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Containerised cargo demand assessment

Central West NSW

Transport for New South Wales

Containerised Cargo Demand Assessment, Central West NSW

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Executive summary

The Central Western Region (the region), produces major export commodities and goods for domestic consumption. Producers of these commodities typically take prices from global markets and so transport costs in Australia influence their profitability and competiveness, and in turn economic activity in the region. The region also relies on inbound goods to support production and a high standard of living. So, access to efficient freight networks into the future is critical to support economic growth in the region.

The region is well connected to domestic markets by the road-based freight network. The capital cities of Melbourne, Adelaide and Brisbane are all accessible via onward National Highway connections from the Newell Highway. Sydney is also accessible from the region by road, with constraints on vehicle size through the Blue Mountains.

Several rail lines run through the region, with the Main West Line and the Broken Hill Line providing a connection through to the ports of Botany, Newcastle and Kembla. There are also a number of branch lines connecting to the main line in the area, which are part of the NSW Country Regional Network.

Rail currently plays a strong role in the region for certain commodities. There are currently 10 operational intermodal terminals (IMTs) in the region, but only two of which are considered accessible to third party shippers. Further, there is one inactive intermodal terminal, and one proposed intermodal terminal in the region.

This report examines the potential future role of rail in the region. Using a contestability framework, commodity groups that are potentially contestable are identified, and their growth is modelled through to 2031. Geo-spatial analysis is used to assess this growth, and its implications for the infrastructure needs of the region.

With a forecast of approximately 44,000 additional contestable TEUs in the study area by 2031, PwC's geo-spatial analysis demonstrates that there may be scope for additional terminals in the region in the future. Triggers for new infrastructure investment will most likely be growth in containerised grain exports or mining inbound volumes. The location of new terminals will be critical to their success, as will thorough business case assessment to align the location of terminals with the most attractive catchment areas.

PwC's modelling also indicates that in a business as usual case, the majority of freight growth in the period through 2031 in the region will be transported by road. Growth in the region's core exports, currently carried by road, is anticipated to be lower than demand for inbound commodities. To limit the growth of truck movements in the region through to 2031, additional storage and distribution infrastructure for inbound bulk commodities, such as fertiliser or mining inbound, could be examined.

Contents

1 Introduction

Central Western Region (the region) is responsible for a large portion of New South Wales agricultural production. This produce is consumed both domestically and by international markets. Connectivity to freight transport networks is critical to enabling these products access to market.

1.1 Study aims

Central Western Region (the region) is responsible for a large portion of Australia's agricultural production. This produce is consumed both domestically and by international markets. Connectivity to freight transport networks is critical to enabling these products access to market.

The purpose of this study is to investigate demand for transporting containerised cargo as there is a focus on moving more freight from road to rail. The objectives of this study are:

a) Define the demand for containerised cargo over time;

b) Identify existing and potential future contestable flows of containerised cargo;

c) Identify existing intermodal terminals in the cargo catchment, potential new competing terminals, and define the impacts of these potential terminals on transport behaviour; and

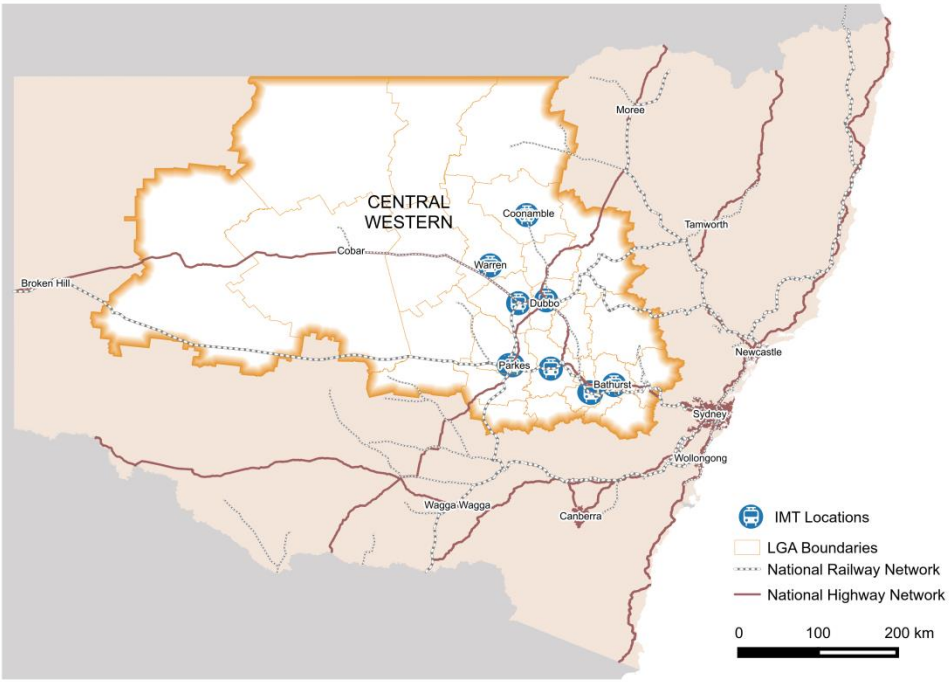
d) Identify potential economic benefits in the study area arising from the development of intermodal terminals.

It should be noted that, whilst there are terminals in the Central West Region which enable freight movements in the East-West Corridor, this study is focused on enabling freight movements within NSW. Therefore, outbound interstate movements are not considered unless they are contestable. In the case of freight movements to Adelaide and Perth via Parkes, freight is bound for domestic consumption and therefore not considered contestable.

1.2 Study area

The study area is indicated in Figure 1, which captures major rail and road infrastructure, and boundaries of Local Government Areas (LGAs).

Figure 1: The study area



Source: Bureau of Freight Statistics and PwC, 2015

As Figure 1 shows, the region is well connected to the national highway and rail networks. Mainlines connect shippers in the region to the Port of Botany and Sydney market. Through Parkes, the rail network provides connections through to Melbourne, Perth, Brisbane and Adelaide. Via the Newell Highway, the region is also well connected to markets in Melbourne and Brisbane, and their respective ports. Section 5.1 discusses the region's rail and road infrastructure in more detail.

Key population centres in the region include Bathurst, Dubbo and Orange, the logistics hub of Parkes, as well as Cowra, Forbes, Mudgee and Oberon and Lithgow. LGA's in the area are separated from Sydney by the Blue Mountains to the east and Wollemi National Park. The NSW and Queensland border forms the northern boundary of the study area.

The region comprises 25 Local Government Areas (LGAs). With the exception of the Central Darling Shire, these LGAs are affiliated with two Regional Organisations of Council (ROC), the Orana ROC and the Central Regional Organisation of Councils (Centroc). Local councils support the economic development of the region, deliver services and maintain infrastructure such as the local road network. The JOC and ROC were instrumental in facilitating access to stakeholders in local government. In turn local government officers assisted with information and introductions to other stakeholders.

The Councils representing each LGA, and their affiliation to Joint/Regional Organisations of Councils, are detailed in Table 1.

Table 1: Study Area Regions and Statistical Local Areas

Joint/Regional Organisation of Council	Local Government Area (LGA)
Central New South Wales Councils (Centroc)	Bathurst Regional
	Blayney Shire
	Cabonne Shire
	Cowra Shire
	Forbes Shire
	Lachlan Shire
	City of Lithgow
	Mid-Western Regional
	Oberon Shire
	Orange City
	Parkes Shire
	Weddin Shire
Orana Regional Organisation of Councils	Bogan Shire
	Bourke Shire
	Brewarrina Shire
	Cobar Shire
	Coonamble Shire
	Dubbo City
	Gilgandra Shire
	Narromine Shire
	Walgett Shire
	Warren Shire
	Warrumbungle Shire
	Wellington Shire
Unassigned	Central Darling Shire

Source: TfNSW 2015

Data used in this report has been collected at the LGA statistical region level, according to the LGAs detailed in Table 1.

1.3 Structure of this report

The remainder of this report is structured as follows:

- Section 2: Details the commodities that underpin demand analysis in the region, and analyses supply chains to and from the region at a high level
- Section 3: Establishes a framework for contestability, which is applied to commodities transported to and from the region to isolate contestable containerised freight volumes
- Section 4: Details the modelling approach used to estimate containerised freight growth rates, and applies these growth rates to quantify future growth in the contestable containerised freight volumes identified in Section 3
- Section 5: Details the existing transport network in the study area, the role played by existing intermodal terminals and the potential growth in residual demand for access to rail infrastructure

- Section 6: Considers intermodal terminals planned for the future, and analyses forecast residual demand for rail infrastructure to identify potential future sites for additional terminals

- Section 7: Consider barriers to mode shift to rail freight

- Section 8: Details the high level primary and secondary economic benefits delivered by intermodal terminals generally in the study area

- Section 9: Concludes with findings about the potential future mode split in the region, and makes recommendations to support mode shift to rail freight.

2 Containerised freight movements in the region

This section analyses current containerised freight flows, in aggregate and by direction of flow. Stylised supply chains are used to provide a context for the movement of goods in and out of the region.

2.1 Total containerised movements in the region

Table 2 presents estimates of the current containerised freight flows in the region. These have been established using Bureau of Freight Statistics data and validated with stakeholders in the region.

Table 2: Estimated 2015 containerised freight

Commodity	Volume (TEU equivalent)	Inbound (%)	Outbound (%)
Consumer Goods	28,775	100%	0%
Containers & General Freight[1]	5,912	18%	82%
Cotton	3,999	17%	83%
Fertiliser	5,670	100%	0%
Flour & Starch	3,021	0%	100%
Food Products	6,550	30%	70%
Forest Products	12,600	0%	100%
Fruit & Vegetables	6,732	40%	60%
Grains	33,207	0%	100%
Meat	11,249	6%	94%
Mining Inbound[2]	26,981	100%	0%
Mining Outbound	2,739	0%	100%
Wine	19,010	0%	100%
Wool	7,513	0%	100%
Total	173,958	40%	60%

Source: Bureau of Freight Statistics and PwC, 2015

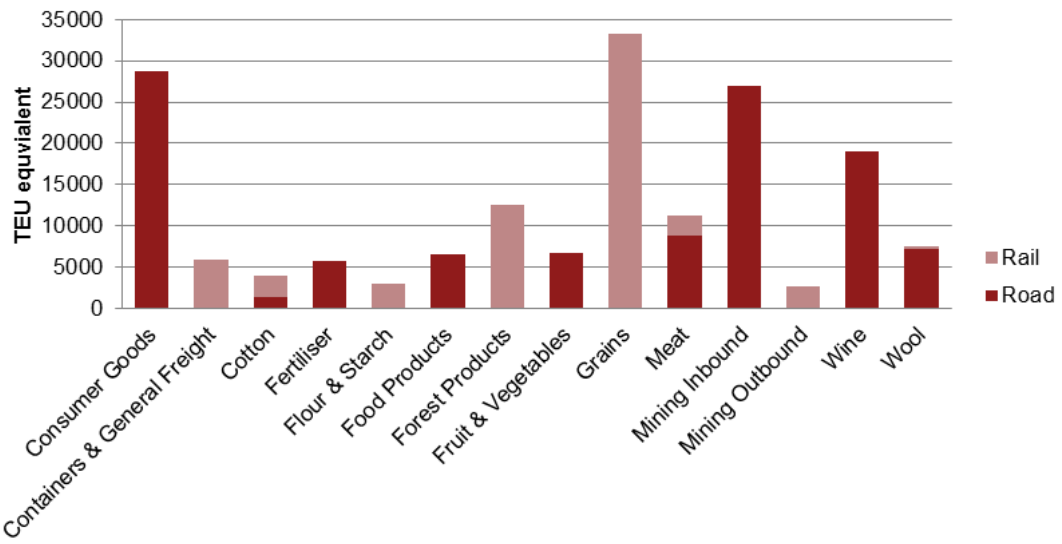
[1] The category 'containers and general freight' is used to describe the following:
- General freight (food products, retail trade, etc.)
- Port Botany Imported/Exported goods (Agriculture and forestry products, food products, manufactured products, retail products, machinery, etc.), and
- Commodities 'not elsewhere classified'

[2] The category "Mining inbound' is a catch-all for inputs into the mining process. It includes fuels, lubricants, explosives, machinery, etc.

Table 2 details the split between inbound and outbound containerised freight flows. Containerised freight flows into the region support the resident population and local primary production, with some manufacturing. Agriculture, mining and manufacturing industries then contribute to outbound containerised freight. The region produces a number of high volume export commodities, and so outbound containerised freight volumes (60.5 per cent of all movements) are ahead on inbound volumes (39.5 per cent).

Figure 2 illustrates the estimated 2015 containerised freight volumes detailed in Table 2, by freight modal split.

Figure 2: Estimated 2015 containerised freight volumes, TEU equivalent



Source: Bureau of Freight Statistics and PwC, 2015

As Figure 2 shows, the existing modal split in the region is weighted towards containerised road freight. In 2015, an estimated 64 per cent of TEUs travel by road and 36 per cent by rail. Further, most shippers use either road or rail, with only three of the 14 commodities transported by both modes. These commodities (cotton, meat and wool) are destined for domestic and export markets – hence the use of dual modes.

2.2 Outbound containerised freight

Table 3 details containerised commodities transported out of the region, and their associated modal split.

Table 3: Estimated 2015 outbound containerised freight

Commodity	Volume (TEU equivalent)	Road (%)	Rail (%)
Containers & General Freight	4,842	0%	100%
Cotton	3,313	22%	78%
Flour & Starch	3,021	0%	100%
Food Products	4,580	100%	0%
Forest Products	12,600	0%	100%
Fruit & Vegetables	4,029	100%	0%
Grains	33,207	0%	100%
Meat	10,560	76%	24%
Mining Outbound	2,739	0%	100%

Commodity	Volume (TEU equivalent)	Road (%)	Rail (%)
Wine	18,904	100%	0%
Wool	7,513	95%	5%
Total	105,306	41%	59%

Source: Bureau of Freight Statistics and PwC, 2015

As with Figure 2, a strong distinction can be seen in Table 3 between goods transported by rail and those by road. Rail is estimated to hold close to a 60 per cent mode share of outbound movements, compared to an estimated 41 per cent share of total containerised freight movements.

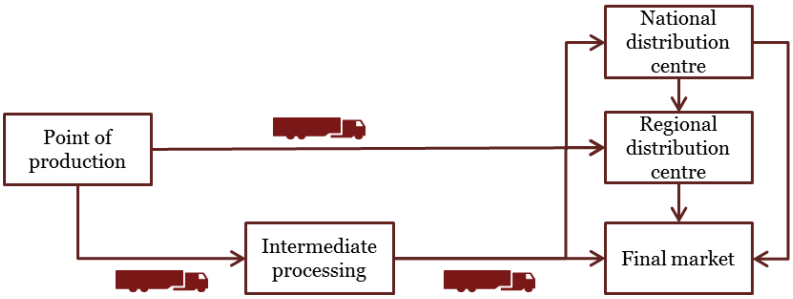
Major commodities produced in the region by volume are grains, wine, forest products and meat. Together, these four commodities account for just over 70 per cent of outbound containerised freight.

2.2.1 Stylised domestic supply chain

Contributing to the pronounced mode split are final markets for commodities. Two stylised supply chains exist for outbound containerised freight, one for export commodities, and one for those travelling to domestic markets, which are analysed in the rest of this section.

Fundamental characteristics of freight causing material to be ill-suited to rail (fragility, perishability) and the need for alignment with complex domestic supply chains determine the preferred channel into domestic markets. A simplified version of these channels is illustrated in Figure 3.

Figure 3: Path to market, domestic



Source: PwC, 2015

In Figure 3, goods move from the region directly, or via intermediate processing, and enter the supply chains of retailers and wholesalers. To align with the just in time practices of their buyers, shippers need to provide small, frequent shipments, meet tight delivery timeframes and serve diverse sites of delivery. Here, the supply chain to market is represented by two stages of distribution and a final market. In practice, shippers from the region send goods into all three levels of the supply chain illustrated to the right, which may be geographically dispersed.

Road freight tends to suit these shippers better, as they can consolidate loads for multiple deliveries in one truck, and plan routes to minimise costs. For rail to be a viable option to domestic markets, the shipper and destination would both need to be located close to an accessible intermodal terminal with sufficient service frequency and quality. The domestic markets for the region are too dispersed for a rail-based supply chain model to be cost-competitive for significant volumes of outbound containerised freight. Bulk rail is used to transport goods from the region on to intermediate processing sites, but as the movement is bulk materials these volumes do not contribute to containerised cargo demand.

Table 4 details commodities travelling from the region to domestic markets, by mode of transport.

Table 4: Estimated 2015 outbound containerised domestic freight

Commodity	Road (TEU equivalent)	Rail (TEU equivalent)
Cotton	739	0
Food Products	4,580	0
Fruit & Vegetables	4,029	0
Meat	8,060	0
Wine	18,904	0
Total	35,572	0

Source: Bureau of Freight Statistics and PwC, 2015

Some of the commodities in Table 4, namely fruit and vegetables, food products and wine, travel to connect with domestic markets, as illustrated in Figure 3. Potentially some of these goods, especially wine, may go on to export markets. In this case, as the export supply chain does not extend to sites of production in the region, road freight is the mode used for transport.

For the meat and cotton volumes in Table 3, dual channels to domestic and export markets result in a split between road and rail. For example, cotton volumes are comprised of cotton lint, an export product, and cotton seeds[3], which have both export and domestic markets. For both cotton and meat, it has been assumed that containerised road volumes from the region represent the majority share of produce transported to domestic markets and these are included in Table 4 above. Associated rail volumes for these commodities are detailed and discussed in Section 2.2.2.

2.2.2 Stylised export supply chain

This section examines how supply chain features determine modal split for exporters in the region. On distance alone to port, rail is regarded as a viable option for most of the region. Rail is considered a cost competitive option at distances greater than 300 km from port[4]. Additional factors explored in this section, such as the location of secondary processing, determine mode choice.

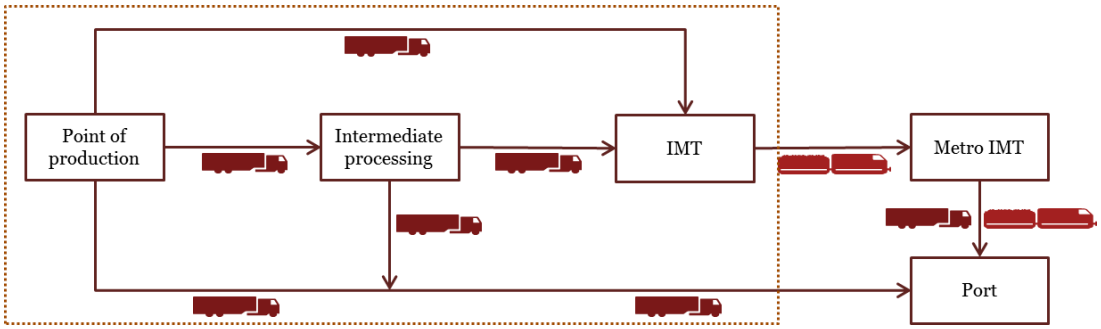
Where rail is competitive

Figure 4 illustrates a stylised path some export commodities take to port from the region. Rail and road freight are included as mode choices.

[3] Cotton seeds, typically 60% of the processed volume of cotton (ABARES Crop Report, June 2015), have domestic and international markets. The final destination for cotton seeds depends on market conditions in a given year. Based on stakeholder consultation in the region, cotton products travel by rail to export markets. The volumes of containerised cotton transported by road in the study area (22.3% or close to 740 TEUs) are considered to be cotton seed. This volume is not considered to be contestable containerised freight.

[4] SD&D Consulting, Sea Freight Council of NSW 2004 Regional Intermodal Terminals – Indicators for Sustainability.

Figure 4: Path to market, export, with aggregation in the region



Source: PwC, 2015

The dotted rectangle in Figure 4 above illustrates a scenario where production, processing and aggregation of freight volumes for export occur in the region. This model is conducive to the use of rail, as the higher payload of rail becomes more attractive when larger volumes are to be shipped. Large volumes also support regular services, which in turn reduce barriers to rail use, such as service frequency, supply chain connectivity and take or pay fee structures. Table 5 details the commodities which are aggregated in the region, for transportation to port.

Table 5: Estimated 2015 outbound containerised export freight

Commodity	Road (TEU equivalent)	Rail (TEU equivalent)
Containers & General Freight	0	4,842
Cotton	0	2,574
Flour & Starch	0	3,021
Forest Products	0	12,600
Grains	0	33,207
Meat	0	2,500
Mining Outbound	0	2,739
Total	0	61,483

Source: Bureau of Freight Statistics and PwC, 2015

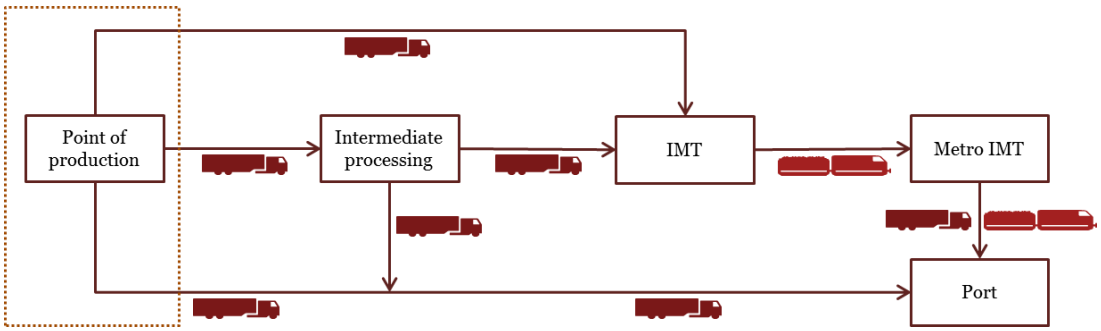
Table 5 contains the majority of outbound containerised volumes from the region. These commodities, which follow the stylised supply chain illustrated in Figure 4, travel exclusively by rail. Major export commodities, such as grain, have a long legacy of rail transport to port and underpin outbound containerised freight volumes. Additionally, containerised export cotton and meat volumes travel by rail. Containerised and general freight volumes are diverse, comprised of goods aggregated ad hoc in the region. As they are travelling by rail to the Port of Botany, it is considered likely that they are for export. In reality, it is probable that some commodities are freighted by road to the Port. However, they have not been reported in either Bureau of Freight Statistics (BFS) baseline data or through industry consultation. This may be due to the following:

- Smaller volumes freighted on an ad hoc basis that are unlikely to be contestable.
- Products are freighted to the Port of Melbourne given access to the Newell Highway and known road freight movements between Parkes and Melbourne. The Parkes Hub enables efficient consolidation and freighting of smaller volumes.

Where road is competitive

Figure 5 represents the same stages in the supply chain to port as Figure 4. The difference between the two diagrams is that in Figure 5, only primary production occurs within the region, the boundary of which is represented by the dotted rectangle.

Figure 5: Path to market, export, with aggregation of volumes outside of the region



Source: PwC, 2015

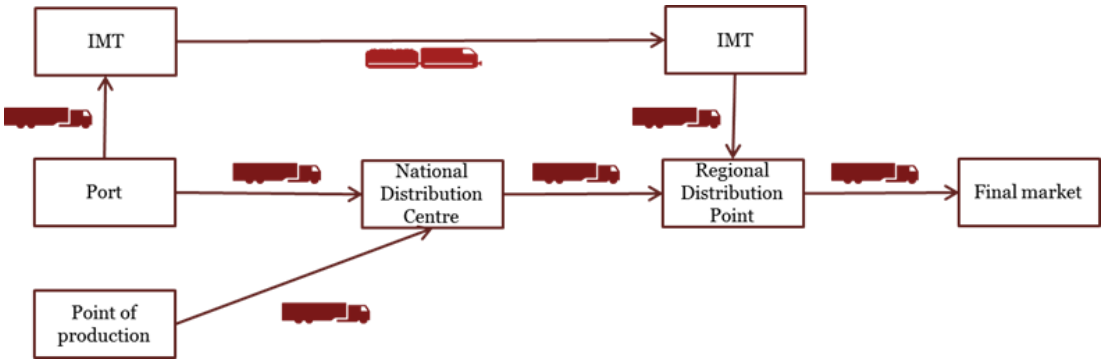
The supply chain illustrated Figure 5 features flows of containerised freight from dispersed sites of production to processing facilities outside of the region. With many small shipments, variability in and diverse sites of production, road freight is a better fit for many shippers. Rail freight is an option for some commodities further down the supply chain, after processing, but not from the region.

The wool supply chain follows this pattern, with aggregation of wool volumes occurring at the point of processing rather than in the region. An estimated 7,142 TEUs of wool will leave the region by road in 2015, with 370 TEUs travelling by rail.

2.3 Inbound containerised freight

Supply chains into the region contain the same elements of outbound supply chains, that is, connections to port and domestic sites of production, as well as intermediate distribution. These stages are illustrated below in Figure 6.

Figure 6: Path to market, inbound containerised freight



Source: PwC, 2015

Figure 6 captures the potential for rail and road freight movements into the region from port, and road freight movements from other sites of domestic production. The rail supply chain from port into the region is viable when imports arrive at port packaged and labelled to travel directly to the region. Further steps in the supply chain, such as de-stuffing and repacking of containers, require additional movements, the cost of which are likely to make rail

uneconomical. The flexibility of road freight by contrast supports intermediate movements in the supply chain to the region.

Conceivably, domestic production aggregated in Sydney could be captured in the mix of products transported from port to the region.

Table 6 details the observed mode of transport for goods into the region.

Table 6: Estimated 2015 inbound containerised freight

Commodity	Volume (TEU equivalent)	Road (%)	Rail (%)
Consumer Goods	28,775	100%	0%
Containers & General Freight[5]	1,070	0%	100%
Cotton	686	100%	0%
Fertiliser	5,670	100%	0%
Food Products	1,970	100%	0%
Fruit & Vegetables	2,704	100%	0%
Meat	689	100%	0%
Mining Inbound	26,981	100%	0%
Wine	107	100%	0%
Total	68,652	98%	2%

Source: Bureau of Freight Statistics and PwC, 2015

Table 6 shows that the vast majority of inbound freight travels to the region by road. With limited storage up country, dispersed local populations across vast distances and numerous sites of primary production, central distribution in the region is often uneconomic for shippers. Instead, the small and frequent volumes of inbound containerised freight required in the region are supplied from major centres by road. The exception is containerised and generalised freight, which travels by rail. These volumes are brought in on an ad-hoc basis, often as backhaul by existing rail freight users.

With the right infrastructure in place in the region, it is conceivable that major inbound containerised volumes of generic products could be transported by rail in the future. Commodities that are inputs to production meet these criteria.

Products like cotton and wine are unlikely to be consumed in the region in the TEU volumes indicated in Table 6. These products are most likely shipped back out of the region, feeding into the supply chains in Section 2.2.1.

[5] Freight goods not elsewhere categorised

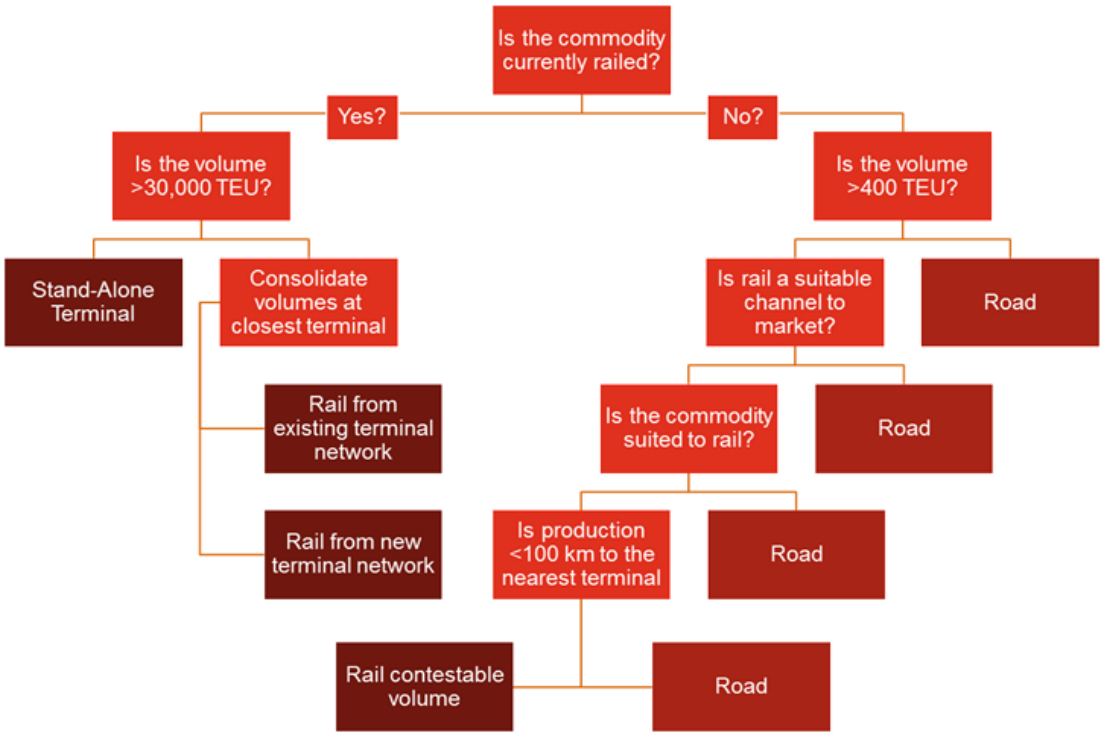
3 Contestable containerised freight

This section builds upon the supply chain analysis in Section 2 to establish current contestable volumes in the study area.

Contestable containerised freight volumes are made up of commodities that could travel either by road or rail. This study considers commodities that are currently travelling by rail, and commodities which are contestable in that they currently travel by road, but could travel by rail, now or in the future. Forecast growth in commodities that currently travel by rail will form future contestable volumes, contributing to demand for rail infrastructure.

PwC has developed a framework to assess containerised freight contestability, illustrated in Figure 7 below. The framework sets out criteria of volume, channel to market (building on the discussion in Section 2), commodity characteristics and proximity to infrastructure that influence modal split. These factors are used to identify freight that could potentially travel by rail, but is not an assessment of what will be transported by rail in the future.

Figure 7: Contestability framework



Source: PwC, 2015

3.1 Volume

There are shippers in the region who may be exporting their produce but have insufficient volumes to warrant using rail transport. Some of the key barriers to rail use for these shippers are:

- Inability to effectively sustain a take or pay arrangement with a service provider. This is particularly difficult for agricultural producers generating low volumes and who are at risk of being affected by seasonality;

- Potential to be bumped from service when clients with larger volumes require additional capacity; and

- Loss of flexibility that road-based transport provides, which can be critical to end customers in low volume operations.

According to the BFS data, the lowest known outbound rail volume in the region (370 TEUs of cotton per annum) is shipped out of Walgett. It is assumed that this is the floor volume for using outbound rail services. At volumes lower than this, shippers are assumed to favour road regardless of distance or other factors.

No floor has been applied to single shipments of potentially contestable inbound commodities. With the appropriate infrastructure, inbound volumes could be consolidated at a central site for storage and distribution for the region. So the total volume of inbound product is considered in the modelling exercise.

3.2 Channel to market

Rail is a competitive mode of transport for transporting sizable volumes of freight over large distances to centralised locations. So in considering contestability, the destination for containerised freight flows is critical.

As the discussion in 2.2 details, the supply chain for commodities is influential on modal split. Commodities travel to centralised locations like ports for consolidation, sequencing and export, while domestic markets can be dispersed throughout the nation and within each state. This has three impacts:

- It dilutes the threshold volumes required for a shipper to utilise rail.

- It consolidates empty containers for repositioning in the supply chain.

- It has a significant impact on the cost of transporting TEUs. In a rail context, shipping to dispersed, final destinations can involve second and third moves between modes and destinations. Containers may need to be deconsolidated in warehouses and products transported on to final destinations. These additional stages increase handling costs. Rail can then become unfavourable compared to road, which allows for loading multiple consignments for multiple destinations without additional lifts or material handling.

Due to issues of cost and access to rail, if a product is transported to multiple destinations outside Melbourne, Sydney and/or Brisbane, it is assumed the shipper will continue to use road. Rail is unlikely to be a cost effective component of these supply chains. The same principle holds for inbound containerised freight, that is, if a product originates from a central location but travels to dispersed locations in the region, road is the likely mode.

The commodities identified in Table 7 and Table 8, which travel between the region and international markets, are considered to be potentially contestable for the purposes of the modelling exercise.

Table 7: Estimated 2015 contestable containerised export volumes

Commodity	Potentially contestable volume (TEU equivalent)	Rail volume (TEU equivalent)
Containers & General Freight	0	4,842
Cotton	0	2,574
Flour & Starch	0	3,021
Forest Products	0	12,600
Grains	0	33,207
Meat	0	2,500
Mining Outbound	0	2,739
Total	0	61,483

Source: Bureau of Freight Statistics and PwC, 2015

Table 8: Estimated 2015 contestable containerised import volumes

Commodity	Potentially contestable volume (TEU equivalent) road	Potentially contestable volume (TEU equivalent) rail
Containers & General Freight	0	1,070
Fertiliser	5,670	0
Mining Inbound	26,981	0
Total	32,651	1,070

Source: Bureau of Freight Statistics and PwC, 2015

The 2015 containerised volumes identified in Table 7 and Table 8 account for close to 94,000 TEUs, of which close to two thirds are outbound volumes currently travelling on rail. These volumes are currently drawn into the active intermodal terminals in the region, which are discussed further in Section 5.1.2.

3.3 Containerised freight characteristics

Three general characteristics of the containerised freight volumes in Table 7 and Table 8 have a bearing upon their suitability for rail. Further considerations, such as the variability of freight flows, are considered in detail in Section 3.3.1.

The first consideration is the physical fragility of the commodity. This affects whether additional lifting and ride quality on rail (steel on steel) may damage the goods. This can be a factor in the transport of wine, although wine is successfully transported by rail out of the Riverina area of New South Wales.

Perishability, or time sensitivity of the commodity, is a second characteristic. Perishable products may not be suited to existing rail service frequency. For example, meat is a perishable commodity, which also requires expensive cold storage. This cost base in turn contributes to time sensitivity of shippers. Meat products currently travel by rail from the region to port, but are considered unlikely to reach domestic markets by this mode.

The third characteristic is how the good is traditionally shipped. When a commodity has a history of being shipped by rail, infrastructure is often in place to handle these goods. For example, grain has a long history of being transported by rail and an existing network of silos and rail heads in the region bear witness to this.

If a product is evaluated as having characteristics making it unsuitable for rail then it is assumed that these volumes will remain on road.

3.3.1 Variable outbound containerised freight flows

Forestry Products

The production of some commodities in the region, like forestry products, can be considered to be highly variable. That is, production can stop, start or shift in focus quickly, based on international competitiveness, irrespective of multiyear contractual agreements. Given the uncertainty of production, shippers are reluctant to fund long term investments in their supply chain, for example, in intermodal terminals. Instead, when they are active, their output can be considered a windfall for existing operators who attract the volumes.

As forestry products are unlikely to support the development of new terminals, forest product volumes have been excluded from the modelling process. Currently, approximately 12,600 TEUs of forestry products (logs) are being transported by rail out of Bathurst. These have not been considered in the analysis in Section 4 and 5 due to production uncertainty.

Seasonal agricultural production

Agricultural products such as grains and cotton remain susceptible to seasonal impacts such as drought which does lead to variable freight volumes year on year.

In years of high production, this results in surplus volumes being transported by road to market, whereas in years of lower production, the bulk handling companies and merchants who own transport infrastructure are unable to use all their capacity. To adjust for the cyclical nature of these industries, investment in intermodal terminals should be considered over a longer time horizon, for example, 15 years of production.

3.4 Contestable containerised freight flows

Applying the first three criteria from the framework in Figure 7 - volume, channel to market and containerised freight characteristics - the volumes detailed in Table 9 and Table 10 have been identified as contestable. These include existing rail volumes, and containerised freight currently travelling by road that could move to rail. In the case of Mining Inbound, it is likely that not all of the volume considered in this report will be contestable. True contestability will depend on the characteristics of individual projects to emerge in the future.

It should be noted that rail volumes are also considered contestable in that they could be freighted by road at some point in the future.

Table 9: Estimated 2015 contestable containerised outbound volumes

Commodity	Potentially contestable volume (TEU equivalent)	Rail volume (TEU equivalent)
Containers & General Freight	0	4,842
Cotton	0	2,574
Flour & Starch	0	3,021
Grains	0	33,207
Meat	0	2,500
Mining Outbound	0	2,739
Total	0	48,883

Source: Bureau of Freight Statistics and PwC, 2015

Table 10: Estimated 2015 contestable containerised inbound volumes

Commodity	Potentially contestable volume (TEU equivalent) road	Potentially contestable volume (TEU equivalent) rail
Containers & General Freight	0	1,070
Fertiliser	5,670	0
Mining Inbound	26,981	0
Total	32,651	1,070

Source: Bureau of Freight Statistics and PwC, 2015

As Table 9 shows, no potentially contestable containerised outbound cargo travelling by road was identified through stakeholder consultations or the Bureau of Freight Statistics model. It is likely that small volumes (less than the 370 TEU per annum threshold established in Section 3.1) exist in the region and travel by road. Due to their small size, they have not been considered further or included in the tables above.

Growth in the volumes in Table 9 and Table 10 above is modelled in Section 4. Section 5 uses geo-spatial modelling to establish the catchment area of existing infrastructure, and identify potential current or future gaps, based on the volumes forecast in Section 5. Chapter 6 addresses potential infrastructure needs for the region, given the contestable volumes identified above, and the forecast growth in these volumes.

Through consultations, emerging containerised freight flows have been identified in the region, which are considered in Sections 3.5 and 3.6. They are analysed to show where the greatest variance to forecasts established in this report is likely. Emerging containerised freight flows have not been included in the core modelling approach.

3.5 Emerging outbound containerised freight flows

Through consultation, trends in containerised freight types and volumes were identified that could shape future demand for containerised freight. These containerised freight flows are contingent on producers in the area changing their practices or developing projects currently under application. As such, they have not been included in the modelling approach.

As a caveat, it is important to note that volumes transported by exporters will depend on their international competitiveness in a given year. It is foreseeable in the forecast period to 2031 that structural changes to Australia's export competitiveness could promote higher export volumes. For example, recent free trade agreements with China, Japan and South Korea could enable greater access to these markets for meat exporters in the forecast period if ratified. Depending on how producers respond, this could increase export volumes.

Grains

Grain has traditionally travelled to port via established bulk rail networks. In the past five years though, there has been growth in containerisation of grain in the region, for export to port in TEUs. This has diverted grain volumes from the established bulk supply chain to the containerised. Grain industry stakeholders report that containerisation can reduce handling costs over the supply chain to delivery in export markets, making it an attractive transport option for some operators.

In the future, more grain exporters may develop facilities to containerise grain in the region for export. To model containerised freight movements in the future, it has been assumed that current volumes of containerised grains increase at the rate forecast using the methodology in Section 4.1. The movement of grain from bulk networks to containerised networks, i.e.

new volumes, has not been forecast. That is, no additional shift from bulk to containerised rail is included in the core modelling approach.

It is also possible that grain volumes may appear on road. Key drivers of this shift include bumper harvests and track occupations. In other areas of New South Wales, such as the Riverina, there has been a recent increase in the movement of containerised grain by road. Although trucks carry a lower tonnage of grain compared to rail due to load requirements, in these regions road transport reduces handling costs associated with other stages of the supply chain.

Mining outbound: minerals

The region is home to existing mineral ore mines, producing commodities like copper and gold for export. These are mainly underground mine operations, with ores processed at mine sites. Mine outputs in the region include high value, low volume shipments of ore. Some existing mineral ore production moves by container to the Port of Botany. The majority of existing production moves in specialised containers by rail to the port of Kembla, or by road.

New mine projects, or expansions to existing mine sites, could contribute to increased TEU volumes in the period through to 2031.

3.6 Emerging inbound containerised volumes

There is the potential for inbound containerised freight volumes to grow, with changes to mining inbound, and general and containerised freight possible. Both commodities are discussed at a high level in this section, and emerging production in the region at late stages of development (financing, after securing development approvals) are detailed. Containerised volumes discussed in this section have not been included in forecasts of future rail and contestable freight.

Mining inbound

With existing and potential future mine sites in the region, there may be opportunities to increase the share of mining inbound containerised freight that travels by rail.

Projects proposed in the region include Alkane Resource's Dubbo Zirconia Project, for the extraction of rare earths in the Dubbo City Local Government Area. Rare earth extraction and processing requires significant amount of mining consumables relative to small, but valuable, output, and so would increase inbound freight flows substantially.

The project is in the late stages of development, and received planning approval from the New South Wales Planning Assessment Commission in June of 2015. Before development, Alkane Resources will need to complete applications for an Environmental Protection Licence (EPL) and a Mining Lease, among other regulatory requirements. Alkane Resources will also seek project financing to develop the project, which it intends to have operational by 2020.

Alkane Resources indicated that 500 to 600 thousand tonnes of inputs will be required in total for the mine annually during full operation. Close to half of these volumes are likely to be sourced from dispersed sites in regional NSW, and so are unlikely to be contestable. It is estimated that contestable containerised volumes could be as high as 12,000 TEUs a year, with the potential to import products like chemical reagents and soda ash in containers through the Port of Botany or in bulk through the Port of Newcastle.

Alkane Resources' Traffic Impact Assessment, lodged with the NSW Department of Planning and Environment, indicates that the company is looking at three main options to bring these volumes into the study area. The first involves freighting inputs to the mine site at Toongi,

the second freighting inputs by rail to Dubbo with a shuttle road freight service, and the third road freight[6].

General and containerised freight

Green Distillation Technologies have piloted a technique of recycling tyres, producing oil, carbon and steel as by-products in the region. The company is currently raising venture capital[7] to expand an existing site at Warren, to which they would transport 1,000 tyres per day in full production.

Green Distillation Technologies reported during stakeholder consultations that they were looking at two freight approaches. The first would collect automotive tyres from centralised sites in major population areas (for example, Sydney), which could then be railed to the region. The second model would involve shipping automotive tyres into the site by road and aggregating them in Warren.

3.7 Recent contestable containerised freight transport flows

Formerly in the region, a group of three co-located manufacturers were able to support regular rail services out of Blayney. Export products were exported by Nestle and Mars to port, while Electrolux's demand for inputs for production accounted for the service's backhaul from port. With high production volumes and freight flows balanced between inbound and outbound freight, this group was able to support daily services to port. The service in turn drew in ad-hoc volumes from small shippers in the region.

This supply chain model dissolved as the three participants changed their production decisions. Nestle and Mars shifted the focus of production to domestic markets, supplying them via road. Electrolux also moved to road-based supply models for inputs. As Electrolux have announced the closure of their plant in Orange, this specific supply chain is unlikely to be repeated.

The model demonstrates that groups of medium sized shippers can coordinate volumes to support a terminal. This model could be successful in the future, especially if food manufacturers in the region re-orientate towards export markets.

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6 Source: Traffic Impact Assessment, lodged with the NSW Department of Planning and Environment, accessed via:

https://majorprojects.affinitylive.com/public/8e88bd0abb545b59f60aa41f673edf59/12.%20Dubbo%20Zirconia%20Project%20-%20EIS%20-%20SCSC%20Part%2011%20Traffic.pdf

7 Source: Aussie innovator cracks tyre recycling conundrum, BRW, July 2015.

http://www.brw.com.au/p/entrepreneurs/aussie_innovator_cracks_tyre_recycling_COyG96PgOrPRogyVsNCzQL

4 Growth in contestable containerised freight

This section of the report details the approach used to forecast growth in the containerised freight task in the region to 2030-31. Forecast growth in all containerised freight, and then in contestable containerised freight is analysed to build a picture of future containerised freight demand. To support the modelling of demand for rail infrastructure in Section 5, growth in contestable containerised freight is further broken down into commodity groups and LGAs.

4.1 Method

PwC's growth forecasts, developed using economy-wide modelling data, capabilities and experience have been used for the purpose of this report.

PwC's model database is sourced from the Australian Bureau of Statistics (ABS) input-output tables, National and State Accounts, and other ABS data sources. Modelling assumptions for growth are based on:

- ABS's population projections;
- Commonwealth Treasury's terms of trade forecasts;
- Commonwealth Treasury's 3-Ps framework (population, productivity and participation); and
- Industry productivity assumptions.

The following methodology was followed to establish a baseline, forecast industry outputs and then validate these results:

1. *Establish a baseline* - To establish a baseline of commodity volumes produced in each LGA within the region, volumes were obtained from the Bureau of Freight Statistics, Strategic Freight Model and then validated through industry consultation.
2. *Produce independent output forecasts* - Economic output forecasts were generated by PwC for 38 industries for the Central NSW region and for the Western NSW region, which were then matched to TfNSW's product groups exported by the region (contained in BFS Strategic Freight Model). These forecasts are detailed in Appendix A.
3. *Validate results through consultation* – Industry stakeholders were consulted in relation to the reasonableness of both PwC's and TfNSW's industry output forecasts. Stakeholders consulted are detailed in Appendix B.

In the remaining parts of Section 4, forecast future volumes estimated using this methodology are presented and analysed.

4.2 Forecast growth in total freight

To forecast TEU volumes out to 2030-31, growth rates from PwC's model have been applied to existing volumes. The results are presented below in Table 11 and Table 12. A visualisation of total freight growth is provided in Figure 8.

Table 11: Forecast growth in inbound containerised freight

Commodity	2015 inbound volume (TEU equivalent)	2021 inbound volume (TEU equivalent)	2031 inbound volume (TEU equivalent)
Consumer Goods	28,775	32,972	41,542
Containers & General Freight	1,070	1,281	1,691
Cotton	686	745	832
Fertiliser	5,670	6,313	7,512
Flour & Starch	0	0	0
Food Products	1,970	2,167	2,527
Forest Products	0	0	0
Fruit & Vegetables	2,704	2,954	3,371
Grains	0	0	0
Meat	689	747	828
Mining Inbound	26,981	37,473	55,647
Mining Outbound	0	0	0
Wine	107	117	137
Wool	0	0	0
Total	68,651	84,769	114,086

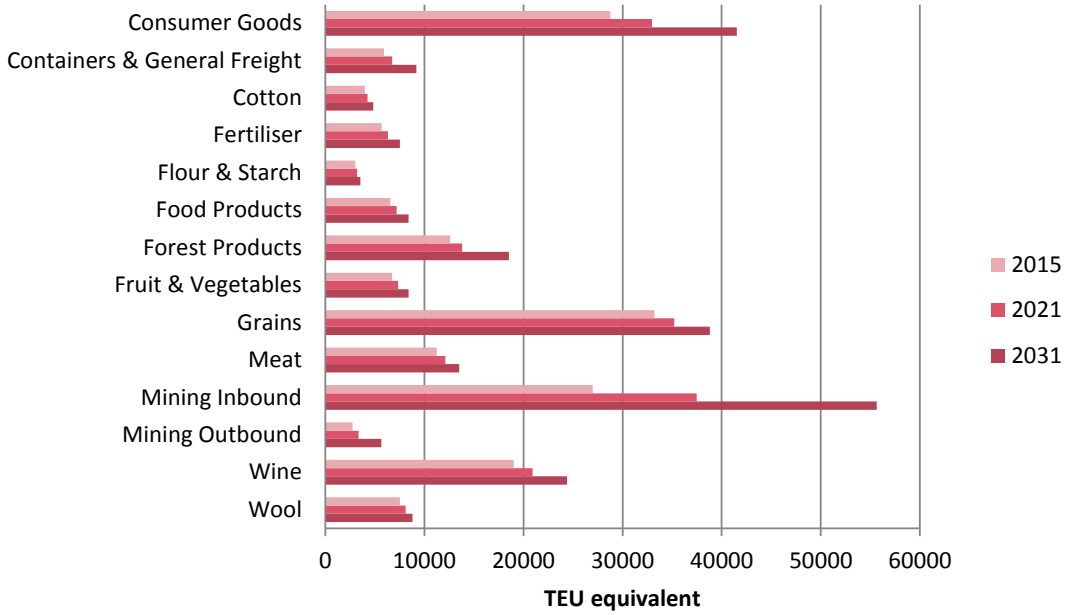
Source: Bureau of Freight Statistics and PwC, 2015

Table 12: Forecast growth in outbound containerised freight

Commodity	2015 outbound volume (TEU equivalent)	2021 outbound volume (TEU equivalent)	2031 outbound volume (TEU equivalent)
Consumer Goods	0	0	0
Containers & General Freight	4,842	5,445	7,508
Cotton	3,313	3,519	4,016
Fertiliser	0	0	0
Flour & Starch	3,021	3,203	3,531
Food Products	4,580	5,038	5,872
Forest Products	12,600	13,816	18,527
Fruit & Vegetables	4,029	4,402	5,023
Grains	33,207	35,203	38,811
Meat	10,560	11,382	12,683
Mining Inbound	0	0	0
Mining Outbound	2,739	3,354	5,649
Wine	18,904	20,796	24,241
Wool	7,513	8,085	8,803
Total	105,306	114,243	134,664

Source: Bureau of Freight Statistics and PwC, 2015

Figure 8: Estimated growth in containerised freight



Source: Bureau of Freight Statistics and PwC, 2015

In 2031, total containerised TEU movements in and out of the region are forecast to total 248,750 TEUs. As Table 11 and Table 12 demonstrate, the current gap between outbound and inbound freight volumes is forecast to even out through to 2031.

The region's outbound freight is dominated by primary production. The growth in major outbound commodities like cotton and grain is constrained by access to scarce resources, such as water and land. By contrast, demand for many inbound commodities depends on population and economic growth, and is forecast to grow at higher rates. Consequently, by 2031, inbound and outbound containerised freight flows are more evenly split in the region than in 2015.

The slower growth of major outbound commodities like grain and cotton, compared to other commodity groups, has implications for future mode share. Higher growth forecast for outbound commodities travelling by domestic supply chains, and inbound commodities currently travelling by road means:

- Inbound freight volumes are forecast to grow by close to 45,000 TEU, while outbound containerised freight increases by 30,000 TEU.

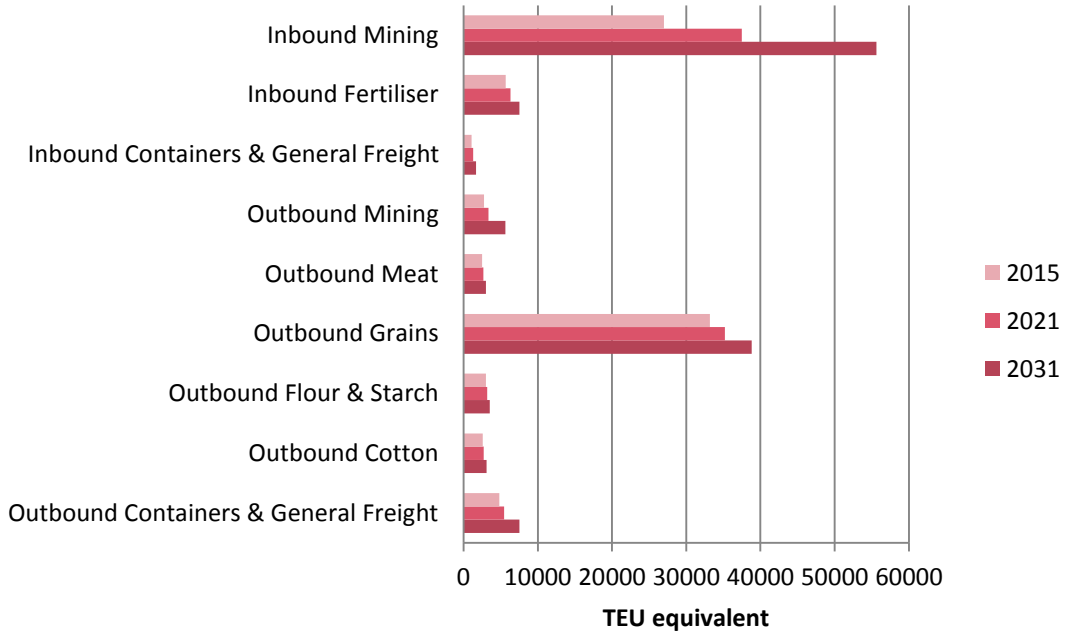
- A forecast 55,500 extra TEU are anticipated to travel by road, with 19,500 forecast to travel by rail to and from the region. In the years to 2031, the share of containerised freight carried by rail is forecast to fall from approximately 36 per cent to 33 per cent.

4.3 Growth in contestable containerised freight

This section of the report examines the growth in contestable freight in detail, by movement, commodity and location. In the years through 2031, total growth in contestable freight, at close to 29,000 TEUs, is forecast to make up close to 40 per cent of the total growth in total freight.

Figure 9 illustrates the decomposition of this forecast growth in contestable containerised freight, by commodity.

Figure 9: Estimated growth in total contestable containerised freight



Source: Bureau of Freight Statistics and PwC, 2015

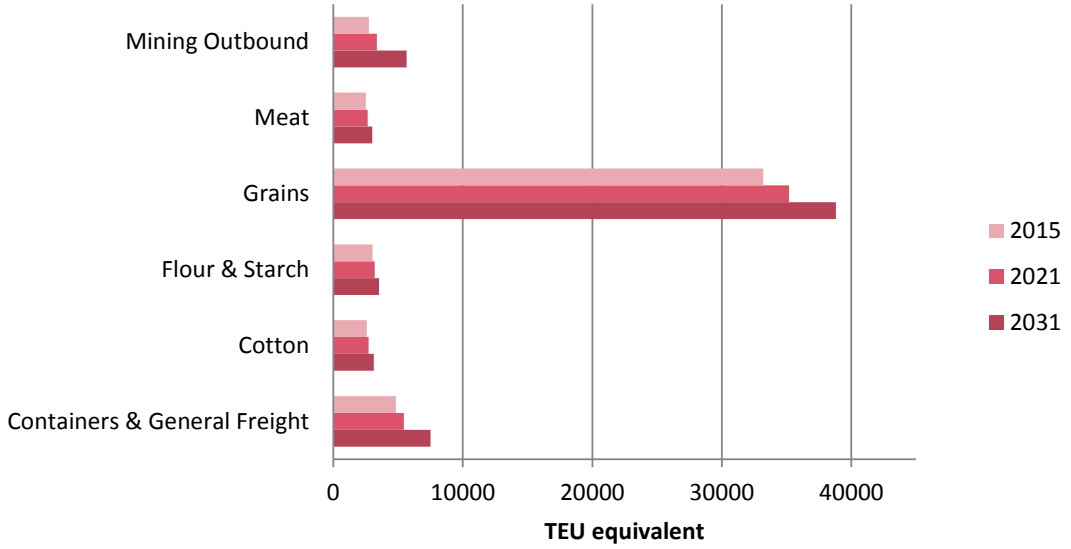
As Figure 9 shows, the two major contestable commodities are inbound mining, and outbound grains, and they continue to hold large shares of total volumes into 2021 and through to 2031. By 2031, total contestable containerised freight is forecast to have grown to 126,473 TEUs per annum.

In contestable freight, the effects of lower than average growth in agricultural commodities traditionally carried by rail, discussed in Section 4.2, are also evident. Stronger growth in inbound contestable containerised freight compared to outbound results in the inbound/outbound split for contestable freight re-balancing by 2031, from 1:1.5 to 1:0.95 based on a future mode shift from road to rail.

4.3.1 Outbound contestable containerised freight growth, by commodity

Outbound contestable containerised freight underpins existing intermodal terminals in the region, with limited backhaul on rail observed. Figure 10 illustrates the growth in outbound contestable containerised freight, forecast through to 2031.

Figure 10: Estimated growth in outbound contestable containerised freight



Source: Bureau of Freight Statistics and PwC, 2015

As Figure 10 shows, grain transport accounts for close to two-thirds of all contestable volumes in the region in 2015. This reflects the long history of grain production and transport by rail in the study area. Increasing containerisation of grain, an increasing trend over the past five years, has diverted grain from bulk freight networks in the region to containerised flows into the Port of Botany.

Into the future, grain transport is anticipated to remain a key element of demand for containerised rail services, as the large existing volumes underpin infrastructure investment and service frequency.

In the outlook period to 2031, other commodities, such as Mining Outbound, are forecast to grow more rapidly than grain, and so reduce grain's share to 63 per cent of all outgoing TEUs by 2031, down from 68 per cent in 2015.

4.3.2 Growth in contestable outbound containerised freight, by LGA

The location of volume growth is important when considering mode shift, and where infrastructure may be needed to accommodate growth. Table 13 details contestable containerised outbound volumes for LGAs in the region, by commodity.

Table 13: Estimated growth in contestable outbound containerised freight, by commodity and LGA

ROC	Local Government Area	Commodity	2015 (TEU equivalent)	2020-21 (TEU equivalent)	2030-31 (TEU equivalent)
Orana	Coonamble Shire	Grains	4,800	5,089	5,610
	Dubbo City	Containers & General Freight	2,689	3,021	4,105
		Cotton	1,005	1,061	1,218
		Grains	12,288	13,027	14,362
		Meat	2,500	2,651	3,003
		Mining Outbound	2,739	3,354	5,649

ROC	Local Government Area	Commodity	2015 TEUs	2020-21 TEUs	2030-31 TEUs
Orana	Gilgandra Shire	Grains	848	899	991
	Narromine Shire	Grains	8,270	8,768	9,666
	Walgett Shire	Cotton	369	390	448
	Warren Shire	Cotton	1,200	1,266	1,455
Centroc	Bathurst Regional	Grains	7,000	7,421	8,182
	Cabonne	Flour & Starch	3,021	3,203	3,531
	Parkes Shire	Containers & General Freight	2,153	2,424	3,403
Total			48,883	52,573	61,622

Source: Bureau of Freight Statistics and PwC, 2015

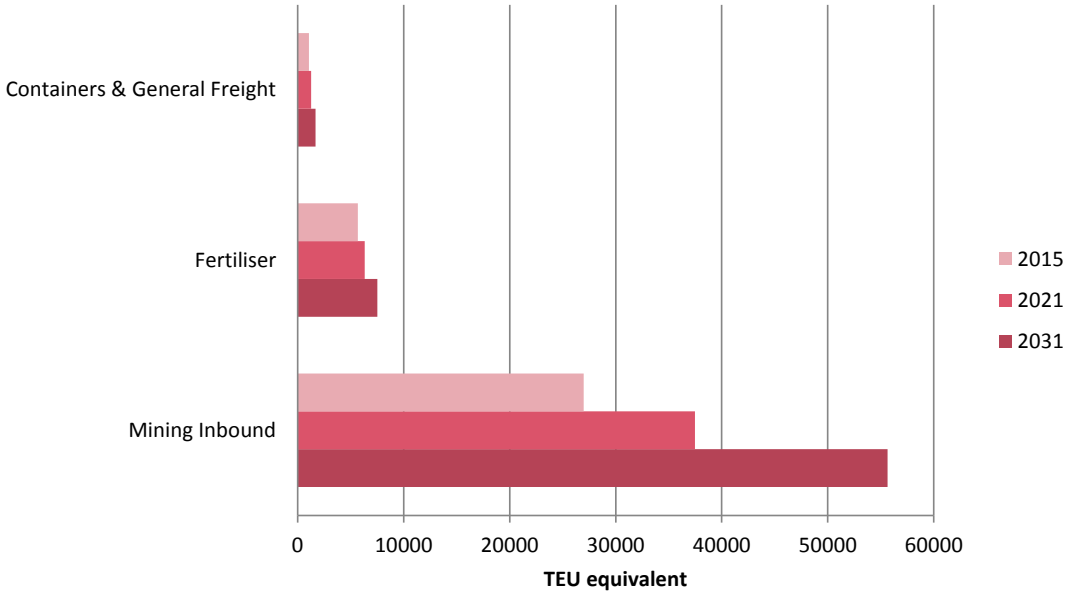
As Table 13 shows, through to 2031, the contestable outbound containerised freight is forecast to grow by close to 13,000 TEUs.

Currently, contestable containerised freight volumes are concentrated in four LGAs, accounting for close to 85 per cent of all contestable outbound containerised freight. The LGAs are Bathurst Regional, Coonamble Shire, Dubbo City and Narromine Shire, and all produce grain. This dominance is expected to remain stable through 2021 and 2031, with concentration increasing only slightly.

4.3.3 Inbound contestable containerised freight growth, by commodity

The majority of inbound volumes considered contestable currently travel by road, and so it is possible that additional scale is required to make rail a viable option. Figure 11 illustrates the forecast growth of these volumes through to 2031.

Figure 11: Estimated growth in inbound contestable containerised freight (TEU and TEU equivalent)



Source: Bureau of Freight Statistics and PwC, 2015

PwC modelling indicates that containerised freight flows relating to mining have the potential to grow the strongest through to 2031 of all commodity groups, particularly inbound volumes as production escalates. As the scale of this containerised freight task increases, rail may become more attractive for shippers.

4.3.4 Growth in contestable inbound containerised freight, by LGA

Two LGAs estimated to handle increasing volumes of mining inbound in the forecast period, Mid-Western Regional and the City of Lithgow. Table 14 details this growth, alongside the more dispersed growth in fertiliser, containers and general freight forecast in the years to 2031.

Table 14: Estimated growth in contestable inbound containerised freight, by commodity and LGA

ROC	Local Government Area	Commodity	2015 (TEU equivalent)	2020-21 (TEU equivalent)	2030-31 (TEU equivalent)
Centroc	Bathurst Regional	Fertiliser	270	301	358
	Blayney Shire	Containers & General Freight	1,070	1,281	1,691
	Cabonne	Fertiliser	216	240	286
	City of Lithgow	Mining Inbound	16,654	23,130	34,348
	Cowra Shire	Fertiliser	378	421	501
	Forbes Shire	Fertiliser	216	240	286
	Lachlan Shire	Fertiliser	702	782	930
	Mid-Western Regional	Fertiliser	54	60	72
		Mining Inbound	9,674	13,436	19,952
	Orange City	Fertiliser	216	240	286
	Parkes Shire	Fertiliser	702	782	930
	Weddin Shire	Fertiliser	324	361	429
Orana	Bourke Shire	Fertiliser	54	60	72
	Cobar Shire	Fertiliser	162	180	215
	Coonamble Shire	Fertiliser	432	481	572
	Dubbo City	Fertiliser	54	60	72
		Mining Inbound	653	907	1,347
	Gilgandra Shire	Fertiliser	162	180	215
	Narromine Shire	Fertiliser	216	240	286
	Walgett Shire	Fertiliser	864	962	1,145
	Warren Shire	Fertiliser	432	481	572
	Warrumbungle Shire	Fertiliser	54	60	72
	Wellington	Fertiliser	108	120	143
Unassigned	Central Darling Shire	Fertiliser	54	60	72
Total			33,721	45,067	64,851

Source: Bureau of Freight Statistics and PwC, 2015

Of the growth in inbound containerised freight detailed in Table 14, it is mining volumes that are the most significant. If these volumes eventuate, a limited number of project proponents

would be expected to make mode choice decisions, potentially over medium and long term project lives. Growth in mining inbound could be significant enough to warrant investment in new or existing rail infrastructure.

Fertiliser, and containers and general containerised freight by contrast, have dispersed final markets across the study area. As Table 14 shows, this pattern is expected to be maintained in a business as usual case. Expanded use of rail in the region, or the development of up-country storage sites, could increase the attractiveness of rail for shippers of these commodities in years through to 2031.

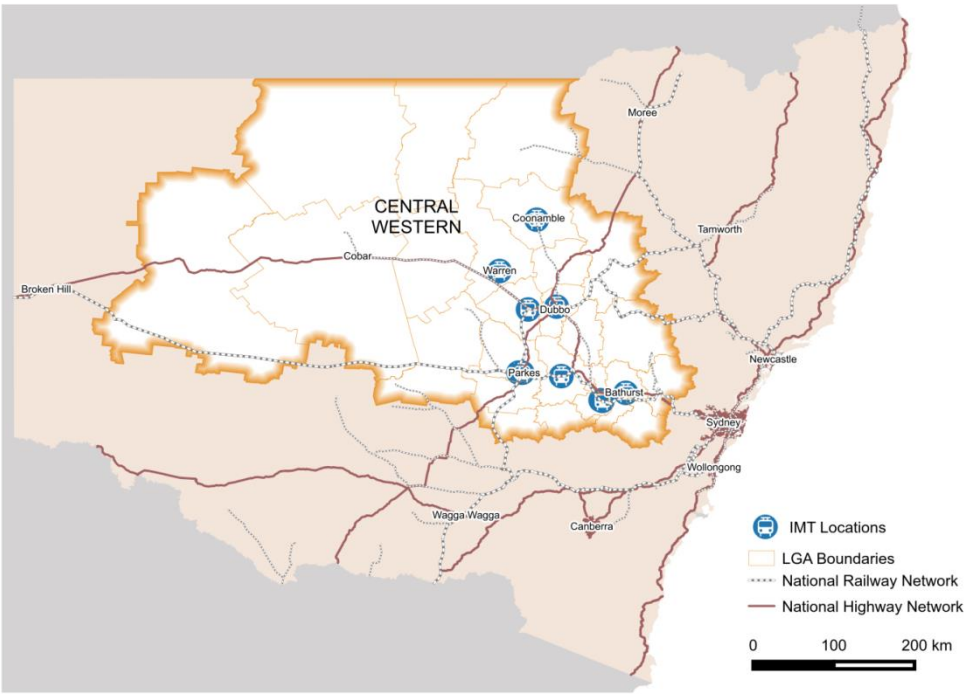
5 Existing infrastructure

This section details how existing containerised freight volumes flow on road and rail networks in the region, and how future volumes will move on the network.

5.1 Network

The region is connected to capital city markets and ports through the national railway and highway network, illustrated in Figure 12 below.

Figure 12: Transport infrastructure in the region, and links to domestic markets.



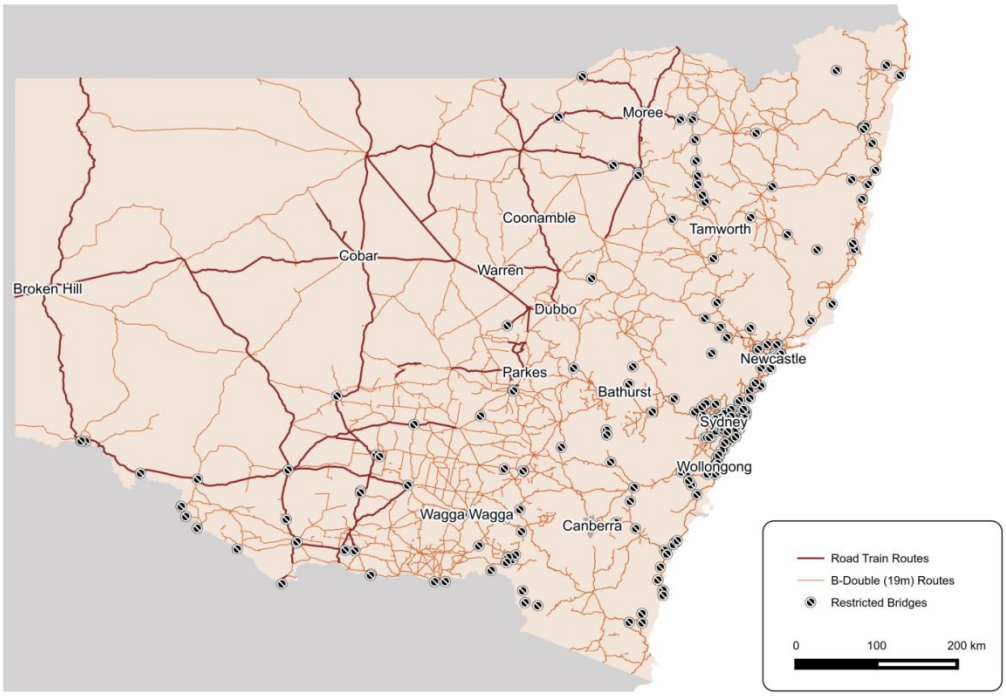
Source: Bureau of Freight Statistics and PwC, 2015

Figure 12 illustrates major features of the national networks that run through the region, such as highways, railway track, intermodal terminal and linkages to ports in NSW. These are discussed in detail in Section 5.1.1 and 5.1.2 below.

5.1.1 Road network

The region is well connected to port, as Figure 13 illustrates below.

Figure 13: Road network in the region, with vehicle routes to port from LGAs



Source: TfNSW and PwC, 2015

The study area is well connected to the national road network, as illustrated by links to the National Highway Network in Figure 12 and the Port of Botany in Figure 13.

The Mitchell highway links shippers to Queensland to the north, and New South Wales ports to the east, while the Newell highway links shippers to markets in Queensland and Victoria, including ports in Brisbane and Melbourne.

The Newell also serves as a dividing line of vehicle access, with road trains permitted to the west of the Newell, but access for only B-doubles and smaller heavy vehicle combinations to the East. Access is constrained further over the Blue Mountains to Sydney, due to HML restricted bridges shown in in Figure 13. Similarly, access to Brisbane for larger heavy vehicle configurations is constrained over the Toowoomba ranges.

In the region, stakeholders were broadly satisfied with the road network, and their ability to reach freight infrastructure points like intermodal terminals. Bottlenecks on routes into Sydney outside of the region were identified as barriers to productive use of road freight. These include HML restricted bridges. As can been seen in Figure 13, there are a number of bridges with restricted mass limits on the route from Parkes to Bathurst and onwards to Sydney. Access restrictions over the Blue Mountains mean that many shippers use a smaller vehicle for the entire journey from the region to Sydney, due to the cost of de-stuffing and repacking along the route.

Table 15: Vehicle type and route access

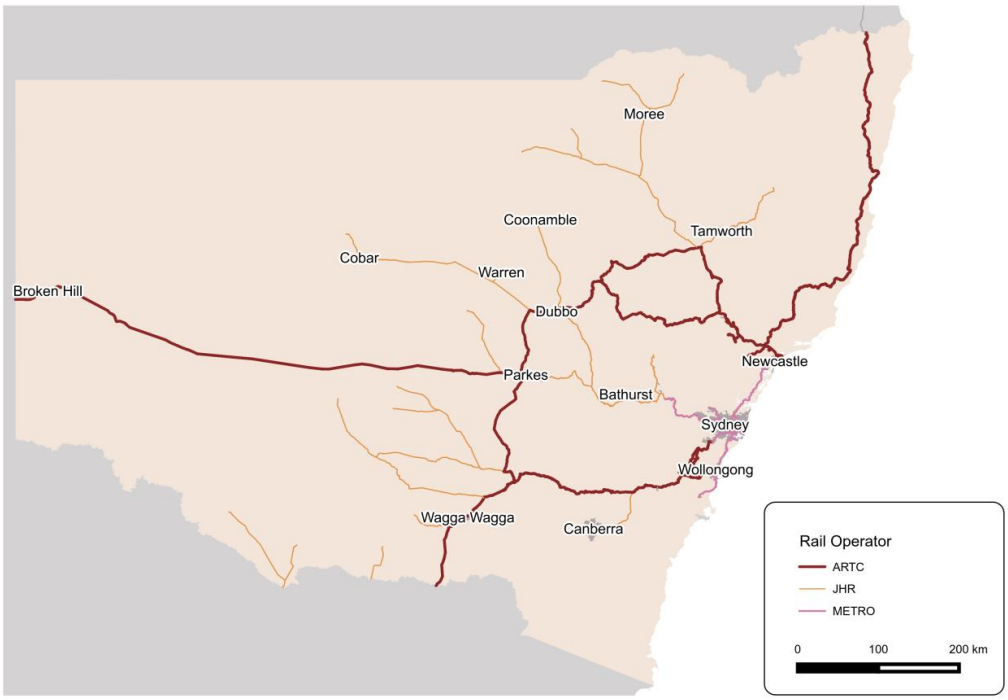
Vehicle Type	Routes to IMTs west of the Newell highway	Routes to IMT's east of the Newell highway	Newell highway	Access through Blue Mountains	Access to Sydney
HML A-double road train	Limited	No	Limited	No	No
HML B-double	Yes	Yes	Yes	No	No
HML 19 metre articulated combination	Yes	Yes	Yes	via HML restricted bridges	Yes
Road trains	Yes	No	No	No	No
B-double 19 metres	Yes	Yes	Yes	via HML restricted bridges	Yes

Source: TfNSW 2015

5.1.2 Rail network

Figure 14 illustrates the New South Wales rail network, by below rail operator.

Figure 14: New South Wales rail network, by operator



Source: TfNSW and PwC, 2015

The Main West rail line and the Broken Hill rail line traverse the region, connecting shippers to the ports of Botany, Kembla and Newcastle to the east, and Perth to the west, out of Parkes. LGAs to the far east and west of the region are connected to the Main West rail line by branch lines. Shippers in LGA's in the north of the study area, such as Walgett, may choose to use the Main North rail line, routing though Muswellbrook to Sydney.

Services connect the Central West region to rail infrastructure in proximity to port, such as the Enfield marshalling yards, intermodal terminals at Minto and Yennora, and the planned Moorebank Intermodal Terminal.

Five main regular container services operate from different terminals in the region to port, with additional services at closed access sites to support the seasonal transport of commodities. Additionally, rail freight operators provide bulk services in the region, which typically run to the Ports of Newcastle and Port Kembla with grain. Rail is also used to transport mineral exports in specialised containers from terminals close to mine sites in the region through to Port Kembla.

Intermodal Terminals

There are 10 operational container freight intermodal terminals in the region serving NSW Ports, clustered on the main line network. These are detailed in Table 16.

Table 16: Intermodal terminals in the region

Region	Location	Owner	Primary Users	Rail connection
Centroc	Bathurst	Pacific National	PF Olsen	Central West Line
	Bathurst	Grainforce	Grainforce, third party shippers	Central West Line
	Blayney	SeaLink	Inactive	Central West Line
	Manildra	Manildra Group	Manildra Group	Central West Line
	Parkes	Asciano and SCT	Open access	Broken Hill Line/East-West Line
	Parkes	Linfox	Open access	Broken Hill Line/East-West Line
Orana	Coonamble	Agrigrain	Agrigrain	Main West Line
	Dubbo	Fletcher International Exports	Fletcher International Exports, third party shippers	Main West Line
	Narromine	Agrigrain	Agrigrain	Main West Line
	Warren	Auscott	Auscott	Main West Line
	Warren	Namoi Cotton	Namoi Cotton	Main West Line

Source: Transport for New South Wales and stakeholder consultations, 2015

The majority of terminals detailed in Table 16 handle volumes from a single user. These primary users have typically developed rail supply chain infrastructure to achieve a competitive advantage in transport costs. This is an advantage they are unlikely to share with direct competitors, and providing containerised freight services to third parties can introduce unwanted complexity for some operators. Terminals with a single primary user are considered closed access unless stakeholder consultations have established evidence to the contrary.

Of the region's terminals, those at Parkes, Grainforce at Bathurst and Fletcher International Exports at Dubbo are considered to offer access to third party shippers. These terminals are considered in Section 5.2.

A container terminal has been developed at Blayney, which, while currently inactive, is expected to become active in 2016.

Transport Cost to Terminal

The cost of pick-up and delivery to and from the terminal is also a key factor in whether a shipper will choose to use rail. Generally, regional intermodal terminals have a service catchment of approximately 100 km. When a shipper has to move their goods via road for more than 100 km the cost effectiveness of rail is eroded and it is most probable that the shipper will continue to use road based transport to the destination.

Therefore, if a shipper has to transport their goods greater than 100km by road to reach the nearest intermodal terminal it is assumed the product will continue using road to reach its destination.

5.1.3 Future freight networks

Developments are currently being progressed through the NSW Freight and Ports Strategy that will improve the ability for exports to reach NSW ports, such as Port Botany and Port Kembla, by rail over time.

Key developments that are currently underway or recently delivered include:

- investigations into the reopening of non-operational rail lines in the country rail network: the Cowra Lines project will identify the capacity of the private sector to restore, operate and maintain non-operational rail lines on a commercially sustainable basis, without NSW Government funding

- TfNSW's "Fast-tracking Freight" and "Fixing Country Roads" initiatives, which are aimed at unlocking productivity for freight in the regions, with a focus on enabling intermodal hubs to accept Higher Productivity Vehicles in their catchments

- Metropolitan IMTs, i.e. Enfield, Moorebank, Chullora, Western Sydney, Leightonfield (to be reopened) and others that will provide triangulation and staging opportunities for rail

- the Enfield Rail Precinct comprises a planned intermodal site, a rail marshalling yard and ARTC staging roads. The marshalling yard has good potential to enable regional trains to split, hold and shuttle to the port terminals. TfNSW are looking to actively manage this yard and institute rail Operational Performance measures. This would improve rail performance, part of which would be represented by improved cycle times for regional trains.

- new dedicated freight infrastructure, i.e. ARTC works and improvements to the Southern Sydney Freight Line, Metropolitan Freight Line and Botany Rail Yard

- planned future projects, which include, and are not limited to, a duplication of the Port Botany Rail Line, capacity upgrades to the Main West Rail Line, a new Western Sydney Freight Line and intermodal terminal, and completion of the Maldon to Dombarton Rail Link.

TfNSW is also investigating a range of options under the Container Rail Share Improvement Program to meet the NSW Government's 2021 objective to "double the proportion of containers moved by rail through NSW's ports by 2020".

The NSW Cargo Movement Coordination Centre (CMCC) began on July 1, 2014 and subsumes the Port Botany Landside Improvement Strategy. The CMCC has established a Rail Operations and Coordination Committee (ROCC), which will improve the reliability and efficiency of rail through the Port Botany supply chain. Moreover, an Operational Performance management regime similar to the successfully integrated regime for road is being investigated.

Further, there may also be greater private investment potential for regional rail infrastructure from the private NSW Ports owner following refinancing of Port Botany landholdings.

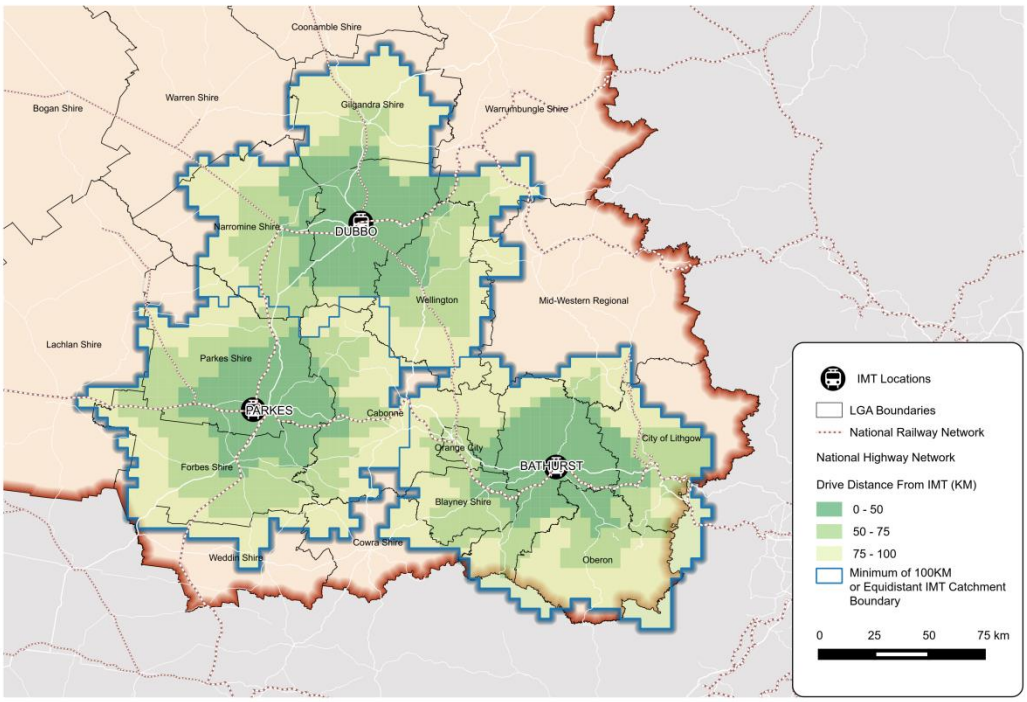
Fixing Country Rail

The NSW State Government allocated a $400 million reservation under Restart NSW for the Fixing Country Rail program to provide funding for upgrades that improve the productivity of regional freight rail in the 2015/16 State Budget.

5.2 Open access IMTs

There are four operational open access terminals in the region, of which two provide regular services to the Port of Botany. Each terminal is considered to have a natural catchment area of 100 km[8], which is illustrated in Figure 15 below.

Figure 15: Existing open access intermodal terminal catchment areas



Source: Bureau of Freight Statistics and PwC, 2015

Figure 15 illustrates the catchment areas for the four operational open access terminals located in the region. As two of these are located in Parkes, their catchment areas overlap completely, and so only three catchment areas are illustrated.

While the terminals at Parkes are illustrated in Figure 15, their role in transporting containerised freight originating or terminating in the region is small and assumed to remain so. Parkes is a major hub for containers travelling on the east-west rail route to Perth, as containers can be double-stacked west of Parkes, which dramatically improves transport costs. Parkes is also an important connection on the north-south route between Brisbane and

[8] Figure based on industry consultation throughout NSW

Sydney. Due to this connectivity, considerable volumes of containers pass through the study area to connect to interstate markets.

Stakeholder consultations confirmed that the majority of outbound export commodities in the region are travelling through the Port of Botany. With current services, it is considered unlikely that goods are going via Parkes to the Port of Botany. It has been assumed that the terminals in Parkes absorb general and containerised freight volumes originating in Parkes, observed in the BFS data, but no further volumes.

The terminal at Dubbo is discussed in Section 5.2.1, and Bathurst in Section 5.2.2.

5.2.1 Dubbo

As illustrated in Figure 15, the 100km catchment area around the Fletcher's International Exports terminal in Dubbo extends to most of Narromine Shire to the West, Gilgandra Shire to the North, the fringes of Mid-Western Regional to the East and the fringes of Cabonne Shire to the South.

The terminal is characterised by:

- strong connections to existing transport road networks, such as the Newell Highway, the Mitchell Highway and the road train network to the west of the Newell;
- strong connections to existing rail transport networks, as Dubbo City lies on the Main West line, which links the intermodal terminal to port;
- facilities to containerise grain on site;
- facilities to re-position containers on site;
- an estimated 48 hour cycle time to the Port of Botany;
- Taking 100km as a limit, the catchment area is estimated to encompass 30,136 TEUs in 2015. In practice, these volumes are also shipped through established, closed access terminal operators in the region.

5.2.2 Bathurst

As illustrated in Figure 15, the 100km catchment area around the Grainforce terminal in Bathurst extends to Orange City to the West, Bathurst City to the North, approximately half of Lithgow Shire to the East and Oberon to the South.

The terminal is characterised by:

- Connection to the road transport network (HML 19 Metre Articulated Combination and B-Doubles), although mass limits apply over the Blue Mountains.
- strong connections to existing rail transport networks, as Bathurst lies on the Central West rail line
- facilities to containerise grain on site;
- an estimated cycle time into the Port of Botany of 24 hours
- A catchment area estimated to encompass 20,212 TEUs in 2015

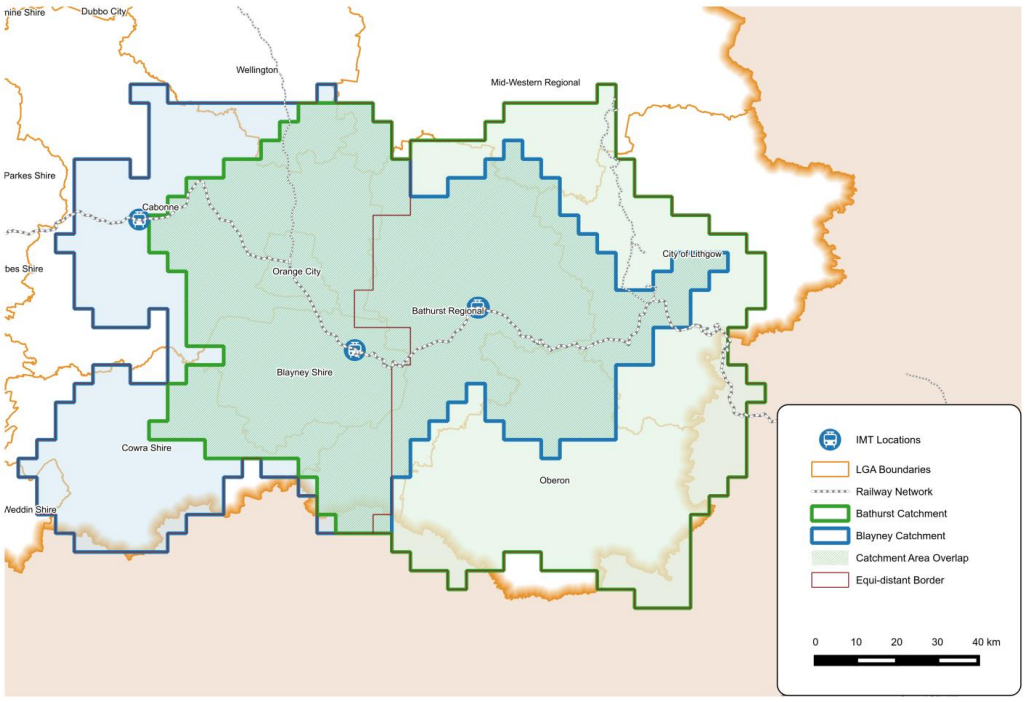
6 New infrastructure and potential infrastructure needs

Section 6 builds on the analysis in Section 5 by considering new terminals that are likely to become operational in the region in the next five years. Given forecast growth in contestable containerised freight, the adequacy of current terminal capacity to meet demand is assessed at a high level.

6.1 Planned new terminal infrastructure

An additional intermodal terminal is planned at Blayney, which is anticipated to commence operations in 2016. Figure 16 below illustrates the catchment area of this new terminal, including overlaps with existing terminals in the region.

Figure 16: Catchment of existing and planned intermodal terminals in the region



Source: Bureau of Freight Statistics and PwC, 2015

6.1.1 Blayney

Blayney Sealink plan to open an additional intermodal terminal in Blayney in 2016. As illustrated in Figure 16 above, the 100km catchment area around the Blayney Sealink Terminal extends to Cabonne Shire to the west, Wellington shire to the north, City of Lithgow to the east, and Cowra Shire to the south. This catchment area overlaps with existing

terminals at Bathurst. In Figure 16, the area of overlap is shown with darker shading, and is at the centre of the two catchment areas. While the overlap is significant, it is unclear if the two terminals will draw freight volumes from the same commodity groups.

Activity at the terminal may support the export of mining commodities from the Blayney area to port. It is anticipated that mining commodities will be transported in purpose built containers enabling them to be handled at bulk ports. The supply chain for such containers is distinct from that of standard containers, for example, customised mining containers could not be repositioned to a general freight shipper. For this reason, these volumes have been excluded from the modelling exercise, as have bulk movements.

The terminal may also transport smaller volumes of standard containerised freight by striking hook and pull arrangements from existing or planned sidings. Such volumes could potentially be sourced from abattoirs at Blayney. It is assumed that these volumes will be drawn from the identified pool of contestable containerised freight.

The terminal is characterised by:

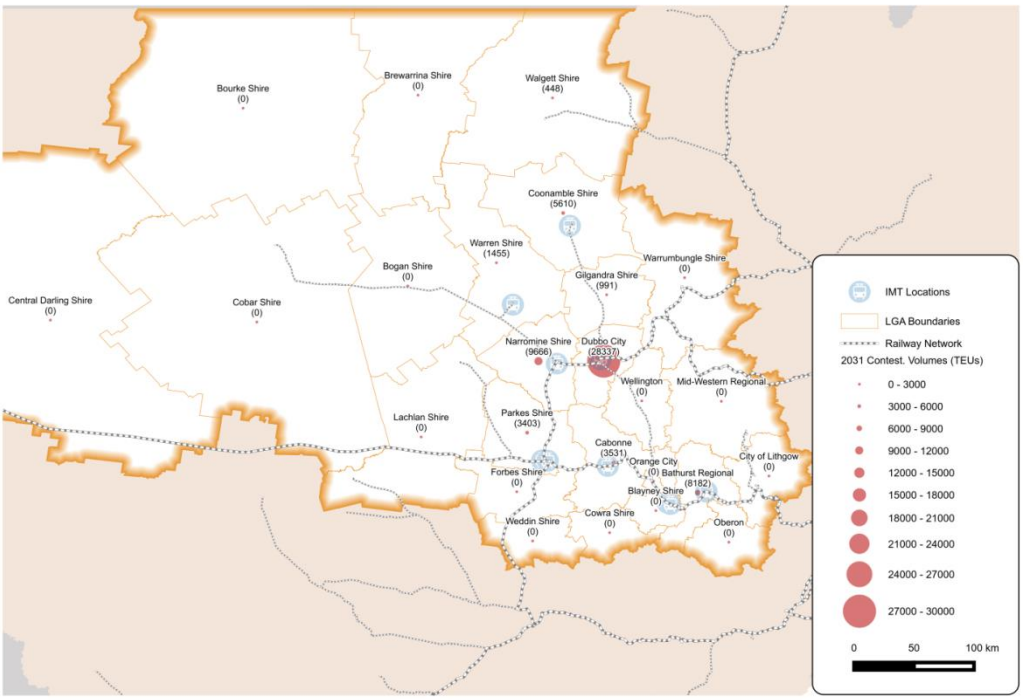
- connectivity to the road transport network (HML 19 Metre Articulated Combination and B-Doubles), although mass limits apply over the Blue Mountains.
- strong connections to existing rail transport networks, as Blayney lies on the Main West rail line and so could connect with services travelling on the Broken Hill and Main West line
- an estimated cycle time into the Port of Botany of approximately 30 hours
- A catchment area estimated to encompass 13,622 TEUs in 2015.
    - Of these, there is considerable overlap with Bathurst. The extent to which the terminal at Blayney cannibalises volumes at Bathurst will depend on the decisions of individual shippers.
    - It is anticipated that grain volumes will continue to freight from Bathurst in the near term, as the Bathurst Grainforce terminal has specialised grain infrastructure.

6.2 Growth in contestable volumes

Building on the analysis in Section 4.3, it is considered that growth in contestable containerised freight will be insufficient to support additional infrastructure by 2021, so 2031 volumes are considered in this section. If emerging volumes detailed in Section 3.5 and Section 3.6, but excluded from the modelling approach, eventuate, then additional infrastructure in the region could become viable earlier.

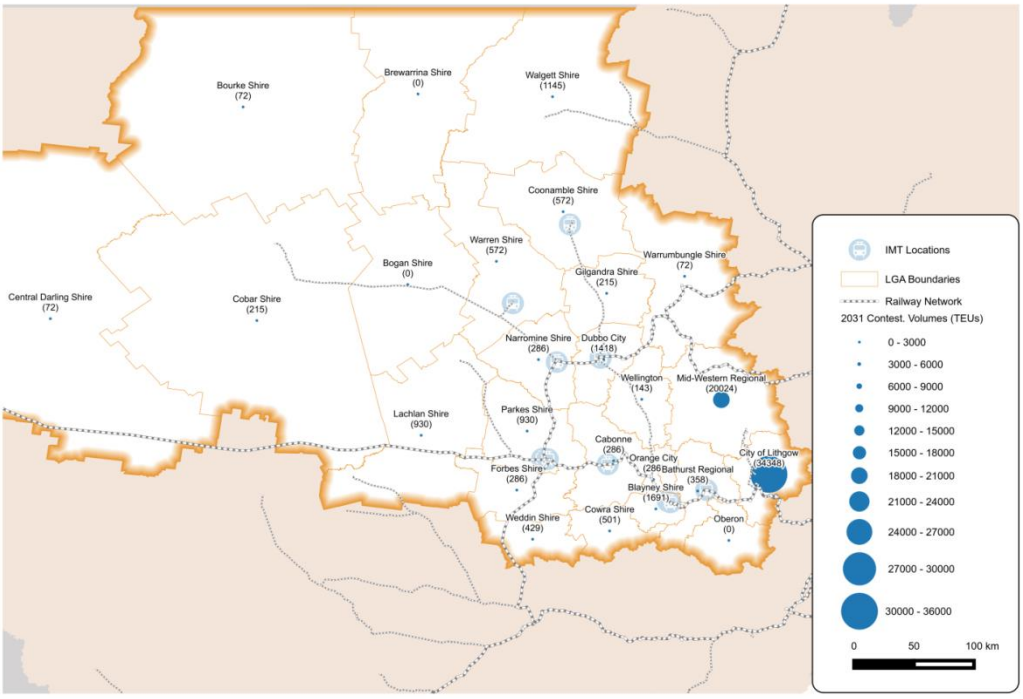
As outlined in Section 4.3, contestable containerised TEU volumes are forecast to grow by close to 29,000 TEUs by 2031. Figure 17 and Figure 18 below illustrate 2031 forecasts, which include this growth, of containerised freight volumes. They present outbound and inbound movement respectively.

Figure 17: Outbound contestable containerised freight volumes, 2031, TEU equivalent



Source: Bureau of Freight Statistics and PwC, 2015

Figure 18: Inbound contestable containerised freight volumes, 2031, TEU equivalent



Source: Bureau of Freight Statistics and PwC, 2015

Figure 17 shows that forecast growth in future outbound contestable containerised freight volumes will be dispersed across the region. This pattern of growth will tend to support the use of road freight, fitting the supply chain to market illustrated in Figure 5 better than that of Figure 4. Figure 17 also shows that Dubbo City is forecast to remain a major site of activity through to 2031, followed by Narromine Shire and Bathurst City.

Figure 18 shows considerable dispersion in freight volumes. With current supply chain forces and limited storage in the region, this pattern of growth is anticipated to continue to support the use of road freight, fitting the supply chain to market illustrated in Figure 6. The exception is a notable clustering of inbound freight in the Mid-Western Shire and City of Lithgow.

6.3 Residual demand

Residual demand is considered to be potentially contestable containerised freight that is outside of the catchment area of existing and planned terminals. Table 17 and Table 18 detail forecasts of residual outbound and inbound containerised cargo demand, by region, for 2031.

Table 17: 2031 outbound residual contestable freight, TEU equivalent, by LGA

ROC	Local Government Area	2030-31 (TEU equivalent)
Orana	Coonamble Shire	5,610
	Gilgandra Shire	283
	Narromine Shire	2,268
	Walgett Shire	448
	Warren Shire	1,434
Centroc	Bathurst Regional	85
	Cabonne	1,075
Total		11,203

Source: Bureau of Freight Statistics and PwC, 2015

Table 18: 2031 inbound residual contestable freight, TEU equivalent, by LGA

ROC	Local Government Area	2030-31 (TEU equivalent)
Centroc	Cabonne	86
	Cowra Shire	98
	Forbes Shire	286
	Lachlan Shire	930
	City of Lithgow	14,618
	Mid-Western Regional	16,958
	Parkes Shire	775
	Weddin Shire	417
Orana	Bourke Shire	72
	Cobar Shire	215
	Coonamble Shire	572
	Gilgandra Shire	61
	Narromine Shire	67
	Walgett Shire	1,145
	Warren Shire	564
	Warrumbungle Shire	66
	Wellington	11

ROC	Local Government Area	2030-31 (TEU equivalent)
Unassigned	Central Darling Shire	72
Total		37,013

Source: Bureau of Freight Statistics and PwC, 2015

Table 17 and Table 18 demonstrate that in aggregate, residual volumes appear to be sufficient to support the development of new infrastructure. While this is true in aggregate, dispersion of these volumes suggests that there are only a few sites that are likely to be commercially attractive.

Given gaps in the current catchment area, terminals that include City of Lithgow, the Central Darling Shire and the City of Dubbo could prove to be viable sites for additional rail infrastructure in the years through to 2031. Given the size of the forecast volumes at these sites, it is likely that existing and emerging private sector operators will respond to growth in the region in the years through to 2031.

The cannibalisation of volumes at an existing terminal by a new terminal is always a possibility. Figure 16 is an illustration of a case where the catchment areas for two intermodal terminals overlap. While competition between open access terminals is likely to benefit shippers, it may not result in net additions to the number of terminals active in the area, as the more cost competitive terminals could replace rather than add to infrastructure in the region.

6.3.1 Potential areas for development

In considering growth in the number of viable intermodal terminals, the approach has been to identify sites where additional volumes sufficient to support a new terminal are forecast to emerge.

Central Darling Shire and City of Lithgow

Mining inbound is the potentially contestable commodity grouping that could support the development of further infrastructure in the catchment of Central Darling Shire and the City of Lithgow in the years to 2031. While potentially large, the exact nature of these volumes, and their suitability for rail, will depend on the specifics of future projects.

The proximity of the two LGAs to Port Botany presents additional challenges, as they are within a distance where rail is not traditionally considered contestable. In that regard, the City of Lithgow, which has connections to existing rail infrastructure, is likely to be more feasible than the Central Darling Shire.

Dubbo

Currently, an intermodal facility is located in the City of Dubbo. Strong forecast growth in the catchment area for the City of Dubbo may support additional investment in the region. As an additional terminal would likely cannibalise volumes from existing operators, even the volumes forecast for 2031 may prove to be insufficient to support additional operators.

7 Inhibiting factors for rail adoption

This section identifies factors that inhibit the use of rail freight in the region. Many shippers avoid rail because of negative perceptions of service reliability, frequency and cost. This section examines inhibiting factors as they relate to supply chains, above rail services and below rail capacity, to identify where and how these perceptions act as barriers to the use of rail freight.

These factors, drawn from stakeholder consultation, combined with the discussion of commodity supply chains in Section 2.2 and 2.3, and the framework for contestability in Section 3, provide a perspective of the attractiveness of rail to shippers in the region.

The planned developments for the region's freight rail networks, discussed in Section 5.1.3, are anticipated to address some of these concerns when implemented.

7.1 Supply chain

As discussed in Section 2.2.2, rail is currently used to transport export commodities to port. Exporters face a number of challenges when integrating rail into their supply chains, which apply in most cases equally to importers.

Container flows repositioning/demurrage

To containerise freight, shippers need access to shipping containers. Shipping containers are typically hired from shipping lines, on terms as short as seven days, although larger shippers may be able to secure terms of 10 to 20 days. If the shipping container is not re-positioned, or de-hired, to another user in the supply chain within the lease timeframe, the shipper is then liable for demurrage fees.

Limited opportunities to reposition up country mean that seven days is a tight timeline for many shippers. For example, an exporter would need to transport a potentially empty container to the point of origin, pack, and then return the container to port within seven days. With a rail cycle time of up to 48-72 hours and low service frequency (with no services on weekends), demurrage fees can be a considerable expense for shippers particularly during service outages and unforeseen events.

Ship receival windows

With multiple freight and passenger services running on the region's rail networks, freight rail paths are typically confirmed well in advance. The fixed nature of rail timetables is not able to cater well to variability in ship arrival times, which are confirmed close to the time of ship arrival. When shippers miss a receival window, it increases their costs considerably, as they then need to pay for transport and storage of their cargo at port.

The extent that ship receival windows affected the decisions of shippers varied with the size of the cargo. As a general principle, smaller shippers experienced less flexible terms with shipping lines, and so were more exposed when they did miss a shipment. There are also complexities associated with rail consist sizes at the three port terminals at Botany.

Infrastructure at Botany

Stakeholders consulted highlighted that infrastructure at port, rather than infrastructure in the region, was a barrier to the use of rail.

The ease of access to the port via road, with a slot booking system in place, was favoured compared to the rail system, which suffers from a lack of existing agreement between the

Port, stevedores and above and below rail operators to coordinate movement. It is noted that the CMCC is progressing this issue.

The need to transit through intermodal terminals, and to break up long trains for handling at Port, were identified as additional steps in the supply chain for rail that increase cost and complexity, as is the lack of marshalling area for freight services on the metropolitan network. The lack of choice in stevedores, and a perception of a lack of productivity improvement in stevedoring services, were also identified as inhibiting factors.

Additionally, importers identified current customs and quarantine procedures as inhibiting factors. Organic commodities travelling west of the Blue Mountains require clearance from customs. The cost of clearing individual TEUs was compared unfavourably to de-stuffing, clearing larger volumes and re-packaging at port. This second approach then favours the use of road freight, as additional moments back to intermodal terminals then make rail freight a more costly choice. Some stakeholders had sought to address this barrier by working with customs at port to develop special working arrangements to process containers more efficiently.

7.2 Above rail factors

Three main factors in above rail services were identified through consultations.

Take or pay

Take or pay contracts commit a shipper to purchasing a certain amount of capacity on a service, which the shipper will then pay for whether they use it or not. Take or pay structures allow rail providers to manage their demand risk and high capital investment and high operational costs. Shippers of variable or seasonal freight struggle with the lack of flexibility in the structure, which compares unfavourably to road freight

As discussed in Section 3.1, smaller shippers may not have the volume to enter into take or pay arrangements. In that case, access to rail comes through freight forwarders, or terminal operators who are prepared to consolidate small loads with their other volumes.

Cycle time

The amount of time a train takes to travel from origin to destination and back again is known as cycle time. It is a large factor in how well the services will align with the supply chain for a commodity. Cycle time has implications for container re-positioning and reliability, especially in terms of meeting ship receival windows. The quality of the track and congestion on the line influence cycle times, as well as the sheer distance from port.

Pathing

Pathing refers to the ability of trains to access routes to their destinations. In terms of the region, pathing was not identified as a barrier to accessing rail freight, as adequate to surplus capacity appears to exist. This contradicts the view of above and below rail operators who claim the line is almost at capacity, due in part to the prevalence of single line sections which limit path capacity.

Stakeholders also highlighted the challenges in the traversing the congested Metropolitan Sydney passenger and freight network to port. The route into port is slowed by a lack of capacity for freight on the shared rail network. This is pronounced during peak periods for passenger rail, which effectively prohibits the movement of freight during these times, as passenger rail services have priority use of the network which is enshrined in legislation.

Capacity constraints can affect a service as it enters into Sydney, and again at points like the Enfield freight precinct, increasing cycle time.

7.3 Below rail factors

Below rail factors influence the productivity, and therefore cost, of rail services to shippers.

Track possessions

Track possessions occur when a part of a network is closed for maintenance, repair or upgrades. Necessarily, possessions disrupt scheduled services, which effects reliability. Possessions are more disruptive when they arise through an emergency or on short notice. It is also possible that the flow of information between below rail operators, above rail operators and shippers is not smooth, especially when the possession effects, but does not occur in, an area. Major shippers observed a lack of coordination between below rail operators as to the timing of possessions, which limited their ability to re-route.

Axle weight limits

The condition of the track on some routes limits the amount of freight that can be safely carried, or affects the speed at which a train can travel. Both constraints limit the productivity of rail services.

Safe work rules

Single track sections in parts of the regional rail network necessitate the use of rail sidings and passing loops to allow trains to effectively path. A lack of this infrastructure was identified by stakeholders as a factor that increased cycle times and reduced average speed, reducing the efficiency of rail services.

8 Economic benefits of rail

This section of the report provides a high level discussion of the potential economic benefits and dis-benefits from potential new IMTs in the study area. In a standard cost-benefit analysis framework one would quantify the costs and benefits from a particular defined investment – in this case, it would relate to a specific investment into an IMT. However, the context of this study was not of a single investment, but to broadly investigate the economic benefits of several potential new IMTs for the region. As a result, in pursuing that objective and given the limited information, a broader high level and qualitative assessment of the benefits and dis-benefits of investment into IMTs had been undertaken.

This assessment is not designed to quantify the costs and benefits of an investment into a specific IMT. Rather, it details potential benefits and dis-benefits of IMTs, which could then be applicable to a specific IMT. When individual projects are proposed, the standard cost-benefit analysis framework would then be a useful tool to determine the net benefits of investment.

8.1 Assessment framework

The assessment approach is to analyse the first and second order economic benefits and dis-benefits of the identified potential new IMTs in the study area, and also any relevant sustainability matters. This approach provides a framework to consider both the economic and sustainability effects of potential new IMTs.

This high level qualitative assessment has been primarily guided by the Transport for NSWs guidelines for the economic appraisal of transport investments (the Guidelines).[9] The following reference material has also been used:

- Road and rail freight: competitors or complements, by BITRE[10];
- Freight transportation – improvements and the economy, by US Department of Transportation [11];
- The value of Rail Intermodal to the U.S Economy, by T.Brown and A.Hatch[12]; and
- Regional intermodal terminals – indicators for sustainability by SD&D.[13]

8.2 Benefits of potential new IMTs

Overall, from the qualitative analysis and within the scope of benefits identified and analysed, it is unclear that the potential new IMTs are likely to generate more benefits than

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9 Transport for NSW, *Principles and Guidelines for Economic appraisal of Transport Investment and Initiatives,* March 2013

10 Bureau of Infrastructure, Transport and Regional Economics, *Road and rail freight: competitors or complements?,* Information sheet 34

11 US Department of Transportation (federal highway administration), *Freight Transportation Improvements and the Economy,* June 2004

12 Thomas R Brown and Anthony B Hatch, *The value of Rail Intermodal to the U.S Economy,* 19 Sept 2002

13 SD&D, *Regional Intermodal Terminals - Indicators for Sustainability,* January 2004

dis-benefits. A summary of the assessment of first and second order benefits, and sustainability matters are found below, and are discussed in greater detail in turn:

- First order benefits – There are benefits from reductions to overall transport vehicle operating and capital costs and safety benefits, but these are offset by an increase in cargo handling costs. It is unclear whether there are positive reliability and time benefits;

- Second order benefits– A range of benefits will be generated, driven by a likely reorganisation of the freight supply chain driving greater cost efficiency and more efficient and productive use of existing land; and

- Sustainability benefits – Likely reduction to air pollution, noise and congestion. There is the potential for these to be offset by a reduction in heritage land.

8.2.1 First order benefits

First order benefits represent the benefits derived from the immediate impact of new IMTs on economic behaviour. As discussed and shown earlier, there are two effects from the potential new IMTs:

- Firstly, current users of road transport may transfer their goods to rail transport. The potential volume shift would depend on the dynamics with currently existing terminals at Dubbo, Bathurst and Parkes, discussed in Section 5.2.1 and in Section 5.2.2.

- Secondly, a reduction in the truck travel distance from the production region to the nearest IMT.

Put alternatively, there is likely to be an overall reduction in the number of net tonne kilometres travelled by truck, offset by an increase in rail transport.

From these effects, a range of benefits as described in Table 19 has been identified.

Table 19: High level qualitative assessment of first order benefits from potential new IMTs

Benefit	Comment
Vehicle operating and capital cost savings	There is likely to be an overall cost reduction driven by two factors. First, there is a substitution of trucks with trains. Given that research has shown that on average it costs less to transport a tonne kilometre by rail than by road, there is likely to be an overall cost reduction.[14] Second, the new IMTs are likely to be closer to production regions, and therefore there will be fewer tonne kilometres for trucks to travel to each IMT.
Safety benefits	Transport by rail has a lower probability of accidents. For each net tonne kilometre travelled, rail is a third less likely to cause either an injury or fatality. [15] This results in savings in relation to medical and vehicle repair costs.

[14] Thomas R Brown and Anthony B Hatch, *The value of Rail Intermodal to the U.S Economy,* 19 Sept 2002

[15] Thomas R Brown and Anthony B Hatch, *The value of Rail Intermodal to the U.S Economy,* 19 Sept 2002

Benefit	Comment
Transport reliability	There is likely to be a reliability dis-benefit caused by modal transfer because road transport is generally more reliable door to door than rail. [16] However, this may be more than offset from an increase in reliability because production areas are closer to the new IMTs than existing ones, reducing truck travel times and distances.
Time costs	There is likely to be a time dis-benefit as road transport takes less time door to door than rail.[17] Again, this may be more than offset from a reduction in travel time for production areas that are closer to the new IMTs than those in the existing network.
Handling costs	There is likely to be a dis-benefit regarding handling costs as cargoes that substitute from road to rail transport will need to be double-handled.

Source: PwC analysis, Consultation

8.2.2 Second order benefits

Second order benefits are distinguished from first order benefits in that they are benefits experienced further in time and are the result of the reorganisation of the industry. After some time, and under the new operating environment, the supply chain is likely to begin to re-organise itself, shift the way its capital is deployed, and optimise itself based on the new operating conditions.

If there is a substantial shift from road transport to rail, which implies greater volumes of cargo at receiving intermodal terminals, it is likely that the logistics supply chain will shift from dispersed distribution centres to large centralised distribution warehouses.

From this analysis, three potential second order benefits have been identified as shown in Table 20.

Table 20: High level qualitative assessment of second order benefits from potential new IMTs

Benefit	Comment
Consolidation of warehousing facilities	Rural producers may be able to reorganise their supply chains and, through the consolidation of production and warehousing facilities, reduce their costs. For example, given that more cargo is being transported by rail, it may be feasible for a common user warehouse facility to handle warehousing services and therefore, through economies of scale, reduce the overall cost of warehousing. This may be offset by potential increases in transport costs from the new

[16] Bureau of Infrastructure, Transport and Regional Economics, *Road and rail freight: competitors or complements?,* Information sheet 34

[17] Bureau of Infrastructure, Transport and Regional Economics, *Road and rail freight: competitors or complements?,* Information sheet 34

Benefit	Comment
	consolidated warehouse.
Land use change	The relocation of IMTs, or the reorganisation of the transport supply chain, results in either increases to available land due to facility consolidation, or land being made available for greater productivity uses. The former occurs through the economies of scale of a larger warehouse/production facility which can enable greater investment in technology to improve efficiency, and the latter from relocating an IMT that uses valuable urban land to lower cost rural land.
Increase in demand for final goods	Due to lower supply chain costs, which are likely to lead to lower prices of goods, there is likely a subsequent increase in demand and therefore output of products.

Source: PwC analysis, Consultation

8.2.3 Sustainability matters

Sustainability matters relate to environmental issues due to potential new IMTs, either due to the construction of the IMT or its short term impact. Several of these matters have been identified, which are explained in further detail in Table 21.

Table 21: High level qualitative assessment of sustainability matters from potential new IMTs

Benefit	Comment
Reduction in air pollution	There are likely to be benefits from a reduction in air pollution, driven by fewer tonne kilometres travelled by road, with some proportion substituted by rail. [18]
Reduction in noise	There are likely to be benefits from fewer net tonne kilometres travelled by road, reducing overall noise. In particular, there are fewer urban net tonne kilometres. [19]
Reduction in congestion	Given that there are fewer net tonne kilometres travelled by road, there are fewer trucks and therefore lower congestion.
Heritage land	There may be dis-benefits from potential reduction to heritage land. This depends on the extent to which heritage land is needed to develop the new IMTs.

Source: PwC analysis, Consultation

It is noted that the construction of any new IMT is likely to cause a temporary increase in air pollution, noise and congestion.

[18] SD&D, *Regional Intermodal Terminals - Indicators for Sustainability,* January 2004

[19] SD&D, *Regional Intermodal Terminals - Indicators for Sustainability,* January 2004

Appendices

Appendix A Forecast containerised freight growth

The growth rates used reflect the forecast growth in Gross Value Added (GVA) for production of each of the commodities travelling to and from the study area. The growth in containerised freight volumes generated is assumed to be commensurate to the growth in industry GVA.

Growth rates have been forecast for the Central NSW and for Western NSW, for each year of the outlook through to 2031. Forecast volumes have been modelled for intervals in this period, namely, 2015, 2021 and 2031. The applicable compound annual growth rates (geometric average) for these three periods are presented in Table 22 and Table 23 below. As these tables show, over the longer term, forecast growth rates taper, and tend towards average long term economic growth.

Table 22: Forecast Growth Rates (annual), Central NSW

Commodity	2011- 2015	2011- 2021	2011-2031
Consumer Goods	3.07%	2.60%	2.50%
Containers & General Freight	4.04%	3.38%	3.08%
Cotton	1.81%	1.52%	1.30%
Fertiliser	2.60%	2.07%	1.90%
Flour & Starch	1.97%	1.50%	1.13%
Food Products	2.12%	1.78%	1.65%
Forest Products	3.12%	2.59%	2.55%
Fruit & Vegetables	1.97%	1.65%	1.48%
Grains	1.97%	1.50%	1.13%
Meat	1.98%	1.55%	1.28%
Mining Inbound	6.99%	6.08%	5.00%
Mining Outbound	6.99%	6.08%	5.00%
Wine	2.12%	1.78%	1.65%
Wool	1.90%	1.46%	1.14%

Source: PwC, 2015

Table 23: Forecast Growth Rates (annual), Western NSW

Commodity	2011- 2015	2011- 2021	2011-2031
Consumer Goods	2.99%	2.43%	2.30%
Containers & General Freight	3.95%	3.21%	2.88%
Cotton	1.81%	1.52%	1.30%
Fertiliser	2.60%	2.07%	1.90%
Flour & Starch	1.97%	1.50%	1.13%
Food Products	2.12%	1.78%	1.65%
Forest Products	3.12%	2.59%	2.55%
Fruit & Vegetables	1.97%	1.65%	1.48%
Grains	1.97%	1.50%	1.13%
Meat	1.98%	1.55%	1.28%
Mining Inbound	6.99%	6.08%	5.00%
Mining Outbound	6.99%	6.08%	5.00%
Wine	2.12%	1.78%	1.65%
Wool	1.90%	1.46%	1.14%

Source: PwC, 2015

Appendix B Stakeholders contacted

Table 24: Stakeholders consulted

Stakeholder Group	Name	Local Government Area
Regional Organisation of Councils	Orana	Bogan Shire
		Bourke Shire
		Brewarrina Shire
		Cobar Shire
		Coonamble Shire
		Dubbo City
		Gilgandra Shire
		Narromine Shire
		Walgett Shire
		Warren Shire
		Warrumbungle Shire
		Wellington Shire
Regional Organisation of Councils	Centroc	Bathurst Regional
		Blayney Shire
		Cabonne Shire
		City of Lithgow
		Cowra Shire
		Forbes Shire
		Lachlan Shire
		Mid-Western Regional
		Oberon Shire
		Orange City
		Parkes Shire
		Weddin Shire
Government	NatRoad ARTA	Dubbo City
Government	RDA Central West	Orange City
Government	RMS Parkes	Parkes Shire
Bulk Handling Company	Agrigrain	Multiple sites
Bulk Handling Company	Auscott	Multiple sites
Bulk Handling Company	Cargill/ Grainflow	Multiple sites
Bulk Handling Company	Graincorp	Multiple sites
Bulk Handling Company	Louis Dreyfus Commodities	Multiple sites
Bulk Handling Company	Robinson Grain	Dubbo City
Bulk Handling Company	Walgett Special One Co-Operative PTY LTD	Walgett Shire

Stakeholder Group	Name	Local Government Area
Freight Originator	Alkane Resources	Dubbo City
Freight Originator	Aurelia Metals/Hera project	Cobar Shire
Freight Originator	Blayney Wholesale Foods	Blayney Shire
Freight Originator	Cowra Meat Processors Pty Limited	Cowra Shire
Freight Originator	CSA Mine	Cobar Shire
Freight Originator	Endeavour operations	Cobar Shire
Freight Originator	Green Distillation Technologies	Warren Shire
Freight Originator	KJ Halal Meat	Nyngan Shire
Freight Originator	Manildra	Cabonne Shire
Freight Originator	Manuka Silver Project	Cobar Shire
Freight Originator	Mars Petcare	Bathurst Regional
Freight Originator	Namoi Cotton	Multiple sites
Freight Originator	Nestlé Purina PetCare	Blayney Shire
Freight Originator	Newcrest Mining	Blayney Shire
Freight Originator	North Parkes Mine	Parkes Shire
Freight Originator	Peak Gold Mine	Cobar Shire
Freight Originator	PF Olsen	Bathurst Regional
Freight Originator	Queensland Cotton (Olan group)	Warren Shire
Freight Originator	Tritton Mines	Bogan Shire
Shipper	Asciano	Multiple sites
Shipper	Bathurst Rail Intermodal Terminal	Bathurst Regional
Shipper	Blayney Sealink	Blayney Shire
Shipper	Fletcher's International Exports	Dubbo City
Shipper	Grainforce Rail Terminal	Bathurst Regional
Shipper	Hennings Harders	Orange City
Shipper	KPC Bulk	Multiple sites
Shipper	Linfox	Multiple sites
Shipper	MacInnes Transport	Dubbo City
Shipper	Mountain Industries	Forbes
Shipper	Pacfic National	Multiple sites
Shipper	Qube	Multiple sites
Shipper	Robert Holmes Transport	Dubbo City
Shipper	Transforce Bulk Haulage	Dubbo City

Appendix C Questionnaire for Government Agencies

Government Agencies Consultation – Indicative questions

1) *Government agency name*

2) *Contact person and title*

Current situation

1) *Confirmation of the current location of production, product, volume, destination, domestic or export and mode of transport for containerised cargoes*

Location of production	*Product/ Commodity*	*Tonnage (TEU conversion)*	*Destinations for products*	*Domestic/ Export (%)*	*Current mode of transport*

2) *For your jurisdiction, can you indicate the uppermost vehicle access limits? (please add rows as required)*

Shipper	*First Move (Farm)*	*Second Move (Gin, Mill Other)*	*Third Move (Terminal, Destination)*

3) *Is the hierarchy of producers (high volume to low volume) likely to change in the future? If so why?*

4) *Are other commodities being considered for transportation that has yet to be captured? If so, what are their planned locations and forecast expectations?*

5) *What modes of transport are being considered for these new commodities?*

6) *What percentage reduction in rail costs do you think is required to shift from road to rail?*

7) *Are there current limitations on the use of existing IMT locations in the region?*

8) *Do you have plans or thoughts on desirable locations for future IMTs, why are they preferred?*

Appendix D Questionnaire for shippers

Shippers Consultation – Indicative questions

3) *Company name*

4) *Contact person and title*

Current situation

9) *Confirmation of the current location of production, product, volume, destination, domestic or export and mode of transport for containerised cargoes*

Location of production	***Product/ Commodity***	***Tonnage (TEU conversion)***	***Destinations for products***	***Domestic/ Export (%)***	***Current mode of transport***

10) *What is the main commodity supplied from your company? Do you think this will change in the future, if so why?*

11) *What proportion of commodities received or supplied by your company are currently non-containerised? How might this change in future?*

12) *What major routes do you use for rail or road? Who makes the logistical decision?*

13) *Are there alternatives to the routes described above (e.g due to bad weather, traffic, greater loads)?*

14) *What factors affect mode choice? Please fill in the following:*

Factor	**Importance from 1 to 6 (1 the most important)**
Destination Market	
Travel time	
On time performance	
Other logistic costs	
Risk of loss or damage	
Geographic coverage	
Other (specify)	

15) *What are the current costs per tonne of the transport option? Does the cost reduce with demand?*

16) *If known, what is the rail equivalent transport cost?*

17) *What percentage reduction in rail costs do you think is required to shift from road to rail? Is there a volume minimum needed for particular commodities?*

18) *Besides costs, are there any other barriers to shifting to rail?*

19) *All things being equal (such as costs, transport time, risk), would you prefer to use rail?*

20) *Are there new technologies to move road to rail that would be beneficial? Will this adjust to demand fluctuations?*

21) *What commodity currently transported by road could potentially be moved to rail with the right factors such as increases in demand and infrastructure changes?*

22) *Any other comments?*