CHAPTER

06

Alternatives and proposal options

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT

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6. Alternatives and proposal options

This chapter provides a summary of the alternatives that have been considered as part of the development of Inland Rail and the process undertaken to determine the preferred option for the Albury to Illabo (A2I) section of the Inland Rail program (the proposal). These options include the strategic alternatives to Inland Rail as a whole (including road upgrades, upgrading the east coast railway, and greater use of maritime and air freight), and alternative route locations. The chapter also includes a summary of the main options that were considered during the concept design process for the proposal and explains the selection of the preferred option.

The Secretary's Environmental Assessment Requirements (SEARs) related to the alternatives and proposal options, and where in the environmental impact statement (EIS) these have been addressed, are detailed in Appendix A: Secretary's Environmental Assessment Requirements.

6.1 Inland Rail alternatives

6.1.1 Strategic alternatives—alternative freight transport solutions

Alternative freight transport solutions with the potential to address Australia's current and future freight challenges were considered as part of a strategic options assessment set out in the *Inland Rail Program Business Case* (ARTC, 2015), and examined in the *Melbourne–Brisbane Inland Rail Report* (Inland Rail Implementation Group, 2015).

The 'do nothing' alternative

Review of Australia's current and future freight challenges by the Inland Rail Implementation Group found that, without action, key transport links would continue to experience increasing capacity constraints and congestion as a result of inadequate infrastructure (Inland Rail Implementation Group, 2015). If these issues are not addressed, national productivity and economic growth would be constrained, with environment and safety outcomes also becoming increasingly sub-optimal.

Current investment in road and rail was found to be insufficient to address Australia's future freight task. Further population and freight growth along the north–south corridor between Melbourne and Brisbane would increase the demand for transport services at a local, state and national level, placing freight corridors under severe pressure and compounding the inefficiencies that already exist (Inland Rail Implementation Group, 2015).

Review of alternatives

The following alternatives were reviewed by the Inland Rail Implementation Group:

- maritime freight
- air freight
- road freight
- rail solutions.

The results of the review of alternatives undertaken by the Inland Rail Implementation Group are summarised as follows.

Maritime freight

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

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

Following review of demand modelling developed for the *Inland Rail Program Business Case* and the *Melbourne–Brisbane Inland Rail Report* concluded that:

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

Air freight

Domestic air freight accounts for less than 0.01 per cent of total domestic freight movements in Australia by weight. The majority of these movements comprise newspapers and parcels between major cities, on either dedicated freight flights or on existing passenger flights. Air freight is highly specialised due to the inherent constraints on aircraft size and the nature of the goods that can be carried. The report (Inland Rail Implementation Group, 2015) concluded that:

- air freight has a limited role 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
- air freight is not a viable alternative for addressing Australia's freight requirements on the Melbourne to Brisbane corridor into the future.

Road freight

The role of road transport was considered as a potential alternative to Inland Rail. While rail carries a larger volume of freight overall, road transport is the main mode of transport for the majority of 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 rates
- conflicts between local traffic, private vehicles and freight vehicles on these corridors will increase, in line with significant forecast growth in population, employment and demands for freight transport
- compared with rail, road freight results in additional environmental costs, including from air pollution, greenhouse gas (GHG) 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
- the Australian Government and 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.

The report (Inland Rail Implementation Group, 2015) 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.

Rail solutions

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

The report noted that there are a number of capacity, reliability and performance issues associated with the existing east coast railway, mainly relating to constraints associated with moving freight trains through the Sydney metropolitan rail network. The Sydney metropolitan rail network suffers from congestion, with freight services heavily restricted in this area, particularly during peak passenger periods. The difficulty of moving freight trains through the metropolitan network will only increase as freight and passenger needs grow.

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 is 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 northwest NSW and southern Queensland would still be required, or the existing coastal line would need to be upgraded. The report determined that use of the Outer Sydney Orbital corridor would complement, but not replace, Inland Rail.

The report (Inland Rail Implementation Group, 2015) 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, and 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.

Summary of findings

Overall, in relation to the various alternatives to Inland Rail, the Implementation Group (Inland Rail Implementation Group, 2015) concluded that:

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

Strategic options assessment

Three options were assessed by the *Inland Rail Program Business Case*:

- progressive road upgrades
- upgrade of the existing east coast railway
- development of an inland railway.

These options were subjected to a rigorous assessment consistent with Infrastructure Australia's *Reform and Investment Framework* (Infrastructure Australia, 2014). The options were assessed against seven equally weighted criteria:

1. capacity to serve east coast future inter-capital regional/bulk freight market needs
2. foster economic growth through improved freight productivity and service quality (including improved reliability and resilience)
3. optimise environmental outcomes
4. alleviate urban constraints
5. enable regional development
6. ease of implementation
7. 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 overall 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 assessment concluded that an inland railway bypassing Sydney is the preferred option; in particular, to service anticipated future freight demand, provide an increase in productivity, act as an enabler for regional development, and improve road safety while reducing congestion and environmental impacts. An efficient rail network and competitive rail services would reduce the nation's reliance on road transport. This would reduce road congestion, lower carbon emissions, reduce noise, reduce deaths and injuries from road accidents, improve amenity in urban and regional centres, enable regional development, and enable new mines and agricultural business in the region to remain productive.

6.2 Alternative locations/route options for Inland Rail

Alternative routes for Inland Rail as a whole were considered by the following two studies:

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

The results of the studies are summarised in the following section.

6.2.1 North–South Rail Corridor Study

The corridor study considered potential corridors for the rail line to determine which route would deliver the best economic and financial outcome.

Options identified

Potential options were identified within a 'north–south rail corridor', which comprises an elliptically shaped 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. This area covers all sections of the existing rail network in Victoria, NSW and Queensland that currently form, or could potentially form, part of a freight route between Melbourne and Brisbane.

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

1. 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
2. central inland sub-corridor—linking Junee to Brisbane via any inland route that includes the Werris Creek to Armidale to Tenterfield rail links
3. coastal sub-corridor—following the existing coastal route between Junee and Brisbane (via Goulburn), through Sydney
4. 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 amounts of new track and/or upgrading existing sections of track.

Analysis of options

The route options were compared using an optimisation model specifically developed for the corridor study. The optimisation modelling process determined the optimal outcome for route option scenarios covering combinations of capital expenditure, freight demands, access prices and economic parameters. The optimisation model was 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 undertaken for the corridor study concluded that the far-western sub-corridor (as shown in Figure 6-1) was markedly superior to the other alternatives. The far western sub corridor would provide the shortest transit distance from north to south of the sub-options considered, while also avoiding the congested Sydney metropolitan area. The far western sub-corridor has the least amount of developed land and has generally low amounts of major environmental limitations compared to the other sub-corridor options. While the sub-corridor would require significant investment in new infrastructure, there would be 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.

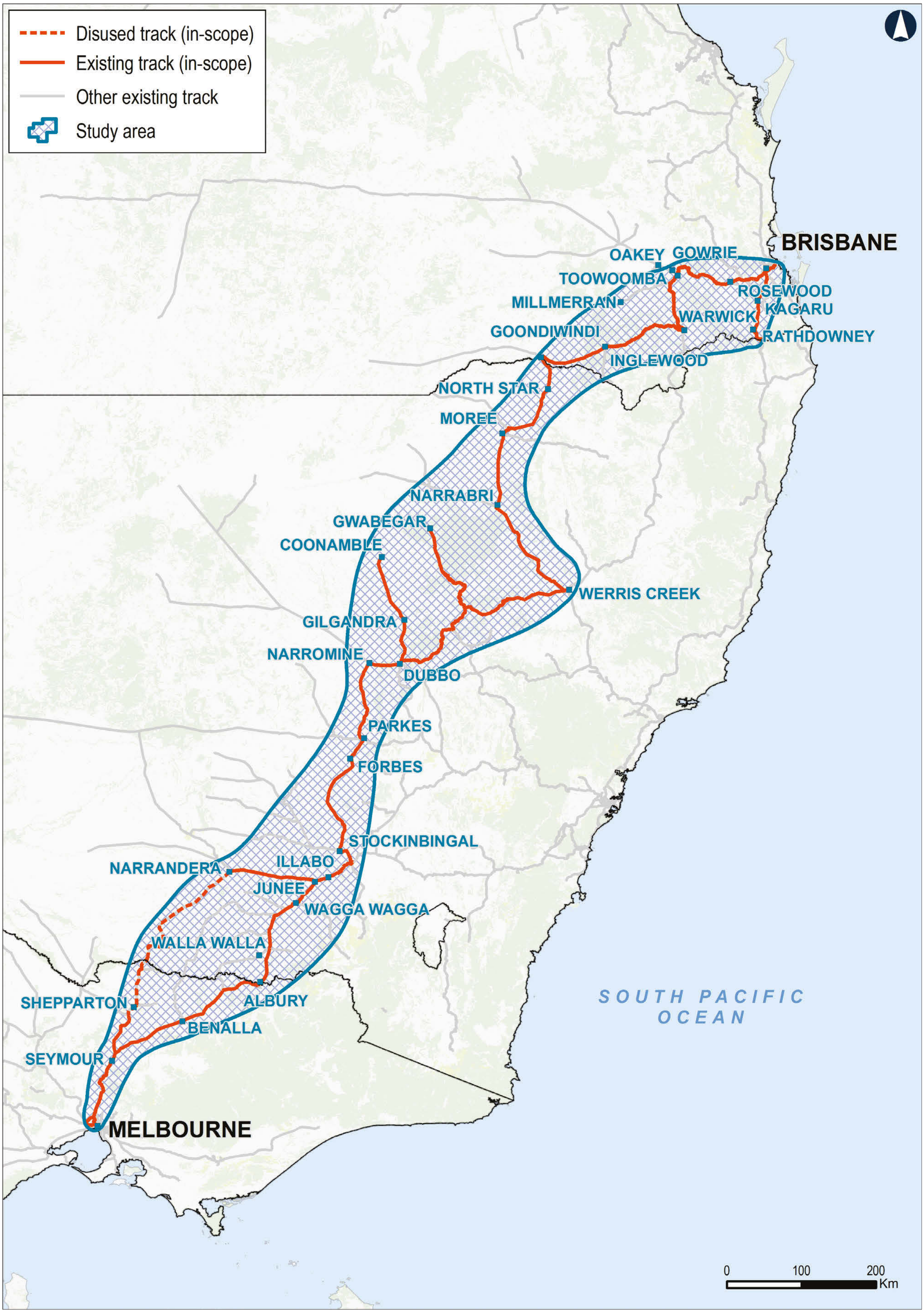

FIGURE 6-1 FAR-WESTERN SUB-CORRIDOR

6.2.2 Melbourne–Brisbane Inland Rail Alignment Study

The purpose of the *Melbourne–Brisbane Inland Rail Alignment Study* (‘the alignment study’) (ARTC, 2010) was to determine the optimum alignment, 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 it to develop a detailed route alignment, generally following the far western sub-corridor identified by the corridor study.

Options identified

The alignment study shortlisted and analysed a number of route options. The stages of route analysis involved:

- identification of the route—evaluation of the route options and preliminary analysis for the three main areas: Melbourne to Parkes, Parkes to Moree, and Moree to Brisbane
- analysis of the route—the route was analysed in terms of capital cost, environmental impacts and journey time, as well as its preliminary economic and financial viability
- development of the preferred alignment—the alignment was developed considering environmental and engineering factors.

The alignment study noted that, with the combination of numerous route options and sections, 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 (as shown in Figure 6-2). 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, bypassing 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, and use of the proposed Southern Freight Rail Corridor from Rosewood to Kagaru.

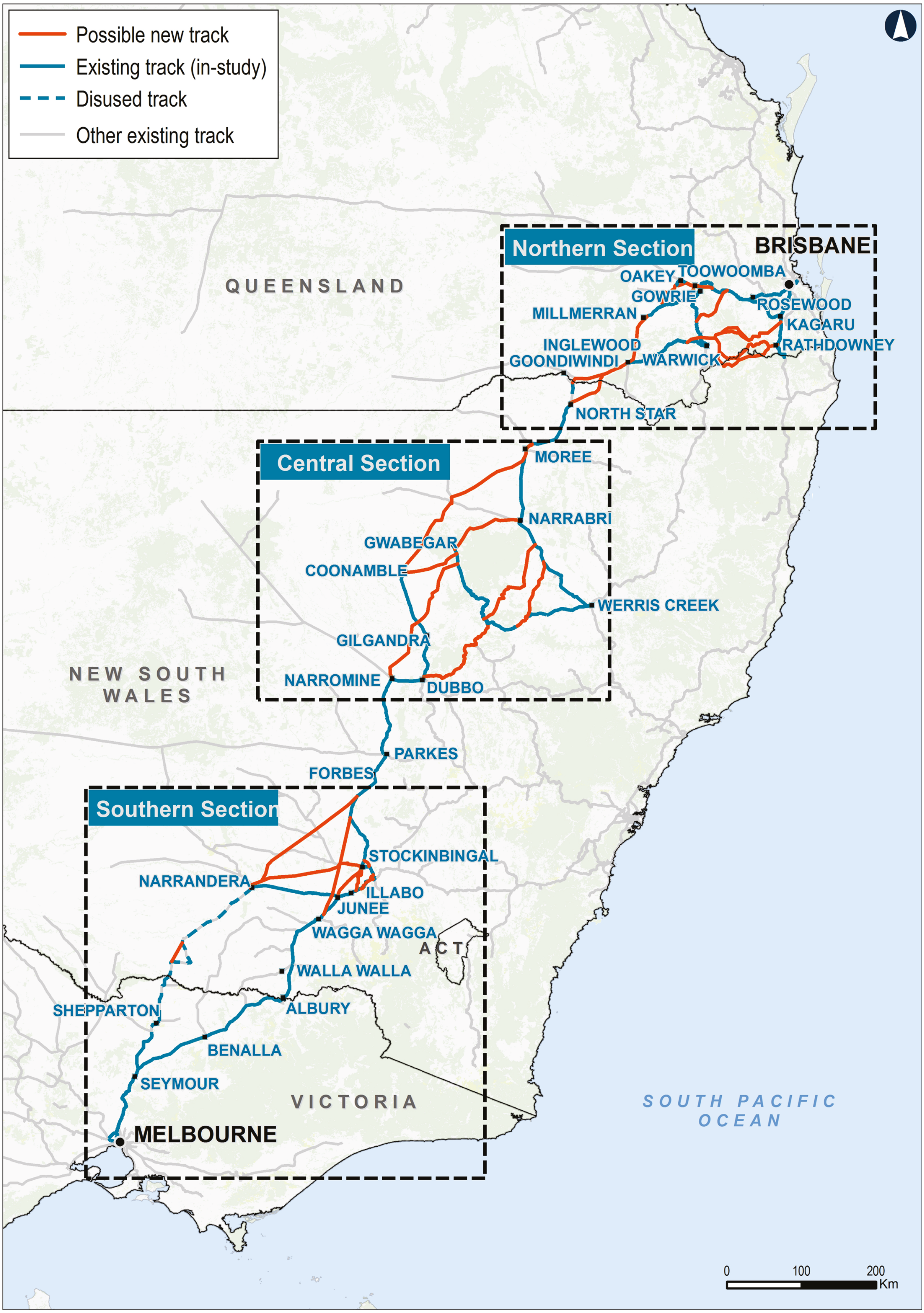

FIGURE 6-2 MELBOURNE–BRISBANE INLAND RAIL ALIGNMENT STUDY—SHORTLISTED OPTIONS

Analysis of options

The shortlist of route options was subjected to more detailed technical, financial and economic assessment.

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 kilometres (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.

6.3 Options for Albury to Illabo

Option development has been an integral part of the overall design process for the proposal. An iterative process of option selection, design development and evaluation has been undertaken to define the proposal. Further to the strategic and initial planning studies for Inland Rail, as described above, the design process for the proposal involves the following general phases:

- Phase 1—concept design
- Phase 2—reference design
- Phase 3—detailed design.

A comprehensive review and assessment of potential options for enhancement works between Albury and Illabo has been undertaken during Phase 1 and Phase 2 and is described in the following sections. The option selection and design process has also taken into account the issues raised during consultation with relevant stakeholders (refer to Chapter 5: Engagement), and the findings of environmental and engineering investigations.

The reference design documents the final scope of enhancement works. The proposal, as described in this EIS, is based on the outcomes of the reference design. The Phase 3 detailed design would take into account the outcomes of the reference design phase; the findings of this EIS, including the mitigation measures; and any conditions of approval (if the proposal is approved).

6.3.1 Phase 1 concept design assessment

The Phase 1 concept design process commenced in 2015. ARTC carried out a detailed review of the enhancement works required for the Albury to Illabo section where existing features did not have the vertical and horizontal clearance required for double-stacked containers to safely pass along the Albury to Illabo (A2I) section. The review included desktop and field investigations and considered the following existing features:

- rail bridges
- road bridges
- pedestrian bridges
- signal structures.

At each enhancement site the following treatments were considered for existing features:

- lowering, widening or shifting the track
- modifying the bridge and/or signal structure
- replacing or reconstructing the bridge and/or signal structure
- seeking waivers to not achieve compliant clearances where alternative controls or treatments can be reasonably implemented, and that are approved by ARTC.

Key considerations in the options assessment for suitable treatments are summarised in Table 6-1.

TABLE 6-1 KEY CONSIDERATIONS FOR SUITABLE TREATMENTS IN THE PHASE 1 OPTIONS ASSESSMENT

Key considerations	Track lowering	Structure replacement, modification and/or removal
Line of sight for both trains and vehicles (safety)	✓	✓
Topography (the feasibility of achieving design grades)	✓	
Operational issues, such as safe egress onto platforms and associated infrastructure upgrades and tie-ins with other roads and infrastructure	✓	✓
Hydrology and hydrogeology (propensity to track flooding, environmental impacts)	✓	✓
Heritage values		✓
Ecological communities and remnant vegetation	✓	✓
Disruption to rail operations, road operations and to communities	✓	✓
Land availability/potential acquisition required		✓
Grade requirements on pedestrian bridges (*Disability Discrimination Act 1992* (NSW) (DDA) requirements)		✓
Constructability complexity	✓	✓
Value for money within project scope and budget (so far as reasonably practicable)	✓	✓

6.3.2 Phase 2 reference design

The Phase 2 reference design process commenced in 2020. The review by ARTC considered enhancement sites required for the A2I section where design solutions had not been confirmed at the time of the Phase 1 concept design assessment or required further development of alternative options.

The options for each enhancement site were refined and assessed during multi-criteria analysis (MCA) workshops in 2021. Evaluations were guided by the following criteria with consideration of the characteristics, scale and complexity of each enhancement site:

- technical viability: sub-criteria included (but was not limited to) alignment geometry, design requirements, flood immunity, and interactions with other infrastructure (e.g. road)
- safety: sub-criteria included (but was not limited to) rail, road and public safety considerations as well as safety during construction
- operations: sub-criteria included (but was not limited to) travel times, reliability and broader rail network operations
- constructability: sub-criteria included (but was not limited to) construction duration, complexity, access, resource requirements and rail interface issues
- environmental impacts: sub-criteria included (but was not limited to) a range of environmental and amenity issues such as biodiversity, visual, noise and vibration, flooding and biosecurity
- community and property impacts: sub-criteria included (but was not limited to) severance, land use impacts, business impacts, heritage impacts and community issues raised during stakeholder engagement
- approvals and stakeholder risks
- construction costs.

6.3.3 Option assessment outcomes

A summary of the outcomes of the Phase 1 and Phase 2 assessment, including the options considered, the preferred options identified for each precinct, and the assessment criteria that were key differentiators for each precinct, is in Table 6-2 to Table 6-5. These outcomes form part of the proposal and further information is provided in Chapter 7: Proposal features and operation.

The preferred options identified are considered to satisfy the objectives of the proposal, stated in Chapter 1: Introduction, by providing rail infrastructure that meets the Inland Rail specifications while minimising the potential for environmental and community impacts.

In addition to these items, a number of signalling structures (gantries) were identified across the enhancement sites that required modification, replacement or a waiver of the required clearance envelope. These decisions were made on a case-by-case basis according to the site context and the condition of the structure.

TABLE 6-2 OPTIONS ASSESSMENT SUMMARY—ALBURY

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Murray River bridge	▸ Modification (Option 1) ▸ Replacement bridge in adjacent location (Option 2) ▸ Replacement in the current location (Option 3)	▸ Modification (Option 1)	While Option 2 would deliver a new bridge structure that would meet current design specifications and would not require physical modifications to the state heritage listed item, Option 1 was selected as the preferred option as it: ▸ minimises environmental and amenity impacts. It would not require works in the Murray River and would avoid the need for more substantial construction activities associated with a new crossing ▸ avoids changes to flooding behaviour as it would only require minimal changes to the existing bridge. In comparison, Option 2 would require a new bridge and viaducts on the northern and southern approaches to the bridge ▸ avoids direct property impacts. Option 2 would require changes to the rail corridor to accommodate the new crossing ▸ retains the function and continued use of the heritage item. It would also avoid further changes to the visual setting of the heritage item ▸ avoids potentially complex rail interfaces at the Victorian end of the bridge and would be less expensive to construct. Option 3 was identified but not considered further in an options assessment as it was not technically feasible. It would have resulted in an unacceptable impact to the Main South Line while the bridge is demolished and rebuilt. It would have also resulted in the loss of the state heritage item.
Albury Station—pedestrian bridge	▸ Removal (Option 1) ▸ Replacement in current location (Option 2) ▸ Replacement in adjacent location (Option 3) ▸ Reinstatement (Option 4) ▸ Track lowering (Option 5)	▸ Replacement in current location (Option 2)	Option 2 and Option 3 would deliver similar benefits as both options: ▸ maintain connectivity for the community between Albury Station and areas to the east of the Hume Highway. Option 1 was not considered further as it would have resulted in the permanent loss of this crossing ▸ provide a DDA-compliant bridge solution. While Option 3 would enable the existing crossing to be maintained during construction, Option 2 was selected as the preferred option as it would require fewer changes to connecting infrastructure and avoid potential land acquisition. Option 4 and Option 5 were identified but not considered further in an options assessment as they are not technically feasible as: ▸ track lowering would have required lowering of the track adjacent to the station platform. This would have resulted in operational impacts (passenger and freight), including changes to the state heritage listed station platforms to enable passenger services to continue ▸ reinstatement was not considered feasible because the bridge would not meet current design requirements without substantial structural modifications.

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Albury Yard clearances	‣ Slew main line and loop (direct adjacent to brick signal hut) (Option 1) ‣ Slew main line and loop (around brick signal hut) (Option 2)	‣ Slew main line and loop (around signal hut) (Option 2)	Option 2 was selected as the preferred option because in comparison to Option 1 it: ‣ limits the potential interaction with the North Signal Hut (a component of the state heritage listing) during construction and operation given clearances to the structure and adjustments to track formation; however, it would have an impact on areas of archaeological potential in the yard ‣ reduces interaction with the main line during construction when compared to Option 1 ‣ provides opportunities for works to be completed outside track possessions.
Riverina Highway bridge	‣ Track lowering (Option 1) ‣ Raise existing bridge (Option 2)	‣ Track lowering (Option 1)	Option 1 was selected as the preferred option because in comparison to Option 2 it: ‣ avoids disruption to local and highway traffic, and the community. Option 1 can occur with minimal interaction with the bridge foundations and avoids any closure (full or partial) ‣ reduces construction complexity and construction cost ‣ avoids interaction with the Hume Highway bridge and ramps.
Billy Hughes bridge	‣ Reconstruction (Option 1) ‣ Raise existing bridge (Option 2) ‣ Track lowering (Option 3)	‣ Track lowering (Option 3)	Option 3 was selected as the preferred option in comparison to the other options because it: ‣ avoids disruption to Wagga Road and the Hume Highway. The alternative options would require road closures of Wagga Road during construction and would likely require tie-in works with the Hume Highway interchange ‣ avoids the potential need for a temporary crossing to maintain road connectivity ‣ minimises changes to the existing bridge structure. While Option 3 would potentially require modification to bridge piers and/or utilities, it would be less complex and a more cost-effective solution ‣ avoids property acquisition. Permanent infrastructure would be wholly contained within the rail corridor.

TABLE 6-3 OPTIONS ASSESSMENT SUMMARY—GREATER HUME–LOCKHART

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Culcairn Parade pedestrian bridge	‣ Removal (Option 1) ‣ Replacement (Option 2) ‣ Reinstatement (Option 3) ‣ Track lowering (Option 4)	‣ Removal (Option 1)	While Option 2 would provide a DDA-compliant crossing, Option 1 was selected as the preferred option as the bridge is disused and an existing safe at-grade alternative is available and shorter. Option 3 and Option 4 were identified but not considered further in an options assessment as they are not technically feasible because: ‣ reinstatement (Option 3) would not meet current design requirements without substantial structural modifications ‣ track lowering (Option 4) to achieve the required clearances would impact the Balfour Street (Olympic Highway) level crossing. It could also potentially impact the station platforms (a state heritage listed station).

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Culcairn Yard clearances	▸ Realignment of the loop (Option 1) ▸ Realignment of the loop and remove siding (Option 2)	▸ Realignment of the loop (Option2)	Option 1 was selected as the preferred option as in comparison to Option 2 it has: ▸ less interaction and changes to rail operations ▸ less track work and changes to signalling.
Henty Yard clearances	▸ Realignment of the main line (Option 1) ▸ Realignment of the main line and loop line (Option 2)	▸ Realignment of the main line (Option 1)	While Option 2 would reduce the extent of work required on the main line, Option 1 was selected as the preferred option as it: ▸ reduces the need for work on multiple tracks ▸ minimises construction activities, reducing potential amenity impacts ▸ requires potentially less track work, with more favourable ballast and track conditions expected. Both options had comparable impacts on the Goods Shed (part of the state heritage listing of Henty Station).
Yerong Creek Yard clearances	▸ Realignment of the main line (Option 1) ▸ Realignment of the loop (Option 2)	▸ Realignment of the main line (Option 1)	While Option 1 would require demolition of the previously partially demolished former station platform (an area of archaeological potential) and work on the main line, it was selected as the preferred option as it: ▸ avoids complexity of interfaces with grain silos ▸ minimises the potential extent of required track work (given the potential condition of the loop line) ▸ minimises changes to other rail infrastructure (including crossing loops, turnouts and signals).

TABLE 6-4 OPTIONS ASSESSMENT SUMMARY—WAGGA WAGGA

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Uranquinty Yard clearances	▸ Realignment of the main line (Option 1) ▸ Realignment of the loop line (Option 2)	▸ Realignment of the loop line (Option 2)	While Option 2 would require more track work to make the loop line suitable for the proposal, it was selected as the preferred option because it: ▸ reduces the complexity of signalling alterations ▸ limits alterations to adjacent infrastructure ▸ reduces the need to work on multiple tracks ▸ avoids work on the main line and additional maintenance requirements
Pearson Street bridge	▸ Track lowering (Option 1) ▸ Track lowering with reduced vertical clearance envelope (Option 2)	▸ Track lowering (Option 1)	Option 2 when compared to Option 1 only provided marginal benefits due to the reduced depth of excavation. As such, Option 1 was selected as the preferred option as it avoided the need to depart from the required clearance envelope.

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Cassidy Parade pedestrian bridge	▸ Track lowering (Option 1) ▸ Replacement (Option 2) ▸ Reinstatement (Option 3)	▸ Replacement (Option 2)	Option 2 was selected as the preferred option because in comparison to Option 1 it: ▸ delivers a DDA-compliant bridge crossing ▸ minimises interaction with the rail corridor ▸ avoids impacts to drainage and overland flow paths across the rail corridor. While track lowering (Option 1) would avoid the loss of the heritage-listed bridge (under the ARTC section 170 heritage register) and disruption to pedestrians during construction, this solution is reliant on also doing track lowering at Edmondson Street bridge and into the Wagga Wagga Yard. Track lowering was not selected as those locations. As the bridge is a concrete structure, Option 3 was not carried into an options assessment as it is not technically feasible due to the need to raise the bridge deck and the ramps to achieve the required clearances. This would also result in non-DDA compliant ramps for pedestrian access.
Edmondson Street bridge	▸ Track lowering (Option 1) ▸ Bridge replacement (Option 2) ▸ Hybrid track lowering and bridge replacement (Option 3)	▸ Bridge replacement (Option 2)	While a track lowering solution would avoid the demolition of Edmondson Street and the need for a taller bridge structure, Option 2 was selected as the preferred option because, in comparison to the other options, it: ▸ reduces disruption to passenger and rail freight services ▸ avoids need for a mechanical drainage system (that would be needed for a track lowering solution), given the overland flow paths at this location ▸ avoids reconstruction of existing culverts and other drainage infrastructure ▸ minimises impacts to utilities ▸ minimises the extent of excavation ▸ avoids potential impacts to Wagga Wagga Yard and Wagga Wagga Station (a state heritage item). Track lowering is constrained by the proximity to the station, as lowering would have needed to extend further east. The hybrid option (Option 3) would have compounded impacts due to works required on rail and road corridors with no significant benefits.
Wagga Wagga Station pedestrian bridge	▸ Replacement (Option 1) ▸ Track lowering (Option 2) ▸ Reinstatement (Option 3)	▸ Replacement (Option 1)	Option 1 was selected as the preferred option because, in comparison to Option 2, it: ▸ avoids potentially more significant impacts on the state heritage-listed station. A track lowering solution was not suitable at this site given the proximity to the station buildings and platform, which would have resulted in more significant impacts to the state heritage-listed station and pedestrian train platform height alignments ▸ delivers a DDA-compliant bridge solution. Option 3 was identified but not considered further in an options assessment as it was not technically feasible. It would not meet current design requirements without substantial structural modifications.
Wagga Wagga Yard clearances	▸ Track realignment (main line)	▸ Track realignment (main line)	This was the only option identified in the yard. Possible alternatives were discounted as remaining sections of sidings in the yard are disconnected and/or removed.

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Bomen Yard clearances	▸ Realignment of main line and loop (Option 1) ▸ Realignment of the main line with waiver of required clearance envelope (Option 2)	▸ Realignment of the main line and loop (Option 1)	Option 1 was selected as the preferred option as it would provide compliant clearances for safe operations and avoid the need to seek a waiver of the required clearance envelope between the main line and the crossing loop.

TABLE 6-5 OPTIONS ASSESSMENT SUMMARY—JUNEE

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Harefield Yard clearances	▸ Main line, loop and stock siding realignment (Option 1) ▸ Loop and stock siding realignment (Option 2)	▸ Loop and stock siding realignment (Option 2)	Option 2 was selected as the preferred option as in comparison to Option 1 it: ▸ avoids work on the main line and would require a shorter construction period ▸ maximises clearances between the main line and the stock siding ▸ has lower construction costs.
Kemp Street bridge	▸ Bridge replacement (offline) (Option 1) ▸ Track lowering (Option 2) ▸ Bridge replacement (online) (Option 3)	▸ Bridge replacement (online) (Option 3)	A new bridge structure (off- or online) would temporarily impact connectivity for the local community, would change the scale of the bridge structure and would have impacts to public open space; however, the bridge replacement options were preferred over a track lowering solution (Option 2) as these options: ▸ deliver collision protection of all bridge piers ▸ avoid the need for track work, with track lowering necessitating additional track work beyond lowered track section ▸ deliver a preferred drainage outcome. A track lowering solution would require a mechanical drainage system to deal with flood events and would require ongoing maintenance ▸ future-proof the rail corridor without requiring further track lowering or bridge replacement in the future ▸ reduce construction complexity and program, with track lowering requiring multiple rail possessions and staging in order to maintain rail operations. As both bridge replacement options would require the closure of Kemp Street and would have comparable outcomes for most criteria, Option 3 was selected as the preferred option as it: ▸ avoids property acquisition. The bridge would remain on its current alignment, whereas acquisition would be required for an offline solution (Option 1) ▸ limits changes at the tie-in points to the road network and enables compatibility of the road alignment for heavy vehicles, when compared to an offline solution (Option 1).

Enhancement sites	Options considered	Preferred option	Justification for preferred option against relevant assessment criteria
Junee Station pedestrian bridge	▸ Removal (Option 1) ▸ Replacement (Option 2) ▸ Reinstatement (Option 3) ▸ Track lowering (Option 4).	▸ Removal (Option 1)	The current bridge and station platform are disused and closed. Any new DDA-compliant bridge may require partial demolition of the state heritage listed platforms or buildings. As such, Option 1 was selected as the preferred option as: ▸ there is no longer the need for ongoing access (and therefore a replacement structure) ▸ would have a minimal physical impact on the station platforms. Option 3 and Option 4 were identified but not considered further in an options assessment as they are not technically feasible because: ▸ reinstatement (Option 3) would not meet current design requirements without substantial structural modifications ▸ track lowering (Option 4) to achieve the required clearances would impact the station platforms (a state heritage listed station) and passenger train services.
Junee Yard clearances	▸ Track realignment	▸ Track realignment	This was the only option identified for achieving the required horizontal clearances in the yard, noting no overhead structures impede this section of the yard.
Olympic Highway underbridge	▸ Minimal track and structure works (Option 1) ▸ Bridge replacement (Option 2) ▸ Bridge replacement (superstructure only) (Option 3) ▸ Track reconfiguration (Option 4)	▸ Track reconfiguration (Option 4)	In comparison to the other options, Option 4 was selected as the preferred option as in comparison to the other options it: ▸ minimises construction noise and amenity impacts associated with more substantial works ▸ minimises impacts to the operation of the Olympic Highway ▸ eliminates the requirement for a raised bridge, which would result in substantial track lift works on the bridge approaches. This would also significantly impact rail operations during construction ▸ minimises construction complexity when compared to Option 2 and Option 3, given less work would be required on the underbridge structure ▸ reduces vegetation clearing requirements ▸ removes the need for a waiver for horizontal clearances, when compared to Option 1.
Junee to Illabo clearances	▸ Track realignment (down track) (Option 1) ▸ Track realignment (up track) (Option 2) ▸ Track realignment (up track and down track) (Option 3)	▸ Track realignment (up track and down track) (Option 3)	Option 3 was selected as the preferred option as it reduces the requirements for track reconstruction on a single track and also reduces the requirements for replacement of structures along the alignment.

6.3.4 Public road interactions

The approach to considering level crossing options has taken into account relevant NSW and Australian level crossing policies, which emphasise the need to minimise the number of level crossings, as far as reasonably practicable. The Office of the National Rail Safety Regulator's (ONRSR) level crossing policy (*ONRSR Policy: Level Crossings* (ONRSR, 2019)) sets out the approach and broader expectations for improving the safety of railway operations, with regard to existing level crossings, and the early design of future road and rail intersections. In terms of managing risks to safety, ONRSR's level crossing policy upholds that no new level crossings should be constructed. The policy notes that, where a new crossing is necessary, safety risks must be eliminated or minimised by designing new infrastructure consistent with requirements of the Rail Safety National Law. The NSW Government's level crossing policy (*Construction of New Level Crossings Policy* (Transport for NSW (TfNSW), n.d.)) notes that building new level crossings is to be avoided wherever possible and all other options, including grade separation and use of existing level crossings, should be explored before a new crossing is proposed. ARTC's approach is consistent with these policies.

Nine level crossings are located in the proposal site, one of which has been closed to vehicles (Bomen). No new level crossings are proposed.

The treatment options for the interaction of public roads and the rail corridor consist of:

- grade-separated crossings—for these crossings, the road and rail line cross each other at different heights (via a bridge) so that traffic flow is not affected. This can be either a road bridge or a rail bridge
- level crossings—for these crossings, the road and rail line cross each other at the same level ('at grade'). Level crossings would be provided with warning signage, line marking, and other relevant controls, in accordance with the relevant ARTC and Australian standards, incorporating either:
  - passive crossings, which involve static warning signs (e.g. stop and give-way signs) that are visible on approach. This signage does not change and there are no mechanical aspects or light devices
  - active crossings, which involve flashing lights, warning bells and boom barriers for motorists. These devices are activated prior to and during the movement of a train through the level crossing.

The other relevant consideration is crossing consolidation, road relocation, diversion or realignment. This involves considering where roads could be:

- closed to avoid the need to cross the road corridor, such as where safe access cannot be provided, or to consolidate crossing points to avoid multiple level crossings in close proximity to each other
- relocated or realigned (diverted)—to avoid or minimise the need for new level crossings or to provide for safe access to a new level crossing.

Option development and assessment

Opportunities for grade separation

ARTC's policy is that rail–road interfaces would be automatically grade separated in the following three instances:

- rail–road crossings with four rail tracks
- rail–road crossings of freeways and highways of four or more lanes (current and committed future plans)
- where grade separation is the preferred option for topographical or engineering reasons.

Within the proposal site, there are no level crossings that fall into these categories. All level crossings occur for local or two-lane roads (and highways), and at areas of relatively flat terrain.

Closure of level crossings

It is not proposed to close any level crossings given the impact this would have on connectivity within local towns, impacts to private property access and broader implications to the Olympic Highway where level crossings are present within the enhancement site.

Determining the preferred level crossing treatment

For passive level crossings within the proposal site, a methodology that aligns with ONRSR's policies and guidelines has been used to determine proposed level crossing treatments (active or passive). This approach involves applying the Australian Level Crossing Assessment Model (ALCAM) to determine the 'risk score' for each level crossing, and then undertaking a cost–benefit analysis to assess whether higher levels of protection are justified. ALCAM is the nationally accepted risk tool for level crossings, which looks at a range of factors, including road and rail volumes and speeds, heavy vehicle use, sighting distances and road/rail geometry. The road inputs are validated by the relevant road manager through the stakeholder consultation process.

Preferred options

The preferred option for public road interactions across the proposal site, based on the considerations described above, involves a mix of active and passive level crossings. The preferred option is listed in Table 6-2, Table 6-3, Table 6-4 and Table 6-5. Further details are provided in Chapter 7: Proposal features and operation. ARTC would continue consultation with relevant road managers during detailed design, to finalise preferred treatments at each location. The appropriate treatment would be assessed on a case-by-case basis for design purposes, with consideration given to the results of consultation; current and future usage of the asset; its location relative to other crossings of the rail corridor; and the road and rail geometry at the crossing location.

Three level crossings would be upgraded as part of the proposal:

- Henty Yard clearances: Sladen Street (LX625). At this location the pedestrian crossing would be upgraded from a passive to an active level crossing. The existing active vehicular crossing would be modified to accommodate the proposal.
- Wornes Gate Lane (LX1472) would be upgraded from a passive to active vehicular level crossing.

- Shire and Carter property access road (LX605) would be upgraded from a passive to active vehicular level crossing.

Elsewhere, adjustments to five open active level crossings and one closed level crossing would be required to accommodate the realigned track, or to address short-stacking issues at some level crossings. Further detail is provided in section 7.3.1 of the EIS.

6.4 Approach to avoiding or minimising impacts during construction and operation

The design development of the proposal and development of the construction methodology has included a focus on avoiding or minimising potential impacts at all enhancement sites. This has included:

- designing construction footprints to use existing disturbed areas where possible
- using existing public roads and/or rail corridor access points
- using major roads for construction traffic access and avoidance of local roads, where possible
- prioritising use of government-owned land (such as existing rail corridor, ARTC lease areas, land owned by the NSW Government or local council) to limit temporary and permanent private property impacts
- avoiding impacts to Aboriginal heritage and non-Aboriginal heritage values where possible
- avoiding impacts to native vegetation and street trees where possible
- minimising potential vibration risks by using bored piling methods only.

The selected design and construction methodology approaches are considered to satisfy the objectives of the proposal stated in Chapter 1: Introduction and are in the public interest by providing rail infrastructure that meets the Inland Rail specifications, while best minimising the potential for environmental and community impacts. The selected approaches have also responded to feedback received from the community or local councils, where possible. Further information on the stakeholder feedback received during the development of the proposal is provided in Chapter 5: Engagement.

6.4.1 Construction methodology options

Due to the uncomplicated nature of the proposed works at most of the enhancement sites, standard construction methodologies have been adopted. However, alternative construction methodologies were considered for more complex enhancement works as outlined in Table 6-6.

The construction methodologies proposed to be employed are outlined in Chapter 8: Construction of the proposal.

TABLE 6-6 CONSTRUCTION METHODOLOGY OPTIONS CONSIDERED FOR COMPLEX ENHANCEMENT WORK

Construction methodology options	Relevant enhancement works	Considerations
Staged bridge replacement by demolishing and constructing half of the bridge at a time and maintaining public access to one of the lanes.	- Road bridge replacement	To maintain a safe, publicly accessible lane on the bridge while replacing the adjacent lane would require the bridge structure to be substantially reinforced and the traffic controls leading to the bridge to be altered. Periods of full closure of the bridge for periods of time would still be required. Further, at Edmondson Street bridge, substantial temporary changes to traffic signaling at the intersections directly to the north and south of the bridge would be required to maintain safe efficient access for the public and private property. This method would have substantial cost and time implications and would increase the development footprint for compounds and construction plant. Therefore, the staged demolition and construction of the bridges to maintain partial traffic access across the rail corridor at Wagga Wagga and Junee was not considered feasible and not carried forward into the options assessment.
Construction of the bridge offline (adjacent to the existing bridge) to maintain traffic access during construction.	- Road bridge replacement	Construction of the Kemp Street bridge offline was considered in the option assessment as an alternative design as described in section 6.3.3. The offline bridge methodology would have still required full bridge closures for prolonged periods to facilitate the construction of the bridge approaches without delivering a substantial time saving. At Edmondson Street bridge, constructing offline was not identified as a feasible option given the property constraints and proximity to adjoining intersections.

Construction methodology options	Relevant enhancement works	Considerations
Use of precast concrete structures.	‣ Road bridge replacement ‣ Pedestrian bridge replacement ‣ Track lowering ‣ Culvert works	A method considered to shorten the construction duration was installing pre-cast concrete structures in place of completing on-site concrete pours. Due the structural requirements of the new bridges and retaining walls, the pre-cast pile option was not feasible for bridge replacements and track lowering. Use of pre-cast pile caps, piers and headstocks would be further investigated during detailed design.
Percussive piling for construction of retaining walls and bridges.	‣ Road bridge replacement ‣ Track lowering	Bored piling for establishment of the retaining walls was selected over percussive piling due to design requirements and to minimise vibration impacts to the community and nearby structures.
Establishment of temporary pedestrian bridges adjacent to the existing bridges during construction.	‣ Pedestrian bridge replacement	Due to site constraints and structural requirements for temporary structures above an active rail corridor (which are similar to those required for a permanent bridge), the construction of temporary pedestrian bridge structures was not carried forward as it would increase the construction time, costs and the proposal footprint.
Sequencing/staging of bridge works.	‣ Road bridge replacement ‣ Pedestrian bridge replacement	The sequencing of the bridge works was considered during the development of the construction program with respect to impacts to transport and amenity issues from construction, and the overarching program for Inland Rail. Some of the work occurs within or very close to the rail corridor and requires track occupation where train movements are temporarily stopped or reduced to ensure safety for construction workers. Opportunities to use track work authorisations in addition to scheduled major rail possessions have been applied in the construction program. Further opportunities for additional track possessions would be explored during detailed design, where this would benefit the construction program. Further information on track occupation is provided in section 8.4.1 of Chapter 8: Construction of the proposal. **Wagga Wagga** The sequencing of the bridge works at Wagga Wagga was revised to ensure that pedestrians can be detoured to at least one of the three bridges during construction works to minimise impacts to connectivity, while still meeting the schedule requirements of the Inland Rail program and minimising duration of construction in this area. Further opportunities to reduce the duration of concurrent bridge closures would be explored during detailed design in consultation with impacted stakeholders. **Junee** Construction of the altered Olympic Highway intersection with Kemp Street bridge has been programmed to limit the closure of this intersection (and the associated impacts of this closure) to two months. To reduce the duration of construction and to ensure rail safety during bridge works, an additional minor rail possession has also been scheduled to enable bridge piling works to occur outside scheduled rail possession periods.
Workforce allocation for track realignment works at Junee to Illabo clearances.	‣ Track realignment at Junee to Illabo clearances	As the track realignment works at the Junee to Illabo clearances are over 15 km in length, two workforce options were considered including allocation of a small construction workforce to work progressively along the alignment or multiple workforce crews working simultaneously at multiple locations on the alignment. To minimise the construction program and take advantage of major rail possessions, the multiple crew option was adopted.

6.4.2 Site-specific considerations

Site-specific design or construction methodology responses to avoid and minimise potential impacts are detailed in Table 6-7 to Table 6-10.

TABLE 6-7 SUMMARY OF ADVERSE IMPACTS AVOIDED OR MINIMISED THROUGH CONSTRUCTION AND OPERATIONAL DESIGN—ALBURY

Enhancement site	Site-specific design responses
Murray River bridge	▸ Enhancement works to Murray River bridge designed to retain the maximum possible amount of original materials with minimal intervention and to enable opportunities to repurpose original materials removed ▸ Restriction of use of Townsend Road to light vehicles only to avoid vegetation clearance and impacts to areas of Aboriginal archaeological potential, as far as practicable ▸ Adjustment of the construction compound areas for the enhancement site to avoid impact to areas of Aboriginal archaeological potential and to minimise impacts to areas of native vegetation ▸ Temporary creek crossing at Oddies Creek removed from reference design to avoid direct impacts to potential areas of Aboriginal heritage and to biodiversity values.
Albury Station ▸ Albury Station pedestrian bridge ▸ Albury Yard clearances	▸ Construction compounds designed with minimal excavation requirements to minimise impacts to items within the Albury Railway Station and Yard group (state heritage listing) and surrounding archaeological potential in Albury Yard, such as the brick North Signal Hut and the railway turntable, as far as practicable ▸ Refinements to minimise long-term impacts on parking (staff and station parking).
Riverina Highway bridge	▸ Construction access limited to the immediate vicinity of construction works ▸ Construction compounds designed with minimal excavation requirements to minimise impacts to areas of archaeological potential associated with the Albury Railway Precinct (state heritage listing) and the Bunge Flour Mills site (local heritage listing). ▸ Drainage design refined to include a pumped drainage solution to minimise changes to Mudges Canal for surface water flows impacted by track lowering works. Overland flows from the Scots School would be diverted and managed to mimic the existing overland flow route.
Billy Hughes bridge	▸ Construction footprint refined to avoid areas of native vegetation and native fauna habitat as far as practicable. ▸ Temporary works area located to avoid impacts to the Hume Highway ramps (currently under construction). ▸ Construction access designed to use existing access tracks to avoid vegetation clearance.

TABLE 6-8 SUMMARY OF ADVERSE IMPACTS AVOIDED OR MINIMISED THROUGH CONSTRUCTION AND OPERATIONAL DESIGN—GREATER HUME–LOCKHART

Enhancement site	Site-specific design responses
Culcairn ▸ Culcairn pedestrian bridge ▸ Culcairn Yard clearances	▸ Enhancement works to the Culcairn pedestrian bridge designed to enable opportunities for Greater Hume Council to repurpose the bridge structure, which forms part of the state heritage-listing for the station ▸ Traffic management designed to minimise impacts to the Balfour Street level crossing during construction ▸ Works at the Culcairn Yard clearances enhancement site designed to avoid built components of the Culcairn Railway Station and Yard group (state heritage listing), as far as practicable ▸ Construction footprint at Culcairn Yard refined to exclude vegetated areas within the rail corridor due to identified biodiversity values.
Henty Yard clearances	▸ Trackside drainage design refined to avoid impacts to Henty Goods Shed (part of the Henty Railway Station and Yard group state heritage listing) as far as practicable. ▸ Traffic management designed to avoid use of local roads as far as practicable and to maintain pedestrian access and community connectivity across the rail corridor at Sladen Street during construction. ▸ Construction footprint refined to avoid riparian areas of Buckargingah Creek and suitable frog habitat in trackside drainage as far as practicable. ▸ Construction laydown areas designed to minimise impacts to public open space between Railway Parade and the rail corridor as far as practicable.

Enhancement site	Site-specific design responses
Yerong Creek Yard clearances	- Traffic management designed to minimise impacts to the Plunket Street/Cole Street level crossing and use of local roads during construction as far as practicable.
The Rock Yard clearances	- Traffic management designed to minimise impacts to the Urana Street level crossing during construction as far as practicable.

TABLE 6-9 SUMMARY OF ADVERSE IMPACTS AVOIDED OR MINIMISED THROUGH CONSTRUCTION AND OPERATIONAL DESIGN—WAGGA WAGGA

Enhancement site	Site-specific design responses
Uranquinty Yard clearances	- Construction footprint refined to avoid direct impacts to the Uranquinty Silos (local heritage listing). Construction compound area would be limited to previously disturbed areas - Temporary construction access refined to avoid direct impacts to native vegetation as far as practicable - Traffic management designed to minimise impacts to the Yarragundry Street level crossing during construction - Level of track lift designed to minimise interaction with flood flows as far as practicable - Selection of a temporary creek crossing at Sandy Creek to avoid requirements to access through private agricultural property, and to enable construction plant and vehicle movements to be contained within the corridor when accessing works near Sandy Creek. While the crossing would have temporary impacts to the creek, mitigation measures have been identified and areas would be reinstated after completion of construction.
Pearson Street bridge	- Construction footprint refined to avoid impacts to temporary wetland/soaks on the southern side of the rail corridor and to the east and west of Pearson Street, as far as practicable. - Use of the construction compound with the Wagga Show was limited to support only works during rail possessions to minimise impacts on the showground and camping areas as far as practicable. Construction works designed to minimise ground disturbance.
- Cassidy Parade pedestrian bridge - Edmondson Street bridge - Wagga Wagga Station pedestrian bridge - Wagga Wagga Yard clearances	- Staging across Cassidy Parade, Edmondson Street and Wagga Wagga Station bridges designed to maintain access across the rail corridor for pedestrians and cyclists - Construction access to Cassidy Parade pedestrian bridge to be prioritised from Fox Street to minimise impacts to the Telstra depot property on Brookong Avenue. - Adjustments to Cassidy Parade pedestrian bridge to avoid direct impacts on the ErinEarth centre property and adjustment to ramps to enable the reinstatement of the Kildare Street park and associated play equipment. - Construction footprint for Edmondson Street bridge works near Donnelly Avenue refined to minimise impacts to vegetation and streetscape, as far as practicable. - Construction footprint at Wagga Wagga Station refined to avoid impacts to the former Best Street railway gatehouse (part of the state heritage listed Wagga Wagga Railway Station and Yard ground) as far as practicable - Use of yard space at Wagga Wagga Station Yard to incorporate construction vehicle parking to minimise impacts to surrounding local roads, as far as practicable - Level of track lift designed to minimise interaction with overland flows as far as practicable.
Bomen Yard clearances	- Construction works refined to avoid direct heritage impacts to Bomen Railway Station (state heritage listing) and Stationmasters Residence building (local heritage listing) as far as practicable. Construction works within the heritage curtilage would be limited to previously disturbed areas - Construction footprint refined to minimise impacts to native vegetation.

TABLE 6-10 SUMMARY OF ADVERSE IMPACTS AVOIDED OR MINIMISED THROUGH CONSTRUCTION AND OPERATIONAL DESIGN—JUNEE

Enhancement site	Site-specific design responses
Harefield Yard clearances	▸ Construction site access designed to reuse closed sections of Byrnes Road ▸ Bridge works designed to avoid changes to the bridge at Reedy Creek.
Kemp Street bridge	▸ Route selection for the temporary diversion of the Olympic Highway minimised the number of receivers impacted by changes in traffic noise and road environment though the selection of the shortest possible route on local roads, while minimising further impacts to Endeavour Park as far as practicable.
Junee Station ▸ Junee Station pedestrian bridge ▸ Junee Yard clearances	▸ Enhancement works designed to enable opportunities for Junee Shire Council to repurpose heritage pedestrian bridge structure ▸ Track work minimised to the greatest extent possible.
Olympic Highway underbridge	▸ Construction footprint refined to avoid impacts to an isolated Aboriginal heritage item ▸ Construction works and traffic management designed to avoid closure of the Olympic Highway during construction.
Junee to Illabo clearances	▸ Construction works and traffic management designed to avoid closure of the Olympic Highway during construction ▸ Construction footprint refined to minimise impacts to native vegetation as far as practicable. Priority to minimise direct impacts to moderate condition vegetation in favour of vegetation of lower condition was taken where possible.