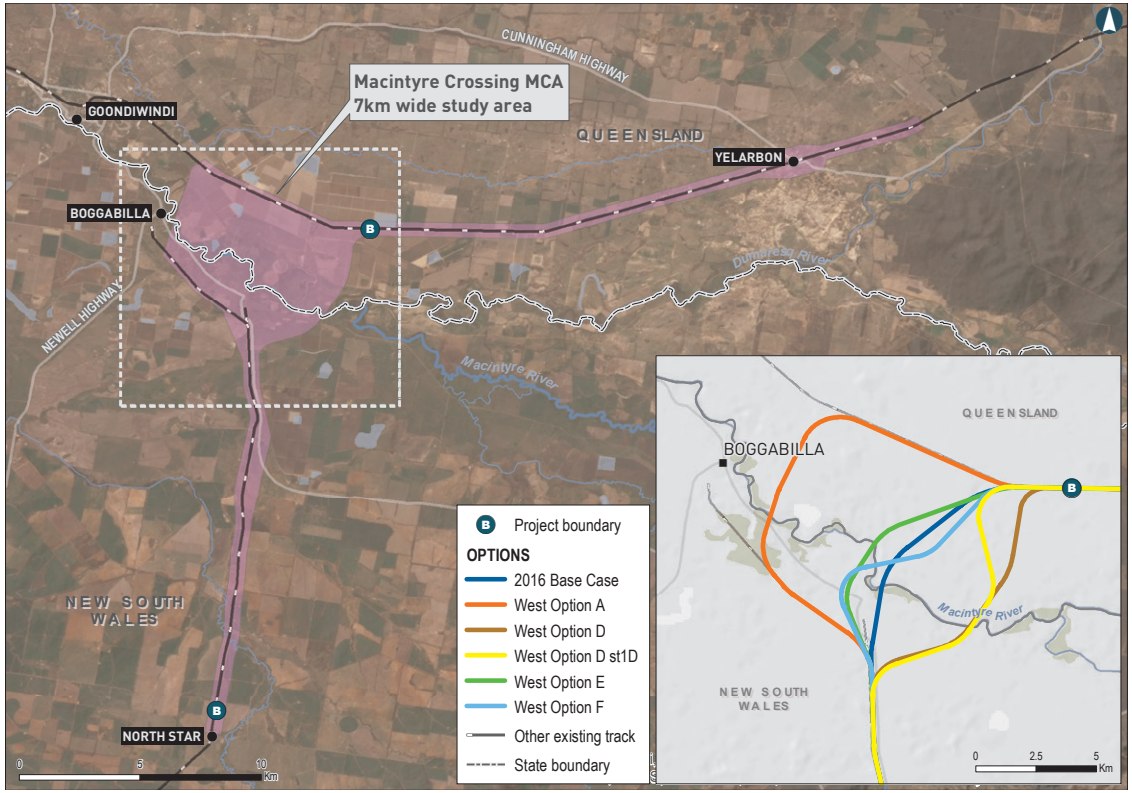
North Star to the NSW/QLD Border: east versus west route decision

	East (Base Case)		West	
Distance	65km		73km 8km longer	
Service Offering / Transit time	-		4m 26s longer	
MCA:				
Stakeholder/ community impact	Greater impact on greenfield stakeholders including compromising viability of organic certified business employing 40 people		Wide support for Western alignment	
Flooding	Similar for both options		Similar for both options	
Environmental	Multiple environmental impacts including crossing of Yelarbon desert		Reduced impacts on EPBC* and remnant vegetation, (104ha vs 133ha on eastern route) lower property impacts, reduced visual impact	
MCA Score	0		+1.2	
Construction Cost	$0m (for relativity)		+$29m/+6.5%	
Recommended				✓

- Favourable
- Neutral
- Unfavourable
- Highly unfavourable

*EPBC – Environmental Protection and Biodiversity Conservation Act 1999

North Star to the NSW/QLD Border western route refinement: 2017–2018



- On 14 February 2017, Federal Member for Parkes The Hon Mark Coulton MP announced, on behalf of the Minister for Infrastructure and Transport, that the western option would be adopted for this section of Inland Rail.
- Upon the announcement of the western option being announced as the study area, ARTC conducted further community consultation and additional engineering, flood modelling and environmental studies.
- The focus of these activities was centred on the complex Macintyre River crossing.
- These studies were progressed in order to identify a specific corridor across the Macintyre River and a route linking into the existing Queensland Rail South Western Rail Line.
- By November 2018, ARTC had completed the initial flood modelling of the Macintyre River floodplain, which also incorporates other rivers and catchments, and progressed design of structures to cross the floodplain with minimal impact on landowners. A 100m-wide focused area of investigation for the Macintyre crossing was identified as a key outcome of this work.
- Throughout 2019, ARTC Inland Rail has undertaken intensive engagement with local stakeholders to address concerns about the crossing of the Macintyre floodplain. As at November 2019, ARTC was continuing to work with local flood specialists and further refining the Macintyre flood model including taking into account new LiDAR data and reviewing costings for alternative crossing points.

NSW/QLD Border to Gowrie

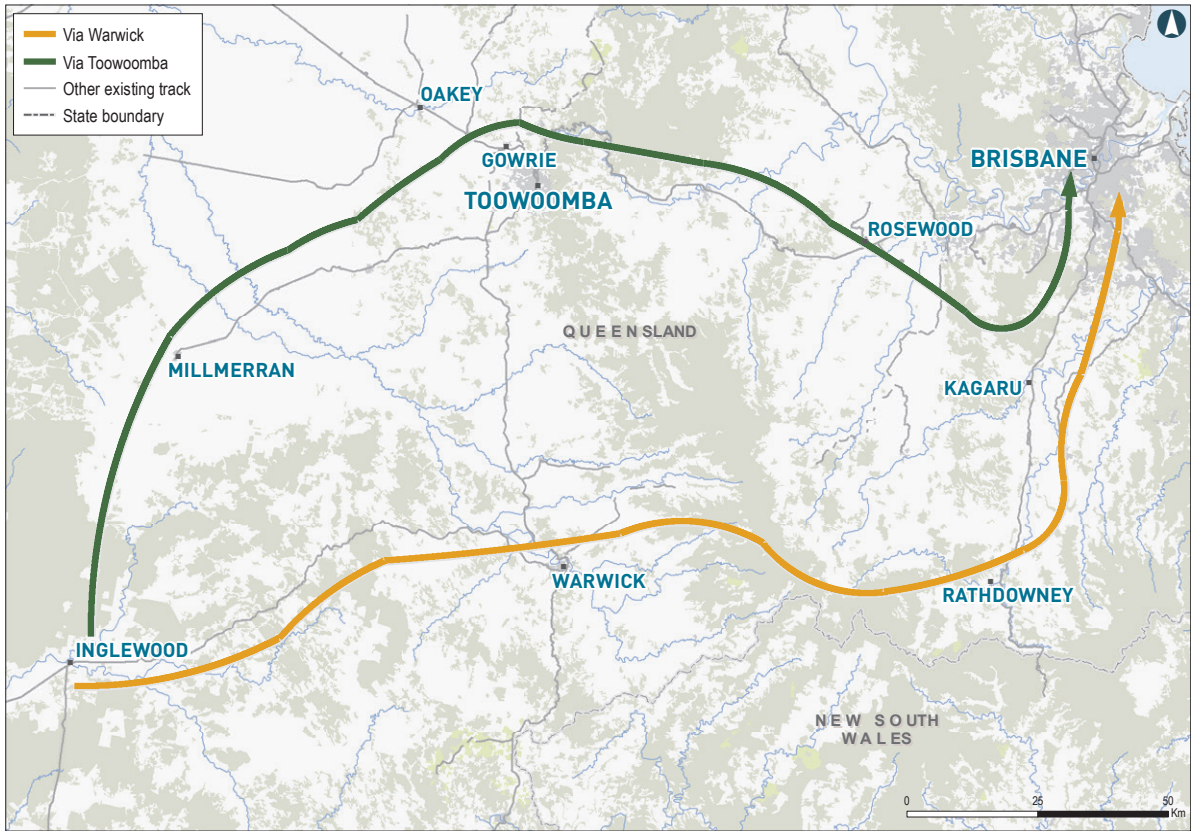
The 2006 North-South Corridor Study identified a wide area in South East Queensland as part of the Far Western Sub-Corridor, extending from Goondiwindi, and bounded by Toowoomba and Warwick, towards Brisbane.

2010 IRAS

- In the 2010 IRAS, two main route options were considered for Inland Rail in Queensland, one going to Brisbane via Toowoomba and the other via Warwick and Rathdowney. These are shown on the map on this page.
- While the option via Warwick provided some reduction in transit time, the route via Toowoomba had lower capital cost and significantly higher demand/revenue. The Toowoomba route was therefore preferred.
- Since the 2010 IRAS, it has also become evident that the Toowoomba option is better positioned to take advantage of economic growth opportunities (such as the developing Charlton-Wellcamp precinct and the InterlinkSQ intermodal development).

2015 IRIG

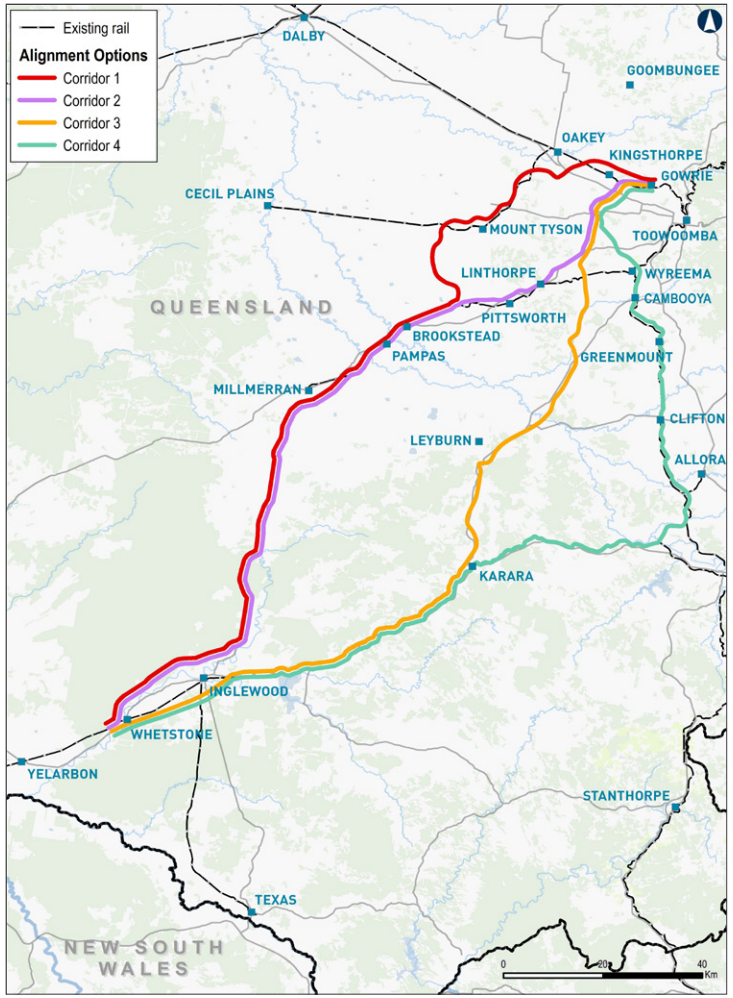
- The IRIG Report noted further hydrological and geotechnical assessments would be required between North Star and Toowoomba and could result in a final alignment to the east or west of the 2010 IRAS alignment.



Border to Brisbane Toowoomba vs Warwick Options 2010 IRAS

NSW/QLD border to Gowrie route options: 2016–2017

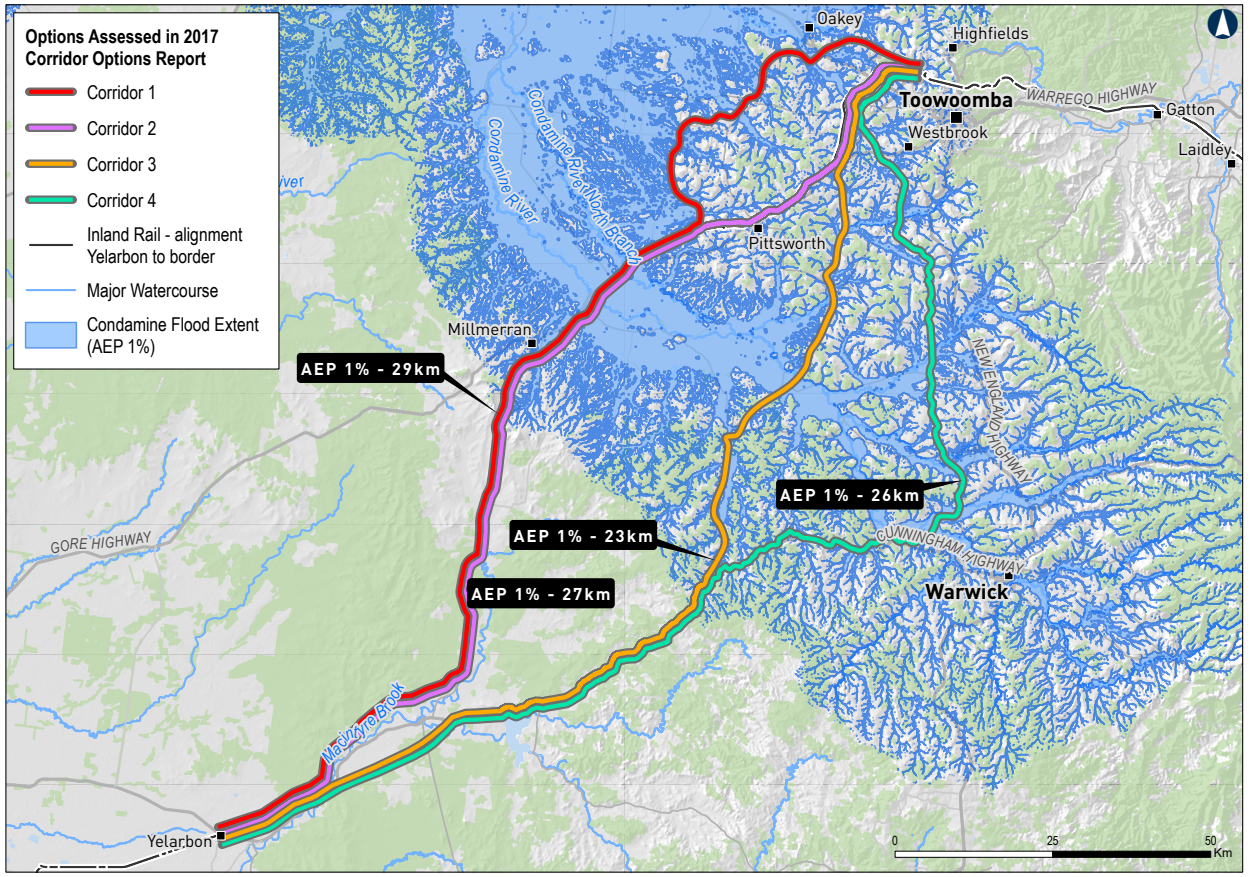
- Following on from the 2015 IRIG Report, ARTC continued iterative development of a route between Yelarbon and Toowoomba (known as the Base Case Modified route) that headed in a generally north-easterly direction via Millmerran, Brookstead and Mount Tyson until it joined the QR West Moreton Line near Kingsthorpe.
- In October 2016, the Australian Government announced there would be an assessment of alternative corridors in this section. The four options were:
  - **Corridor 1:** Base Case Modified from Yelarbon to Gowrie via Millmerran and Mt Tyson
  - **Corridor 2:** Base Case Modified with a deviation to pass close to Wellcamp and Charlton
  - **Corridor 3:** Yelarbon to Gowrie via Karara, Leyburn and Felton
  - **Corridor 4:** Yelarbon to Gowrie via Karara, Clifton and Wyreema and utilising the existing rail line close to Warwick.
- The alternative corridor assessment process was conducted by independent consultants Aurecon and AECOM and overseen by the Yelarbon to Gowrie Project Reference Group, consisting of community and industry representatives with an independent Chairman, Mr Bruce Wilson AM.
- The assessment compared the three alternative corridors against the Base Case Modified corridor on a like-for-like basis.
- The assessment work was summarised in the Corridor Options Report dated 21 April 2017 and made publicly available by the Australian Government and Inland Rail on 21 September 2017.



Border to Gowrie options 2016–17

The Condamine floodplain and the 2016–2017 route options

- A key component in the route option assessment was the crossing of the Condamine Floodplain and associated waterways. The assessment looked at the length of each route that traversed land that would be flooded in 1% Annual Exceedence Probability (AEP)* events and flooded in 10% AEP events.
- The assessment took into account the length of 1% AEP floodplain that each route was required to traverse. Corridor 2 and Corridor 3 were rated more favourably than the Base Case Modified route (Corridor 1) and Corridor 4. The results are set out on pages 100-101 of the 2017 Corridor Options Report.
- As with all sections of Inland Rail, the priority task is to design a rail line that is safe. In this section that also means a line that will not cause unacceptable flooding impacts to landowners.
- The challenge is to do this while meeting the need to find a route as flat and straight as possible (to achieve optimum transit times) and the need for the rail line to meet the performance specifications expected of Inland Rail (i.e. the 98% reliability target can be maintained even during floods).



Border to Gowrie options 2016–17 – length of 1% AEP floodplain crossed (total km)

* A flood with a 1% AEP has a one in a hundred chance of being exceeded in any year. Currently, the 1% AEP event is designated as having an 'acceptable' risk for planning purposes nearly everywhere in Australia. Cited in *Understanding Floods*, Office of the Queensland Chief Scientist

Evolution of ARTC reference design for crossing of the Condamine floodplain

In early 2018 the Australian Government determined that ARTC should undertake as a priority task the development of a flood model and preliminary design solution for crossing the Condamine floodplain.

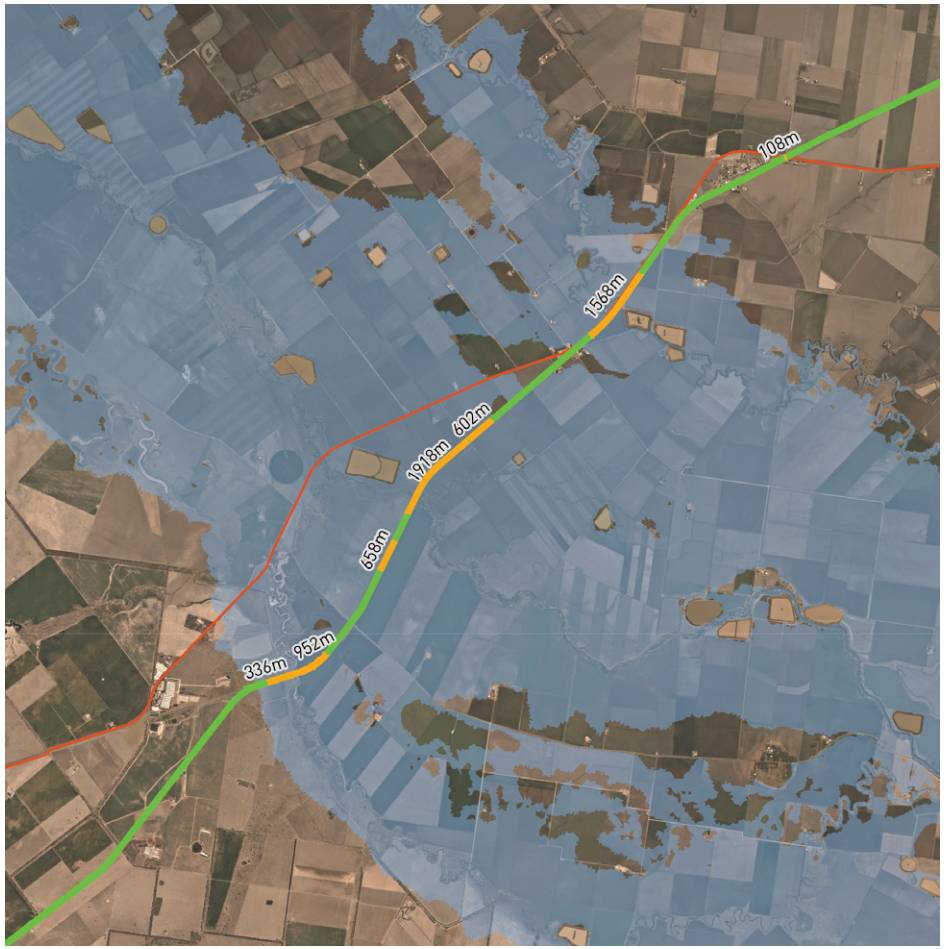
Since that time significant work has been undertaken by ARTC's appointed technical advisors to develop the flood model and crossing design in consultation with landowners and other key stakeholders.

- The Southern Darling Downs Community Consultative Committee appointed Dr John Macintosh (Water Solutions) to provide an independent review of the flood modelling and impacts. ARTC assisted with this independent review by providing technical data and funding.
- The Millmerran Rail Group and a Millmerran landowner appointed their own technical consultant, Dr Sharmil Markar, to conduct an independent review of the flood model and design, which ARTC has been supporting.
- The 100% Reference Design for the Condamine crossing is complete, and includes six bridges/ viaducts with a total length of 6.1km together with circa 500 culverts (900mm – 2.1m in diameter). Comparison to previous indicative structure solutions is set out in the Table below.

Year	Design Solutions
2016	▸ Phase 1 concept design ▸ 3 Bridges ▸ 1.8km total bridge length ▸ 900 culverts
Oct / Nov 2018	▸ Preliminary crossing design ▸ 5 bridges ▸ 5.7km total bridge length ▸ 540 culverts
Sept 2019	▸ Proposed crossing design ▸ 6 bridges (4 locations) ▸ 6.1km total bridge length ▸ 500 culverts

Evolution of ARTC reference design for crossing of the Condamine floodplain

- The 100% Reference Design for the Condamine crossing is represented in the accompanying map illustrating the approximate location of the bridges and embankments.
- As at December 2019, ARTC included the Reference Design for the Condamine Crossing in the draft project Environmental Impact Statement (EIS) submitted to the Office of the Coordinator-General. It is anticipated that the draft EIS will be exhibited for public comment in the first half of 2020.



Legend

- Gore Highway
- Rail on embankments with culverts
- Rail on bridges
- Floodplan at 1% AEP

Diagrammatic representation of current Inland Rail Reference Design for crossing of the Condamine floodplain

NSW/QLD border to Gowrie route options: 2016–2017

2017 Corridor Options Report – Yelarbon to Gowrie

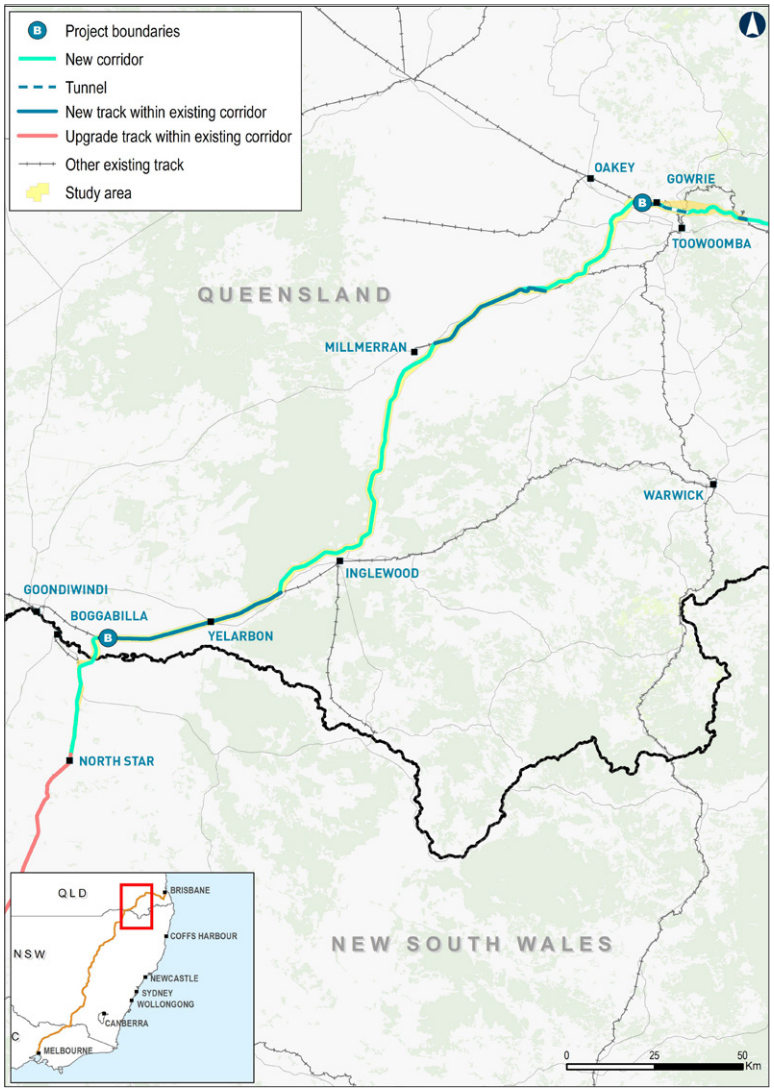
- The assessment work included the results from a Multi-Criteria Analysis (MCA) conducted across the four corridor options comparing each against technical, environmental and socio-economic criteria. This work was overseen by an independent Project Reference Group and independent Chair Mr Bruce Wilson AM.
- The inputs into the MCA are detailed in Chapter 7 of the 2017 Corridor Options Report and the MCA scores are detailed in Appendix Q to the report.
- Each corridor option also underwent an independent construction capital cost estimate, and was assessed against the Inland Rail Service Offering, incorporating rail transit times, reliability and safety.

	Corridor 1 Base Case Modified		Corridor 2 Wellcamp-Charlton		Corridor 3 Karara, Leyburn & Felton		Corridor 4 Warwick	
Distance	181km		168km 13km shorter		172km 9km shorter		208km 27km longer	
Service Offering / Transit time (northbound)	129min		125 min 4 min saving		135 min 6 min longer		154 min 24 min longer	
No. of agricultural properties on alignment	242		203		156		219	
No. of residences on alignment	35		42		69		170	
MCA Technical Score	0		–0.126		–0.417		–1.815	
MCA Non-technical Score	0		–0.156		+0.906		–1.22	
Overall MCA Score	0		-0.283		+0.490		–3.03	
Construction Cost	$0m (for relativity)		+$102m		+$285m		+$415m	
Strategic factors:								
Avoidance of constructing in an operational rail line and congested area at Kingsthorpe								
Tap into strategic potential of Wellcamp-Charlton								
Recommended				✓				

Favourable
Neutral
Unfavourable
Highly unfavourable

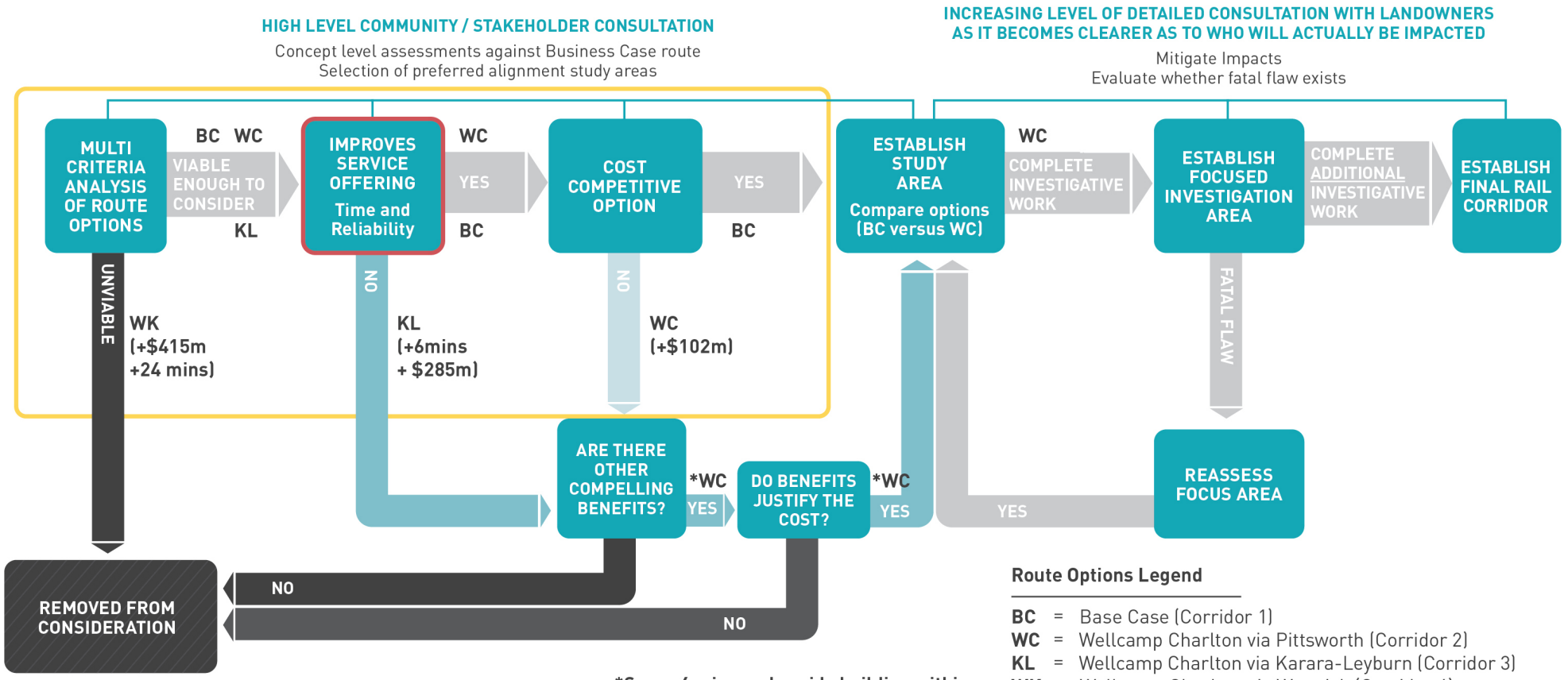
NSW/QLD Border to Gowrie: 2017–2019

- On 21 September 2017, the Minister for Infrastructure & Transport, The Hon Darren Chester, confirmed the study area for the Border to Gowrie project section.
- The majority of the study area route (146km) is greenfield while 78km of the 224km project, including the section crossing the Condamine floodplain, lies within existing Queensland Rail corridors.
- The Australian Government's decision on the study area took into account the results of the Corridor Options Report, ARTC's recommendations, and the report from the Chairman of the Yelarbon to Gowrie Project Reference Group, Mr Bruce Wilson AM.
- The study area is generally 2km wide along the route from within which a final rail corridor will be located, based upon engineering design, geotechnical investigations and discussions with landowners. The rail corridor will be approximately 40m wide and in some places up to 65m wide.
- In December 2017, the Australian Government tasked ARTC with prioritising development of a flood model for the Condamine floodplain upon which it could base its design for crossing the floodplain.
- On 26 March 2018, the Queensland Coordinator-General declared the Border to Gowrie project to be a "coordinated project" requiring formal approval of an Environmental Impact Statement (EIS).
- The focused area of investigation for the Border to Gowrie project, including the draft design for Condamine floodplain crossing, was released in November 2018. This was followed by further intensive consultation with the community and their nominated independent expert modellers to calibrate the model and include specific local knowledge into the modelling process
- The preferred 40 to 60 metre rail corridor was announced at the Darling Downs and Southern Darling Downs Community Consultative Committees in September 2019.
- A preferred rail corridor will be incorporated into the project Environmental Impact Statement.



B2G Study Area

NSW/QLD Border to Gowrie corridor options assessment 2017



Route Options Legend

BC = Base Case (Corridor 1)
WC = Wellcamp Charlton via Pittsworth (Corridor 2)
KL = Wellcamp Charlton via Karara-Leyburn (Corridor 3)
WK = Wellcamp Charlton via Warwick (Corridor 4)

Note: This analysis work was undertaken independently of ARTC by AECOM and Aurecon as part of the April 2017 Corridor Options Report

***Saves 4 mins and avoids building within the narrow and constrained operational rail corridor at Kingsthorpe and provides access to new intermodal facilities in the Toowoomba areas.**

Note: Some processes overlap during route development rather than being strictly sequential as per this representative diagram.


Inland Rail project
route selection
summaries
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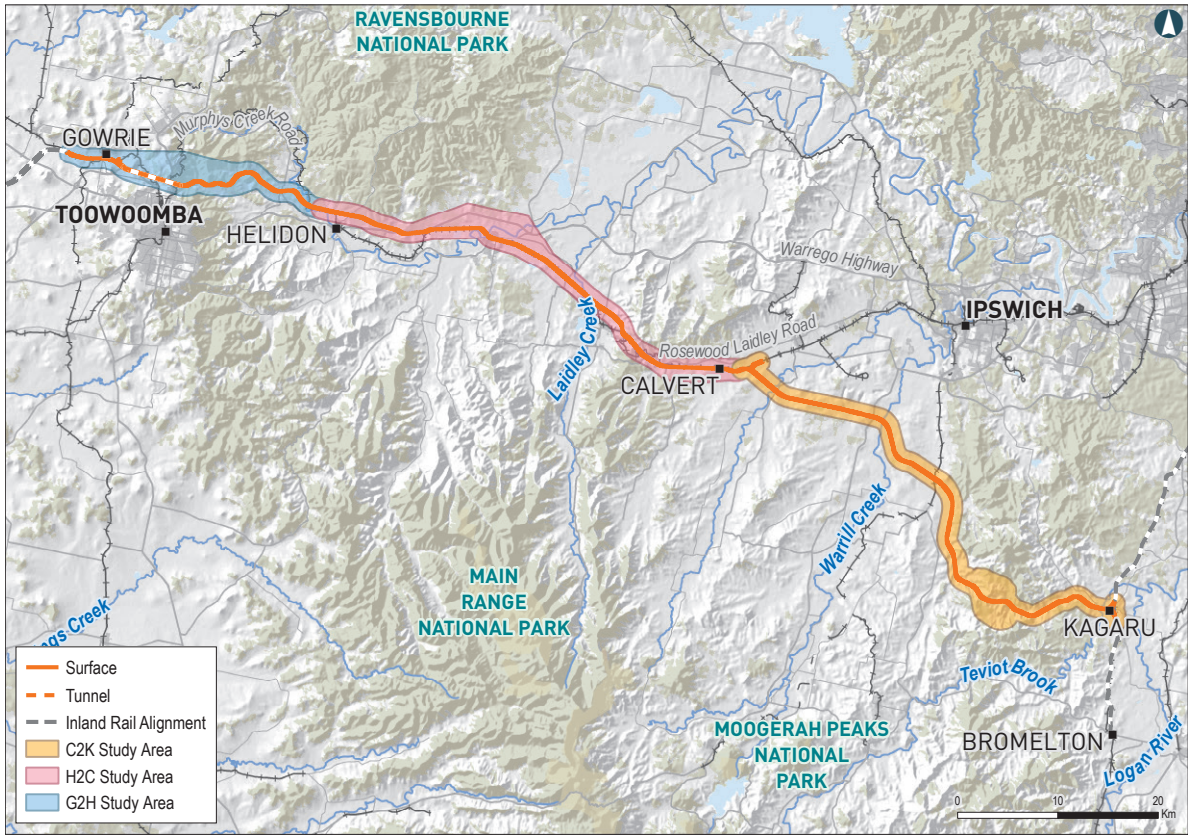
Gowrie to
Kagaru
Gatton, Queensland

Gowrie to Helidon, Helidon to Calvert and Calvert to Kagaru

In May 2017, the Australian Government announced that the three Inland Rail projects between Gowrie and Kagaru would be delivered through the Public Private Partnership (PPP). The decision followed a market testing process led by the Department of Finance during 2016 and 2017 regarding the appropriate delivery mechanism for Inland Rail.

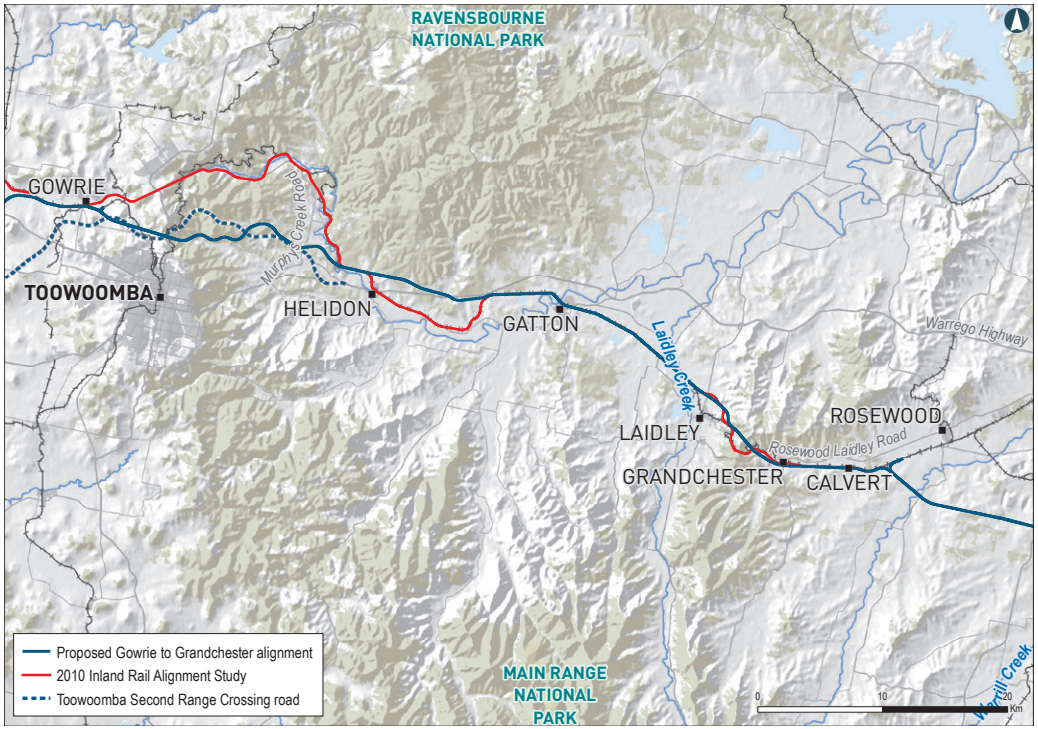
- The three Gowrie to Kagaru projects follow two corridors already protected by the Queensland Government – the Gowrie to Grandchester protected rail corridor and the Southern Freight Rail Corridor.
- The route for these sections dates back to studies facilitated by the Queensland Government in the 2000–2010 period.
- Separate studies were undertaken by the Queensland Government in the Gowrie to Calvert section and the Calvert to Kagaru section, and these are addressed separately on the following pages.
- The three sections from Gowrie to Kagaru are scoped as separate projects in ARTC's work breakdown structure, which was linked to the original ARTC Inland Rail procurement strategy.



Gowrie to Helidon and Helidon to Calvert: 2003–2015

2003 Queensland Transport (QT) study – Gowrie to Grandchester (west of Calvert)

- In 2003 Queensland Transport undertook a study for a proposed high speed (160km/h) rail alignment between Gowrie and Grandchester through the Toowoomba Range.
- On completion of the study, this corridor was gazetted by the Queensland Government.



Toowoomba and Little Liverpool Range options considered by IRIG, 2015. The Gowrie to Grandchester option (blue) which had been reserved by the Queensland Government since 2003, was adopted for Inland Rail

2010 IRAS

- The technical consultants for the 2010 IRAS identified a different alignment between Gowrie and Grandchester that was considered to be adequate for Inland Rail's freight requirement.

2015 IRIG

- One of IRIG's tasks was to determine which of the two alignments through the Toowoomba and Little Liverpool Ranges (QT 2003 or 2010 IRAS) should be adopted for Inland Rail.
- To support this process, the Queensland Department of Transport and Main Roads undertook substantial comparative analysis of the two corridors which was reviewed by ARTC.
- It was concluded that while the QT alignment was superior on non-cost criteria (flood immunity, social/community impacts, and impacts on Queensland Rail operations), it was difficult to differentiate between the two options on capital cost.
- The existence of a gazetted and partially acquired corridor for the QT option was also an important consideration.
- IRIG adopted the protected QT 2003 alignment as the recommended corridor through the Toowoomba and Little Liverpool Ranges.

Calvert to Kagaru: 2010–2019

2010 TMR Southern Freight Rail Corridor

- Prior to the completion of the 2010 IRAS, the Queensland Department of Transport and Main Roads (TMR) had concluded a study for a new freight line from Calvert to Kagaru, termed the Southern Freight Rail Corridor (SFRC). The corridor identified by the study was subsequently gazetted by the Queensland Government.

2010 IRAS

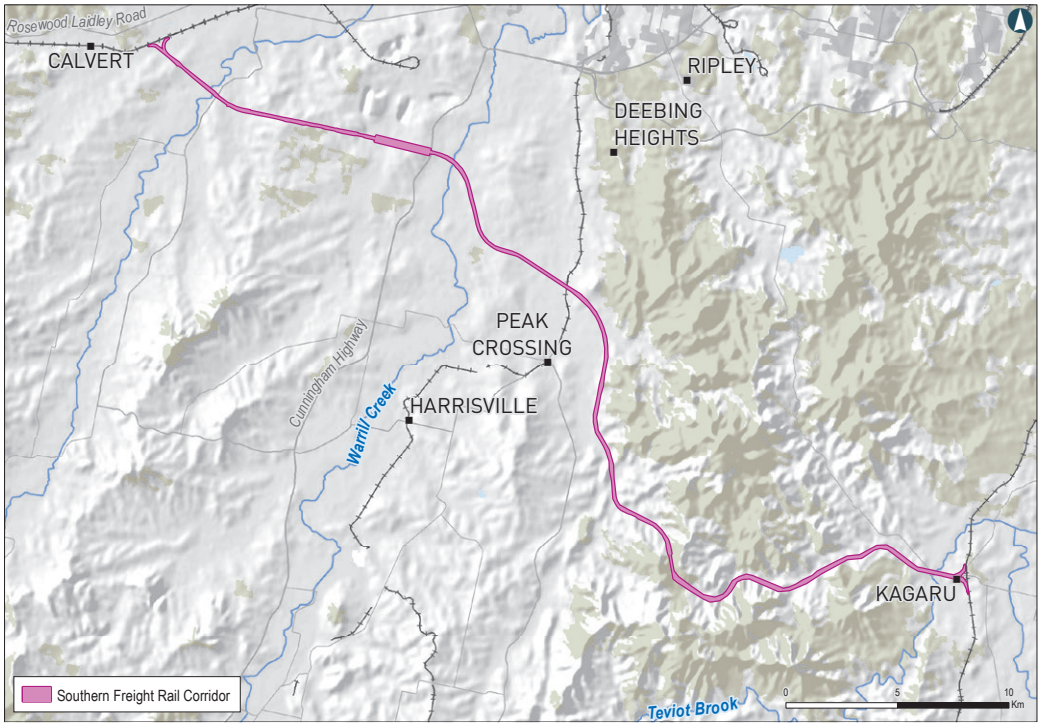
- The 2010 IRAS recommended the SFRC alignment be adopted for the Calvert to Kagaru section of Inland Rail.

2015 IRIG

- The 2015 IRIG adopted the 2010 IRAS recommended route in the Calvert to Kagaru section (i.e. the Queensland Government's gazetted SFRC corridor).

Queensland Government position

- In early 2016, the Queensland Government advised that its preferred strategic alignment for Inland Rail in this area is the Gowrie to Grandchester alignment preserved in 2003 and the SFRC preserved in 2010.
- As at December 2019, that remained the position of the Queensland Government.



Queensland Government Southern Freight Rail Corridor – adopted for the C2K project

Further route refinement – Gowrie to Helidon and Calvert to Kagaru

- Further route refinement is continuing for the Gowrie to Helidon and Calvert to Kagaru projects as reference design activities continue.
- This process has identified some localised variations to the alignment that will be finalised through the Environmental Impact Statement process and may require amendment to the existing gazetted corridors.

Inland Rail project route selection summaries

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Kagaru to Acacia Ridge and Bromelton

Kagaru, Queensland

Kagaru to Acacia Ridge and Bromelton: 2006–2017

As with the Melbourne to Albury and Albury to Illabo projects, this section is an existing main line requiring enhancement to accommodate double-stacked trains and construction of crossing loops to allow trains to pass safely.

- At Acacia Ridge, Inland Rail will connect with the Queensland Rail network, including an existing dual gauge connection to the Port of Brisbane.

2006 North-South Corridor Study

- The 2006 Study assumed that Acacia Ridge would remain the interstate intermodal terminal in the medium term and implicitly assumed that the entry to Brisbane for Inland Rail would be via the existing interstate railway from the south.

2010 IRAS

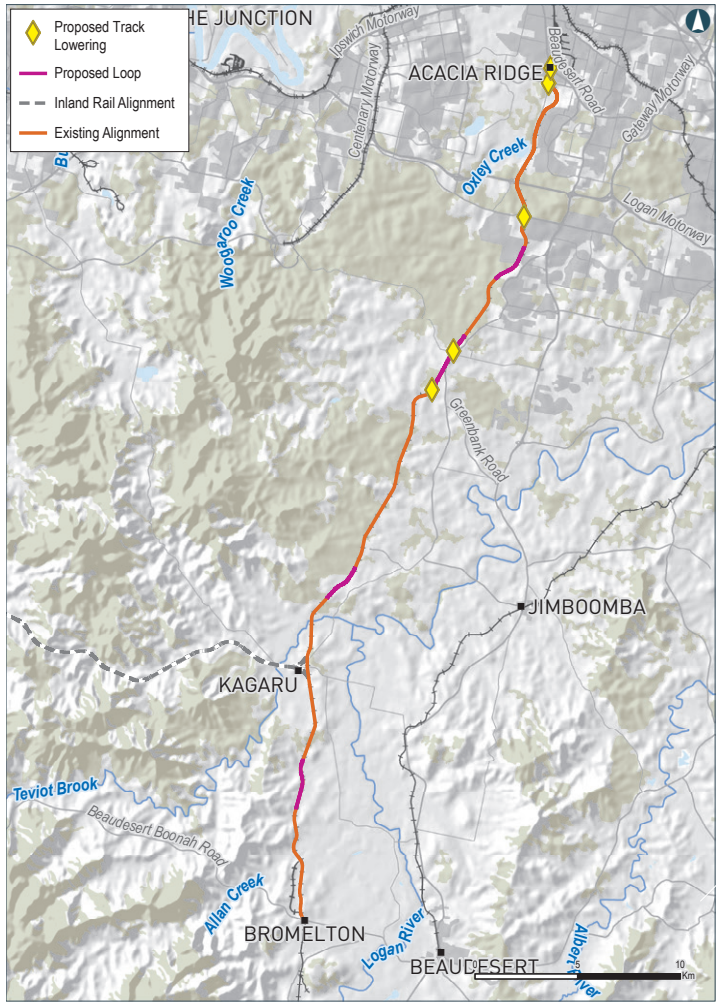
- The adoption of the SFRC for Inland Rail, which connects to the interstate railway at Kagaru, effectively determined the use of the Kagaru-Acacia Ridge line as the entry to Brisbane for Inland Rail.
- At the time of the 2010 IRAS, Acacia Ridge was Brisbane's only intermodal freight terminal on the standard gauge railway. In planning Inland Rail, it was always recognised that trains utilising Inland Rail and needing to go to the Port of Brisbane would be able to do so via the existing dual guage rail connection between Acacia Ridge and the port.

2015 IRIG

- The 2015 IRIG adopted the 2010 IRAS recommended route.

2017: extension to Bromelton

- In January 2017 a new terminal was established by SCT Logistics at Bromelton, south of Kagaru, that forms the northern terminal for SCT's rail services between Victoria and Queensland.
- There is a large industrial development precinct at Bromelton including other sites that also have potential for intermodal terminal development. ARTC owns land at Bromelton.
- The scope of Inland Rail was formally amended in 2017 to include the extension to Bromelton, along the existing ARTC Sydney-Brisbane line.



Map showing connection of Inland Rail to the existing Sydney-Brisbane interstate line at Kagaru

Appendices

A01 N2N Route Option Analysis: economic cost of going via Coonamble

A02 N2N Route Option Analysis: analysis of freight volumes on the Coonamble line

A03 Analysis of potential freight savings from upgrading the Coonamble line

A04 Glossary of terms

A05 Publicly available reports referenced throughout this document

Appendix 1 – N2N Route Option Analysis: economic cost of going via Coonamble

Even relatively small increases in transit time and distance translate into significant economic disbenefit:

- In July 2018, an alternative route for the Narromine to Narrabri (N2N) section of Inland Rail via the Coonamble line was proposed, as an alternative to the 2017 Inland Rail route that runs on a direct alignment from Curban to near Baradine.
- ARTC analysis of the proposed route via Coonamble indicated it would add 24 minutes in transit time and 39 kilometres in distance relative to the 2017 Inland Rail route.
- This and the following page set out the cost impact of this additional 39km over the likely first 55 years of Inland Rail operations.
- A comparative assessment of the proposed alternative route and the Inland Rail study area can be found in the document entitled "Responses by Inland Rail to questions provided by NSW Farmers, 24 October 2018" which is available at inlandrail.artc.com.au/N2N/documents

Assessment of proposed alternative route via Coonamble:

- ARTC undertook an assessment of the proposed alternative route using a benefit-cost approach to examine the incremental capital costs versus the direct economic benefits or disbenefits of the change in scope to Inland Rail.
- In relation to benefits and disbenefits, the methodology estimates the direct economic impacts on a range of factors:
  - Capital cost: The additional capital cost relative to the 2017 Inland Rail Concept Alignment was estimated at $56 million.
  - Rail freight operating costs: Changes in transit time and route distance have a direct impact across a broad range of cost factors:
    - Train crewing costs – directly affected by transit time
    - Fuel consumption – influenced by both distance and transit time
    - Locomotive and wagon maintenance
    - Locomotive and wagon utilisation (capital) – slower transit times reduce rolling stock utilisation and require a larger fleet to carry the same amount of freight
    - Track maintenance and network operations – a function of distance and train tonnage.
- Value of time' savings for freight users: This relates to the value placed by freight customers on having time sensitive freight delivered earlier than delivery times offered by alternative options. Lower transit times generates value within the relevant supply chain of decreased cost (e.g. through lower inventory requirements) and increased willingness by customers to pay for an earlier delivery.
- In relation to freight operating costs and 'value of time' impacts, these are variously determined by the increase in distance or transit time, as shown in the table below. Fuel consumption is predominantly determined by distance but also has a time-related component.

Factor	Driven by	
	Distance	Transit Time
Train crewing		✓
Fuel consumption	✓	✓
Loco and wagon maintenance	✓	
Loco and wagon capital		
Track maintenance / network operations	✓	
Freight 'value of time'		✓

Appendix 1 – N2N Route Option Analysis: economic cost of going via Coonamble

- The methodology does not include 'externality' effects such as changes in safety (accident rates) or greenhouse gas emissions, although these are included in the broader Inland Rail Business Case on a whole of program basis.
- Unit rates used in the modelling are from ARTC's standard rail operating cost model used by ARTC for analysing above rail operations.
- 'Value of time' savings are derived using values from ARTC's demand modelling that are also used across the ARTC network.
- Unit rates are multiplied by the annual number of trains (consistent with the Inland Rail Business Case, including a transition from 1800 metre to 3600 metre trains after 2039-40) and the incremental change in either distance or time, as relevant to the specific factor. Present values of the future stream of benefits / disbenefits are calculated over an evaluation period to 2080 at a 4% discount rate, being the core discount rate in the 2015 Inland Rail Program Business Case.

Results

- The assessment estimated that the additional 39km in distance would produce an economic disbenefit of approximately $450m relative to the 2017 Inland Rail Concept Alignment, over an evaluation period to 2080 (Present Value at a 4% discount rate, being the core discount rate in the 2015 Inland Rail Program Business Case). This represents a benefit cost ratio of -8.2 meaning there is an economic loss of more than 8 times the value of the investment in construction.
- Disaggregated results are below:

Item	Present Value $m
Capital cost	56.14
Benefits (disbenefits)	
Freight operating cost increases	
Train crewing	-6.7
Fuel	-102.9
Locomotive and wagon maintenance	-30.5
Locomotive and wagon capital	-5.5
Track maintenance / network operations	-157.8
Subtotal	*-302.3*
Freight value of time impacts	**-99.3**
Total benefits (disbenefits)	**-401.7**
Net present value	**-457.8**
Benefit Cost Ratio	**-8.2**

Appendix 2 – Analysis of freight volumes on the Coonamble line

The purpose of this brief section is to demonstrate that upgrading of the existing line is both more cost effective and delivers the benefits that would be achieved by routing Inland Rail via or close to Coonamble without incurring the $450 million economic disbenefit of doing so

It has been suggested that the volume of grain and other freight moved on the Coonamble line warrants Inland Rail following the existing Coonamble line, particularly as doing so would result in (potentially significant) freight cost savings to farmers and others in the region.

Coonamble line: current status and use

- The Coonamble-Dubbo rail line is part of the New South Wales Country Regional Rail Network. The Country Regional Network (CRN) is owned by Transport for NSW and is operated and maintained by rail infrastructure manager, John Holland Rail (JHR), under a 10-year contract that commenced in January 2012.
- Currently the Coonamble line is used by trains on a seasonal basis to transport grain.
- As at December 2019, the 2018 map of the Country Regional Network Capability available on the John Holland Rail website showed that the Coonamble line had a capability of 20.25TAL (meaning it could cater for trains with loads equating to 20.25 tonnes per axle load). However, ARTC understands that the rail on the line is 50 - 53kg/metre rail, which is suitable for 25TAL trains subject to the load bearings of any bridges and culverts.
- The New South Wales Government, through Transport for NSW, in 2017 also completed a $20.3 million upgrade program to the Coonamble -Dubbo line that replaced 66,000 life-expired timber sleepers with modern, long-life steel sleepers, provided an additional 17,000 tonnes of ballast and resurfaced 95 kilometres of track.

Grain freight and number of trains

- ARTC undertook an analysis of utilisation of the Coonamble line in the period 01 January 2015 through to 31 December 2019. The analysis included examining loaded grain tonnages on a quarterly basis aligning with grain harvest seasons. In examining the figures in the accompanying Table on the following page, it should be borne in mind that the figures are loaded gross tonnes which includes the weight of wagons.
- The ARTC analysis shows that bulk grain movements in the five quarters from 01 July 2016 to 30 September 2017 totalled 437,804 loaded gross tonnes. This represents 51% of the total loaded gross tonnes moved along the Coonamble line in five years (20 quarters).
- In terms of numbers of trains loaded at Coonamble, the Table also shows there were an average of two trains per week over the five years CY2015 to CY2019, inclusive of both bulk and containerised traffic.
- There have been major year-to-year fluctuations reflecting the variations in harvest volumes, from a maximum of 4.5 trains per week during the bumper 2017 year to only a handful of trains during CY2019.

Appendix 2 – Analysis of freight volumes on the Coonamble line

Bulk Grain Tonnages Coonamble (including Gular and Armatree) - interfacing to the ARTC network at Troy Junction	
01 January 2015 – 31 December 2019	
	Loaded Gross Tonnes ('000s)
Domestic (direct)	483
Staged via Sub-terminal or regional location (may proceed to Domestic or Export)	207
Export (direct to Port)	166
TOTAL	**856**
Annual Average (over 5 years)	171

Number of Trains ex Coonamble				
Calendar Year	Bulk	Containerised	Total	Average per week
2015	11	77	88	1.7
2016	70	59	129	2.5
2017	163	70	233	4.5
2018	24	29	53	1.0
2019	6		6	0.1
Total	**274**	**235**	**509**	
Annual average	55	47	102	2.0

Appendix 3 – Analysis of potential freight savings from upgrading the Coonamble line

Upgrading the Coonamble line to 25 tonne axle load (TAL) offers the potential for reduced train operating costs which could potentially be passed on in reduced freight rates.

- In a media release on 29 October 2019, the Deputy Prime Minister called for proposals for strategic business cases under the two-year Inland Rail Interface Improvement Program. One such business case that the Government has announced under the Program is an investigation of an upgrade to the Gilgandra-Coonamble line. The analysis in this route history document is separate to that business case.
- ARTC has modeled the potential impact on train operating costs (and potential freight rates) of the Coonamble line being upgraded to 25 TAL (the Inland Rail standard) compared with the current stated capability of 20.25 TAL.
- The ARTC modeling shows the following potential savings per tonne. However, it must be noted that these results are from ARTC modeling based on certain assumptions as set out below and may not replicate real world freight rate impacts. They do, however, provide a useful guide.
- The following factors should be noted in respect of potential per tonne savings which are indicated in the table on page 103:
    - small trains have a higher dollar per tonne cost structure to begin with, so there is greater potential for savings given the higher initial cost base
    - In the case of Coonamble to Newcastle services, increasing train length from current (typically circa 700 metres) to 1300 metres will involve additional locomotive requirements, which diminishes the cost savings
    - services to Manildra are currently heavily length restricted because of yard / siding constraints at Manildra, such that the typical train length is circa 370 metres.
- The analysis in the table on the following page demonstrates that the potential benefit in terms of reduced per tonne freight rates for grain growers who load grain trains at Coonamble lies in the Coonamble-Dubbo line being 25 TAL capable, hence offering potential operating cost savings that in theory may be passed on to growers. It is possible that the cost of production inputs, such as fertiliser, may also be reduced although this was not modelled by ARTC.
- Inland Rail will not make a material difference to the distance traveled by freight trains from Coonamble to various destinations, whether it be Manildra, Sydney or Newcastle. However, if Inland Rail were to go via Coonamble, trains headed north to Brisbane or south to Melbourne would be required to take an extra 24 minutes as Coonamble lies west of the more direct route required for Inland Rail.
- As such, the greatest benefit to grain growers remains likely to be realised from upgrading of the Coonamble line to a 25 TAL capability rather than to full Inland Rail specifications.

Appendix 3 – Analysis of potential freight savings from upgrading the Coonamble line

	Coonamble - Newcastle	Coonamble - Newcastle	Coonamble - Newcastle (longer trains)	Coonamble - Newcastle (longer trains)	Coonamble - Manildra	Coonamble - Manildra
Locomotives	20.25 TAL	25 TAL	20.25 TAL	25 TAL	20.25 TAL	25 TAL
Length Limit	700m	700m	1300m	1300m	380m	380m
One-way distance	478km	478km	478km	478km	355km	355km
Annual round-trip services	61	61	61	61	61	61
Train Length	659m	656m	1131m	1190m	359m	365m
Freight cost $ per tonne excl wagon capital	$23.16	$19.72	$18.93	$16.84	$29.20	$23.79
Potential $ savings per tonne at 25TAL		**$3.44 (14.9%)**		**$2.09 (11%)**		**$5.41 (18.5%)**

Appendix 4 – Glossary of terms

BILATERAL AGREEMENT:
An agreement between the Australian Government and a state government providing consent for ARTC to deliver Inland Rail in that state. Bilateral Agreements have been signed with the State Governments of Victoria, New South Wales and Queensland.

BROWNFIELD:
A project or section whereby development and delivery is substantially, if not all, within an existing rail corridor.

CO-ORDINATED PROJECT:
Declaration of a section of Inland Rail as a co-ordinated project is a step in the Queensland Government's approval process, leading to the specification of requirements for an Environmental Impact Statement.

DIRD:
Department of Infrastructure and Regional Development (as at late 2019, the Department of Infrastructure, Transport, Cities and Regional Development).

ENHANCEMENT:
Works undertaken to allow an existing section of main line railway to accommodate double-stacked container trains, by increasing vertical and horizontal clearances. Improvements such as additional loops to allow trains to pass, may also be provided.

EIS:
Environmental Impact Statement, a document required for formal project planning and environmental assessment by State and Federal Governments.

REFERENCE DESIGN:
Drawings and technical specifications for the infrastructure required to deliver the ARTC Inland Rail program which informs approvals processes, land acquisition and detailed design. 'Reference Design' is sometimes used in this context but Feasibility Design is the preferred term.

GREENFIELD:
Term used to refer to railway construction on a new route or alignment. This includes construction of new track within a protected or gazetted rail corridor.

IRAS:
Inland Rail Alignment Study: Completed in 2010, this is sometimes referred to as the 2010 Study.

MCA:
Multi-Criteria Analysis.

Appendix 4 – Glossary of terms

MTPA:
Million tonnes per annum.

PROGRAM/PROJECT/SECTION:
The word Program applies to the entirety of Inland Rail from Melbourne to Brisbane. The Program is divided into a number of projects or sections, for example from Tottenham (Melbourne) to Albury, Albury to Illabo and so on. A list of the projects and the acronyms used to identify them
is on page 5.

SERVICE OFFERING:
The service offering sets out Inland Rail's performance specification in terms of reliability, price, transit time and availability. Refer to page 13.

STATE SIGNIFICANT INFRASTRUCTURE (SSI):
The NSW Government has identified certain types of development that are SSI; Inland Rail falls into this category. ARTC Inland Rail can elect whether to make an SSI application for each project in New South Wales. The NSW Department of Planning and Environment has prepared standard Secretary's Environmental Assessment Requirements (SEARs) for critical state significant infrastructure projects in consultation with other government agencies.
See planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/State-Significant-Infrastructure

STUDY AREA/FOCUS AREA/RAIL CORRIDOR:
Following the Inland Rail Implementation Group's report in 2015 which endorsed a Base Case route generally following the alignment identified in the 2010 IRAS. The process of route and alignment refinement involves first, initial technical studies and stakeholder consultation to define a **study area** generally between 2km and 5km wide. This has generally then led to then further studies and consultation to refine the alignment to a **focused area of investigation** typically 100–400 metres wide. Lastly there will be further refinement to a final rail corridor 40–65 metres wide. The final **rail corridor** is subject to state planning approval processes.

UPGRADE:
Works undertaken to bring an existing section of railway, typically a secondary route, to Inland Rail's mainline standard through the installation of new ballast, sleepers and rail.

Appendix 5 – Publicly available reports referenced throughout this document

2006 North-South Rail Corridor Study Report
https://investment.infrastructure.gov.au/files/north_south_rail_corridor_study/executive_report.pdf

2010 Inland Rail Alignment Study (IRAS) Report
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/a357833a263428a41eb13dfa70e9e638c33b4a1c/documents/attachments/000/029/853/original/IRAS_2010_(1).pdf?1448784942

2015 Inland Rail Implementation Group (IRIG) Report
https://www.inlandrail.gov.au/sites/default/files/documents/inland-rail-implementation-group-report_0915.pdf

2015 ARTC Inland Rail Program Business Case
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/5de589db79424a8f1344e2e42e171fc205104b99/documents/attachments/000/029/855/original/InlandRailBusinessCase.pdf?1448785278

October 2016 Narromine to Narrabri MCA workshop report
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/a673088c7b5b97634613d2f0697b91bf0783352c/documents/attachments/000/077/116/original/NSW_N2NMCAWorkshopReport_Oct2016.pdf?1535500180

December 2016 Narromine to Narrabri MCA workshop report
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/48122c32b7a625ea6ded1476d8c692b4dd4c644d/documents/attachments/000/077/115/original/NSW_N2NMCAWorkshopReport_Dec2016.pdf?1535500196

April 2017 Yelarbon to Gowrie Corridor Options Report
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/65491212cf7bddbc07a4a383c70296254dacb8c8/documents/attachments/000/097/771/original/yelarbon_to_gowrie_corridor_options_report_rev2_-_main_report_.pdf?1575864724

April 2017 Yelarbon to Gowrie Project Reference Group Report from the Chair
https://www.inlandrail.gov.au/sites/default/files/documents/final_y2g_prg_chair_report_to_minister_with_attachments.pdf

May 2017 Narromine to Narrabri MCA workshop report
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/f014a2216ce67f25fb026a2f902e90d61e868e79/documents/attachments/000/077/114/original/NSW_N2NMCAWorkshopReport_May2017.pdf?1535500209

November 2017 Narromine to Narrabri Options Report
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/f6c489e188a03e89a9592919eea085554c2a25a9/documents/attachments/000/067/551/original/N2N_Options_Report_Nov_2017.pdf?1512003169

March 2018 Narromine to Narrabri Route and Alignment Development Summary Presentation
https://s3-ap-southeast-2.amazonaws.com/ehq-production-australia/3fa09b541f511d9e628f90cade2c15cfa265f5ff/documents/attachments/000/077/113/original/N2N_route_and_alignment_development_summary.pdf?1525847835

October 2018 ARTC Response to questions from NSW Farmers' Association
https://inlandrail.artc.com.au/13269/documents/90807/download

Inland Rail office locations

Brisbane (Head Office)

Level 16, 180 Ann Street
Brisbane QLD 4000
GPO Box 2462 Queen Street
Brisbane QLD 4001

Sydney Office

Level 15, 60 Carrington Street
Sydney NSW 2001
GPO Box 14
Sydney NSW 2001

Melbourne Office

97–99 Bakehouse Road
Kensington VIC 3031
PO Box 1391
Kensington VIC 3031

Parkes Office

290 Clarinda Street
Parkes NSW 2870

Toowoomba Office

65–67 Neil Street
Toowoomba QLD 4350

Gatton Office

47 North Street
Gatton QLD 4343

FURTHER INFORMATION:

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infrastructure.gov.au
inlandrail.gov.au

Additionally you may seek answers to specific questions at:

1800 732 761
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ARTC

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

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