

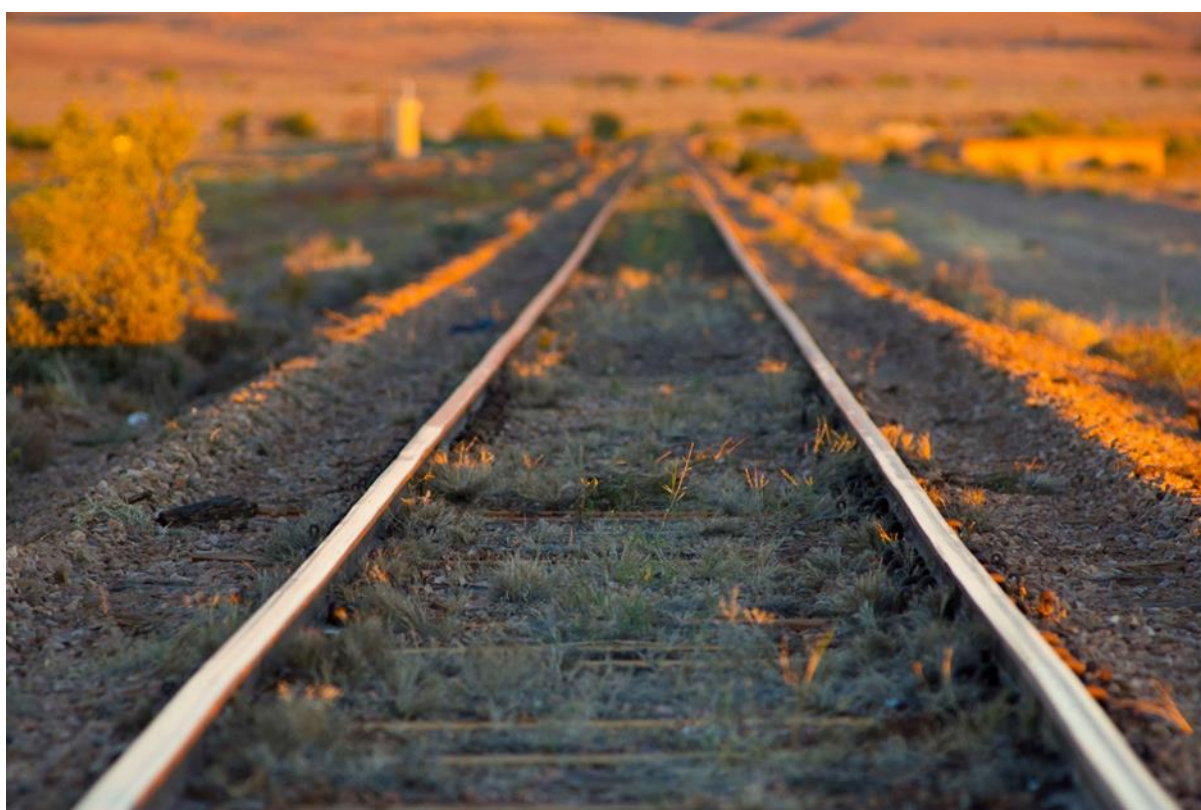
Northern Rail Bypass

Scoping Study

Regional Development Australia Adelaide Hills, Fleurieu and Kangaroo Island



August 2018



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Foreword

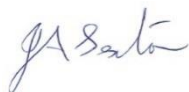
The Adelaide Hills and surrounding districts is one of the most dynamic regions in South Australia. It contains 4 growth communities, with Mount Barker District Council in the region's centre expecting to double in size over the next 20 years. This peri-urban area of Adelaide is not only a very beautiful region, it is rich in agriculture, tourism and general economic activity. It is linked to Adelaide by the South-Eastern freeway.

The capacity of this Freeway at times struggles with the increased freight volumes and community travel. The existing Adelaide to Melbourne rail corridor has changed little in the hills since its introduction in the 1800s. It is clear that if we are to meet the economic and social challenges facing us, the existing rail corridor and its use must be re-evaluated. One option what is known as the Northern Rail Bypass, is to re-route the freight rail corridor, to allow the existing corridor to be used for commuter passenger travel.

The study highlights the economic and social benefits of this potential Northern Rail Bypass initiative. We know that efficient infrastructure is essential for driving sustainable economic development. We also know that the continued use of the existing rail line is inefficient and a poor use of resources.

We are also concerned that the existing route is unattractive to east coast freighters sending freight to South Australia and beyond. There is already talk of Melbourne freight forwarders utilising the under construction inland railway, which will allow them to bypass Adelaide altogether via Parkes. This would have severe economic impacts on the Adelaide region.

Our study aligns with South Australian Government's GlobeLink proposal, which promotes the modernisation of the railway transport network for expected growth in national land freight. This new corridor will have a central role in interstate freight movements by addressing the existing limitations. It will reduce congestion and open up new opportunities.



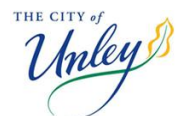
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An Australian Government Initiative



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**Government of
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Executive Summary

Background

The subject of a rail freight bypass of the Adelaide Hills has been debated since the early 2000's. Noise, height clearance and grade issues are but a few of the shortcomings of the existing rail corridor, yet the many investigations to date fail to return a strong business case.

The most recent and significant investigation is the 2010 Adelaide Rail Freight Movement Study (2010 RFMS), commissioned by the Australian Government. This study forecast a time by which the existing rail line would reach capacity, and identified and assessed options to meet future rail demand. A subsequent, separate study was initiated to revisit the findings of the RFMS from an economic perspective and highlight any areas of concern that may require further investigation. While extensive the 2010 RFMS left some key questions unanswered, including:

- Consideration of the growing population in the Adelaide Hills and at Murray Bridge
- Wider social and environmental consequences of the existing system
- The potential impact of a new corridor on the eastern states' freight strategy
- The existing and growing constraints from commuter traffic to the east of the city
- The potential of establishing freight transport hubs to the north of the city
- Increasing project costs over time
- The ability or otherwise to achieve double stacking of freight containers
- Potential opportunities for the existing rail corridor; perhaps passenger movement?
- The impacts/consequences if a new rail line is not considered feasible, and
- The potential for a possible future Emissions Trading Scheme applied to the transport sector and the resultant change in competitiveness of rail over road transport.

Since 2010, there have been many changes to both the national rail freight network as well as the Adelaide Hills section. Inland Rail is now under construction and due for completion in 2025 and a new freight terminal is planned for the Melbourne end (Dymally). Once operational, double stacked trains can travel (via Parkes) between Melbourne and Perth. The Adelaide to Melbourne rail line has been upgraded to cater for 1800m long trains, providing a 20% increase in capacity; grade separation has also occurred at 2 key locations on the existing line. The Adelaide to Melbourne rail line however, cannot cater for double stacked trains; unloading and restacking of trains continues to be common practice at a cost of both labour and time. Significant infrastructure upgrade is required to enable double stacking to occur, including a new rail bridge across the River Murray and tunnelling through the Adelaide Hills.

Concurrently, the use of larger road freight vehicles and competition by the Port of Adelaide has reduced the movement of gross freight tonnages on rail between Adelaide and Melbourne. Intermodal facilities are being planned at both Monarto and Tailem Bend, while closure of rail spur lines in the Mallee region has affected bulk grain transport patterns. Global market conditions for ore and minerals continue to fluctuate and when favourable, may significantly impact the rail freight task.

In addition, the state's road network is under increasing pressure to cater for larger and longer freight carrying vehicles. Residential growth is booming in Mount Barker District Council and increasing traffic volumes on the South Eastern Freeway, including significant freight activity, will drive the need for freeway upgrades sooner than currently planned.

The new State Government has a forward thinking transport policy for freight on its agenda, known as GlobeLink. This is consistent with the concept for the Northern Rail Bypass and is a strategic policy, recognising that

“...A generational upgrade of our freight transport infrastructure is required to provide our companies with the competitive advantage they need to get our premium quality South Australian products to markets across the globe...”

It has now been 8 years since the 2010 RFMS was prepared. According to rail freight forecasts in the RFMS, the rail line should now be 50% closer to capacity. With so many changes and the passage of time, re-examination of the need or otherwise for the Northern Rail Bypass is timely.

The Project

The South Australian RDA's whole of state regional collaboration nominated the Realignment of the Adelaide Hills Rail Corridor as the second highest priority infrastructure for the state's economic prosperity. This Scoping Study has enabled the opportunity to review and confirm (or otherwise) this priority from a more informed perspective.

Focus has been given to the Northern Bypass (south) via Truro only, as indicated in the 2010 RFMS report (Option 3) and rail only has been considered, i.e. no road. It is worth noting that both the 2010 study and this project are considering a Single Track with passing loops; NOT a dual track.

This Scoping Study reflects today's context, current stakeholder wisdom and opinions, costs and economic considerations. In addition, the study has more fully addressed those items left unexplored from the previous investigations, through extensive data and literature review, research, stakeholder liaison, engineering analysis and economic review. These items include:

- The economic impact of social benefits of the Northern Rail Bypass
- Testing of the Option 3 alignment to ensure up and down grades do not exceed +/- 1%
- Costing of the bypass option to reduce land acquisition issues
- Assessment of what is required for double stacking to be achieved
- Review of the 2010 RFMS cost estimate, and
- More detailed assessment of the economic benefit of the project, and the economic impact on Adelaide of the Inland Rail project and a possible link between Mildura and Menindee.

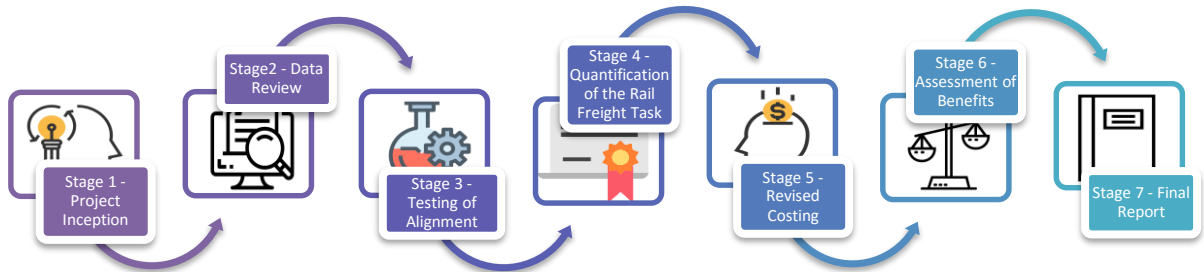
This Scoping Study provides a formal, targeted update and extension to the 2010 RFMS. In addition, this study will inform a second stage subsequent comprehensive Cost Benefit Analysis (CBA).

Scoping Study Participants

As potentially one of South Australia's most significant changes to the rail freight network, the development and assessment of the Scoping Study has included consultation with customers, rail operators, users, local government and government agencies, and other identified stakeholders.

Approach

Key stages of the Scoping Study have comprised:



Data Review (refer Sections 2, 3 and 4) has canvassed existing literature, reports and current data sets pertaining to freight movement, ranging from national initiatives and strategic directions through to detailed rail freight volumes. Further, this considers the characteristics and context of both the national rail freight network and the Adelaide Hills section.

Testing of the Alignment (refer Section 6) has comprised a detailed review of the proposed Northern Rail Bypass route, including refinement to ensure minimum horizontal curves and vertical gradients can be achieved. Preliminary consideration has also been given to the need to minimise land acquisition and overall cost in terms of bridge structures, tunnelling and the like.

Quantification of the Rail Freight Task (refer Sections 4 and 5) provides key insight into the past, present and future role of rail freight on the Adelaide Hills line and commentary on the impacts/opportunities of a new alignment. Significant changes since the 2010 RFMS have been identified, including to the national rail freight network and in particular the Adelaide Hills section. The current freight task and likely future demand for rail on this section of the rail corridor and beyond have been explored, including identification of key influencing factors.

The refined alignment has been costed for both the Northern Rail Bypass (refer Section 7), as well as the broad cost of upgrading the existing Adelaide Hills section to accommodate double stacking. This costing has been based on current rail construction costs, including those used by ARTC for Inland Rail.

A more detailed set of social and economic considerations for the Northern Rail Bypass has been prepared, refining and extending the benefits identified in the 2010 RFMS (refer Section 8). Discussion has also been provided regarding potential implication should no rail bypass be created (refer Section 9).

The findings have been concluded with advice regarding further work that will be required to advance the Northern Rail Bypass investigations and to prepare a corresponding Business Case in accordance with the requirements of Infrastructure Australia.



Key Findings

Key outcomes and findings of the Scoping Study include:

1. Costs continue to be more competitive for road freight rather than rail when moving goods between Adelaide and Melbourne.
2. Changes to the Adelaide Hills Rail Alignment since 2010 have enabled a 20% increase in the carrying capacity of the existing rail line. This indicates that today, the rail line has a maximum capacity in the order of 12.8M tonnes.
3. In 2015-16, statistical data indicates that 8.11M gross tonnes was carried over this section of line, indicating the spare capacity of the line is in the order of 37%.
4. Rail freight costs and increased competition by the Port of Adelaide have largely contributed to a reduction in rail volumes traveling between Adelaide and Melbourne.
5. A windy, steep alignment continues to prevent the Adelaide Hills rail line from catering for double stacked trains, although double stacking could achieve in the order of 25% savings for rail customers, and significant time savings for the movement of goods. Double stacking will require significant infrastructure works to be undertaken to achieve vertical clearances, including tunnels and a new rail bridge over the River Murray.
6. Population growth through the Adelaide Hills has occurred at a greater rate than expected, particularly through the Mount Barker District Council region.
7. Accelerated population growth and a greater desire for the road freight task will see the South Eastern Freeway reach its capacity sooner than expected.
8. Significant changes are both planned and currently under construction for the National Rail Freight network (i.e. Inland Rail and a new rail freight terminal in Melbourne) which have the ability to fundamentally change the movement of rail freight through South Australia, and the role of the Adelaide to Melbourne link in the national rail freight network. These changes are expected to be complete and in operation by 2025 and will potentially enable double stacked rail freight to move between Perth and Melbourne without passing through (or near) Adelaide, with Parkes likely to become the geographic centre of national rail freight activities. Less freight rail services will potentially stop near or in the vicinity of Adelaide, reducing the modal choice for freight movement. There is a very real possibility that South Australia and Adelaide in particular may be 'forgotten' in the national rail picture.
9. The original cost benefit analysis of the rail freight diversion in the 2010 RFMS is now outdated. Costs have escalated, and the analysis does not address some significant economic benefits. While only providing an estimation of the broad value of these benefits, they have been found to potentially be quite large, notwithstanding the application of conservative assumptions wherever possible. Non-quantifiable benefits are still to be fully analysed. Further, the base case in the 2010 RFMS assumed a 'Do Nothing' scenario; this is considered unrealistic and a 'Do Minimum' scenario should be used for more appropriate comparison.
10. The estimated cost of the Northern Rail Bypass has been calculated between \$3.84 and \$4.96 billion.

Northern Rail Bypass – Cost Summary

Component	Cost (\$m)
Rail Track	214
Earthworks	1309.45 - 1489.27
Tunnels, Level Crossings, Bridges, Viaducts, Murray Bridge Works	1480.77-2232.77
Land Acquisition	76.27
Services/Signalling	120.15
Sub Total	3200.61-4132.43
20% Contingency	640.12 - 826.49
Total	3840.73 - 4958.91

Benefits identified to date total \$2.67 billion.

Northern Rail Bypass – Summary of Benefits

Benefit	Value (\$m)
Urban consolidation	71.4
Productivity improvements	135.7
South East freeway savings	60.4
Amenity improvements	431.0
Time savings at level crossings	518
Double stacking benefit	1460
Improved equity of access to job and service opportunities	
Creation of metro public transport options	
Unknown connection to burgeoning defence industry	
Improved connectivity and function of the national rail freight network	
Total	2676.5++

++ Yet to be fully quantified

While further benefits have now been quantified, more detailed analysis should be conducted as part of a full updated cost benefit analysis of the Northern Rail Bypass. This analysis should also address some of the non-quantifiable benefits identified in this report, including improved equity of access to job and service opportunities, creation of metro public transport options, and the wider strategic impact of improvements to the national rail freight network.

This will be required to complete a robust business case in accordance with the requirements of Infrastructure Australia.

Impact of Doing Nothing

Importantly, this scoping study also addresses the effect of no rail bypass. This section of the rail network and indeed the overall Adelaide to Melbourne rail link could potentially be superseded by Inland Rail, but at what expense to the state?

At worst, the risk of not creating the Northern Rail Bypass is that Adelaide and wider South Australia becomes forgotten or is at best seen as an 'add on' to the national rail freight network; superseded by Inland Rail, intermodal facilities at Parkes, and the east-west rail corridor. Most concerning, it sends a message to current and future investors both locally and globally that South Australia is seemingly 'less connected' than other states and less committed to best positioning ourselves for positive long-term growth.

At this level of investigation, the value of 'lost opportunity' is yet to be quantified, but weighs heavily on the overall economic value of our future rail links.

This too, will require further work as part of a holistic economic assessment.

Summary – Where to from Here?

From a 'big picture' perspective, the state's road and rail assets require optimisation to best cater for the movement of both goods and people. The rail link between Adelaide and Melbourne is a key infrastructure investment, utilised for freight and passenger transport. Current changes to rail freight movement at a national level however may adversely influence the use of this asset. Further, modal choice becomes even less competitive with a road dominated transport network for freight across the state.

While the cost of the Northern Rail Bypass has increased, benefits have also increased significantly and still do not reflect the full extent of positive outcomes to be achieved as part of such an infrastructure investment.

More detailed investigations are required to properly quantify a revised Cost Benefit Analysis for the project, and to complete a robust Business Case in accordance with the requirements of Infrastructure Australia.

These investigations should include:

1. More detailed costing for the project, on a more refined alignment based upon engineering survey
2. More detailed economic assessment of the 'Do Minimum', 'Achieve Double Stacking' (as outlined in the 2010 RFMS and which arguably, should be the Base Case) and 'Northern Rail Bypass' options for the rail freight route, including:
 - Refined assumptions, based upon more project specific data
 - Consideration given to whether the current rail line should be upgraded to cater for the freight task alone (i.e. double stacking), or conversely, to investigate the value of dual rail use of a new corridor
 - Identification of an appropriate 'value' of traditionally non-quantifiable benefits, including improved access to job and service opportunities, creation of metro transport options, minimising major delays to commuters and emergency services, and the 'lost opportunities' when compared to the national rail freight network.
3. Further liaison with key stakeholders as required, to assist in refining the alignment. In particular, consultation will need to be conducted with Councils to the north-east of Adelaide, in the vicinity of the proposed alignment.
4. Further engagement with the State Government to explore the characteristics and objectives of the Northern Rail Bypass and its role as part of GlobeLink, and
5. Preparation of a submission to Infrastructure Australia for this project, in accordance with the relevant requirements and checklists.

The State is considered to be in a key period regarding security of its future economic position and role in the national rail freight network. Actions must occur quickly, to quantify the real Cost Benefit Analysis of the overall Northern Rail Bypass.



1 Introduction

1.1 Background

The 1887 linking of the South Australian main rail line to the Victorian rail system created the first single gauge inter-colonial rail link in Australia. Today, the rail line forms part of the wide-reaching interstate freight rail corridor connecting Sydney, Melbourne (and to a lesser degree, Brisbane) with Adelaide, Perth and Darwin.

The terrain through the Adelaide Hills section of the corridor (between Murray Bridge and Islington) however restricts travel speeds, requires greater locomotive power and incurs increased maintenance costs to meet the higher levels of wear and tear compared to other rail freight lines in Australia. Increasing residential development in the vicinity of the rail corridor over time has also brought the alignment under scrutiny, due to complaints about the noise generated by train movements. The demand for rail freight movement continues as an important and complementary alternative to road transport, and there will be a time at which the line will reach the limit of its capacity. Further, rail offers significant environmental and economy of scale benefits when compared to the road network.

In 2010 the Adelaide Rail Freight Movement Study (RFMS) was commissioned by the Australian Government to identify and assess options to meet future rail freight demand in light of the above issues. These investigations sought to quantify the time at which the rail line would reach capacity, and future options included realignment of the rail corridor. While extensive, the report left some key questions unanswered, including (but not limited to):

- Consideration of the growing population in the Adelaide Hills and at Murray Bridge
- Wider social and environmental consequences of the existing system
- The potential impact of a new corridor on the eastern states' freight strategy
- The existing and growing constraints from commuter traffic to the east of the city
- The potential of establishing freight transport hubs to the north of the city, and
- Increasing project costs over time.



Other considerations left unexplored included:

- The ability or otherwise to achieve double stacking of freight containers
- Potential opportunities for the existing rail corridor; perhaps passenger movement?
- The impacts/consequences if a new rail alignment is not considered feasible
- The potential for a possible future Emissions Trading Scheme applied to the transport sector and the resultant change in competitiveness of rail over road transport, and
- Population projections for both Melbourne and Adelaide.

An independent review of the RFMS report prepared by SGS Economics in 2010 raised many of the above comments and related questions.

It has now been 8 years since the RFMS was prepared. According to rail freight forecasts in the RFMS, the rail line should now be 50% closer to capacity.

The Federal Government has recently committed to \$20B in funding for key national rail projects including Inland Rail, and there is Victorian interest in a potential standard gauge rail link between Mildura and Menindee. These links however, have the potential to leave South Australia 'forgotten' for national rail freight connectivity.

In addition, the Ministerial DPAs for both Mount Barker District Council and Murray Bridge rely on a significant employment node occurring at Monarto to provide employment for residents in these growth areas. Mount Barker District Council in particular is growing rapidly as land sales continue to gain momentum.

Changing production and packaging practices, increasing production volumes and the value of the Australian dollar also all affect the demand for rail freight. Given the changes that have occurred over the past 7 years, a review and update of the 2010 RFMS is timely.

Further, a key policy of the recently elected State Liberal Government is the GlobeLink plan, designed to "...provide a new road, rail and air freight corridor, bypassing existing road and rail corridors through the suburbs and around the Adelaide Hills. The corridor will avoid the heavily populated areas of the existing freight routes, and will take freight directly to Port Adelaide..."

The GlobeLink plan is consistent with the concept for the Northern Rail Bypass and is a strategic policy, recognising that "...A generational upgrade of our freight export infrastructure is required to provide our companies with the competitive advantage they need to get our premium quality South Australian products to markets across the globe...". In 2017, Regional Development Australia Adelaide Hills, Fleurieu and Kangaroo Island appointed Tonkin Consulting to undertake a Scoping Study for this section of rail corridor.

Focus has been given to the Northern Bypass (south) via Truro only, as indicated in the RFMS report (Option 3) and Rail only has been costed; i.e. no road. It is worth noting that both the 2010 study and this commission are considering a Single Track with passing loops; NOT a dual track.

1.2 Scoping Study Objective and Key Issues

The RFMS concluded that a proposed realignment of the rail corridor to bypass residential areas (amongst other benefits) was not financially viable. A subsequent, separate study was initiated to revisit the findings of the RFMS and highlight any areas of concern that may require further investigation.

The South Australian RDA's whole of state regional collaboration nominated the Realignment of the Adelaide Hills Rail Corridor as the second highest priority infrastructure for the state's economic prosperity. This Scoping Study will provide an opportunity to review and confirm (or otherwise) this priority from a more informed perspective.

In addition, the Scoping Study will inform a second stage subsequent comprehensive Cost Benefit Analysis (CBA). The Scoping Study will form an update to the RFMS Report, but with targeted focus on key elements as outlined below.

Key issues to be explored and extended in analysis will include the following:

- Economic impact of social benefits – these will be explored in more detail in general, consistent with the Infrastructure Australia methodology. In particular, the potential for the existing Hills Corridor to be used for public transport will be assessed.
- Testing of Option 3 – Northern Bypass (south) via Truro to ensure up and down grades do not exceed 1%.
- Costing of the bypass option (Option 3) to reduce land acquisition issues. This will assume a direct route from Murray Bridge to Truro, this possibly following the existing old rail corridor to Millendella, then Greenfields to Truro and beyond (via 2010 RFMS assessment route). A triangular connection will be assumed to link Monarto using the existing rail corridor from Murray Bridge to Monarto and then the old rail corridor from Monarto back to the proposed new route.
- Assessment of what is required for double stacking to be achieved; particularly the implications of the cutting in Murray Bridge (immediately west of the River Murray rail bridge) under the Old Princes Highway. It should be noted however that double stacking of trains will require additional works to be undertaken at the Melbourne end, at considerable cost.
- Review of the previous cost estimate in reference to the double track elements in the 2010 RFMS.
- More detailed assessment of the economic benefit of the east-west freight movement overall, and the economic impact on Adelaide in the event that a Mildura or Eastern Inland Bypass is constructed.

1.3 Scoping Study Approach

Tonkin Consulting's approach to the Scoping Study investigations has focused on providing Regional Development Australia with the confidence to determine the real need or otherwise for a realigned freight corridor. Should the findings be favourable, this report will provide a valuable base for development of a more detailed investigation and business case.

The key stages of the Scoping Study are as follows:

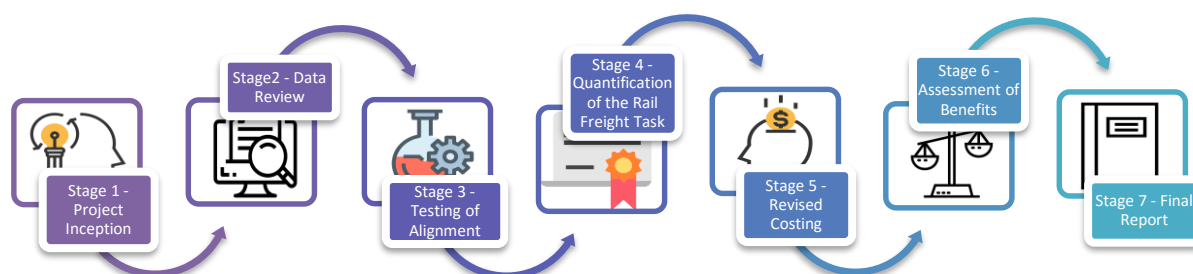


Figure 1.1 Key Project Stages

Appendix A includes a copy of the Methodology Flow Chart for the Scoping Study; indicating Key Tasks, Outputs, Consultation Tasks and Timelines for each of the Key Stages.

1.4 Scoping Study Participants

As potentially one of South Australia's most significant changes to the rail freight network, the development and assessment of such a proposal requires consultation with customers, rail operators, users and other key stakeholders.

Figure 1.2 illustrates stakeholders and team members involved in the Scoping Study. Further details of the information gathering and consultation process are described in Section 4.3 of the report.

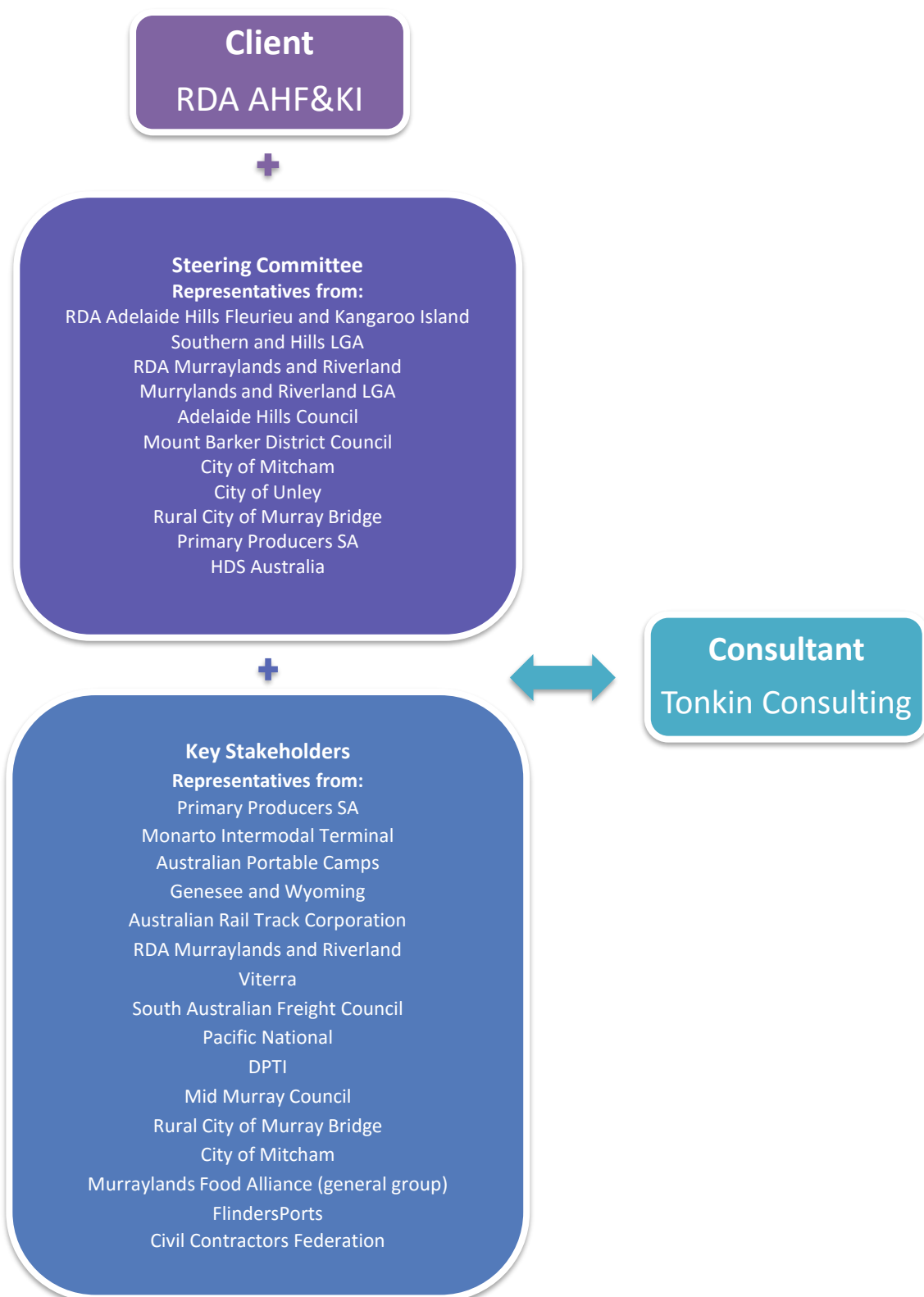


Figure 1.2 Northern Rail Bypass Scoping Study Contributors

1.5 Structure of the Scoping Study Report

This report has been set out in a series of comprehensive, yet easy to read sections as follows:

Section 2 comprises a review of existing literature and reports.

Section 3 considers context and current characteristics of both the national rail freight network and the Adelaide Hills section.

Section 4 identifies the significant changes in the national rail network and in particular, the Adelaide Hills line since the RFMS was completed. In addition, this section presents key insight into the past, present and future role and function of rail freight on the Adelaide Hills line and commentary on the impacts/ opportunities of a new alignment.

Section 5 discusses both the current freight task and likely future demand for rail on this section and beyond, including key influencing factors.

Section 6 includes review and refinement of the proposed route for the Northern Rail Bypass.

Section 7 provides up-to-date costings for both the (refined) Northern Rail Bypass and upgrade of the existing Adelaide Hills section to accommodate double stacking.

Section 8 presents a more detailed set of social and economic considerations for the Northern Rail Bypass, expanding upon the findings of the RFMS to address wider benefits.

Section 9 includes discussion regarding potential implications should no bypass be created.

Sections 10 advises on further work that will be required to advance Northern Rail Bypass investigations and prepare a business case.

2 Relevant Existing Literature and Reports

A number of existing reports, studies and other valuable information relating to movement of freight both across South Australia and nationally, particularly by rail, have been reviewed as part of this investigation.

Reports include but are not limited to, the following:

- Previous investigations regarding issues with the current rail corridor and options for realignment
- Statistical data regarding rail activity across Australia, including from the Bureau of Infrastructure, Transport and Regional Development (BITRE) and ARTC's 'Trainline' publication issues 1 to 5 (inclusive).
- Checklist and Requirements for Business Cases submissions to Infrastructure Australia
- DPTI's Integrated Transport and Land Use Plan
- Other rail related investigations
- Recent economic outlook reports for both Australian and South Australia, including CommSec, AMP, Westpac and the South Australian Centre of Economic Studies (SACES), including discussions with Professor Dick Blandy, and
- Information obtained from relevant websites.

The following reports in particular have been reviewed and summarised:

- ***Who Moves What Where - Freight and Passenger Transport in Australia***
National Transport Commission, August 2016
- ***South Australian Rail Freight – A Bypass to Save the Heart of Adelaide***
Mitcham Community Rail Freight Task 2007
- ***Adelaide Rail Freight Movements Study Final Report***
GHD 2010
- ***Adelaide Interstate Rail Freight – Brief for Strategic Assessment of Corridor Options***
SGS Economics, 2010
- ***Northlink, Getting SA on Track, and Northlink Road and Rail Bypass – 2015 update***
Northlink Reference Group, 2010 and 2015
- ***Australasian Railway Association Statistical Report- Trainline 5***
Department of Industry and Regional Development (DIRD) – Bureau of Infrastructure, Transport and Regional Development (BITRE), November 2017
- ***Discussion Paper 1 and Checklist for Stages 3 and 4: Business Case Development and Business Case Assessment***
Infrastructure Australia, 2008 and 2017
- ***Murray Basin Region Freight Demand and Infrastructure Study Project Report***
Department of Transport, Planning and Local Infrastructure (DTPLI), July 2014
- ***Integrated Transport and Land Use Plan (ITLUP)***
Department of Planning, Transport and Infrastructure, 2013

Too comprehensive to include here; Appendix B includes a relevant summary of each of these reports. These reports contain a number of key statistics, discussion and relevant information in these reports which provide valuable, informative background to this study.

3 Rail Freight Context

3.1 The National Rail Freight Network

Figure 3.1 identifies Australia's Standard Gauge Network - used for the national movement of freight. Blue lines indicate rail lines currently in operation, linking each of the mainland capital cities. The orange line depicts the Inland Rail route; this is currently under construction and when complete and in service in 2025, will provide the 'spine' of the national freight network between Melbourne and Brisbane. Appendix C includes details of this project.

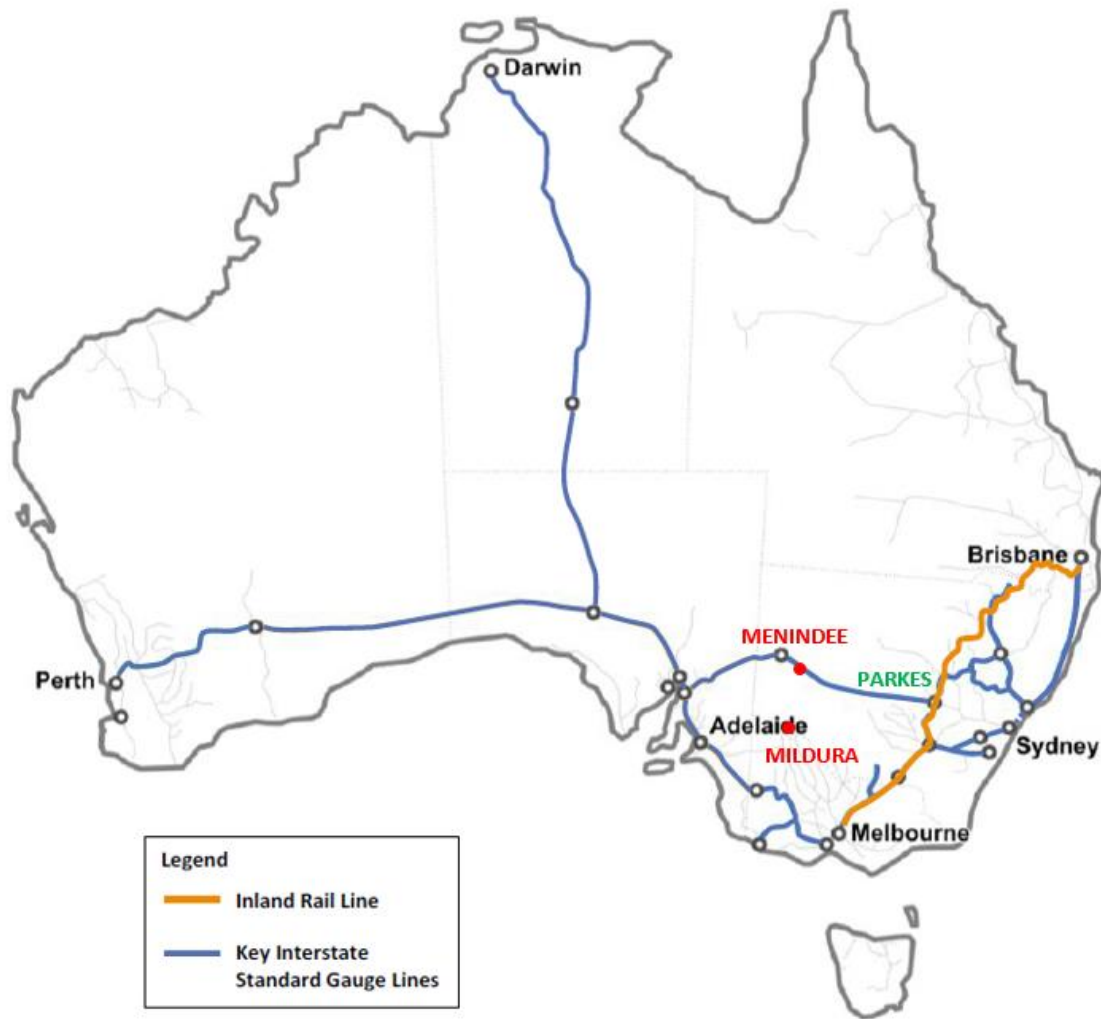


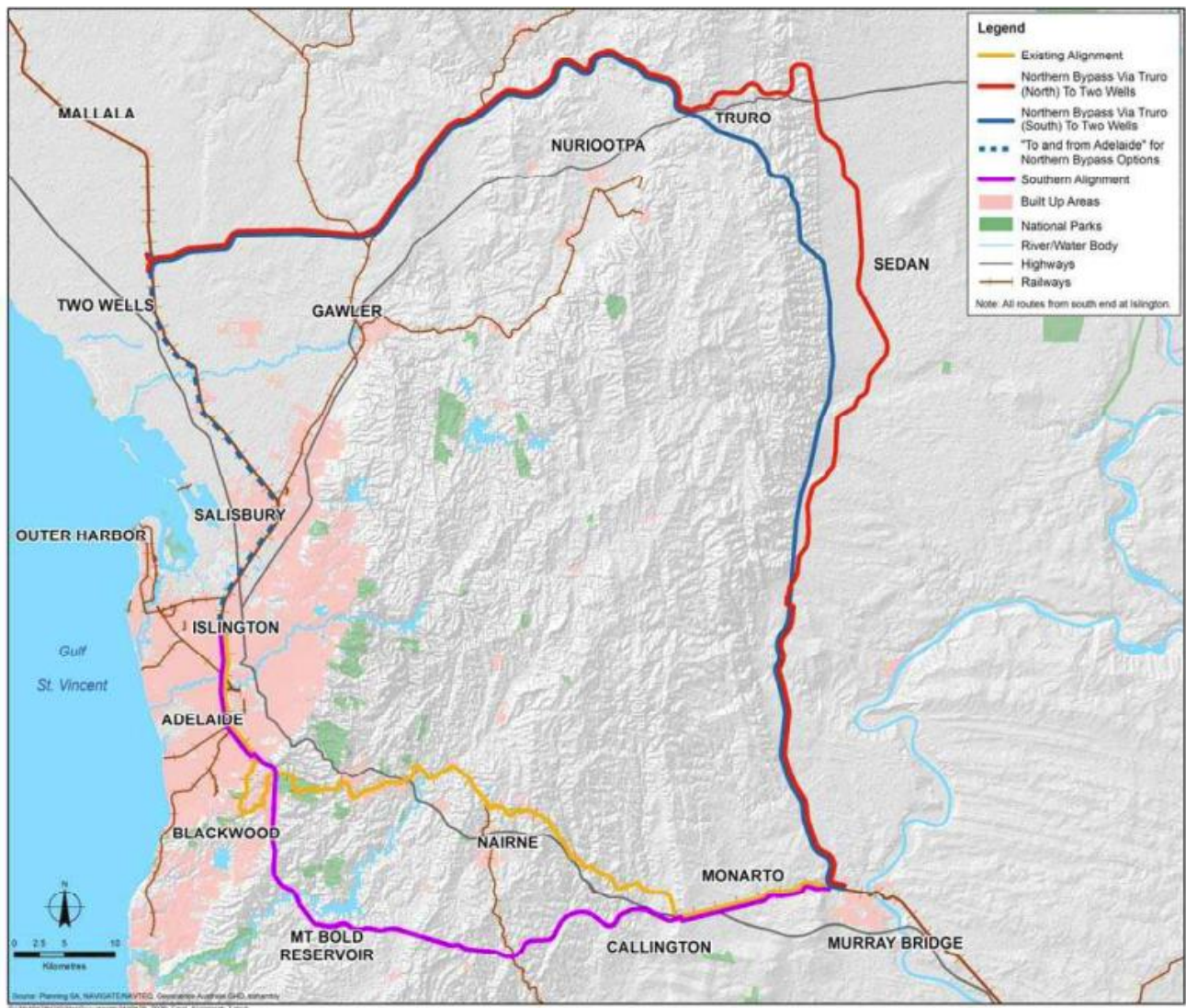
Figure 3.1 Australia's Standard Gauge Network, as used for the national movement of freight

The 2016 DIRD publication "Trends – Transport and Australia's Development to 2040 and Beyond" states that:

"...Rail accounts for almost half of all freight activity in Australia..." and "...By 2040, our national rail freight is expected to increase above its 2010 level by 130%...".

3.2 The Adelaide Hills Section

The Adelaide Hills section of the National Freight Network (as illustrated in Figure 3.2) is characterised by steep grades, winding sections and height limitations as it traverses the hilly terrain. Measuring 104km in length, this section forms a key element in the national rail links between Perth and Melbourne and also Darwin and Melbourne.



Source: GHD, 2010

Figure 3.2 Adelaide-Melbourne rail alignment; Adelaide Hills section (source: 2010 RFMS report)

While a key element in the overall national freight network, this section is known for its inefficiencies, which include:

- Vertical (clearance height) limitations which cannot accommodate double stacking
- Vertical gradients which limit the speed at which trains can travel and extend overall travel time
- Horizontal curves which also limit the speed of the trains
- The higher demand for power and therefore fuel to be able to haul laden wagons through this section.

In addition, there are further negative impacts of the rail infrastructure as it passes through the urban landscape, including:

- Noise
- Bushfire risk
- Safety risks
- Lack of emergency access
- Delay to commuters
- Pollution, and
- Safety at level crossings, where the rail line intersects with road traffic (there are 41 level crossings between Murray Bridge and Adelaide). In particular, Main Road in Glenalta, Main Road in Belair and Cross Road in Hawthorn are heavily trafficked and the long delays cause extended delays across the wider road network, particularly during peak traffic periods.

4 2010 to 2018: The Changing Picture for Rail

4.1 General

While the concept of creating a rail freight bypass of the Adelaide Hills remains unchanged since the 2010 Adelaide Hills Rail Realignment Study, there have been significant changes to both the National Freight Rail Network and also the operation of the current Adelaide Hills alignment, which have clear impacts for this investigation.

These changes include (but are not limited to) the following:

1. Commencement of the Inland Rail Project

Inland Rail is a 1700km long freight railway project, linking Melbourne to Brisbane along a route located to the west of the mountainous Great Dividing Range.

The rail line is currently under construction, and when complete will complete the 'spine' of the national rail freight network between Melbourne and Brisbane. Appendix C includes details of this project. 1.8km long, double stacked trains will be accommodated for the full length of the Inland Rail line.



Figure 4.1 Inland Rail route

Intersection of the Inland Rail Line with the East West Rail Line will occur at Parkes. As a result, Parkes is now considered an ideal location for major intermodal and national logistics activities, with all major capital cities within a 12-hour reach; Perth is accessible from Parkes in approximately 2 days. Travel from Melbourne to Perth via Inland Rail has been estimated at 62 hours¹ (refer the Parkes Shire Council website article “National Logistics Hub”, which illustrates the relative rail freight times from Parkes to key major cities). The level of interest in Parkes as a major Intermodal and Logistics Hub is evidenced by significant current investment by SCT Logistics, Linfox and Pacific National.

¹ By comparison, the travel time between Melbourne and Perth via the current rail alignment is 55 hours (including unstacking/restacking tasks)

The significance of this project to the National Rail Freight network is such that it has the capacity to change not only the 'footprint' of the rail freight network itself, but in addition, its impacts significantly affect the character and performance of the wider rail freight network.

2. Increased length of trains running between Adelaide and Melbourne

Until recently, the maximum length of trains running between Adelaide and Melbourne was 1500m. Supported by the provision of adequate passing loops, the maximum length of train has now been increased by 300m to a total of 1800m. This has resulted in a 20% increase in productivity for rail operators, and therefore extended the capacity of the life of the line.

3. Grade Separation along the Adelaide – Melbourne Rail line

Two rail grade separation projects have been completed in metropolitan Adelaide, which significantly improve safety and reduce delays for road traffic. Passenger and freight rail lines (Noarlunga passenger line and Adelaide to Melbourne line) have been grade separated at Torrens Junction and at Goodwood.

4. Decline in gross rail tonnages

Overall volumes on this section of track have been in decline since the 2010 study. Gross rail tonnages on the East-West rail corridor (i.e. between Perth and Melbourne) have been in decline since 2013-14. "Trainline 5" – a statistical report by Bureau of Infrastructure, Transport and Regional Economics (BITRE), indicates that there has been an approximate 20% decline in these tonnages in both directions between Dry Creek and Taillem Bend. As advised by ARTC, the overall decline in intermodal tonnages between Adelaide and Melbourne has been due to a reduction in export shipping container traffic between Adelaide and Melbourne. These containers are now either being exported directly from the Port of Adelaide, or travelling between Adelaide and Melbourne by road.

5. It is worth noting that the length of the rail line between Adelaide and Melbourne is 863km. Road transport is generally more competitive than rail on routes up to 800 – 1000km in length (refer DPTI commentary in Appendix D), consequently the Adelaide to Melbourne rail freight market is relatively low.

6. Increased Port competition

Flinders Ports has been actively increasing its competitiveness in recent years. Consequently, more containerised goods are being moved directly through the Port of Adelaide, reducing the volume of land bridged product between Adelaide and Melbourne (thus supporting point 4, above).

7. Use of larger freight vehicles

Actions arising from the Department of Planning, Transport and Infrastructure (DPTI) "Moving Freight" study have facilitated the use of larger freight vehicles on the road network, making the already highly competitive road freight mode even more economically attractive. By way of example, Sturt Highway is now classified for PBS level 3A vehicles (i.e. Double Road Trains or B-Triples).

8. Closure of Holden's Elizabeth plant

Closure of the Holden manufacturing facility at Elizabeth has substantially reduced the movement of steel on rail between Adelaide and Melbourne.

9. Loss of spur lines for grain haulage

Rail spur lines linking grain storage sites between Loxton and Taillem Bend and Pinnaroo and Taillem Bend closed in 2015. In consequence, grain is now trucked to Taillem Bend, and this strategic grain storage facility is further expanding. This has subsequently affected rail volumes between Taillem Bend and Port Adelaide.

10. Intermodal facility development

There is significant interest in the provision of an intermodal facility at Taillem Bend, in the vicinity of the existing rail line. In addition, Stage 1 approval has recently been granted for development of an intermodal facility at Monarto; with or without the presence of rail.

In any case the presence of an intermodal facility in the vicinity of rail provides many potential rail opportunities.

11. Rapid residential growth

Residential growth in Mount Barker District Council is occurring at a relatively rapid rate, placing increased pressure on the region to consider options for efficient public transport. This includes consideration of use of the current Hills Rail Corridor for passenger transport.

Further, this residential growth also increases the demand for supporting provisions, including employment nodes.

12. Addressing Double Stacking Limitations

Rail freight can only traverse the Adelaide Hills line segment as single stacked trains due to height limitations at Murray Bridge and other vertical restrictions elsewhere (e.g. Tunnels). To the west of Adelaide, trains can be double stacked to continue westbound. Conversely, double stacked rail from Perth (for example) must be unstacked prior to travel through the Adelaide Hills.

The reloading of freight takes place at Dry Creek, and adds in several additional hours of transit time. Double stacked wagons are the norm however from Perth and Darwin. In result, almost twice as many trains are required to cross South Australia in both directions.



ARTC have commented that works are required along the full length of the Adelaide-Melbourne corridor to facilitate double stacking; not just at the Adelaide end. This includes other works beyond Murray Bridge and Monarto. ARTC however will not provide details of these works and it is suspected that these may not be significant. Any double stacking issues beyond the extent of the Northern Rail Bypass project would also need to be resolved.

Double stacking at the Dynon Terminal is an issue at the Melbourne end of the line (with the key constraint being the Bunbury Bridge). Double stacking into this facility is impractical; it has been concluded that a new facility is needed.

The development of a new terminal in Melbourne will be highly significant and will impact upon rail operations on the rest of the network. Two options are currently under consideration – west of Melbourne or north of Melbourne. ARTC is currently working with the Victorian Government with a view to ensuring a solution is in place by 2025 (Note: this will therefore also coincide with completion of the Inland Rail Project). It is understood that the preferred option is referred to as the Western Inland Freight Terminal (WIFT).

Once this is complete, the Adelaide Hills section will remain the only significant component of the Adelaide – Melbourne corridor that requires investment to accommodate double stacking.

13. The Mildura – Menindee Option (and then linking to Melbourne/ Geelong)

The provision of a rail line between Mildura and Menindee has previously been identified, to improve freight efficiency, provide national defence benefits and stimulate economic development within the surrounding region. The project would involve standardising the existing Geelong – Mildura line and building a new link between Mildura and the new transcontinental line at Menindee, NSW.

While this option has been discussed over the years, only pre-feasibility analysis has been undertaken regarding the proposed alignment. As such it is difficult to determine the potential difference in travel time. Double stacking along this alignment however, would be a given.

4.2 Other Influencing Changes

Broader changes than rail alone have also occurred since the RFMS which have influence or require consideration for the future rail network. These include, but are not limited to the following:

1. Consolidation of Central Australia's Defence Base to Edinburgh

Consolidation of key elements of Defence Bases for Central Australia to Edinburgh places key priority on the need for quality, diversified transport routes to and from Adelaide for the movement of both goods and people. Quality access and egress routes must be available at all times, particularly in the event an alternate transport mode becomes inaccessible or unavailable.

2. South Australia's Economy

The January 2018 State of the States report produced by CommSec sees South Australia "...ease from fourth to fifth on the (economic) performance rankings in the last quarter...", just behind Tasmania.

Further, the final economic report for 2017 by the South Australian Centre for Economic Studies (SACES) advises that while the State's real Gross State Product (GSP) rose by 2.2% in the 2016/17 financial year, this is forecast to grow by only 1% in the 2017/18 year. For the next 3 years, SACES' predictions for economic growth are notably below those of Treasury.

Although the 2016/17 rise in GSP was significantly above that of the average of the preceding 5 years (around 1%), this was largely as a result of the strong winter crop. Outside of the farming sector, growth remained stagnant at around 1% and well below Australia's Gross Domestic Product (GDP), which is around 2.0%. Population growth too, particularly in the 18 – 25 year old age group, continues to be less than 20 years ago.

SACES advises that while recent economic indicators suggest a strengthened state economy, the outlook is uncertain, with both positive and negative factors having a bearing.

One of South Australia's most highly regarded economists has commented that the recent change in State Government leadership has seen confidence levels in the Government's ability to manage the economy lift significantly. However, there is an enormous task ahead and this will take time. He has also indicated through discussions that the next 5 years or so will be crucial to the economic future of South Australia. In particular, there is a very real need to increase our profit rate and significantly stimulate investment.

Providing quality infrastructure that matches or betters that of other states for the delivery and movement of goods and services and offers flexibility and choice is a key drawcard for future investment.

3. The GlobeLink plan

As part of their 2036 Plan, the State Government has stated

“A generational upgrade of our freight export infrastructure is required to provide our companies with the competitive advantage they need to get our premium quality South Australian products to markets across the globe...The GlobeLink plan will provide a new road, rail and air freight corridor, bypassing existing road and rail corridors through the suburbs and around the Adelaide Hills. The corridor will avoid the heavily populated areas of the existing freight routes, and will take freight directly to Port Adelaide...”

In essence, the GlobeLink plan is consistent with the concept for the Northern Rail Bypass.

4. Diversity and modal choice

Embracing ‘diversity’ is a key buzz word in today’s society, and it is widely recognised that it provides optimal outcomes in the full range of scenarios.

Diversity in modal choice is not so different, and offers the following benefits:

- Competitive pricing
- Opportunity to best match product to transport mode
- Consumer choice
- Alternative transport in the case of emergency scenarios (e.g. rail derailment, highway shutdowns and the like), and
- Flexibility.

4.3 Key Stakeholder Input

The key stakeholder consultation process for the Northern Rail Bypass Scoping Study has been a key element of the overall investigation, designed to understand:

- The current and future rail task for the subject corridor, by volume and commodity
- Potential impacts of a realigned corridor on key stakeholder operations
- Potential impacts of a realigned rail freight corridor on existing and proposed terminals and intermodal facilities, including changes to viability of location/s
- The number and location of crossings and/ or potential passing loops
- Potential impacts (if any) if the Mildura link into the main line is built (and any impacts emanating from the Inland Rail Link in general).

From both a time and financial perspective, it has been impractical to survey the full extent of stakeholders involved and/or affected by realignment of the rail corridor. Instead, a number of key stakeholders have been identified for consultation as part of this project, representing:

- Regional Development Boards (RDAMR & RDA AHF&KI)
- Government agencies
- Peak industry bodies
- Affected Councils within the MRLGA and SHLGA
- Major companies, and
- Transport Providers in the region
- Selection of these stakeholders has occurred through discussions with the RDA AHF&KI, SHLGA and RDA MR.

Results of the stakeholder consultation process were presented to the Steering Committee for review and discussion. Where gaps were identified in this information, RDA AHF&KI provided

assistance with additional information or in encouraging stakeholders to provide more detailed input. Inputs and opinions were mixed, depending upon stakeholder interests.

Appendix D includes a comprehensive summary of the stakeholder consultation process. More detailed records of stakeholder inputs to the Scoping Study (as reviewed and confirmed by stakeholders) can be made available if required.



5 Freight Task Assessment

5.1 The Current Freight Task

The 2010 Study advises that the existing rail line has a maximum capacity of 10.7M tonnes per year. This was based on information provided by Freight Rail Operators Group (FROG) and Australian Rail Track Corporation (ARTC).

Current rail freight activity continues to move between the following four origin-destination pairs:

- Adelaide and Melbourne
- Perth and Melbourne
- Melbourne and Darwin, and
- Regional South Australia and the Port of Adelaide.

Each week, 55 freight trains travel the line; 28 trains travel in a westbound direction, and 31 trains are eastbound on the Adelaide Hills section, as summarised below.

Table 5.1 *The current rail task*

	PND Steel	SCT Intermodal	PNT Intermodal	INTR Intermodal	INTR PC INTM	PNT PC INTM	Total
Westbound	2	4	15	5			26
Eastbound	1	4	16	5	1	2	29
Total	3	8	31	10	1	2	55

Further to Sections 4.1 and 4.2, ARTC has advised of the following changes in rail freight and related tasks since the 2010 Study:

- There has been a decline in land bridged containers travelling to and from Melbourne by rail as these containers are now moving directly through Port Adelaide on new and existing shipping services. In the past, 9 trains per week travelled to and from Melbourne carrying export containers; today there are no services dedicated to this task. All remaining land bridged volumes now travel on other services carrying domestic freight; largely by road.
- Brisbane to Adelaide rail traffic (which used to travel via Melbourne) now travels via the Broken Hill corridor.
- There has been some increase in Melbourne to Perth traffic volumes (with some recent offset of growth as a result of volume declines driven by the downturn in WA's mining sector activity)
- Mindarie Sands operations have also ceased since the 2010 (original closure September 2009); this was restarted by Murray Zircon in 2012 – 2015. This has again ceased operations, although the opportunity to reopen remains
- While grain volumes can vary due to seasonal conditions, there have been no significant changes over recent years
- Steel volumes on the rail line have declined due to the cessation of vehicle manufacture in Adelaide
- 1800m trains can now access the network; this represents a 20% increase in capacity over trains that could access the network in 2010.

Today, the rail line has a maximum capacity of 12.8 M tonnes per annum (resulting from the increase described above).

Statistical data produced by BITRE indicates that in 2015-16, 8.11M gross tonnes was carried over this section of line; this indicating that the spare capacity of the line is in the order of 37%.

Figure 5.1 below illustrates the change in gross tonnages on the rail line between Dry Creek and Tailem Bend.

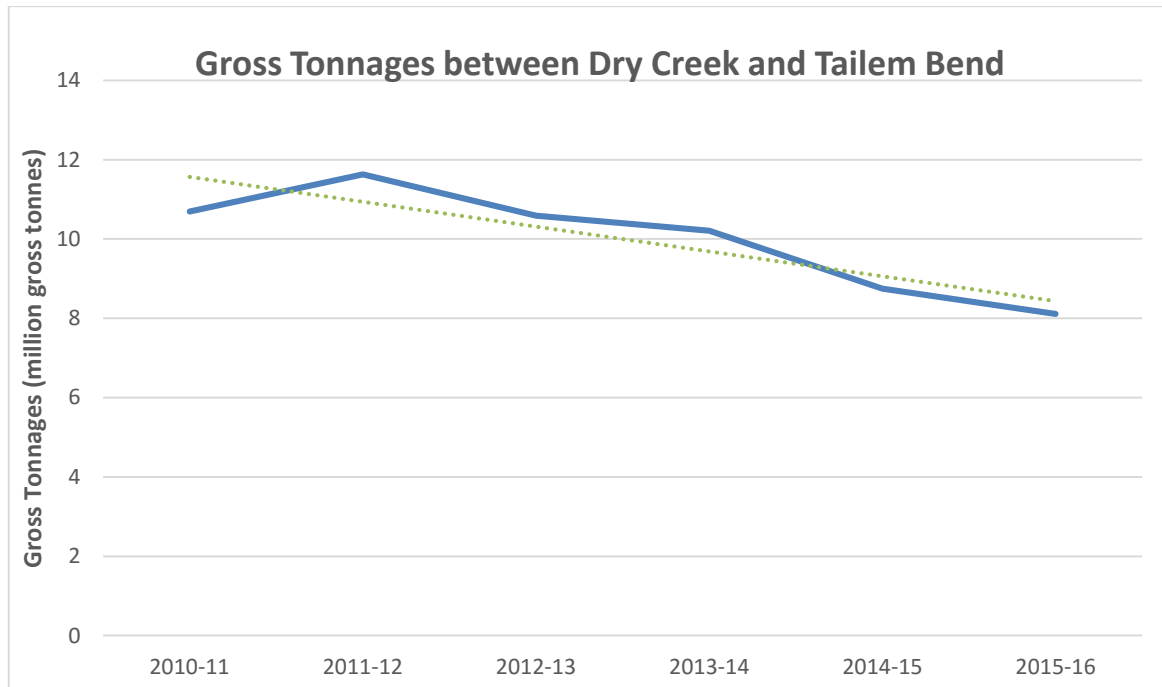


Figure 5.1 Gross tonnages between Dry Creek and Tailem Bend, between 2010 and 2016

The above graph indicates a gradual decline in gross tonnages carried on the subject section of rail line since 2010-11; the blue line representing the change in gross tonnages, and the dotted green line representing the overall trend line. This has been influenced by a number of factors as described above and with further changes expected over time, is not considered to be sufficiently stable to project future rail line demand.

5.2 Likely Future Demand

The likely future demand for the rail freight task is difficult to quantify for the following reasons; some of which still hold from the previous study:

1. Underlying economic growth (annual growth in Gross State Product (GSP)), for South Australia, Western Australia, Victoria and the Northern Territory. This has fluctuated in recent years, most notably the GSP for South Australia which is above the National GSP (2.2% vs the National GSP of 2.0%), and the decline in GSP growth in WA due to a population surge and a slow mining industry.
2. Changes in rail mode share along the east-west corridor, such as:
 - A carbon pollution reduction scheme (or road pricing) on transport competition between road and rail
 - The possible introduction of B-Triple trucks on the Melbourne – Adelaide Road corridor
 - Truck driver fatigue legislation
3. Changes in the relationship between freight and economic growth. By example, more concentrated production practices for manufacture creates longer supply chains.
4. Impacts of Inland Rail – Inland Rail is scheduled to commence operations in 2025. There is potential however to move freight between Perth and Melbourne (and vice versa) via the

east-west rail link between Perth and Parkes and then from Parkes to Melbourne. This practice would therefore bypass Adelaide, dramatically reducing volumes on the corridor. Similarly, review of terminal locations and freight systems may also impact route choice.

5. The ability or otherwise to double stack rail freight to achieve greater economies of scale. Scott McKay, CEO – Bowman’s Rail has advised that in the order of 25 cents in every dollar can be saved (and largely to the direct benefit of the customer) if rail could progress from its current single stacked limit to achieve double stacking. Transport of dry lentils between Adelaide and Melbourne for example, have been recently quoted at \$25 per tonne for road travel, versus \$40 per tonne for rail. With a 25 percent saving for double stacked rail, the price differential between road and rail becomes far more competitive (i.e. \$30 per tonne for rail).
6. WA’s mining sector activity – the mining sector places major demands on the rail network, but this fluctuates significantly depending on consumer demand and the quality and availability of ore and minerals. In recent years, there has been a downturn in WA’s mining and resources sector, which has had a marked effect on rail volumes. When this recovers, and indeed such activity also in South Australia (Mindarie Sands, for example), the demand for rail for movement of bulk goods will substantially increase.
7. Future changes to road pricing regimes may change the competitive positions of rail and road (in favour of rail). Rail produces 75% less carbon emissions when compared to road transport (refer Energy Exchange website – managed by the Australian Government Department of Environment and Energy). Should road pricing be adjusted to accurately reflect its carbon footprint, the cost of rail would become significantly cheaper relative to that for road transport.
8. Moving towards advanced manufacturing – in recent years there has been a significant economic downturn in South Australia due to closure of major manufacturing facilities in both the Upper Spencer Gulf and Holden’s Elizabeth plant. Renewed interest in investing in South Australia however is already occurring, including in both the steel industry and defence. Further industries predicted for the state include pharmaceuticals, aircraft manufacturing, professional and scientific equipment manufacturing and computer and electronic manufacturing. The transport demand and mix for such bulk products remains to be seen, but positioning ourselves to best attract global investment will be key.
9. Population growth and increased traffic congestion in both the Adelaide Hills and Metro Docklands sections of the rail network.

5.3 Summary

As discussed in section 5.1, the rail freight task has been in decline for a number of years, for many reasons. Significant changes have occurred for the rail line from both an economic and also a capacity perspective, and further change is expected. Economic outlooks for South Australia indicate that there are many positive opportunities waiting to be embraced across a number of market sectors. For Western Australia, there is consensus that the recent downturn in GSP will recover in the next few years as the mining sector reinvigorates and rebalances the effects of significant population growth.

The size of the future rail task is unclear and is dependent on many factors, not the least of which is South Australia’s economic investment and growth. The economic performance of the state over the next 5 years is considered critical for its future.

What is clear, is that:

Without either significant upgrade or realignment, the current rail link cannot compete with the capacity or efficiency of the national freight network, particularly upon completion of Inland Rail. In result, the Adelaide Hills section will likely become the nation’s weakest rail freight link. Further investigation is required to fully determine the effect this has on the long term economic competitiveness of South Australia.

6 Refinement of Proposed Route

No electronic version of the alignment was provided as an output of the 2010 Study. In order to refine the proposed route, the GHD proposed alignment (Option 3) from the previous report was scanned and inserted into Google Earth.

This alignment was then reviewed and modified to suit existing conditions, loosely based on the following:

- The proposed route follows the existing rail corridor from Monarto, along the eastern side of the ranges
- From the hills to the south of Truro, minor modifications have been made to the proposed route, to follow boundaries where practical
- The proposed route follows the rail corridor to Roseworthy / Freeling, and then follows the road reserve and/or property boundaries, to link with the existing rail corridor at Mallala.
- Further refinement of the alignment for the Northern Rail Bypass has been undertaken to meet specific requirements from ARTC, for example minimum curve radii. The vertical alignment as identified in the 2010 Study falls within $\pm 1\%$, hence requiring no further change.
- The review however has enabled the location and indicative length of bridges and tunnels to be confirmed, together with the location of road/ rail crossing points.
- Figures 6.1 overleaf illustrates the refined alignment for the Northern Rail Bypass; indicating the location of key road and waterway crossings, the need and extent of tunnels and bridges, as well as identifying key landmarks, townships and roads. It should be noted that this alignment is still considered preliminary and will be subject to further development through conceptual and detailed design.

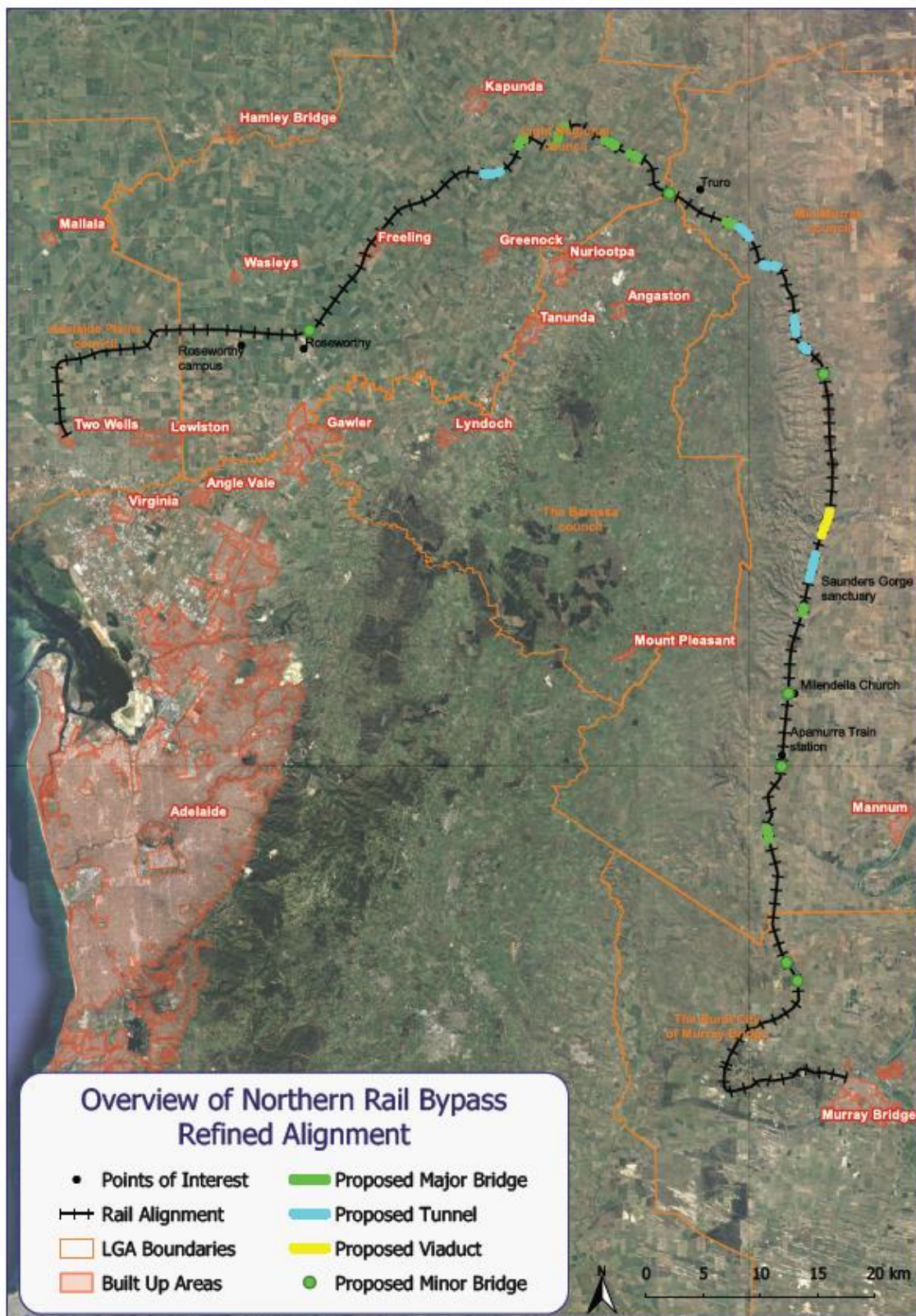
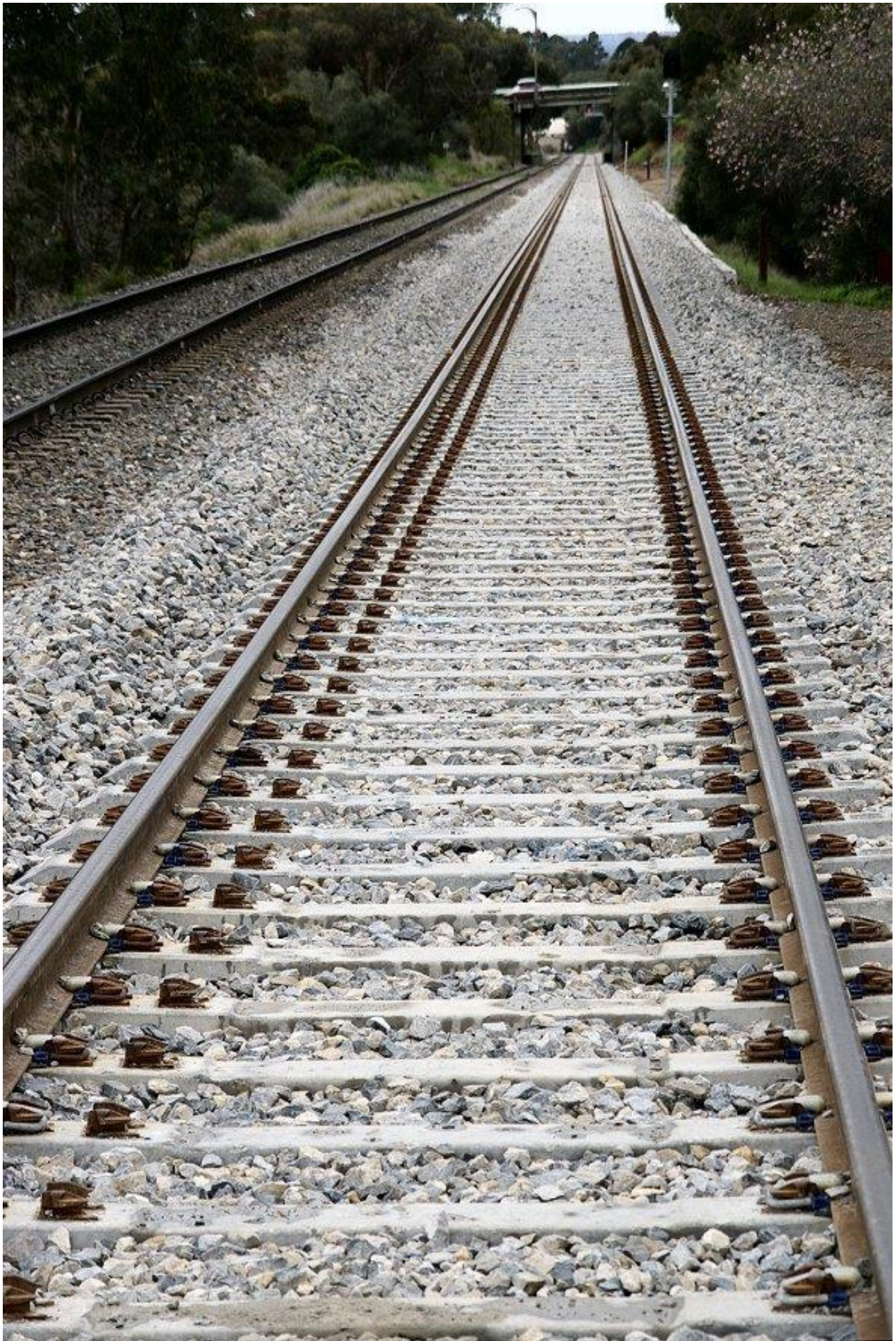


Figure 6.1 Northern Rail Bypass Alignment



7 Revised Costing

7.1 General

The Northern Rail Bypass has been costed in 2018 dollars and is summarised in Table 1 below. Costing has been based on Figure 6.1, and as such is preliminary only, subject to further development through conceptual and detailed design. Cost estimates have been based on a combination of:

- Previous major rail and road project experiences
- Publicly available information from ARTC pertaining to the Inland Rail Project, and
- 2018 Rawlinsons Australian Construction Handbook.

7.2 Northern Rail Bypass - Cost Breakdown

The following table provides a breakdown of all costed components of the Northern Rail Bypass:

Table 7.1 Northern Rail Bypass – Breakdown of Components

Component		Quantity
Rail Track		
Line Track Length (km)	2	154.52
Passing Loops		
Number	3	3
Length (km)	3	3
Total Length (km)	9	9
Total Track Length (km)		163.52
Earthworks (track km)		
Cut (km)	3	
0-5m		17.19
5-10m		18.87
10-15m		15.46
15-20m		12.20
20-25m		5.60
25-30m		0.45
30-35m		1.45
35-40m		0.50
Total Length (km)		71.72
Fill (km)		
0-5m		29.03
5-10m		16.99
10-15m		9.85
15-20m		6.74
20-25m		1.26
25-30m		0
30-35m		0
35-40m		0
		63.87

Total Length (km)		
Tunnels	0	7
Number		8.15
Total Length (km)		
Level Crossings		7
Number		
Road Bridges		6
Number		
Rail Bridges/Viaducts		10
Number		10.30
Total Length		48386.5
Total Area (m2)	7	

The following table of costs was therefore developed, based upon the sources listed in section 7.1.

Table 7.2 Northern Rail Bypass Costing Summary

Component	Cost (\$m)
Rail Track	
Track	163.52
Turnouts	3.00
Base Layer	47.44
Total Rail Track Costs	213.96
Earthworks	1309.45 - 1489.27
Tunnels, Level Crossings, Bridges, Viaducts, Murray Bridge Works	
Tunnels	978.00 - 1630.00
Level Crossings	0.84
Road Bridges	60.00
Rail Bridges/Viaduct	241.93
Murray Bridge Works	200.00-300.00
Total	1480.77-2232.77
Land Acquisition	76.27
Services/Signalling	
Service Clashes	73.20
Services for Level Crossings	3.50
Common Service Trench	15.45
Signalling at Turn Points	28.00
Total Services/Signalling	120.15
Sub Total	3200.61-4132.43
20% Contingency	640.12 - 826.49
Total	3840.73 - 4958.91

7.3 Assumptions

The following assumptions were made for the cost estimate:

- 50% of excavated material is assumed to be suitable to be used elsewhere as fill
- The cross sections for cut/fill were taken from 'Adelaide Rail Freight Movements Study' (2010) by GHD and are based on the depth
- Rock blasting is assumed to be required for a percentage of the specified cut. This percentage is depended on region and depth of cut.
- A larger presence of rock is expected from chainage 34000-83000. As such, a high percentage of rock blasting is expected to be required in this region, however the cut cross section is assumed to be steeper due to the side support from the rocky material.
- Free and unobstructed access will be available to the site at all times
- Sufficient area will be available for storage of materials and equipment.
- Given the constraints at Murray Bridge, it is assumed that alterations to the existing bridge and tunnel will be possible. If it is not, a new alignment will need to constructed including a new river crossing.
- Sections 7.4 to 7.6 further describe the approach and more detailed assumptions/ considerations for each component of the costing.

7.4 Earthworks

Alignments and cut/fill depth estimates were taken from 'Adelaide Rail Freight Movements Study' (2010) by GHD. These drawings estimated the cut/fill requirements along the track based on 10m contour lines, which provided a basis for an estimated earthworks costing.

For ease of calculation, the cut/fill was categorised into 5m intervals, from 0m to 40m in depth. The excavation profile differed every 5m due to the battering requirement, thus these intervals were developed. This allowed for a cost per linear metre to be developed for each interval, which combined with the chainage, resulted in the cut/fill cost estimation.

7.4.1 General

The cost estimations are based on first principles and includes the cost of plant, labour and material supply. The estimated costs of fill include compaction of the fill material.

7.4.2 Rock Blasting

Allowance was made for rock blasting as part of the excavation process, with the rock content based on the depth and location of the excavation. The central mountainous section of the track (approximately from chainage 34,000 to 83,000) was assumed to have a higher rock content due to the terrain, thus a greater percentage of excavation was assumed to require blasting. Excavation costs include the additional costs associated with excavating blasted rock compared to soil.

Due to uncertainties in the rock content and composition, lower and upper bound costs were calculated to give a potential range in the excavation costs.

7.4.3 Profile

Excavation and fill profiles were taken from 'Adelaide Rail Freight Movements Study' (2010) by GHD. The cut profiles make allowance for a service track at ground level for excavation up to 7m, and on the first batter for excavation over 7m in depth. All fill profiles have an allowance for a service track at the height of the rail track.

The cut profile was altered for the central mountainous region, where higher rock content is expected. The rock contained in this area is assumed to provide additional side support, allowing for steeper batters to be used.

7.4.4 Cut to Fill

It is assumed that some of the excavated material will be suitable to be used as fill in other sections of the track. This was estimated at 50% of cut to fill, accounting for the quality of the excavated material (potentially unsuitable material where rock blasting has occurred) and the location of respective cut and fill areas (long travel distances become unfeasible).

The estimated cost of fill where there is a potential for cut to fill, was reduced due to the reduction in new fill material required. This reduction still includes the costs associated with cleaning and preparing the excavated material, to make it suitable to be used as fill.

7.5 Track and Formation

The cost estimates related to track and formation were based on previous rail projects and information from ARTC.

7.5.1 Rail Track

Estimated costs for the rail track include the rail, sleepers and labour for installation. Based on information from ARTC, an estimated cost of \$1m per linear km of track was used.

7.5.2 Ballast

Costs associated with the base layer and ballast for allowed for in addition to the rail track costs. A rate of \$40/m² was estimated for both the base layer and the ballast, taking into account the potential to use larger blasted rock from the excavation process as ballast.

7.5.3 Passing Loops

Allowance was made for 3 passing loops each 3km in length. These were costed by using the same rate for rail track as mentioned above, with an allowance for additional width of ballast and base layer. It was assumed that these passing loops would be situated in locations of minimal cut/fill requirements, and so additional excavation costs have not been allowed for.

7.5.4 Turnouts

Turnouts are required for each of the passing loops, at an assumed cost of \$1m per loop.

7.5.5 Level Crossings

All level crossings required were costed as passive crossings with services required to upgrade to active crossings calculated below. The total cost for a single passive crossing is estimated to be \$120,000.

7.5.6 Tunnels

7 tunnels are allowed for along the length of the track, with the majority of them located in the central mountainous region. Uncertainties in the ground composition and accessibility to each tunnel site, has resulted in a lower and upper cost being adopted. This is due to factors such as the rock content and soil stability conditions requiring different methods of tunnelling with have different associated costs. A range of \$120-200m per km was estimated for tunnelling. This



estimate includes an allowance for the set up costs, which are high resulting from the design involving a number of small tunnels in succession.

7.5.7 Bridges

Road Bridges

Alterations to existing roads to form road bridges are assumed to cost \$10m per bridge, including all associated costs.

Rail Bridges/Viaducts

The profile for the rail bridges and viaducts were taken from 'Adelaide Rail Freight Movements Study' (2010) by GHD. Assuming these profiles, a cost of \$5,000 per m² of surface area, was estimated. Given a width of 4.7m, the costs of rail bridges and viaducts is estimated to be \$23,500 per linear metre.

7.6 Miscellaneous

7.6.1 Land Acquisition

An allowance has been made for acquiring land for the rail corridor. Two prices were used for land acquisition, with the land required for the section of rail up to Truro (approximately chainage 83,000), having a price of half that of the later section of the track. This was supported by brief research into the cost of land for sale in each of these areas.

Land acquisition was only based on a corridor, and allowance has not been made for properties where the rail line will cause major inconvenience. These situations would require addition land acquisition or payment for damages.

A single price has been allowed for each of the sections mentioned above, and so no allowance has been made for the price differential between remote areas and areas on the fringe of towns. Land acquisition would require a property by property analysis and negotiation.

7.6.2 Services and Signalling

An allowance has been made for services/signalling for level crossings, the installation of a common service trench, signalisation at turn points and the relocation of services due to service clashes.

It is estimated that the installation of services and signalling at level crossings will cost \$500,000 per crossing. This includes the installation of boom gates.

As services will be required along the length of the track, it is assumed that a common service trench will be required. This trench is assumed to cost \$100/m and will continue the entire length of the track. No allowance has been made for the services in the trench, just the creation of the trench. Details of the actual services required would be necessary for further costing.

Each turn point (at each end of the track and each passing loop) will require signalisation. This is estimated to incur a cost of \$3.5m per turn point.

It is assumed that the installation of new structures and services will cause clashes with existing services in the area. The cost of relocating existing services is estimated to be 2% of the total project cost. The location and depth of existing services will be required to refine the costing.

7.7 Upgrade of Existing Alignment

A key element of upgrade of the existing alignment will lie in addressing double stacking issues, along the route, particularly through Murray Bridge. Other upgrade requirements are listed in the RFMS report and some of these have already been implemented.

To enable double stacking through this section, alterations will need to be made to both the rail bridge crossing the river and the tunnel/road bridge where the rail line passes under Bridge Road. The extent of the works required are uncertain, and further investigation of the load capacity of the bridge, and the clearance of both the bridge and the tunnel/road bridge will be required. Given that the bridge is relatively old, the load capacity will need to be investigated to determine if it has the capacity to support double stacking, or if additional strengthening will be required. Although the bridge is not heritage listed, it was built in 1925 and is considered an iconic structure in Murray Bridge.

Due to the constraints imposed by the properties surrounding the Bridge Street tunnel/road bridge, it will not be possible to significantly raise this road to gain clearance for double stacking. Therefore, if it is not feasible to lower the rail track by the required amount, a new rail alignment may need to be considered. This would involve a new river crossing at an alternate location which will incur additional costs.

At this stage an allowance of \$200-300M has been made for alterations to both the bridge and the tunnel/road bridge, assuming that alterations are possible.

A key benefit achieved by upgrade of the existing alignment lies in grade separation at key road crossings. The value of time savings for freight is discussed in Section 8.3.

Should time savings for passenger rail be calculated (e.g. as a result of grade separation of the existing alignment), this would provide a further saving of more than \$860M over 20 years, this is based on an assumed crossing closure time of 45 seconds, for 80 movements each day (both directions).

8 CBA Review

8.1 Introduction

The original cost benefit analysis of options to reconfigure the interstate rail freight corridor through Adelaide excluded many potential benefits. This project will examine many of those benefits and provide a rapid, high level and approximate estimate of their value.

Several options for reconfiguration of the interstate rail freight corridor traversing metropolitan Adelaide were considered in 2010 by the Commonwealth and State Government. The options ranged from upgrading existing rail links which run through established residential and mixed-use areas, including inner city suburbs, to schemes which would see 'break of bulk' points established to the north and south on metropolitan Adelaide's periphery, accompanied by a circumferential rail link which would avoid the need to take freight through central areas. Other options included bypassing the Adelaide metropolitan area altogether by taking interstate rail freight through an inland corridor linking Mildura in Victoria to Menindee in NSW.

Some of the options were subjected to cost benefit analysis as part of the Adelaide Rail Freight Movements Study (RFMS) completed by GHD. The GHD analysis maintained what can be considered a 'traditional' scope; that is, on the benefit side of the equation, it focussed on time savings and other freight cost efficiencies which might be on offer. Offsetting these benefits were the increased capital and operating costs associated with the option in question, compared to a 'base case' or 'business as usual' scenario. This was largely an 'intra-sectoral' approach, with impacts on the freight sector as the prime consideration.

The GHD study was only a preliminary cost benefit analysis because a number of key potential benefits were not within scope. Externalities such as greater urban consolidation, productivity improvements, savings in the life and capacity of South East (SE) Freeway, amenity improvements to residential areas and other non-quantifiable benefits were all excluded from the study.

At the time of the 2010 FMS, SGS Economics and Planning (SGS) was commissioned to prepare a paper setting out the theory and available international and national evidence to support the repositioning of the rail freight options as potential 'city shaping' projects, with collateral impacts ranging beyond the traditional scope of the preliminary GHD Study.

The rail freight options are again under consideration in 2018 by the South Australian and Australian State and Federal Governments. In particular, the northern rail bypass option that bypasses the Adelaide Hills line between Murray Bridge and Two Wells is being examined.

SGS's brief in this project was to prepare a rapid, high level and approximate analysis of the externality benefits of the freight diversion options that were not included in the original analysis. The following sections of this paper describe the benefits and methods of the analysis, provide estimates of the benefits and make conclusions about the overall value of 'additional' benefits.

8.2 Benefits and Methods

8.2.1 General

This section details the benefits in scope, describes the methods and assumptions behind the estimation for each benefit, and identifies other non-quantifiable benefits.

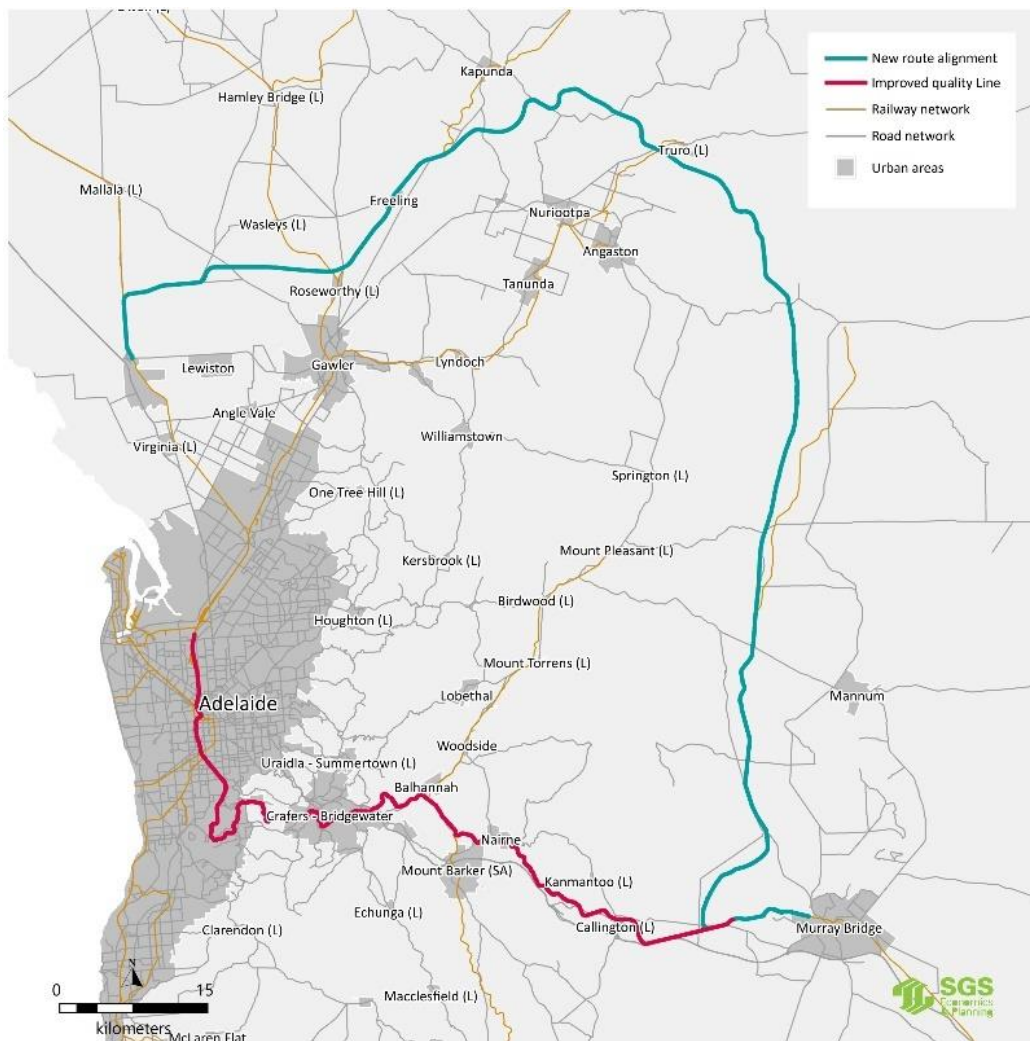
8.2.2 Greater urban consolidation

- There are still a considerable number of freight-dependent manufacturing and warehousing businesses utilising large areas of land in the inner suburbs. Freight hubs outside the metropolitan area could enable re-location, and free up this valuable land for housing.

- Growth through urban consolidation requires lower infrastructure spending than growth through greenfield development. The typical savings in Australia are in the order of \$30,000 to \$80,000 per dwelling. Here we will use a conservative estimate of \$40,000 per dwelling.
- We assume a fixed population, where one new dwelling in the infill corridor removes the need for one new dwelling in greenfield development.
- The current residential density is calculated for a 250m buffer zone either side of the rail line. This is obtained using the ABS Census of Population and Housing 2016.
- The rail line is mapped in red in Figure 8.1 overleaf, however, urban consolidation was only considered for the portion of the line that is inside the Adelaide Urban Centre and Locality (UCL).¹
- We assume that the number of dwellings will rise by a factor of 25 per cent through urban consolidation and cross-check the new density against existing residential densities in other inner-city areas of Adelaide and other Australian capital cities.
- The number of new dwellings is multiplied by the \$40,000 infrastructure saving to estimate the total infrastructure costs that would be saved through urban consolidation.

8.2.3 Productivity improvements

- Building up employment density in Adelaide would boost productivity through agglomeration economies (an overview of agglomeration economies is at Appendix 1).
- The benchmark approach for calculating the marginal productivity benefit is effective job density (EJD). EJD is a measure of the relative concentration of employment, derived from the density and accessibility of all jobs across a region.
- In line with previous CBA studies conducted by SGS, we assume that 1 extra job will move to the new area for each added dwelling. These are not net additional jobs but jobs that move from outer suburban areas.
- We use elasticities from SGS modelling to calculate the productivity uplift that would be generated by an increase in EJD in the area. This is estimated by regressing the relationship between EJD and labour productivity, and applying that relationship to the estimated rise in EJD that will come through urban infill.
- Annual productivity gains to South Australia's gross state product are then capitalised with a discount rate of 7 per cent.



Source: SGS, 2018

Figure 8.1 Map of buffer Zone

8.2.4 Savings in the life and capacity of the South East Freeway

- The SE Freeway carries large numbers of heavy vehicles (up to 4300 vpd). Due to their need to "crawl" down, and "climb" up the Freeway, they consume an outside share of freeway capacity. The freeing up of a significant part of this capacity will reduce travel time, and potentially delay the need to widen or duplicate the freeway. This will be achieved via a shift of container freight from road to rail.
- We assume that the current overuse of the freeway will reduce its lifespan from a standard 100 years for major road infrastructure to 75 years.
- We estimate the replacement value of the highway, based on its length of 76 km and the price of recent projects in South Australia. Drawing on these examples, we estimate the highway to be worth \$36.3 million per km. We consider this to be a modest estimate because the input projects are considerably smaller in scale when compared to the SE Freeway.
- The freeway was fully opened in 1979 and has been running for 39 years. The highway is expected to last until 2054 with its current overuse.
- We assume that diverting the freight rail line will mean that the highway will last the full 100 years to 2079, an additional 25 years.

- We then calculate the saving as the net present value of 25 per cent of the capital cost of the highway, a saving that would be incurred in 2054 (in 36 years' time).

8.2.5 Amenity improvements to residential areas

- There will be higher amenity for residential areas around the rail line from two sources. First, reduced noise and lower levels of industrial activity with freight. Second, improved access to public transport options with the switch to passenger activity on the existing line.
- We measure improved amenity through a predicted uplift in residual land value (RLV). We assume a current residual land value of \$150,000 per dwelling, this is in line with current RLV estimates for similar areas of Adelaide.
- In line with findings from other SGS cost benefit analysis studies, we assume a 10 per cent uplift in RLV. This is calculated for all dwellings along the 250m buffer zone around the rail line, including the dwellings outside of the Adelaide UCL.
- The calculation is also made on the estimated additional dwellings that are introduced through urban consolidation.

8.2.6 Other non-quantifiable benefits

The following benefits are significant to the project but are not quantifiable given the resource and time constraints of this project:

- Generating improved equity of access to job and service opportunities: creating more jobs in regional areas and in accessible inner urban locations would boost equity of opportunity across the state.
- Creation of metro public transport options: Taking freight trains out of the Adelaide Hills creates a possible corridor for public transport investment and integrated housing development, generating further environmental and social benefits. Services could possibly be extended to the rapidly expanding Mount Barker District Council, with many associated benefits such as reduction of pollution and congestion as result of fewer cars travelling to the city.
- Minimising major delays for commuters and emergency services at crucial railway crossings.
- Wider strategic impact of improvements to the national rail freight network.

If the findings of this analysis are to be incorporated into a full cost benefit analysis, many of the benefits above could be quantified with more time than was available here.

8.3 Benefit Estimates

8.3.1 General

This section details the estimates of the various benefits of the northern diversion of the Adelaide rail freight link. The analysis reveals that the total benefit could amount to nearly \$700 million.

8.3.2 Greater urban consolidation

The net benefit of urban consolidation is detailed in Table 1 below. There are currently 7,140 dwellings around the rail corridor in the Adelaide UCL. We estimate that 1,785 new dwellings will be added to the areas around the rail corridor, which equates to an infrastructure saving of \$71.4 million.

Table 8.1 Urban Consolidation Benefit

Item	Value
(A) Count of dwellings in urban infill area	7,140
(B) Urban consolidation impact	1.25
(C) New dwelling count ($C = A \times B$)	8,925
(D) Added dwellings ($D = C - A$)	1,785
(E) Infrastructure savings per dwelling (\$)	\$40,000
(F) Total savings (\$m) ($F = D \times E$)	\$71.4

8.3.3 Productivity improvements

The productivity benefits of agglomeration economies from urban consolidation are shown below in Table 8.2. The rise in annual gross state product was estimated.

Table 8.2 Productivity Gains

Item	Value
Rise in annual Gross State Product (\$m per annum)	9.5
Capitalised value of Gross State Product (\$m)	135.7

8.3.4 Savings in the life and capacity of the South East Freeway

Using the costs of three recent or current highway project in South Australia, we estimate the average cost of highway replacement to be \$36.3 million per km (see Table 3). The resulting estimate of the benefit of the savings in the life of the SE Freeway are shown in Table 4. Given the additional lifespan of 25 per cent, a length of 76km, the benefit estimate is \$689.8 million.

Table 8.3 Existing Highway Projects in South Australia

Previous Projects	Cost (\$m)	Length (km)	Cost per km (\$m)
Southern Expressway Duplication	407.5	18.5	22.0
Main South Road Duplication (Stage 1)	305	10.0	30.5
Northern Connector Project	885	15.5	57.1
Average	1597.5	44.0	36.3

Source: South Australian Department of Planning, Transport and Infrastructure

Table 8.4 Savings in the life and capacity of the South East Freeway

Item	Value
(A) Additional lifespan	25%
(B) Length (km)	76
(C) Value per km (\$m)	\$36.3
(D) Benefit = extra lifespan x length x value (\$m) ($D = A \times B \times C$)	\$689.8
(E) Discount rate	7%
(F) Net present value of benefit (\$m)	\$60.4

8.3.5 Amenity improvements to residential areas

The net benefit of amenity improvements to residential areas is estimated via increased RLV, as shown in Table 5 below. The base case includes 9,099 dwellings with an aggregate value of

\$1,364.8 million. The new land value includes a 10 per cent rise in RLV per dwelling, which brings the RLV up to \$165,000, and 1,785 new dwellings in central Adelaide, which brings the total up to 10,884 dwellings. The resulting net benefit in RLV (amenity) is \$431.0 million.

Table 8.5 *Benefit from Amenity improvements to residential areas*

Location	Dwellings	RLV per dwelling (\$)	Aggregate RLV (\$m)
Base case land value			
Adelaide UCL	7,140	\$150,000	\$1,071.0
Adelaide Fringe	1,959	\$150,000	\$293.8
(A) Total	9,099		\$1,364.8
New land value (10% uplift)			
Adelaide UCL	8,925	\$165,000	\$1,472.6
Adelaide Fringe	1,959	\$165,000	\$323.2
(B) Total	10,884		\$1,795.8
(C) Net benefit (C = B - A)			\$431.0

8.3.6 Time Savings at Level Crossings

Time savings to road users at 8 level crossings between Islington and the Adelaide Hills is estimated based upon an assumed value of personal time of \$15/hour, and an average daily traffic volume on roads at level crossings of 20 000 vehicles per day.

For an 1800m long train travelling at 60km/h, the average delay time to vehicles at level crossings is calculated as 2 minutes. Based upon an average of 10 freight trains per day and 1200 vehicles delayed per train, the total delay to road users is 24,000 minutes, or 400 hours per day. Across 300 days each year for a period of 36 years, this totals \$518M.

It should be noted that this is in today's dollars only, and therefore does not allow for growth on the road network or any discounting.

8.3.7 Benefits of Double Stacking

It is understood that double stacking freight can achieve a saving in the order of 25% of the cost of single stacked rail freight. For commercial in confidence reasons, it is difficult to obtain the annual volume of rail freight travelling in and out of Adelaide, and that Melbourne and Adelaide and vice versa. Assuming the 2015/16 volumes of rail freight (8.11M tonnes) and a conservatively assumed transport value of \$20 per tonne, this indicates a saving of \$40.5M per year, or \$1.46B (undiscounted) over 36 years.

8.4 Summary of benefits

Table 8.6 gives a summary of the additional benefits calculated in this project. The total benefit is \$2.68 billion, which indicates that the original cost benefit analysis of the rail freight diversion excluded some significant benefits and may have undervalued the proposal.

Table 8.6 *Summary of Benefits*

Benefit	Value (\$m)
Urban consolidation	\$71.4
Productivity improvements	\$135.7
South East freeway savings	\$60.4
Amenity improvements	\$431.0
Time savings at level crossings	\$518
Double stacking benefit	\$1460
Total	\$2676.5

8.5 Summary

At a high level, this analysis has found the benefits of the northern rail bypass have been found to be substantial. Further analysis could examine these benefits in more detail as part of a full, updated cost benefit analysis.

The RFMS conducted by GHD in 2010 had a focus that excluded many potential benefits. This Scoping Study gives targeted focus to and considers a number of wider social and economic benefits that had not been previously explored.

This extended assessment provides a rapid, high level and approximate analysis of the externality benefits, including greater urban consolidation, productivity improvements, savings in the life and capacity of South East (SE) Freeway and amenity improvements to residential areas. While only providing an estimation of the broad value of these benefits, they were found to be quite large despite using conservative assumptions wherever possible. In total, we estimate that the net benefit of these factors could amount to in the order of \$2.68 billion.

The findings indicate that further, more detailed analysis could be conducted as part of a full updated cost benefit analysis of the northern rail bypass. This analysis could also address some of the non-quantifiable benefits identified in this report, including improved equity of access to job and service opportunities, creation of metro public transport options, minimising major delays for commuters and emergency services, and the wider strategic impact of improvements to the national rail freight network.

9 The effect of *No* Rail Freight Bypass

From a single-minded perspective,

- less freight travels on the Hills Rail Alignment than 8 years ago
- road transport is significantly cheaper than rail (particularly between Adelaide and Melbourne)
- movement of containerised freight by rail is increasingly handled through the Port of Adelaide
- upon completion, Inland Rail could cater for Perth-Adelaide-Melbourne bound double stacked freight (although arguably not so cost competitively or as quickly), and
- a 'Do Nothing' or 'Do Minimum' approach would be significantly less cost.

The Adelaide Hills Rail Alignment would however become arguably, the 'weakest link' in the national rail network, as:

- the only sector unable to carry double stacked freight, and
- the sector that still require trains to have an additional engine to make the section's steep journey safely.

This section of the rail network (and indeed the overall Adelaide to Melbourne rail link) could potentially be avoided by using Inland Rail, but at what expense?

The very real risk of not creating the Northern Rail Bypass is that Adelaide and wider South Australia becomes forgotten or at best is seen as an 'add on' to the national rail freight network; superseded by Inland Rail, intermodal facilities at Parkes, and the east-west rail corridor.

Further, modal choice becomes even less competitive with a road dominated transport network for freight across the state. Most concerning, it sends a message to current and future investors both locally and globally that we are seemingly 'less connected' than other states and less committed to best positioning ourselves for positive long-term economic growth.

Section 4.2(2) refers to the uncertainty of the current South Australian economy, and the crucial time ahead to attract and secure profitable, private investment to grow the economy. The Northern Rail bypass represents an opportunity to provide greater modal choice through more competitive access to both the national road and rail network for business and industries now and in the future.

At this level of investigation, the value of 'lost opportunity' is yet to be quantified, but weighs heavily on the overall economic value of our future rail links.

10 Further Investigations – Where to from here?

This Scoping Study has updated and extended the RFMS to reflect today's costs, circumstances and consider a much broader set of social and economic circumstances. Further, the study has also highlighted the state's critical economic position, and the very real risks of not ensuring our key infrastructure fosters and supports strong investment and growth. More detailed investigations are now required to properly quantify a revised Cost Benefit Analysis for the project, and to complete a robust Business Case in accordance with the requirements of Infrastructure Australia.

1. More detailed costing for the project, on a more refined alignment based upon engineering survey
2. More detailed economic assessment of the 'Do Minimum', 'Achieve Double Stacking' (as outlined in the 2010 RFMS and which arguably, should be the Base Case) and 'Northern Rail Bypass' options for the rail freight route, including:
 - Refined assumptions, based upon more project specific data
 - Recognition that the 'Do Nothing' option in the RFMS is not an accurate Base Case. The aged structures, condition and load bearing capacity of the line will require review and intervention to maintain operational standards over time. Consideration should also be given to whether the current rail line should be upgraded to cater for the freight task alone (i.e. double stacking), or conversely, to investigate the value of dual rail use of a new corridor?
 - Identification of an appropriate 'value' of traditionally non-quantifiable benefits, including improved access to job and service opportunities, creation of metro transport options, minimising major delays to commuters and emergency services, and the 'lost opportunities' when compared to the national rail freight network.
3. Further liaison with key stakeholders as required, to assist in refining the alignment. In particular, consultation will need to be conducted with Councils to the north-east of Adelaide, in the vicinity of the proposed alignment.
4. Further engagement with the State Government to explore the characteristics and objectives of the Northern Rail Bypass and its role as part of GlobeLink, and
5. Preparation of a submission to Infrastructure Australia for this project, in accordance with the relevant requirements and checklists.

The State is considered to be in a key period regarding security of its future economic position and role in the national rail freight network. Actions must occur quickly, to quantify the real Cost Benefit Analysis of the overall Northern Rail Bypass.

Appendix A

Scoping Study Methodology Flow Chart

Project Methodology Flow Chart



Stage 1 Project Inception	Stage 2 Data Review	Stage 3 Testing of Option 3 Northern Bypass (south) via Truro	Stage 4 Quantification of the Rail Freight Task	Stage 5 Revised Costing	Stage 6 Assessment of Benefits	Stage 7 Final Report
Inception Meeting <ul style="list-style-type: none"> - Meet and Greet - Discuss the overall project context, including key drivers, issues and constraints - Confirm scope/ approach/ timelines/ meetings - Identify consultation objectives/approach/stakeholders - Identify information gaps, sources and how these may be accessed 	Research <ul style="list-style-type: none"> - Existing documentation, previous investigations - Related strategic planning context documents - Relevant design criteria for rail alignment Data Collection <ul style="list-style-type: none"> - Key asset and services locations, future proposals and requirements - Topographic survey - Past flooding impacts on infrastructure - Other Client inputs Preliminary Investigations <ul style="list-style-type: none"> - Services and Utilities investigations (if not completed previously) 	Vertical Alignment <ul style="list-style-type: none"> - Confirmation of the ability to meet grade criteria Horizontal Alignment <ul style="list-style-type: none"> - Confirmation of the ability to meet design criteria for the horizontal alignment Infrastructure requirements <ul style="list-style-type: none"> - Where and how is grade separation required? - Location and spacing of passing loops - Requirement or otherwise for tunnels - Identification of major infrastructure constraints, including services - Key drainage issues - Impacts of provision for double stacking 	Key Stakeholder Consultation <p>Liaison through one on one discussions with key stakeholders including</p> <ul style="list-style-type: none"> - Rail infrastructure owners, operators and users - DPTI - RDAs - Flinders Ports Define the Freight Task <ul style="list-style-type: none"> - Confirm the current demand - Define future demands - Define the spare capacity of the existing rail corridor 	Preliminary Cost Estimate <ul style="list-style-type: none"> - Today's dollars - Current industry rates and standard prices - Clearly set out assumptions - Choice of materials that are readily available - Limited to a rail corridor realignment only; ie no road 	Economic, Social and Environmental Benefits <ul style="list-style-type: none"> - Direct and Indirect Benefits, eg - Improved equity of access to jobs and service opportunities - Greater urban consolidation - Savings in the life and capacity of the south eastern freeway - Creation of metro public transport options - Potential impact of the Inner Rail Project 	Draft Report <ul style="list-style-type: none"> - To be a culmination of investigations - Represents an update of the previous GHD report, with focus given only to Option 3 - Includes updates freight data and forecasting - Includes updated cost estimates - Includes a broader approach to the overall economic impacts from the full range of perspectives; direct and indirect - Includes consideration of the economic impact of the proposed Inland Rail Freight Corridor for east-west movements Final Report <ul style="list-style-type: none"> - Refinement of the Draft Report to include client comments
OUTPUTS <ul style="list-style-type: none"> - Return Services Brief, including updated Project Plan 	<ul style="list-style-type: none"> - Compiled set of existing information - List of additional information required, with an agreed approach to obtain these 	<ul style="list-style-type: none"> - Confirmation of the ability or otherwise to achieve the vertical alignment grade constraints - Understanding of the key impacts of the alignment; ie land, infrastructure constraints, infrastructure requirements 	<ul style="list-style-type: none"> - Stakeholder consultation summary - Confirmation of the current and future freight task - Understanding of the spare capacity of the current alignment - Broader feedback on the alignment in general 	<ul style="list-style-type: none"> - Revised project costing 	<ul style="list-style-type: none"> - A comprehensive, revised set of benefits/drawbacks of the alternative rail corridor alignment, in accordance with the approach required by Infrastructure Australia 	<ul style="list-style-type: none"> - Draft Report for review and comments - Final Report
CONSULTATION						
Project Initiation Meeting 1	Project Progress Meeting 2	Discussion with Client as required	One on one discussions with key stakeholders	Project Progress Meeting 3	Round Table Discussion with RDAs	Presentation to the Client
TIMELINES						
14/8/17	14/8/17 to 25/8/17	28/8/17 to 8/9/17	28/8/17 to 6/10/17	9/10/17 to 20/10/17	9/10/17 to 3/11/17	14/8/17 to 1/12/17

Note: Project Review Meetings shall be held equally in both Strathalbyn and Adelaide



Appendix B

Relevant Literature and Reports

Who Moves What Where - Freight and Passenger Transport in Australia

National Transport Commission, August 2016

To be completed as part of the Final Report

South Australian Rail Freight – A Bypass to Save the Heart of Adelaide

Mitcham Community Rail Freight Task 2007

In 2006 the City of Mitcham initiated a Rail Freight Task Force (RFTF). This group, comprised of elected Council members and community representatives, sought to address concerns expressed from residents affected by freight train movement on the Adelaide Hills Line.

The report identified that there are various issues associated with its existing alignment through tunnels, tight curves and steep gradients, including those associated with noise, health, safety and delays in traffic.

This report identified a number of key issues which assist in contextualising the importance of the project:

6. Rail freight is more efficient than road transport. Freight trains can carry the equivalent of 35 road trains through the Adelaide Hills
7. Almost all freight traffic bound for the east or west currently travels through the Adelaide Hills Railway System Corridor
8. The ports of Darwin and Perth (Fremantle) and their proximity to South East Asian markets compared with east coast cities, makes them increasingly important destinations for imports and for the export of Australian made goods and bulk commodities transported by rail. The Adelaide Hills Corridor is an important link for this market.
9. The imposition of the urban growth boundary means that the Adelaide Hills part of the railway corridor will become more densely populated throughout the hills zone and beyond.

The report aimed to develop appropriate solutions to the issues raised, including the proposal of a freight train bypass north of Adelaide and the suggestion to convert the existing railway into a passenger line. It highlighted the various potential benefits associated with this, including:

- Higher track speeds and fewer delays, therefore improved freight transit times
- Operator cost savings
- Reduced fuel costs
- Reduced greenhouse gas emissions
- Ability to double stack containers
- Longer train lengths
- Improved efficiency of the National freight network

The report also suggested potential benefits could be associated with supporting South Australia's mining industry.

The report concluded that:

"...The Rail Freight Task Force recommends a new freight train bypass to the north of Adelaide. The new corridor, running from Murray Bridge in the east to Mallala in the west, would be much straighter and would travel through relatively unpopulated and much flatter country than the present route...the bypass offers long-lasting benefits to both residents of the wider community as well as to those in the rail freight industry. It increases the efficiency and carrying capacity of

the rail freight industry in order to accommodate the inevitable increase in freight volumes in the coming years.

...At the same time it allows the Adelaide Hills Line to fulfil its full potential in becoming a dedicated public transport corridor which, could more effectively serve metropolitan Adelaide as well as the rapidly expanding communities of the Adelaide Hills such as Mt Barker and beyond...

Adelaide Rail Freight Movements Study Final Report

Prepared by GHD 2010

A report conducted by GHD was commissioned to investigate existing and future rail movements to and from Adelaide, where the capacity of the current rail line to meet these demands was assessed.

Following an assessment of freight demand forecasts the report found that, when accounting for expected upgrades planned between 2009 and 2011, capacity was not expected to become restricting until 2025 and 2030.

The Study also found that the rail alignment through the Adelaide Hills between Murray Bridge and Salisbury freight movement efficiency is constrained due to steep grades and tight curves resulting in

- reduced speeds and decreased efficiency (trains were found to be using 50% more locomotive power per tonne than other rail corridors),
- restriction of trains to a maximum of 3500 tonnes,
- increased 'wear and tear' and increased maintenance
- Due to the proximity of the rail alignment with urban areas, a number of social and environmental amenity issues were also raised, including
- train noise
- impact of freight on traffic delays at level crossings
- risk to public safety (incl. pollution)

Five options for the realignment of the rail corridor through this section were explored in this report:

- Base Case: Existing alignment between Murray Bridge and Islington remains unchanged. Includes existing expected improvements (new or extended passing loops)
- Option 1: Upgrade the existing alignment (orange in Figure 10.1). Includes grade separation level crossings, additional passing loops, improvements to enable double stacking.
- Option 2: Northern Bypass via Truro (red in Figure 10.1). Flatter alignment by re-directing to Truro.
- Option 3: Northern Bypass via south of Truro (blue in Figure 10.1). Flatter alignment by re-directing to Truro.
- Option 4: Southern Alignment (purple in Figure 10.1). Bypass to the south, including 22km of tunnelling.
- Option 5: Upgrade existing and Northern Bypass via south of Truro. Combination of Option 1 and Option 3.

The options were assessed for appraisal against a number of objectives and comment sought from the public. A benefit cost analysis was then performed to give an indication of the economic viability of the various options. This CBA found that

- Capital costs are high and outweigh benefits
- Operational benefits (such as reduced land transport costs and reduced transit times) are modest
- Social benefits are minimal

The two seemingly 'top' options were the upgraded existing alignment (Option 1) and the northern bypass south of Truro (Option 3 (now known as Northlink)). Despite this, based on the CBA conducted, the Study found that none of the options investigated were economically feasible.

Unfortunately, the full extent of detailed investigations undertaken to complete this report have not been available for reference for this Scoping Study.

Adelaide Interstate Rail Freight – Brief for Strategic Assessment of Corridor Options, SGS Economics 2010

The report produced by SGS Economics and Planning, commissioned by a voluntary group of Councils, reviewed the Adelaide Rail Freight Movement Study (RFMS) conducted by GHD and assessed the validity of the outcomes produced in the study.

In including a 'traditional' scope and undertaking a CBA, the RFMS Study conducted by GHD focussed on freight movement efficiencies and found that none of the options investigated produced net positive CBAs. The review conducted by SGS, however, suggested that the scope of this study was too narrow, where the impacts associated with the various options are broader and not negligible, and therefore should be accounted for to deliver CBAs that are representative. It argued that additional focus should be given to 'cross-sectoral' issues, such as impacts on settlement patterns and regional productivity in other industries, which can deliver broader social benefits not quantified in the CBA previously undertaken for the various options.

In particular, SGS recommended that as a minimum, the current benefit cost analysis for Strategic Assessment of Corridor Options should be paired with a complementary analysis, as follows:

- Specification of alternative metropolitan urban development scenarios under the different rail freight options, covering the distribution of jobs and housing at a suitable small areas level (e.g. travel zones)
- Specification and analysis of appropriate travel time matrices (houses to jobs) for these various scenarios, to measure agglomeration effects
- Identification of a comprehensive impacts table covering metropolitan and regional 'city shaping' and impacts
- Quantification of amenity and urban (metropolitan and regional) consolidation benefits
- Quantification of productivity and human capital development benefits.
- The presentation which accompanied this report also highlighted the following:
 - The concept would allow for freight hubs in the Murraylands and the Two Wells district
 - There is potential to run high quality public transport services from the Hills into Adelaide using former freight corridor and therefore freeing up road capacity
- 65 of the 68 Councils support the proposal
- All of SA's RDAs have prioritised this project

A second presentation prepared in 2012 identified a number of more specific issues which were not covered by the GHD Freight Movement Study, as follows:

- Creating more jobs in regional areas and in accessible inner urban locations would boost equity of opportunity across the state. This is a valuable community benefit in its own right.
- There are still a considerable number of freight dependent manufacturing and warehousing businesses utilizing large areas of land in the inner suburbs. Freight hubs outside the Metropolitan area may be part of a strategy to urge re-location, and free up this valuable land for housing
- Building up employment density in Adelaide would boost productivity
- The South eastern Freeway carries large numbers of heavy vehicles. Due to the need for them to 'crawl' down, and 'climb' up the Freeway, they use much of the Freeway capacity
- The freeing up of a significant part of this capacity will reduce travel time, and potentially delay for a decade or more the need to widen or duplicate the Freeway
- This would also deliver significant safety benefits of the 'down track' of the Freeway and the Toll Gate intersection
- Taking freight trains out of the Adelaide Hills creates a possible corridor for exciting Public Transport Options, including both passenger rail or a busway option.

Northlink – Getting SA on Track

In July 2010, GHD prepared an Adelaide rail freight movements study for the Department of Infrastructure, Transport, Regional Development and Local Government (DITRD LG). Five options were investigated for the rail freight alignment, including retention and upgrading of the existing Adelaide Hills rail freight line and a 'northern bypass'. The report concluded that the existing hills rail freight alignment would be serviceable for at least 15-25 years.

Despite indications of significant long term benefits for regional and urban communities for a northern rail freight bypass (i.e. Northlink), neither the State or Federal Government has expressed support in this regard. The above investigation dismissed the option to build a 'northern bypass' based upon capital cost.

In 2010 a Northlink Reference Group was formed, comprising the Mitcham Council, Adelaide Hills Council, Unley Council, District Council of Mallala, Rural City of Murray Bridge and the Regional Development Australia groups of Barossa, Murraylands and Riverland and Metropolitan Adelaide. The group collectively recognise the potential of an Adelaide northern rail freight bypass to deliver job creation, competitive advantage and community building and the opportunity to persuade Governments that a Northlink bypass is a sound long term investment for Australia's Rail Freight Network that will facilitate both urban and regional growth.

The report set out a number of actions to be undertaken and concluded that "...this is a once in lifetime social and economic development opportunity for South Australia that should be enabled by progressive State and Federal Governments...".

Northlink Road and Rail Bypass - 2015 update

This document provided a short history of the project to date, and summarised the current position as follows:

- The concept is in favour with the State Liberal Government but not that of Labor. At a Federal level, infrastructure spending on rail in the eastern states is considered to be of greater importance
- Rail freight has increased in length, weight and frequency over the past 10 years, which is positive from an economic perspective, but also increases noise, health, safety and traffic delays
- The rapid increase in population and industry growth in the Adelaide Hills to Murray Bridge corridor may also affect the destination to which freight is being directed (potentially away from Adelaide)

In conclusion, the RDAMR will advocate renewed interest in the bypass to both State and Federal Governments.

DIRD – Bureau of Infrastructure, Transport and Regional Economics (BITRE) – Australasian Railway Association Statistical Report – Trainline 4 (November 2016)

Trainline 4 provides an overview of freight, urban and non-urban passenger rail across Australia. The report analyses traffic levels, the provision of infrastructure and rolling stock, and railway performance.

Table 5 of Chapter 2 -Rail Traffic, indicates that over the 3 financial years of 2012–13, 2013–14 and 2014-15, the tonnage of interstate intermodal traffic on the Tailm Bend – Dry Creek line segment has been in decline.

Discussion Paper 1: Australia's Future Infrastructure Requirement

Infrastructure Australia 2008

Infrastructure Australia is a statutory advisory council, providing advice to governments, investors and owners of infrastructure. As a consequence of discussions with stakeholders and internal research, Infrastructure Australia produced a discussion paper to encourage conversation, raise questions and facilitate the identification of issues and advice regarding infrastructure of national significance from community members, as well as industry and government.

Submissions were provided to this discussion paper addressing the following questions:

- What are the features and goals of Australian Infrastructure?
- Why is it important?
- What are the problems?
- What are the impacts of these problems?
- How did these problems come about?
- How might these problems be addressed?
- Given the situation, what should be done first?

Submissions were used by Infrastructure Australia to develop a report to the Council of Australian Governments.

Infrastructure Australia – Checklist for Stages 3 and 4: Business Case Development and Business Case Assessment

Infrastructure Australia is an independent statutory body with a mandate to prioritise and progress nationally significant infrastructure. This document provides a checklist for proponents when preparing a submission (or Business Case) for Infrastructure Australia.

The complete Infrastructure Australia Assessment Framework (June 2017) can be found at infrastructureaustralia.gov.au. The Assessment Framework Stages are as follows:

Stage 1 – Problem Identification and Prioritisation

Stage 2 – Initiative Identification and Options Development

Stage 3 – Business Case Development

Stage 4 – Business Case Assessment

Stage 5 – Post Completion Review

Previous studies and investigations have considered Stages 1 and 2 in detail; this Scoping Study will need to address the requirements for Stages 3 and 4, which are outlined in detail in Infrastructure Australia's Submission Checklist C6; named "Checklist for Stages 3 and 4: Business Case Development and Business Case Assessment".

Some of this work has already been completed as listed in the checklist, but to address these checklists fully, more detailed evaluation of key project elements must be undertaken, including:

- Reflection of the proposal for a single (rather than double) rail track

- Land use projections
- Population and employment projections
- Key assumptions
- Changes in numbers and distribution of population and employment
- Wider economic and social benefits of the project
- Related initiatives or projects
- A revised Cost Benefit Analysis
- Assessment of non-monetised costs and benefits, and
- Consideration of Delivery of the project.

These (in particular) and other project elements will need to be clearly articulated and addressed in developing and completing a Business Case for the Northern Rail Bypass.

‘National Link’ – Connecting Australia’s Rail Freight Network

Broken Hill Council, Ballarat Council and Mildura Council 2008

In response to Infrastructure Australia’s Discussion Paper 1, GHD undertook a report for Broken Hill, Ballarat and Mildura Councils which highlighted that there currently exists a gap between the east west transcontinental rail line and the Mildura-Geelong rail line. This means that freight moved to Melbourne from Perth or Darwin must travel via the Adelaide Hills. Given the inefficiencies along this section of rail line, freight is often moved by road.

This submission proposed a solution; the National Link Project, consisting of a 220 kilometre rail connection to close this gap. This would enable freight moving between these destinations to travel along the east west transcontinental line (north of Adelaide), bypassing Adelaide altogether.

This report highlights the inefficiencies of the Adelaide Hills section of the rail freight network as being the excessive gradients of the route and its inability to handle double stacking of containers.

Murray Basin Region Freight Demand and Infrastructure Study Project Report – July 2014 (DTPLI)

This study comprised investigation of the current and future freight demand in the region covering the north-west of Victoria, south west of New South Wales and adjoining areas of South Australia, to provide a basis for future infrastructure planning in the region.

Key outcomes of the assessment included confirmation of a high and increasing level of output from freight transport activities relating to grain, mineral sands, food and wine products and general freight (for domestic use and export). Developing transport needs in the mining and interstate sectors were evident with significant growth predicted over the next 20 years and beyond.

The report concluded that in order to meet the projected freight demand for the region, a ‘Transcontinental Link’ between Maryborough and Yelta should be constructed.

Integrated Transport and Land Use Plan (‘ITLUP’)

This Plan has been produced since the preparation of the Adelaide Rail Freight Movements Study Final Report (2010)

1 – Our Vision for South Australia

An alternative freight line in northern Adelaide will reduce travel times for goods to Port Adelaide and Outer Harbour and reduce the need for freight trains to use the existing line through the northern suburbs.

In conjunction with the rail grade separation of Goodwood junction, longer-term upgrades to the freight rail line through the Adelaide Hills will also improve domestic and interstate access to our industrial centres and Outer Harbour.

Regional South Australia

...Actions in the Plan will better connect regional communities to jobs, services and opportunities...improved access to community and passenger transport will give regional South Australians more travel options.

...With massive growth inspected in the volumes of freight moving around the state, interstate and overseas we must find ways to manage this task efficiently and safely, by using High Productivity Freight Vehicles, freight rail and ships.

Key Challenges to Achieving our Vision

2 – Providing efficient connections to export/import gateways

In an increasingly globalised world, any transport infrastructure limitations will have major impacts on trade competitiveness in an export-reliant economy such as South Australia's – with flow on-effect on jobs, investment and economic development across the state.

3 -Prioritising transport infrastructure and services to encourage mixed use development in central and inner Adelaide

Providing adequate transport services to low density, new outer metropolitan growth areas can be expensive and inefficient. With more people wanting to live in central and inner Adelaide, providing transport to encourage higher density, mixed use development in the central and inner city needs to be a priority.

3.2 Greater Adelaide

...The growth of Mount Barker District Council, designed to prevent incremental, ad-hoc and unplanned development of important agricultural and water protection areas across the Mount Lofty Ranges, will create a demand for more efficient travel through the middle suburbs to the city centre.

Transport and land use issues in Outer Adelaide

"...deliver more frequent and reliable connections for people in the outer suburbs accessing employment and services within inner and middle Adelaide..."

"...enhance the efficiency and safety of freight movement to key ports and support the growth of industry and business..."

6.4 Moving our Goods

We have a different freight mix – relative to other states such as Queensland, Western Australian and New South Wales, South Australia has a significantly lower volume of bulk products destined for export markets (such as iron-ore and coal)

Interstate freight comprises the majority of our domestic freight task – Interstate freight accounts for approximately 70% of the total freight task, with interstate movements accounting for 30%. We transport the majority of our interstate freight by sea, with coastal shipping comprising 44% of our total interstate freight task.

A growing and evolving freight task

South Australia's freight task is substantial and was estimated to be 35.7 billion tonne kilometres in 2010/11, representing 6% of the total Australian domestic freight task. Our freight task is also growing. Between 1995/6 and 2007/08 South Australia's domestic freight task grew by 35% at an

average of 2.4% per annum. While this growth is less than that for the nation (at 3.5% per annum), South Australia's contribution to Australia's total freight task is likely to be underestimated as the figures do not include 'through freight' - freight which does not originate or terminate in South Australia, such as freight moving between the eastern states and Western Australia.

It is worth noting that the decline in our vehicle exports over the past decade has been accompanied by the strong growth in mineral and grain exports, reflecting the rapid expansion of the mining sector as well as the ongoing importance of agricultural production to the state. The mining commodity of the freight task is expected to increase rapidly and the efficient management of this task is a key challenge for South Australia.

Appendix C

Inland Rail Project Sheets



Australian Government

BUILDING OUR FUTURE

ARTC **InlandRail**



SERVICE OFFERING

ABOUT INLAND RAIL

Inland Rail is a once-in-a-generation project connecting regional Australia to domestic and international markets, transforming the way we move freight around the country. It will complete the 'spine' of the national freight network between Melbourne and Brisbane via regional Victoria, New South Wales and Queensland.

This new 1,700km line is the largest freight rail infrastructure project in Australia. Early works will start in 2017, and based on the 10-year delivery schedule developed in 2015, the first train is expected to operate in 2024/25.

The dedicated freight network will connect our farms, mines, cities and ports to global markets and will support Australia's four richest farming regions; provide supply chain benefits and substantial cost savings for producers.

The Australian Government, through the Australian Rail Track Corporation (ARTC), is delivering the multi-billion dollar infrastructure in partnership with the private sector. The Government has committed \$8.4bn to deliver Inland Rail, on top of the \$900m already funded.

DEVELOPING THE SERVICE OFFERING

Inland Rail will provide freight customers on the east coast with competitive pricing, 98% reliability, a transit time from Melbourne to Brisbane of less than 24 hours, flexibility for faster and slower services, and freight that is available when the market wants.

This service offering is central to Inland Rail and reflects the priorities of freight customers for a road competitive service based on reliability, transit time, price and availability.

This service offering was developed in close consultation with customers, rail users and other key stakeholders.

The industry and freight customers have been consistent in expressing their priorities throughout this process and these remain at the core of the service offering.

They highlighted the need for flexibility, interoperability, the importance of terminals and to clearly state the target for reliability.

This feedback is reflected in the service offering, with a clear potential for faster and slower services to meet customer needs (while preserving the core offering of a 24 hour transit time from Melbourne to Brisbane); a clearly specified reliability target of 98%; and clarity around the commitment to interoperability with connections to the NSW country rail network and Queensland narrow gauge network.

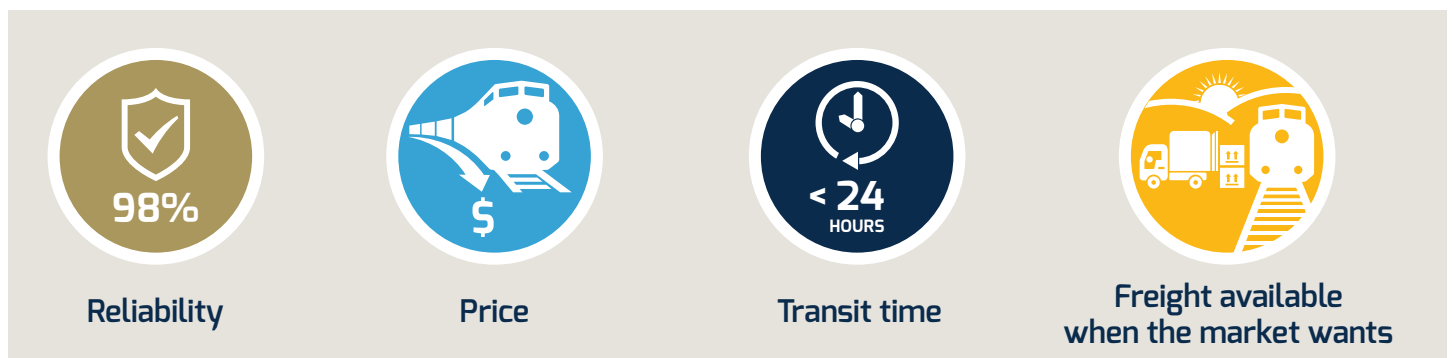
While the service offering is specific to the rail network, terminals are a critical element and ARTC will continue to work with terminal operators and proponents as the Inland Rail programme progresses.



KEY ELEMENTS OF THE SERVICE OFFERING

The key characteristics of the service offering are reliability, price, transit time and availability. These are underpinned by the key technical characteristics that are particularly relevant to rail operators as these directly influence operating cost structures and their own service offerings to the market.

A ROAD COMPETITIVE OFFERING



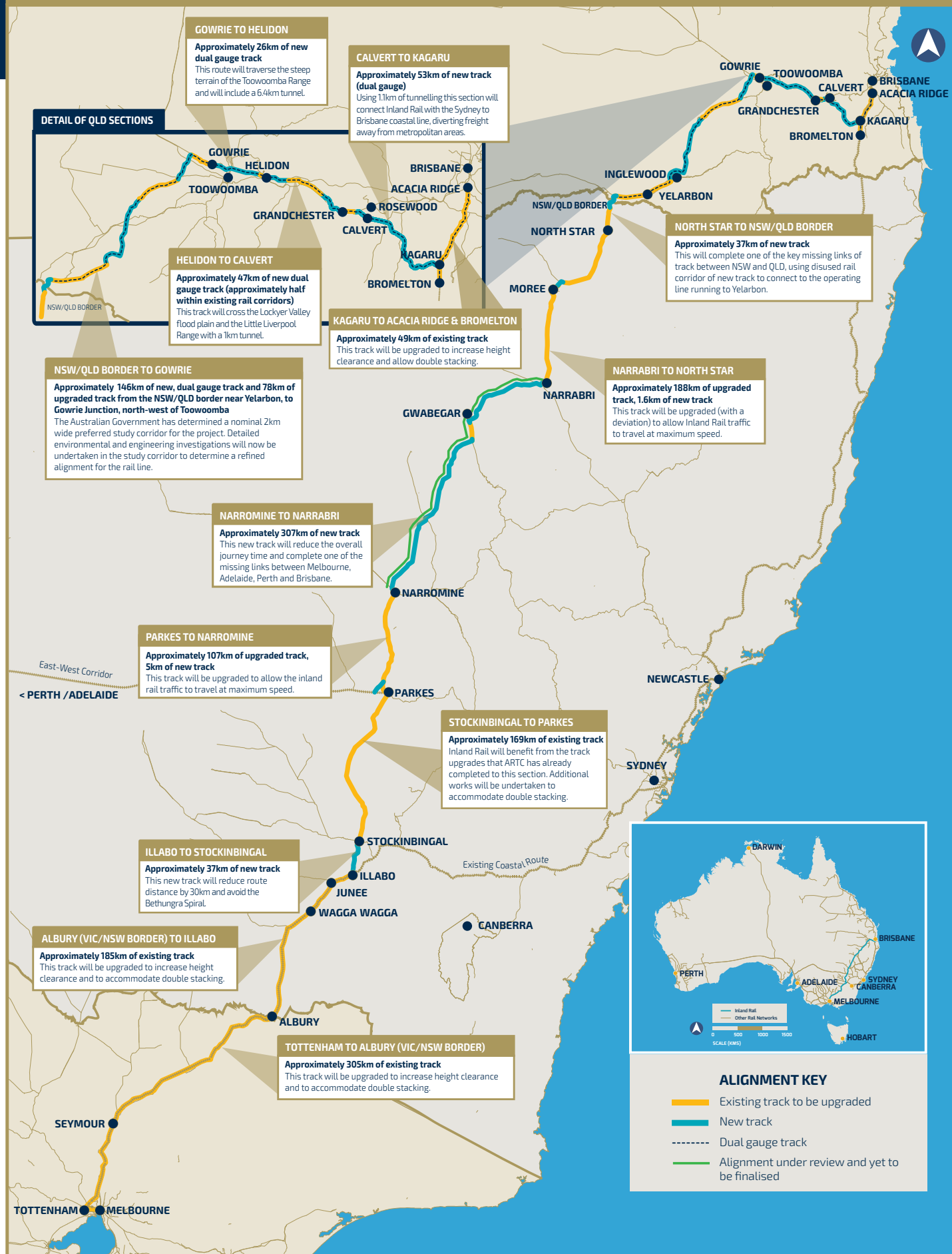
» Inland Rail - Key technical characteristics that underpin the service offering

Train Length	1,800m with future proofing for ultimate 3,600m train length
Axle Load / Max Speed	21 tonnes @ 115km/h, 25 tonnes @ 80km/h, with future proofing for 30 tonnes @ 80km/h
Double Stacking	7.1m clearances for double stack operation
Interoperability	<ul style="list-style-type: none"> ▶ Full interoperability with the interstate mainline standard gauge network ▶ Dual-gauging in Queensland to provide for connectivity to the Queensland narrow gauge regional network ▶ Connections to the NSW Country Regional Network to provide for standard gauge connections to the ports of Melbourne, Port Kembla, Sydney, Newcastle, Brisbane, Adelaide and Perth

INLAND RAIL PERFORMANCE SPECIFICATION

ATTRIBUTE		SPECIFICATION
Reference Train		
Intermodal		21 tonne axle load, 115km/h maximum speed, 1,800m length (initial), 2.7hp/tonne power:weight ratio
Coal / bulk		25 tonne axle load (initial), 80km/h maximum speed, length determined by customer requirements within maximum train length
Operational Specification		
Freight train transit time (terminal to terminal)		Target driven by a range of customer preferences and less than 24 hours Melbourne-Brisbane for the intermodal reference train. Flexibility to provide for faster (higher power:weight ratio) and slower (lower power:weight ratio) services to meet market requirements
Gauge		Standard (1,435mm) with dual standard / narrow (1,067mm) gauge in appropriate Queensland sections
Maximum freight operating speed		115km/h @ 21 tonne axle load
Maximum axle loads (initial)		21 tonnes @ 115km/h
		23 tonnes @ 90km/h
		25 tonnes @ 80km/h
Clearance (terminal to terminal)		As per ARTC Plate F for double stacking (7.1 m above rail)
Maximum train length (initial)		1,800m
Braking curve		G40 for intermodal reference train
Minimum Design Standards		
General alignment standards		
Design speed		115km/h
Maximum grade		1:100 target, 1:80 maximum (compensated)
		1:200 maximum at arrival or departure points at loops
Curve radius		1,200m target, 800m minimum
Cant / cant deficiency		Set for intermodal reference train
Medium speed alignment standards (mountainous terrain)		
Design speed		80km/h minimum
Maximum grade		1:100 target, 1:50 maximum (compensated)
		1:200 maximum at arrival or departure points at loops
Curve radius		800m target, 400m minimum
Cant		Set for coal reference train
Corridor width		40m minimum
Rail		Minimum 53kg/m on existing track; 60kg/m on new or upgraded track
Concrete sleepers		Rated @ 30 tonne axle load
Sleeper spacing		667mm spacing (1,500/km) - existing track
		600mm (1,666/km) - new corridors / track or re-sleepering existing track
Turnouts		Tangential, rated at track speed on the straight and 80km/h entry / exit on the diverging track
Crossing loops (initial)		1,800m (clearance point to clearance point) plus signalling overlap
		No level crossing across loops or within road vehicle sighting distance from loops
Future Proofing		
Train length		To provide for future extension of maximum train length to 3,600m
New structures		Capable of 30 tonne axle load @ 80km/h minimum
Formation		Formation on new track suitable for 30 tonne axle load @ 80km/h
Crossing loops		Loops designed and located to allow future extension for 3,600m trains
Reliability and availability		Competitive with road

INLAND RAIL ALIGNMENT 2017



Appendix D

Key Stakeholder Inputs

Department of Planning, Transport and Infrastructure (DPTI)

- DPTI believe that it will be many years before the capacity of the Adelaide – Melbourne line will be reached, particularly with the increase in train length from 1500m to 1800m
- Modal pricing and competition between modes drives the choice between road and train transport. Road is much more competitive on short haul corridors; rail is best serving long haul routes
- Road is very competitive on haul routes up to 800–1000km in length; consequently, the Adelaide to Melbourne rail freight market is relatively low. Freight on the corridor is therefore largely Melbourne to Perth freight, with some niche markets such as grain and SCT train.
- Grain volumes on the line have increased since the closure of the Mallee spur lines
- Double stacking would increase capacity, but will need to be done well – particularly on a short haul corridor. The Melbourne end of the corridor will also require significant investment, and double stacking will also require review of the container types (not all containers are suitable for double stacking)
- Significant consideration will need to be given to future potential of the existing corridor

The bypass may:

- Increase costs (for Adel – Melb and Melb – Perth due to the longer distance)
- Reduce the likelihood of the establishment of any intermodal facility in the South East
- Place pressure upon existing terminals in Adelaide
- Encourage operators to review existing terminal locations and freight systems
- Require investment in the Adelaide-Mallala corridor to accommodate additional two-way traffic on this section

Mid-Murray Council

- Consider the rail bypass concept to be ideal to have through this region rather than impacting the Adelaide Hills
- Potential outcomes/opportunities for the Council:
 - This may result in an additional grain silo, if there is potential for much more grain to use rail
 - There is an opportunity for the Mid-Murray Council to have maintenance yards around Sean and Cambrai (with links to the Sturt Highway)
 - Sedan has plenty of available farming land
 - A workforce is available (including from the Barossa)
- Ingham's feedlot at Tungali is considered to be very important as a commodity that can make use of rail
- Tepko has good potential for growth, with irrigation, water and gas, and very large farms
- Council advised that it would be worth following upon potential mining demand, via both Hillgrove and SACOME

Rural City of Murray Bridge

- Mount Barker District Council is very limited for industrial land, but through development of Monarto there is an opportunity to provide this in terms of jobs, growth and an economic zone. This is consistent with the Ministerial DPA for Greater Adelaide (2009?). Water at this stage however is an issue, but there are opportunities to provide this

- Should water become available, there are significant opportunities for horticulture and agriculture, including orchards, juicing and the like
- Should the Mildura – Menindee rail line go ahead, this would free up approximately 60% of the capacity of the line
- The RCMB is keen to see any changes or otherwise to the rail alignment ensure consistency with the Monarto Master Plan
- Note that the '2nd' Adelaide Airport at Monarto is proposed to accommodate both freight and passenger rail (Note – GLOBELink does not cover both)

Mitcham Council

- Considerable costs are incurred as a result of fuel and time costs due to traffic stoppages at level crossings through the area
- Other environmental impacts are noise, dust and bushfire risk
- A few summers ago a spark from the train (or thrown brake block) started a bushfire in Crafrers West within the Belair National Park and spread to peri-urban residential areas
- Study could give consideration to the WHO standards of noise and vibration due to the impact these have upon the local communities; the resulting sleep disturbance and economic impacts associated with reduced productivity.

District Council of Mount Barker District Council

- Opportunity for passenger rail

ARTC

Note: ARTC manages the interstate mainline rail track including the existing Murray Bridge to Mallala section running through the Adelaide Hills

- Overall volumes on this section of the track have declined since the 2010 study - historical stats outlining trends in volumes are attached
- There has been a decline in land bridged containers travelling to/ from Melbourne by rail as these containers are now moving direct through Port Adelaide on new and existing shipping services
- In the past there were 9 trains per week travelling to and from Melbourne carrying these export containers. There are no services dedicated to this trade today with any remaining land bridged volumes now travelling on other services carrying domestic freight
- In addition, Brisbane to Adelaide traffic (which used to travel via Melbourne) now travels via the Broken Hill corridor
- There has been some increase in Melbourne to Perth traffic volumes (with some recent offset of growth as a result of volume declines driven by the downturn in WA's mining sector/activity)
- Mindarie Sands operations have also ceased since the 2010 study (original closure September 2009); this was restarted by Murray Zircon in 2012 through to March 2015. This has again ceased operation – although the opportunity to reopen remains
- While grain volumes can vary depending upon seasonal conditions, there have been no significant changes over recent years
- Steel volumes on the rail line are expected to decline due to the cessation of vehicle manufacture in Adelaide
- ARTC do not consider capacity to be an issue, rather productivity

- Note that 1800m trains that can now access the network represent a 20% capacity increase over 1500m trains that could access the network in 2010

Genesee and Wyoming Rail (GWR):

- Over time, rail freight volumes have declined
- Would prefer to see the existing corridor upgraded rather than a realignment

Primary Producers SA:

- There is potential to use the existing rail corridor (via Belair etc.) to construct a dedicated passenger transport system between Adelaide and Mount Barker District Council; this would prolong the life of the South Eastern Freeway and will defer its expensive replacement and/or duplication.
- The overall cost for the northern rail bypass could be significantly reduced when compared to the current proposal by provision of a single track only with passing loops.

Monarto Inland Port (MILP):

- DPA passed by the City of Murray Bridge in 2015 to facilitate changes and future development. Master plan for the overall development prepared by Jensen planning in 2015. A Business Plan (confidential) has also been prepared
- An intermodal terminal at Monarto is expected to be attractive for containerised food products produced from the Barossa Valley, Adelaide Hills, Langhorne Creek, the South East and the Murraylands region. Other opportunities could include Ingham's feed mill and Big W's distribution centre
- A container facility for maintenance and repairs etc. as well as rail workshops are also economic opportunities
- An intermodal facility at Monarto can occur independently of the rail realignment, but there is a desire for the intermodal facility to be linked to the rail network
- Would like to see double stacking

Note: Since this discussion, MILP has now received consent for Stage 1 approval.

Viterra

- Of the opinion that there are other priorities to spend money on rather than a new rail corridor alignment
- Advise that due to the history of the rail corridor, residents etc. should expect to hear the noise generated by the train, rather than to simply 'shift' this to other communities; perhaps noise mitigation measures could be implemented?
- Viterra currently transports around 600,000 tonnes per annum of grain from Tailem Bend to Adelaide as funnelled in from other areas)
- Some grain growth can be expected from areas such as the Mallee and the Lower South East
- Viterra has heavily invested at Tailem Bend to facilitate the road to rail transfer
- Viterra considers the rail bypass to be a less viable option than the current alignment through the Adelaide Hills as the route distance will be longer and transit times are expected to be longer
- Concern that the rail bypass may also see more Melbourne to Perth trains bypass Adelaide altogether
- It has been suggested that a benefit may exist for Viterra and others if the corridor was changed and a spur line added such that the existing rail corridor via Freeling, Roseworthy

and down to port Adelaide were re-established as part of the standard gauge network (approx. 300 000t per annum). It should be noted however that the recent enhanced access for High Productivity Vehicles to/from Roseworthy may make any shift back to rail less viable.

Australian Portable Camps

- APC is actually a mining based business; this has slowed however and therefore APC has decided to now push forward with the Monarto Intermodal
- Has received formal approval (16/9/17) for Stage 1 of the Monarto Intermodal Facility; this being the track work (i.e. Section 49 – Crown Development Application approval)
- Stage 2 will allow for storage of fresh produce and is currently being prepared for lodgement for State Development approval.
- The facility has a total of 4 stages, and is consistent with the Monarto Master Plan as prepared by Jensen Planning. Upon completion, the facility could reach a capacity of 50,000 TEU's per annum (if financially viable)
- Note that in 2008, the Big W distribution Centre generated 20,000 TEUs per annum; they have a contract with SCT for another 3 years
- Currently it is not cost effective to use rail for Camp transport. In future, there may be opportunity to set up a remote commercial facility to utilise the rail infrastructure
- Also refer Monarto South Intermodal Land Use Study (2008) – available online. This includes forecast volumes for freight.

Note: Since this discussion, APC has withdrawn its Section 49 application for the Monarto Intermodal Facility.

Pacific National

- Believes the current corridor is ok, but supports the bypass if longer, heavier and double stacked trains can operate on the national network between Melbourne and Adelaide and use less horsepower
- Pacific National provides hook and pull services for Great Southern Rail's (GSR) passenger services. The Indian Pacific and Ghan will not be impacted, however the (government subsidised) Overland service between Adelaide and Melbourne will be impacted if the route is changed
- Pacific National would not move its Adelaide terminal (Islington) to Mallala in the near term. Instead they would bring their train from Mallala into Adelaide
- Pacific National currently operates 18 trains per week on the Melbourne – Adelaide corridor and return
 - 7 x intermodal Superfreighters from Melbourne to Perth
 - 3 x Intermodal Express Trains from Melbourne to Perth
 - 5 x Intermodal Superfreighters from Melbourne to Adelaide
 - 1 x Intermodal Superfreighter from Sydney to Adelaide
 - 2 x SteelLink Trains from Melbourne to Perth

All of these trains would be impacted by this change

- Some Melbourne to Perth containers are loaded on the Melbourne to Adelaide trains and then double stacked on top of containers on the Melbourne to Perth trains in Adelaide. This increases the train's payload capacity while remaining within the 1800m confines of the interstate rail network between Adelaide and Perth

- Double stacking on the Adelaide - Melbourne line (as well as the Inland Rail currently being progressed) will require their Melbourne terminal to relocate from current Dynon site and free from any overhead bridge restrictions and tunnels that currently exist between Melbourne and Adelaide
- There are significant economies available to Pacific National if they can double stack trains from Melbourne to Perth
- In future, Pacific National may have the option to consign some Melbourne to Perth double stacked trains via the Inland Railway to Parkes (and then onto Perth via Broken Hill, Port Augusta and Kalgoorlie)
- Currently, an extra loco is required to be added to trains entering and exiting Adelaide from the east to cope with the steep gradients of the Adelaide Hills (added to and taken off trains at Tailem Bend). Until the bypass route is decided it is unclear whether this additional locomotive power will still be required if the Northern Bypass is constructed)

SAFC

- Does not support the rail bypass at this time, given the recent investment in upgrades to the Adelaide- Melbourne Rail Corridor to cater for 1800m long trains
- Note that the cost to upgrade the corridor will now be reduced as a result of these recent works
- Concerned that double stacking will continue to be an issue unless issues are also resolved across the Victorian border

Bowman's Rail

- Significant customers such as Big W (DC at Monarto), Thomas Food International (meat at Lobethal and Murray Bridge), Lithgow Enterprises (hay at Tailem Bend) and JBS (meat at Bordertown and Port Wakefield) are understood to have recently signed long term contracts that commit them to road (Qube)
- Most Adelaide origin/ destination imports and exports are now consigned direct through Adelaide due to land bridge costs to and from Melbourne
- Bowman's currently run 6-8 trains per week between Bowman's and Port Adelaide, carrying containerised hay, grain and pulses and lead, and also stop to collect wagons carrying wine from the SCT Terminal at Penfield

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- There are significant industry development opportunities that may be consigned to rail, thereby becoming customers for any proposed rail bypass (e.g. Thomas Foods, Australian Portable Camps)
- Product is also expected to move up the value chain resulting in different products requiring different freight tasks that may be consigned to rail
- Future changes to road pricing regimes may change the competitive positions of rail and road (in favour of rail)
- Industry will make the decisions about how will they will consign freight in the future in a competitive market

Appendix E

CBA Review – Agglomeration Economies and Effective Job Density

SGS Economics and Planning

Agglomeration economies

Agglomeration economies relate to the productivity enhancements that firms gain from locating in an area of relatively dense economic activity. These benefits stem from a variety of factors including:

- The ability to achieve economies of scale and scope through specialisation given the large numbers of potential customers that are readily accessible;
- The availability of numerous supply sources and potentially specialised infrastructure, and the competitive environment that stems from this; and
- Access to a deep and diverse pool of skilled labour, often complemented by high levels of technological/ knowledge transfer between firms, which helps bolster innovation.

Literature related to agglomeration can be traced back to the work of Marshall (1920). Marshall's work, despite the passage of a century, still provides an excellent description of the conceptual benefit which firms can gain by locating in a particular location. Since that time agglomeration has been measured in a number of ways including city population (Aaberg, 1973; Tabuchi, 1986), industry employment (Nakamura, 1985; Henderson, 1986), the number of industrial plants (Henderson, 2003b) and effective job density (Graham, 2006).

Although all these methods attempt to measure the same basic economic phenomena, there are two somewhat distinct effects at work. The first is *scale* of the city, i.e. the larger the city, the higher the productivity. The second is related to the actual *spatial organisation* of the city, i.e. the ease with which firms can interact with each other.

Effective job density

A simple measure such as looking at the employment density of an area does not effectively demonstrate the phenomena of agglomeration. A firm in a relatively low-employment area but located on the edge of a Central Business District (CBD) could potentially capture agglomeration benefits by being close to the CBD. Thus a measure of agglomeration must “*incorporate both proximity and the scale of the economic activity and ...be calculated for very small areas*” (Graham, 2006).

Accordingly, this study has used the level of employment relative to the time taken to gain access to that employment and the mode split that is currently experienced by those employees. The travel time matrix (sourced from the South Australian Government's Metropolitan Adelaide Strategic Transport Evaluation Model (MASTEM)) is available for 298 travel zones across Adelaide. A travel time matrix shows how long it takes to travel from one zone in the city to all other zones by both car and public transport. In the analysis presented in this section the travel times have been converted from the travel zone level to a Statistical Local Area level.

This measure of effective job density (EJD) enables a more ‘real life’ representation of the proximity (in terms of travel time) component of agglomeration that other more basic measures overlook. That is, 37% of people working in the CBD of Adelaide travel to work on public transport and thus the proximity to those jobs is somewhat related to public transport travel times. The other extreme can be seen in locations such as Marion (an outer location in Southern Adelaide), where 95% of workers travel to work using private vehicles². Therefore, effective job density has been estimated as follows:

$$EJD_i = \sum_j \left(\frac{PT \text{ Mode Share}_j \times Emp_j}{PT \text{ Travel Time}_{ij}} + \frac{(1 - PT \text{ Mode Share}_j) \times Emp_j}{PV \text{ Travel Time}_{ij}} \right) \quad (1)$$

Where:

² This method excludes travel times from other modes (bicycle or walk).

EJD_i is the Effective Job Density for zone i ;
PT Mode Share $_j$ is the percent of work trips which involve public transport for zone j ;
Emp $_j$ is the number of jobs/employment within zone j ;
PT Travel Time $_{ij}$ is the time it takes to travel on public transport from zone i to zone j ; and
PV Travel Time $_{ij}$ is the time it takes to travel by private vehicle from zone i to zone j .

This method also provides insight into the costs associated with travel in various parts of the city. A rational commuter would use the mode of transport which would minimise their travel costs including value of time and any monetary cost. Therefore, the mode split between public transport and private vehicle at a particular origin-destination pairing should provide insight into the overall travel cost. The travel zone EJD is then aggregated to an SLA level using a weighted average based on population for origin and employment for destination.