Document 6

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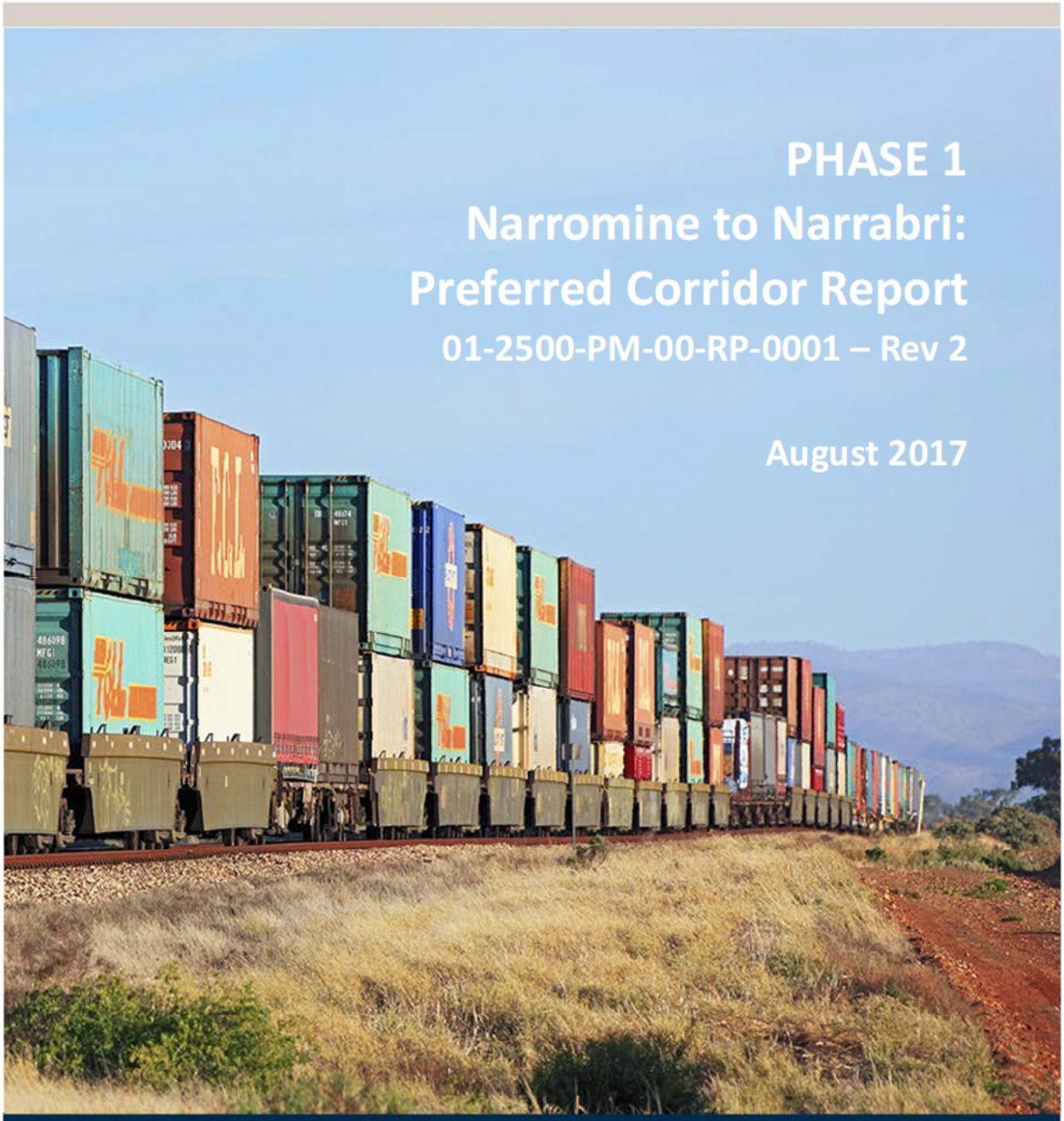

PHASE 1
Narromine to Narrabri:
Preferred Corridor Report

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August 2017

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APPENDICES

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1. EXECUTIVE SUMMARY

This report provides an assessment of the route options reviewed as part of the Narromine to Narrabri (N2N) Phase 1 Concept Assessment and provides a recommendation of the Preferred Corridor as shown in Figure 1.

The recommendation has been made following the Inland Rail (IR) Route Refinement Process as described in Appendix A with a summary of the criteria assessed provided in Table 1 below.

Table 1: Summary of Route Selection Criteria

ELEMENT	CONCEPT	PREFERRED	DIFFERENCE
Service Offering			
Corridor Length (km)[a]	311.7	299.9	**-11.8**
Transit Time (h:mm:ss)[d]	3:10:18	3:05:40	**-0:04:38**
Capital cost estimate			
Construction Cost ($,000)[b]	s47		**-50,564**
Multi Criteria Analysis			
MCA Overall[c]	0	1.06	**+1.06**
MCA (Technical)[c]	0	1.02	**+1.02**
MCA (Non-Technical)[c]	0	0.05	**+0.05**

Notes:

a – allows for a 4.84km overlap with P2N for comparison purposes

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

c – the average of the weighted MCA scores for the individual option

d – arithmetic average of the eight (8) cases modelled

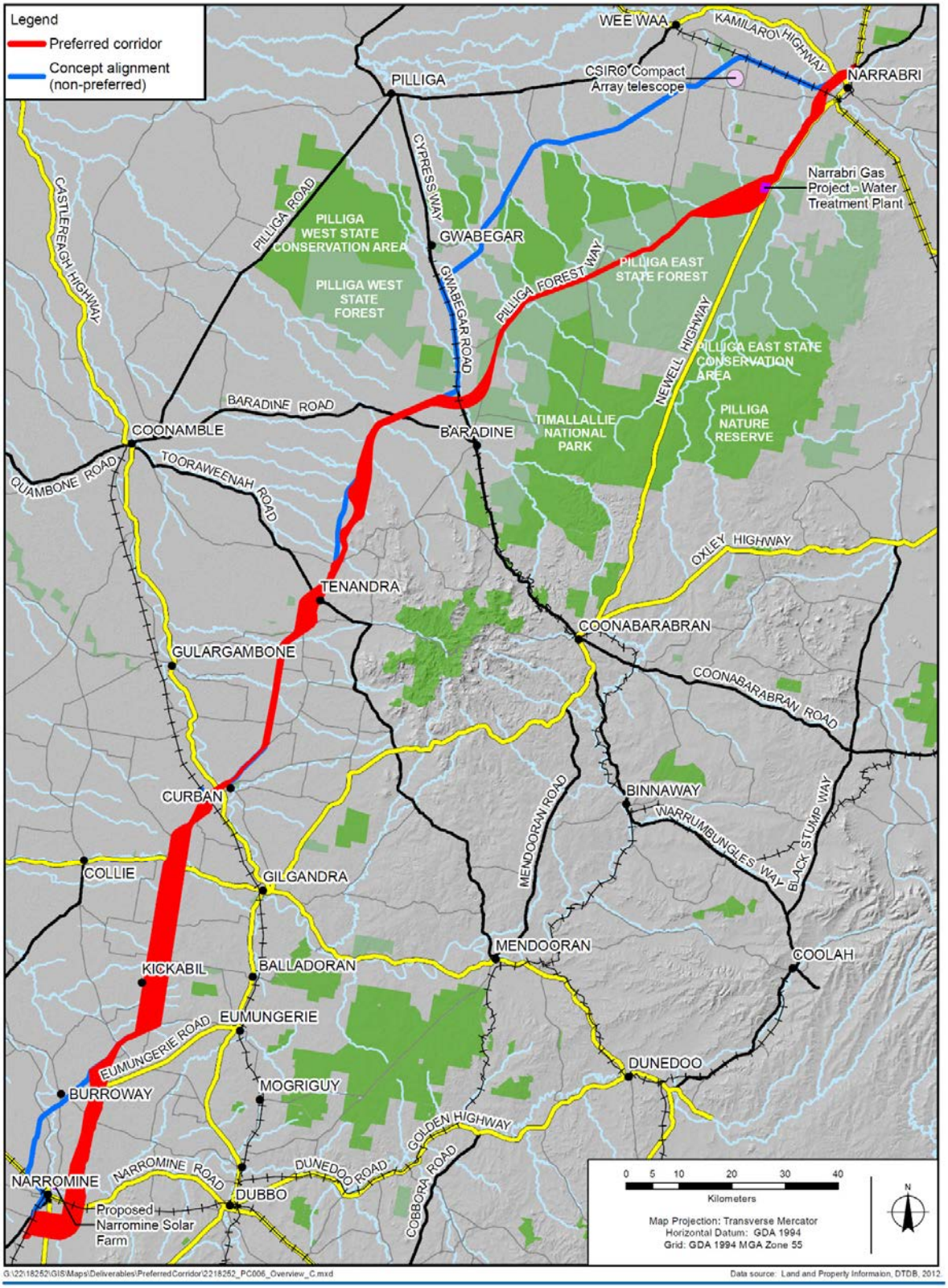


Figure 1: N2N Preferred Corridor

1.1. Service Offering

The Preferred Corridor was modelled in the IR operational model (RailSys) against the Concept Alignment with the transit time differences being estimated as:

- 3.0 - 4.0 minutes shorter for non-stopping services (depending on direction); and
- 6.0 - 8.0 minutes shorter for stopping services (depending on direction).

The trains travelling in the southbound direction have a transit time approximately 0.5 - 1.0 minutes longer than the northbound direction, for both the Concept Alignment and the options reviewed.

A copy of the travel time comparison is included in Appendix B.

All other aspects of the Service Offering such as loop number and location, vertical grades, track formation and compliance with the Basis of Design are unchanged and consistent between the corridors.

1.2. Costs

From the engineering and investigation work undertaken, a Bill of Quantities (BoQ) was developed for the Preferred Corridor of the same standard and accuracy as the Concept Alignment BoQ. The Preferred Corridor BoQ was estimated by IR using the rates, assumptions and logic that underpins the Base Case estimate as per the February 2017 update.

The resultant comparison is shown below in Table 2, with a summary of the differences by section included in Appendix C.

Table 2: Summary Comparison of Capital cost estimates

	CONCEPT ALIGNMENT	PREFERRED CORRIDOR	DIFFERENCE
Total Estimate[b]	$s47		-$50,563,663

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

For the purposes of direct comparison, the estimate for the Concept Alignment of s47 (February 2017) has been increased by s47 to account for the 4.84km length of overlap with Parkes to Narromine (P2N). It follows that P2N would see a commensurate reduction in the total estimate on the basis that no upgrade work would be required for IR in the overlap section.

The resultant overall saving is primarily driven by the preferred corridor generally traversing better geotechnical conditions and is higher in the catchments which allows for the increased use of site won material in the formation and the use of less and smaller culverts.

1.3. Multi- Criteria Analysis

The final MCA workshop in May 2017 reviewed the options under consideration in accordance with the IR MCA process, weightings and criteria, with the results shown by criteria in Table 3. A full copy of the May 2017 MCA Workshop Report is included in Appendix D.

MCA criteria are scored based on either being significantly different (+/-10), clearly different (+/-5) or neutral (0) to the Concept Alignment. A negative score indicates a less favourable option and positive score indicates a more favourable option to the Concept Alignment.

Table 3: Summary of MCA Results for Preferred Sections

ASSESSMENT CRITERIA	WEIGHTING	AVERAGE SCORE[c]
Technical viability	17.5%	+0.44
Safety assessment of the proposed alignment	15.0%	+0.18
Operational approach	17.5%	0.00
Constructability and schedule	12.5%	+0.40
Technical Subtotal	**62.5%**	**+1.02**
Environmental and heritage impacts	12.5%	+0.17
Community and property impacts	12.5%	-0.09
Approvals and stakeholder risk	12.5%	-0.03
Non-Technical Subtotal	**37.5**	**+0.05**
Total	**100%**	**+1.06**

Note:

c – the average of the weighted MCA scores for the individual options

The overall positive technical result is reflective of the preferred corridor targeting the better geotechnical material and the construction and program benefits that they provide. The non-technical criteria do provide a positive benefit overall which is due to the preferred corridor targeting the areas with less environmental and heritage impacts.

1.4. Community and Stakeholder Engagement

The community and landowner consultation undertaken involved over 450 individual meetings where concerns were raised. The feedback raised was similar on all options with the following feedback provided for the greenfield sections:

- Overall the project is supported and the rationale behind the route selection process is understood;
- Aim to minimise property severance by following property boundaries;
- Avoid houses and groups of houses;

- Avoid higher production areas of land used for cropping;
- Be aware that some properties operate across roads and property boundaries which can result in operational severance;
- Areas of new small lifestyle acreages will be impacted greater than the larger properties by a rail line;
- They are seeking visibility about the decision-making process;
- The use of existing rail lines is preferred; and
- Following a road may minimise severance of a property but result in operational severance if the property operates on both sides of the road.

There are close-knit communities along the routes with instances of related landowners and multi-generational farmers. Some landowners want to have group consultations and others prefer one to one consultation with ARTC. ARTC has offered and provided both.

1.5. Discussion

- The community and stakeholder engagement to date has provided a sound basis to gauge community sentiment and feedback with 63% of total property representatives / owners consulted between February and April 2017. Some of the feedback in terms of flooding, geotechnical, property and operational severance has been incorporated into the options and decision-making process.
- Endorsing the recommendation for a Preferred Corridor will allow the project team to revert to the community and commence further engagement with the affected landholders and the landholders now unaffected can be advised. The project team can work with the directly and indirectly affected landholders to further refine the corridor down to an alignment. The decision will allow all parties to progress with a definite path.
- Generally, the land is privately owned.
- The areas where the Preferred Corridor follows roads will need further engagement with the road authority and/or the road owner. The aim would be for the railway to be outside of the road corridor to avoid any environmental aspects within the road corridor but share a boundary with the neighbouring property to minimise severance. It is not expected that this process will result in schedule delays.

s47B

- The northern section traverses a State Forest which is generally owned by the Crown. s47B

1.6. Recommendation

Considering the IR Route Refinement process, the results of the assessment included in this report and noting the inherent and contingent project risks it is recommended that the Preferred Corridor be supported and endorsed.

The recommendation is made to nominate the Preferred Corridor for Narromine to Narrabri as summarised in Table 4.

Table 4: Preferred Corridor Summary for Narromine to Narrabri

ITEM	PREFERRED	NON-PREFERRED
Service Offering Difference to Concept Alignment (Blended Run Time) (h:mm:ss)	-0:04:38	+0:04:57
Cost Differential to Concept Alignment ($)	-50,563,663	-16,860,562
MCA Score	+1.06	+1.01

This recommendation is made for the following reasons:

- There is a positive impact on the Service Offering with a reduction of 4 minutes 38 seconds in transit time, which over 3 hours and 10 minutes is approximately a 2.5% decrease;
- There is a $50.56m capital cost saving;
- The overall MCA scoring is positive;
- The corridor takes into account feedback from the local and broader community and affected landholders;
- The investigation areas include better geotechnical conditions and will provide opportunity for capital cost savings and reduced maintenance costs;
- The hydrology and flooding issues will be reduced; and
- The corridor allows for further refinement in areas where additional investigation and consultation is required.

The recommendation is made to take the Preferred Corridor as shown in Figure 1: N2N Preferred Corridor through to Phase 2.

The Preferred Corridor as shown makes the following width allowances for further investigation:

- An investigation zone up to 5km wide at the southern end to:
    - allow for a connection to P2N;
    - avoid or minimise the flooding effects of the Backwater Cowal; and
    - target a better crossing point of the Dubbo to Narromine line, the Mitchell Highway and Macquarie River.
- Follows the western side of Eumungerie Road with up to a 2.5km investigation width in order to provide for an alignment option along the back-property boundary;

- An investigation zone up to 2km wide for the crossing at Curban;
- An investigation zone of 2km for the crossing of the Castlereagh Highway and Castlereagh River;
- A reduced zone of 500m wide along National Park Road;
- The standard investigation zone of 2km wide from the end of National Park Road to Mt Tenandra;
- An investigation zone of 3km wide to take into account an option along Weenya Road;
- Reduced to 500m wide toward Tabletop Mountain;
- A zone up to 3.5km wide to take into account an option to the east or west of Tabletop Mountain;
- The standard 2km wide investigation zone to Baradine;
- A reduced zone 600m wide along Pilliga Forest Road;
- An investigation zone 4km wide at the proposed Santos facility;
- A reduced width of 1km on the westerns side of the Newell Highway; and
- A zone 1.5km wide for the viaduct to the west of Narrabri.

2. INTRODUCTION

This report presents details of the shortlisted route options for Inland Rail (IR) between Narromine and Narrabri (N2N) at the end of the Phase 1 Concept Assessment. The N2N section comprises approximately 311.7 km of new track through open farmland and State Forest and is part of the overall Melbourne to Brisbane Inland Rail programme.

The original N2N corridor was selected in 2010 and is presented in the Inland Rail Alignment Study (IRAS), (ARTC, 2010). This corridor was subsequently adopted in the Inland Rail Programme Business Case (ARTC, 2015) that sets out the justification for the project. In early 2016, the alignment was further developed into the 2016 Concept Alignment for discussions with local councils, farmers' representatives and the community. A key output from these consultations was a desire from stakeholders and the community for ARTC to review alternative rail corridors, in addition to those considered in the IRAS report.

Approximately fifty (50) additional route options were developed between July and September 2016 as part of the Concept Assessment. These were reviewed internally at a multi-criteria analysis (MCA) workshop in October 2016. In November 2016, the options identified from the MCA were shown as general 2km wide corridors and discussed with stakeholders and the community.

Refinements were made based on the feedback from stakeholders and from community information sessions and a further MCA workshop was held in December 2016 that resulted in the shortlisted options presented in this report being taken forward for further consideration.

In March and April 2017, ARTC consulted with over 400 landowners on both the 2016 Concept Alignment and the alternative options being considered to obtain feedback on the corridors. A further MCA workshop was held in May 2017 to review the alignments in the light of this feedback and to select a preferred corridor to take forward for the Phase 2 Feasibility Assessment.

Phase 2 is expected to start in the third quarter of 2017, following a tender process to select an engineering and environmental design consultant. This Phase will include feasibility level engineering and environmental investigations within the Preferred Corridor and development of a Feasibility alignment that will form the basis of the Environmental Impact Statement (EIS).

2.1. Purpose of this report

The purpose of this report is to provide supporting information relating to a comparison of the 2016 Concept Alignment and options shortlisted from the December 2016 MCA Workshop and provide a recommendation for a preferred corridor in accordance with the IR processes to take into Phase 2.

It is not intended to be a Concept Design Report or a Concept Assessment Report as defined in ARTC's Project Management Procedures.

2.2. Referenced documents

The Phase 1 concept designs and associated comments and observations within this report have been based on the studies completed to date for the Narromine to Narrabri Project, including:

- ARTC. (2010). Melbourne-Brisbane, Inland Rail Alignment Study.
- ARTC. (2015). Inland Rail Programme Business Case.
- ARTC. (2015). Inland Rail Service Offering.
- ARTC. (2015). Melbourne-Brisbane Inland Rail Engineering Technical Services - Basis of Design (rev G).

- GHD. (2016). Inland Rail - Narromine to Narrabri Concept Design Report.
- ARTC (2016) Inland Rail – Concept Assessment Report.
- GHD (2016). Inland Rail – MCA Workshop Report (Dec 16) (Appendix E)
- KBR. (2016). Narromine to Narrabri (N2N) Inland Rail Flood Modelling - TC-04602: Revised Design Criteria Report.
- GHD (2017) Inland Rail – MCA Workshop Report (May 2017) Rev 1 (Appendix D)
- GHD (2017) Inland Rail – Review of Corridor Options for Phase 1 Concept Design

3. BACKGROUND

The N2N alignment has been the subject of review since the Concept Assessment Report (CAR) was endorsed by the Inland Rail Senior Management team and Gold Review Committee in July 2016.

This review work was undertaken to contemporaneously test the underlying basis of assessment used in the 2010 IRAS report, seek and incorporate stakeholder feedback, and carry out additional engineering and field work to support a robust process for route analysis in accordance with the Inland Rail process described in Appendix A.

A summary of the timeline and steps undertaken is provided below in Figure 2.

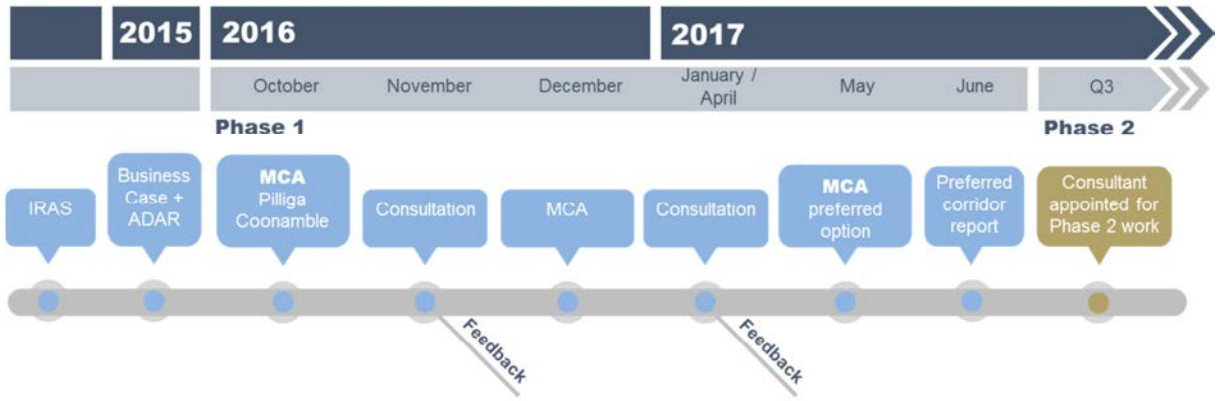


Figure 2: Representation of Corridor Development for N2N

The Route Refinement Process requires options to be assessed against each other on a like for like basis for three key elements:

- Service Offering
- Costs
- Multi-Criteria Analysis

The Final MCA Workshop was undertaken on 11 May 2017 with the results included in Appendix D - GHD MCA Workshop Report.

The options reviewed in the May 2017 MCA workshop are shown below in Figure 3 with the sectional results from the MCA and route selection review contained in the subsequent sections of this report.

To allow direct comparisons to be made alignments were developed within the corridors under investigation. The alignments had quantities extracted to allow an estimate of the same accuracy to be generated and the alignments were modelled in the Inland Rail RailSys operational model to understand any impacts on the Service Offering.

A summary of the Operational Modelling Results and Estimate Summary are included in Appendix B and C respectively.

3.1. Community and Stakeholder Consultation

Until mid-2016 the only corridor option for the N2N project was the 2010 IRAS Base Case. Following landowner, stakeholders and broad community consultation in early 2016, the community encouraged ARTC to consider alternative route options with the suggestion from the community to consider traversing the Pilliga State Forest and utilising the upgraded existing Coonamble rail line.

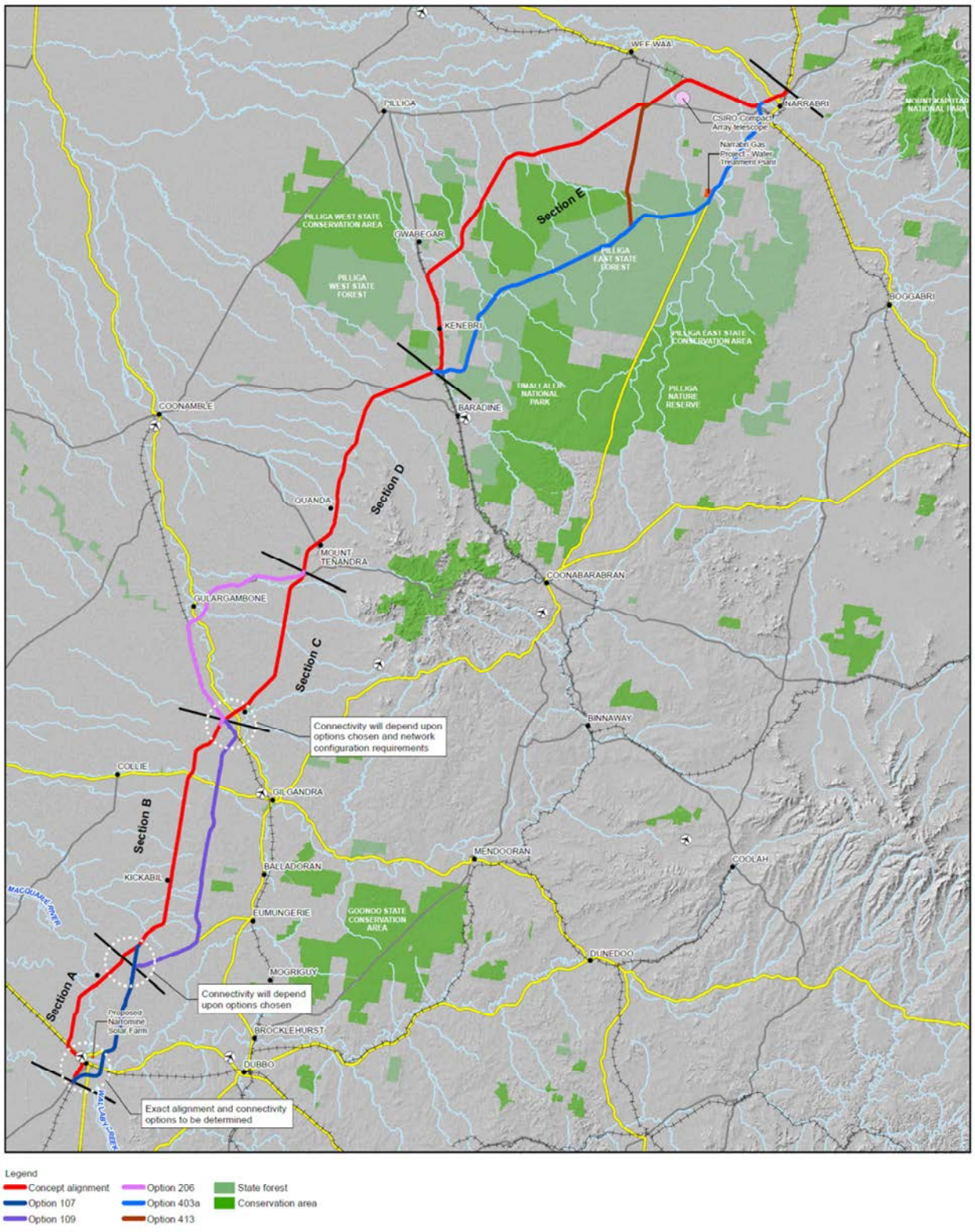


Figure 3: Corridor Options Reviewed in Final MCA Workshop

ARTC engaged with the community and stakeholders whilst undertaking further review of the proposed route and in November 2016 held community information sessions to gather more feedback on the new options. Over 17,000 residences received notification of the information sessions via post as well as newspaper advertisements and radio.

Additionally, the community and engagement team has established and maintained relationships with landowners who have come forward and requested further information and consultation.

Following the December 2016 MCA and further option refinement, the Inland Rail community engagement team identified property owners across all route options as well the 2016 Concept Alignment. During February and April 2017, the community engagement and project team conducted over 400 face to face meetings with property owners / tenants across these options. Not all landowners were able to be identified or contact details obtained. Figure 4 below provides a graphical status of the landholder meetings as at the end of April 2017.

Meetings with key stakeholders such as Councils and Federal MPs were also held to gather feedback on the options under consideration.

Landowners have also written to ARTC and political stakeholders identifying their preferred alignment.

Issues have emerged from the consultation and engagement that are consistent across every option under consideration. These issues are:

- Land acquisition process and compensation;
- The valuation process for agricultural land given that it is not only a house but also a business;
- Impacts on property valuation;
- Time frames until there is a clear decision on the route;
- Protection of prime agricultural land;
- Minimisation of impacts;
- The stress and anxiety this process is causing the landowners; and
- Creation of connectivity points.

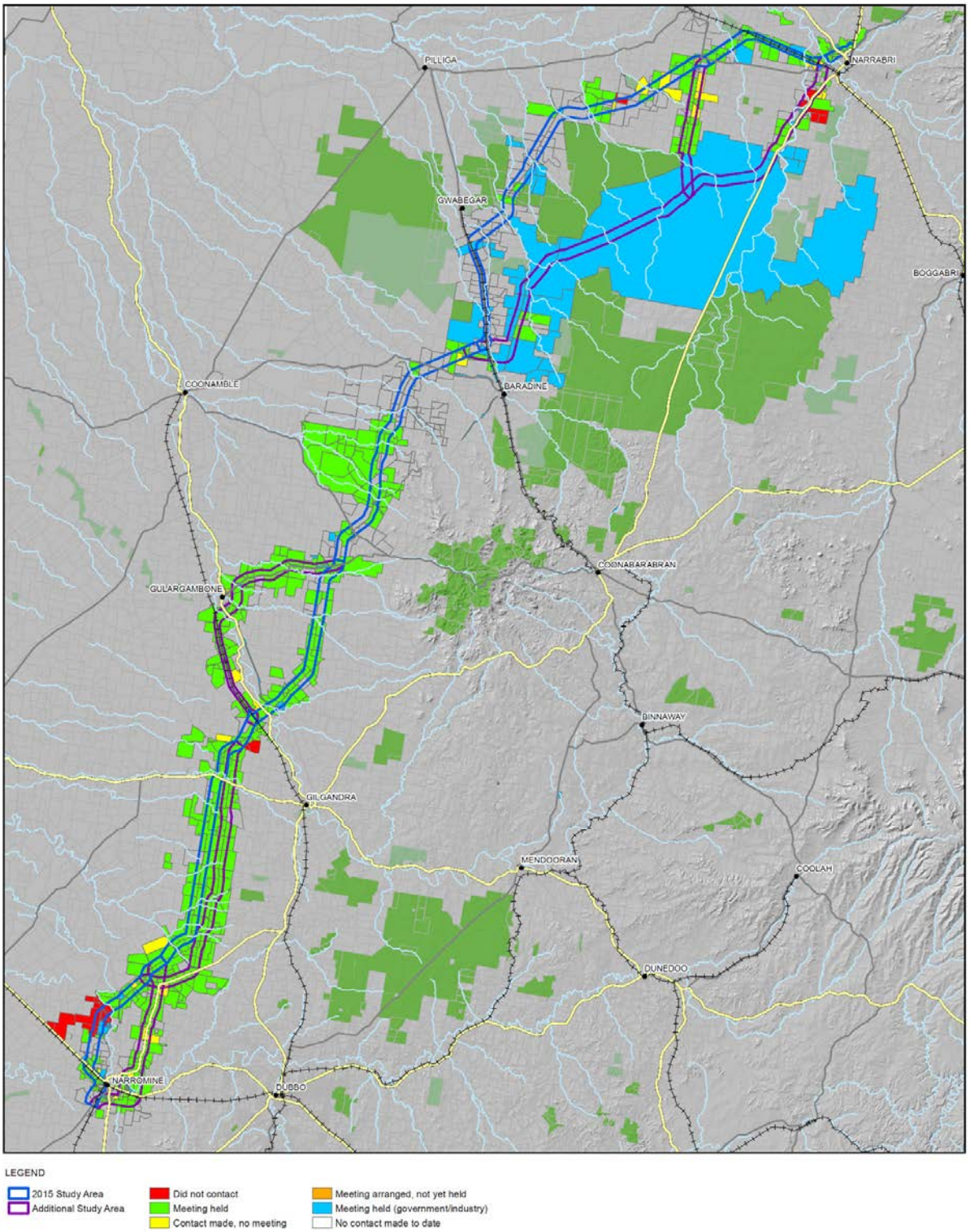


Figure 4: Landholder Meeting Status at April 2017

4. NARROMINE TO BURROWAY

4.1. Options

Two route options were considered in the Final MCA Workshop for the Narromine to Burroway section:

- 2016 Concept Alignment.
- Eumungerie Road option - an additional option to the east of Narromine (**Option A**).

These options are shown below in Figure 5.

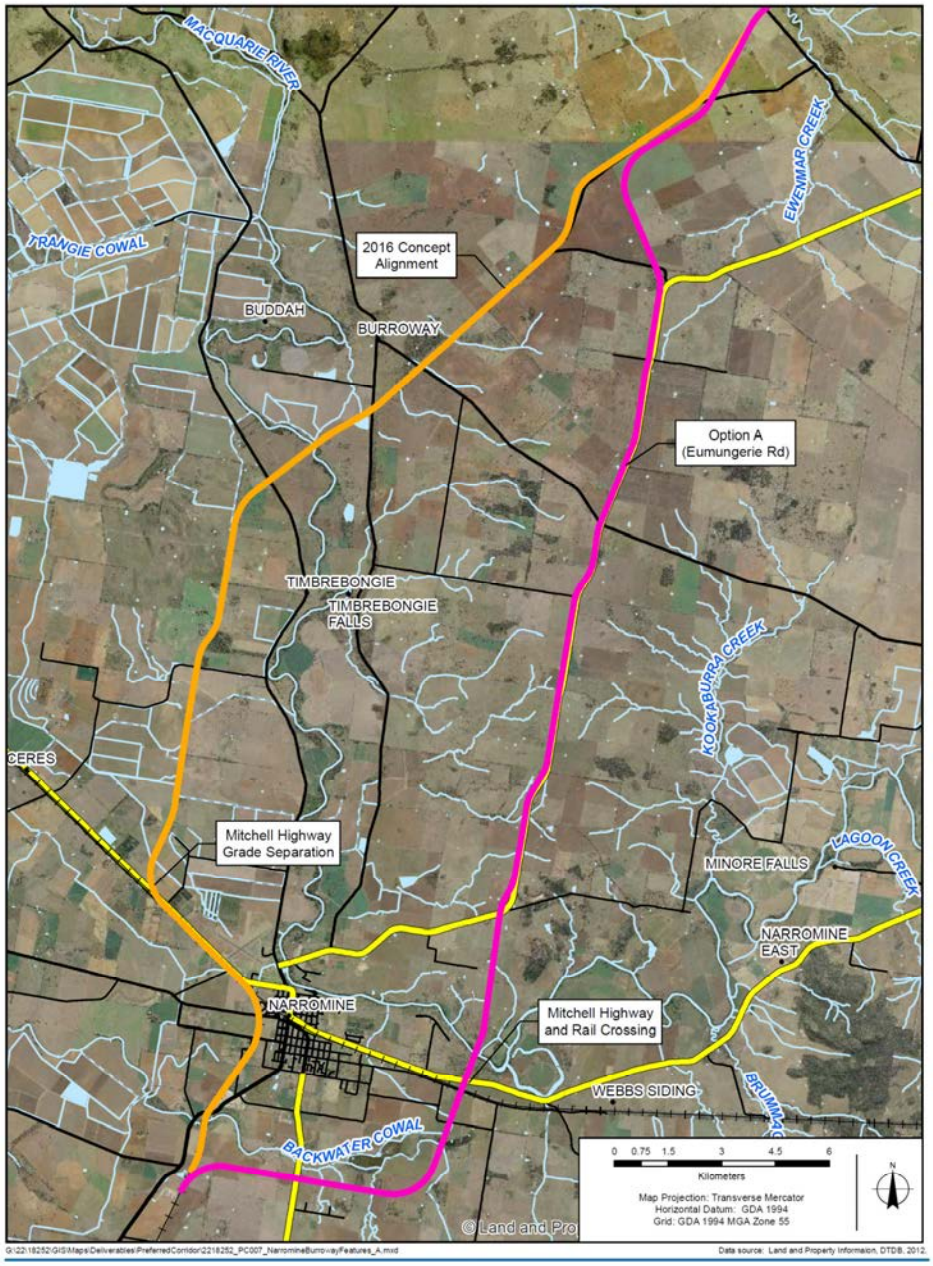


Figure 5: Corridors for Narromine to Burroway

A general description of the options considered in this section are summarised below in Table 5.

Table 5: Summary of the Corridor options for Narromine to Burroway

ISSUE	CONCEPT ALIGNMENT	OPTION A
Geotechnical conditions/track formation.	Poor ground conditions in Macquarie River flood plain (~21 km). Risk of deeper track formation, increased quantity of imported structural fill.	Poor ground conditions in Macquarie River/Backwater Cowal flood plain to the east of Narromine (~10 km). Risk of deeper track formation, increased quantity of imported structural fill. Better geotechnical conditions following Eumungerie Road over sandstone with nearby granite and existing Council quarry offering potential for borrow pits.
Hydrology and flooding	Impacts on Macquarie River flood flows to the west. Risk of viaduct structure to mitigate flooding impacts (afflux).	Impacts on flooding from Macquarie River/Backwater Cowal, but to a lesser extent than the 2016 Concept Alignment. More opportunity to select route above 1:100 year flood level.
Major Structures	Grade separation of Mitchell Highway (road over rail). Viaduct over flood plain. Bridge over Macquarie River	Grade separation of Mitchell Highway (rail over road). Bridge over Macquarie River extending to viaduct over flood plain. Probable 2 additional grade separations at Tomingley Road and Eumungerie Road – dedicated freight routes.
Railway operations	Good interoperability with Main Western line. New triangle/north fork required to provide full interoperability. Impacts on Mitchell Highway Grade Separation	New triangle required at connection with Parkes to Narromine line to provide full interoperability.
Constructability	Construction risks in flood risk areas (~21 km) associated with working adjacent to waterways, trafficability in wet weather, soft soils, and lack of structural fill.	Construction risks in flood risk areas (~10 km) associated with working adjacent to waterways, trafficability in wet weather, soft soils, and lack of structural fill.

ISSUE	CONCEPT ALIGNMENT	OPTION A
	Opportunity to win structural fill over sandstone areas (~20 km).	Opportunity to win structural fill over sandstone areas (~30 km).
Property and community	29 properties within 2 km corridor (excluding existing rail corridor). Likely adjustments to existing irrigation schemes	40 properties within 2 km corridor. Alignment would need to avoid electricity substation. Adjustments required to 2 x 132 kV power lines parallel to Mitchell Highway.

4.2. Service Offering

Option A (Eumungerie Road option) is 1.02km km longer than the Concept Alignment which equates to a time penalty of approximately 24 seconds to the transit time for this section. A summary of the effects of the option on the Service Offering is included in Table 6 and Table 7 below.

All other aspects, such as grades and curves and other technical aspects of the design are in accordance with the Service Offering.

Given that Option A starts south of Narromine there is a 4.84km section of the adjacent P2N project that has been included in the length of the Concept alignment for direct comparison purposes.

Table 6: Lengths of the Options in Narromine to Burroway

	CONCEPT	OPTION A
Corridor Length (Total) (km)	311.7	
Section Length (km)	41.84	42.89
Difference (km)		+1.05km
Section as a % of the Total	13.42%	13.76%

Table 7: Transit Time Summary for Narromine to Burroway

	DIR'N	CONCEPT	OPTION A	DIFF	CONCEPT	OPTION A	DIFF
		NON-STOPPING			STOPPING		
IR Express (h:mm:ss)	North Bound	0:24:43	0:25:01	**+0:00:18**	0:29:17	0:29:11	**-0:00:06**
IR Express (h:mm:ss)	South Bound	0:24:25	0:25:04	**+0:00:39**	0:28:44	0:29:18	**+0:00:34**
Superfreighter (h:mm:ss)	North Bound	0:25:01	0:25:25	**+0:00:24**	0:30:52	0:30:05	**-0:00:47**
Superfreighter (h:mm:ss)	South Bound	0:24:37	0:25:19	**+0:00:42**	0:29:49	0:30:25	**+0:00:36**

An initial blended run time is calculated separately for the Concept and Option by averaging the sectional run time (SRT) for each of the following services/directions:

- Inland Rail Express Northbound
- Inland Rail Express Southbound
- Inland Rail Superfreighter Northbound
- Inland Rail Superfreighter Southbound

The blended average SRT for the Concept and Option as shown in Table 8 is then calculated with 75% of Non-Stopping SRT and 25% of the Stopping SRT. This assumes that all trains stop at every fourth loop, which is consistent with the analysis underpinning the Concept of Service Capability Report.

Table 8: Blended Run Time

	CONCEPT	OPTION A	DIFFERENCE
Blended Run Time (h:mm:ss)	0:25:56	0:26:20	+0:00:24

4.3. Costs

Option A is $37.1m more than the Concept Alignment which equates to a 16.5% increase for this section. Table 9 provides a breakdown of the differences between the Concept Alignment and Option A.

Table 9: Estimated Capital Cost Summary

	CONCEPT ALIGNMENT	OPTION A
Capital Cost (Total)[b]	s47	
Capital Cost (Section)	s47	s47
Section as a proportion of Total	14.5%	16.9%
Difference: Option A to Concept		+$37,093,861
Section Difference as % Change		+16.5%
Difference as Proportion of Total		2.40%

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

The main differences in the capital cost estimate that reconcile to an overall $37.1m increase are described below.

4.3.1. Structures

Both alternate routes have large structures to cross the Macquarie River and flood plain. In the case of Option A, the river crossing is combined with a grade separated crossing of the Dubbo to Narromine rail line and the Mitchell Highway.

Option A also has an additional grade separated crossing of Tomingley Road, estimated at s47 m, which is a designated heavy vehicle route. This road crossing may not require a grade separated crossing once the Feasibility

Design and level crossing assessment is completed but an allowance has been made for one given the type and frequency of the current traffic.

The net effect of the allowances for the additional grade separation and different river/road crossing structures is an additional amount of approximately s47 m for this element of Option A.

4.3.2. Civil and Earthworks

Option A is situated on better geotechnical material which provides for the opportunity to produce structural formation material from onsite rather than importing from an offsite borrow pit or quarry.

This fact provides an approximate cost reduction of s47 m to the estimate against the Concept, for this element, as it has allowances for a larger proportion of the earthworks material to be imported.

The other elements in the estimate that reconcile to the overall increase for Option A, of s47 m, are shown below:

- s47 for Site establishment
- s47 for Contractor's Indirect Costs
- s47 for Design
- s47 for ARTC Supplied Materials and Trackwork
- s47 for Culverts
- s47 for Crossings
- s47 for Utilities, Fencing and Landscaping

4.4. Multi-Criteria Analysis

The assessment of Option A to the east of Narromine against the Concept in the MCA workshop resulted a positive result of +0.55 when assessed using the IR criteria and weightings.

The split of the results by the sub-criteria is shown below in Figure 6.

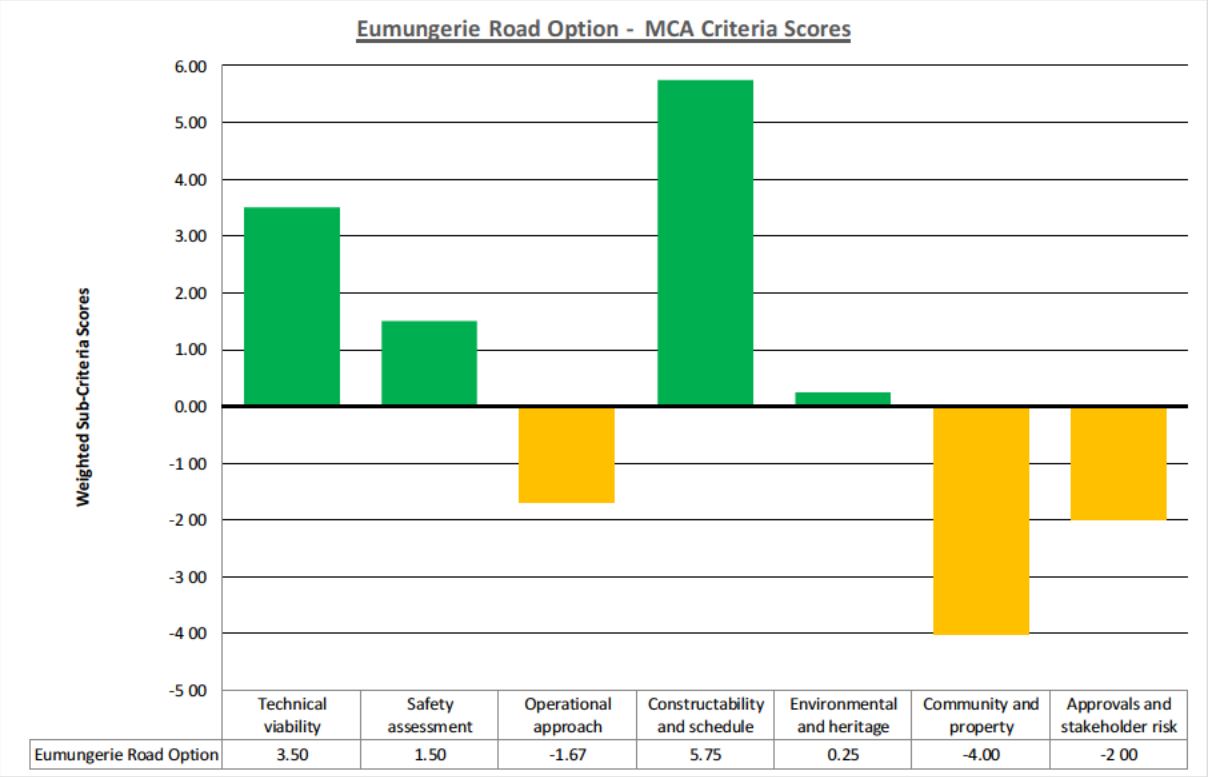


Figure 6: MCA Results for Eumungerie Road Option

It can be seen from a review of Figure 6 that Option A is technically superior to the Concept which results in the overall positive result. This is primarily driven by the alignment being situated on better geotechnical conditions and having a shorter extent in the flood plain.

The negative assessment from the Community and Property criteria reflects the fact that there are more properties on Option A and that there is a higher potential for indigenous heritage items to be found as the route crosses the Macquarie River.

The negative score in the Approvals and Stakeholder risk reflected advice from Narromine Council in April 2017 (prior to the May 2017 MCA Workshop) that they were considering rezoning land to the east of Narromine for development, but no plans have been formally lodged. If this score was updated to reflect the advice that has been received, see Section 4.5, this score would be closer to zero and would increase the overall MCA score making it more positive.

4.5. Community and Stakeholder

From the community and landowner consultation undertaken the community concerns and impacts are similar on both options. There are small new lifestyle acreages impacted on both, and community sentiment was similar.

ARTC consulted with 66% of property representatives within this area across the two options.

Narromine Council General Manager and Planning Manager confirmed in July 2017 that only rezoning had occurred for a possible housing development on the eastern option. No development application has been submitted. Council advised that their understanding was that the developer was halting further activities until the Inland Rail preferred alignment was identified.

A summary of the community feedback received is provided in Table 10.

Table 10: Summary of Community Feedback

	SUMMARY OF FEEDBACK	COMMENT
Narromine 2 options, 1 east and 1 west	**Concept Alignment:** Flooding and surface water concerns Impacts on new property developments and new homes Too close to town Consulted with 62% of property representatives. **Option A:** Community saw benefit of eastern route from a flooding point of view Impacts on new housing near the River Consulted with 69% of property representatives.	Both options share similar concerns

4.6. Discussion

- Inland Rail trains on Option A will not go through Narromine as the route is to the south and east of the town.
- Both options do require trains to run through or close to Narromine to connect from the existing east and west lines to Inland Rail. These trains would run on the track as they do today. Connectivity for both options can be achieved with relatively simple connections.
- There is a greater risk of a latent condition of hydrology (flooding) or poor geotechnical conditions issues increasing the cost of the viaduct structure to traverse the Macquarie River flood plain for the Concept Alignment due to the extent of the route that is within the flood plain. If this was realised the current capital cost differential could reduce or be negated.

4.7. Recommendation

The recommendation is made to nominate Option A as the Preferred option for Narromine to Burroway as summarised in Table 11.

Table 11: Preferred Corridor Summary for Narromine to Burroway

ITEM	PREFERRED
Service Offering (Blended Run Time) (h:mm:ss)	+0:00:24
Cost Differential	+$37,093,861
MCA Score	+0.55

This recommendation is made for the following reasons:

- The impact on the Service Offering is only an additional 24 seconds.
- Overall MCA scoring was positive.
- The route was preferred by the broader community in general, as it reduces property severance by following Eumungerie Road or if routed to the back of properties reduces level crossings.
- By avoiding Narromine, the route will minimise future environmental and social issues that may exist with a route closer to town.
- The geotechnical conditions are better and will provide more opportunity for capital cost savings and reduced maintenance costs.
- The hydrology and flooding issues are reduced.

The recommendation is made to take the Preferred Corridor as shown in Figure 7 through to Phase 2.

The Preferred Corridor as shown makes the following allowances:

- A zone up to 5km wide at the southern end to:
    - allow for a connection to P2N
    - avoid or minimise the flooding effects of the Backwater Cowal
    - target a better crossing point of the Dubbo to Narromine line, the Mitchell Highway and Macquarie River
- Follows the western side of Eumungerie Road with a corridor up to 2.5km wide to provide for an option along the back-property boundary

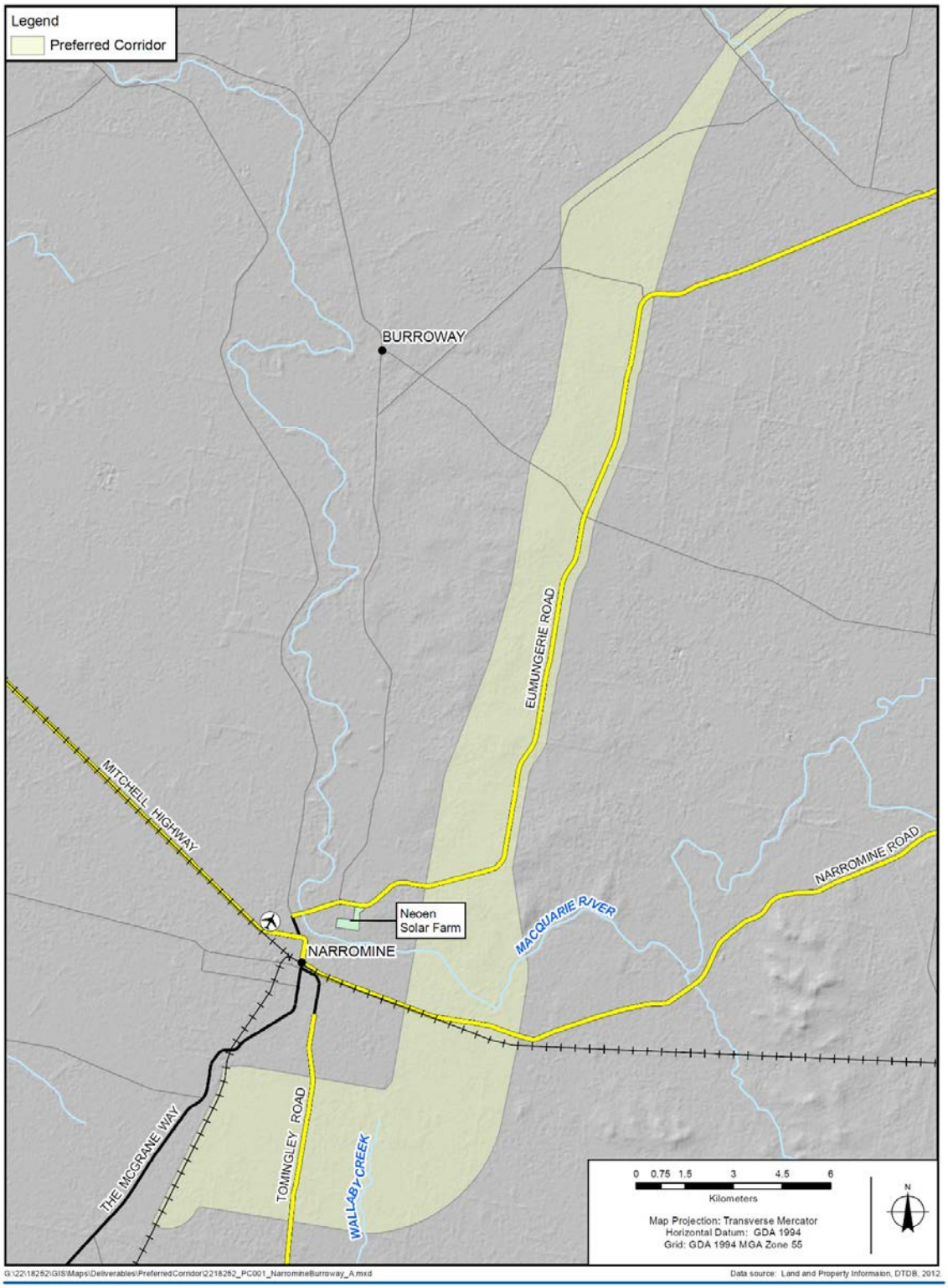


Figure 7: Preferred Corridor Recommendation for Narromine to Burroway (Option A)

5. BURROWAY TO CURBAN

5.1. Options

Two route options were considered in the Final MCA workshop for the Burroway to Curban section:

- 2016 Concept Alignment.
- Gilmours Road alternate - an alternative option to the east of Gilmours Road (**Option B**).

These options are shown in Figure 8.

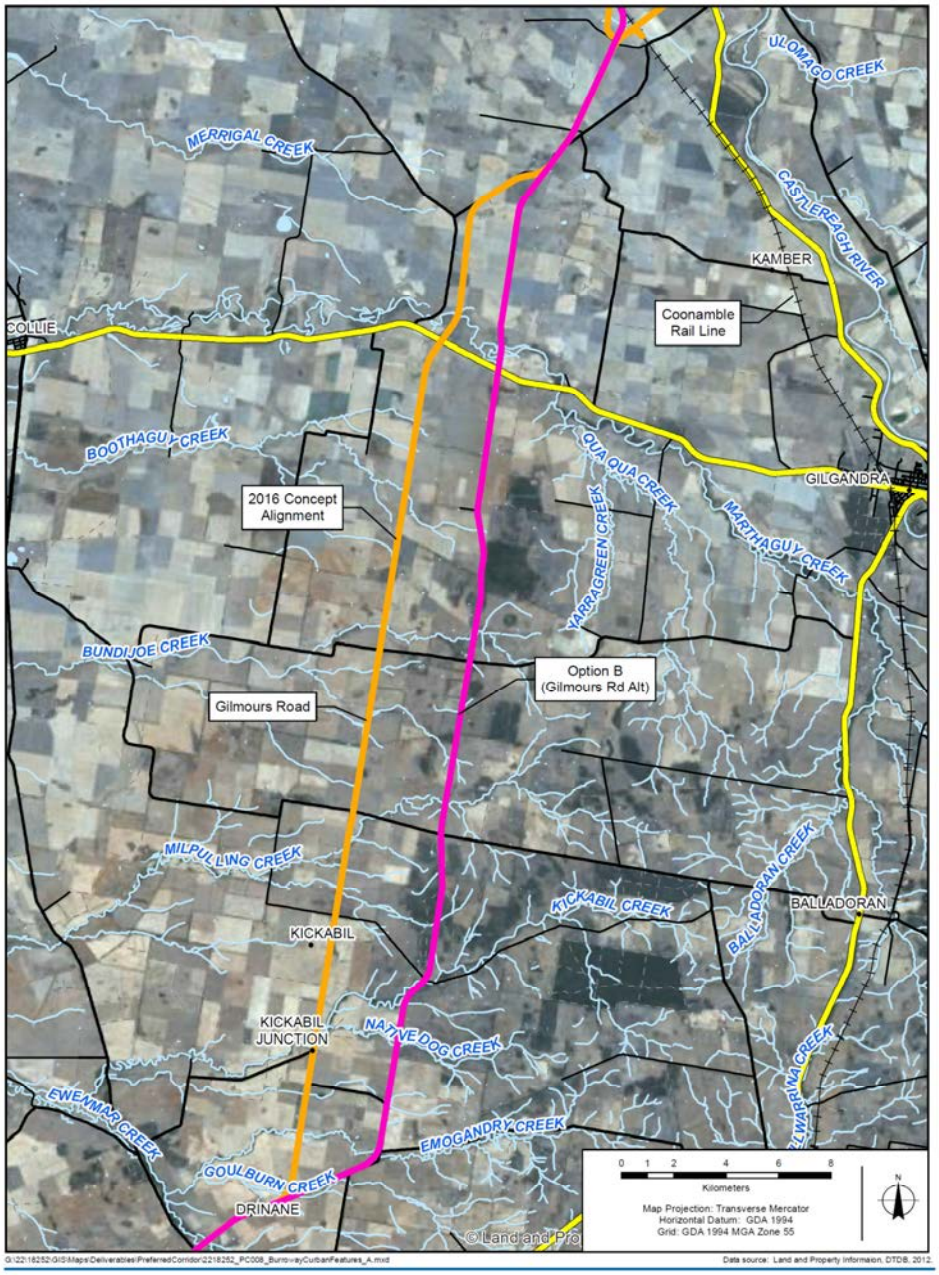


Figure 8: Corridors for Burroway to Curban

A general description of the options considered in this section is summarised below in Table 12.

Table 12: Summary of the Corridor options for Burroway to Curban

ISSUE	CONCEPT ALIGNMENT	OPTION B
Geotechnical conditions/track formation.	Geotechnical conditions are generally reasonable. Local testing indicated CBR values generally over 3%.	The alternative option passes over more underlying sandstone. Better ground conditions would be expected with more opportunities for borrow pits
Hydrology and flooding	Similar issues	Similar issues. Fewer potential flooding issues affecting property access
Major Structures	Oxley Highway grade separation	Oxley Highway grade separation
Railway operations	No connections to existing lines.	No connections to existing lines.
Constructability	No significant issues	Increased clearing of native vegetation. Potentially better ground for haul routes over soils derived from underlying sandstone.
Property and community	21 properties within 2 km corridor. Local landowners opposed to both routes.	19 properties within 2 km corridor. Local landowners opposed to both routes
Level Crossings	10 private level crossings 7 public level crossings	9 private level crossings 6 public level crossings

5.2. Service Offering

Option B is 0.7 km longer than the Concept Alignment which equates to a time impact of 1 minute and 20 seconds to the transit time for this section. A summary of the effects of the option on the Service Offering is included in Table 13 and Table 14 below.

All other aspects, such as grades and curves and other technical aspects of the design are in accordance with the Service Offering.

Table 13: Lengths of the Options in Burroway to Curban

	CONCEPT	OPTION B
Corridor Length (Total)(km)	311.7	
Section Length (km)	46.77	47.52
Difference (km)		+0.75
Section as a % of the Total	15.00%	15.24%

Table 14: Transit Time Summary for Burroway to Curban

	DIR'N	CONCEPT	OPTION B	DIFF	CONCEPT	OPTION B	DIFF
		NON-STOPPING			STOPPING		
IR Express (h:mm:ss)	North Bound	0:26:52	0:28:22	**+0:01:30**	0:31:22	0:32:37	**+0:01:15**
IR Express (h:mm:ss)	South Bound	0:26:53	0:27:42	**+0:00:49**	0:31:45	0:32:36	**+0:00:51**
Superfreighter (h:mm:ss)	North Bound	0:26:57	0:29:01	**+0:02:04**	0:32:18	0:34:29	**+0:02:11**
Superfreighter (h:mm:ss)	South Bound	0:27:02	0:28:03	**+0:01:01**	0:33:27	0:34:20	**+0:00:53**

An initial blended run time is calculated separately for the Concept and Option by averaging the sectional run time (SRT) for each of the following services/directions:

- Inland Rail Express Northbound
- Inland Rail Express Southbound
- Inland Rail Superfreighter Northbound
- Inland Rail Superfreighter Southbound

The blended average SRT for the Concept and Option as shown in Table 15 is then calculated with 75% of Non-Stopping SRT and 25% of the Stopping SRT. This assumes that all trains stop at every fourth loop, which is consistent with the analysis underpinning the Concept of Service Capability Report.

Table 15: Blended Run Time

	CONCEPT	OPTION B	DIFFERENCE
Blended Run Time (h:mm:ss)	0:28:15	0:29:35	+0:01:20

5.3. Costs

Option B is $4.26m less than the Concept Alignment which equates to a 2.0% decrease for this section. Table 16 provides a breakdown of the differences between the Concept Alignment and the Preferred Corridor.

Table 16: Estimated Capital Cost Summary

	CONCEPT ALIGNMENT	OPTION B
Capital Cost (Total)[b]	s47	
Capital Cost (Section)	s47	s47
Section as a proportion of Total	13.4%	13.2%
Difference: Option B to Concept		-$4,257,193
Section Difference as % Change		-2.0%
Difference as Proportion of Total		0.28%

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

The longer route of Option B equates to additional costs for trackwork and track materials but these are offset by the option traversing over better geotechnical material allowing for onsite material to be used with less and smaller culverts structures.

The major structures such as a grade separation of the Oxley Highway are common to both.

5.4. Multi-Criteria Analysis

The assessment of Option B against the Concept in the MCA workshop resulted a positive result of +0.43 when assessed using the IR criteria and weightings.

The split of the results by the sub-criteria is shown below in Figure 9.

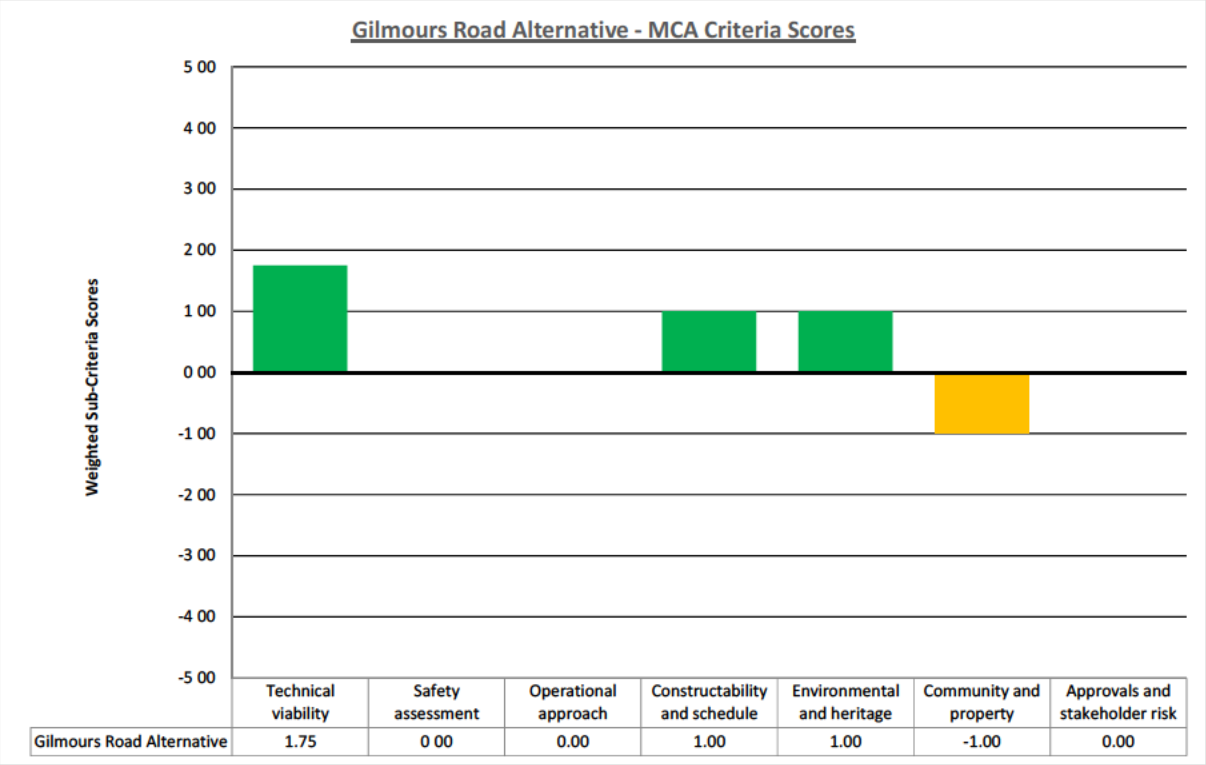


Figure 9: MCA Results for Gilmours Road Alternate Option (Option B)

It can be seen from a review of Figure 9 that Option B is technically superior to the Concept which results in the overall positive result. This is primarily driven by the alignment being situated on better geotechnical material and the flow on benefit to the constructability of the option.

5.5. Community and Stakeholder

The feedback from the community consultation undertaken from February to April 2017 is summarised in Table 17 below, with 90% of property representatives across these combined options.

It is important to note that at the November 2016 consultation, the alternative option to the 2016 modified base case was not Option B as per the alignment shown in Figure 8. The alternative option was an option adjacent to Eumungerie Road that traverses east and crosses the Castlereagh Highway to join the Coonamble line.

From the November 2016 consultation, there was a preference for the Eumungerie Road option from the community. This option was discounted by the project team in the December 2016 MCA workshop with the results included in the December 2016 MCA Worksop Report contained in Appendix E.

The alternative Gilmours Road option (Option B) was suggested in the November 2016 consultation by a landowner as a suggestion to refine the alignment to minimise property and operational severance and not as a corridor preference.

Landowners first heard of Option B when the February – April 2017 consultation occurred. As a result, this refinement has not been canvassed with the broader community as has previously occurred at information sessions.

There are a number of landowners who have property on both the current options, and a number of these have expressed their preference for Option B and have written to ARTC and elected representatives expressing their preference.

Similarly, there are landowners who have property on both options who do not prefer Option B and have also written to ARTC and elected representatives.

Also for the landowners who have property only on Option B, this was the first time they had heard of Inland Rail and that they would now potentially be impacted.

Given the circumstances outlined above there is no clear community preference for either of the options currently being considered.

Table 17: Summary of Community Feedback

	SUMMARY OF FEEDBACK	COMMENT
Burroway to Curban	**Concept Alignment:** • Flooding • Alignment with the road will create issues of farm operability • No consensus from landowners who have property on both options • Impacts on lifestyle and environmental issues such as visual amenity, noise, vibration • Consulted with 90% of property representatives within the concept alignment **Option B:** • No consensus from landowners who have property on both options • Impacts on lifestyle and environmental issues such as visual amenity, noise, vibration • Landowners concerned that this option only came about due to	Both options share similar concerns No overall preference identified from the consultation completed except the Eumungerie Road option which was discounted in the Dec 2016 MCA.

	SUMMARY OF FEEDBACK	COMMENT
	landowners on concept alignment wanting the route further from their houses • Consulted with 92% of property representative within the alternative option	

5.6. Discussion

- From the engagement undertaken the community does not see a transparent rationale for discounting the Eumungerie Road option that was presented in November 2016.
- The aim through the corridor from Burroway to Curban would be to follow roads and/or property boundaries.
- Alignments that follow a route similar to Option B will traverse better geotechnical material and allow for reduced and smaller culverts. There will also be other benefits with a possible reduced number of level crossings by following back boundaries.
- The lack of private property access meant there was limited engineering work possible in the development of alignment options at the concept stage. There needs to be further site based review to ensure any future refinements that are investigated follow a consistent process.

5.7. Recommendation

The recommendation is made to nominate an investigation area as shown in Figure 10 as the Preferred Corridor for Burroway to Curban as summarised in Table 18. This corridor includes Option B and the statistics for Option B have been used below.

Table 18: Preferred Corridor for Burroway to Curban

ITEM	PREFERRED
Service Offering (Blended Run Time) (h:mm:ss)	+ 0:01:20
Cost Differential	-$4,257,193
MCA Score	+0.43

This recommendation is made for the following reasons:

- The impact on the Service Offering is only an additional 1 minute and 20 seconds.
- There is a $4.3m cost saving.
- Overall MCA scoring was positive.

- By setting the corridor as shown in Figure 10 the risks associated with the community not being fully engaged in the development of the refinements can be minimised.
- The corridor allows for an alignment that follows Option B.
- Refinements will occur after further site work and consultation is carried out in Phase 2, the results of which will provide the community with an open and robust process. The Phase 2 scope of work has an allowance to refine the corridors prior to the 30% Feasibility Design stage.
- The geotechnical conditions are better to the east and will provide more opportunity for capital cost savings and reduced maintenance costs.
- The hydrology and flooding issues are reduced.

The recommendation is made to take the Preferred Corridor as shown in Figure 10 through to Phase 2.

The Preferred Corridor as shown makes the following allowances:

- Follows the eastern side of Gilmours Road with an investigation zone of 3.5km to 4.5km wide to provide for an option along the front or back-property boundary.

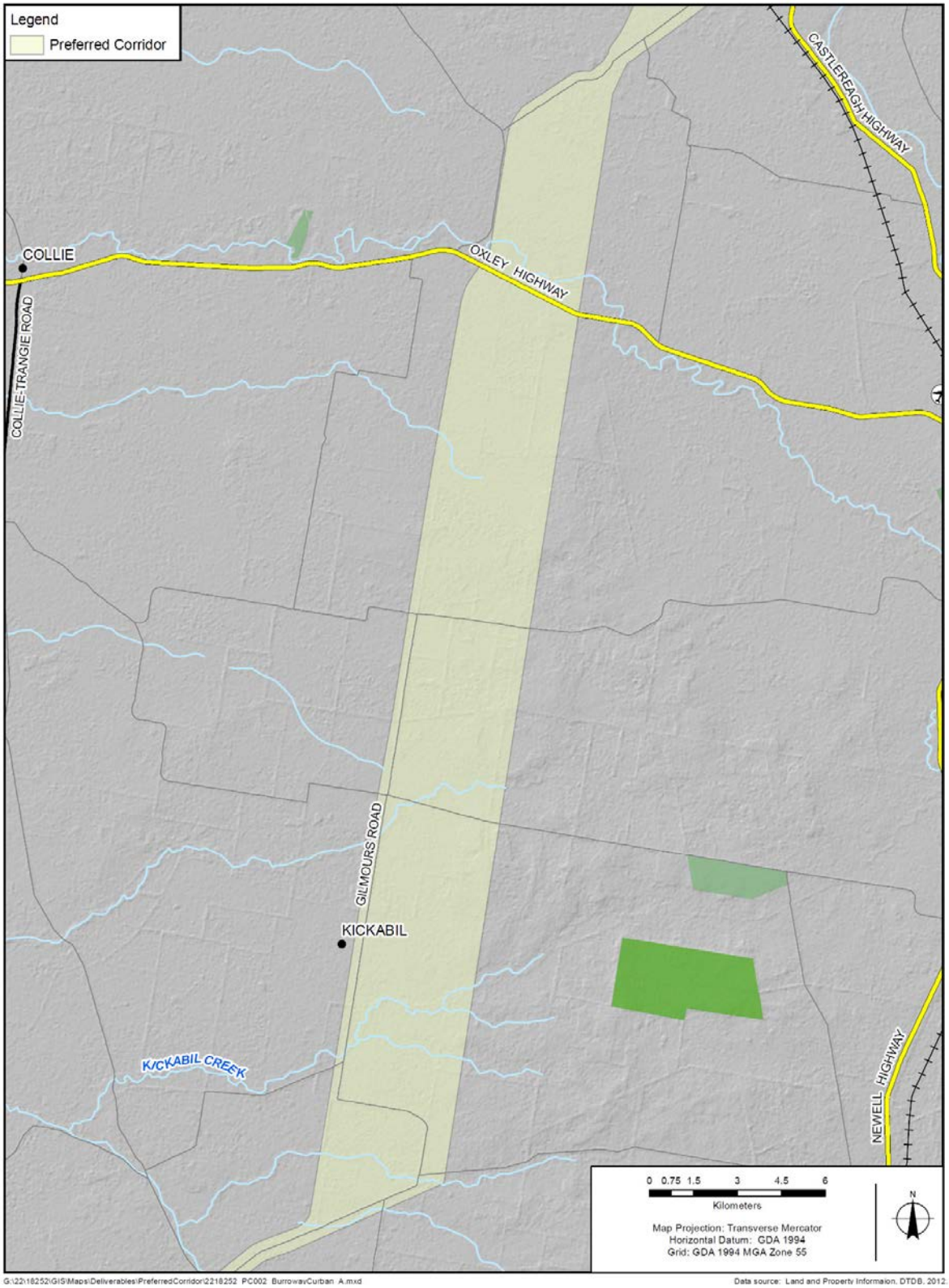


Figure 10: Preferred Corridor Recommendation for Burroway to Curban

6. CURBAN TO MT TENANDRA

6.1. Options

Two route options were considered between Narromine and Burroway:

- 2016 Concept Alignment.
- Box Ridge Road option - an alternative option that utilises some of the Coonamble line (**Option C**).

These options are shown in Figure 11.

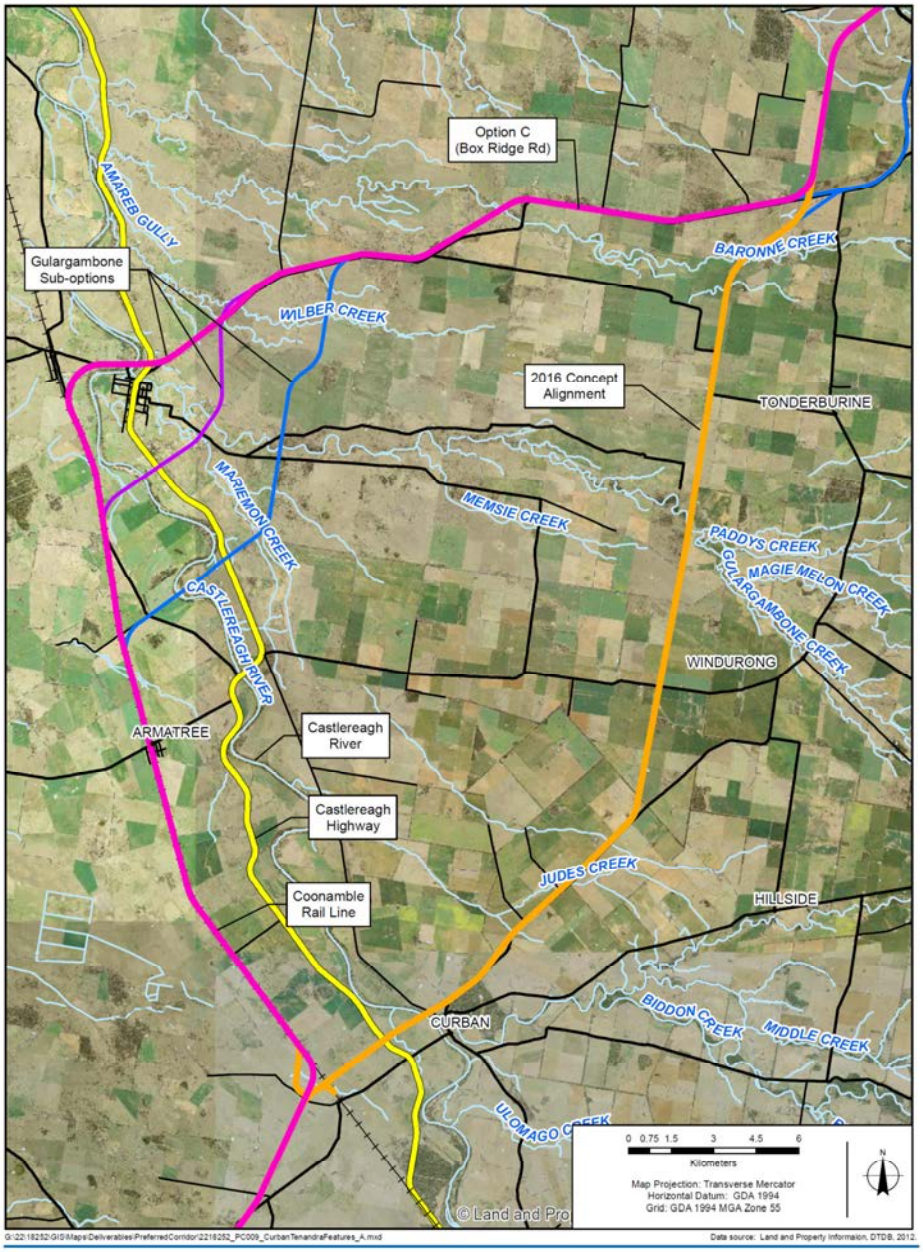


Figure 11: Corridors for Curban to Mt Tenandra

A general description of the options considered in this section is summarised below in Table 19.

Table 19: Summary of the Corridor options for Curban to Mt Tenandra

ISSUE	CONCEPT ALIGNMENT	OPTION C
Geotechnical conditions/track formation.	Geotechnical conditions expected to be better than Box Ridge Road Option as alignment is further east. Test results for soils derived from sandstone indicated CBRs >3% for approx. 7 km towards the start of this section. Expected to deteriorate with remaining 37 km being over clayey "black" soils, CBR <3%, similar to Box Ridge Road.	25 km would comprise track reconditioning on Coonamble Line. 36 km are expected to be over clayey "black" soil, CBR <3%.
Hydrology and flooding	Flooding issues with crossing of Castlereagh river and sheet flow runoff from Warrumbungles.	Fewer drainage issues. Flooding issues with crossing of Castlereagh River. Final crossing location to be determined following detailed flood study.
Major Structures	Grade separation of Castlereagh Highway. Bridge/viaduct over the Castlereagh River	Grade separation of Castlereagh Highway. Bridge/viaduct over the Castlereagh River.
Railway operations	Realignment of Coonamble line required at Curban to allow Inland Rail to be the main line. Additional "triangles" required to provide full interoperability.	Simpler junction at Curban. Additional "triangle" required to provide full interoperability. Additional junction at Gulargambone with north fork to provide access from Coonamble to Brisbane.
Constructability	Potential borrow pits over 7 km section shortly after Curban over sandstone areas. Also existing borrow pit within basalt hill on National Park Road. Remaining 37 km would require imported structural fill for track formation and possibly for construction access roads.	Reconditioning of the Coonamble line for the first 25 km would largely be track based work. Remaining 36 km would require imported structural fill for track formation and possibly for construction access roads.

ISSUE	CONCEPT ALIGNMENT	OPTION C
Property and community	Impacts on 29 properties	Impacts on 24 properties, (excluding Coonamble Line rail corridor).
Level Crossings	9 private level crossings 9 public level crossings 1 grade separation	14 private level crossings 11 public level crossings 1 grade separation
Other	Impacts on wheat producers including severance of smaller farming operations.	Potential clearing of native vegetation if route is within Box Ridge Road reserve. Could be avoided/mitigated if alignment is along the road boundary, but within adjacent properties. Community feedback supports following Box Ridge Road.

6.2. Service Offering

Option C is 16.4 km longer than the Concept Alignment which equates to a time penalty of approximately 9.5 minutes. A summary of the effects of the option on the Service Offering is included in Table 20 and Table 21 below.

All other aspects, such as grades and curves and other technical aspects of the design are in accordance with the Service Offering.

Table 20: Lengths of the Options in Curban to Mt Tenandra

	CONCEPT	OPTION C
Corridor Length (Total)(km)	311.7	
Section Length (km)	44.31	60.71
Difference (km)		+16.40
Section as a % of the Total	14.21%	19.48%

Table 21: Transit Time Summary for Curban to Mt Tenandra

	DIR'N	CONCEPT	OPTION C	DIFF	CONCEPT	OPTION C	DIFF
		NON-STOPPING			STOPPING		
IR Express (h:mm:ss)	North Bound	0:26:09	0:35:29	**+0:09:20**	0:30:54	0:39:58	**+0:09:04**
IR Express (h:mm:ss)	South Bound	0:25:25	0:34:45	**+0:09:20**	0:29:03	0:39:51	**+0:10:48**
Superfreighter (h:mm:ss)	North Bound	0:26:43	0:35:58	**+0:09:15**	0:32:43	0:41:40	**+0:08:57**
Superfreighter (h:mm:ss)	South Bound	0:25:35	0:35:10	**+0:09:35**	0:29:42	0:41:38	**+0:11:56**

An initial blended run time is calculated separately for the Concept and Option by averaging the sectional run time (SRT) for each of the following services/directions:

- Inland Rail Express Northbound
- Inland Rail Express Southbound
- Inland Rail Superfreighter Northbound
- Inland Rail Superfreighter Southbound

The blended average SRT for the Concept and Option as shown in Table 22 is then calculated with 75% of Non-Stopping SRT and 25% of the Stopping SRT. This assumes that all trains stop at every fourth loop, which is consistent with the analysis underpinning the Concept of Service Capability Report.

Table 22: Blended Run Time

	CONCEPT	OPTION B	DIFFERENCE
Blended Run Time (h:mm:ss)	0:27:07	0:36:42	+ 0:09:35

6.3. Costs

Option C is $34.6m more than the Concept Alignment which equates to a 15.8% increase for this section. Table 23 provides a breakdown of the differences between the Concept Alignment and Option C.

Table 23: Estimated Capital Cost Summary

	CONCEPT ALIGNMENT	OPTION C
Capital Cost (Total)[b]	s47	
Capital Cost (Section)	s47	s47
Section as a proportion of Total	14.1%	16.4%
Difference: Option C to Concept		+$34,620,629
Section Difference as a %change		+15.8%
Difference as Proportion of Total		2.24%

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

The major factors contributing to the cost differences are summarised below.

6.3.1. Civil and Earthworks

Both alignments traverse poor alluvial material for the majority of the routes with the balance being better weathered sandstone. The estimate takes this into account by allowing for the Concept alignment to produce a greater proportion of the structural material from an onsite cut and fill operation rather than importing.

6.3.2. Trackwork

Option C has 24.7km of the Coonamble line to upgrade as a brownfield construction, leaving 36.0km of greenfield in comparison to the Concept Alignment greenfield length of 44.31km. The overall length increase of Option C equates to s47 of additional materials and extra installation cost for the trackwork.

The cheaper brownfield construction rate does not fully offset cost increase in the Trackwork activity.

6.3.3. Culverts

The concept alignment has extensive culvert crossings of the multiple shallow creek crossings which all flood in a sheet flow manner as the water runs off the foothills of the Warrumbungles heading for the Castlereagh River. The existing Coonamble line on Option C generally follows a watershed with the Castlereagh River on the eastern side catching the westward heading sheet flow water. Anecdotal advice from the local track teams is that the Coonamble line has not

flooded in the last 35 years. Box Ridge Road does not follow a ridge as the name suggests but it traverses parallel to the majority of the waterways and results in less culverts overall and a s47 reduction in culverts against the Concept alignment.

6.4. Multi-Criteria Analysis

The assessment of Option C against the Concept in the MCA workshop resulted in a negative result of -0.27 when assessed using the IR criteria and weightings.

The split of the results by the sub-criteria is shown below in Figure 12.

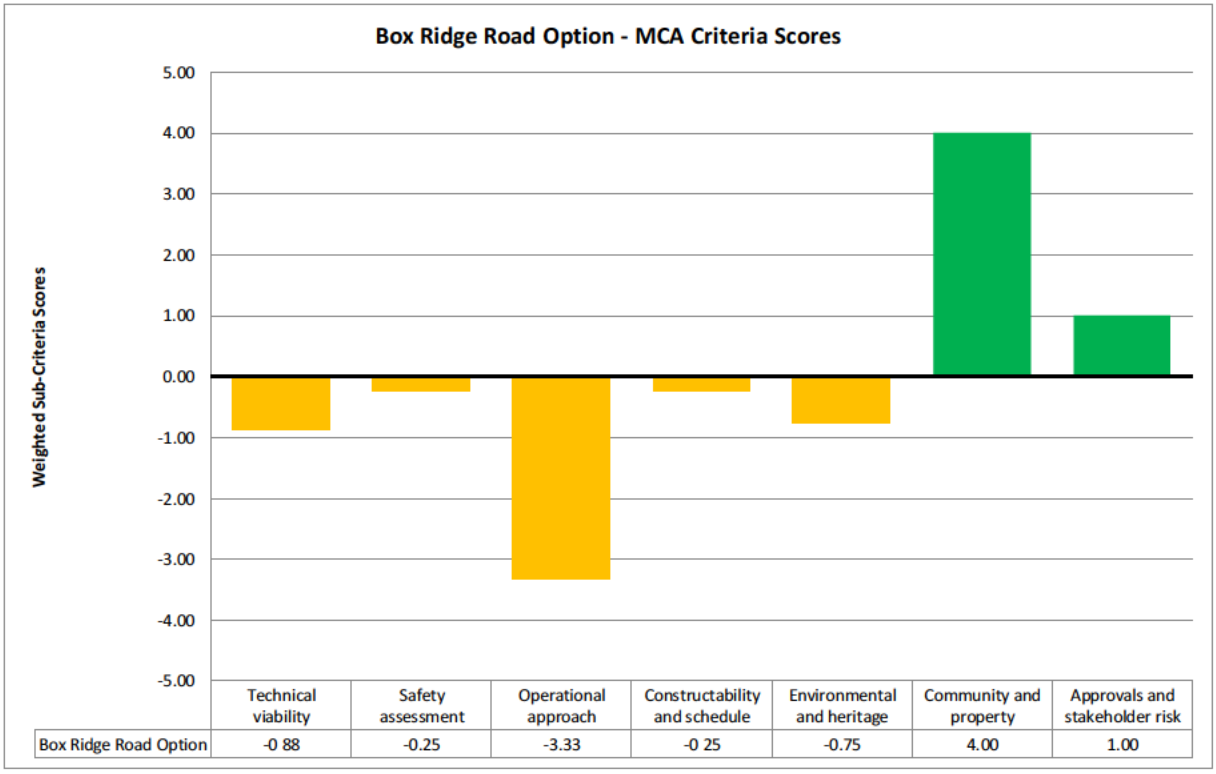


Figure 12: MCA Results for Box Ridge Road Option

It can be seen from a review of Figure 12 that there are two major differences between the options:

- The additional length and transit time of the option is resulting in a negative score of -3.33 for the Operational approach, and
- The strong community and local government support for the option results in positive results of +4.0 and +1.0 for Community and Property and Approvals and Stakeholder risk respectively.

There was robust discussion during the MCA workshops on the rankings applied to the Box Ridge Road option with the results verified post the final MCA workshop to ensure that the basis of the judgements, in terms of differences in geotechnical conditions, known heritage, road/rail interfaces and judgements were valid.

6.5. Community and Stakeholder

The feedback from the community consultation undertaken during February to April 2017 is summarised in Table 24 below. ARTC consulted with 74% of the property representatives across these combined options.

Following the May 2016 consultation, community members and the local Council suggested a potential alignment option using the existing Coonamble rail line and then across Box Ridge Road.

This option was presented to the community in November 2016 and received positive support from the community. This included support from a number of landowners who would be impacted by both options.

The Council supports the Box Ridge Road option as the Concept Alignment traverses properties that provide a high rate contribution.

From the consultation with landowners and stakeholders to date, there has been significant consistent support for the alternative Box Ridge Road option.

Table 24: Summary of Community Feedback

SECTION	SUMMARY OF FEEDBACK	COMMENT
Curban to Mt Tenandra	**Concept Alignment:** • Concern from Council given that the route will impact their high rate landowners • Small high production agricultural properties • Landowner objections • Consulted with 86% of property representatives within the concept alignment option **Option C:** • Council suggested, and supported, an option that followed Box Ridge Road. • Impacted residents understand the reason for the alignment and willing to work with ARTC. • Supported option from a number of landowners on both options. • Consulted with 69% of property representatives within the Box Ridge Road option	Preference from community consultation for Option C. Support for Option C from landowners who have property on both options. Impacted landowners keen to discuss compensation.

6.6. Discussion

- Option C is dependent on a satisfactory agreement being reached in a timely manner with TfNSW for the uses of the line and corridor.
- The broader community and impacted landowners are aware of the stakeholder support for the Box Ridge Road option (Option C).
- The Concept Alignment crosses the higher production cropping land within the Gilgandra Shire and once it leaves National Park Road the opportunities to reduce property severance are limited.

6.7. Recommendation

The recommendation is made to nominate the Concept Alignment as the Preferred option for Curban to Mt Tenandra as shown in Figure 13 and summarised in Table 25.

Table 25: Preferred Corridor Summary for Curban to Mt Tenandra

ITEM	PREFERRED
Service Offering (Blended Run Time) (h:mm:ss)	0:27:07
Total Cost Estimate[b] *(not the differential)*	s47
MCA Score	0.0

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

This recommendation is made for the following reasons:

- Option C did not provide a compelling case to be recommended as the Preferred Corridor when assessed in accordance with the IR Route Refinement Process:
    - Run time impact on Service Offering of +0:09:35
    - Capital Cost increase of +$34,620,629
    - MCA Score of -0.27
- The Preferred corridor will avoid Gulargambone and will allow the project to refine the alignment along the route with further investigations and engagement with the local community and stakeholders.

The recommendation is made to take the Preferred Corridor as shown in Figure 13 through to Phase 2.

The Preferred Corridor as shown makes the following allowances:

- An investigation zone up to 2km wide for the crossing at Curban.
- An investigation zone 2 km wide for the crossing point of the Castlereagh Highway and Castlereagh River.
- A reduced zone of 500m wide along National Park Road.
- An investigation zone of 2km wide from the end of National Park Road to Mt Tenandra

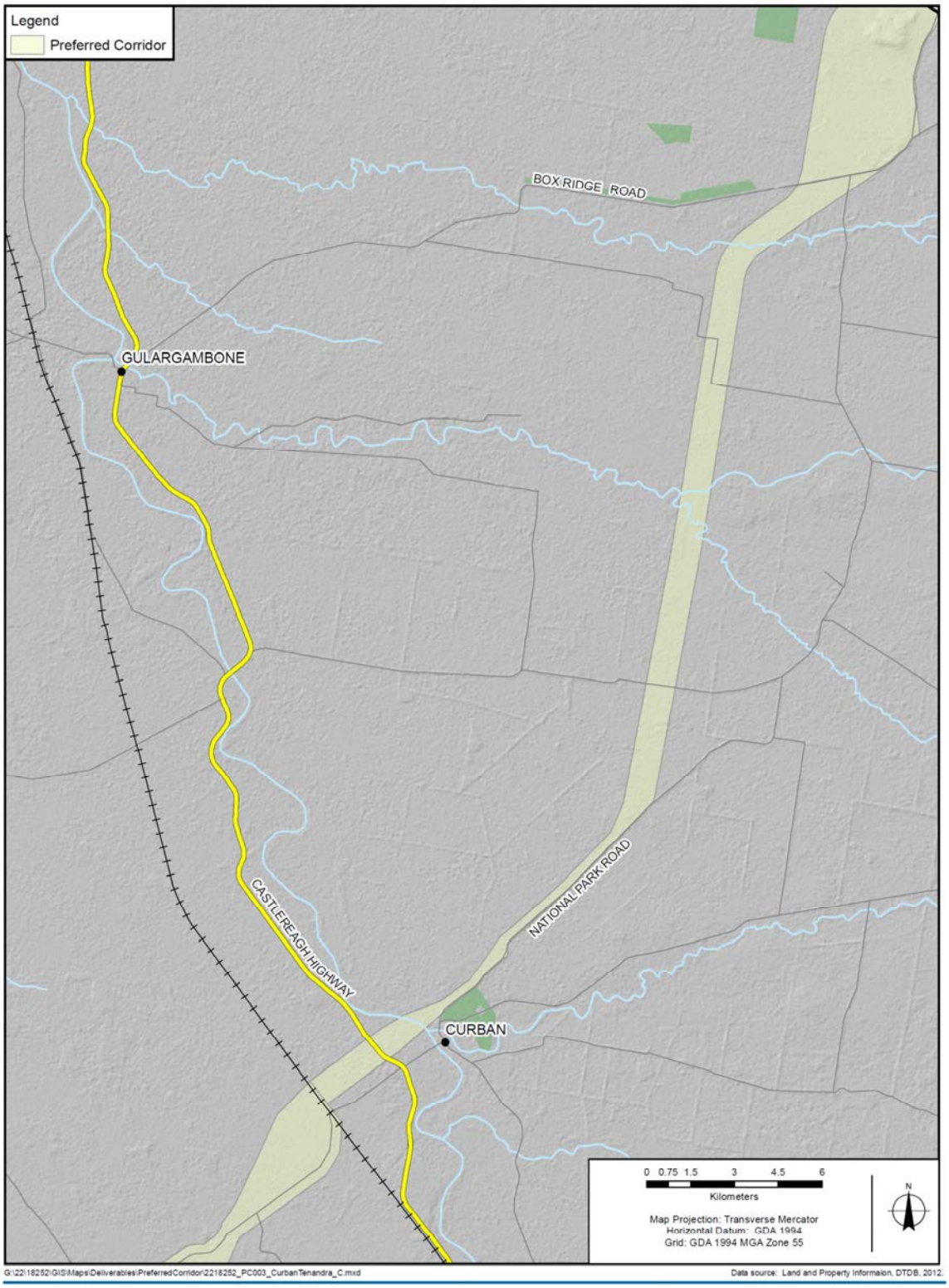


Figure 13: Preferred Corridor Recommendation for Curban to Mt Tenandra

7. MT TENANDRA TO BARADINE

7.1. Corridor Refinements

The only corridor option considered in the final stage of Phase 1 was the 2016 Concept Alignment, with all other options discounted following the December 2016 MCA workshop, report attached in Appendix E. During the landowner consultation, February to April 2017, the landowners were advised that the only corridor under investigation was the Concept alignment with discussions held around refinements that would reduce property impacts and target better geotechnical conditions.

The refinements considered are shown in Figure 14 and described in Table 26.

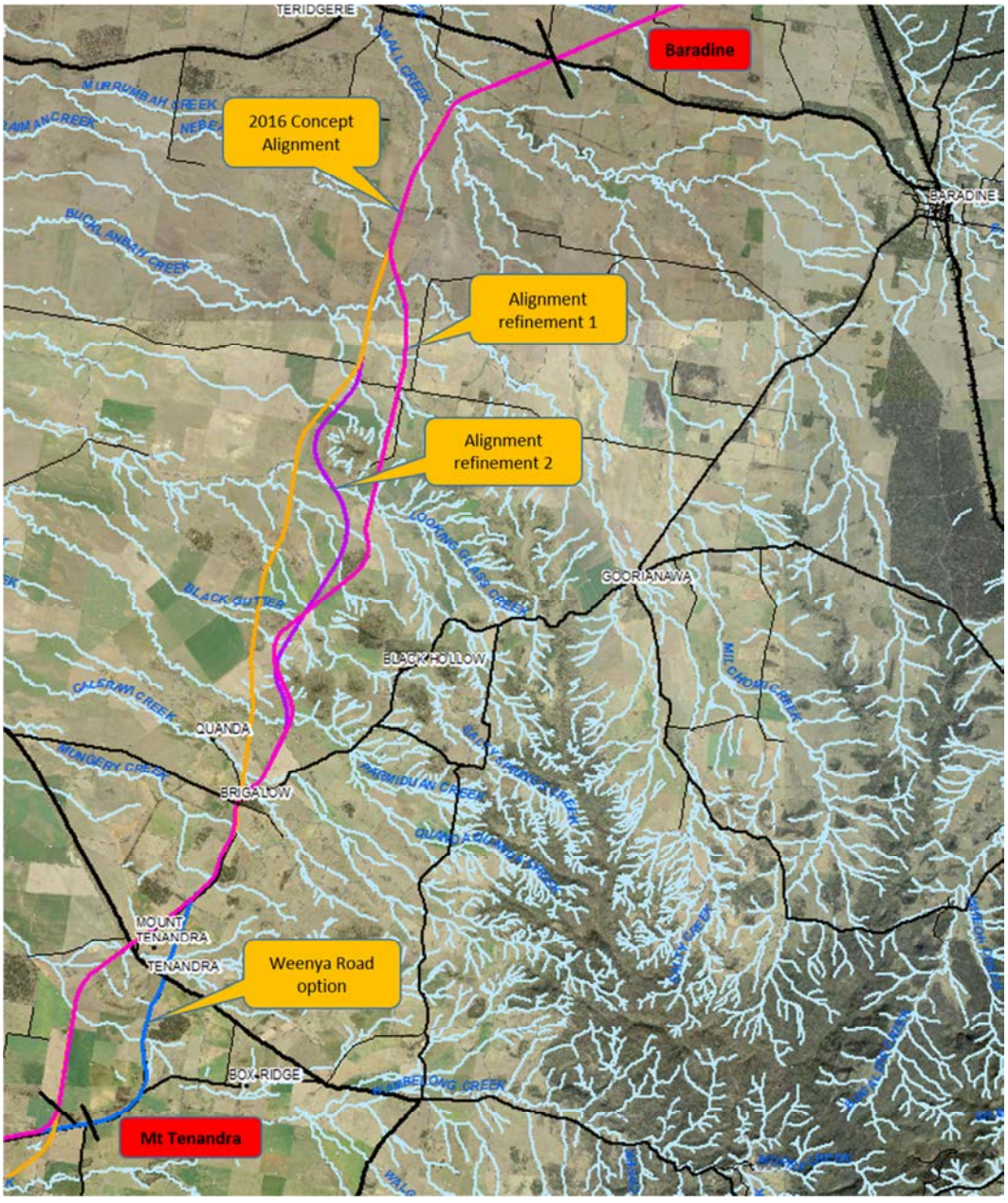


Figure 14: Refinements for Mt Tenandra to Baradine

Table 26: Summary of the Corridor Refinements for Mt Tenandra to Baradine

SECTION	DESCRIPTION
Mt Tenandra to Baradine	The refinement corridors take into account the better geotechnical conditions to the east, take account of feedback from the landholder consultation and aim to reduce property severance by generally following property boundaries where possible.
Weenya Road Option	Joins either the Concept Alignment or Box Ridge Road option at the intersection point and follows Box Ridge Road for approximately 300m before heading north along the edge of Weenya Road. The Concept alignment intersects two (2) landholdings as it traverses to the west of Mt Tenandra with little opportunity to minimise the severance. The detail of this refinement has not been discussed with the affected landowners but it does allow for a reduction in the intersection of properties on the Concept alignment. The refinement would be at a higher elevation than the Concept alignment and there is opportunity to create structural fill through a cutting or increase the cut to produce a structural fill balance locally.
Alignment refinement 1 and 2	Initial investigations suggest that a deep fill and cutting would be required for Alignment refinement 1 to achieve the required vertical grade (to the east of Table Top mountain) but this may be offset by the creation of significant structural material and possibly capping which would need to be accounted for in the investigation and design of the next phase of work.

7.2. Service Offering

The Preferred Corridor through this section is based on the Concept alignment corridor with the refinements as noted and is common to all options reviewed as part of this report.

The alignment that is included in the RailSys operational model for the options assessment, and is common to all runs, is the Concept Alignment to the west of Mt Tenandra and Alignment refinement 1 to the east of Table Top Mountain.

All other aspects, such as grades and curves and other technical aspects of the design are in accordance with the Service Offering.

Table 27: Lengths of the Refinement in Mt Tenandra to Baradine

	CONCEPT	ALIGNMENT REFINEMENT 1
Corridor Length (Total)(km)	311.7	
Section Length (km)	47.88	47.88
Difference (km)	0	0
Section as a % of the Total	15.36%	15.36%

Table 28: Transit Time Summary for Mt Tenandra to Baradine

	DIR'N	CONCEPT	REF'T 1	DIFF	CONCEPT	REF'T 1	DIFF
		NON-STOPPING			STOPPING		
IR Express (h:mm:ss)	North Bound	0:27:42	0:27:42	**0:00:00**	0:32:41	0:32:41	**0:00:00**
IR Express (h:mm:ss)	South Bound	0:27:42	0:27:42	**0:00:00**	0:36:21	0:36:21	**0:00:00**
Superfreighter (h:mm:ss)	North Bound	0:28:20	0:28:20	**0:00:00**	0:34:04	0:34:04	**0:00:00**
Superfreighter (h:mm:ss)	South Bound	0:27:59	0:27:59	**0:00:00**	0:38:31	0:38:31	**0:00:00**

An initial blended run time is calculated separately for the Concept and Option by averaging the sectional run time (SRT) for each of the following services/directions:

- Inland Rail Express Northbound
- Inland Rail Express Southbound
- Inland Rail Superfreighter Northbound
- Inland Rail Superfreighter Southbound

The blended average SRT for the Concept and Refinement as shown in Table 29 is then calculated with 75% of Non-Stopping SRT and 25% of the Stopping SRT. This assumes that all trains stop at every fourth loop, which is consistent with the analysis underpinning the Concept of Service Capability Report.

Table 29: Blended Run Time

	CONCEPT	ALIGNMENT REF'T 1	DIFFERENCE
Blended Run Time (h:mm:ss)	0:29:48	0:29:48	0:00:00

7.3. Costs

The estimated capital cost through this section remains the same as that estimated for the February 2017 update.

Table 30: Estimated Capital Cost Summary

	CONCEPT ALIGNMENT	ALIGNMENT REFINEMENT 1
Capital Cost (Total)[b]	s47	
Capital Cost (Section)	s47	s47
Section as a proportion of Total	13.5%	13.5%
Difference: Refinement to Concept		0
Section Difference as a %change		0%
Difference as Proportion of Total	0%	0%

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

7.4. Multi-Criteria Analysis

This section did not have an option to assess in the May 2017 MCA workshop so there are no results to discuss.

With the results of further geotechnical investigation and landholder consultation through this area generated in Phase 2 a formal MCA process will need to be undertaken to confirm the alignment of any refinements.

7.5. Community and Stakeholder

Stakeholders within this section have been vocal in their concern regarding impacts on agricultural land and productivity and the potential to make farms inoperable. Many landowners have written to elected representatives and ARTC.

This is a close-knit community with many landowners related and multi-generational farmers. Some landowners want to have group consultations and others prefer one to one consultation with ARTC. ARTC has offered and provided both.

In the recent consultation phase, it became apparent that there is a level of awareness and resignation that they will be impacted and that the work ARTC is undertaking is alignment refinement and not option identification.

Given this understanding a number of landowners are keen to work with ARTC to minimise the impact and look at refinement options such as aligning with roads, property boundaries and avoiding key infrastructure.

The feedback from the community consultation undertaken from February to April 2017 is summarised in Table 31 below.

Table 31: Summary of Community Feedback

SECTION	SUMMARY OF FEEDBACK	COMMENT
Mt Tenandra to Baradine	• Request to work together to find most suitable option and maximise farm operations	Refinement process ongoing Focus on impact minimisation – away from houses, aligning with property boundaries The lack of route certainty is creating significant stress on individuals and the community

The team has worked with the individual landholders through this area to determine the extents of the Preferred corridor which has been primarily targeted at minimising property severance by following a boundary and reviewing alignments toward the east where there are significantly better geotechnical conditions.

7.6. Discussion

- The majority of the original base case alignment traversed across poor geotechnical conditions with extensive black soil areas intersected.
- In consultation with the individual landholders it has been identified that there is opportunity for an alignment through this area that follows better geotechnical conditions and possibly generate all the formation and structural material onsite whilst minimising the impact and property severance.

7.7. Recommendation

The recommendation is made to nominate a corridor that takes into account the landholder feedback and investigation work to date as the Preferred Corridor for Mt Tenandra to Baradine as shown in Figure 15 and summarised in Table 32.

Table 32: Preferred Corridor for Mt Tenandra to Baradine

ITEM	PREFERRED
Service Offering (Blended Run Time) (h:mm:ss)	0:29:48
Total Cost Estimate[b] *(not the Differential)*	s47
MCA Score	N/A

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

This recommendation is made for the following reasons:

- There is no impact on the Service Offering or Capital Cost.
- By refining the corridor it takes into account the direct feedback from the landholder consultation to allow Phase 2 to commence from a contemporary point.
- The landholders in the area will get more certainty where the alignment will or will not go.
- The geotechnical conditions are better to the east and will provide more opportunity for capital cost savings and reduced maintenance costs.
- The hydrology and flooding issues are reduced.

The recommendation is made to take the Preferred Corridor as shown in Figure 15 through to Phase 2.

The Preferred Corridor as shown makes the following allowances:

- An investigation zone of 3km wide to take into account an option along Weenya Road.
- Reduces to 500m wide toward Tabletop Mountain.
- An investigation zone up to 3.5km wide to take into account an option to the east or west of Tabletop Mountain.
- The standard 2km wide investigation zone from Tabletop Mountain to Baradine.

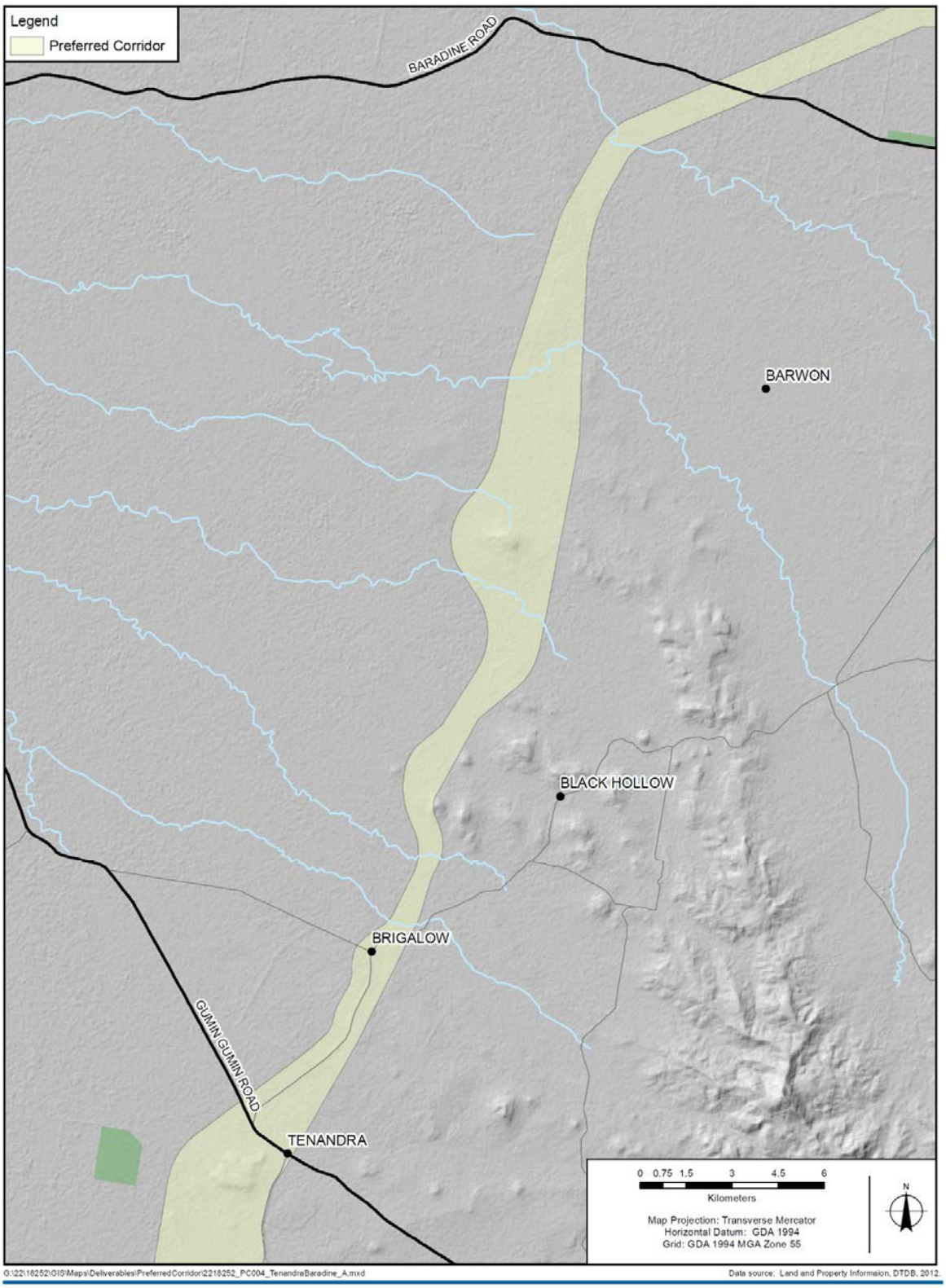


Figure 15: Preferred corridor Recommendation for Mt Tenandra to Baradine

8. BARADINE TO NARRABRI

8.1. Options

Three route options were considered between Baradine to Narrabri:

- 2016 Concept Alignment.
- Pilliga State Forest/Newell Highway **(Option D)**
- Pilliga State Forest/20 Foot Road **(Option E)**

These options are shown in Figure 16.

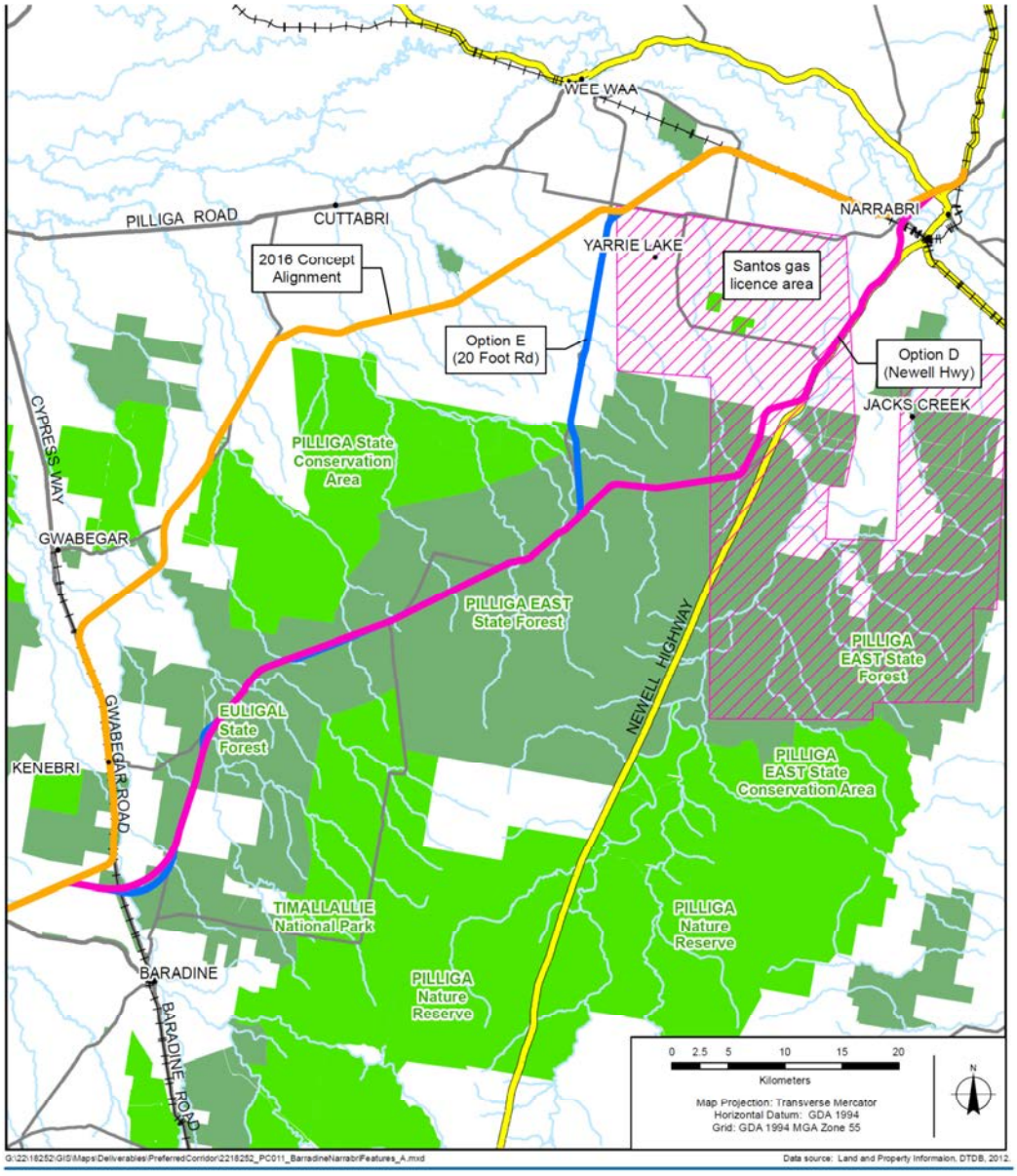


Figure 16: Corridors for Baradine to Narrabri

At the completion of the May 2017 MCA workshop it was agreed that the Pilliga/20 Foot Road option (Option E) did not offer any distinct advantage over the Pilliga/Newell Highway (Option D) and that the only option to be compared to the Concept Alignment was the latter.

This report provides an assessment of Option D against the Concept Alignment.

A general description of the options considered in this section is summarised below in Table 33.

Table 33: Summary of the Corridor options for Baradine to Narrabri

ISSUE	CONCEPT ALIGNMENT	OPTION D
Geotechnical conditions/track formation.	Poor geotechnical conditions over approximately 100 km. CBR values expected to be <3%, lack of suitable fill for construction of haul roads and rail formation. Approx. 18 km of track reconstruction along disused Gwabegar Line. Approx. 14 km of full depth track reconditioning along the Walgett Line.	Relatively good soils expected in Pilliga State forest. CBRs 3%-8%+ expected for approx. 32 km across Pilliga. Sandy textured and alluvial soils along the Newell Highway. CBR ~3%. May require blending with higher quality material for track formation
Hydrology and flooding	Potential flooding from local creeks. Crossed further downstream in the catchment, therefore flow volumes expected to be higher than options, leading to larger culvert/bridge structures.	Section through Pilliga similar to Pilliga State Forest option. Potential for flooding from Bohena Creek along Newell Highway and Long Creek.
Major Structures	Bohena Creek overbridge on Walgett Line (existing structure may be suitable).	Bohena Creek overbridge (new structure). Bohena Creek scour protection/retaining wall.
Railway operations	Initial 18 km run along disused Gwabegar Line. Interface with Walgett Line – 14 km within existing rail corridor.	Corridor crosses the CRN at Narrabri along Walgett Line via a proposed grade separation with no interconnections
Constructability	Poor ground conditions requiring imported structural fill for haul roads or high wet weather delay risks. Rail embankment with 1V:4H batters. Approx. 1 m depth of imported structural fill.	Relatively good ground conditions through Pilliga State forest. Conditions deteriorate along Newell Highway, but better than Twenty Foot Road. Good access from Newell Highway. Traffic

ISSUE	CONCEPT ALIGNMENT	OPTION D
		control required.
Property and community	74 properties within 2 km corridor. (excluding existing rail corridor).	50 properties within 2 km corridor.
Level Crossings	29 private level crossings 23 public level crossings 5 forest track crossings	17 private level crossings 9 public level crossings 28 forest track crossings
Other		Constraint at "pinch point" by proposed Santos Water Treatment Plant to be resolved.

8.2. Service Offering

Option D is 14.0 km shorter than the Concept Alignment which equates to a time saving of 6 minutes and 20 seconds to the transit time for this section. A summary of the effects of the option on the Service Offering is included in Table 34 Table 35 below.

All other aspects, such as grades and curves and other technical aspects of the design are in accordance with the Service Offering.

Table 34: Lengths of the Options in Baradine to Narrabri

	CONCEPT	OPTION D
Corridor Length (Total)(km)	311.7	
Section Length (km)	130.92	117.86
Difference (km)		-13.06
% of total	42.00%	37.81%

Table 35: Summary of Service Offering Impacts

	DIR'N	CONCEPT	OPTION D	DIFF	CONCEPT	OPTION D	DIFF
		NON-STOPPING			STOPPING		
IR Express (h:mm:ss)	North Bound	1:15:03	1:08:47	**-0:06:16**	1:28:41	1:20:44	**-0:07:35**
IR Express (h:mm:ss)	South Bound	1:15:12	1:09:41	**-0:05:31**	1:28:45	1:19:13	**-0:09:32**
Superfreighter (h:mm:ss)	North Bound	1:15:27	1:09:28	**-0:05:59**	1:32:13	1:24:57	**-0:07:16**
Superfreighter (h:mm:ss)	South Bound	1:15:52	1:11:05	**-0:04:47**	1:32:34	1:23:10	**-0:09:24**

An initial blended run time is calculated separately for the Concept and Option by averaging the sectional run time (SRT) for each of the following services/directions:

- Inland Rail Express Northbound
- Inland Rail Express Southbound
- Inland Rail Superfreighter Northbound
- Inland Rail Superfreighter Southbound

The blended average SRT for the Concept and Option as shown in Table 36 is then calculated with 75% of Non-Stopping SRT and 25% of the Stopping SRT. This assumes that all trains stop at every fourth loop, which is consistent with the analysis underpinning the Concept of Service Capability Report.

Table 36: Blended Run Time

	CONCEPT	OPTION B	DIFFERENCE
Blended Run Time (h:mm:ss)	1:19:11	1:12:49	-0:06:22

8.3. Costs

Option D is $83.4m less than the Concept Alignment which equates to a 12.1% decrease for this section. Table 37 provides a breakdown of the differences between the Concept Alignment and Option D.

Table 37: Estimated Capital Cost Summary

	CONCEPT ALIGNMENT	OPTION D
Capital Cost (Total)[b]	s47	
Capital Cost (Section)	s47	s47
Section as a proportion of Total	44.4%	39.0%
Difference: Option D to Concept		-$83,400,331
Section Difference as a % change		-12.1%
Difference as Proportion of Total		5.39%

Note:

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

The shorter length is the key driver for the reduction in the capital cost estimate but the expected savings by the route requiring less and smaller culverts and traversing better geotechnical material are also reflected in the estimate for the option.

8.4. Multi-Criteria Analysis

The assessment of Option D against the Concept in the MCA workshop resulted in a positive result of +3.18 when assessed using the IR criteria and weightings.

The split of the results by the sub-criteria is shown below in Figure 17.

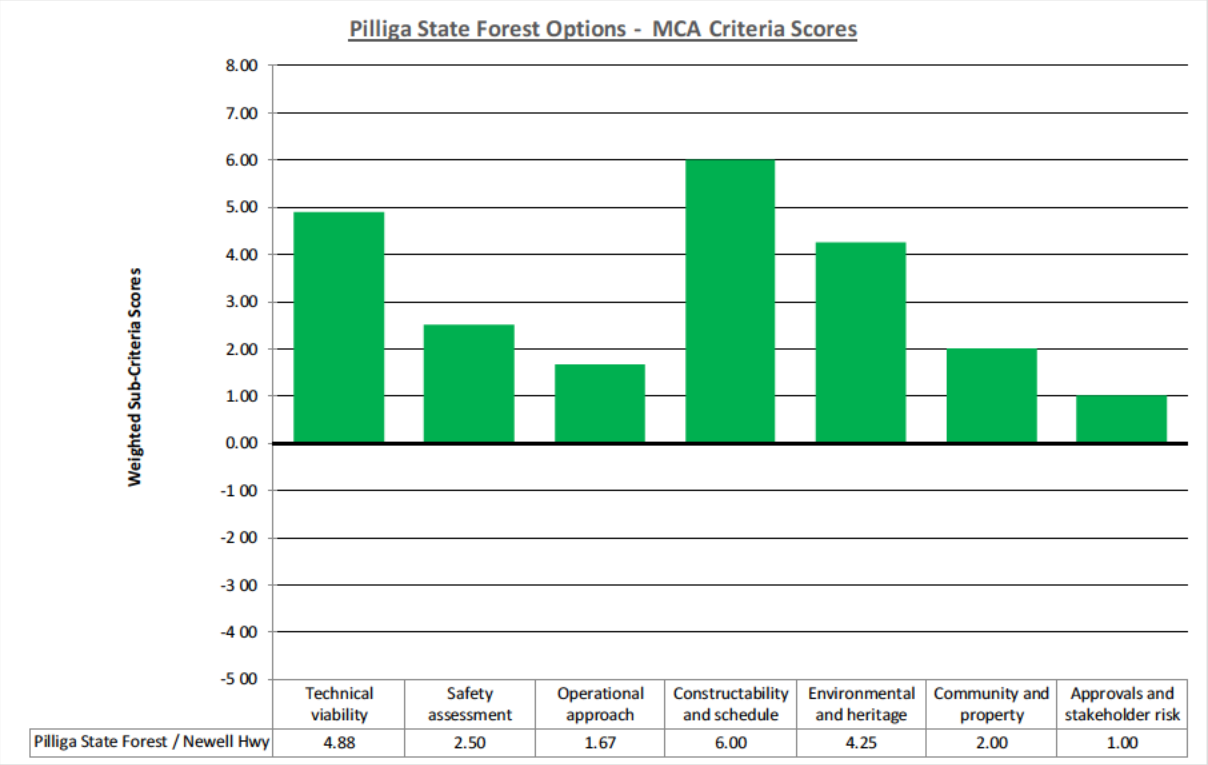


Figure 17: MCA Results for Pilliga State Forest/Newell Highway Option (Option D)

Option D ranked higher in all aspects of the weighted MCA criteria scoring.

8.5. Community and Stakeholder

From the first community consultation undertaken in early 2016, the community and stakeholders suggested that ARTC should consider traversing the Pilliga State Forest with 50% of property representatives consulted across all of the options.

This feedback has been consistent and supported by landowners, stakeholders and local groups.

Whilst there have been some conspiracy theories proposing a link between ARTC and Santos coal seam gas operations, there has been minimal opposition to this option.

The feedback from the community consultation undertaken from February to April 2017 is summarised in Table 38 below.

Table 38: Summary of Community Feedback

SECTION	SUMMARY OF FEEDBACK	COMMENT
Baradine to Narrabri	• Support for Pilliga State Forest/Newell Highway option • Need to keep away from the	Preference from the community consultation for Pilliga State Forest/Newell Highway option.

SECTION	SUMMARY OF FEEDBACK	COMMENT
	conservation areas • Consultation undertaken with property representatives as follows: - Concept Alignment 46% - Newell Hwy option 53% - Pilliga Forest Way 86% - 20 Foot Road 73%	

8.6. Discussion

- The land through the State Forest is predominantly owned by the Crown. s47B [redacted]
- The Pilliga State Forest covers an area of 164,000ha and includes approximately 33,400ha of conservation area which has cultural and environmental significance. Whilst local groups understand the location of the proposed Inland Rail alignment, many others will be fearful that there will be damage and impacts to conservation areas and valuable forest.
- The expected disturbance footprint for Option D would be 530ha or 0.32% of the area of the adjacent State Forest.
- There has been an alliance between farmers, aboriginal cultural knowledge holders and activist groups regarding the Santos coal seam gas operations within the Pilliga State Forest. ARTC needs to work with all stakeholders to ensure understanding of the proposal and location of the option.
- Option D intersects the proposed Santos Narrabri Gas Project adjacent to the Newell Highway. In discussions with Santos they have advised their preference for the rail alignment to be on the west of their proposed facility. The highway road corridor in the same vicinity narrows which reduces the ability for a rail alignment to go on the east of the proposed Santos plant footprint, within the road corridor. Discussions with Santos are ongoing in relation to the alignment and the progress of their proposed development.
- Media and activist attention on perceived impacts

8.7. Recommendation

The recommendation is made to nominate Option D as the Preferred option for Baradine to Narrabri as shown in Figure 18 and summarised in Table 39.

Table 39: Preferred Corridor Summary for Baradine to Narrabri

ITEM	PREFERRED
Service Offering (Blended Run Time) (h:mm:ss)	-0:06:22
Cost Differential	-$83,400,31
MCA Score	+3.18

This recommendation is made for the following reasons:

- There is a transit time saving
- There is a capital cost saving
- The option scored positively in the MCA
- There is support for the route in the direct and broader community and stakeholder groups.
- By avoiding the higher production land and minimising property severance the project will maintain positive community and stakeholder support for this section.
- The nominated corridor around the proposed Santos project will allow the alignment to be refined in that area with further investigations and engagement with Santos.

The recommendation is made to take the Preferred Corridor as shown in Figure 18 through to Phase 2.

The Preferred Corridor as shown makes the following allowances:

- A reduced investigation zone 600m wide along Pilliga Forest Way.
- A 4km wide investigation corridor at the proposed Santos facility to allow both parties to refine the rail alignment that area.
- A reduced width of 1km on the western side of the Newell Highway.
- An investigation zone 1.5km wide for the viaduct to the west of Narrabri.

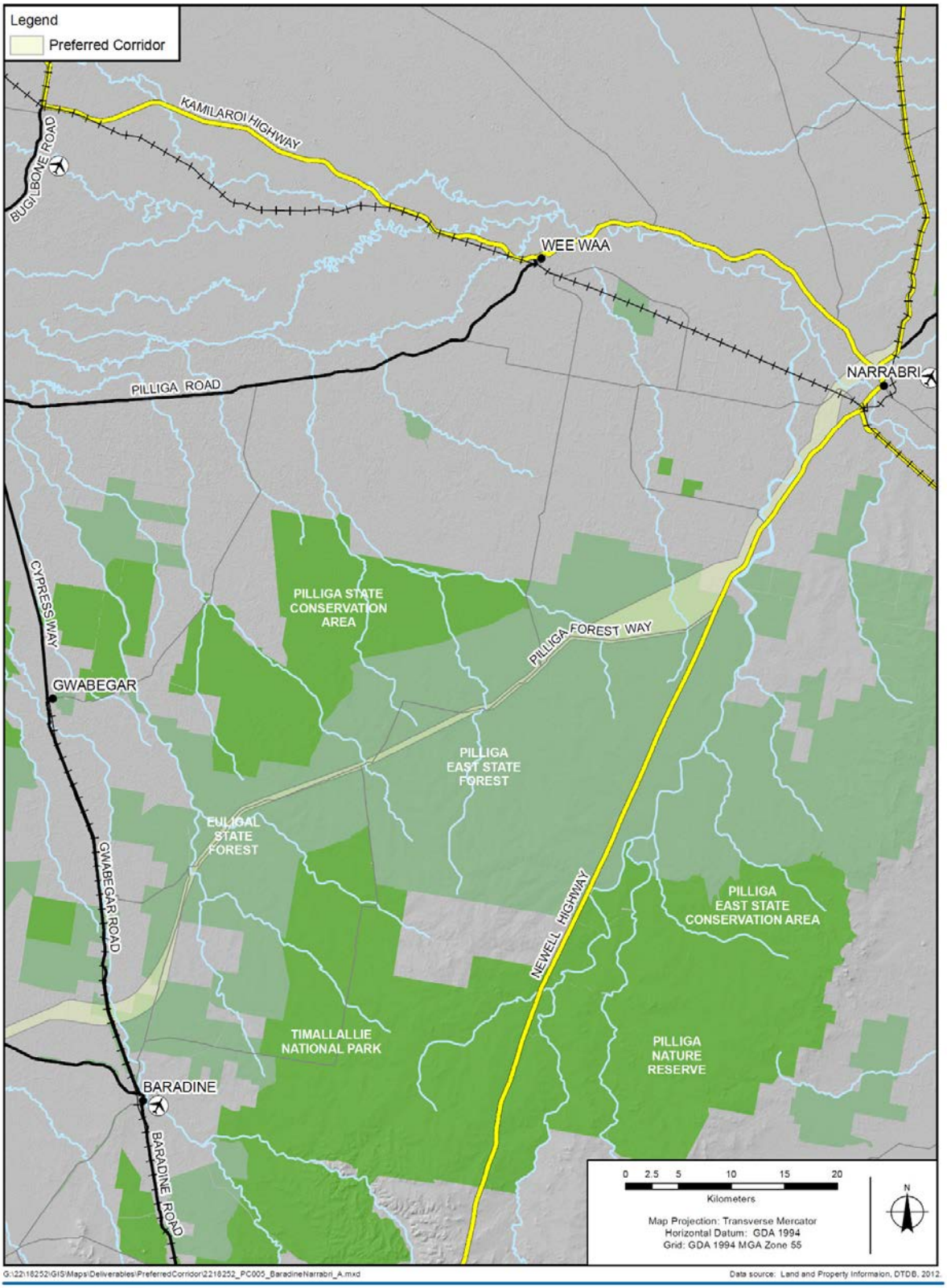


Figure 18: Preferred Corridor Recommendation for Baradine to Narrabri

9. CONCLUSION

This section provides a summary of the Preferred Corridor recommendations and a holistic assessment on the project recommendation.

The Preferred Corridor is the compilation of the recommendations made and is shown in Figure 19: Preferred Corridor Recommendation for N2N at the end of this section.

9.1. Service Offering

Table 41 and Table 43 below summarise the effect of the Preferred Corridor on the Service Offering in terms of the Blended Run Time differentials for the reference trains and scenarios.

Table 40: Total Blended Run Time Difference

N2N	CONCEPT	PREFERRED	DIFFERENCE
Transit Time (h:mm:ss)	3:10:18	3:05:40	-0:04:38

The reduction of 4 minutes and 38 second for the total run time for N2N is a decrease of 2.4%.

Table 41: Summary of Blended Run Times by Train and Direction

TRAIN	DIRECTION	TYPE	CONCEPT	PREFERRED	DIFFERENCE
Inland Rail Express (h:mm:ss)	North Bound	Non-Stopping	3:00:29	2:56:01	**-0:04:28**
Inland Rail Express (h:mm:ss)	North Bound	Stopping	3:32:55	3:26:07	**-0:06:48**
Inland Rail Express (h:mm:ss)	South Bound	Non-Stopping	2:59:37	2:55:34	**-0:04:03**
Inland Rail Express (h:mm:ss)	South Bound	Stopping	3:34:38	3:26:31	**-0:08:07**
Inland Rail	North Bound	Non-Stopping	3:02:28	2:58:57	**-0:03:31**

TRAIN	DIRECTION	TYPE	CONCEPT	PREFERRED	DIFFERENCE
Superfreighter (h:mm:ss)					
Inland Rail Superfreighter (h:mm:ss)	North Bound	Stopping	3:42:10	3:36:18	**-0:05:52**
Inland Rail Superfreighter (h:mm:ss)	South Bound	Non-Stopping	3:01:05	2:58:01	**-0:03:04**
Inland Rail Superfreighter (h:mm:ss)	South Bound	Stopping	3:44:03	3:36:08	**-0:07:55**

9.2. Capital Cost

Table 42 below provides a summary of the cost differences by element from the IR estimate system.

Table 42: Capital Cost Differences by Section of the Preferred Corridor

			Capital Cost Differences for Preferred Corridor by Section and Element					
	TOTAL N2N Feb 2017 ESTIMATE	Concept Total	Narromine to Burroway via Eumungerie Rd	Burroway to Curban via Gilmores Rd	Curban to Mt Tenandra via Box Ridge Rd	Mt Tenandra to Baradine via Black Hollow	Baradine to Narrabri Pilliga via Newell Hwy	Preferred Total Difference
Environmental & Herritage	s47, s47C							
Public Utilities								
Earthworks								
Capping								
Fencing								
Trackwork								
Loops								
Culverts								
Bridges								
Viaduct								
Grade Separation								
Crossings								
Roads and Landscaping								
Delivery Regime								
Site Establishment								
Contractor's Indirect Cost								
Design								
Client Cost								
ARTC Supplied Materials								
Camps								
Noise Mitigation								
ATMS Allowance								
TOTAL N2N	s47	s47	37,093,861	-4,257,193	0	0	-83,400,331	-50,563,663

The total is a saving of $50,563,663 against the Concept estimate updated in February 2017, which is a 3.2% reduction.

Included in the construction estimate are direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

9.3. Multi Criteria Analysis

The results of the MCA for the Preferred Corridors are summarised in Table 43 below.

Table 43: Summary of MCA results by criteria for the sections of the Preferred Corridor

ASSESSMENT CRITERIA	WEIGHTING	EUMUNGERIE ROAD (OPTION A)	GILMOURS ROAD ALTERNATE (OPTION B)	CURBAN TO BARADINE CONCEPT ALIGNMENT	PILLIGA/NEWELL HIGHWAY (OPTION D)
Technical viability	**17.5%**	+3.50	+1.75	0.00	+4.88
Safety assessment of the proposed alignment	**17.5%**	+1.50	0.00	0.00	+2.50
Operational approach	**15.0%**	-1.67	0.00	0.00	+1.67
Constructability and schedule	**12.5%**	+5.75	+1.00	0.00	+6.00
Environmental and heritage impacts	**12.5%**	+0.25	+1.00	0.00	+4.25
Community and property impacts	**12.5%**	-4.00	-1.00	0.00	+2.00
Approvals and stakeholder risk	**12.5%**	-2.00	0.00	0.00	+1.00

For the purposes of comparison in total the individual scores were averaged and summed to produce the results in Table 44.

Table 44: Total MCA Scores for Preferred Corridor

ASSESSMENT CRITERIA	WEIGHTING	AVERAGE SCORE[C]
Technical viability	17.5%	+0.44
Safety assessment of the proposed alignment	15.0%	+0.18
Operational approach	17.5%	0.00
Constructability and schedule	12.5%	+0.40
Technical Subtotal	**62.5%**	**+1.02**
Environmental and heritage impacts	12.5%	+0.17
Community and property impacts	12.5%	-0.09
Approvals and stakeholder risk	12.5%	-0.03
Non-Technical Subtotal	**37.5**	**+0.05**
Total	**100%**	**+1.06**

9.4. Community and Stakeholder

From the community and landowner consultation undertaken the community concerns and impacts are similar on all options. The community feedback provided the following feedback for the greenfield sections:

- Overall the project is supported and the rationale behind the route selection process is understood;
- Aim to minimise property severance by following property boundaries;
- Avoid houses and groups of houses;
- Avoid higher production areas of land;
- Be aware that some properties operate across roads and boundaries which can result in operational severance;
- Areas of new small lifestyle acreages will be impacted greater than the larger properties by a rail line;
- They are seeking visibility about the decision-making process;

- The use of existing rail lines is preferred but noting following a road may result in operational severance.

There are close-knit communities with related landowners and multi-generational farmers along the route. Some landowners want to have group consultations and other prefer one to one consultation with ARTC. ARTC has offered and provided both.

9.5. Discussion

- The community and stakeholder engagement to date has provided a sound basis to gauge community sentiment and feedback. Some of the feedback in terms of flooding, geotechnical and property and operational severance has been incorporated into the options and decision-making process.
- Endorsing the recommendation for a Preferred Corridor will allow the project team to revert to the community and commence further engagement with the affected landholders and the landholders now unaffected can be advised. The project team can work with the directly and indirectly affected landholders to further refine the corridor down to an alignment. The decision will allow all parties to progress with a definite path
- Where there is insufficient information to support a decision for a distinct or narrowed corridor the recommendation is made to progress with wider investigation areas, such as:
    - South of Narromine to avoid flooding issues at the Backwater Cowal and determine a crossing point of the highway, rail line and river;
    - Along Gilmours Road to continue with the community engagement and technical field work to support a refinement to a single alignment;
    - The crossing at Curban of the Coonamble line;
    - At Mt Tenandra and Tabletop Mountain to allow the investigation to continue to review an eastern or western alignment around the mountains
    - A detailed assessment of where the alignment passes the proposed Santos gas plant at Narrabri; and
    - The viaduct structure to the west of Narrabri to connect to Narrabri to North Star.
- Generally, the land is privately owned.
- The areas where the Preferred Corridor follows roads will need further engagement with the road authority and/or the road owner. The aim would be outside of the road corridor to avoid any environmental aspects within the road corridor but share a boundary with the neighbouring property to minimise severance. It is not expected that this process will result in schedule delays.
- s47B [redacted]
- The northern section traverses a State Forest which is generally owned by the Crown. s47B [redacted]

9.6. Conclusion

The Preferred Corridor that is recommended in this report takes into account the technical work completed to date as well as consideration of the consultation with the community and stakeholders.

Providing clarity on the corridor will allow the project team to commence further field and investigation work and consultation with the affected landholders to refine the corridor to an alignment.

The overall summary of the assessed elements for the Preferred Corridor in accordance with the Route Refinement Process is presented in Table 45 below and shown below in Figure 19.

Table 45: Summary of Preferred Corridor Route Refinement Elements

ELEMENT	CONCEPT	PREFERRED	DIFFERENCE
Service Offering			
Corridor Length (km)[a]	311.72	299.92	**-11.80**
Transit Time (h:mm:ss)[d]	3:10:18	3:05:40	**-0:04:38**
Capital cost estimate			
Construction Cost ($,000)[b]	s47	s47	**-50,564**
Multi Criteria Analysis			
MCA Overall[c]	0	1.01	**+1.06**
MCA (Technical)[c]	0	0.83	**+1.02**
MCA (Non-Technical)[c]	0	0.18	**+0.05**

Notes:

a – allows for a 4.84km overlap with P2N for comparison purposes

b - Included in the construction estimate: direct job costs, construction overheads, clients supply, property costs and an allowance for an overlap with P2N for comparison purposes. The estimate does not include contingency or escalation.

c – the average of the weighted MCA scores for the individual option

d – arithmetic average of the eight (8) cases modelled

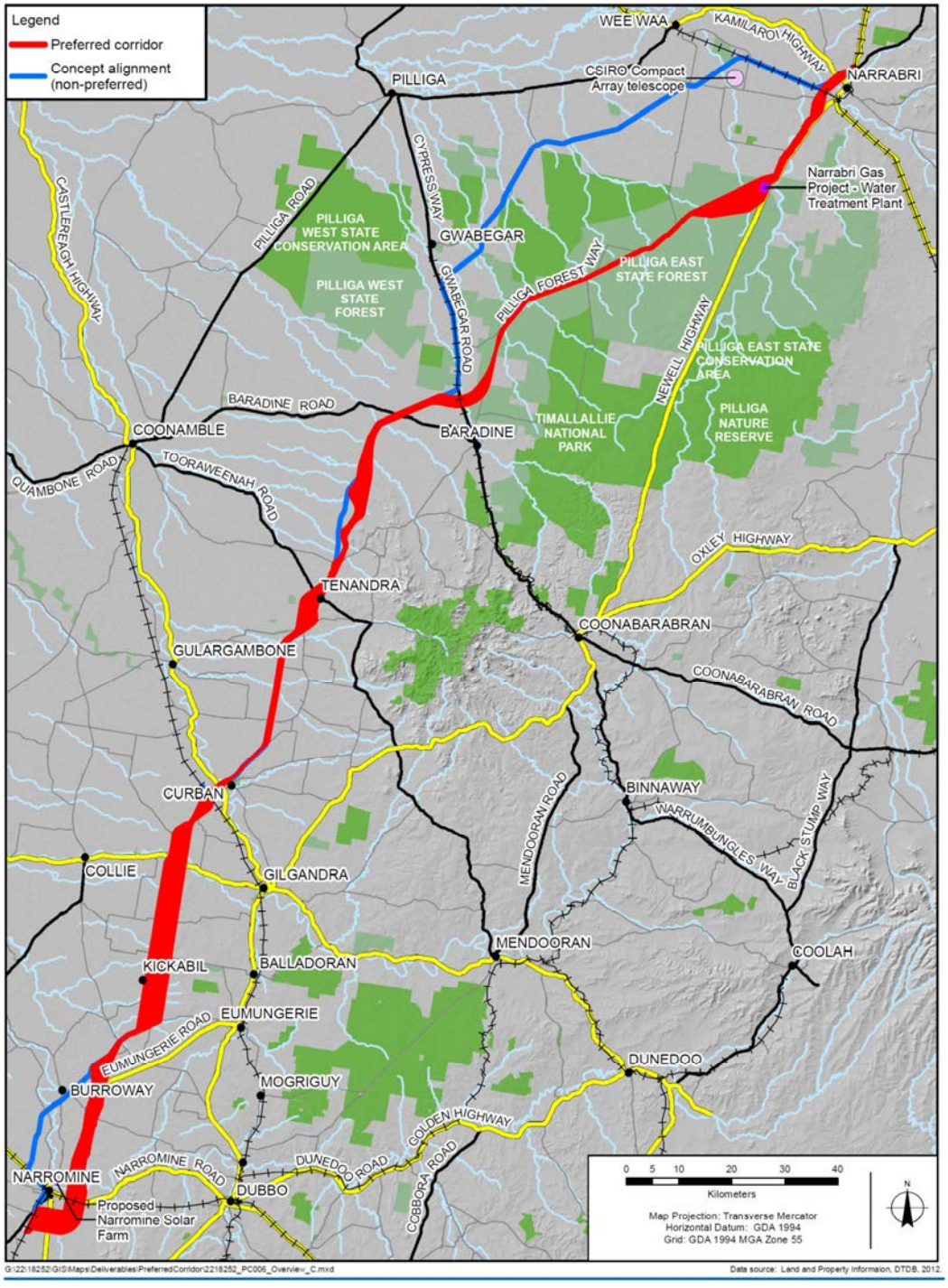
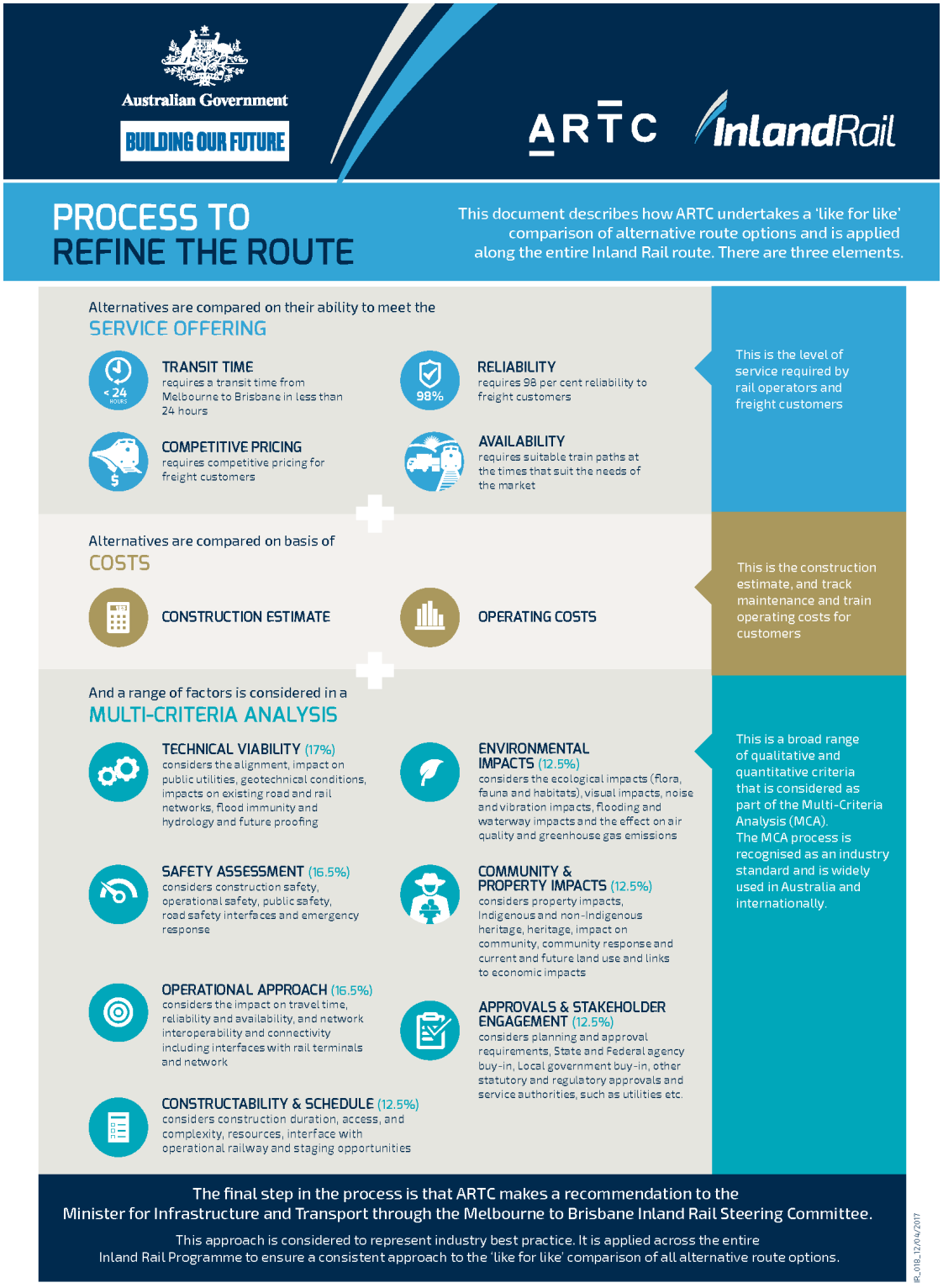


Figure 19: Preferred Corridor Recommendation for N2N

10. APPENDIX A – INLAND RAIL ROUTE REFINEMENT PROCESS



11. APPENDIX B – TRAVEL TIME ASSESSMENT OF MODELLED OPTIONS

12. APPENDIX C – ESTIMATE DIFFERENCES SUMMARY BY SECTION

			Capital Cost Differences for Preferred Corridor by Section and Element					
	TOTAL N2N Feb 2017 ESTIMATE	Concept Total incl P2N overlap	Narromine to Burroway via Eumungerie Rd	Burroway to Curban via Gilmores Rd	Curban to Mt Tenandra via Box Ridge Rd	Mt Tenandra to Baradine via Black Hollow	Baradine to Narrabri Pilliga via Newell Hwy	Preferred Total Difference
Environmental & Herritage	s47, s47C							
Public Utilities								
Earthworks								
Capping								
Fencing								
Trackwork								
Loops								
Culverts								
Bridges								
Viaduct								
Grade Separation								
Crossings								
Roads and Landscaping								
Delivery Regime								
Site Establishment								
Contractor's Indirect Cost								
Design								
Client Cost								
ARTC Supplied Materials								
Camps								
Noise Mitigation								
ATMS Allowance								
TOTAL N2N	s47	s47	37,093,861	-4,257,193	0	0	-83,400,331	-50,563,663

13. APPENDIX D – GHD MCA WORKSHOP REPORT (REV 1) MAY 2017

14. APPENDIX E – GHD MCA WORKSHOP REPORT DECEMBER 2016