INLAND RAIL

CHAPTER 02

Project rationale

HELIDON TO CALVERT ENVIRONMENTAL IMPACT STATEMENT

ARTC

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

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2. Project rationale

2.1 Introduction

This chapter describes the rationale for the Helidon to Calvert Project (the Project) and the broader Inland Rail Program (Inland Rail). This chapter provides detail on:

- The justification for Inland Rail, including:
  - Description of the existing freight network between Melbourne and Brisbane and the future demands that are forecast to be placed on this network
  - History of Inland Rail
  - Comparison of freight movement alternatives as a solution to the projected freight network capacity constraints
- The benefits of proceeding with Inland Rail and the Project
- The consequences of not proceeding with Inland Rail and the Project
- Alternative locations and route options for Inland Rail and the Project, including infrastructure alternatives
- Principles adopted regarding ecologically sustainable development
- Relationship to other projects.

2.2 Terms of Reference

The Terms of Reference (ToR) describes the matters the proponent must address in the Environmental Impact Statement (EIS) for the Project. This chapter addresses the items of the ToR outlined in Table 2.1. Appendix B: Terms of Reference Compliance Table provides a cross-reference for each ToR against relevant sections in this EIS.

TABLE 2.1: TERMS OF REFERENCE—PROJECT RATIONALE

Terms of Reference requirements		Where addressed
6.7.	Present feasible alternatives of the Project's configuration (including individual elements) that may improve environmental outcomes. Discuss the consequences of not proceeding with the Project.	Sections 2.5, 2.6, 2.7, and 2.9
7.6.	An EIS should also describe the expected benefits and opportunities associated with the Project.	Section 2.4
10.1.	The EIS must describe and illustrate at least the following specific information about the proposed Project. e) Rationale for the Project g) Relationship to other projects for the proposed Inland Rail Program between Melbourne and Brisbane.	e) Section 2.3 g) Section 2.10
10.11.	Describe the following information about the proposed Project: e) Any infrastructure alternatives, justified in terms of ecologically sustainable development (including energy, water conservation and wastewater management).	Sections 2.8 and 2.9
11.18.	In accordance with Schedule 4 of the Environment Protection and Biodiversity Conservation (EPBC) Regulations, feasible Project alternatives must be discussed, including: a) If relevant, the alternative of taking no action b) A comparative description of the impacts of each alternative on the triggered Matters of National Environmental Significance (MNES) protected by the controlling provision c) Sufficient detail to make clear why any alternative or option is preferred to another.	a) Section 2.5 b) Sections 2.6, 2.7 and 2.8.3 and Appendix J: MNES. c) Section 2.6 and 2.7
11.19.	Short, medium and long-term advantages and disadvantages of the alternatives or options must be discussed.	Section 2.4, 2.5, 2.6 and 2.7 and Appendix J: Matters of National Environmental Significance

Terms of Reference requirements		Where addressed
11.21.	The economic and social impacts of the action, both positive and negative, must be summarised. Matters of interest should include: a) consideration at the local, regional and national levels b) any public consultation activities undertaken, and their outcomes c) any consultation with indigenous stakeholders d) identification of affected parties and communities that may be affected and a description of the views of those parties and communities e) project economic costs and benefits of the project and project alternatives, including the basis for their estimation through cost/benefit analysis or similar studies; and f) employment and other opportunities expected to be generated by the project in each of the construction and operational phases.	Section 2.3, 2.4 and 2.5
11.110.	Describe and map where the project's preferred alignment differs from the State's strategic rail corridors, and the reasons for any such deviation.	Section 2.7 and Figure 2.3 to Figure 2.7

2.3 Justification for Inland Rail

2.3.1 Existing rail network and capacity

The *Australian Infrastructure Plan: Priorities and reforms for our nation's future* (Infrastructure Australia, 2016) identified that the demand for urban transport infrastructure is projected to increase significantly. Without implementing key infrastructure projects, the cost of congestion on urban roads is expected to exceed $50 billion per annum by 2031 (Infrastructure Australia, 2016). Demand for key urban road and rail corridors between Melbourne and Brisbane is projected to significantly exceed current capacity by 2031, with a growth of 86 per cent between 2011 and 2031 (mainly by road freight).

The *National Land Freight Strategy* (Standing Council on Transport and Infrastructure, 2013) identifies several challenges facing road and rail freight in general, including:

- Congestion due to increasing numbers of passenger vehicles and the priority given to passenger vehicles over freight vehicles in urban transport, which can adversely impact on efficient freight vehicle movement
- Urban development encroaching on freight routes and precincts as cities grow in size and density, which can lead to an increased potential for amenity, environmental and interface issues.

The *Melbourne–Brisbane Inland Rail Alignment Study* (Australian Rail Track Corporation (ARTC), 2010a) indicated:

- There are likely to be capacity constraints for freight haulage on the existing coastal railway unless significant capital works are undertaken
- The coastal railway between Sydney and Brisbane would reach capacity around 2052.

Much of the infrastructure on the existing regional rail systems is old and has maintenance and renewal issues. Poorly maintained rail lines lead to more freight being transported by road, imposing additional maintenance burdens on affected councils and government authorities (Infrastructure Australia, 2015).

Inland Rail will include approximately 1,100 km of major upgrades and enhancements and 600 km of new tracks. Using existing tracks or preserved rail corridors, where feasible, is expected to represent the lowest capital expenditure option (ARTC, 2015a).

2.3.2 Future east coast freight demand

In 2011, the Australian domestic rail freight task totalled 261.4 billion tonne-kilometres, accounting for approximately 46 per cent of total domestic freight. This represents an increase of 91 per cent since 2000–2001 (Infrastructure Australia, 2015).

The *Australian Infrastructure Audit* (Infrastructure Australia, 2015) notes that:

- The national land freight task is expected to grow by 80 per cent between 2011 and 2031
- Demand for freight rail infrastructure is expected to grow, particularly for resource bulk commodity haulage in Western Australia (WA), Queensland and New South Wales (NSW).

Freight rail will need to play a growing role in the movement of goods between ports and Inland Rail freight terminals, and in the movement of containerised and general freight over longer distances.

The Melbourne to Brisbane corridor is one of the most important general freight routes in Australia, supporting key population and employment precincts along the east coast and inland NSW. The current volume of non-bulk and complementary freight moving within this corridor is approximately 21 million tonnes per annum (Mtpa). This is expected to increase to 40 Mtpa by 2050 (Infrastructure Australia, 2016).

The eastern states of Australia comprise 18 million residents (79 per cent of Australia's population), nine million jobs (78 per cent of Australia's national employment), and contribute $1.1 trillion in gross state product (75 per cent of gross domestic product). Interstate freight transport is projected to increase by 70 per cent between 2015 and 2030, to 140 billion tonne kilometres. The Melbourne to Brisbane corridor already supports 17 per cent of these interstate movements (ARTC, 2015a).

With the population of the eastern states forecast to increase by 60 per cent over the next 40 years, the need for efficient and effective freight transport will continue to increase. Strong forecast population growth, accompanied by comparable employment growth, is likely to place significant pressure on existing infrastructure and services (ARTC, 2015a). Without the increased use of rail, the growth in freight demand is likely to increase pressure on the road network, resulting in increased freight costs and lost economic opportunities.

2.3.3 History of Inland Rail

Currently in Australia, there is no continuous rail freight line through the eastern states, specifically from Melbourne to Brisbane. At present in eastern Australia, rail freight travels between Melbourne and Sydney via Albury, and then between Sydney and Brisbane, generally along the coast. About 74 per cent of freight between Melbourne and Brisbane is via road.

Freight volumes are continually increasing, with volumes forecast to more than double by the year 2050. At the present rate of growth, the existing transport network along the eastern states will not manage without further investment and improved infrastructure (ARTC, 2015a).

Inland Rail was initiated in 2006, as a safe, sustainable solution to the freight challenge that will transform the way freight is moved around the country. Inland Rail has been the subject of significant analysis for the following reasons (ARTC, 2015a):

- The existing north–south coastal railway is expected to reach capacity by 2052 (ARTC, 2015a). Additional capacity is required to accommodate increasing demand for interstate and regional rail freight.
- The quality of service (specifically scheduling reliability) currently provided by the existing coastal rail route is adversely impacting on freight productivity. This also includes transport costs.
- The existing north–south coastal railway is used by both passenger and freight trains. This is impacting on the reliability of rail freight and is constraining opportunities for the expansion of passenger services.
- In the absence of a continuous inland rail link between Melbourne and Brisbane, transporting freight by road has a competitive advantage over rail, with margins associated with operating characteristics of the coastal rail route. This indicates a clear constraint on increasing rail freight market share.
- Transporting freight by road has associated safety, congestion and environmental risks.

Since 2006, two major studies have been commissioned in relation to the development of an inland rail route between Melbourne and Brisbane. The first study, the *North–South Rail Corridor Study* (Department of Transport and Regional Services (DTRS, 2006) examined potential inland rail routes. The preferred route was the 'far-western sub-corridor' route, via Parkes, Moree and Toowoomba.

In 2008, the Australian Government Minister for Infrastructure, Transport, Regional Development and Local Government announced a second study: *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a). The purpose of this study was to optimise the 'far-western sub-corridor' route and analyse the likely economic and commercial benefits of an inland rail route between Melbourne and Brisbane.

In November 2013, the Australian Government Minister for Infrastructure and Regional Development announced $300 million in funding for Inland Rail, to be used for pre-construction activities such as detailed corridor planning, environmental assessments and community consultation. The Minister also announced that a high-level Implementation Group would be formed for Inland Rail.

In 2014, ARTC developed a *Concept Business Case* (ARTC, 2014a) as a precursor to a more detailed Program business case. The *Concept Business Case* outlined key scope and scheduling assumptions, identified key risks and environmental and planning considerations, and preliminary updates to demand, economic and financial analyses.

The *Concept Business Case* identified key areas for further consideration and/or analysis. These areas included demand, costs, risks, technical and operational requirements, and refined financial and economic analysis, which were subsequently addressed within the *Programme Business Case* (ARTC, 2015a).

The Inland Rail *Programme Business Case* was developed in 2015 to provide a detailed assessment of why Inland Rail is needed and how it could be delivered. The viability, benefits, costs and risks associated with Inland Rail were all assessed (ARTC, 2015a).

The outcomes of these studies and their implications for Inland Rail, including benefits, are presented in Section 2.4.

2.3.4 Freight movement alternatives

Alternative freight transport solutions with the potential to address Australia's current and future freight challenges were considered by *The Case for Inland Rail—Summary of the 2015 Business Case* (ARTC, 2015b) and *Melbourne–Brisbane Inland Rail Implementation Group Report* (IRIG) (IRIG, 2015).

Three capital investment options were assessed by *The Case for Inland Rail—Summary of the 2015 Business Case* (ARTC, 2015b):

- Progressive road upgrades
- Upgrading the existing east coast railway
- An inland railway, including the Project.

These capital investment options were assessed against seven equally weighted criteria:

- Capacity to serve east coast future inter-capital regional/bulk freight market needs
- Foster economic growth through improved freight productivity and service quality (including improved reliability and resilience)
- Optimise environmental outcomes
- Alleviate urban constraints
- Enable regional development
- Ease of implementation
- Cost-effectiveness.

Overall, constructing an inland railway ranked highest with an average 'high likelihood' of improving outcomes across all criteria. Progressive road upgrades and upgrading the existing east coast railway both had an average 'medium likelihood' ranking across all criteria.

In relation to individual criteria, progressive road upgrades outranked an inland railway only in relation to ease of implementation and ranked equally with an inland railway in relation to enabling regional development outcomes. An inland railway was found to be the best option across all other criteria.

The following alternatives were reviewed by the IRIG within the *Melbourne–Brisbane Inland Rail Implementation Group Report* (IRIG, 2015):

- Maritime shipping
- Air freight
- Road freight
- Rail solutions.

The results of the review of alternatives undertaken by the IRIG are outlined in the following sections.

2.3.4.1 Maritime shipping

Maritime shipping was examined as a potential alternative to Inland Rail based on two types of services:

- A dedicated service between Melbourne and Brisbane (coastal shipping)
- Using spare capacity on vessels calling at Melbourne and Brisbane as part of an international voyage.

The *Melbourne–Brisbane Inland Rail Implementation Group Report* (IRIG, 2015) concluded that maritime shipping:

- Is unlikely to be a strong alternative to Inland Rail, because it does not provide the level of service (transit time and service availability) required by the majority of the Melbourne to Brisbane interstate market
- Still has a role to play, especially due to its strengths in transporting high-volume and long-distance cargo around the coast. Shipping can be used in conjunction with other modes such as an inland railway to meet Australia's future transport needs.

2.3.4.2 Air freight

Domestic air freight accounts for less than 0.01 per cent of total domestic freight movements in Australia by weight (IRIG, 2015). Most of these movements comprise newspapers and parcels between major cities, on either dedicated freight flights or on existing passenger flights. The report concluded that air freight:

- Has a limited role to play in the transport of bulky or heavy goods on the Melbourne to Brisbane corridor, but will continue to play a crucial role for small, high-value and time-dependent goods
- Is not a viable alternative for addressing Australia's freight requirements on the Melbourne to Brisbane corridor into the future.

2.3.4.3 Road freight

The role of road freight was considered as a potential alternative to Inland Rail. Road transport is the main mode of transport for most commodities produced or consumed in Australia. Along the north–south corridor, the main routes for road freight are on the Hume Highway (between Sydney and Melbourne), the Pacific Highway (for coastal transport between Sydney and Brisbane) and the Newell Highway (between Melbourne and Brisbane).

The identified issues and considerations relevant to road freight on these corridors include:

- The north–south road corridor will face significant local and regional capacity constraints for road freight in the medium to longer term
- The mix of local traffic, private vehicles and freight vehicles on road transport corridors reduces reliability as a result of the different average travel speeds between cars and heavy vehicles and increases accident risk
- Conflicts and safety issues between local traffic, private vehicles and freight vehicles on these corridors will increase in line with the significant forecast growth in population, employment and demand for freight transport
- Compared with rail, road freight results in additional environmental costs, including from air pollution, greenhouse gas emissions and water pollution
- The cost to freight operators of congestion in urban areas as a result of reduced travel speeds and reliability for freight transport is estimated to be around $60 million per year for Melbourne to Brisbane inter-capital freight alone (IRIG, 2015)
- The Australian Government and the state governments are investing in road infrastructure along the north–south corridor. However, this investment will be insufficient to remove all the existing and predicted future issues along the full length of the corridor, leaving trucking productivity exposed to the cumulative effects of the remaining deficiencies of road freight.

The report concluded that:

- While road transport will continue to contribute to Australia's freight task, unless substantial additional investment is made, it will be unlikely to meet the longer-term needs for Australia's freight task alone
- Should the Australian Government decide not to proceed with a rail solution, further investigation of road transport is required to determine its capacity to manage the future north–south freight task.

2.3.4.4 Rail solutions

The two main rail solutions were considered: enhancing the existing east coast railway and constructing a new inland railway.

The *Melbourne–Brisbane Inland Rail Report* (IRIG, 2015) noted that there are several capacity, reliability and performance issues associated with the existing east coast railway. The performance issues mainly relate to constraints associated with moving freight trains through the Sydney metropolitan rail network. The service offering constraints of the existing coastal rail route compared to Inland Rail are summarised in Table 2.2.

TABLE 2.2: COMPARISON OF EXISTING MELBOURNE TO BRISBANE COASTAL ROUTE TO INLAND RAIL SERVICE OFFERING

Service offering	Coastal Rail (2014–15)	Inland Rail	Improvement with Inland Rail
Transit time	32–34 hours	Up to 24 hours	10 hours
Reliability[1]	83%	98%	15%
Availability[2]	61%	95%	34%
Relative price (to road)[3]	85%	57–65%	20–28%

Source: *Inland Rail Programme Business Case* (ARTC, 2015a)

Table notes:
1. Reliability is defined as the percentage of goods delivered on time by road freight, or available to be picked up at the rail terminal or port, when promised.
2. Availability refers to the percentage of available departure and arrival services that are convenient for customers, which depends on cut-off and transit times.
3. Relative price is presented for non-bulk inter-capital freight (door-to-door) indicating the range over the period 2024–25 to 2049–50.

As a sub-option of enhancing the existing east coast railway, the report noted that the proposed new Outer Sydney Orbital corridor would provide opportunities for a rail route that could ease freight congestion on Sydney freight networks. However, the main role of this corridor would be to address freight capacity constraints on other routes, such as those for intrastate and export freight. In addition, this option would not provide significant transit time savings for Melbourne to Brisbane freight, as the missing link between north-west NSW and southern QUEENSLAND would still need to be provided, or the existing coastal line would need to be upgraded.

The report concluded that:

- For Melbourne to Brisbane freight, the existing east coast railway would not be competitive with road in terms of cost or time—even with significant further investment it is not a viable alternative to Inland Rail
- Inland Rail would meet Australia's future freight challenge and bring significant and positive national benefits by boosting national productivity and economic growth, while promoting better safety and environmental outcomes.

2.3.4.5 Summary of findings

After examining the various alternatives to Inland Rail, the IRIG concluded that:

- While shipping and air will continue to play a role in the interstate freight market, they are not viable alternatives to rail (IRIG, 2015)
- Without Inland Rail, road is the only mode capable of addressing the majority of the future freight task, with associated direct and indirect costs (IRIG, 2015).

2.3.5 Service offering

Inland Rail, and the Project, provides a significant opportunity to change the fundamentals of the freight logistics supply chain in Australia and deliver economic and social benefits long into the future.

The service offering is central to the delivery and competitiveness of Inland Rail and reflects the priorities of freight customers. It was developed in consultation with key market participants and stakeholders and represents the key elements to be addressed by Inland Rail to enable a competitive and complementary service offering compared to other modes, including road transport.

The key characteristics of the Inland Rail service offering are:

- **Reliability:** 98 per cent, defined as the percentage of goods delivered on time by road freight, or available to be picked up at the rail terminal or port, when promised
- **Price:** cheaper relative to road transportation, as a combined cost of access to the rail network, rail haulage and pick-up and delivery
- **Transit time:** 24 hours or less from Melbourne to Brisbane
- **Availability:** services available with departure and arrival times that are convenient for customers, which depends on cut-off and transit times.

These key characteristics are underpinned by technical characteristics that are particularly relevant to rail operators as these characteristics directly influence operating cost structures and the rail operators own service offerings to the market. The key technical characteristics of Inland Rail and the Project are discussed in Chapter 6: Project description.

While the service offering is specific to the rail network, terminals are a critical element and ARTC will work with terminal operators and proponents as Inland Rail progresses to enable connection opportunities.

2.4 Benefits of proceeding with Inland Rail

Inland Rail presents a unique opportunity to realise broader benefits for the economy and the community as it enables market-driven complementary investments. There are a range of direct and indirect benefits of Inland Rail, as described in this section.

2.4.1 Direct benefits

Foreseeable direct benefits of Inland Rail, as identified by *The Case for Inland Rail—Summary of the 2015 Business Case* (ARTC, 2015b), are summarised in the following sub-sections.

2.4.1.1 Improved access to and from regional markets

Inland Rail will improve access to and from regional markets including:

- Improved linkages to regional areas for inter-capital freight
- Improved mine to port accessibility between coal mines in the Surat and Clarence–Moreton Basins and the Port of Brisbane, which reduces operating costs and results in additional coal exports that would not have otherwise occurred
- Agricultural areas and regions have improved access to key local and international markets, providing improved drought resilience and ability to move greater volumes of grain via rail.

2.4.1.2 Reduced costs for the market

Inland Rail, and the Project, is expected to result in reduced costs for the market through the development of a dedicated freight rail system. Anticipated benefits include:

- Reduced inter-capital freight transport costs for the market are likely to result in lower prices for consumers (predominantly manufactured goods). This also presents an opportunity for flow-through of cost savings to reduce the cost of living for households.
- Inland Rail is likely to reduce life cycle costs for infrastructure owners/operators on the coastal route and road network (i.e. Newell, Warrego and Pacific Highways) due to lower freight volumes on these assets. This reduces maintenance costs and enables investments in increased capacity to be avoided or deferred.
- Reduced transport costs may make key markets and economic activity more competitive, particularly in the agricultural and coal sectors.
- Reduced operating costs may improve the viability of some mines resulting in induced coal freight volumes that would not otherwise have occurred. There will be additional profits to mines, which Australian owners will retain, and additional taxes (company, royalties and payroll tax) for profits accruing to overseas owners.

- Coal freight in the Surat and Clarence–Moreton Basins should benefit from reduced above-rail operating costs as a result of:
  - Higher axle loads east of Oakey (20-tonne axle loads compared to the current 15.75)
  - Longer trains (1,010 m compared to the current 650 m)
  - A more direct alignment in the tunnel across the Toowoomba Range that avoids the current crossing where operating speeds are constrained by high gradients and tight curves on a winding track.
- Inter-capital and agricultural freight currently travelling by road is likely to benefit from reduced operating costs due to economies of scale of rail relative to road transport.

2.4.1.3 Improved reliability and certainty of transit time

The dedicated Inland Rail freight system will deliver greater efficiencies in terms of reliability and certainty through the following measures:

- Improved reliability and certainty of transit-time results in productivity and economic efficiency due to operating cost savings, shorter transit times, improved availability and reduced incidents on the coastal route
- Benefits associated with higher axle loads, longer trains, lower gradients, and longer curves resulting in shorter transit times and avoided incidents (such as flooding)
- Linkages between existing rail networks, such as the existing Queensland Rail (QR) West Moreton System rail corridor and the Brisbane to Sydney Interstate Line. Additionally, railway infrastructure within existing corridors used by Inland Rail would be subject to replacement and upgrade. New linkages and upgraded infrastructure would combine to enable faster transit time on existing journeys.

Freight customers have indicated they may be willing to pay for improved reliability and availability with Inland Rail. These benefits would induce additional freight volumes that would not have occurred in the absence of Inland Rail.

2.4.1.4 Increased capacity of the transport network

The capacity of the overall transport network will be enhanced by the development of Inland Rail through:

- Increased capacity providing the opportunity to return unused freight paths to passenger trains in Sydney and Brisbane during off-peak periods (noting that passengers are already given absolute priority in peak periods)
- Improved customer outcomes for rail passengers between Sydney and Brisbane with unused freight paths on the coastal route returned to passenger services (the benefit of increased frequency of passenger services reduces average wait time and provides greater reliability and certainty for passengers)
- Increased freight capacity enabling great volumes of inter-capital freight to be moved via rail with a reduced reliance on existing State-controlled and local road networks
- By creating new linkages between existing rail networks, such as those operated by QR, Inland Rail would provide an option for alleviating future short- or long-term capacity constraints on these rail networks
- Relief for road traffic through Sydney by allowing greater capacity for public transport, avoiding the need for capacity augmentation on existing routes
- Greater volumes of inter-capital freight being moved via rail with a reduced reliance on road
- Coal trains using longer/heavier trains with better port access
- Agricultural freight such as grain using rail in accessing key local and international markets.

2.4.1.5 Reduced distances travelled

Inland Rail reduces the distance travelled by freight, which supports and enables other benefits such as reducing costs, improving safety and sustainability. This will also provide benefits, reducing shrinkage or damage to freight through reduced distances travelled.

2.4.1.6 Improved road safety

Benefits relating to road safety through the development of Inland Rail include:

- Potential to remove 200,000 long-haul truck movements from roads each year—it is expected that road transport will still be required for distribution from intermodal terminals
- Reduced congestion and more capacity on existing road and rail networks in metropolitan Sydney
- Less burden on roads and improved road safety
- Lower through truck traffic volumes in over 20 regional towns
- Relocated mainline freight traffic from existing railways out of some town centres such as Inglewood, Pittsworth and Southbrook, providing a safer environment with enhanced liveability.

Inland Rail will adopt a train control system with a global positioning system for the control of train movements on the network. Each train will 'know' where it is on the network and can be automatically braked if it exceeds speed or does not have permission to be on a section of track.

2.4.1.7 Improved sustainability and amenity for the community

Inland Rail will provide a long-haul freight solution that is time and cost competitive when compared to road freight. Consequently, Inland Rail will replace some of the long-haul road freight task, resulting in reduced road congestion, fewer vehicular carbon emissions and reduced noise. It is estimated that transportation of freight on Inland Rail will use up to two-thirds less fuel than that would be required to transport the same volume of freight via the existing road route.

2.4.2 Indirect benefits

Foreseeable indirect benefits of Inland Rail, as identified by *The Case for Inland Rail—Summary of the 2015 Business Case* (ARTC, 2015b) are described in the following sections.

2.4.2.1 Create a step change in the Australian freight network

Inland Rail offers significant performance advantages over the existing coastal route, including:

- Faster and more reliable transit times
- Shorter alignments
- More optimal grades
- The potential for double stacking and longer and heavier axle load trains.

Inland Rail will improve the reliability and resilience of the freight network and improve access to export ports and urban freight destinations. These operational efficiencies will increase the role rail plays in the broader freight network and will allow rail to compete in the market as a viable alternative to road, increasing the overall network capacity and freight mode options available to the market.

2.4.2.2 Be a catalyst for growth

Inland Rail will future-proof Australia's rail freight task against population growth and the projected increase in freight demand, allowing for increased productivity in major capital cities.

Inland Rail is expected to deliver 16,000 new jobs at the peak of construction. It is expected to increase Australia's gross domestic product (GDP) by $16 billion during its construction and first 50 years of operation.

Inland Rail will improve the safety of the network with a better mix and separation of modes in urban and regional environments, providing options for movement of goods that do not require larger vehicles than are currently used throughout the passenger vehicle network. This separation will result in improved network efficiency by shorter journeys, lower fuel and maintenance costs, leading to supply-chain efficiencies and reduced costs, which will ultimately benefit consumers.

At a local level, the Project has the potential to catalyse development through:

- **Employment:** The construction workforce is expected to be drawn primarily from communities within the Project region and nearby local government areas, and therefore employment and training benefits would extend to construction industry workers across the region. The availability of long periods of employment in Project construction is likely to be a positive opportunity for those personnel and their families.

  Employment opportunities in the Project region during the construction stage will have positive mental health benefits for the individuals employed, particularly if they are exiting a period of unemployment or commencing their career. This would be particularly important in communities with high levels of unemployment such as Rosewood, Ebenezer and Willowbank, and for particular population groups where unemployment rates are high.

- **Business opportunities:** Local and regional businesses will benefit from the construction phase. Opportunities to supply the Project may include supply of fuels, equipment, borrow and quarried material, and services including fencing, electrical installation, rehabilitation, landscaping, maintenance and trades services.

  Local transport or logistics businesses may also have significant opportunities to service the construction phase.

  The Project's local supply arrangements will provide an opportunity to develop and grow local businesses.

  The expansion in construction activity in the vicinity of the Project will support additional flow-on demand and additional spending by the construction workforce, and therefore increased business activity in the region.

  The Project will improve the connection between local produce such as bulk grain, containerised cotton and other agricultural products, and markets, through to both domestic markets in cities and international markets via the Port of Brisbane.

Further details on local community benefits are discussed in Chapter 16: Social and Chapter 17: Economics.

2.4.2.3 Facilitate training and skills development

ARTC has a strong commitment to training local and Indigenous people and has consulted with Indigenous community members about employment and training opportunities. Training pathways and creation of opportunities for the development of skilled local and Indigenous workers through the Project's construction and operation will be achieved by:

- Providing information about the nature of skills required with sufficient lead-time to enable local training programs to be customised
- Cooperating with high schools in the region and training providers to provide appropriate training and skill development, and identify available employment pathways
- Working with Indigenous community networks to encourage applications and increase the number of Indigenous people applying for jobs
- Initiating key partnerships to link training and development programs with other projects and local industries to provide the greatest regional benefit
- Working with the Queensland Government and the Australian Government to provide long-term outcomes through training, mentoring and other support programs.

ARTC has launched the Inland Rail Skills Academy, which is a collection of projects and partnerships, which aim to:

- Facilitate local employment and procurement opportunities regionally by 'priming the market' in each region in which Inland Rail would be constructed
- Make it easy for Inland Rail contractors to employ and procure trained and competent people locally
- Build ARTC's social licence to operate for all Inland Rail projects.

The Inland Rail Skills Academy comprises four pillars:

- Education: science, technology, engineering and maths and trades education in schools and university scholarships into Inland Rail-related professions (e.g. engineering, project management)
- Skills and training: apprenticeships and traineeships, and gaining industry accreditation to support employment into all Inland Rail projects as well as other major regional industries
- Business capacity building: for small-to-medium enterprises to understand and meet major projects' supply chain requirements and enhance the value proposition of local business chambers and business groups
- Inland Rail staff training and inductions: opportunities for individuals to increase skills in a range of areas, including safety, environment and sustainability.

The partnerships and projects that make up the Inland Rail Skills Academy are in progress, with a comprehensive program to be delivered from 2020. Further details are discussed in Chapter 16: Social.

ARTC's workforce development project, training partnerships and the Inland Rail Skills Academy will help to ensure that young people and Indigenous people in the region have the opportunity for skills training that will equip them for the construction industry and will be transferrable to future projects. It will also result in an increase in the skilled labour force in the region.

2.4.2.4 Provide benefits for metropolitan and regional areas

Diverting Melbourne to Brisbane and regional rail freight off the Sydney and Brisbane metropolitan rail networks and transferring road freight (which currently transits through the Newell Highway or regional towns in Victoria, NSW and Queensland) onto Inland Rail will reduce the competition for capacity on the rail and road networks of these major cities.

It is predicted that the construction of Inland Rail will remove a significant number of trucks from roads on the east coast, resulting in improved amenity through reduced road congestion, fewer emissions and less noise. The 10-year delivery program will support economic activity in the regions and create regional jobs in Queensland, NSW and Victoria during construction as well as longer-term economic opportunities for the regional areas through access to the new infrastructure and associated services.

2.4.2.5 Enable complementary market-driven investments

The ultimate forecast benefits of Inland Rail require interdependent and complementary investment in several other projects, policies and initiatives and these will be coordinated throughout Inland Rail, including:

- Regional terminals and loading facilities for regional/agricultural/coal freight
- Rollingstock investment in longer, heavier trains along with supporting train operations to take advantage of the improved rail offering (e.g. greater certainty of arrival, departure and transit times) by train operators
- Double-stack terminal capacity in Melbourne and Brisbane and the ability to accommodate 1,800 m trains initially (and up to 3,600 m trains in the future based on business needs and subject to separate assessment works)
- Investment in connecting coal and agricultural rail lines and rail sidings from the Surat and Clarence–Moreton Basins in south-west Queensland to the Port of Brisbane (the Western Line and in metropolitan Brisbane).

2.4.2.6 Consistency with the Queensland Freight Strategy

The *Queensland Freight Strategy* (Department of Transport and Main Roads (DTMR), 2019a) establishes a vision for the State's freight system, outlining a series of commitments that guide policy, planning and investment decision making for Queensland's freight system. The strategy includes five commitments, shared by industry, customers and government:

- **Build effective partnerships:** We will work collaboratively to deliver a freight system that advances customer, industry and government interests, now and into the future
- **Unlock economic opportunity:** We will optimise the use of existing freight infrastructure and target investment towards creating economic opportunities
- **Smarter connectivity and access:** We will plan a freight system that provides Queensland businesses with smarter access to local, national and overseas markets
- **A resilient freight system:** We will support the adoption of sustainable freight practices and resilient infrastructure
- **Safer freight movements:** We will support safe freight movements across Queensland through technology and system planning.

2.4.3 Helidon to Calvert Project-specific benefits

As identified in Section 2.4.1 and Section 2.4.2, Inland Rail will ensure significant benefits on a large scale. Specific benefits will also be generated at a local and regional level. The Project of Inland Rail will provide further benefits specific to the Lockyer Valley and Ipswich regions of South East Queensland (SEQ). Some of these benefits, which have been determined through the EIS, include:

- Economic growth
  - The Project will allow for connections to be made through linkages along the Project alignment to enable regional markets to trade with the larger markets of Melbourne, Brisbane and Sydney through rail freight
  - The expansion in construction activity would support additional flow-on demand and additional spending by the construction workforce, and therefore increased business activity in the region, including for small businesses such as cafes, shops and service stations in town centres
  - Local and regional businesses will benefit from the Project's construction phase through opportunities to supply material and services.
- Job creation
  - It is expected that the workforce required for this Project will involve approximately 190 employees per year for the construction, and up to 15 to 20 employees during operations
  - Benefits will also be experienced through the training of the workforce, which will produce skilled labourers who can subsequently work towards other employment opportunities at the conclusion of the Project.
- Infrastructure
  - Benefits of past and ongoing investment in infrastructure and facilities can be maximised through a high level of integration with existing infrastructure, such as the QR West Moreton System rail corridor and current and future land use planning.
- Environmental
  - Environmental offsets will be used to introduce benefits to counterbalance the impacts of construction and operation of the Project, after the implementation of mitigation measures. Specific environmental offset plans will be provided by ARTC post-EIS.
- Transit
  - Freight through the region is currently transported primarily as road freight. Moving freight transport to rail corridors will result in regional benefits in line with those associated with Inland Rail as a whole
  - Increased spending on public infrastructure to service this section of Inland Rail will allow for higher-quality infrastructure to be implemented and used by the local population living along the alignment.

2.5 Consequences of not proceeding with Inland Rail

Not progressing with Inland Rail would potentially hinder the future growth of the national economy. Without the increased rail efficiency and performance provided by Inland Rail, pressure on road networks will continue to increase, freight costs will continue to rise, consumers will pay more for products and productivity in important industrial sectors could decline.

Without Inland Rail, road will increasingly become the dominant mode of freight transport with rail becoming less relevant. This will become an issue along the Warrego Highway within the context of this Project. A continued over-reliance on road transport to meet the future east coast freight task will increase the vulnerabilities to projected population growth that is, even today, driving shortages of long-distance truck drivers and increasing costs; providing customer choice between competitive transportation modes will build resilience into the national freight network.

More specifically, if investment in the east coast freight corridor is not undertaken to increase capacity and minimise supply chain costs, the following consequences are expected:

- Constrained national productivity and economic growth
- Freight companies and the consumers of products transported along the corridor may experience excessive freight costs
- An increase in congestion on both rail and road networks, given the reliance on shared freight/passenger corridors
- Increased number of trucks on urban and regional roads required to move the rising freight volumes
- Larger trucks (i.e. B-doubles, B-triples) will be mixing with smaller passenger vehicles on major highways
- Governments will be required to make significant investments in major arterial and regional roads to ensure they can support the increase in the number and size of heavy vehicles
- There will be a deterioration of safety on the road network with the existing infrastructure not able to support changes in vehicle mix
- Ongoing fuel use and emissions from an increased number and size of heavy vehicles will have environmental impacts
- The increase in freight road traffic will have major impacts, such as congestion, amenity and noise, on urban and regional communities on freight routes, resulting in safety and environmental issues
- Significant economic impacts associated with the inability of the freight network to meet the demand for goods and services.

2.6 Alternative locations and route options for Inland Rail

After it was determined that Inland Rail would meet Australia's future freight challenge, alternative routes were initially considered through the following studies:

- *North–South Rail Corridor Study* (DTRS, 2006)
- *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a).
- *Melbourne–Brisbane Inland Rail Implementation Group Report* (IRIG, 2015)
- *Final Assessment Report—Southern Freight Rail Corridor Study* (AECOM, 2010).

The results of the studies follow.

2.6.1 North–South Rail Corridor Study

The *North–South Rail Corridor Study* (DTRS, 2006) considered potential routes for Inland Rail. The purpose was to identify a route that would deliver the best overall environmental, social and economic outcome.

2.6.1.1 Options identified

Potential route options were identified within a 'north–south rail corridor', an elliptically shaped area defined by the standard gauge rail line along the NSW coast, and an arc west of Shepparton, Jerilderie, Coonamble, Burren Junction, Goondiwindi and Toowoomba. This area covers all sections of the existing rail network in Victoria, NSW and Queensland that currently form, or could potentially form, part of an inland freight route between Melbourne and Brisbane.

Within this corridor, four sub-corridors were identified, each of which could be combined with alternative routes between Melbourne and Junee, via Shepparton or Albury. The four sub-corridors comprised:

- Far-western sub-corridor—linking Junee to Brisbane via Parkes, Dubbo and/or Narromine, Coonamble, Burren Junction, Narrabri and/or Moree, North Star, Goondiwindi, Warwick and/or Toowoomba
- Central inland sub-corridor—linking Junee to Brisbane via any inland route that includes the Werris Creek to Armidale to Tenterfield rail links
- Coastal sub-corridor—following the existing coastal route between Junee and Brisbane (via Goulburn), through Sydney
- Hybrid sub-corridor—combining elements of an inland and coastal route, linking Junee to Brisbane via Muswellbrook and Maitland.

Within each of these sub-corridors, the feasibility of 136 possible route options was investigated. These options involved different combinations of new track and the upgrading of existing track.

2.6.1.2 Analysis of options

The route options were compared using an optimisation model specifically developed for the study, based on the following criteria:

- Operating efficiency
- Infrastructure requirements
- Market demand
- Environmental constraints
- Financial and economic viability.

The study identified potential demand, financial issues, environmental issues and infrastructure costs relevant to the four sub-corridors. The analysis concluded that the far-western sub-corridor was markedly superior to the other alternatives.

Figure 2.1 shows the study area from the *North–South Rail Corridor Study* (DTRS, 2006). Route options were identified within a 'north–south rail corridor', which was an elliptical area defined by the standard gauge rail line along the NSW coast, and a broad arc west of Shepparton, Jerilderie, Coonamble, Burren Junction, Goondiwindi and Toowoomba.

The study identified potential demand, financial issues, environmental issues and infrastructure costs relevant to the four sub-corridors. The study concluded that the Far Western Sub-corridor was the best performing sub-corridor option based on:

- Shortest and fastest transit journey from north to south, while avoiding the impact of Sydney rail traffic congestion
- Projected to require the lowest level of capital expenditure of the four sub-corridors
- Potential to derive additional revenue from southern Queensland freight travelling to the western states and from Perth to the east coast, in addition to carrying Melbourne–Brisbane freight. This additional revenue opportunity is specific to this sub-corridor
- Expected to divert some of the freight that moves between regional areas and ports.

2.6.2 Melbourne–Brisbane Inland Rail Alignment Study

In 2008, Inland Rail was announced by the Australian Government, to be led by ARTC. This resulted in the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a), which identified the preferred corridor through central-west NSW and established the business case for Inland Rail.

The purpose of the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) was to determine the optimum alignment, as well as the economic benefits and likely commercial success, of a new standard gauge inland railway between Melbourne and Brisbane. The terms of reference for the study required the development of a detailed route alignment, generally following the far western sub-corridor identified by the North–South Rail Corridor Study (DTRS, 2006).

2.6.2.1 Options identified

The *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) short-listed and analysed a number of route options. The works involved:

- Route identification—evaluation of options and preliminary analysis for areas: Melbourne to Parkes, Parkes to Moree, and Moree to Brisbane
- Analysis of the route—capital cost, environmental impacts and journey time, as well as preliminary economic and financial viability
- Development of the preferred alignment—the alignment was developed considering environmental and engineering factors.

The study noted that there were over 50,000 possible options for the route between Melbourne and Brisbane. As it was not feasible to analyse each option, two key criteria (capital cost and journey time) were used to establish a shortlist of route options in each of the three main areas. The shortlist included:

- Melbourne to Parkes—two main options:
  - Via Albury, using existing track from Melbourne to Parkes (with a possible new direct line from Junee or Illabo to Stockinbingal by-passing Cootamundra)
  - Via Shepparton, using the existing broad-gauge Mangalore–Tocumwal line via Shepparton, the disused standard gauge line to Narrandera and a new direct connection through to near Caragabal, before re-joining the existing line to Parkes
- Parkes to Moree—four main options:
  - Parkes to Moree via Werris Creek, using existing track (with a new section of track at Binnaway and Werris Creek to avoid reversals)
  - Parkes to Moree via Binnaway and Narrabri, using existing track to Binnaway and then a new section connecting to the existing track near Emerald Hill or Baan Baa
  - Parkes to Moree via Curban, Gwabegar and Narrabri, using existing track to Narromine predominately new track between Narromine and Narrabri and existing track from Narrabri to Moree
  - Parkes to Moree via Burren Junction using existing track to Narromine and predominately new track via Coonamble and Burren Junction to Moree
- Moree to Brisbane—two main options:
  - The Warwick route—a new 'greenfield' route via Warwick to the existing standard gauge Sydney–Brisbane line
  - The Toowoomba route—a new corridor direct from Inglewood to Millmerran and Oakey, near Toowoomba and then a new alignment down the Toowoomba range. It was then proposed to use the protected Gowrie to Grandchester future State transport corridor stretching east from Gowrie near Toowoomba through to Grandchester near the town of Rosewood and the Southern Freight Rail Corridor from Rosewood to Kagaru.

FIGURE 2.1: STUDY AREA FOR THE *NORTH–SOUTH RAIL CORRIDOR STUDY*

2.6.2.2 Analysis of options

The main route options were subjected to more detailed technical, financial and economic assessment. The option involving use of existing track towards Werris Creek was chosen to represent the option with the lowest capital expenditure meeting the performance specification. This option was approximately 1,880 km long. The option involving the more direct route between Narromine and Narrabri had the fastest transit time for a reasonable capital expenditure. This option, which was about 1,731 km long, became the focus for more detailed route, demand, economic and financial analysis.

Refining the proposed alignment involved an iterative process, with evaluation of the following:

- Environmental and land issues
- Railway operations considerations
- Engineering assessments
- Capital cost estimates.

The final preferred alignment, between South Dynon in Melbourne and Acacia Ridge in Brisbane, incorporated:

- Melbourne to Parkes—670 km of existing track and 37 km of new track on a greenfield alignment from Illabo to Stockinbingal, bypassing Cootamundra and the Bethungra spiral
- Parkes to North Star—307 km of upgraded track and 291 km of new track on a greenfield alignment from Narromine to Narrabri
- North Star to Acacia Ridge—271 km of new track on a greenfield alignment, 119 km of existing track upgraded from narrow gauge to dual gauge and 36 km of the existing coastal route.

The alignment for Inland Rail is shown in Figure 2.2 and was endorsed by the IRIG as the base case alignment.

In 2014, the IRIG tasked ARTC with developing a business case and a 10-year delivery plan for Inland Rail.

2.6.3 Inland Rail Implementation Group Report

The *Melbourne–Brisbane Inland Rail Implementation Group Report* (IRIG, 2015) was delivered to the Australian Government in August 2015. The report recommended the adoption of the *Melbourne–Brisbane Inland Rail Alignment Study* (ARTC, 2010a) alignment, with some detailed consideration of three sections in further detail. These included:

- Albury vs Shepparton. The report endorsed the route via Albury on the basis that potential freight values through Shepparton did not justify the significant additional capital cost.
- North Star to Toowoomba. The report noted that further engineering assessments were required between North Star and Toowoomba, which may result in a deviation of the alignment in this section.
- Toowoomba Range. The report endorsed the adoption of the Queensland Transport Gowrie to Grandchester future State transport corridor that was protected in 2003.

The 2015 base case alignment identified in the report is shown in Figure 2.2.

2.6.4 Southern Freight Rail Corridor

DTMR completed a preliminary planning and impact assessment for the Southern Freight Rail Corridor (SFRC) study in 2005 to reserve a corridor of land for future railway development (AECOM, 2010). The aim of the study was to identify a future route for a freight rail corridor connecting the western rail line near Calvert to the interstate railway north of Beaudesert. An additional 55 km long and 2 km wide corridor of interest was investigated in 2010 based on preliminary studies undertaken in 2005.

The findings of the studies provided an understanding of the onsite constraints within the corridor of interest that ultimately influenced the alignment development process and final location. Based on design criteria and the studies referenced above, a preferred alignment for the SFRC was gazetted. The gazetted rail corridor is 80 m to 100 m wide and extends about 53 km from Calvert at its northern extent to Kagaru at its south-eastern extent. Technical, environmental and cultural heritage studies undertaken as part of the assessment of the SFRC highlighted the need for further assessments, when more detailed designs were progressed closer to construction.

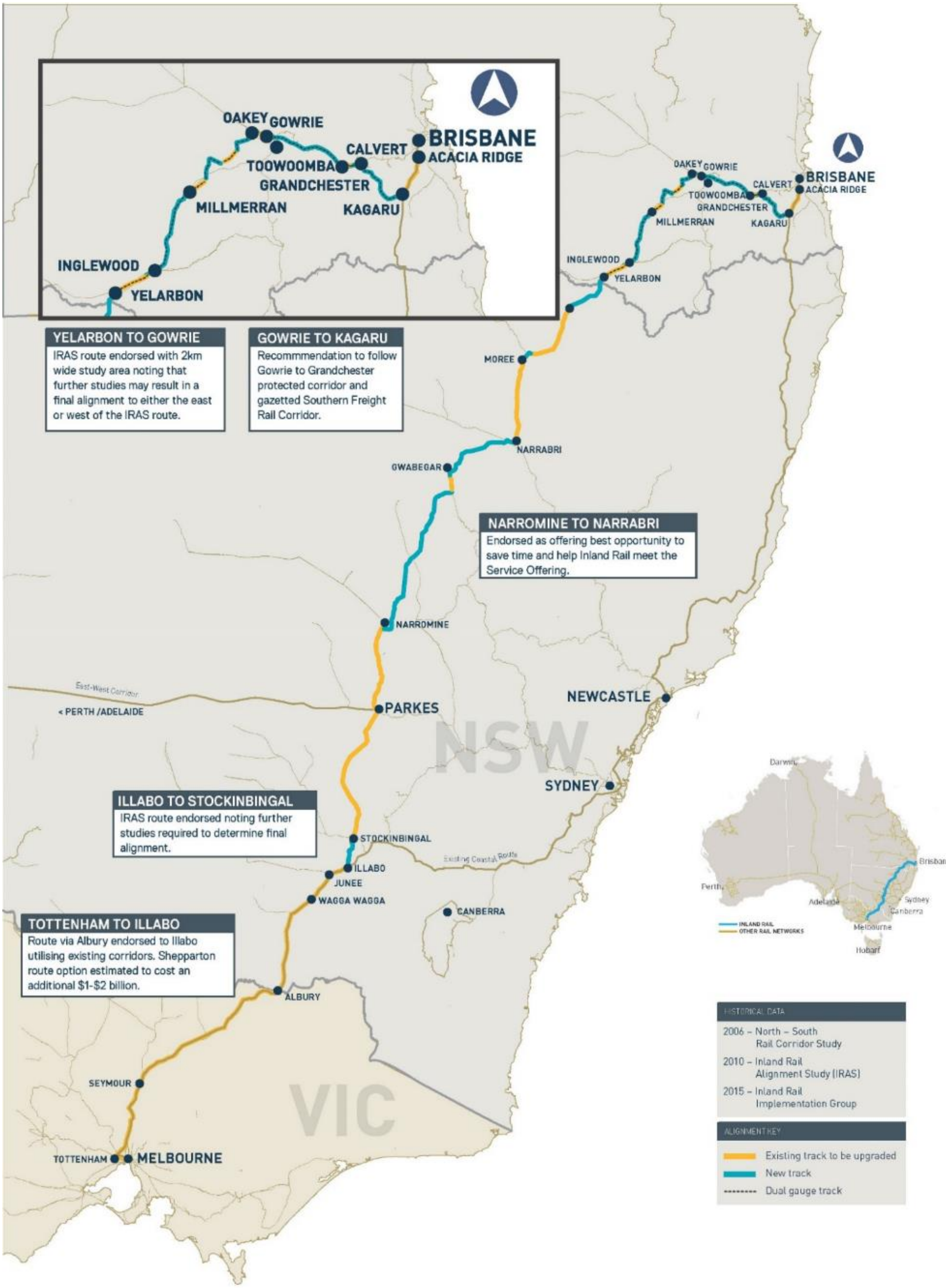

FIGURE 2.2: 2015 BASE CASE ALIGNMENT FOR INLAND RAIL

2.7 Project-specific alternatives

The 1,700 km long Inland Rail Program has been divided into 13 separate projects to assist with the delivery of the Inland Rail Program of works. In 2016, ARTC commissioned multiple Phase 1 concept level, technical engineering and environmental services contracts, each looking at separate projects within the Program. This section provides background on the alternative routes considered during the design development of the Calvert to Kagaru Project.

Feasibility and preliminary planning studies that investigated potential alignments for the corridor during the course of project development are described in Section 2.7.1 and Section 2.7.2. Optioneering works undertaken are discussed in Section 2.7.3 and Section 2.7.4.

2.7.1 The Gowrie to Grandchester Rail Corridor Study

The Gowrie to Grandchester Rail Corridor Study was a joint initiative between the DTMR and QR. The purpose of the study was to identify a rail corridor to relieve the constraints on rail operations caused by the Toowoomba and Little Liverpool Range crossings. The rail corridor would provide rail infrastructure to support development in Toowoomba, south-west Queensland and northern NSW. The study was completed in May 2003.

The study was divided into two sections:

- Part 1—Grandchester to Helidon corridor
- Part 2—Helidon to Gowrie Junction corridor.

The preferred corridor identified in the study provided for:

- A high level of rail service to connect the south-west of Queensland to Brisbane
- Design speeds of up to 200 km/h, where possible, to cater for potential future high-speed passenger trains
- Possible future double-stacked container freight trains
- Potential link to any future private sector proposal for the Melbourne–Darwin inland rail concept
- Standard and narrow-gauge rail capability
- Electrification, if this is a future requirement
- Retention of historic rail tunnels and stations.

Technical, environmental and cultural heritage studies highlighted issues that could arise if the construction of the proposed rail line goes ahead.

The strategic environmental study considered the potential environmental impacts associated with the proposed rail corridor. The study objectives were to:

- Examine and describe the existing environment the corridor is located in
- Identify the potential environmental impacts that might occur as a result of the construction and operation of the rail line
- Provide a framework against which the study team could consider the environmental aspects of the proposal when selecting a preferred route.

The study found that the impacts associated with construction and operation of the proposed railway could be managed through detailed engineering design, which will occur at some time in the future, closer to construction.

A cultural heritage study was undertaken in accordance with State legislation and DTMR and QR procedures and practice including:

- A literature review and background research
- A site reconnaissance under permit from the (then) Environmental Protection Agency
- Consultation with Indigenous groups
- Formulation of recommendations for protection from, or mitigation of, the impact of modification of the landscape on items and places of cultural significance.

The study concluded the proposed railway had little likelihood of impacting on sites other than stone artefact scatters and isolated finds. To support future works, a Cultural Heritage Management Plan was prepared and approved (CLH017009) in 2018. Regarding non-Indigenous matters, the Grandchester railway station and associated infrastructure are of State heritage significance and are listed on the Queensland Heritage Register and the Ipswich City Council Local Heritage Register. Construction and operation of the new rail corridor will not impact on this heritage-listed facility and rail access to Grandchester railway station can be maintained.

The Gowrie to Grandchester future State transport corridor was protected by the Queensland Government in 2003.

2.7.2 Inland Rail options assessment

Various options were assessed as part of the EIS and initial design to refine the alignment within the protected Gowrie to Grandchester future State transport corridor. A number of different corridors were investigated in recent years, with preference for using existing publicly owned corridors, including rail lines and road reserve areas.

Factors considered during design, included:

- The nature of the terrain in these areas (e.g. steep grades and/or the need to wind through such areas are not desirable due to the size and weight of the trains)
- Flooding and hydrology (e.g. ensure a 98 per cent level of serviceability for Inland Rail, so the corridor needs to be developed to withstand flood conditions)
- Environmental, social and heritage constraints (e.g. vegetation communities, sensitive receptors, waterway crossings, registered heritage sites)
- Cost (e.g. due to the physical construction requirements in some locations, critical construction constraints exist)
- Travel time (e.g. ARTC has a service offering requirement of less than 24 hours between Melbourne and Brisbane express)
- Constructability (e.g. some locations will make construction more difficult)
- Easement setback requirements (e.g. a number of minimum clearances required from road, power and other public utility easements must be met)
- Several optioneering analyses were carried out to identify potential significant efficiencies in construction and reductions in potential environmental and social impacts. The Project generally follows the protected Gowrie to Grandchester future State transport corridor.

2.7.3 Alignment options investigated within optioneering

The following sections provide detail of the main alignment options developed and the changes made to the alignment once optioneering was undertaken. Note that sketches provided are schematic only to illustrate the alignment options. It is important to note that for each option investigated, the following possible impacts were considered:

- Environmental
  - Ecological impacts (flora, fauna, and habitats)
  - Visual impacts
  - Noise and vibration impacts
  - Flooding and waterway impacts
  - Effect on air quality
  - Effect on greenhouse gas emissions
- Community and property
  - Property impacts
  - Heritage
  - Impact on community (e.g. through roads and other amenity aspects)
  - Community response (community stakeholder risk)
  - Current and future land use impacts
- Constructability (e.g. design and engineering) considerations
- Cost implications.

2.7.3.1 Warrego Highway Crossing

Early alignment option

An early alignment option crossed the Warrego Highway at a very shallow angle (refer Figure 2.3). Following an assessment of the bridge span required to accommodate the initial alignment and accommodate the proposed Warrego Highway upgrade to six lanes, it was found that two 90 m spans would be required. This was found to be too long for a box girder bridge, and a steel tied arch bridge or similar would be too costly.

Alternative alignment options

Three alternative alignment options were developed during early stages of the Project design to attempt to reduce the bridge's span lengths to 50 m or less so that a box girder arrangement could be used. The three alternative alignment options shown in Figure 2.3 use tighter horizontal curves (1,200 m compared to 2,200 m of the early alignment design), matching the curves on both ends of this section. The optimal alignment option was further restricted to the protected Gowrie to Grandchester future State transport corridor, as well as the clearances over the Warrego Highway and Philps Road (refer Figure 2.3).

Alignment outcome

It was decided to include the alternative alignment option 2 as indicated in Figure 2.3 in the reference design and Project EIS, as it provided for a shorter span bridge, while not affecting the operations of this section of the line. The environmental and community impacts were estimated to be approximately the same for all options assessed for this section of the alignment. The options for the bridges would not result in significant environmental impacts, and community amenity would remain approximately the same. The key factor was based on the constructability of the preferred alignment due to the shorter span bridge and the visual impact of a shorter bridge in comparison to the alternative alignment.

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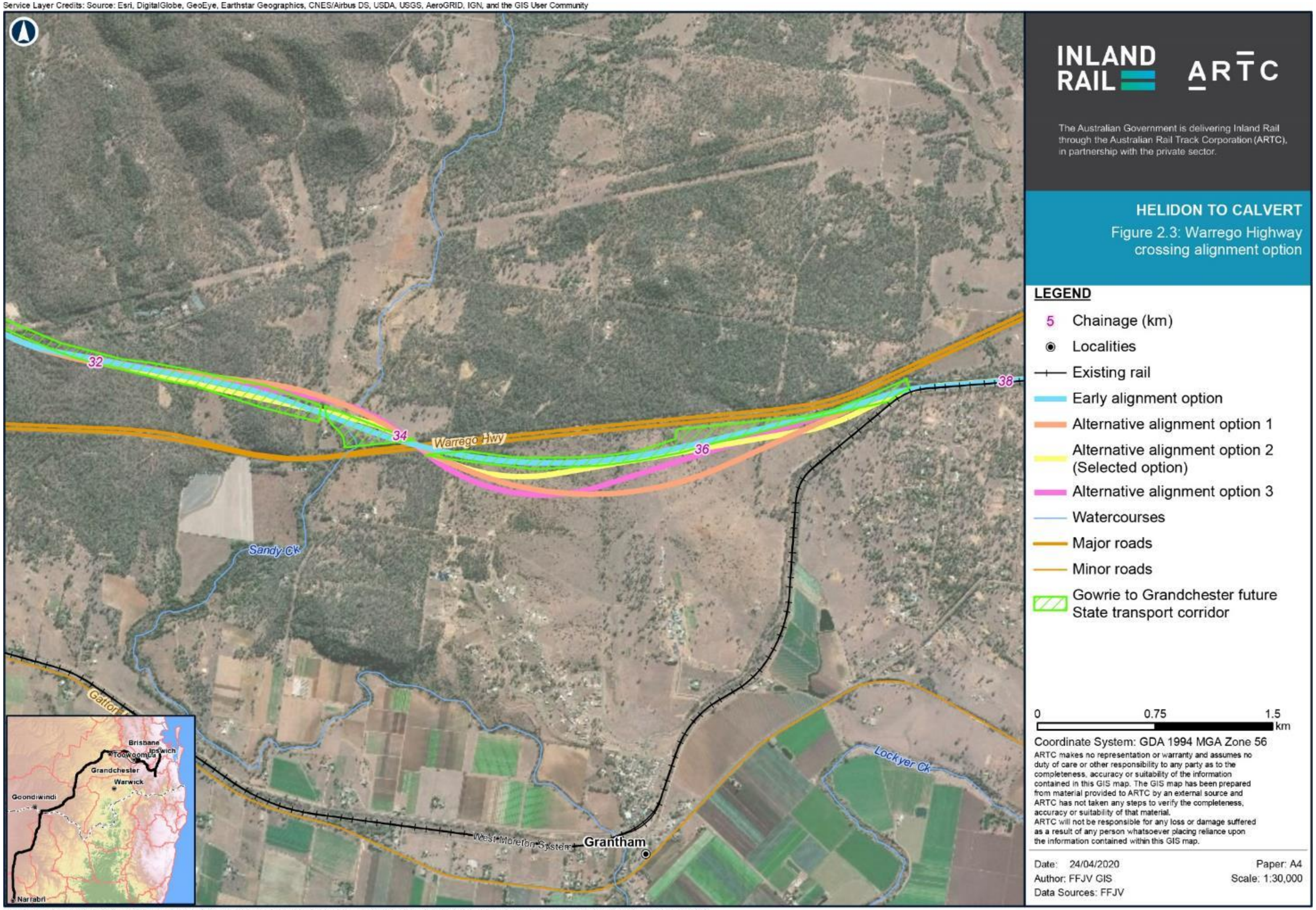

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2.7.3.2 Gatton

Early alignment option

The early alignment option for this section ran parallel to the existing QR West Moreton System rail corridor (within the existing rail corridor), through Gatton. Concerns over potential traffic impacts at level crossings and noise, air quality and amenity issues associated with the operation of the railway were raised during community and stakeholder engagement.

Alternative alignment options

Three alternative alignment options were therefore produced during early design phases of the Project to avoid the conflicts.

Alternative alignment option 1

The first option shown in Figure 2.4 formed a bypass option, which was discounted mainly due to the cost differential compared to the early alignment option. It was also determined that fewer long-term impacts were likely to be experienced compared to the early alignment option due to the presence of the existing rail line and the future plans of DTMR to establish a passenger rail through the protected Gowrie to Grandchester future State transport corridor (refer Section 2.7.2). The ability to align the Project with future upgrades and the existing rail corridor would minimise disturbance to communities and the environment.

The alternative alignment option 1 deviates from the existing QR West Moreton System rail corridor and while it avoids the majority of the floodplains, it results in unnecessary severance to community properties that could, instead, be confined to the existing rail corridor.

Alternative alignment option 2

A second option was examined to determine whether a reduced cost differential could be achieved—making the alternative alignment more favourable (refer Figure 2.4).

The alternative alignment option 2 crosses major floodplains and is undesirable considering the possible environmental impacts.

Alternative alignment option 3

A third option was also investigated to determine the potential for an elevated rail bridge to follow the same alignment as the early alignment option, reducing traffic impacts and road–rail interfaces.

The alternative alignment option 3 was determined to cause significant potential disruption to the local community during construction and operation without adding additional value to the alignment option.

Alignment outcome

The investigation concluded that the three alternative alignment options proposed significantly more earthworks, additional structures and impacts to properties with high value cropping land than the early alignment option. Based on this assessment, the early alignment option was determined to be the favourable option and was progressed to the EIS phase.

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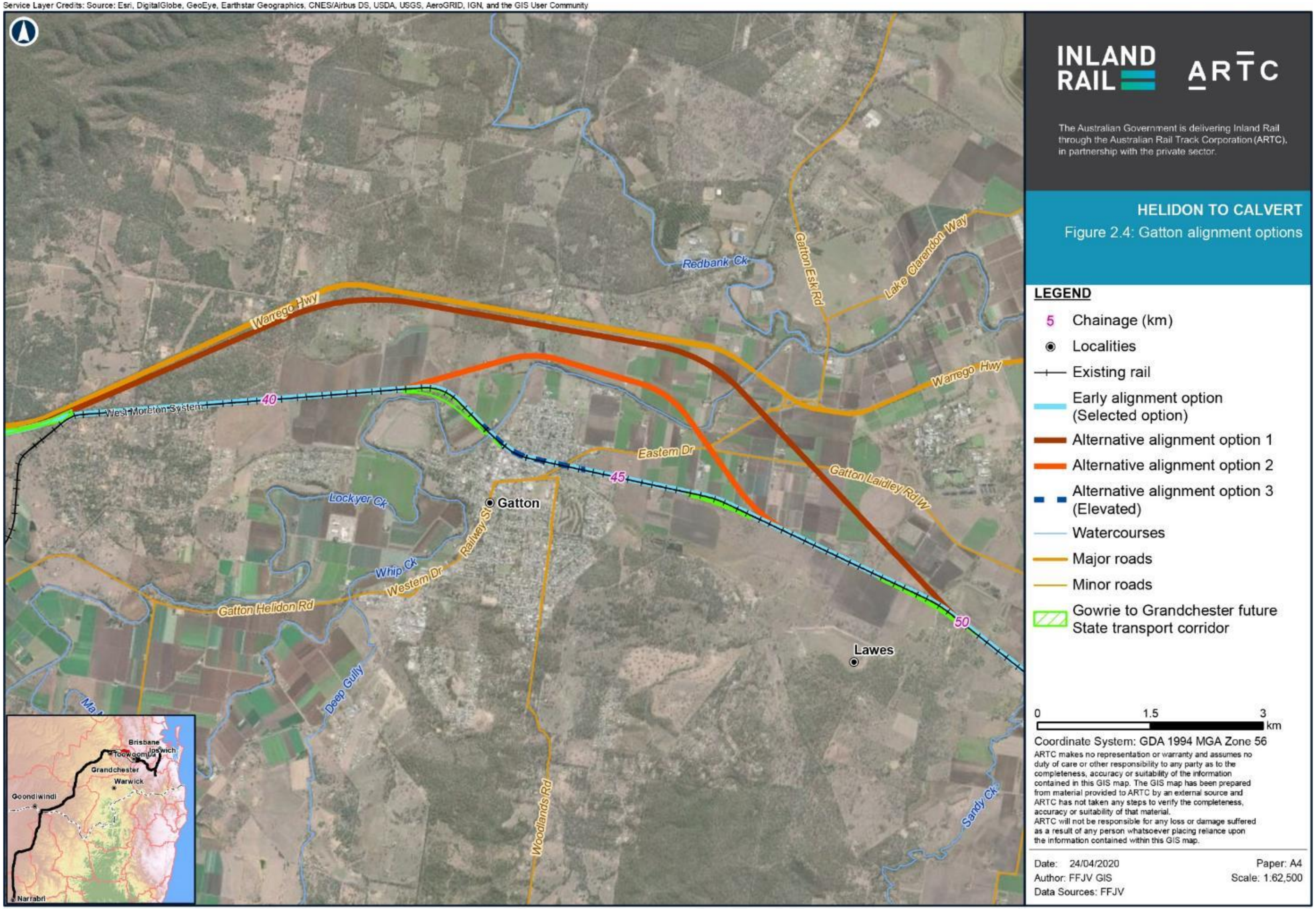

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2.7.3.3 Forest Hill

Early alignment option

The early alignment option for this section runs through the town of Forest Hill.

Two alternative alignment options were developed to determine the feasibility of bypassing the town of Forest Hill or elevating the track as it runs parallel to the existing QR West Moreton System rail corridor through Forest Hill (refer Figure 2.5).

Alternative alignment option 1

The alternative alignment option 1 provides a solution to reduce the noise and traffic impacts within the town of Forest Hill. In bypassing the town, the alternative alignment removes additional constraints imposed on the existing level crossing. However, the alternative presents an increase in the quantity of required earthworks from the initial alignment and has a significantly greater impact to farming and cropping land as it will sever a number of existing fields (refer Figure 2.5).

Furthermore, alternative alignment option 1 was presented at a community engagement session with feedback showing that the alignment was not preferred due to the impact on farming land.

Alternative alignment option 2

The alternative alignment option 2 involving elevating the track as it runs parallel to the existing QR West Moreton System rail corridor was considered to result in significantly more earthworks and construction impacts for the town of Forest Hill, which is already impacted by the existing QR West Moreton System rail corridor.

This is similar to the environmental and social impacts discussed in Section 2.7.3.2 in which the alignment options deviated from brownfield development areas, increasing impacts on floodplains, community amenity, properties, and potential future-proofing of the alignment to tie in to passenger services.

Alignment outcome

The early alignment option was selected to be developed during the EIS phase of the Project.

2.7.3.4 Little Liverpool

A key issue for the Project is the interaction between the QR West Moreton System rail corridor and the Inland Rail alignment west of the Little Liverpool Range tunnel. In addition, the vertical alignments at each side of the range had the potential to be optimised.

Early alignment option

The early alignment option for the Little Liverpool Range severs the QR West Moreton System rail corridor at-grade twice, with approximate change of 500 m (refer Figure 2.6). In addition, the alignment requires large volumes of earthworks and a tunnel on a horizontal curve, which is not desirable. The issues are primarily caused by the alignment following the protected Gowrie to Grandchester future State transport corridor, which has large horizontal curves (radius of 3,400 m) and maximum grades of 1:100.

Alternative alignment

An alternative alignment option was produced that aimed to minimise the earthworks while staying clear of the existing QR West Moreton System rail corridor. Staying clear of the existing QR West Moreton System rail corridor was a priority as the QR alignment is already very steep with 1:50 grades. Any realignment would most likely shorten the existing line, causing the grades to steepen. Alternatively, the vertical alignment would need to be adjusted for a significant distance past the horizontal realignment section to maintain a maximum 1:50 grade.

The alternative alignment option has been designed with radius of 800 m horizontal curves, a 1:72 grade on the western side of the range and a 1:60 grade on the eastern side. The section through the Little Liverpool mountain range is considered mountainous terrain, which requires horizontal curves 800 m radius (minimum radius of 400 m) with grades of no more than 1:50 (curve compensated). These grades were adopted to closely match the terrain on each side of the range and, therefore, minimise earthworks volumes. Flatter grades will require more earthworks and a longer tunnel. By adopting tighter horizontal curves, the tunnel has been straightened to minimise the cross-sectional area.

Alignment outcome

The alternative alignment option presented was a significant improvement from the early alignment option as it removes conflicts with the QR West Moreton System rail corridor, reduces the tunnel length by approximately 250 m and will significantly reduce earthworks volumes. The alternative alignment option was selected and incorporated in the preferred alignment development. The alternative alignment was adopted within the reference design and Project EIS.

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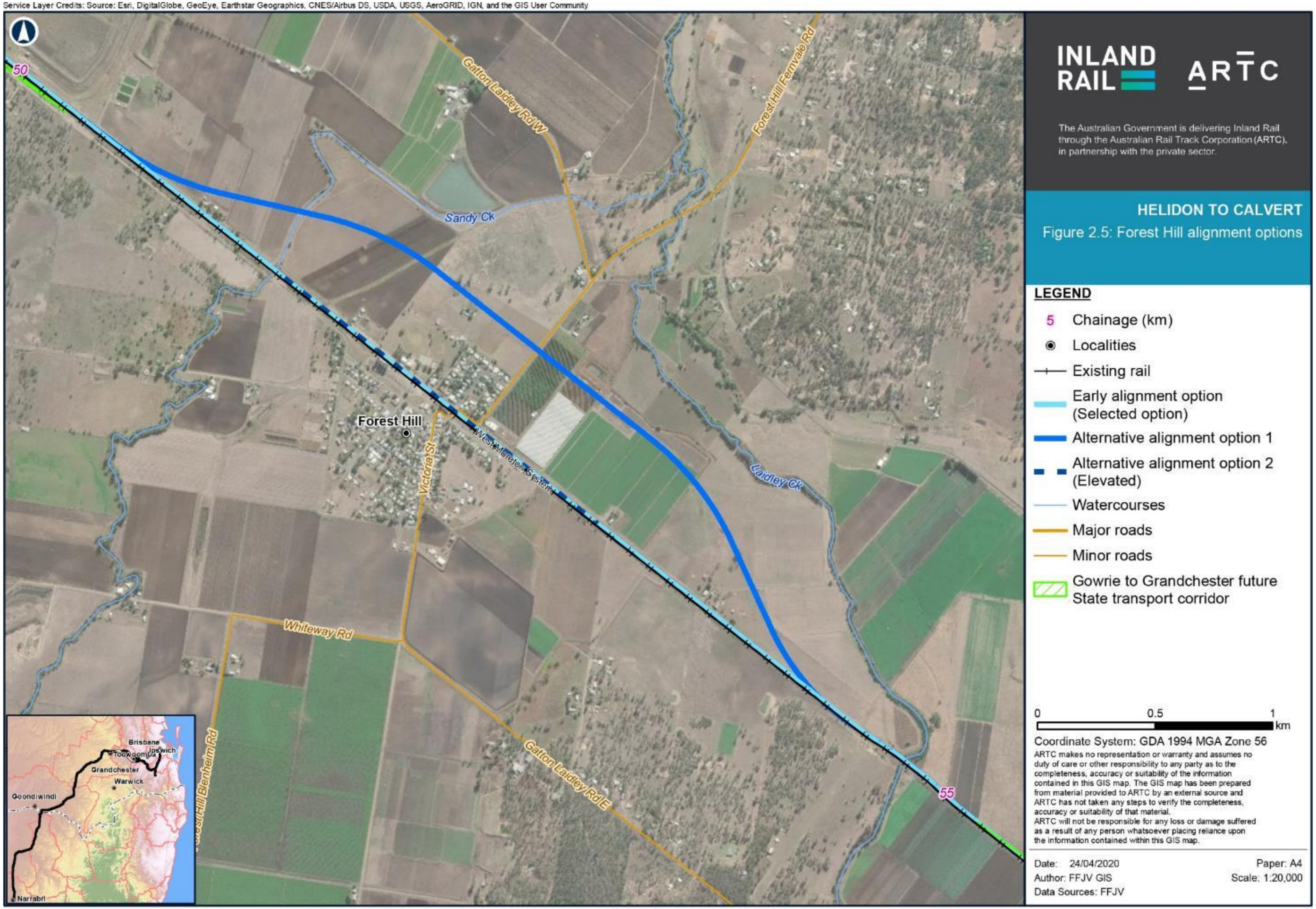

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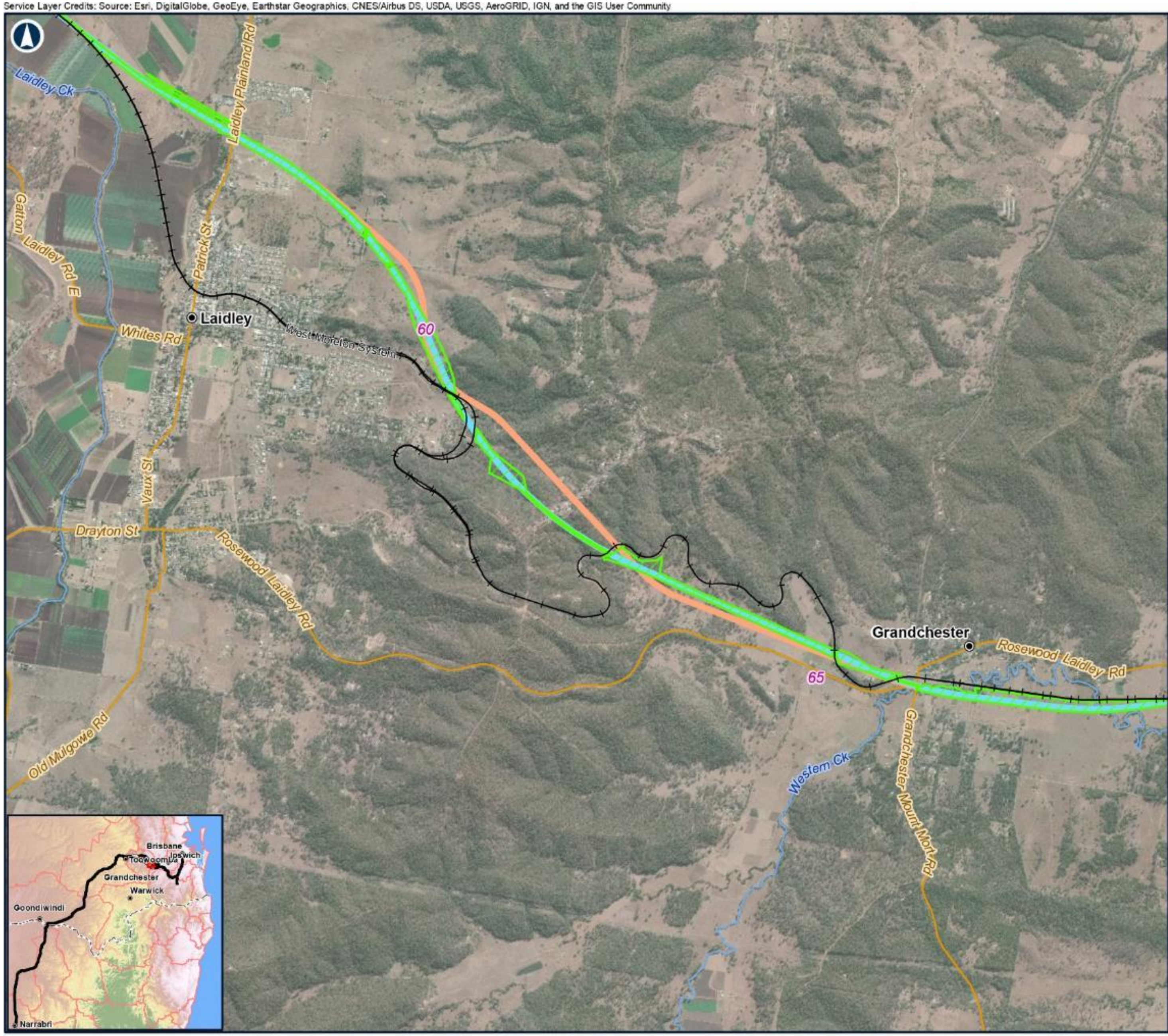

INLAND RAIL

ARTC

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

HELIDON TO CALVERT

Figure 2.6: Little Liverpool alignment options

LEGEND

- 5 Chainage (km)
- Localities
- Existing rail
- Early alignment option
- Alternative alignment option 1 (Selected option)
- Watercourses
- Major roads
- Minor roads
- Gowrie to Grandchester future State rail corridor

0 1 2 km

Coordinate System: GDA 1994 MGA Zone 56

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2.7.3.5 Grandchester

The early alignment option ran parallel to the existing QR West Moreton System rail corridor within the protected Gowrie to Grandchester future State transport corridor, through Grandchester. The early alignment option required large volumes of earthworks, long bridges to cross Western Creek multiple times, and multiple road and rail crossings and was determined to be unsuitable to progress to the EIS phase of the Project.

Several alignment options were developed as alternatives to the early alignment option to reduce the expected impacts. Two of these options are displayed in Figure 2.7 as the alternative alignment options, which were able to be contained mostly within the protected Gowrie to Grandchester future State transport corridor. The options were developed considering:

- Potential cost impacts
- Alignment with the bypass
- Environmental impacts
- Stakeholder inputs
- Nextgen data cable
- Santos pipeline easement
- Koala habitat
- Flooding from Western Creek
- Passenger-proofing requirements versus defined mountainous areas
- Community input during the community information sessions including the request to realign the route to the southern side of Rosewood–Laidley Road.

During the development of the alignment options, two separate community information sessions were held at Grandchester. The sessions introduced the alternative alignment options that were investigated and played a key part in refining the preferred alignment. The sessions helped determine where the high-value cropping land was located and what was preferred from a community point of view.

The preferred alignment option was determined to be the alternative alignment option 1 shown in Figure 2.7. This was the preferred alignment as it optimised the proximity to the existing QR West Moreton System rail corridor, while aligning closely with the bypass option investigated as part of the early design investigation.

The alignment achieves the following:

- Minimises the impact to high-value grazing land by paralleling Rosewood–Laidley Road and the existing QR West Moreton System rail corridor as much as possible
- Avoids paralleling Western Creek and therefore pulled the alignment away from the centre of the floodplain
- Removes the high embankment through town and the large structures associated with the multiple crossings of creeks and the QR West Moreton System rail corridor
- Minimises the impact to residents in Grandchester.

The alternative alignment option 1 was selected and incorporated in the reference design and Project EIS.

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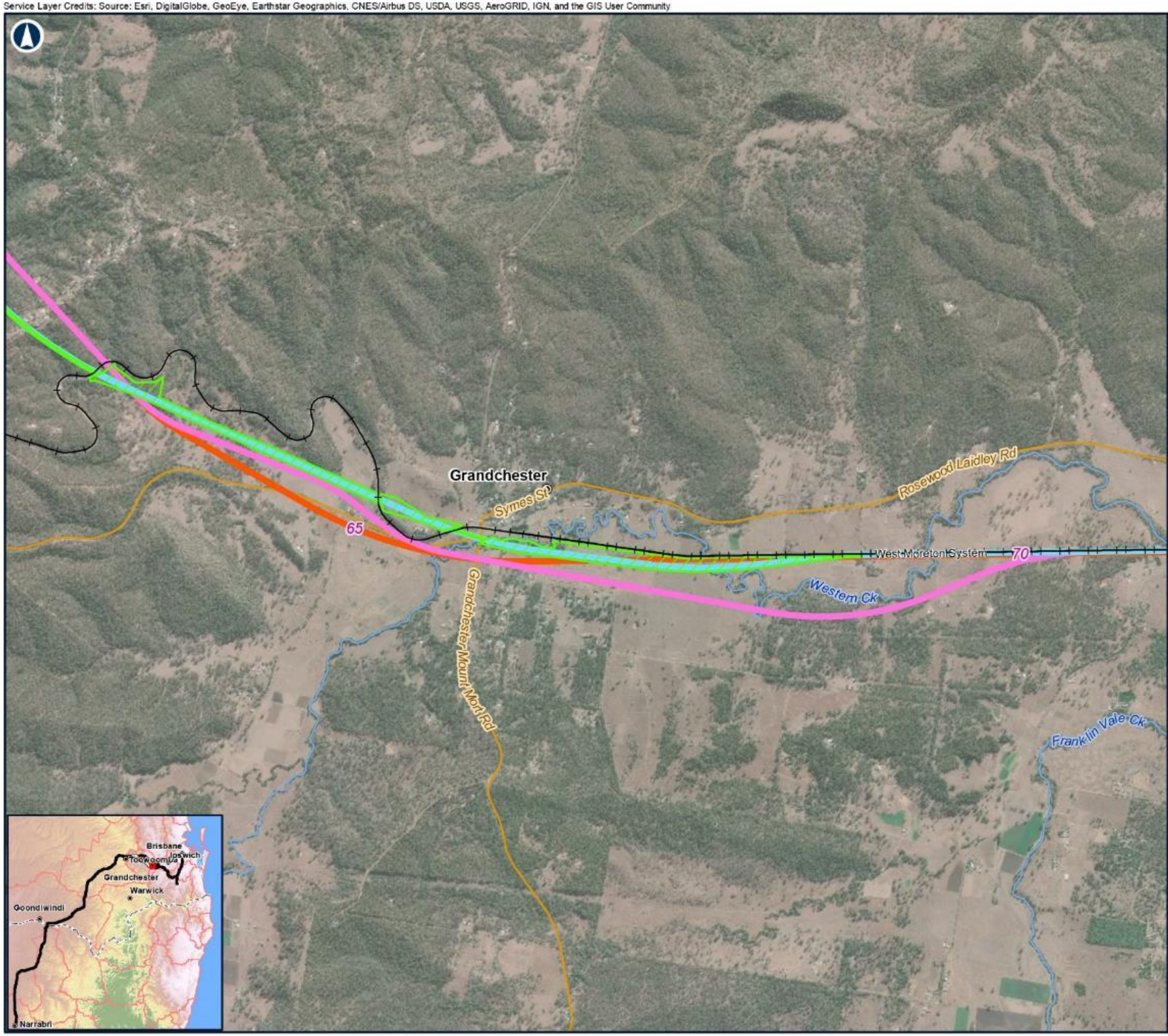

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HELIDON TO CALVERT

Figure 2.7: Grandchester alignment options

LEGEND

- 5 Chainage (km)
- Localities
- Existing rail
- Early alignment option
- Alternative alignment option 1 (Selected option)
- Alternative alignment option 2
- Watercourses
- Major roads
- Minor roads
- Gowrie to Grandchester future State transport corridor

0 1 2 km

Coordinate System: GDA 1994 MGA Zone 56

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2.7.4 Road–rail interface options investigated within optioneering

The following sections detail the three road–rail interface options developed, and the changes made to the initial design, following optioneering.

2.7.4.1 Helidon road–rail interface

The Project alignment runs through Helidon on the north side of the township, near a number of quarries, explosives facilities and logistics/road transport yards.

Three different road–rail interface options were assessed as part of the optioneering:

- Option 1 (base case): Seventeen Mile Road bridge, realign Air Force Road north of Inland Rail
- Option 2: Air Force Road bridge, realign Seventeen Mile Road north of rail
- Option 3: Air Force Road level crossing, Seventeen Mile Road bridge.

The optioneering process concluded that in comparison to option 1 and option 3, option 2 provides the best outcomes in areas of safety, operations, constructability, environment and community. The preferred option (option 2) reduces the impact on utilities through the Helidon area, with fewer cross-intersections to reduce traffic impacts, and will impact fewer properties through noise, vibration and air quality impacts than option 1 and option 3. It was also determined during community information sessions, that option 2 was the preferred option for residents in the area.

Based on the optioneering comparison, option 2 is the preferred option for the EIS.

2.7.4.2 Gatton road–rail interface

The Project alignment runs through Gatton on the north side of the town centre, along the existing QR West Moreton System rail corridor. Supplementary works to this rail alignment involved raising/reconstruction of the existing road bridge at Eastern Drive (with a proposed improvement from two to four lanes) and improvement of the existing underpass at Old College Road to a safer design, with improved traffic flow, improved clearance, and allowing connectivity to a proposed future Lockyer Valley Regional Council road bridge upgrade across Lockyer Creek (should this be undertaken post-EIS by others).

Due to the forecast future increase in rail and road traffic in Gatton, and due to an unsafe existing level crossing at Gaul Street, the level crossing arrangement cannot remain as-is with the introduction of Inland Rail. There is a high safety risk of short stacking across the rail tracks with the existing intersection design, so this interface was required to be re-designed for the Project.

- Option 1 (base case): Close the level crossing, consolidate traffic to nearby upgraded grade separated crossings
- Option 2: One-way level crossing (south to north), restricted movements at Hickey Street intersection
- Option 3: Signalised intersections either side of the crossing, restricted Hickey Street movements.

The optioneering process concluded that in comparison to option 2 and option 3, option 1 provided the best outcomes in areas of safety, operation, constructability and environment. Option 1 was the base case designed during initial phases of the Project. Investigation determined that safety impacts due to additional level crossings, environmental impacts in relation to noise impacts on local properties, and traffic impacts for local residents, which all informed the decision to retain the initial option through to the next phase of the Project to reduce impacts to the environment and community.

Based on the optioneering comparison, option 1 is the preferred option for the EIS phase of the Project.

2.7.4.3 Forest Hill road–rail interface

The Project alignment runs through Forest Hill on the north side of the town centre, along the existing QR West Moreton System rail corridor. Currently there is a level crossing at Hunt Street, which allows vehicle and pedestrian access across the rail corridor between the northern and southern sides of the town.

Due to the forecast future increase in rail and road traffic in Forest Hill, and due to unsuitable existing road geometry at the Hunt Street level crossing, the existing level-crossing arrangement cannot remain as-is with the introduction of Inland Rail.

As part of the ongoing design, three different road–rail interface options have been developed and assessed:

- Option 1 (base case): Hunt Street level crossing relocated to Glenore Grove Road; pedestrian crossing to remain at Hunt Street
- Option 2: Hunt Street level crossing closed to vehicles; vehicle overpass east of town
- Option 3: Hunt Street level crossing closed to vehicles; vehicle overpass west of town.

The optioneering process concluded that in comparison to option 2 and option 3, option 1 (base case) provided the best outcomes for technical viability, constructability, environment, and community. Option 2 and option 3 scored highly in safety due to closure of the level crossing but did not score as highly as option 1. The key impacts of option 2 and option 3 related to utilities interactions, design complexity and constructability. Potential environmental impacts for option 2 and option 3 were greater for air quality, visual amenity and flooding.

Based on the optioneering comparison, option 1 is the preferred option for the EIS phase of the Project.

2.8 Principles of ecologically sustainable development

It is impossible to construct and operate a major transport infrastructure development, such as this Project, without causing environmental, social and/or economic impacts (positive and negative). During Project design, the principles of ecologically sustainable development (ESD) were used as a guide to identify potential impacts and develop mitigation measures that afford equal weighting to environmental, social, economic and engineering opportunities and constraints.

In 1992, the Ecologically Sustainable Development Steering Committee developed a *National Strategy for Ecologically Sustainable Development*. ESD refers to using, conserving and enhancing the community's resources so that ecological processes are maintained and total quality of life, both now and in the future, can be increased (Council of Australian Governments (COAG), 1992).

The guiding principles of the *National Strategy for ESD* are as follows:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equity considerations
- Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The global dimension of environmental impacts of actions and policies should be recognised and considered
- The need to develop a strong, growing and diversified economy, which can enhance the capacity for environmental protection should be recognised
- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
- Cost-effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- Decisions and actions should provide for broad community involvement on issues, which affect them (COAG, 1992).

Each of these principles underpin ARTC's Inland Rail Environment and Sustainability Policy (refer Appendix F: Corporate Policies), with each considered at all stages of the design and this EIS.

The Intergovernmental Agreement on the Environment (Commonwealth of Australia (CoA), 1992) further identified four principles that should inform national policy making and program implementation at all levels of government:

- Precautionary principle
- Principle of intergenerational equity
- Conservation of biological diversity and ecological integrity principle
- Principle of improved valuation, pricing and incentive mechanisms.

Application of these principles to this Project is described in Section 2.8.1 to Section 2.8.4. Sustainability considerations incorporated into Project design, including defined preferences, in relation to infrastructure design, sources of water, waste management and utility requirements are discussed in Section 2.9 and Chapter 7: Sustainability. Alternative consideration are discussed in Section 2.7.

The economic justification and direct and indirect economic benefits of Inland Rail are discussed in Section 2.3 and Section 2.4 as well as Chapter 17: Economics.

Stakeholder consultation undertaken to advise the Project is discussed in Chapter 5: Stakeholder engagement. Social impact assessment outcomes and recommendations are presented in Chapter 16: Social.

2.8.1 Precautionary principle

The precautionary principle stipulates that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (CoA, 1992). In applying the precautionary principle, decisions should be guided by:

- Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment
- An assessment of the risk-weighted consequences of various options (CoA, 1992).

The Project is aligned with the precautionary principle in the following ways:

- The assessment of potential impacts is based on best practice, using the best available information. The assessment has involved key stakeholders and relevant government agencies.
- The impact assessment considered conservative scenarios. The EIS is considered 'worst case'.
- Since 2005, the Project has been the subject of numerous studies, as well as wide-reaching stakeholder consultation. Knowledge gained over this period will ensure that the Project is designed, constructed and operated in a way that minimises potential impacts.

- The EIS draws attention to aspects of the Project that may cause serious and/or irreversible environmental damage, especially if the nature and extent of the damage is uncertain. Where environmental damage cannot be avoided, mitigation and management measures to protect the receiving environment are proposed. This includes securing offsets for impacts to biodiversity values (post-EIS).
- Lack of full scientific certainty has not been used as a reason for postponing measures to prevent environmental damage. For example, threatened species that could potentially occur, but were not observed within the ecology study area during field surveys, are still assumed present (rather than absent). Measures to avoid and/or mitigate impacts to threatened species are proposed, on the basis that these threatened species could be present within the ecology study area.
- The detailed design will aim to further minimise impacts and site- and species-specific mitigation measures will then be applied to ensure the significance ratings of any potential impacts are classified as low as reasonably practicable and the significant adverse residual impacts are appropriately offset.
- Limits, goals and criteria have been deliberately recommended in a conservative manner (e.g. operational noise assessment levels (triggers) that are more stringent than both the ToR and current Queensland requirements).
- During development of the Project, alternative routes have been considered and the alignment has been refined to:
  - Avoid sensitive vegetation, areas with known threatened flora and fauna communities, and key habitat areas
  - Avoid known items/areas of cultural heritage significance
  - Minimise flooding impacts
  - Minimise impacts on existing agricultural land and infrastructure, while also considering potential future land uses
  - Include concept options for barrier design (noise path transmission control concept options).

2.8.2 Principle of Intergenerational equity

The principle of intergenerational equity is that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations (CoA, 1992).

The Project is aligned with the principle of intergenerational equity by:

- When developing the proposed alignment, minimising potential environmental impacts was a key consideration. This aims to ensure that environmental values (hydrological regimes, water quality, habitat connectivity, and cultural heritage sites) are maintained for existing and future generations.
- Climate change projections were factored into flood modelling for the Project. Climate change-specific mitigation measures are proposed.
- A Sustainability Management Plan will be developed before the commencement of construction, consistent with the draft Outline Environmental Management Plan (refer Chapter 23: Draft Outline Environmental Management Plan) to guide the Project, which will include engaging meaningfully with stakeholders, promoting long-term economic benefits and training and development opportunities for local workers (refer Chapter 7: Sustainability).

The need for Inland Rail is well documented. As part of the wider Inland Rail operations, the Project would benefit existing and future generations by providing a safer, more efficient, means of transporting freight between Melbourne and Brisbane.

Conversely, should the Project (and therefore Inland Rail) not proceed, the principle of intergenerational equity may be compromised. Future generations would experience increasingly worse safety and environmental impacts due to continued growth in road transport between Melbourne and Brisbane, particularly along the Warrego Highway.

2.8.3 Conservation of biological diversity and ecological integrity principle

A number of sustainability initiatives were identified and incorporated into the Project during the development of the reference design and Project EIS, which included protecting the environment by minimising the Project's environmental footprint. As in Section 2.7, the environmental, social and/or economic impacts have been factored into assessments and the selection of corridor and alignment options for the Project.

Impacts on biological diversity and ecological integrity have been avoided, where possible. For example, investigations to verify the presence of threatened species and ecological communities within the Ecology study area were completed. The results were used to inform the design and location of fauna crossings, fauna exclusion fencing, landscaping, revegetation and rehabilitation works.

Other ways in which the Project contributes to the conservation of biological diversity and ecological integrity include:

- A crossing structure hierarchy was adopted during design development. Preference was given to bridges over culverts as, on the whole, bridges result in less severe impacts to fauna passage. The span of bridges allows for dryland fauna crossings.
- Close attention was paid to the Department of Agriculture and Fisheries' *Accepted development requirements for operational work that is constructing or raising waterway barrier works* (DAF, 2018a). This applies specifically to bridges and culverts designed to cross mapped Queensland Waterways for Waterway Barriers Works.
- Measures detailed in the Landscape and Visual Amenity Sub-plan of the draft Outline EMP (refer Chapter 23: Draft Outline Environmental Management Plan) will guide the approach to rehabilitating disturbed areas. Rehabilitation will occur progressively throughout the construction phase and beyond (as required).
- Other plans will be developed to minimise potential impacts on biodiversity during the construction phase including erosion and sediment control, biosecurity and soil management as detailed in the draft Outline EMP (refer Chapter 23: Draft Outline Environmental Management Plan).

Where impacts cannot be avoided (e.g. clearing of regional ecosystems and essential habitat), mitigation and management measures will be implemented. Where required, biodiversity offsets will be secured. Post-EIS, and prior to construction, an offset strategy for the Project will be prepared in close consultation with the Queensland State Government and Australian Government.

2.8.4 Principle of improved valuation, pricing and incentive mechanisms

The principle of improved valuation, pricing and incentive mechanisms requires that environmental factors be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement
- The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste
- Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems (CoA, 1992).

It is difficult to place a monetary value on the Project's environmental impacts. However, the value placed on environmental resources within and surrounding the alignment is apparent in the breadth and depth of environmental investigations undertaken to inform the Project design and recommended mitigation measures.

The costs associated with environmental design and mitigation measures have been built into the overall Project cost. For example:

- Where required, offsets will be secured (post-EIS) to ensure a neutral or net beneficial biodiversity outcome for the region is achieved
- A range of mitigation measures will be implemented to ensure that, during construction and operation, waste is avoided, reused or recycled wherever possible. Waste mitigation measures are documented in the Waste and Resource Management Sub-plan of the draft Outline EMP refer Chapter 23: Draft Outline Environmental Management Plan. Waste management is discussed further in terms of the preferred waste management hierarchy (refer Section 2.9)
- Increased economic growth and reduced freight transport costs as a result of Inland Rail have been recognised. Inland Rail is expected to increase Australia's GDP by $16 billion during construction and the first 50 years of operation, while decreasing freight transport costs by an estimated $10 per tonne.

2.9 Infrastructure alternatives

During the development of the design, a number of sustainability initiatives have been identified and incorporated into the Project. These identified opportunities and initiatives will contribute towards achieving an Infrastructure Sustainability rating for the Project against version 1.2 of the scheme, which is administered by the Infrastructure Sustainability Council of Australia. The Project's contribution will also form part of Inland Rail's target of achieving an 'Excellent' rating. Chapter 7: Sustainability provides a summary of sustainability considerations in relation to the design, construction and operation of the Project.

Sustainability considerations, including defined preferences, in relation to sources of water, waste management and utility requirements are summarised in the following sections. Further information can be found in Chapter 6: Project description, Chapter 7: Sustainability and Chapter 21: Waste and resource management.

2.9.1.1 Water

Water will be required for dust control, site compaction and reinstatement during construction. A number of potential water sources have been investigated, including extraction of groundwater or surface water, private bores, recycled water and watercourses. Sources of construction water will be finalised during the detailed design and construction phase of the Project (post-EIS) in consultation with regulatory agencies, local councils and landowners, and will be dependent on:

- Climatic conditions in the lead up to construction
- Confirmation of private water sources made available to the Project by landowners under private agreement
- Confirmation of access agreements with local governments for sourcing of water mains for concrete batching (or other) purposes.

The hierarchy of preference for accessing of construction water is generally anticipated to be as follows:

- Public surface water storages, i.e. dams and weirs
- Recycled water, where appropriate
- Permanently (perennial) flowing watercourses
- Privately held water storages, i.e. dams or ring tanks, under private agreement
- Existing registered and licensed bores
- Mains water.

The suitability of each source will need to be determined for each construction activity that requires water. An appropriate quality of water will be sourced for each use.

2.9.1.2 Waste

The management of waste activities associated with the Project will be underpinned by the *National Waste Policy* (2018) and the *Waste Reduction and Recycling Act 2011* (Qld) waste and resource management hierarchy, as listed below in the preferred order to be considered:

- Avoid or reduce
- Reuse
- Recycle
- Recover energy
- Treat
- Dispose.

2.9.1.3 Utilities

When the final location of site offices and batch plants are known, the construction contractor will engage with the utility owners to connect to mains power, water, communications and sewerage, where possible. Temporary requirements will be provided by portable water tanks and gen-sets, where required. Consideration will be given to the use of solar power systems, including stand-alone systems, for the provision of power at site offices and for permanent infrastructure associated with signalling.

2.10 Relationship to other Inland Rail projects

2.10.1 Inland Rail projects

Inland Rail is a 1,700 km route that will link Melbourne and Brisbane via regional Victoria, NSW and Queensland. It will connect farms, mines, cities and ports to domestic and international markets. Inland Rail will support Australia's four richest farming regions, as well as providing supply chain benefits and substantial cost savings for producers.

The route uses the existing interstate line from Melbourne, Victoria to Illabo, NSW, which will be enhanced to accommodate double-stack trains up to 1,800 m long. A combination of new and upgraded tracks will then be used via Parkes, Moree, Toowoomba and Calvert to reach the existing interstate line at Kagaru, and then to Acacia Ridge and Bromelton, south of Brisbane.

Inland Rail has been divided into 13 projects as detailed in Chapter 1: Introduction and shown in Figure 2.8 to Figure 2.20.

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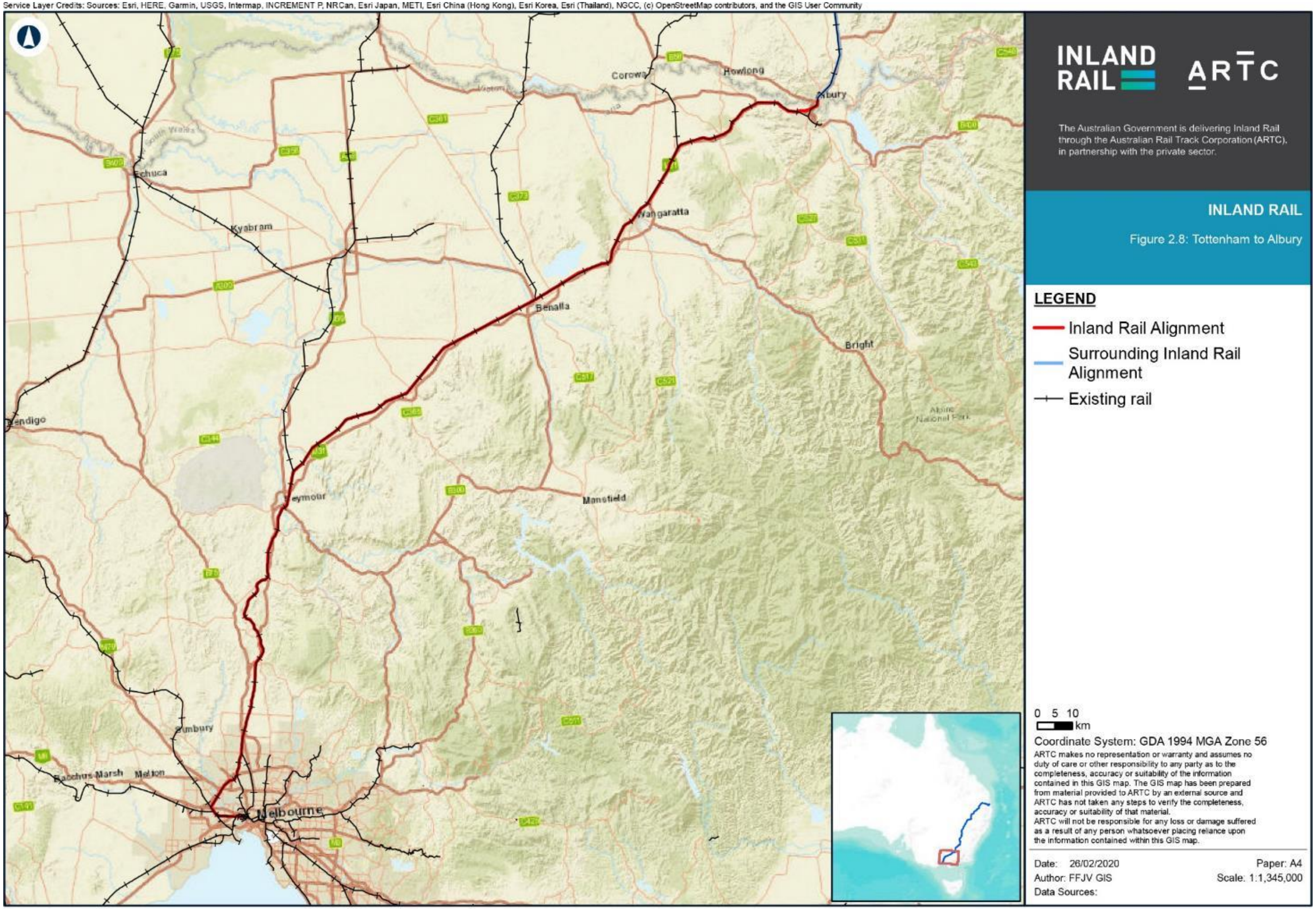

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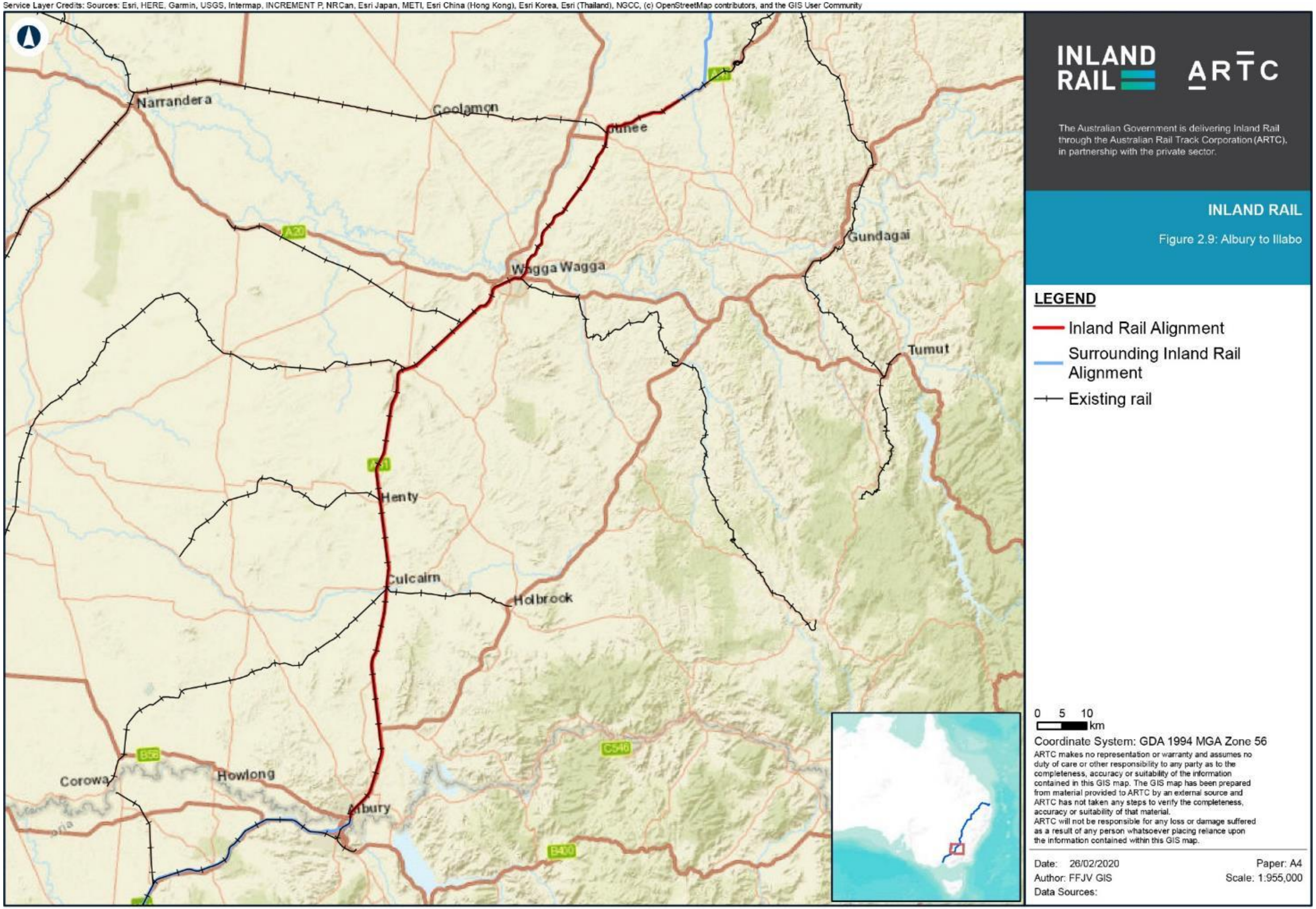

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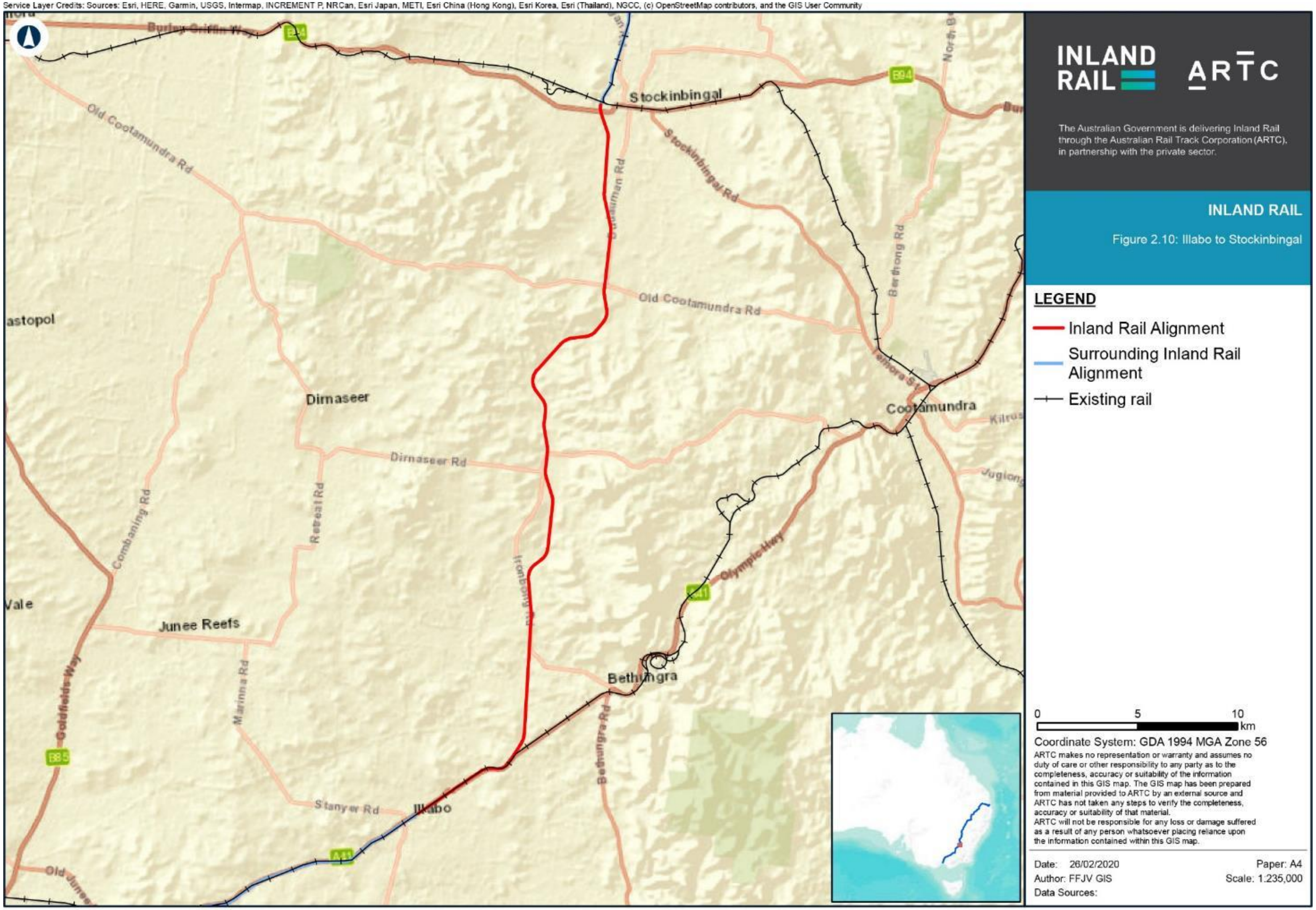

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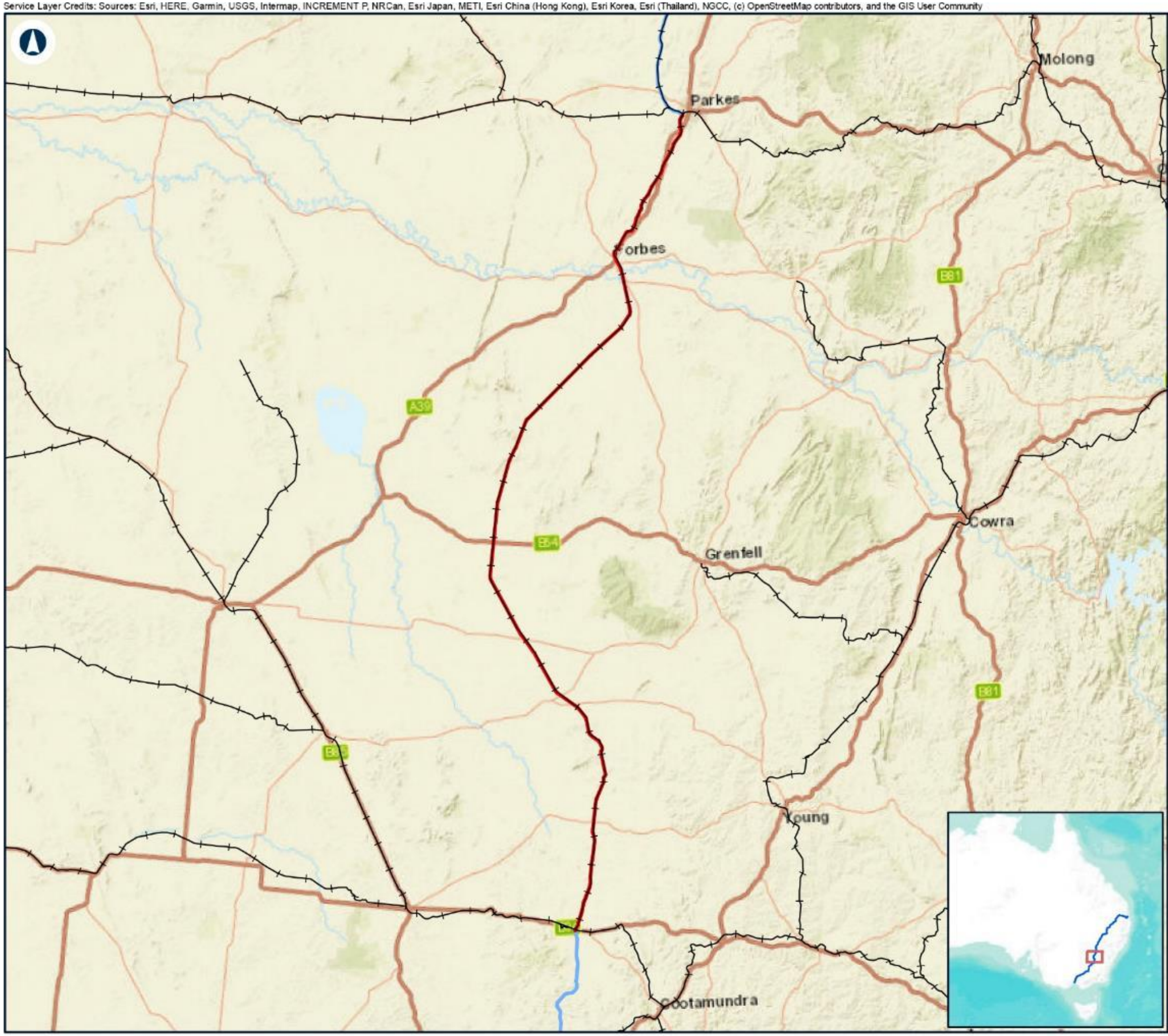

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INLAND RAIL

Figure 2.11: Stockinbingal to Parkes

LEGEND

- Inland Rail Alignment
- Surrounding Inland Rail Alignment
- Existing rail

0 5 10
km

Coordinate System: GDA 1994 MGA Zone 56

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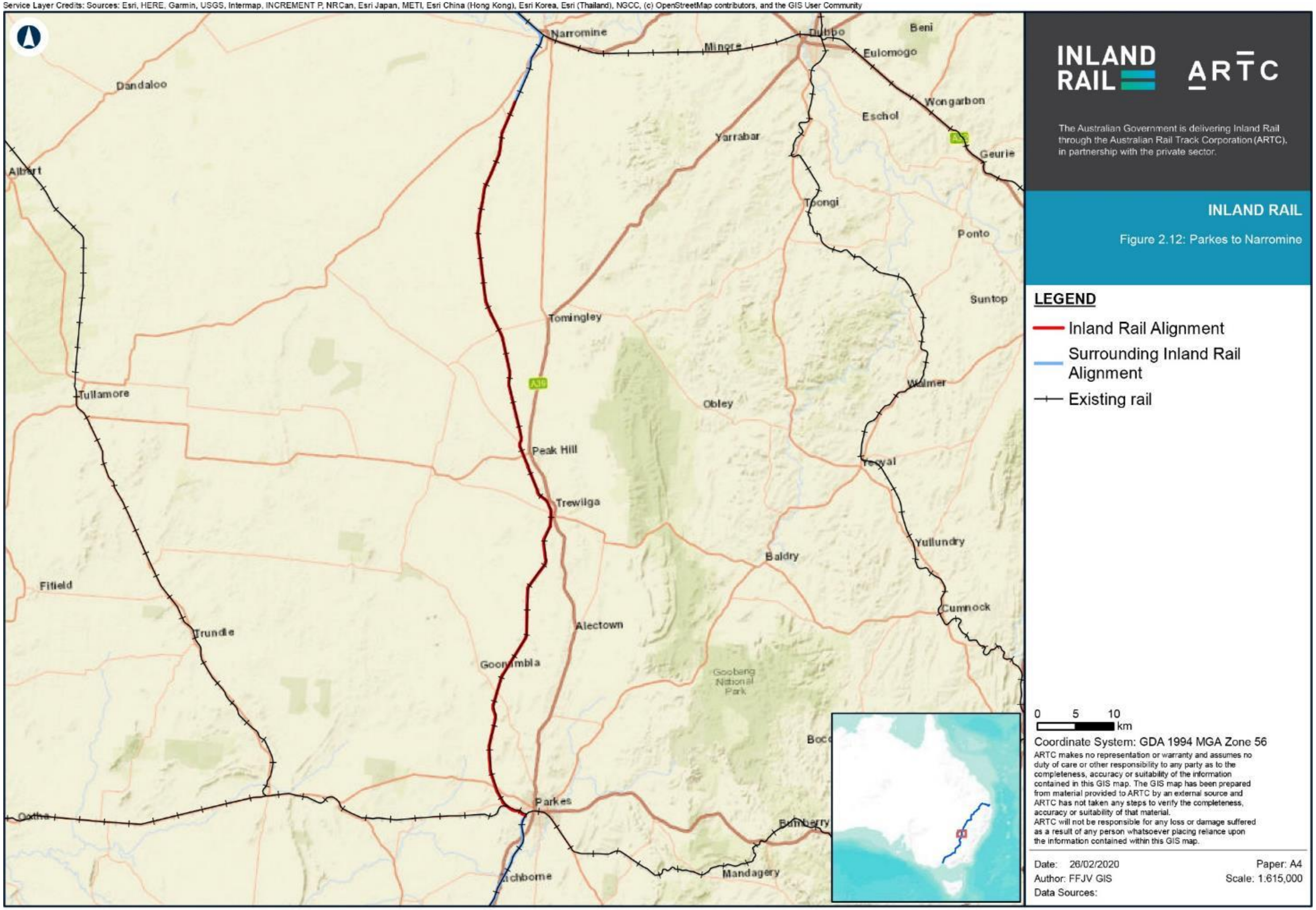

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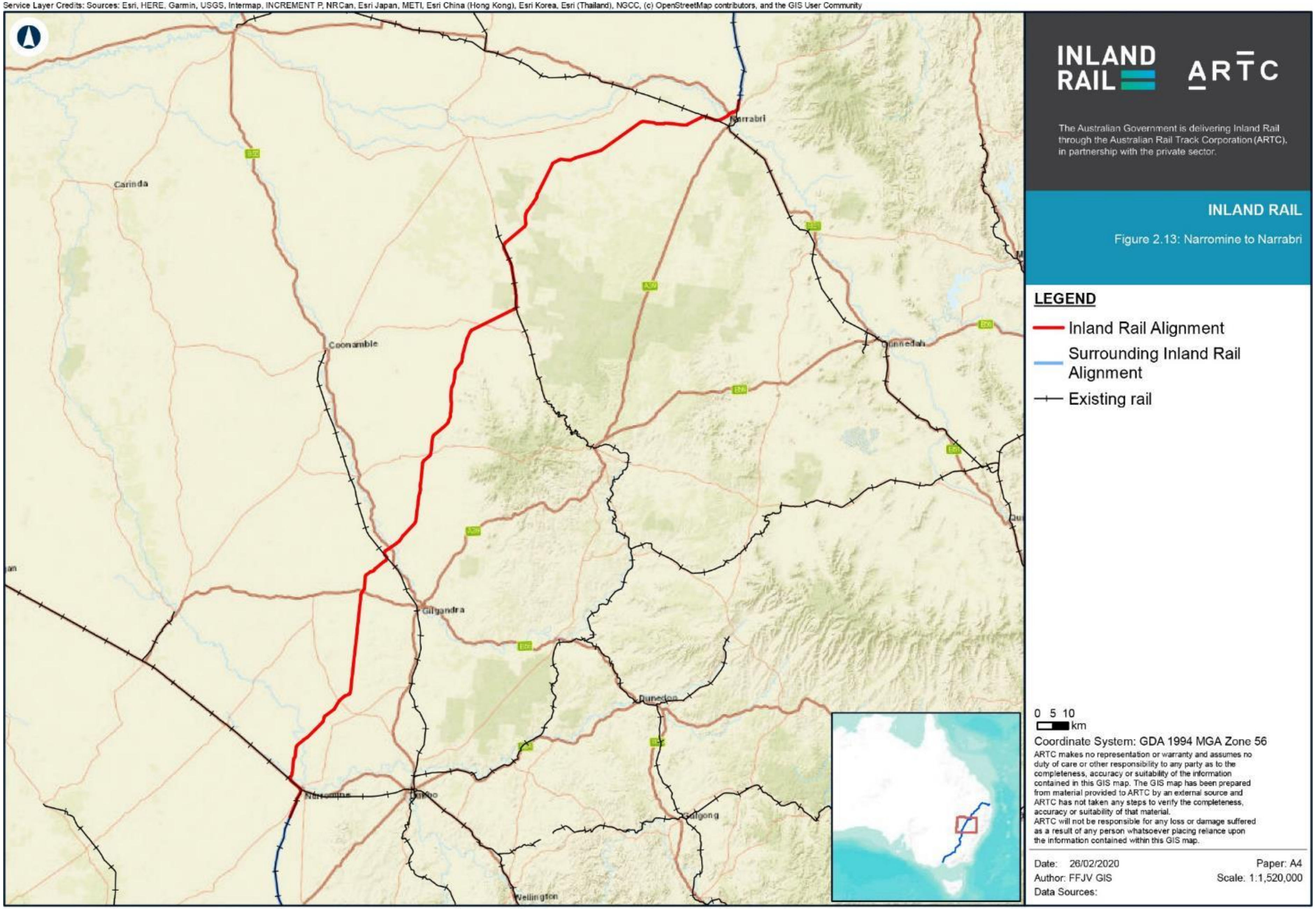

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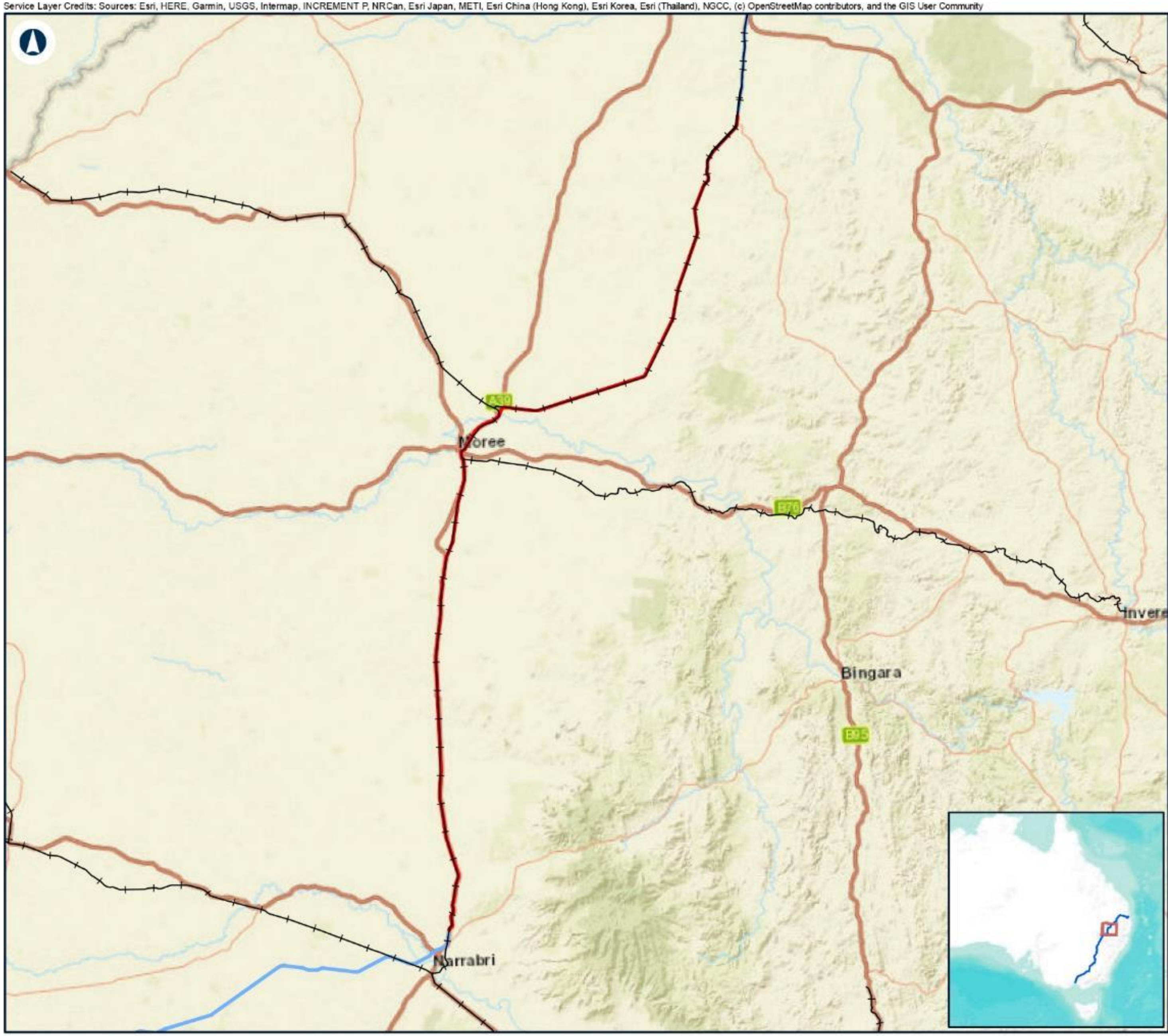

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INLAND RAIL

Figure 2.14: Narrabri to North Star

LEGEND

- Inland Rail Alignment
- Surrounding Inland Rail Alignment
- Existing rail

0 5 10 km

Coordinate System: GDA 1994 MGA Zone 56

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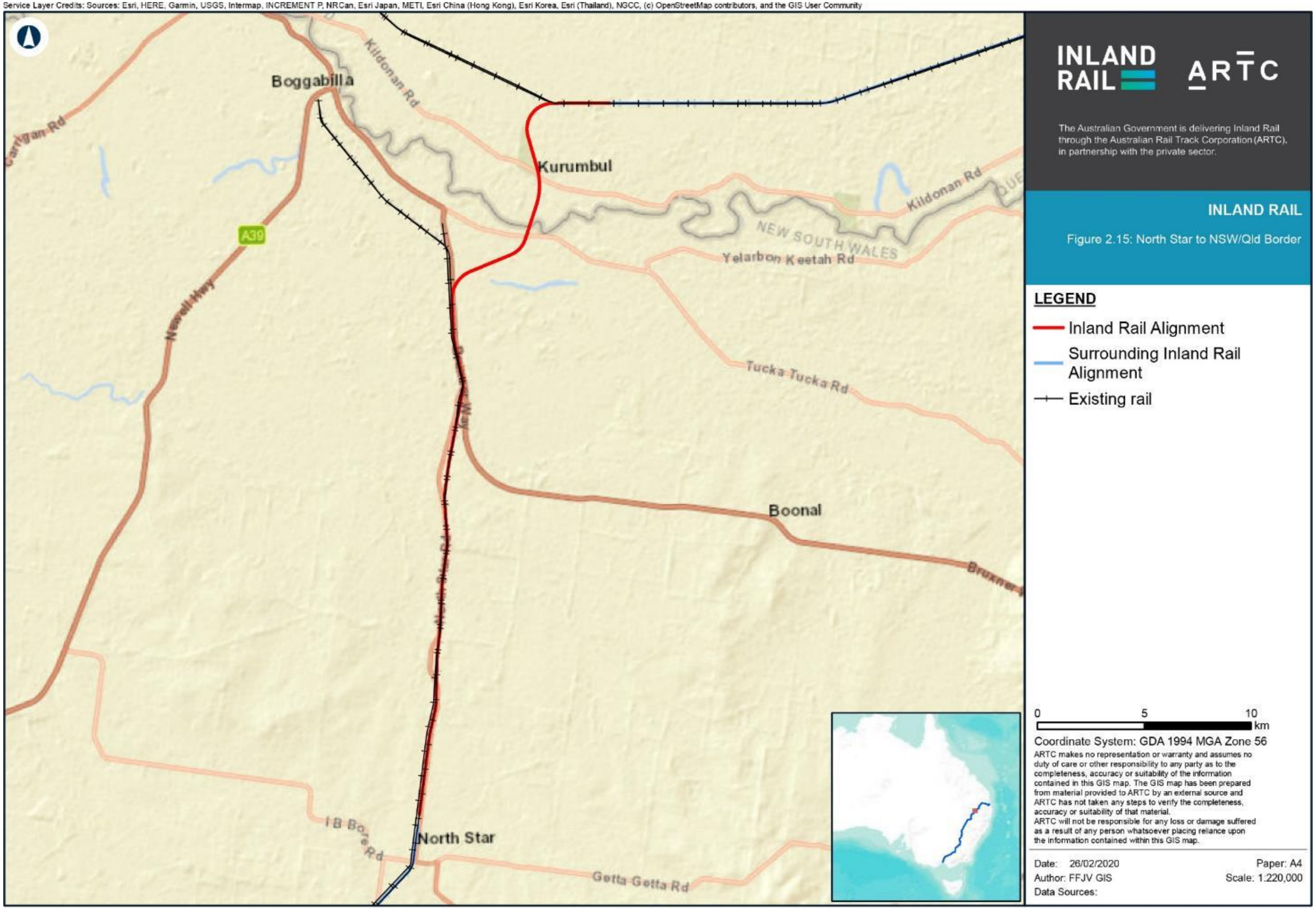

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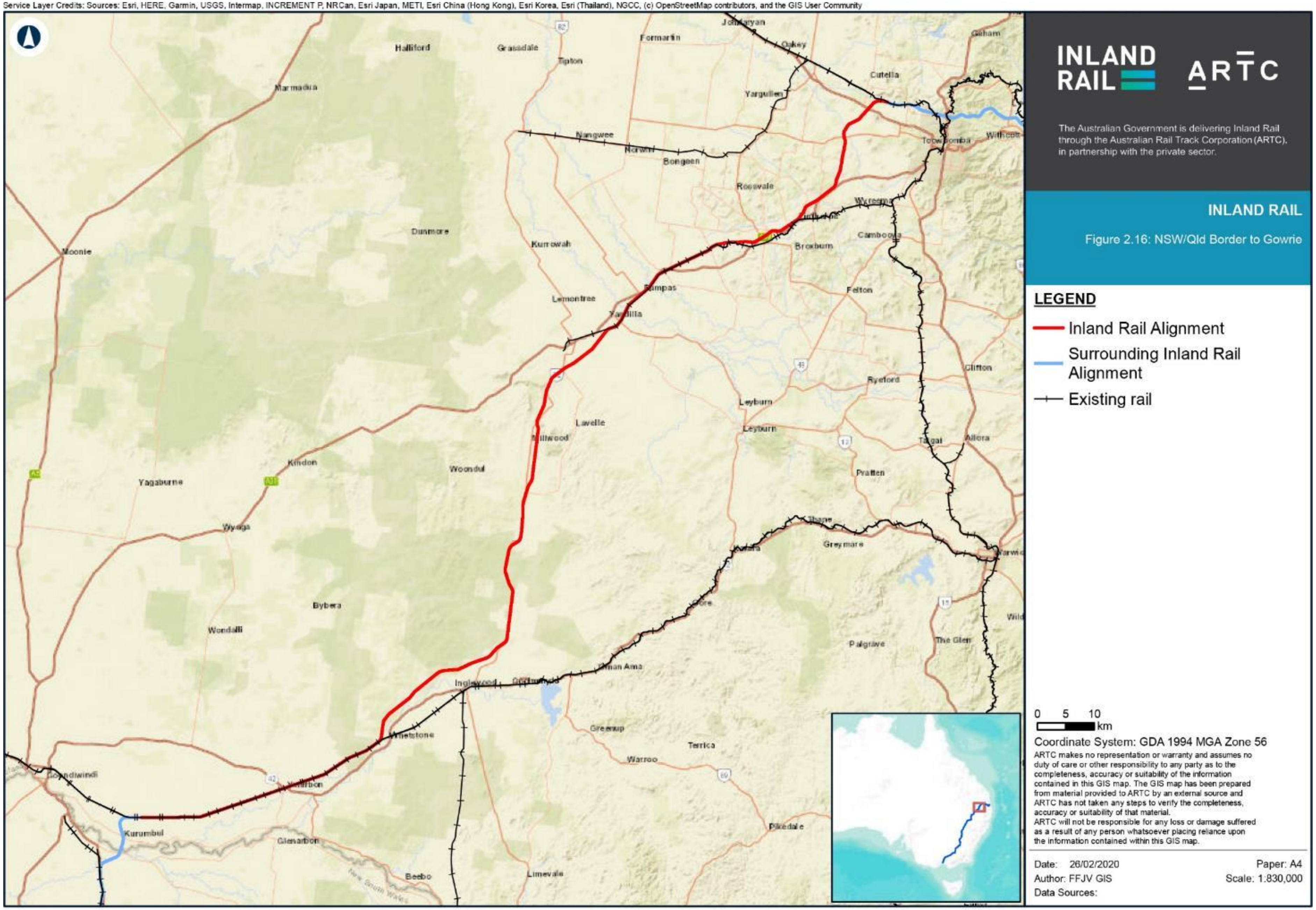

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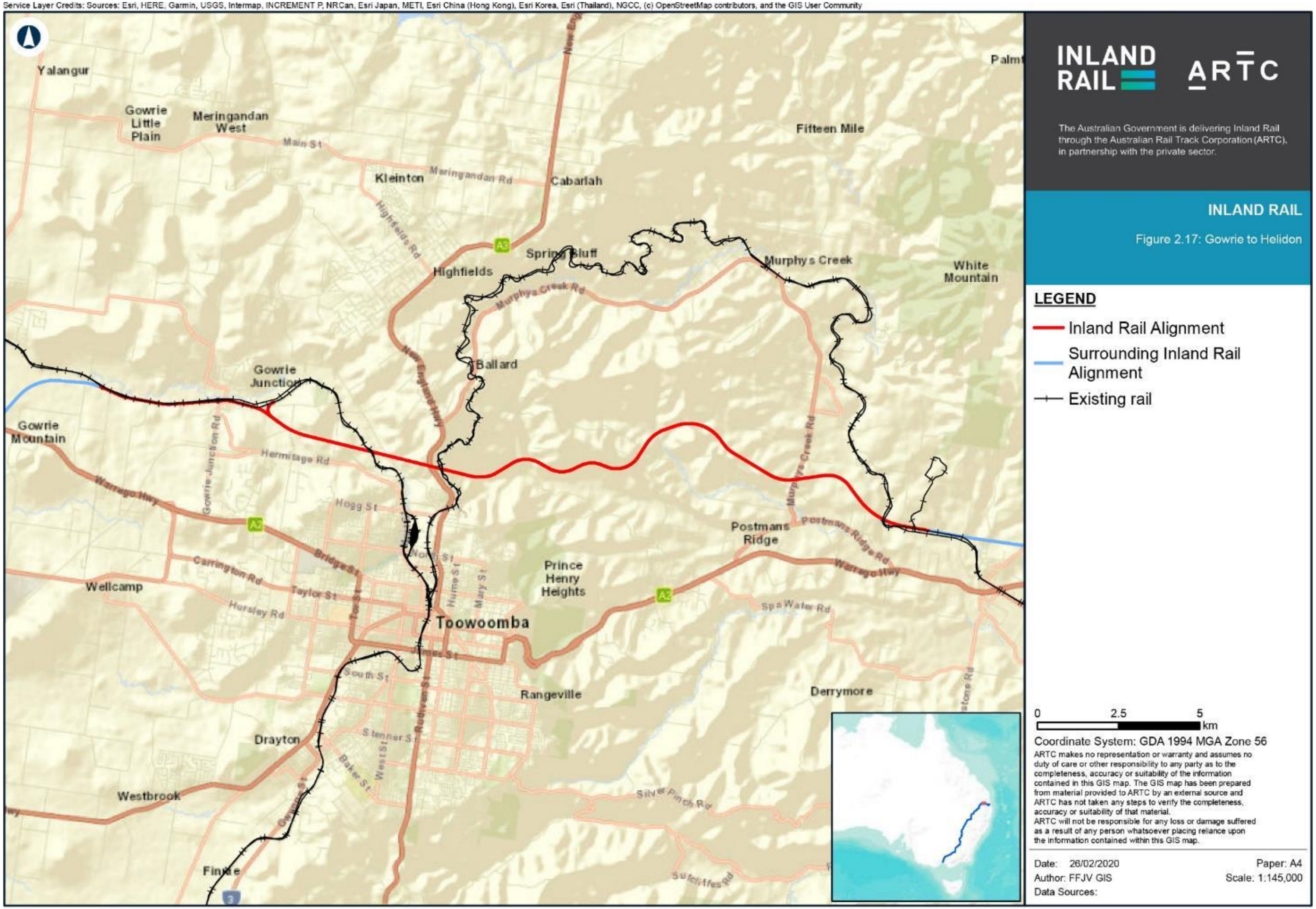

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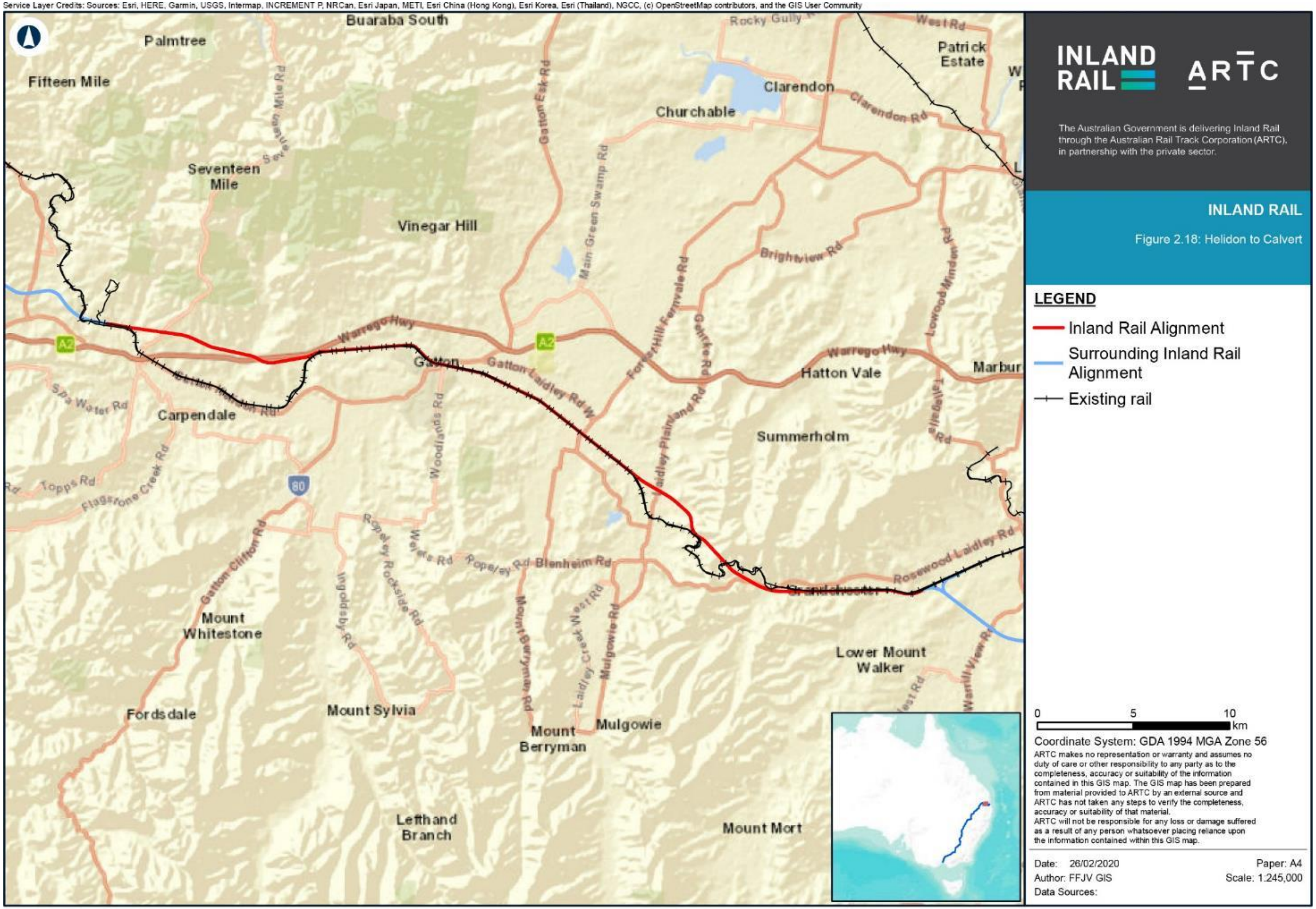

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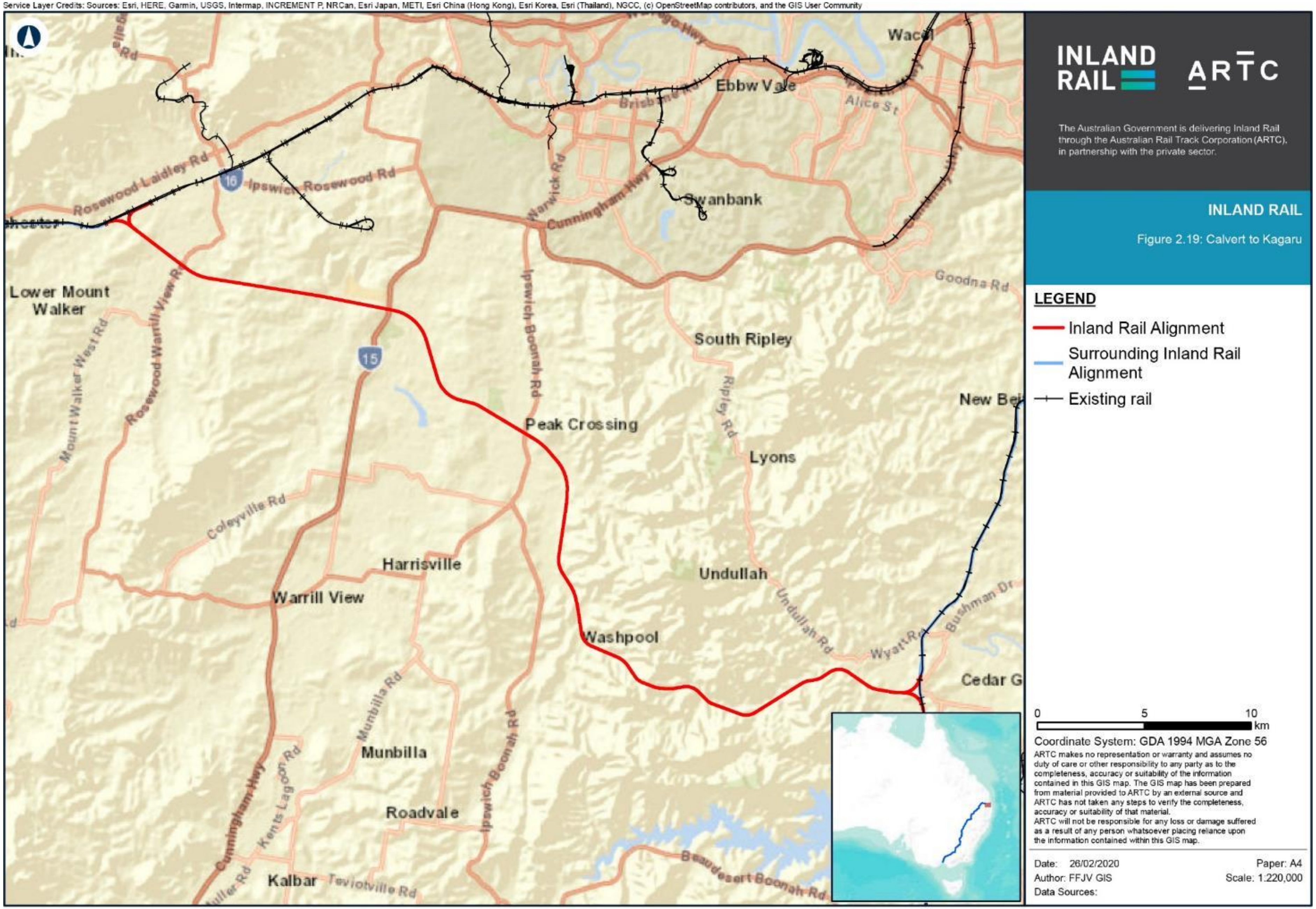

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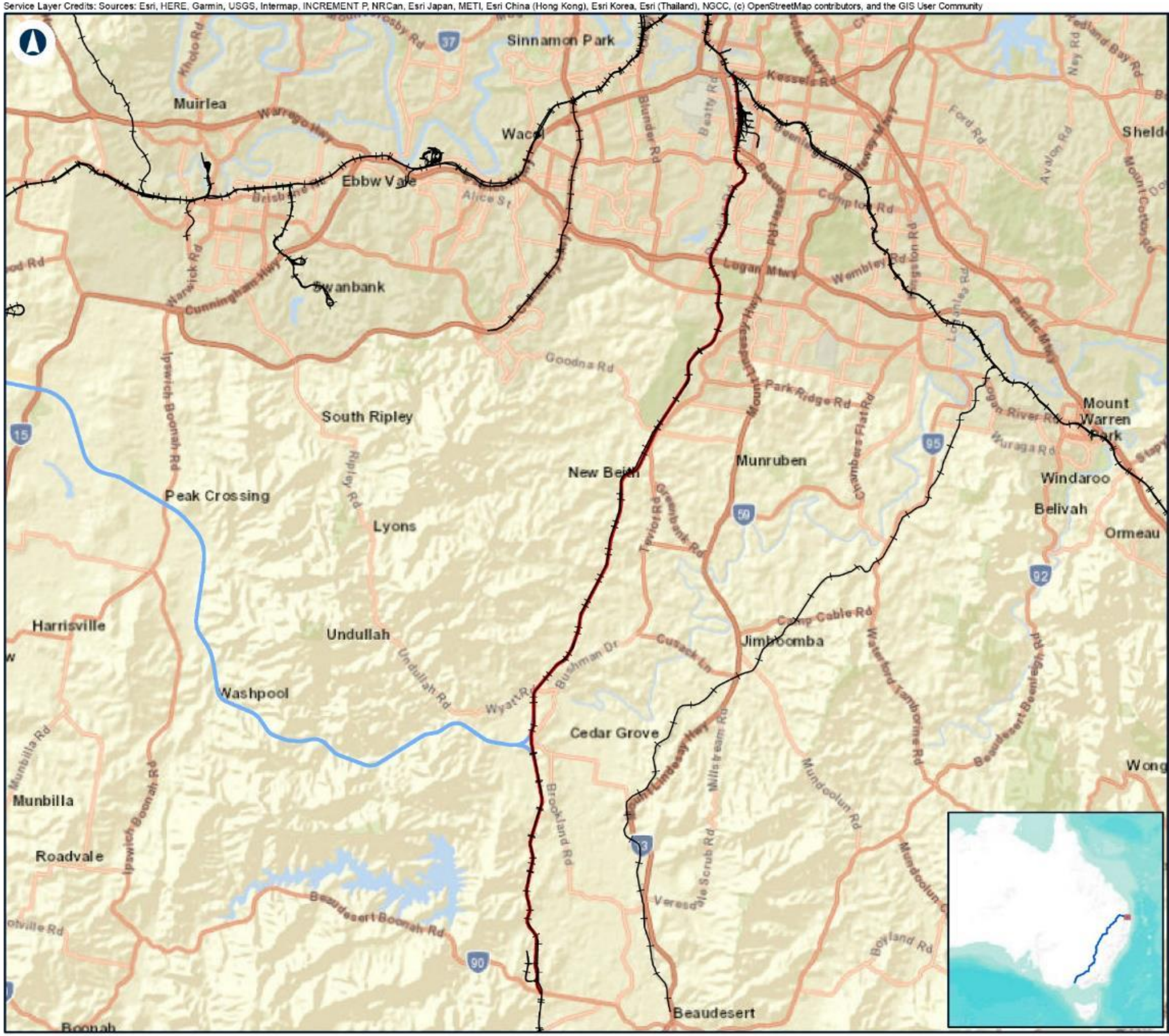

INLAND RAIL

ARTC

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

INLAND RAIL

Figure 2.20: Kagaru to Acacia Ridge & Bromelton

LEGEND

- Inland Rail Alignment
- Surrounding Inland Rail Alignment
- Existing rail

0 5 10 km

Coordinate System: GDA 1994 MGA Zone 56

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Author: FFJV GIS Scale: 1:270,000
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2.10.2 Project dependencies

The Project is both greenfield and brownfield and is one of the 'missing links' across Inland Rail. At the eastern end of the Project, the alignment at Calvert joins the adjacent project alignment, Calvert to Kagaru (C2K), running parallel to the QR West Moreton System rail corridor. At the western end of the alignment, the Project joins the adjacent project alignment, Gowrie to Helidon (G2H).

Inland Rail will be operational once all 13 sections are complete. Each of the 13 Projects can be delivered independently with tie-in points on the existing railway.

The full suite of potential benefits associated with the Inland Rail Program, as discussed in Section 2.5, can only be realised once the Project is complete and operational, as well as the other 12 Inland Rail sections.

The Project does not have a direct relationship with any other coordinated projects, major projects or developments. However, the Project will provide more direct connectivity opportunities between the existing QR West Moreton System and ARTC Interstate lines, as well as being a potential catalyst for the development and growth of regional intermodal hubs (InterLinkSQ, Bromelton Intermodal Hub) and local industrial areas (Gatton West Industrial Zone, Willowbank Industrial Area).

The potential for cumulative impacts due to the Project in combination with other coordinated projects, major projects and/or developments has been assessed as part of this EIS and is presented in Chapter 22: Cumulative impacts.