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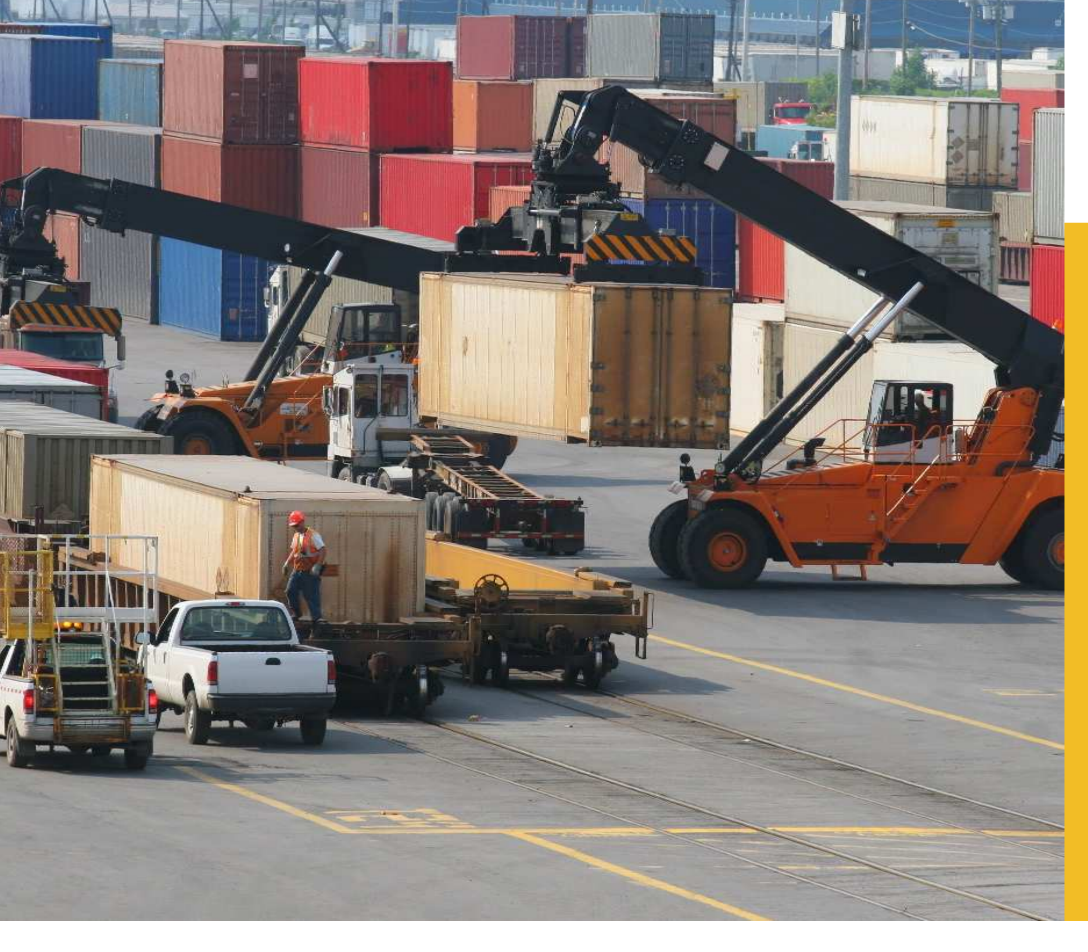
Future of Intermodal Terminals

Department of Infrastructure and Regional Development

May 2017

ranbury



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Executive summary

PricewaterhouseCoopers Consulting (Australia) Pty Limited (PwC), in collaboration with Ranbury Pty Ltd (Ranbury), was engaged by the Department of Infrastructure and Regional Development (DIRD) to undertake a study on the future of intermodal terminals in Australia. The study focuses on intermodal terminals serving the interstate and import/export (IMEX) markets, including terminals within the proposed Inland Rail corridor.

The freight and logistics industry is a key driver and enabler of economic activity within Australia. ACIL Allen Consulting[1] estimated that the true value[2] of the freight and logistics sector to the Australian economy in 2013 was $131.6 billion, which is 8.6 per cent of Gross Domestic Product. The sector was estimated to employ 1.2 million people.

The sector will have ongoing importance to the Australian economy as the freight task is projected to increase by 80 per cent between 2010 and 2030 with this rate of growth seeing freight triple by 2050. The proportion of this freight task by volume undertaken through the rail based supply chain is growing as a result of increasing bulk exports.

Intermodal terminals are critical in the rail based supply chain

Intermodal terminals occupy a critical position in the rail based supply chain. Terminals provide the connecting interface point between the rail network and the customer facing operations. Effective terminal operations and sufficient capacity are essential building blocks for the overall competiveness of the rail based supply chains.

Terminal viability is driven by throughput

The scale and viability of intermodal terminals is dependent on terminal throughput. There are significant fixed costs (capital and operating expenses) incurred in terminal development and operations. Maximising volume for terminal configuration (which is unique for each intermodal terminal) optimises efficiency and reduces the cost per container handled, which is essential to ensure price competiveness against alternative supply chain options.

The rail based supply chain must be at least a highly competitive, if not optimal solution for the cargo owner in order to attract freight traffic to an intermodal terminal. At a high level, the key drivers of choice of freight solution for cargo owners include:

- cost effectiveness
- time effectiveness
- reliability.

Throughput is driven by the competitiveness of the rail based supply chain

The rail based supply chain is characterised by a large number of disaggregated components, some of which are substantially fragmented, as shown overleaf in Figure 1. The performance and costs of any one participant in the supply chain will flow through to participants in other positions of the chain given its integrated nature and have to be absorbed as part of the total supply cost.

The competitiveness of the rail based supply chain and the associated freight traffic is optimised by efficient interaction and interface between all positions within the rail based supply chain.

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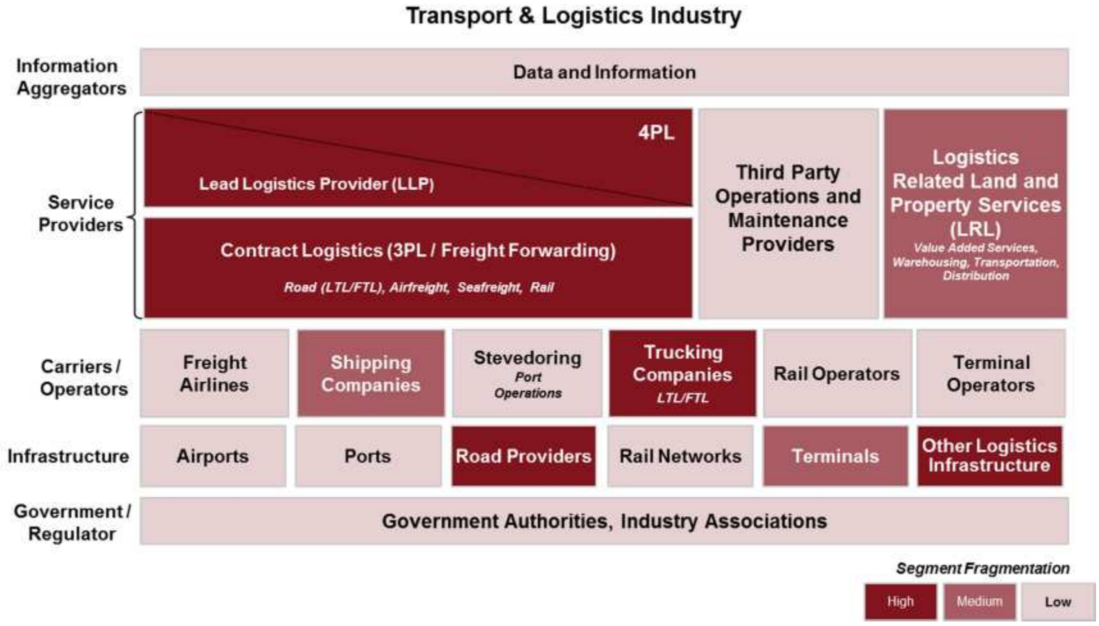
[1] ACIL Allen Consulting, *The Economic Significance of the Australian Logistics Industry*, 2014.

[2] The value of the transport and logistics industry as estimated by the Australian Bureau of Statistics is potentially understated as they do not capture internal logistics expenditure by firms or logistics expenditure not related to the movement of physical goods

Figure 1: Freight Supply Chains



Source: PwC 2017

The individual efficiency and capacity of any position within the supply chain is generally insufficient to drive the overall suitability of the chain if the interdependent components are not also functioning at optimal efficiency and capacity. This drives the behaviour of service providers within the supply based supply chain to assume multiple positions to improve cost competiveness though control, efficiency, responsiveness, integration (either vertical and/or horizontal) and flexibility.

There is growing recognition within the industry of the need for supply chain co-ordination to contribute to the effective integration and interface between all positions within the supply chain to address single point failure in the supply chain.

Potential gaps in intermodal terminal capacity

Gaps in intermodal terminal capacity may arise within the next 20 years. A capacity assessment has been undertaken on a ‘with’ and ‘without’ Inland Rail basis. Regions where gaps will potentially arise and the timing of these gaps are shown in the table below.

Table 1: Potential Capacity Gaps – Intermodal Terminals

Region	Markets Served	Potential timing: With Inland Rail	Potential timing: Without Inland Rail	Context
Brisbane	Interstate	2025	2035	Industry stakeholders have already identified a potential short term capacity constraint at Acacia Ridge, arising from customer preferences for 'premium train paths' and commercial and contractual issues associated with multi user terminals which can inhibit demand transfer and adjustment from one terminal to another.
	IMEX	2023		Brisbane could face short term IMEX capacity issues under a project case scenario (with Inland Rail) by 2023 arising from the current lack of IMEX feeder terminals. This is likely to be addressed by the market. This assumes there is no demand constraint on the corridor (although it is likely to be partially constrained in reality) due to passenger network issues.
Sydney	IMEX	2035	2035	Capacity gaps in terminals serving the IMEX market will potentially emerge in Sydney by 2035 irrespective of whether Inland Rail proceeds or not. This gap refers to an aggregated capacity assessment for port and inland IMEX terminals combined. The major constraint will arise at Port Botany, and in theory, capacity gaps at Port Botany terminals will potentially arise sooner, as early as 2017. This limiting factor at the port-side may create a bottleneck for the Sydney IMEX terminal network in general.
Melbourne	Interstate	2030	2035	Volumes projected here relate to throughput for the intermodal terminals North and South Dynon and SCT Altona. The Dynon terminals are subject to leases from the Victorian Government through VicTrack and the state government has indicated a desire to relocate the operations from the precinct. The capacity analysis here does not consider future intermodal terminal capacity at the Western Interstate Freight Terminal (or any similar development within the metropolitan catchment in Melbourne). New terminals would be expected to address capacity constraints.
Perth	Interstate	2030	2030	Capacity gaps in terminals serving the interstate market will potentially emerge by 2030 irrespective of whether Inland Rail proceeds or not. However, demand growth rates underpinning this capacity analysis appear optimistic especially given recent growth experience. Industry and state government stakeholder analysis has instead indicated that interstate rail terminal capacity is considered to be sufficient until roughly 2050 given infrastructure in operation at Kewdale and Forrestfield.
	IMEX	2025	2025	Capacity gaps in terminals serving the IMEX market will potentially emerge by 2025 if demand is consistent with Port of Fremantle forecasts. The capacity gap may be brought forward if the WA Government target of 30 per cent rail mode share target is achieved.

Note: Our scope included Adelaide and Darwin but no capacity constraints were forecast for these regions and hence are not listed above.

Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC/Ranbury analysis

This capacity assessment is underpinned by the following assumptions:

- Demand forecasts are based on the Inland Rail Business Case forecasts (IRBC) prepared by ACIL Allen for the Inland Rail Implementation Group. Any subsequent change in forecast demand will change the outcome of the capacity analysis.
- The scope of analysis is on infrastructure capacity within the terminal gate. In practice, there are a variety of determinants of terminal capacity which fall outside the terminal gate which may impact the outcome of capacity assessments
- Capacity analysis does not consider future intermodal terminal capacity at the Western Interstate Freight Terminal (or a commensurate development) given the lack of publicly available data on forecast throughput and capacity. This will have an impact on the capacity assessment for Melbourne.

Capacity is scalable

Short term capacity uplift is scalable but long term uplift requires investment. Short term capacity can be realised through:

- modifying operational procedures (rail site, PUD legs)
- limited expansion of the terminal footprint (additional hardstand (width/length) storage and potential warehousing)
- extension of loading sidings to improve train handling/turnaround
- additional lift equipment (decrease turnaround time).

Long term capacity is generally more capital and time intensive and realised through terminal reconfiguration and upgrade of lift equipment (where a brownfield site has spatial constraints and is at or near capacity).

Key intermodal terminal capacity constraints include:

- terminal infrastructure such as:
  - insufficient road and siding length to minimise shunting and over reliance on external holding yards (which potentially impact accessibility)
  - insufficient material handling equipment to efficiently strip and load the train
- terminal configuration that impedes optimal rail operations such as dead end terminals
- availability of terminal sites that:
  - optimise the distance between terminal and end customer
  - enable the use of high productivity vehicles either to or within the terminal gate
- accessibility challenges such as:
  - high productivity vehicle access to the road and highway network
  - unfettered rail access to the terminal and competing passenger priority on shared networks
  - network constraints such as line tonne axle load and lack of vertical clearance that limit the size of the reference train
  - path availability that is consistent with the cargo owners preferred service plan
- contractual challenges including:
  - access arrangements which impede investment in terminal capacity
  - lease conditions (such as term of lease) which impede investment in terminal capacity
- urban encroachment which impedes the operation of the terminal and opportunities for expansion of the terminal envelope.

The private sector is active in terminal investment

The private sector will invest in the intermodal terminal network where it is commercially prudent. Therefore direct Government intervention (at all tiers of Australian Government) may be limited to instances where specific market failure (such as the ability to assemble and protect land holdings for future development)

impedes private sector investment. Market failure requiring Government intervention in the intermodal market is rare.

In general, private sector entities will opt for brownfield over greenfield investment given:

- the capital intensive nature of most greenfield solutions including the mandatory rail network interface and connections
- the risk tied to capital intensive terminal investment given the potential for the stranding of assets due to the highly competitive market between road and rail modes and between rail operators.

The attractiveness of the overall rail based solution underpins the viability of an intermodal terminal. Therefore the private sector decision to invest in terminal capacity is not made in isolation of broader investment decisions within the supply chain, including network capacity, and broader development decisions (such as power, water and road access to greenfield sites such as Bromelton).

Co-location and freight precincts are growing in number

Co-location is an emerging trend both within Australia and globally that supports volume growth at intermodal terminals as it delivers the following benefits:

- generates a service catchment within the terminal envelope or environs
- reduces distance of the pickup and delivery (PUD) leg to reduce operating costs.
- use of high productivity vehicles (HPV) and internal transfer vehicles (ITV) within terminal gate to improve efficiency of PUD and reduce cost.
- vertical and horizontal integration by service providers within a site to improve the competitive advantage of the rail based supply chain.
- a semi-captive customer base.

Co-location also helps improve the overall efficiency of the rail based supply chain through:

- linehaul efficiency through reliable freight volumes
- network planning – certainty of infrastructure standards
- introducing a property revenue stream for the owner/developer thereby diversifying the revenue base for the facility
- adoption of technology (which generally comes at significant fixed cost and is justifiable when this cost can be disbursed across a high volume of containers).

A key challenge to co-location with customers (particularly in metro areas) is the ability to assemble significant tranches of appropriately zoned and buffered land, ensuring the prerequisite road and rail connectivity of the site and financing the investment.

Key lessons learned for Australia

There are many models for terminals in Australia and internationally, each of which has different characteristics. Key lessons learned from the case studies, which are relevant to Australian terminal solutions include:

- Terminal connectivity – a critical success factor for any intermodal terminal is its connectivity to the road and rail network. The case studies demonstrate the value of terminal precinct planning to optimise its configuration and operations.
- Co-location – benefits of co-location include reducing double-handling, improving the efficiency of coordinating supply chain moves and reducing operations costs. There are various operating models which can be applied:
  - Independent owner, infrastructure leased to multiple operators
  - Joint venture between two or more parties
  - Regulated open access which is enforced

- Vertical and horizontal integration – Providing additional services at terminals can be an opportunity to increase vertical integration. Vertical integration improves the efficiency of coordinating the transition points within the rail supply chain.
- Ability to generate volume – Without sufficient scale, the cost effectiveness of rail freight can be marginal and subject to competition from both road and sea transport for intermodal freight tasks.
- Investment in a rail supply chain that is fit-for-purpose – Not all global models of co-location and freight precincts will be applicable within the Australian context. In particular, North American models are typically founded upon large scale hub and spoke networks (as opposed to the point to point nature of the Australian network) which enables access to far larger and more populated service catchments than in Australia.

Determining the need for an intermodal terminal

This study provides a high level preliminary decision making framework to ascertain whether there is a need for an intermodal terminal. It is designed to be used by local government in conjunction with terminal typology info sheets. It is not intended to be exhaustive – recognising that terminal investment proposals will be unique in each region – but to provide a high level framework for decisions.

Contents

Glossary

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Term	Definition
Above rail services	Rail transport services provided by passenger and freight transport operators. Does not include ownership of rail tracks (see 'below rail services').
ACCC	Australian Competition and Consumer Commission
ACFS	Australian Container Freight Services
ARA	Australasian Railway Association
ARTC	Australian Rail Track Corporation
AZ	Aurizon
Below rail services	Provision of rail infrastructure services to freight and passenger rail transport operators, including rail tracks and associated infrastructure such as signalling
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BMT	Brisbane Multi-Modal Terminal
PBPL	Port of Brisbane Pty Ltd
Broad gauge	Track gauge of 1600mm
CBH	Co-operative Bulk Handling
DIRD	Department of Infrastructure and Regional Development
DTMR	Department of Transport and Main Roads (Queensland)
DPW	DP World Australia
Freight DCs & W/houses	Freight distribution centres (DCs) and warehouses within the terminal envelope
GWA	Genesee & Wyoming Australia
HPV	High Performance Vehicle
ICS	Intermodal Container Services
ILS	Intermodal Link Services
IMEX	Import export
IMT	Intermodal Terminal
IPART	Independent Pricing and Regulatory Tribunal
IRBC	Inland Rail Business Case
ITV	Internal Transfer Vehicle
Land bridging	Land transfer of freight between port(s) or major metropolitan locations
MCS	Maritime Container Services
Multiple operators	More than one rail operator utilising the terminal
Narrow gauge	Track gauge of 1067mm
NQRT	North Quay Rail Terminal (Fremantle Harbour)

Term	Definition
Open access	Open access means that freight firms can apply to terminal operator to have access to the site to service their customers. The access is on a non-discriminatory basis so that all parties are provided services to the same level. Open access can be regulated (for example coal terminals) or agreed under commercial terms.
OD	Origin-destination pair Origin – The location where containers are packed Destination – The location where containers are unpacked.
PN	Pacific National
PUD	Pick up and delivery
PwC	PricewaterhouseCoopers Consulting (Australia) Pty Ltd
QCA	Queensland Competition Authority
Reach stacker	Container fork lift with capacity to reach into a container storage stack
Reference train	Nominated maximum operating train service configuration
RMG	Rail mounted gantry
Rollingstock	A vehicle that operates on or uses a railway track. A collective term for a group of rail wagons of various types.
SCT	Specialised Container Transport
Services per week	Number of return services per week
Short term capacity	Short term capacity has been assessed where incremental throughput can be achieved through existing latent buffer capacity or incremental lifting equipment without major infrastructure upgrades of existing brownfield terminals.
SOY	Sydney Operational Yard
SSFL	Southern Sydney Freight Line
Standard gauge	Track gauge of 1435mm
Stevedore	Business that engages in loading and unloading ships' cargo.
TAL	Tonne axle load
TEU	TEU is an acronym for 'twenty-foot equivalent unit'. The most common container sizes for international shipping are 20-foot and 40-foot. TEU is used as a standard measure for the capacity of a container ship, the capacity of a port and the volume of container trade. For a standard measure, 40-foot containers are converted into 20-foot container equivalents. For example, one 40-foot container is counted as two 20-foot containers or 2 TEU.
VICT	Victoria International Container Terminal
Volume	Throughput of containers (TEU) at intermodal terminals has been categorised as 'high', 'medium' or 'low' based on the following groupings: High – 200,000+ TEU Medium – 70,000 – 200,000 TEU Low – Up to 70,000 TEU

1 Introduction

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PricewaterhouseCoopers Consulting (Australia) Pty Limited (PwC), in collaboration with Ranbury Pty Ltd (Ranbury), was engaged by the Department of Infrastructure and Regional Development (DIRD) to undertake a study on the future of intermodal terminals in Australia.

The study focuses on intermodal terminals serving the interstate and import/export (IMEX) markets, including terminals within the proposed Inland Rail corridor.

1.1 Approach

The study was undertaken over two phases.

Phase	Summary	Objectives
Phase A	An assessment of the physical capacity (existing and short term future) of terminals by region and on a regional needs analysis.	To provide DIRD with a baseline of intermodal terminal capacity at a regional level, identifying emerging trends and developments that may impact terminals, a range of constraints and analysis of future regional needs by market (interstate and IMEX).
Phase B	An evaluation of domestic and global intermodal terminals and preparation of intermodal terminal fact sheets.	To provide information on terminal characteristics that can be disseminated to local state government.

1.2 Study Scope

1.2.1 Containerised Freight

This study focuses predominantly on containerised freight, which excludes bulk freights (conveyed in bulk wagons) and specialised freights operating out of single purpose facilities and sidings. Within the last decade, there has been a modest trend towards containerised bulk (eg grain and mineral concentrates) and these are in-scope for this study.

The Specialised Container Transport (SCT) Logistics business model transports general freight using covered, high cubic capacity van wagons as well as utilising standard containers. This van traffic and the SCT terminals are included in this assessment.

1.2.2 Demand Forecasts

The demand forecasts underpinning the analysis in this report were sourced from the Inland Rail Business Case (IRBC), prepared by ACIL Allen for the Inland Rail Implementation Group. The analysis consists of two demand scenarios:

- With Inland Rail
- Without Inland Rail

Demand was forecast under different assumptions about relative pricing of alternative freight modes, reliability, availability and transit time, and assumptions about drivers of freight demand such as GDP, fuel prices and labour costs. These factors are all important for demand for non-bulk inter-capital freight, with availability and reliability considered essential for express and other just-in-time freight (eg postal, retail chains). Industrial commodities (eg paper and steel) are less sensitive to journey time and more sensitive to price, and as such tend to use rail or sea freight on the domestic legs of international shipping services.

Under the IRBC, it is expected that total demand for rail freight (bulk and non-bulk) will increase in future, with forecast growth in the freight task arising from growing costs of road-based supply chains including congestion.

1.2.3 Capacity Assessment

The scope of analysis is on infrastructure capacity focusing on operations **within the terminal gate**. The focus is on short term capacity where incremental throughput can be achieved through existing latent buffer capacity or incremental lifting equipment without major infrastructure upgrades of existing brownfield terminals. Short term capacity is based on assessment by terminal operators and analysis by Ranbury/PwC.

In practice, there are a variety of determinants of terminal capacity which fall outside the terminal gate. These could potentially impact the capacity assessment and needs analysis and the Phase A report should be read within this context. Some of the capacity determinants outside the terminal gate are discussed below.

Network infrastructure

Network infrastructure and features can have a significant impact on terminal capacity. The nominated train configuration, which is driven by crossing loop length, track structure gauge clearance, and other network constraints impose limitations on the types or train services that can operate on various network track sections.

Commercial imperatives

Terminals are not regulated for open access in most cases. They are facilities that are often in legacy locations in freight catchments, which in turn provides commercial advantages and barriers to entry with respect to competitors. As a result, leases, operational control, costs for access and services for third parties are tailored to maintain commercial advantage.

Rail operators in Australia treat terminals as cost centres for their rail line haul operations. The efficient loading/unloading of services is a key determinant of service reliability. Retaining control of terminal operations is considered critical to the delivery of reliable customer service and customer retention.

In this competitive environment, future freight demand growth may not spread evenly across the rail and terminal operators. There are contractual obligations, competitive tensions and infrastructural barriers that disrupt this smoothed distribution of supply and demand.

For example, future IMEX capacity can be limited by the freight windows offered by stevedores and the competitive response to this window structure – participants can theoretically secure windows for competitive advantage without making full use of them.

Operational constraints

Intermodal terminal capacity for interstate traffic is also driven by the pick-up and delivery (PUD) profile of customers. Most customers seek transit times that result in train service departures in the evening and morning arrivals. This compresses the periods during which train services arrive and depart and increases demand for “premium train paths” that meet the optimal arrival/departure profile. This demand profile suits businesses that primarily operate week days and day shift. These weekly peaks and the seasonal peak periods that occur around Christmas and Easter result in demand being very uneven across most working weeks. The extent to which individual terminals have uneven peak demand profiles is not assessed as part of the study. It is accepted that there is an ability to extend working hours, apply booking systems and supplement existing lifting equipment to increase terminal capacity if required by the terminal operator.

In addition, it should be noted that even where capacity is not apparently constrained, no assessment has been made as to whether the terminals are operating effectively within this capacity. Most terminals are operating to meet current throughput requirements and demonstrable demand increases.

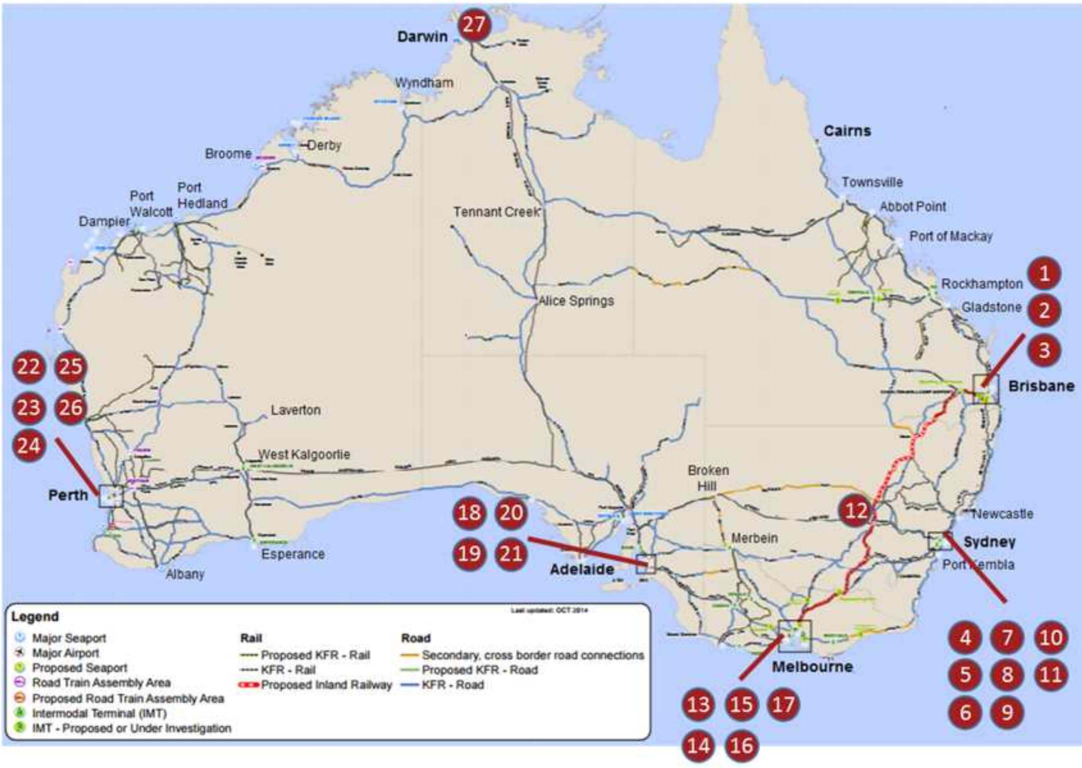
1.2.4 *In-scope terminals*

The study considers key intermodal terminals that influence the effectiveness of the rail based supply chain. In-scope terminals were selected through consideration of terminal throughput, the number of linkage routes and the freight types handled.

In-scope terminals form part of the standard gauge interstate and/or IMEX rail based supply chains. They are mapped in Figure 2 and listed in Table 2.

These terminals may also play an enabling role in intrastate rail freight movements, for example, port-based IMEX terminals. It should be noted that some IMEX terminals can accommodate dual gauge services.

Figure 2: Location of in-scope terminals



Source: DIRD, with update by PwC to mark in-scope terminals

The in-scope terminals are listed in Table 2.

Table 2: In scope terminals

State	Location	Terminal
Queensland	Brisbane	1. Acacia Ridge Interstate Terminal
	Brisbane	2. SCT Bromelton
	Port of Brisbane	3. Brisbane Multi-Modal Terminal (BMT)
New South Wales	Sydney	4. Chullora
	Sydney	5. Enfield
	Sydney	6. Moorebank (under development)
	Sydney	7. Yennora
	Sydney	8. Minto
	Sydney	9. Villawood
	Sydney	10. Cooks River
	Port Botany	11. DP World, Hutchinson and Qube
	Regional NSW	12. SCT Parkes Logistics Terminal
Victoria	Melbourne	13. North Dynon
	Melbourne	14. South Dynon
	Melbourne	15. SCT Altona (Laverton) Terminal
	Melbourne	16. Somerton Terminal
	Port of Melbourne	17. Appleton Dock, Victoria Dock, West Swanson Intermodal Terminal and East Swanson
South Australia	Adelaide	18. Gillman Port Flat
	Adelaide	19. Islington
	Adelaide	20. Penfield Terminal
	Port of Adelaide	21. Flinders Adelaide Container Terminal and Qube
Western Australia	Perth	22. Kewdale
	Perth	23. Forrestfield (Aurizon) Terminal
	Perth	24. Forrestfield (SCT) Terminal
	Perth	25. Forrestfield (ILS/ICS) Terminal
	Perth – Fremantle Port	26. North Quay Rail Terminal
Northern Territory	Darwin	27. Darwin Intermodal Terminal

1.2.5 Report Structure

This report addresses the scope and objectives of Phase A-B.

Phase	Report reference	Theme	Content description
Phase A	Section 2	Intermodal Terminals	Describes the position and function of terminals in their respective supply chains, key market participants, their role and factors influencing the use of rail freight compared to other modes.
	Section 3	Terminal Insights	Outlines emerging trends in the rail intermodal supply chains, terminal provision and capacity, including industry responses.
	Sections 4-10	Regional Analysis	Considers the following items for each region: – **Markets/destinations** establishes the geographic classifications, catchment areas and commodities underpinning the regional assessment of capacity and demand. – **Capacity analysis** provides an overview of capacity at existing in-scope intermodal terminals. – **Needs analysis** considers, by rail freight corridor and capital city terminals, future demand forecasts and identifies key constraints to capacity (where applicable).
Phase B	Section 11	Case studies	Provide domestic and international examples of intermodal terminals of varying scale and function. The objective is to identify critical success factors and analyse to what extent these characteristics can be applied to the Australian market.
	Sections 12-13	Terminal typology	Provides a framework to categorise terminals by their function, location, throughput volume size, infrastructure and service frequency. This section is for informational purposes for government to understand terminal types in Australia and their key characteristics.

2 Intermodal Terminals

Intermodal Terminals

By definition, an intermodal terminal (IMT) is a facility along the supply chain that provides for the transfer of freight from one transport mode to another. Facilities may range from transfer points that provide a limited set of services, to purpose-built terminals or hubs, designed for transfers, storage, distribution and a host of associated services.

2.1 Rail use

Container freight is contestable between rail and road. There is often a 'natural fit' between the transport mode and a given freight task which accounts for the characteristics of a freight movement, such as freight type or the shipper's preferences with regard to cost, speed and security.

For example, the rail based supply chain has an established role in transporting bulk commodities to port due to its advantages in carrying capacity and because rail freight is cost-competitive over long distances. In terms of non-bulk freight, the most significant rail based supply chains are for interstate and IMEX.

The following trends are emerging in rail based supply chains, with the potential to shape mode choice in their respective markets.

2.1.1 IMEX

- Development of large intermodal terminals close to port with co-located freight precincts, including major freight forwarding tenants.
- Interest in port shuttle services in response to road congestion.

2.1.2 Interstate

- Consideration of major rail network investment in the form of Inland Rail, a new alignment between Melbourne and Brisbane. This is in response to growing congestion on road networks, the partially shared rail network in the Sydney-Newcastle region (passenger and freight), and the need for major investment in freight networks to support future volumes.
- Road network access reform and road pricing reform have been underway since the early 1990s, however are likely to be accelerated as the National Heavy Vehicle Regulator has taken responsibility for safety and access regulation from the states. Governments are placing greater prominence on road pricing policy reform through mechanisms such as the Council of Australian Governments ('COAG'). These changes could affect the competiveness of road based transport with rail.

2.2 Intermodal supply chain

The intermodal sector consists of import and export movements (port oriented), interstate freight movements and intrastate movements. These movements are made via road, rail, air and maritime based supply chains and supported by infrastructure, enabling services, governance structures and regulatory frameworks. In many ways these operations are independent of each other, but some terminals cater to both port-oriented and domestic movements.

2.2.1 IMEX supply chain

IMEX supply chains include both import and export intermodal freight.

Export – rail based supply chain

Rail is typically used to transport export commodities such as containerised grain and cotton, as well as general freight. The first move of export freight is typically by road from the site of production to a point of aggregation, either to an intermediate processing stage (such as cotton gins), or directly to terminal site for storage until a train is assembled.

From the intermodal terminal, processed and unprocessed export commodities are hauled towards the coast. At the end of their journey they may be transferred at an intermodal terminal and travel by road to port.

Alternatively, the train may be broken up and reassembled in holding yards for direct transport to port, where stevedores load the cargo onto vessels.

Import – rail based supply chain

Unlike export commodities, import commodities have a centralised entry point (the port) and diverse final destinations. Movements from port to an intermodal terminal can occur by road, by dedicated port shuttle arrangements, as seen in ports like the Port of Botany and Fremantle, or as backhaul on export related rail movements. Rail's mode share varies by port. Rail is used to transfer containers from ports to inland terminals that are typically located within freight precincts.

Freight movements can be minimised when a rail service can travel directly to an intermodal terminal co-located with a freight precinct. Goods can then be transferred within the precinct and assembled into loads for onward movement to end destinations by road. If the intermodal terminal is not co-located with a freight precinct, additional onwards movements occur by road.

2.2.2 Interstate supply chains

Interstate freight generally consists of commodities bound for consumption in domestic markets or through imported commodities landbridged to other markets (eg Adelaide and Melbourne). The three key interstate rail corridors are:

- North South
- East West
- Adelaide-Darwin.

The supply chain for interstate freight is more streamlined than for IMEX. The simplest interstate supply chain involves three movements:

i road movement to the origin terminal

ii rail haulage between states

iii road movement from the distribution intermodal terminal to the final destination.

Depending on the characteristics of the origin and destination terminals, and the freight volumes involved, additional movements between warehouses and distribution centres may form part of the supply chain.

2.3 Terminal operations

The core intermodal rail task is predominantly a range of containerised freight, which excludes bulk freight (eg grains) and specialised industrial point to point rail freight tasks operating out of single purpose facilities and sidings, such as steel, mineral concentrates, and paper. It should be noted that a range of industrial products can be converted to an intermodal task through strapping products to a container deck (ie flat racks) or transporting liquid in storage vessels with a container platform or structure (ie tanktainers). This allows them to be handled with heavy forklifts at intermodal terminals and loaded onto intermodal wagons combined with other containerised freight to form combination train services.

The SCT Logistics business model involves rail services based on heavy utilisation of enclosed, high cubic capacity van wagons, in lieu of containers, as well as utilising standard containers for customers that specify this requirement. This results in a hybrid cross-dock terminal that can load both vans and containers. Freight is loaded into the vans from PUD vehicles in broken down form (eg pallets). These SCT rail van services also undertake general freight transport tasks. The SCT terminals are included in this assessment.

2.3.1 Location

Intermodal rail terminals can be developed on any suitable site with a network connection. While finding a suitable greenfield site can be challenging in congested cities, locations tend to be available on the outer industrial edges of the cities where land is more available and less expensive. Complementary facilities (eg warehouses and distribution centres – DCs) can also be collocated in the precinct which can reduce the total end to end cost of general freight transported on rail services through reduced container PUD (pick-up and delivery) costs, thereby driving terminal throughput.

2.3.2 Terminal infrastructure

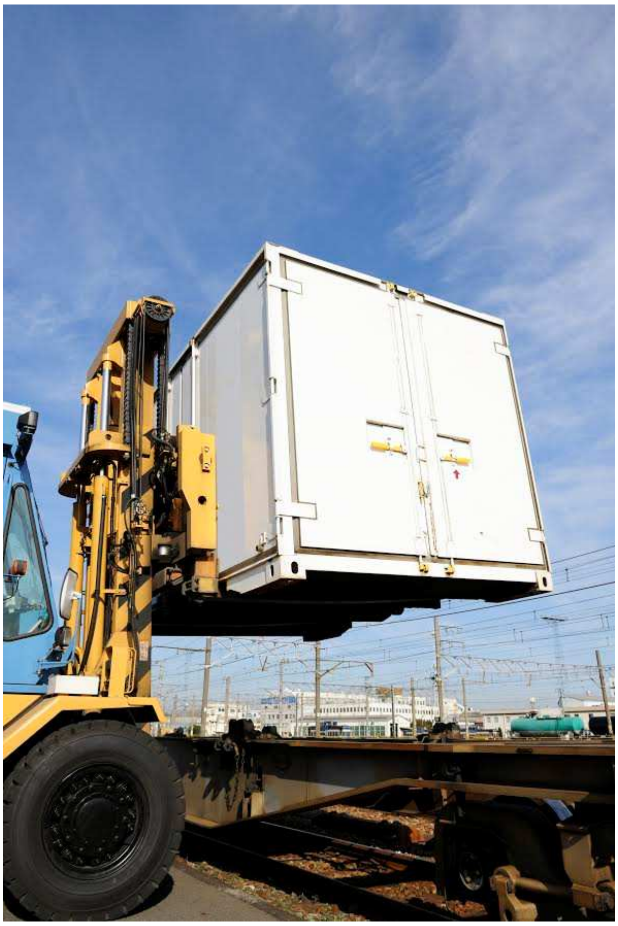
Terminal infrastructure development can be expensive and must be tailored to the operational scale required to service customers. At the low volume end of the spectrum, this may be a simple siding with adjacent compacted gravel pad that is a fit for purpose design for an infrequent (ie one service per day) short service from a regional area. There is potential for major capital city terminals to be incrementally upgraded to increase capacity.

However, unlike shipping terminals which have limited mode competition, major intermodal rail terminals are capital intensive and have significant stranding risk. Rail is subject to competition from road transport for intermodal freight tasks. With limited road user charges, shorter equipment replacement cycles and the ability to relocate road freight depots over shorter timeframes than rail and with a lower capital cost, road is able to compete with and be an effective substitute for rail as a mode.

2.3.3 Lifting equipment

There is a range of container handling machinery at intermodal terminals. The different machines can include various types of forklifts, reach stackers and rail-mounted gantry cranes or, more usually, a combination of these. The figures below show images of each of these equipment types.

Figure 3. Container forklift



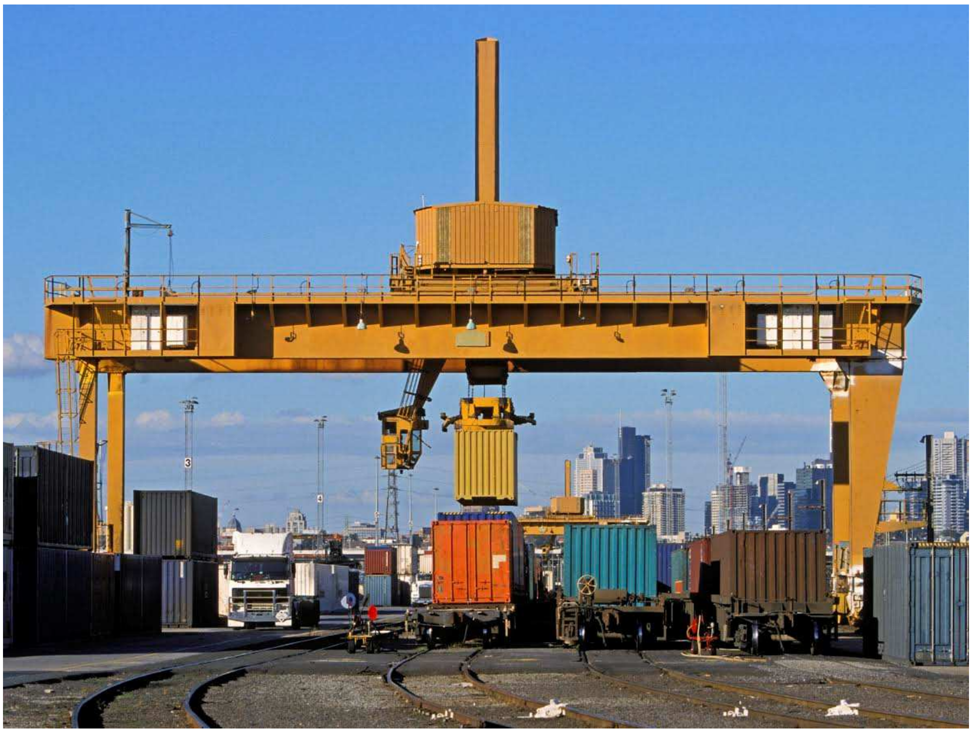
Source: iStock images

Figure 4: Container reach stacker

Source: Fletcher International Export

Reach stackers are often highly valued due to their versatility, manoeuvrability, cost effectiveness and speed, and where they are not relied on exclusively in terminals, are often to be found as a supporting piece of equipment.

Figure 5: Rail mounted gantry



Source: iStock images

Rail-mounted gantry cranes are deployed in some instances (Enfield, Chullora, South Dynon and planned for Moorebank), predominantly at major metro intermodal terminals.

2.3.4 Supply chain efficiency

Road haulage turnaround times

Reducing turnaround time provides benefits across the supply chain including to the terminal operator itself. Queuing trucks that have to wait for a considerable time is potentially a sign of operational inefficiency and will translate into extra cost to the haulier and terminal operator.

Train turnaround times

An efficient terminal must have the ability to unload and load a train efficiently and within the allocated time-slot. An intermodal terminal should not only be able to consistently unload a train to time but also have the ability to 'make up' time at this stage of the operation without compromising safety in any way.

Intermodal trains generally operate to a fixed timetable, dictated by contracted train paths through the rail network. They require set deadlines for pick-up and delivery (PUD), which is influenced by terminal configuration and requirements for receiving and dispatching trains. The terminal operation and turn-around time is very much site and business specific, including the number of origin-destinations ('ODs') serviced, the number of trains operated, terminal configuration and customer requirements.

2.3.5 Ancillary services

Intermodal terminals can offer ancillary services such as warehousing, empty container park capacity, washing of containers, repair and maintenance of containers, packing, unpacking, and rollingstock servicing. Services can also be established to accommodate freight that is imported from international origins and require either quarantine inspections or cleaning or fumigation services. Inland bonded customs facilities may also be established for customers subject to meeting regulatory requirements and formal approval processes regarding access and security.

3 Intermodal Terminal Insights

Intermodal Terminal Insights

The purpose of this section is to outline insights and key emerging trends in the rail freight industry and how they are likely to impact terminal provision and capacity. These trends have been identified by PwC/Ranbury from terminal studies undertaken previously. They are not intended to be definitive or exhaustive.

The trends include:

1. Evolution of terminals
2. Operating models (single vs. multi-user terminals)
3. Train operations and configurations (reference train)
4. Co-location
5. Automation

Each section considers how industry is responding (or is likely to respond) to these emerging trends.

3.1 Evolution of terminals

The existing national intermodal freight terminal network has evolved over many years.

Below rail services

There has been a drive towards the standardisation of track gauge to facilitate interstate freight movements. Prior to the extension of the standard gauge network, freight was often trans-shipped at state borders. Initiatives were undertaken to establish the "Defined Interstate Rail Network" controlled by the Australian Rail Track Corporation (ARTC) in 1997.

Above rail services

Historically, freight was operated by the respective state-owned railways. A national rail operator was established in 1992 called National Rail. The company included the components of state rail operating companies (Australian National, V/line and Rail Corp) that provided interstate rail services at that time. That company evolved into Pacific National ('PN').

Train services were the major freight delivery option prior to the emergence of articulated heavy vehicles. These services often provided "sweeper" services that stopped at many locations en route to drop off/collect either for loading vans or rail wagons. This made rail service transit times slow and very inefficient in terms of equipment utilisation. As road services and vehicles increased in size and decreased in transit time, general freight intermodal rail services have migrated to long haul tasks. In addition, service planning and train configurations eliminated services that involved multiple stops and were shunt intensive. Generally, train services evolved over time to concentrate on full load point to point services where possible.

PN generally assumed control of the major freight terminals in each of the capital cities on an ownership or lease basis. This established PN as the major freight terminal operator with control of the major metropolitan terminals in Sydney, Melbourne, Adelaide and Perth.

Over time, new entrants such as Aurizon, SCT and GWA developed a presence in the intermodal rail market and established their own terminal facilities. Terminal access is one of a number of barriers to entry in the rail market. Generally, integrated terminal/rail operators do not wish to provide services to their competitors which enable them to grow and compete in the rail market.

Finding suitable new sites for terminal development is difficult given the site must be:

- proximate to the national standard gauge rail network to allow access
- have effective road linkages to enable efficient pick-up and delivery (PUD) road operations

- configured long and narrow land envelopes to accommodate train services as distinct from standard rectangular land parcels.
- located as close as possible to customers that use a rail supply chain.

Over time, the position of the brownfield terminals may be less than ideal due to:

- encroachment of other industry or residents (eg Dynon)
- relocation of industrial precincts to cheaper industrial development land on the urban periphery (eg Western Sydney) which occurs gradually due to new road links between businesses and customers in major metropolitan areas.

The costs of establishing rail terminals are significant. In addition, intermodal rail operations and terminals (with the exception of port terminals) are subject to stranding risks from intense mode competition from road. Recent improvements in the standard of major arterial roads and highways as well as the increasing heavy vehicle mass limits make road a formidable competitor to rail. The capital intensive nature of rail terminals can be a challenge compared to road depots that have a greater relocation ability to new precincts and industrial development areas. This combined with the shorter asset replacement cycle for road vehicles and ability to assemble smaller scale full loads creates further ongoing challenges for intermodal rail operations.

Rail terminals generally cater for the most efficient reference train for their products. As interstate intermodal superfreighter services have increased in length due to network improvements and the extension of passing loops, accommodating a large train directly off the network can be challenging for older terminals. If entry into the terminal directly is not possible, the train must be placed in a holding road or marshalling yard and rakes of wagons broken off the service and placed into terminal loading roads. This operation is shunt intensive, delays the availability of intermodal freight at terminals, increases the train cycle times and decreases the overall operational efficiency.

3.2 Operating models

3.2.1 Single vs. multi-user terminals

Multi-user terminals accommodate a range of rail freight operators, subject to suitable available capacity at terminal and acceptable commercial terms including pricing for rail operators seeking capacity.

While multi-user terminals are common in rail operations that transport bulk products for export through a single regional port, they are not common for intermodal shipping terminals. The alternative and most common terminal structure for intermodal rail terminals are owner operated single user terminals. These terminals are effectively closed to additional users due to capacity constraints or commercial strategic reasons.

In some cases, lease arrangements impose an obligation for open access to other users. However the ability to obtain aligned network train paths and terminal loading/unloading windows at a time suitable for rail operators and customers can prove problematic.

Rail operators will typically prefer to own their own terminals as a single-user. Industry consultations have revealed that rail supply chain participants value the control they have over freight movements and future planning when they operate services out of a single user terminal. Where terminal operators are active in rail haulage, single use enables them to provide integrated line haul services for their customers and drive flexibility and efficiency in their businesses.

The control offered by un-regulated single use terminals also means that operators have more influence over the volume of goods they ship and their positioning in the terminal catchment area. While open access operators may set, or be regulated to set a price that maximises the volume of goods on rail, single use terminals may set a price that maximises return on the terminal asset or total rail assets in the supply chain. Where terminal owners benefit from vertical integration, prices may be set to optimise the total supply chain costs – as opposed to just maximising return on a single asset.

In regional terminals, the common operating model in industry is also single-user where a rail operator can establish a customer service base in a region and build business volume over time.

Ports can be set up as multi-user rail facilities for inbound freight (where there is not necessarily an alternative) but there is no natural inclination to have multi-user terminals for export shipping terminals. A multi-user terminal may be partially developed where the stevedore is not able or chooses not to establish rail operator capability.

This operating model differs from coal bulk terminals, which may be regulated (or potentially regulated) on a voluntary or non-voluntary undertaking to ensure terminals are open-access (multi-user). Competition regulators include Queensland Competition Authority ('QCA'), Essential Services Commission ('ESC'), Independent Pricing and Regulatory Tribunal ('IPART') and the Australian Competition and Consumer Commission ('ACCC').

For containerised intermodal terminals, multi-user arrangements may exist where:

- Terminal operators do not operate transport services and so rely on freight haulage companies to transport volumes to/from terminal site, for example, at a port.
- Terminal operators have an incentive to maximise the total volume of freight on rail, rather than optimising their return on existing customers/volumes.
- Owners of terminals set open access arrangements as a condition of their lease on commercial terms.
- Regulators intervene to set access arrangements at critical points in the supply chain, ie ports where monopoly characteristics are exhibited (eg the terminal is not able to be economically replicated).

Open access terminals in scope for this report meet some of these criteria. The majority are IMEX terminals, owned by port corporations, leased to container stevedores who operate them as part of port operations.

3.2.2 Impact on terminals

Where rail terminals form gateways for access to freight networks for the smooth flow of freight, such as at IMEX terminals at port locations, the majority of industry participants are likely to support open access arrangements. For metropolitan and regional terminals, the views of different participants may vary.

Rail network operators are generally in favour of terminal models that promote higher use of rail freight networks, and open access terminals can be structured to fit this model. Shippers and freight forwarders are expected to prefer to use the cheapest mode of transport. These could be enabled by economies of scale at shared access terminals if high volumes can be achieved.

Conversely, terminal developers/owners are likely to tailor investment to their own needs and consequently may be reluctant to take on the demand risk associated with a shared access terminal. Terminal owner-operators may be reluctant to build terminals with enough capacity to be open access (ie with volumes greater than their own market share), and provide such capacity to competitors.

3.3 Train operation and configuration (reference train)

3.3.1 Reference train

The reference train for a rail freight corridor is dependent on the design characteristics of the relevant network, branch line and track section of the corridor. Currently, through limitations of the passing loop length and structure gauge (ie train height/width envelope), east coast intermodal rail services are limited to single stacked services with a maximum length of 1500 metres compared to east west rail services to Perth that can be double stacked and a maximum length of 1800 metres (west of Parkes and Adelaide).

A key assumption of the Inland Rail Business Case is the development of network infrastructure to facilitate 1800 metres train length and double-stacking between Brisbane and Melbourne. However, this assumed reference train is only relevant where it is appropriate for the task. Factors to consider include:

- Volume of throughput and service frequency –1800 metres double-stacking is most appropriate where the volume of high demand requires long train services and the route distance is long. Depending on the demand drivers and customer requirements, it may be necessary to have lower volumes transported at a more frequent service level ie 1200 metres single stacked superfreighter delivered six days per week rather than 1800 metres double-stacked superfreighter delivered twice a week.

- IMEX services to/from the ports – IMEX services in Australia are predominantly short haul. Given the ratio of load to transport time, the key factor prized by operators is cycle frequency rather than upscaling the train load. Invariably, port rail terminals can only accept short train services (due to short siding configurations) resulting in rail operators running short services that can directly enter the port sidings or having to find a yard to break larger services into shorter rakes of wagons.

The deployment of longer double stacked trains provide efficiencies for rail operators but need to be carefully considered as part of future infrastructure investment decisions by network managers and Governments. The train configuration used by industry for different haulage tasks will need to be fit for purpose. There needs to be careful consideration of the total infrastructure impacts associated with a potential transition from higher cycle frequency, short port services to a longer interstate configuration for IMEX port haulage.

3.3.2 Impact on terminals

An intermodal terminal should ideally be designed or upgraded to effectively deal with the type and frequency of intermodal rail services on the relevant track section of the rail network. Changes to the reference train configuration have extensive implications for terminals and their configuration. Any train service must be able to completely exit the network at destinations to prevent negative impacts on other services scheduled on the mainline network. Trains can enter directly to a terminal or exit to a holding/marshalling yard where rakes of wagons are cut off the service and placed in the terminal for loading/unloading. Major determinants of terminal efficiency and capacity include loading road length, the container handling equipment including heavy forklifts, reach stackers and gantries, container storage capacity and road access for PUD vehicles.

An impact of longer trains is increased shunting (subject to the terminal design). Rail services have moved away from shunting to instead adopt point-to-point terminals with minimal shunting. Shunting to break a long train into multiple loading roads that reduce the strip and reload time may decrease the turnaround time, operating costs and cycle times if designed to do so.

3.4 Co– location

Co-location is the presence of multiple freight services at one site, for example, freight haulage, warehousing and distribution centres in the same location. This reduces double-handling and supply chain costs and reduces the complexity of coordinating additional supply chain moves. The most efficient rail-based supply chains are those where the terminal is located with other functions.

With co-location, there is also the opportunity to conduct value-adding activities, such as cross docking or reconfiguring freight for on-forwarding or processing at terminal site. This further reduces supply chain costs and transit times.

For rail operators, providing additional services at terminals can be an opportunity to increase vertical integration. This includes investment in freight tracking and traffic management systems, which smooth the road-based flow of goods at terminal and offer improved customer service. The pressure from shippers to offer real-time tracking of goods is likely to continue to drive investment in freight tracking software, which in turn enables better coordination of movements.

3.4.1 Timing and location of investment

For co-location with other freight services to be successful, a site should able to provide a range of options and services that meet customer requirements. These include sufficient land for development, efficient connections for onward moves by road, rail network connectivity and proximity to population centres to attract a skilled workforce. Declared roads within terminal sites can further increase efficiency, allowing for the use of high productivity freight vehicles (HPVs) within the terminal precinct and enabling customers to take advantage of the higher axle loads that rail can offer.

For metropolitan and IMEX terminals, co-location is most easily achieved in new terminal developments if land is available, where sites can be chosen to address the needs of different freight and logistics industries. The industries present will be determined by the needs of IMEX or interstate supply chains.

Existing terminals tend to be at sites where development potential for co-location is constrained, or where the remaining operating life of the terminal is insufficient to generate a payback on investment. Operators then face

a trade-off between the benefits of co-location at a new site, distances to potential remote land sites for new developments and the high sunk costs in existing rail infrastructure.

3.4.2 Impact on terminal development

The scale and extent of co-location will vary by terminal type. Regional hub terminals may include freight precincts with only warehousing, while metropolitan developments may be home to freight forwarders, distribution centres and other freight support services.

The trend of co-location in rail has intensified with recently developed sites such as Kewdale in Western Australia. New terminal investment may be led by rail/terminal operators, or by property developers, who perform the role of aligning the needs of the terminal site with those of related industry. Rail tenants are important in determining site location, as their network connectivity and operating infrastructure require significant capital investment combined with other features, such as efficient road access.

Interstate and IMEX supply chains could both benefit from investment in co-location to minimise pick-up and delivery costs which are critical to the efficiency of an intermodal rail supply chain.

Refer to Figure 6 below for case study on co-location at Kewdale.

Figure 6: Case study – Co-location – Kewdale

Case Study – Co-location
Kewdale Intermodal Terminal, Perth, WA

The Pacific National (PN) Kewdale terminal is the most advanced version of the key partners in the supply chain being co-located. Based on the rail terminal, PN acquired land adjacent to its terminal under a long lease. PN's major customers are the major freight forwarders, with PN only providing rail line-haul services.

Toll, Linfox and K&S committed to establishing freight depots on the adjacent sites. This allows direct access from the depots to the terminal allowing very short transfer times. The "Cargo Link" concept aims to reduce freight handling costs by providing a faster and more efficient transfer of freight direct into the customers' premises.

Containers are transferred without the need to be loaded onto licensed trucks, driven via road and unloaded again. Freight containers are taken off the rail wagons by reach stackers and transferred onto Internal Transfer Vehicles (ITV's). This integrated approach reduces container handling times and results in more efficient delivery of freight.

While not located on the PN site, a number of customers who are dependent on the rail supply chain to/from Perth are also located nearby in the Kewdale precinct. This includes Coles, Woolworths, Super Retail Group, Bunnings, multiple mid size transport companies and industrial businesses.

Aerial of Kewdale freight terminal

Source: Freight & Logistics Council of Western Australia, 2014

3.5 Terminal automation

There is the potential to automate key activities at terminal site, such as lifting, moving and loading containers. Automation of these functions allows continuous operation and extended operating hours, enabling terminals to handle higher throughput even on the same land parcel. More efficient handling can reduce total journey times, for example through faster loading and unloading of trains. Automation also reduces the use of labour at terminal site, increasing labour productivity, and has safety benefits.

For example, at Port Botany, Qube (formerly Patricks) has completed a three year upgrade program of the terminal. Key investments include 10 ship-to-shore gantry cranes, 45 automated container carriers and 31 automated truck loading stations. The movement of the automated container carriers between gantry cranes and truck loading stations is guided by a radar based navigation system. The use of the navigation system allows the port to operate with reduced lighting at night, limiting the amenity impacts of the terminal and so allowing for longer operating hours. The investment has created the potential for full automation at the quay, with benefits to asset utilisation, throughput and safety.[3]

The increased productivity of automated terminals requires substantial capital investment. This increases the ratio of fixed costs to variable costs, reducing operational flexibility as compared to less automated terminals. To justify the investment in automation, terminal operators need to have confidence that they will achieve threshold volumes, and that volumes will be sufficiently consistent, to make a return on this investment. The payback period on the investment also influences the decision to invest in automation, as terminal operators need to have sufficient tenure on site to realise benefits.

3.5.1 Impact on terminal development

The need for scale, tenure and certainty of volumes to justify automation have influenced uptake. Automation is most advanced at port terminals, where large container volumes from international trade are handled on constrained sites and operators have long term leases.

The use of automation at metropolitan terminals is mixed. Automation is highest at recently developed and planned future terminals, where the land use at the terminal can be planned around the investment to maximise the benefits. Retro-fitting automation to existing terminals can be a way to increase capacity at established sites. However, even in new metropolitan developments, terminal operators may prefer the flexibility of lower fixed costs, if demand is limited, and so choose more labour intensive systems. This could mean for example, the use of forklifts and reach stackers, rather than investment in automated container carriers and radar based navigation.

The need for flexibility is more pronounced at regional, and regional hub terminals, where freight volumes are generally smaller and can be highly seasonal, favouring a lower capital solution than at metropolitan terminals.

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3 Patricks, Introducing Patrick's Sydney Automated Terminal at Port Botany, https://www.youtube.com/watch?v=-jKyMHesW7w, Accessed November 2016.

4 Regional Analysis

Regional Analysis

4.1 Regional definitions

The purpose of this section is to define the geographic classifications underpinning the regional assessment of capacity and demand and to analyse capacity for the terminals in-scope. These classifications have been chosen because they enable terminal capacity and freight demand to be analysed at a regional level without losing the granularity of the freight flows.

4.1.1 Regional definitions

The following capital cities/regions have been identified for analysis:

State	Location
Queensland	Brisbane
New South Wales	Sydney
	Regional
Victoria	Melbourne
	Regional
South Australia	Adelaide
Western Australia	Perth
Northern Territory	Darwin

4.1.2 Summary of key markets served

The three main corridors for rail freight movements include:[4]

- Eastern states to Perth
- Melbourne to Brisbane
- Brisbane to northern and far north Queensland (out of scope for this study, being intrastate).

Rail dominates the east-west corridor freight flows (Melbourne-Adelaide-Perth). It is estimated that over 70 per cent (and up to 90 per cent) of the contestable container freight between Sydney/Melbourne and Perth is moved by rail.[5]

Due to infrastructure constraints, rail is generally considered uncompetitive against road freight on the north-south corridor (Melbourne-Sydney-Brisbane).[6]

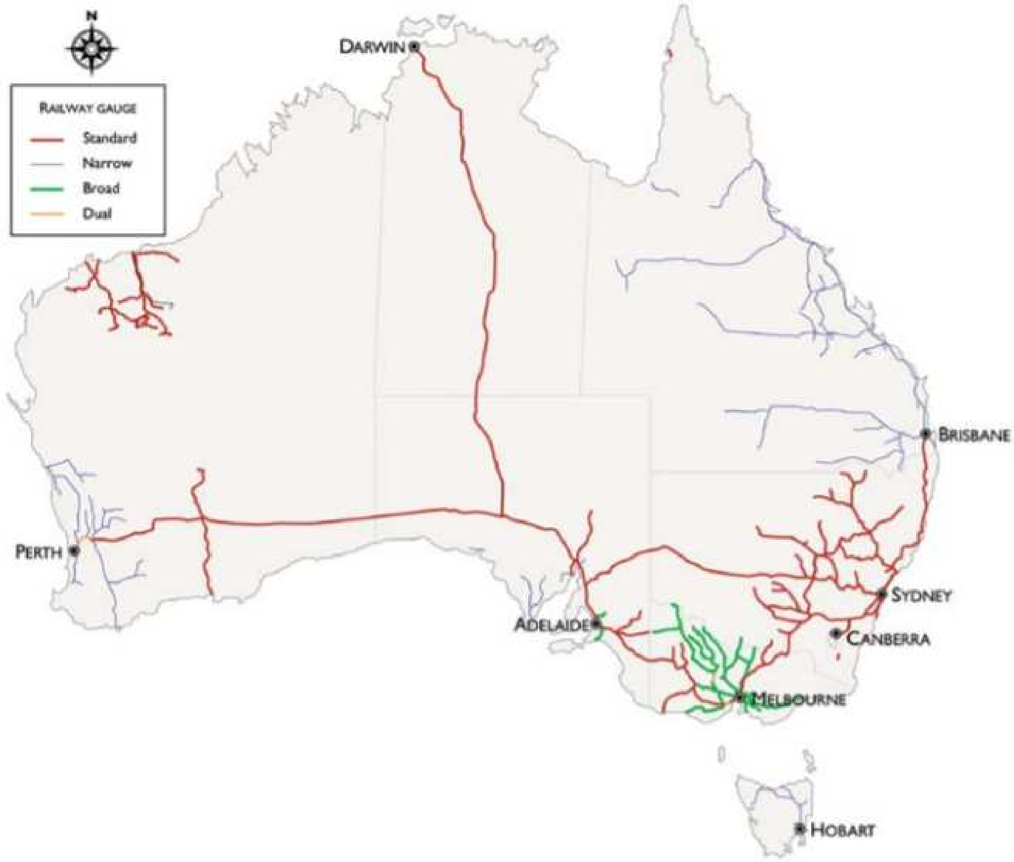
As outlined in the Introduction, this study has a primary focus on the national interstate (standard gauge) rail network, linking the mainland capital cities from Brisbane to Perth, including Darwin.

4 Queensland Transport and Logistics Council (QTLC), *Supply Chain*, 2014.

5 ACIL Allen Consulting, *The Economic Significance of the Australian Logistics Industry,* 2014, p.5

6 Ferrier Hodgson, *Transport and Logistics insights: the road ahead*, 2014.

Figure 7: Rail network by track gauge, July 2014



Source: BITRE 2014 [7]

4.1.3 Throughput

A summary table of freight volumes/forecasts has been provided for the terminals in-scope for each region. Freight volumes have been converted to TEU based on analysis performed.

Given data complexities at the hubs of Sydney and Adelaide where significant through-traffic occurs, freight volumes cannot be distinguished by origin-destination pairs ie to exclude intrastate movements or other throughput. TEU forecast units have been calculated by applying an Inland Rail Business Case growth rate to 2015 TEU volumes confirmed by the intermodal terminals in-scope. Hence the TEU volumes reported here are specific to the intermodal terminals in that region, rather than specific to an origin-destination pair.

Refer below for further discussion on forecast assumptions and methodology applied to this study of intermodal terminals.

4.1.4 Commodities

The key commodity groups for containerised freight across Australia include:

- agricultural products such as grain and cotton
- mining products and minerals
- refrigerated products
- general freight.

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7 BITRE, *Trainline 2 Statistical Report*, 2014, Canberra ACT, p.52.

Refer to sections below for further detail on commodities specific to each region.

4.2 Demand analysis

The purpose of this section is to outline the methodology applied in this study to forecast intermodal terminal demand. This report is not a demand forecasting study in itself. Existing forecast data from the Inland Rail Business Case (IRBC) has been applied to provide two scenarios, with and without Inland Rail.

4.2.1 Forecast demand methodology

Forecast demand (2015-2035) has been calculated as follows:

2015 throughput for terminals in scope (TEU)	x	Growth rate for region (%)	=	Forecast demand for terminals in scope (TEU)

4.2.2 Data limitations

High forecast throughput volumes may not reflect true growth rates given data limitations and assumptions applied in the methodology.

Data limitations

The growth rate for the demand forecasts refer to IRBC forecasts that were based on a point in time. In some instances, assumptions for the IRBC may already be superseded (start date of Inland Rail, base case growth rates for all corridors and impact of diversion of Riverina traffic from Port of Melbourne to Port Botany).

Further to above, demand forecasts are sensitive to investments in road and road pricing (including potential for heavy vehicle load pricing) as well as induced demand from the opening of WIFT and any significant changes in the level of automation.

Assumptions applied by methodology

There are a number of limitations in the assumptions underpinning this study's methodology including:

- Regional growth rate has been applied uniformly to all terminals in scope for that region (not constrained)
- Regional growth rate may include through traffic rather than origin-destination (OD) pairs
- Demand is assumed to grow evenly rather than applying a peak/off-peak demand profile to reflect customer preferences for optimal arrival/departure times (similarly short term capacity assessments do not profile this peak/off-peak capacity)
- Standard gauge rail freight growth rate has been applied to intermodal terminal throughput (which includes all modes of freight – broad gauge, narrow gauge, standard and road) and hence does not account for modal shifts ie rail freight growth may represent a modal shift rather than an overall throughput growth. This methodology may overstate forecast demand.

4.2.3 Sensitivity analysis

Stakeholder feedback has indicated that revised industry demand forecasts (and potentially methodologies) are being developed. They have not been finalised at the time of this study. Given the data limitations recognised above, and industry updates on base case throughput levels, an alternative demand forecast has been generated at 66.67 per cent of forecast growth rates under base case and project case scenarios.

4.3 Capacity analysis

Each terminal is a bespoke facility that reflects the nature of its location, envelope and site configuration, connection to the rail and road networks, loading roads, holding roads, hardstand, container storage, lifting equipment, support facilities and the nominated maximum train configuration that can operate on the relevant proximate network section specified by the network manager (the reference train configuration).

Intermodal terminal capacity for interstate traffic is driven by the pick-up and delivery (PUD) profile of customers. Most customers seek transit times that result in train service departures in the evening and morning

arrivals. This compresses the periods during which train services arrive and depart and increases demand for "premium train paths" that meet the optimal arrival/departure profile. This demand profile suits businesses that primarily operate week days and day shift. These weekly peaks and the seasonal peak periods that occur around Christmas and Easter result in demand being very uneven across most working weeks. The extent to which individual terminals have uneven peak demand profiles is not assessed as part of the study. It is accepted that there is an ability to extend working hours, apply booking systems and supplement existing lifting equipment to expand terminal capacity if required by the terminal operator.

The ability to tailor terminal capacity to an individual customers' needs is a critical component of intermodal rail services. This drives the main terminal model in Australia where rail operators tend to operate their own terminals as a cost centre component of the line haul operation. In circumstances where a rail operator has to obtain services from a multi-user terminal operated by a third party or a competitor, the level of priority, service or expansion capability may be constrained or not be equally available to different terminal users who have varying volume offtakes from the rail terminals. The study will highlight multi-user terminals where capacity or service limitations may occur due to multiple users operating in one facility.

Terminals are identified and described on a regional basis (capital city and regional by state), in the following sections. This includes users, markets currently serviced, functionality, nominal capacity and through-put (where available), and commentary on future capacity/capability. The smaller terminals are listed, along with more basic information on use and future prospects.

4.4 New terminals under construction

A number of new terminals are under development and these are also listed along with their nominated future functionality and nominated capacity.

New major terminals currently under construction include Moorebank (Sydney). A new regional terminal is also under construction at Wagga Wagga.

4.5 Summary – Intermodal terminal capacity

Short term capacity is based on an assessment by terminal operators and analysis by Ranbury/PwC. As noted previously, the scope focuses on capacity where incremental throughput can be achieved through existing latent buffer capacity or incremental lifting equipment without major infrastructure upgrades of existing brownfield terminals. The assessment focuses on operations within the terminal gate. In practice, there are a variety of determinants of terminal capacity which fall outside the terminal gate and which could potentially impact the capacity assessment.

Outlined below is a summary table of the major terminals assessed as part of this study.

Table 3: Summary table of Australian terminal ownership and throughput

Region	Terminal	Terminal Operator	Throughput TEU p.a.	Short Term Capacity TEU	Services per Week
Queens-Land	Acacia Ridge	AZ/Qube	220,000 +	375,000 +	22 +
	Bromelton	SCT	TBA	100,000 +	TBA
	BMT – Port of Bris	POB	50,000 +	300,000 +	6 +
New South Wales	Chullora	PN	250,000 +	600,000 +	25 +
	Enfield	AZ	70,000 +	300,000 +	12 +
	Moorebank (Note 1)	Qube	250,000 +	1,500,000 +	TBA
	Yennora	Qube	60,000	200,000	15 +
	Minto	Qube	80,000	200,000	5+
	Villawood	Toll/DPW	50,000	100,000	5 +
	Cooks River	MCS	50,000 -	100,000	5 -
	Port Botany	Patrick/DPW	600,000 +	800,000 +	100 +
	Parkes	SCT	30,000 +	100,000+	2 +
Victoria	Dynon	PN	350,000 +	600,000 +	30 +
	North Dynon	Qube	100,000 +	200,000 +	10 +
	Altona	SCT	75,000 +	150,000 +	10 +
	Somerton (Note 1)	DPW	100,000 +	400,000 +	TBA
	Port of Melbourne	Patrick/DPW	320,000 +	450,000 +	30 +
South Australia	Islington	PN	150,000 +	400,000 +	32 +
	Penfield	SCT	30,000 +	100,000 +	8 +
	Gillman	Kerry Logistics	20,000 +	100,000 +	10 +
	Outer Harbour	Flinders/Qube	50,000 +	100,000 +	10 +
Western Australia	Kewdale	PN	400,000 +	500,000 +	21 +
	Forrestfield	SCT	120,000 +	200,000 +	5 +
	Forrestfield	AZ	100,000 +	200,000 +	5
	Forrestfield	ILS/ICS	70,000 +	100,000 +	14 +
	North Quay	ILS/ICS	105,000 +	200,000 +	14 +
NT	Darwin	GWA	70,000 +	340,000 +	6 +

Note 1: Moorebank is under development; the IMEX terminal is expected to be operational by late 2018 and the interstate terminal by 2020. Somerton is being re-activated by DP World ('DPW') and is expected to be operational in early 2017. Neither terminal has a recent throughput volume. Forecast throughput has been estimated based on an assessment by the terminal operator and PwC/Ranbury.

Source: Terminal operator data, PwC Analysis

5 Queensland

Queensland

5.1 Markets/destinations

5.1.1 Origin-destination pairs

Under the current rail freight network, Queensland's key origin-destination pairs operate as follows:

- Brisbane (via Sydney) – Melbourne (interstate)
- Brisbane – Adelaide and Perth
- Port of Brisbane – Central and North Queensland (IMEX – currently only narrow gauge traffic).

The Inland Rail project will create a new rail linkage:

- Brisbane (via Parkes) – Melbourne (interstate).

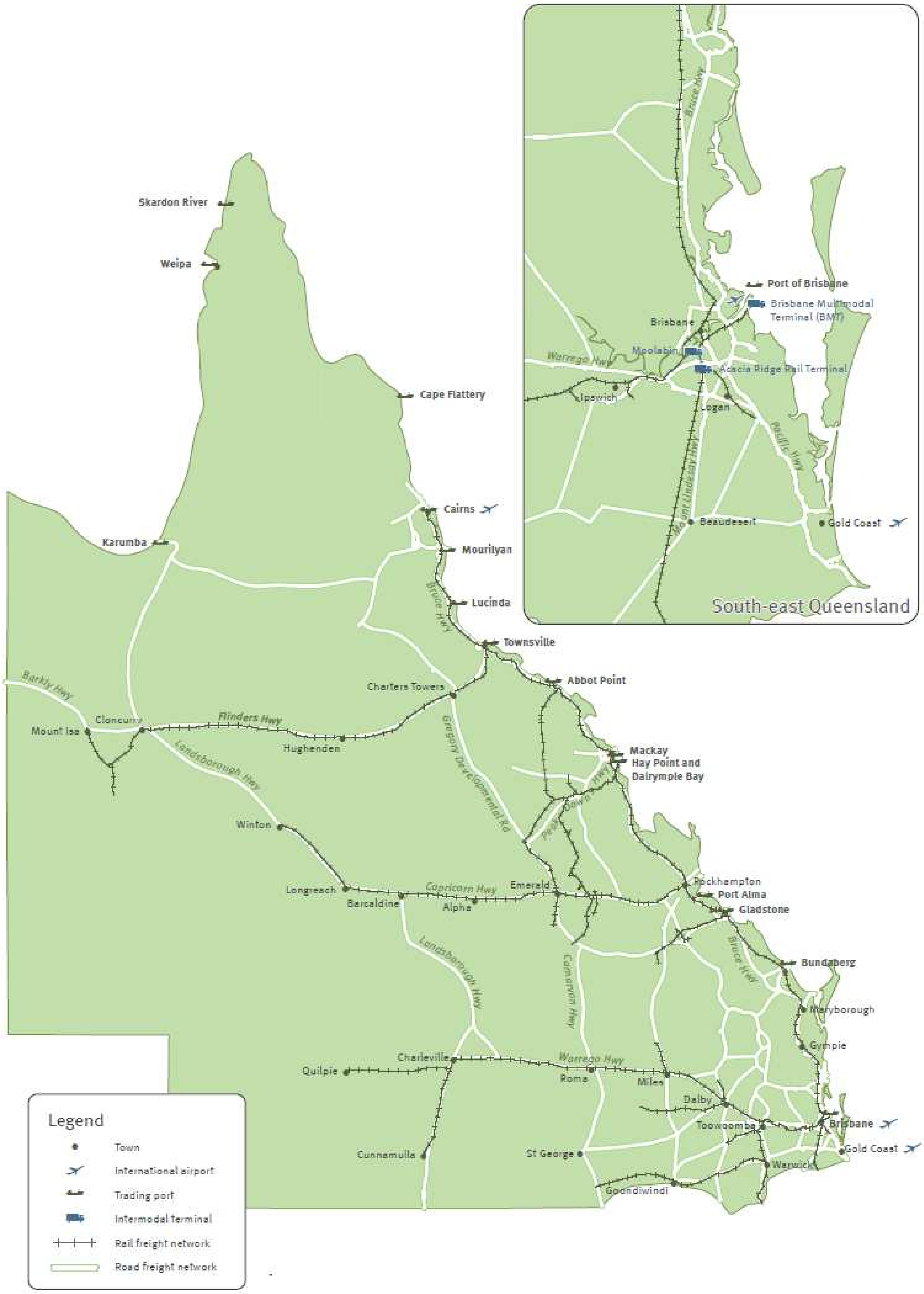
Figure 8 illustrates the key freight corridors in relation to Queensland. The standard gauge freight network extends from NSW to Acacia Ridge and Port of Brisbane (via a dual gauge link). The balance of the network in Queensland is narrow gauge and out of scope for this study.

5.1.2 Key commodities

The range of products and market segments transported on Queensland intermodal services include:

- import and export goods – wet and dry goods including electrical, home goods, processed meat, and agriculture products
- retail dry goods – groceries, white goods, beverages
- retail wet goods – refrigerated and chiller products for retail stores
- fruit and vegetables – wet and dry products for wholesale or export markets
- building and construction products
- industrial products in packaged and palletised form.

Figure 8: Queensland Freight Network



Source: Department of Transport and Main Roads (DTMR), 2013[8]

8 Department of Transport and Main Roads, *Moving Freight*, December 2013, p.11.

5.1.3 IMEX markets

IMEX focused intermodal shipping services operate to/from the Port of Brisbane rail terminal (BMT) to Rockhampton and Townsville via the Queensland narrow gauge network. No IMEX rail traffic currently uses the standard gauge rail connection to the Port of Brisbane. In 2012, containerised freight transported by rail represented only five per cent of total containers transported to/from the port, which is low compared with other Australian container ports.[9]

A high proportion of imported commodities in Queensland (85 per cent) were manufactured products eg clothing and footwear, mostly destined for business-to-consumer industries and transported through distribution centres. A small proportion of containers were transported to and unpacked at processing/manufacturing industries eg pulp and paper.

The export market involves a mix of bulk and containerised grain and seeds, which is part served by rail, with the major share by road, delivering to one of the four bulk export terminals, located at Fisherman Island, Pinkenba, Gladstone and Mackay. In 2012, approximately eight per cent of export containers were transported from regional areas in Queensland by rail to the port. A large number of packing facilities are located near the regional terminals or at the production/processing locations of the exporters supporting export container transport by rail.[10]

The Fisherman Island Grain Terminal provides the bulk task for grain exports from the south-west. The containerised product is currently primarily packed in the regional areas, with delivery by road haulage of the container to the port.

Exports of processed meats are containerised and transported as intermodal freight.

5.1.4 Interstate

The key commodities transported through intermodal rail terminals in Queensland include general freight, groceries, beverages, industrial/building products, grain, cotton and some processed minerals.

The Melbourne – Brisbane Inland Rail Project would offer a potential game-changer for grain and cotton transport from the south west and northern NSW. It will facilitate potential access to higher standard infrastructure (heavier axle loads, longer trains, and higher cubic containers), reducing the impact of existing capacity constraints on the western narrow gauge rail systems, Toowoomba Range and access through the Brisbane network. With complementary investment in the remaining narrow gauge feeder network and loading facilities, this has the potential to permit more efficient bulk grain rail transport, plus attracting containerised grain and cotton transport from container loading facilities located at intermodal hubs in the region.

5.2 Capacity analysis

Intermodal terminals in the Brisbane region are as shown in Figure 9. The regional terminals are on the narrow gauge network, as is Pacific National's Brisbane terminal at Moolabin (Tennyson). As a result, the narrow gauge operations are segregated and are out of scope for this study.

The only current domestic standard gauge intermodal terminal is at Acacia Ridge in Brisbane. The terminal is owned by Aurizon and operated on its behalf by Qube under a sub-contract arrangement. Both Aurizon and Pacific National operate superfreighter services up to 1500 metres in length to/from the terminal. However, PN has the largest throughput and operates more rail services on the route to Brisbane.

SCT has completed and begun operating a new terminal in the rail designated state development area at Bromelton. This initiative arose after SCT sought access to the Acacia Ridge Marshalling Yard (adjacent to the terminal) to enable shunting to their Acacia Ridge rail connected depot, which was rejected by Aurizon. The site is located near Beaudesert approximately 46 kilometres south of Acacia Ridge on the current ARTC national standard gauge network. Similar to SCT's other facilities, it is primarily be a van loading/unloading facility with a supplementary capability to handle and load containerised freight.

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[9] National Transport Commission (NTC), *Who Moves What Where – Freight and Passenger Transport in Australia*, Final Report August 2016, p.154.

[10] QTLC, 2014.

The existing Brisbane Multimodal Terminal at the Port of Brisbane is a dual gauge terminal that can accommodate rail services from the interstate or intrastate networks. Currently, the terminal predominantly caters for narrow gauge IMEX traffic from central and north Queensland. The terminal is significantly under-utilised and former standard gauge services transferring freight from interstate services at Acacia Ridge to the port have not operated for a number of years. The current dual gauge rail link from Acacia Ridge to Port of Brisbane is not suitable for double stacking, and is train length constrained and impacted by shared passenger/freight use of the corridor on the Salisbury to Dutton Park section of the SEQ metropolitan network.

There are other terminal location options that have been mooted as potential future terminal developments. These include two additional sites at Bromelton, and a potential site on the Inland Rail route at Ebenezer, just west of Ipswich. Terminals in-scope are listed in Table 4.

Table 4: Brisbane terminal ownership and throughput

Terminal	Terminal operator	Rail operator	Terminal owner	Recent throughput TEU p.a.	Short term capacity TEU p.a.	Services per week
Acacia Ridge	AZ/Qube	AZ/PN	AZ	220,000 +	375,000 +	22 +
BMT – Port of Brisbane	POB	AZ	POB	50,000 +	300,000 +	6 +
SCT Bromelton	SCT Logistics	SCT Logistics	SCT Logistics	Tbc	100,000 +	Tbc

Source: Terminal operator data, PwC analysis – refer to Glossary for definition of terms

Table 5: Brisbane terminal features

Terminal	1500 m trains	Volume	Freight DCs & w/houses	Multiple operators	Inland Rail route	Domestic IMEX	Open access
Acacia Ridge	Yes	High	No	Yes	Yes	Domestic	No
BMT – Port of Brisbane	No	Low	No	Yes	Yes	IMEX	Yes
SCT Bromelton	Yes	Tbc	Yes	No	Yes	IMEX	No

Source: Terminal operator data, PwC analysis – refer to Glossary for definition of terms

Figure 9: Queensland rail network

Source: BITRE, 2012[11]

5.2.1 Brisbane Terminal Constraints

The Acacia Ridge interstate terminal is site constrained. The ability to extend the length of the loading road would be limited to 1500 metres (currently 1340 metres). This results in a limited ability to fit the complete Inland Rail 1800 metre reference train length without breaking the train into shorter 900 metre wagon rakes for loading/unloading. However, the terminal could be modified to accommodate double stacking if the ARTC network clearances were upgraded south of the entry to the terminal. Further, the loading roads and hardstand

[11] BITRE, *Understanding Australia's urban railways*, Research Report 131, 2012, Canberra Act, p.70.

could be extended to 1500 metres and extra lifting equipment provided to increase capacity. Acacia Ridge also still provides access to a number of short private sidings such as BlueScope and SCT, but the use of these has significantly diminished due to the changing nature of rail intermodal freight and reluctance of intermodal operators to provide shunt intensive services.

5.2.2 Brisbane Expansion and Development

With an ability to have a range of loading roads at Acacia Ridge ranging from 900 to 1500 metres, the capacity at terminal could be expanded with reach stackers to in excess of 500,000 TEU p.a. Further investment in rail mounted gantries at the site could push capacity to the 1 million TEU level. Throughput at this level combined with a longer reference train configuration could require an external holding yard solution similar to Tottenham or Forrestfield where service arrival and departure can be managed and optimised external to terminal loading operations.

5.2.3 Queensland Regional Terminals

There are an extensive range of regional terminals in Queensland. The active terminals are on the North Coast Line and the Mt Isa Line. Terminals in south west Queensland (eg Toowoomba and Goondiwindi) are largely dormant with Aurizon having withdrawn from rail operations to these areas over the past five years. Rail is constrained by axle loads of 15.75 tonnes and structure gauge (eg height) restrictions through the existing Toowoomba range tunnels. The Inland Rail project removes these constraints.

5.3 Needs Analysis

Table 6 outlines forecast demand for the in-scope terminals based on 2015 TEU volumes (confirmed by terminal operators) and growth rates under the IRBC.

Table 6: Demand forecast with and without Inland Rail – Brisbane terminals in scope

Project case	Category	Volume (TEU)/Year		
		2015	2025	2035
Without Inland Rail	Interstate	220,000	340,000	470,000
	IMEX	50,000	160,000	180,000
	Total	**270,000**	**500,000**	**650,000**
	Growth %		***85%***	***30%***
With Inland Rail	Interstate	220,000	475,000	680,000
	IMEX	50,000	525,000	585,000
	Total	**270,000**	**1,000,000**	**1,265,000**
	Growth %		***270%***	***27%***

Source: Terminal operators (2015 throughput), Inland Rail Business Case (growth rates), PwC analysis

5.3.1 Brisbane Interstate Intermodal

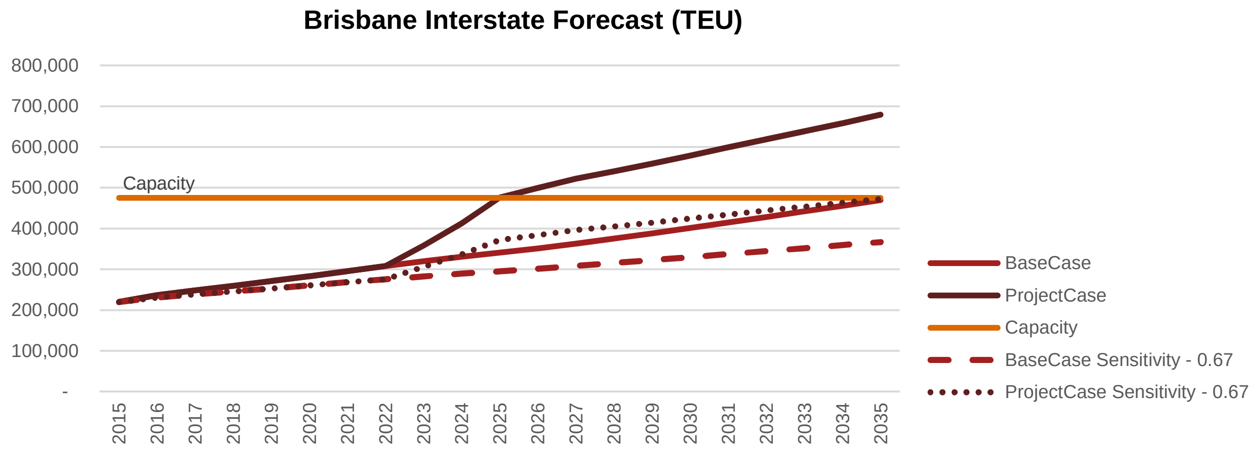
Interstate demand volumes projected here relate to throughput for the intermodal terminal at Acacia Ridge. A demand uplift is forecast for intermodal interstate volumes with Inland Rail, assumed to open from FY23.

Short term intermodal interstate capacity is forecast to be constrained around 2024-2026 under project case scenario (with Inland Rail). This delay is postponed to 2034-2036 under base case scenario (without Inland Rail).

However, the needs analysis in Figure 10 already includes assumed capacity for SCT Bromelton (total short term capacity for region is 475k TEU). This preliminary needs assessment suggests a capacity gap still exists. But forecast demand growth appears optimistic compared to historical growth rates around one per cent. Under

a sensitivity analysis of 67 per cent growth rates, capacity constraints are postponed to 2035 (with Inland Rail) and beyond 2035 (without Inland Rail).

Figure 10: Brisbane Interstate Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis

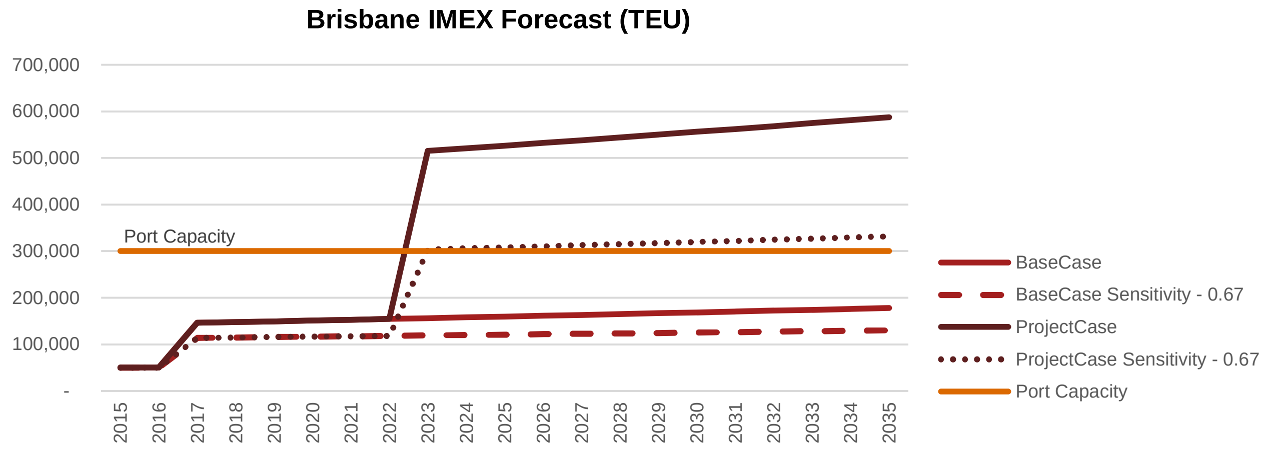
5.3.2 Brisbane IMEX Intermodal

IMEX demand volumes projected here relate to throughput for Brisbane Multi-Modal Terminal (BMT). IMEX services through BMT are currently narrow gauge services from North Queensland. IMEX traffic from South West Queensland is expected to start FY17 with a further demand uplift from the opening of Inland Rail in FY23.

Figure 11 shows that Brisbane is expected to face short term IMEX capacity issues by 2022-2023 under project case scenario (with Inland Rail) arising from the current lack of IMEX feeder terminals. This is likely to be addressed by the market. This assumes there is no demand constraint on the corridor (likely to be partially constrained in reality) due to passenger network issues.

Similar to interstate, IMEX demand forecasts appear optimistic under project case scenario (with Inland Rail). However, even with a 67 per cent sensitivity applied to project case growth rates, IMEX short term capacity would still be constrained.

Figure 11: Brisbane IMEX Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis

6 New South Wales

New South Wales

6.1 Markets/destinations

6.1.1 Origin-destination pairs

Under the current rail freight network, Sydney's key origin-destination pairs operate as follows:

- Sydney (via Parkes) – Perth (interstate) = East-West corridor
- Sydney – Adelaide (interstate)
- Sydney – Brisbane (interstate)
- Sydney – Melbourne (interstate)
- Port Botany and Port Kembla – Sydney and NSW regional terminals (IMEX)

The Inland Rail project will decrease the volume of interstate transport movements between Brisbane and Melbourne via Sydney. Volumes will be diverted via Parkes.

The Inland Rail project is not forecast to affect IMEX volumes for Sydney (equivalent with and without Inland Rail).

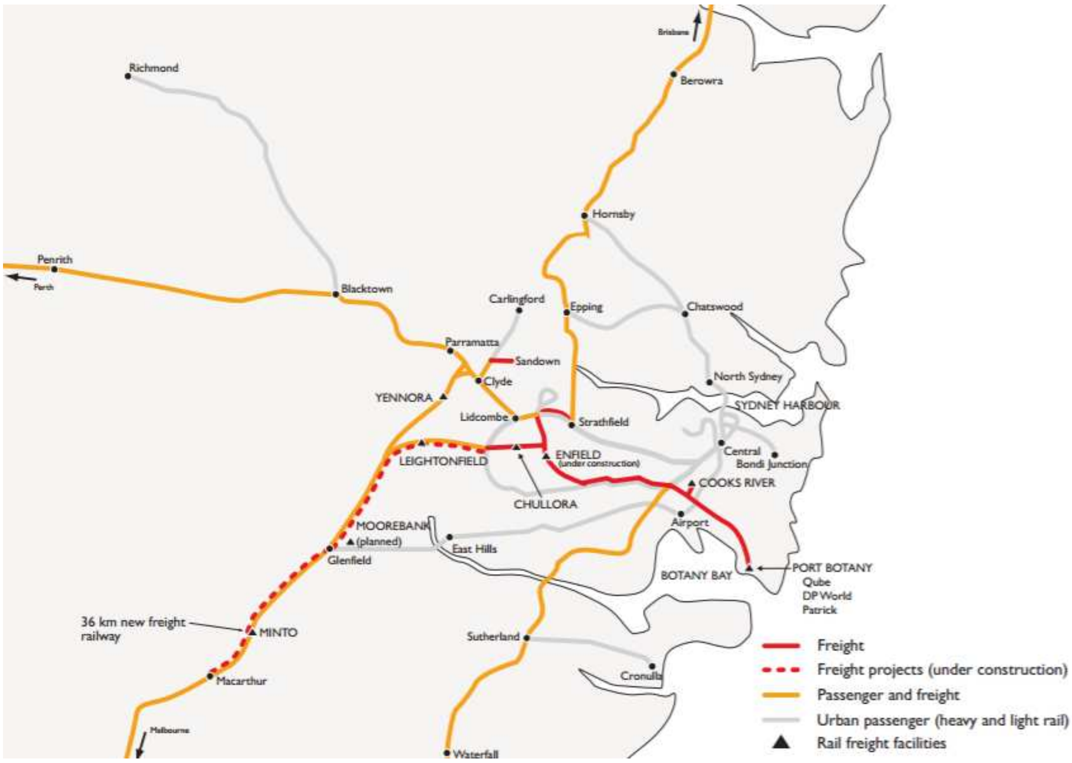
Figure 12 illustrates the key freight corridors in relation to Sydney.

6.1.2 Key commodities

The range of products and market segments transported on Sydney's intermodal services include:

- import and export goods – agricultural products such as grains, cotton, flour & starch, forest products, general freight, meat and mining
- retail dry goods – groceries, white goods, alcohol
- retail wet goods – refrigerated and chiller products for retail stores
- fruit and vegetables – wet and dry products for wholesale or export markets
- building and construction products

Figure 12: Sydney's Freight Operations and Terminals



Note: Map has not been updated to show that Enfield terminal is in operation.

Source: BITRE, 2012[12]

6.1.3 IMEX markets

About 85 per cent of containers originate from or are bound for a destination within 40 kilometres of Port of Botany.[13] There is an imbalance between imports and exports, with full import containers accounting for twice the volume of full export containers (2011).[14] As a result, the majority of unpacked import containers are returned empty to container parks or temporary storage areas before being sent as an empty export. In terms of modal share, the rail freight task is mainly comprised of export containers, despite import containers having twice the volume throughput.

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 through Port Botany. 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.* [15]

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 Kembla, or by road.

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[12] BITRE, *Understanding Australia's urban railways*, Research Report 131, 2012, Canberra Act, p.68.

[13] National Transport Commission (NTC), *Who Moves What Where – Freight and Passenger Transport in Australia*, Final Report August 2016, p.135.

[14] Shipping Australia Limited, *Metropolitan Intermodal Study 2011*, 2011, p.9. Estimates were based data from the Sydney Ports Corporation.

[15] PwC, *Containerised Cargo Demand Assessment - Central West NSW*, 2015, p.16-17.

6.1.4 Interstate

The key commodities transported through intermodal rail terminals in Sydney include general freight, groceries, beverages, industrial/building products, grain, cotton and some, processed minerals.

6.2 Capacity analysis

Intermodal terminals in the Sydney region are as shown in Figure 12. The terminals are listed in Table 7 below.

Table 7: Sydney terminal ownership and throughput

Terminal	Terminal operator	Rail operator	Terminal owner	Recent throughput TEU p.a.	Short term capacity TEU p.a.	Services per week
Chullora	PN	PN	PN	250,000 +	600,000 +	25 +
Enfield	Aurizon	Aurizon	Port Botany	70,000 +	300,000 +	12 +
Moorebank	Qube	Qube	MIC	250,000 +	1,500,000 +[16]	TBA
Yennora	Qube	Qube	Stockland	60,000	200,000	5 +
Minto	Qube	Qube	Qube	80,000	200,000	5+
Villawood	Toll/DPW	TBA	Toll	50,000	100,000	5 +
Cooks River	MCS	Various	MCS	50,000 -	100,000	5 -
Port Botany	Patrick– DPW	Various	Patrick- DPW	600,000 +	800,000 +	100 +
Parkes	SCT	SCT	SCT	30,000 +	100,000+	2 +

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

Note: SCT use Parkes as a de-facto Sydney terminal for freight to Perth.

Table 8: Sydney terminal features

Terminal	1500 m Trains	Volume	Freight DCs & W/houses	Multiple Operators	Inland Rail Route	Domestic IMEX	Open Access
Chullora	Yes	High	No	No	No	Both	No
Enfield	Yes	Med	No	No	No	Both	No
Moorebank	Yes	High	Yes	Unknown	No	Both	Yes
Yennora	No	Low	Yes	No	No	IMEX	No
Minto	No	Med	Yes	No	No	IMEX	No
Villawood	No	Low	Yes	No	No	IMEX	No
Cooks River	No	Low	No	Yes	No	IMEX	Yes
Port Botany	No	High	No	Yes	No	IMEX	Yes
Parkes	Yes	Low	Yes	No	Yes	Domestic	No

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms

[16] Based on contractual obligations with Federal Government.

The major domestic intermodal Rail Operator in NSW is Pacific National (PN). PN operates out of its major Sydney terminal at Chullora. PN has recently upgraded the capacity at Chullora for both interstate and IMEX business primarily through the establishment of additional loading/unloading capacity at the terminal through deployment of two new rail mounted gantries (RMGs). This will ensure that Chullora remains the cornerstone of PN intermodal operations in Sydney.

PN has also announced an intention to establish a second intermodal terminal facility at St Marys closer to its customer base in the north west of the city. With increasing road congestion across Sydney and the migration of industry further west over the past 20 plus years, there would be a significant catchment area for domestic and IMEX intermodal rail services in the St Marys precinct that could either connect with interstate superfreighter services at Chullora or deliver freight to/from Port Botany.

Aurizon while aspiring to obtain a terminal solution in the Moorebank precinct for many years, has recently taken a 10 year lease over part of the Enfield Terminal site and relocated its Sydney operations from Yennora to this site. This provides Aurizon with a comparable terminal platform to PN for its Sydney intermodal operations. Aurizon is obliged to run some port shuttle services to Port Botany as a condition of leasing the Sydney Ports site. There should be an opportunity to build volumes in the IMEX market despite the relatively short haul distance between Enfield and Port Botany if warehousing and cross docking is required.

Qube has an increasing presence in the IMEX market in Sydney. Having established bases at Minto and Yennora for the IMEX port shuttle services to/from Port Botany, this will be further supplemented by the commencement of services to/from Moorebank upon the commissioning of the Terminal in 2017/18. With the break-up of Asciano, and Qube's shareholding and increased role in management of the Patricks port logistics business, it is likely that Qube will be looking to further increase IMEX port shuttle opportunities starting with more integrated services to Moorebank.

6.2.1 Sydney Terminal Constraints

The current major Sydney region terminals have generally evolved with significant land use constraints on their functionality, and the broader rail network constraints. This includes their limited ability to directly accommodate long trains (1500 metres or 1800 metres), and network vertical clearances constraints preventing double stack containers. The Southern Sydney Freight Line from Macarthur to Port Botany provides a dedicated freight link from the south to Chullora and onto Enfield and Port Botany as well as a new connection into the new Moorebank terminal.

However, other Sydney regional terminals will remain constrained by passenger priority. Outside of ARTC's Southern Sydney Freight Line, freight trains are required to travel on the passenger network. Even where the rail line is dedicated to freight, rail access can be inhibited by the need to cross the Sydney passenger track.

The rail network does not permit double stacking. Surrounding road congestion is a major issue through-out the Sydney region, with the wide geographic diversity of the rail customer base.

The Chullora terminal can handle 1800 metre services by breaking the trains in a marshalling yard adjoining the terminal. Some 1800m services to Perth are operating in/out of Chullora. Rail services north to Brisbane that travel away from the Southern Sydney Freight Line operated as part of the ARTC network must transit through the Sydney Trains metropolitan network and is subject to passenger priority and peak period curfews on the network. In addition, double stacking of intermodal services is not possible due to legacy structures across the network that constrain clearances.

Compared to PN, Aurizon has a lower market share in the NSW intermodal market but has aspirations to grow its business. Aurizon was significantly constrained for a number of years due to inefficient terminal operations in the largest Australian city. Services were stabled off the network at the Glenlee siding south west of Moorebank and shuttle services were undertaken to/from Yennora on the Sydney Trains network for loading and unloading. The inability to establish a terminal that facilitated the arrival of 1500 metre services from the network and place the wagon rakes for unload/reload was inefficient. The Enfield terminal has removed this constraint.

SCT historically has only operated rail line haul capacity on its east-west corridor, and has relied upon road line haul on the east coast. In addition, SCT does not have a Sydney Terminal for its Sydney to Perth rail services. It currently operates out of its Parkes Terminal to/from Perth. SCT utilises road transport to transfer freight from

its customer base in the wider Sydney region out to Parkes for loading on services to Perth. Operating from Parkes to the west allows SCT to assemble 1800 metre double stacked services as required.

6.2.2 Sydney Expansion and Development

With the expansion and upgrade of Chullora Terminal by PN and relocation of Aurizon to Enfield, Qube will be solely responsible for development and utilisation of both the IMEX and domestic terminals at Moorebank. While ideally positioned to leverage off the co-located warehousing and distribution centre (DC) developments planned for the precinct, it is expected that the focus of activity for Qube will be primarily on the IMEX rail operations to Port Botany.

6.2.3 Regional NSW Terminals

Regional NSW intermodal traffics are impacted by their relatively small scale, rail service offering and road competition, particularly on the shorter line haul routes. Under the Inland Rail scenario (project case), it is projected that interstate transport movements via Parkes will increase as volumes between Brisbane and Melbourne are diverted away from Sydney.

However, the majority of the demand forecast reflects freight through-traffic rather than OD traffic. Through traffic will not require handling at terminal and hence Parkes terminal will be predominantly unaffected. There are no known short term capacity constraints.

6.3 Needs analysis

Table 9 outlines forecast demand for the in-scope terminals based on 2015 TEU volumes (confirmed by terminal operators) and growth rates under the IRBC. Given the limitations of data and the methodology applied, interstate demand forecasts include through traffic freight volumes in addition to Sydney intermodal OD volume.

Table 9: Demand forecast with and without Inland Rail – Sydney terminals in scope

		Volume (TEU)/Year		
Project case	**Category**	**2015**	**2025**	**2035**
Without Inland Rail	Interstate	313,000	465,000	620,000
	IMEX	747,000	1,315,000	1,415,000
	Total	**1,060,000**	**1,780,000**	**2,035,000**
	Growth %		**68%**	**14%**
With Inland Rail	Interstate	313,000	165,000	190,000
	IMEX	747,000	1,315,000	1,415,000
	Total	**1,060,000**	**1,480,000**	**1,605,000**
	Growth %		**40%**	**8%**

Source: Terminal operators (2015 throughput), Inland Rail Business Case (growth rates), PwC analysis

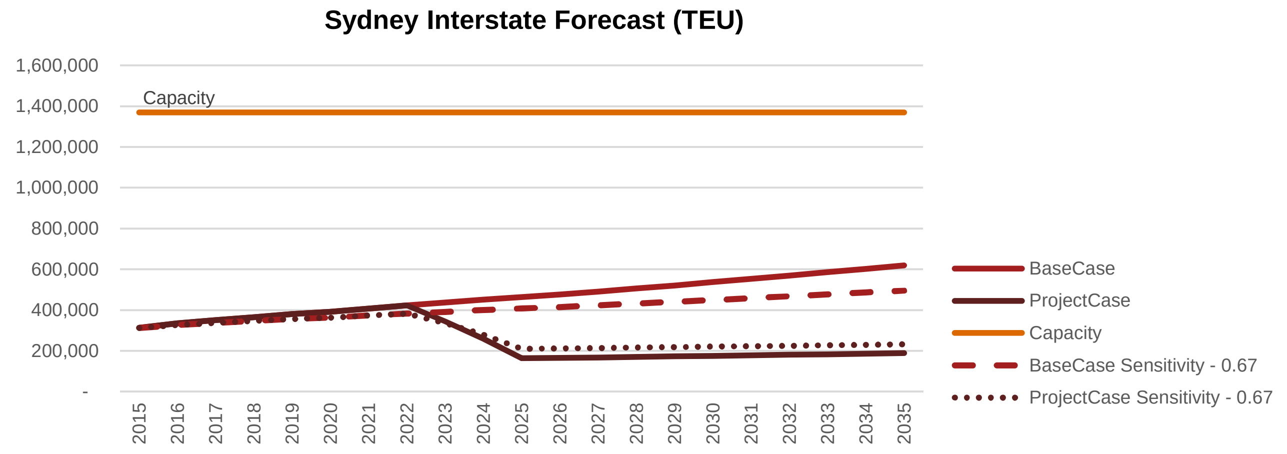
6.3.1 Sydney Interstate Intermodal

Interstate intermodal volumes projected here relate to throughput for the intermodal terminals Chullora and a small proportion of Enfield throughput. Short term capacity includes Chullora, Enfield and Moorebank (expected to open FY18).

Under the Inland Rail scenario (project case), it is projected that interstate transport movements via Sydney will reduce as volumes between Brisbane and Melbourne bypass Sydney via Parkes (regional NSW). However, this diversion reflects the data limitations outlined in Section 4.2.2 whereby the rail freight forecast captures through-traffic rather than OD pairs, particular for hub regions such as Sydney.

Irrespective of this data limitation, Figure 13 shows that short term interstate intermodal capacity is not forecast to be constrained with or without Inland Rail.

Figure 13: Sydney Interstate Needs Analysis



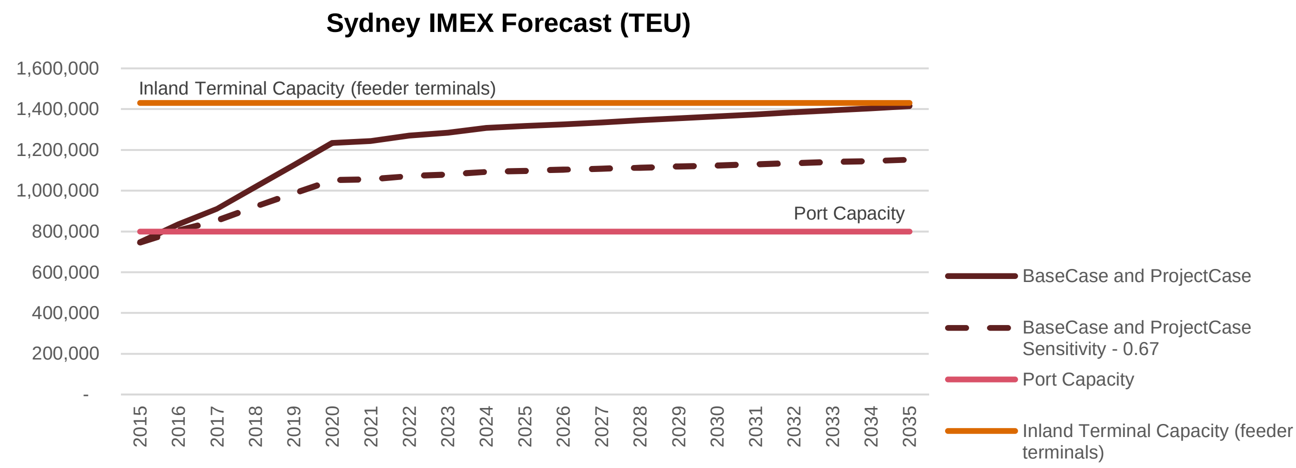
Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis

6.3.2 Sydney IMEX Intermodal

Intermodal IMEX volumes projected here relate to throughput for the terminals of Port Botany (DP World ('DPW'), Hutchinson Qube), Enfield, Minto, Yennora and Moorebank. Demand is projected to be induced from the development of Moorebank terminal, assumed to commence FY18 and reach peak throughput by FY21.

Short term capacity at network level (2,230k TEU) includes assumed capacity for Moorebank (1,000k TEU). However, short term capacity may ultimately be constrained by capacity at Port Botany (assessed at 800k TEU). Capacity limits at port-side terminals appear to be a more pressing constraint than inland feeder/receiver IMEX terminals, even with a 67 per cent sensitivity applied to growth rates. In theory, capacity gaps at Port Botany terminals will potentially arise sooner, as early as 2017.

Figure 14: Sydney IMEX Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis

7 Victoria

Victoria

7.1 Markets/destinations

7.1.1 Origin-destination pairs

Under the current rail freight network, the key origin-destination pairs for Melbourne operate as follows:

- Melbourne – Adelaide
- Melbourne – (via Adelaide) – Perth
- Melbourne – (via Adelaide) – Darwin
- Melbourne – Sydney
- Melbourne – (via Sydney) Brisbane
- Regional Victoria – Port of Melbourne (IMEX); Regional Victorian areas are predominantly export zones accounting for 15 per cent of import containers and 85 per cent of export containers (2009). [17]

The Inland Rail project will increase the volume of interstate transport movements between Brisbane and Melbourne via Parkes. Through traffic volumes will be diverted from Sydney through regional New South Wales. Intermodal terminals in the Melbourne region are as shown in Figure 15.

7.1.2 Key commodities

The range of products and market segments transported on Sydney's intermodal services include:

- manufactured goods eg steel products, automotive, chemicals
- paper and packaging materials
- industrial products
- building materials
- general freight.
- fast moving consumer goods eg food and beverages.

[17] Metropolitan Intermodal Terminal Study 2011', Shipping Australia Limited, p. 18. Estimates were based on the Port of Melbourne 2009 Container Logistics Study.

Figure 15: Melbourne's Freight Operations and Terminals

Source: BITRE, 2012 [18]

7.1.3 IMEX markets

Nearly 80 per cent of international freight moving through the Port of Melbourne has origins and destinations within a radius of about 40 kilometres of the port. Road transport is the dominant mode of transport for port-related containers (less than 90 per cent) [19]

IMEX volumes include the grain exports from the Riverina region.

Melbourne was previously a rail extension, 'land-bridge', to Adelaide with Port of Melbourne acting as the hub for direct sailings to/from destination ports. Some of the trains operate to the stevedore rail sidings at the dock (eg Appleton Dock) while other train movements are to South Dynon intermodal terminal (with containers then conveyed to the stevedore container stacks by road vehicles).

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[18] BITRE, *Understanding Australia's urban railways*, Research Report 131, 2012, Canberra Act, p.69.

[19] Shipping Australia Limited, *Metropolitan Intermodal Study 2011*, 2011, p.20. Estimates were based on the Port of Melbourne 2009 Container Logistics Study.

In recent years, there has been a shift away from hubbing Adelaide's container movements through Melbourne (for direct sailings to/from foreign destination ports). Instead, containers are shipped from Adelaide to a foreign port hub (Singapore in particular), reducing land bridging via Melbourne.

There is an imbalance between imports and exports in Melbourne but the gap between full import and empty export containers is less extreme than that in Sydney. Approximately 70 per cent of the total containers traded through metropolitan areas are for imports compared to 30 per cent exported.[20]

7.1.4 Interstate

Interstate freight tends to be comprised of manufactured goods (eg steel products, automotive, chemicals, packaging materials, paper and building materials) and fast moving consumer goods (eg food and beverages).

7.2 Capacity Analysis

7.2.1 Victorian Terminals

The major domestic intermodal rail operator is PN operating out of Dynon Terminal (South Dynon). PN operate on both the northern and western routes out of Dynon providing in excess of 30 return services per week. SCT (Altona) and Aurizon (North Dynon) have lower market shares with aspirations to grow their businesses. Qube has an increasing presence in the IMEX market. This could increase with the break-up of Asciano and Qube's acquisition of the Patricks port logistics business. DPW is also increasing its focus on rail transport options to the Port of Melbourne and has announced the takeover of the Somerton Rail Terminal.

The current major Melbourne region terminals have evolved with significant land use constraints on their functionality, and the broader rail network constraints. This includes their limited ability to directly accommodate long trains (1500 metres or 1800 metres) and vertical clearances constraints on the rail network to handle double stack containers. The near city terminals at Dynon are also heavily constrained by road congestion during the week-day commuter peaks. The current Dynon domestic terminals are essentially single user operations due primarily to terminal capacity constraints, in spite of their VicTrack lease provisions and regulation by the Essential Services Commission (ESC).

PN has indicated that its Dynon terminal could handle longer 1800m train services. No terminal can cater for double stacking. Hence, there is no current terminal which can cater for the planned Inland Rail reference train (1800 metres, double stacked).

[20] Metropolitan Intermodal Terminals Study', Shipping Australia, 2011, p.18

7.2.2 Melbourne Terminals

Intermodal terminals in the Melbourne region are listed in Table 10.

Table 10: Melbourne terminal ownership and throughput

Terminal	Terminal operator	Rail operator	Terminal owner	Recent throughput TEU p.a.	Short term capacity TEU p.a.	Services per week
South Dynon	PN	PN	VicTrack	350,000 +	600,000 +	30 +
North Dynon	Qube	AZ	VicTrack	100,000 +	200,000 +	10 +
Altona	SCT	SCT	SCT	75,000 +	150,000 +	10 +
Somerton	DPW	TBA	Austrak	100,000 +	400,000 +	TBA
Port of Melbourne	Patrick/DPW	Various	Patrick/DPW	320,000 +	450,000 +	30 +

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

Table 11: Melbourne terminal features

Terminal	1500 m trains	Volume	Freight DCs & warehouses	Multiple operators	Inland Rail route	Domestic IMEX	Open access
South Dynon	Yes	High	No	No	Yes	Domestic	No
North Dynon	Yes	Med	No	Yes	Yes	Both	Yes
Altona	Yes	Med	Yes	No	Yes	Both	No
Somerton	No	Med	Yes	Yes	Yes	IMEX	Yes
Port of Melbourne	No	High	No	Yes	Yes	IMEX	No *

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

Note * Port of Melbourne is not fully open access. There are private sidings for each stevedore with the option to contract operators on commercial terms.

The Dynon Terminals are brownfield operations that have evolved over many years. These terminals operate in conjunction with the ARTC marshalling yard at Tottenham that allows for the arrival and departure of intermodal superfreighter train services to northern and western routes.

The SCT rail services operating from Altona can operate independently of the Dynon precinct. These services arrive/depart into the SCT siding and are broken into the shorter 150 metre wagon rakes that are loaded in its loading sheds. The commencement of services by SCT to Brisbane in 2017 will increase the complexity of this operation, given that the number of services to be handled will be doubling. The services heading north however will be able to head directly north using the Tottenham triangle, avoiding any potential congestion in Tottenham Yard or the Dynon precinct.

7.2.3 Melbourne Terminal Constraints

Both Dynon terminals have loading roads that require the 1500 metre superfreighter services to be broken into smaller rakes of wagons for loading and unloading.

The PN Terminal has two longer 1200 metre roads and four shorter roads (680 metres) under the two rail mounted gantries. The North Dynon Aurizon Terminal is limited to six roads between 500 and 650 metres. This may require shunting to cut the 1500 metre services into three wagon rakes. Breaking a train service into multiple rakes of wagons can facilitate the loading task to be undertaken simultaneously.

Loading/unloading equipment used in terminal operations, whether reach stackers or a rail mounted gantry (RMG), work most efficiently in a compressed lateral zone or constrained area where containers are transferred from road to rail within a short distance. PN has two RMGs at Dynon supported by reach stackers. Efficiency is lost if loading operations have to occur longitudinally over a long loading face resulting in more travel than lifting, which in turn will drive a requirement for more loading equipment.

The trade-off in operations between long or short loading roads is the additional time it takes to break or assemble the train at the beginning or end of loading and the extent to which train services from/to different routes have compressed arrival or departure times that exhaust the loading road availability.

Somerton Terminal on the northern edge of Melbourne network was developed as part of the 106 hectare Austrak Business Park by Austrak AFM Pty Ltd and GPT Nominees Pty Ltd (Austrak). The terminal was established in the early 2000's and has had limited use for port shuttle services to the Port. Qube has leased the terminal since 2005 and predominantly used the terminal for road transfer operations from the port. The connecting track to the terminal can only be accessed from the north rather than the south, and the terminal roads are dead end, making shunting and access to/from the site complex and problematic. DPW announced in 2016 an intention to take over the terminal to undertake rail shuttles to the Port of Melbourne, and Austrak has proposed options to enable direct rail access from the south.

7.2.4 Melbourne Expansion and Development

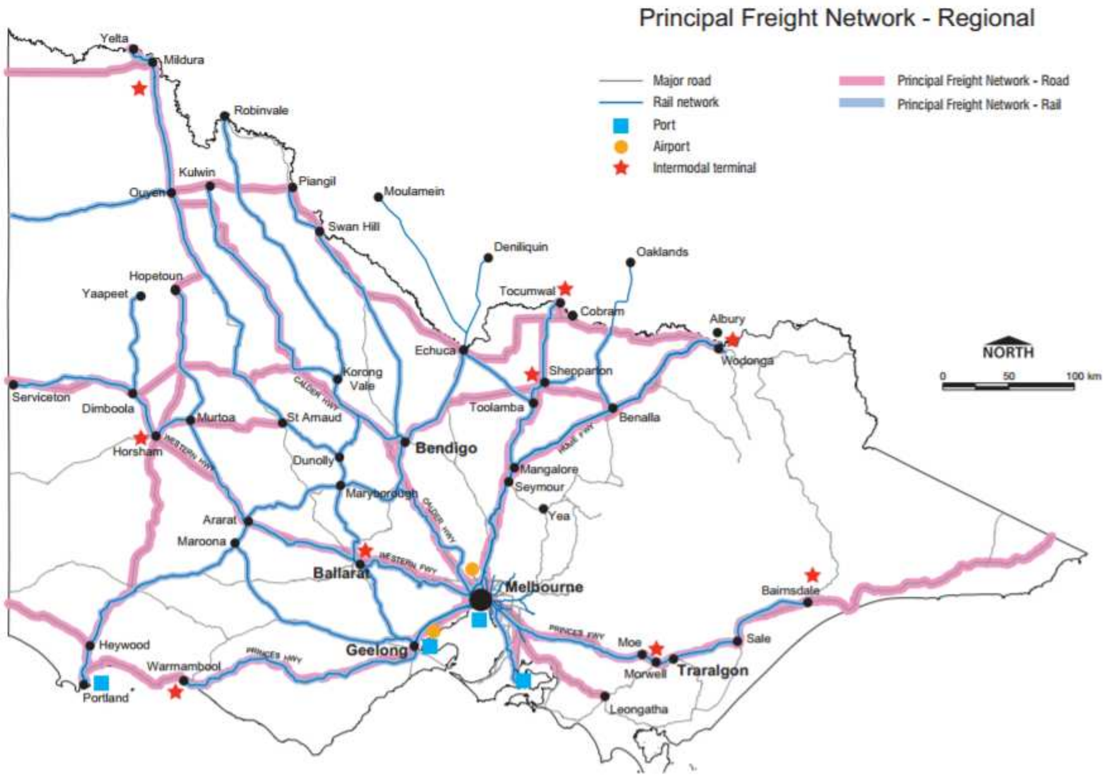
The existing brownfield Dynon precinct is completely constrained in terms of development due to the proximity of the port, CBD and major arterial roads. Existing leases are relatively short with the South Dynon lease expiring in 2030. While increased investment would potentially optimise the existing terminals and increase loading and container handling capacity, there are constraints in terms of the ability to handle double stacked trains as envisaged by the Inland Rail project (given the height restrictions of the Bunbury Street tunnel). In addition, there is no ability to co-locate end-customer warehouses or distribution centres ('DCs') at Dynon.

The SCT terminal is a bespoke van terminal with intermodal container handling capacity and a significant amount of adjoining land for expansion. Somerton also has some spare land in the adjoining business park for customers. However, the terminal track configuration will limit the use to port rail shuttle services.

7.2.5 Victorian Regional Terminals

Most of the regional terminals in Victoria are located on the broad gauge Victorian Rail Network. Currently, the Victorian Government intends to convert the Murray Basin Rail Network progressively from broad gauge to standard gauge during 2017 and 2018. Regional terminals are as indicated in Figure 16.

Figure 16: Regional Victoria principal freight network



Source: Freight Futures Victorian Freight Network Strategy, 2008 p.25

The regional terminals are listed as follows.

Table 12: Victorian regional terminal features

Terminal	Track Gauge	Terminal	Track Gauge
Maryvale	Broad	Horsham/Wimmera	Standard (ARTC)
Shepparton	Broad	Hopetoun	Standard (V/Line)
Tocumwal	Broad	Donald	Broad – Convert to Standard
Warrnambool	Broad	Merbein/Mildura	Broad – Convert to Standard

Source: Terminal operator data, PwC Analysis.

The main regional Victorian terminals connected to the national standard gauge network are Wimmera Intermodal Freight Terminal outside of Horsham and the new Wodonga Terminal opened by SCT 2017. SCT currently operates up to five port shuttles per week from Wimmera/Horsham to/from the Port. With respect to the Wodonga Terminal, it is not clear whether SCT also intends to run port shuttle services, or alternatively attach freight onto Melbourne to Brisbane services.

7.3 Needs Analysis

Table 13 outlines forecast demand for the in-scope terminals based on 2015 TEU volumes (confirmed by terminal operators) and growth rates under the IRBC. Given the limitations of data and the methodology applied, demand forecasts include through traffic freight volumes in addition to Melbourne intermodal OD volume.

Table 13: Demand forecast with and without Inland Rail – Melbourne terminals in scope

Project case	Category	Volume (TEU)/Year		
		2015	2025	2035
Without Inland Rail	Interstate	510,000	705,000	870,000
	IMEX	335,000	320,000	360,000
	Total	**845,000**	**1,025,000**	**1,230,000**
	Growth %		***21%***	***19%***
With Inland Rail	Interstate	510,000	795,000	1,020,000
	IMEX	335,000	320,000	360,000
	Total	**845,000**	**1,115,000**	**1,380,000**
	Growth %		***32%***	***24%***

Source: Terminal operators (2015 throughput), Inland Rail Business Case (growth rates), PwC analysis.

7.3.1 Melbourne Interstate Intermodal

Interstate intermodal volumes projected here relate to throughput for the intermodal terminals North and South Dynon and SCT Altona. The Dynon terminals are subject to leases from the Victorian Government through VicTrack and the state has indicated a desire to relocate the operations from the precinct.

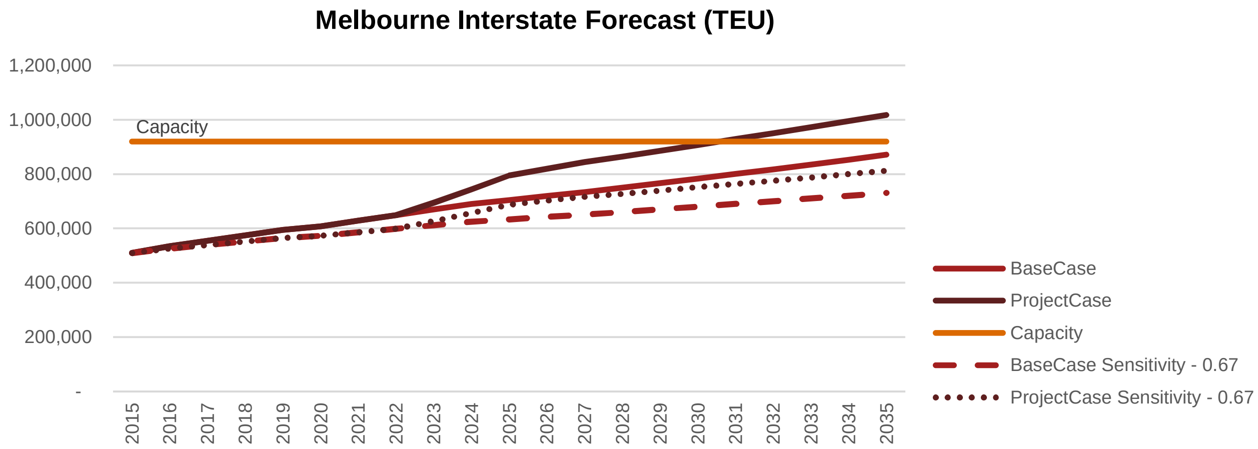
If Inland Rail proceeds, capacity gaps in terminals serving the interstate market will potentially emerge by 2030. This potential constraint would be delayed to 2035 assuming Inland Rail does not proceed.

However, the capacity analysis does not consider future intermodal terminal capacity at the Western Interstate Freight Terminal (or any similar development within the metropolitan catchment in Melbourne). New terminals would be expected to address capacity constraints.

Under the Inland Rail scenario (project case), it is projected that rail freight demand will increase with a short term capacity constraint c.2030. This constraint is postponed to c.2035 under 67 per cent sensitivity or under base case scenario (without Inland Rail).

The timing of this capacity constraint also does not reflect other capacity constraints including broader network constraints (rail access etc.) and the desired rollout of the 1800 metre double stacked reference train, as planned in the IRBC.

Figure 17: Melbourne Interstate Needs Analysis



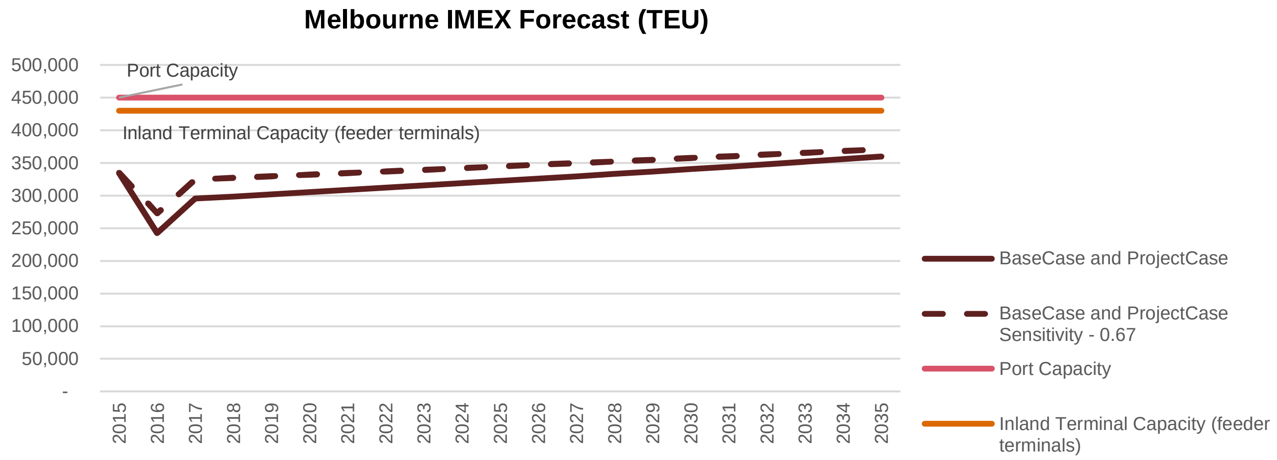
Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis.

7.3.2 Melbourne IMEX Intermodal

IMEX intermodal volumes projected here relate to throughput for the terminals at the Port of Melbourne (East Swanson, West Swanson, Appleton Dock and Victoria Dock), SCT Altona (c.15 per cent of total throughput) and Somerton. The project case and base case scenarios are projected to be equivalent (with and without Inland Rail).

Under these forecasts, it was assumed that Riverina traffic would be repositioned from Port of Melbourne to Port Botany – a diversion staged over 12 months from FY15 to FY16. It was also assumed that port shuttle services would resume from Somerton to Port of Melbourne in FY17.

Figure 18: Melbourne IMEX Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis.

8 South Australia

South Australia

8.1 Markets/destinations

8.1.1 Origin-destination pairs

South Australia contains the major network junctions where the East-West corridor and North-South corridor split at Tarcoola and the route from Parkes enters at Crystal Brook. Under the current rail freight network, the key origin-destination pairs for Adelaide operate as follows:

- Perth – via Parkes to Sydney or Brisbane
- Perth – Adelaide
- Adelaide – Brisbane (via Melbourne)
- Melbourne – Adelaide
- Adelaide northbound – Darwin
- Adelaide – Port Adelaide (IMEX).

8.1.2 Key commodities

The range of products and market segments transported on Adelaide's intermodal services include:

- agricultural products such as grains
- minerals including gypsum, iron ore and copper
- general freight
- consumer goods.

Figure 19: Adelaide's Freight Operations and Terminals

Note: The map includes a marker for the SCT Direk terminal, which is referred to in this report as Penfield.

Source: BITRE, 2012 [21]

[21] BITRE, *Understanding Australia's urban railways*, Research Report 131, 2012, Canberra Act, p.72.

8.1.3 IMEX markets

Import commodities include standard general freight. Export commodities include wine and containerised grain and minerals.

There has been a 'land bridge' movement of containers between Adelaide and the Port of Melbourne. Recently land-bridge freight has declined due to a higher proportion of ships calling direct to Adelaide and transhipping at an overseas hub (eg Singapore) to vessels that deliver containers to their respective destination port.[22]

8.1.4 Interstate

Genesee & Wyoming Australia (GWA) is responsible for 2,200 kilometres of owned/leased track between Tarcoola to Darwin and is the freight rail operator on this route.

GWA owns and controls the Eyre Peninsula narrow gauge rail network, the Mid-North and Barossa Valley broad gauge networks, standard gauge railway lines to Pinnaroo and Loxton and a number of railway yards and goods sidings in South Australia.[23]

Intermodal services depart Adelaide and Darwin six days per week with drop off/pick-up as required at Alice Springs, Tennant Creek and Katherine. Intermodal terminals are located at Adelaide, Alice Springs, Tennant Creek, Katherine and Darwin. Container services include refrigerated and general.

Other interstate movements include traffic to/from Perth, Melbourne and Sydney although this is predominantly through traffic rather than ODs.

Commodities include:

- dry groceries
- chilled/frozen groceries
- building/construction materials
- automotive vehicles and parts
- mining consumables
- beverages
- parcel and express freight.[24]

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[22] National Transport Commission (NTC), *Who Moves What Where – Freight and Passenger Transport in Australia*, Final Report August 2016, p.67.

[23] Genesee & Wyoming Australia Pty Ltd, *Submission to The Essential Services Commission of SA 2009 Rail Access Regime Enquiry*, 2009.

[24] Genesee & Wyoming Australia (GWA), *Capabilities Statement*, October 2016.

8.2 Capacity Analysis

Intermodal terminals in the Adelaide region are as shown in Figure 19. Most of the regional terminals in South Australia are on the Eyre Peninsular narrow gauge network and hence out of scope for this study.

The terminals are listed in Table 14.

Table 14: Adelaide terminal ownership and throughput

Terminal	Terminal operator	Rail operator	Terminal owner	Recent throughput TEU p.a.	Short term capacity TEU p.a.	Services per week
Islington	PN*	PN	PN	150,000 +	400,000 +	32 +
Penfield	SCT	SCT	SCT	30,000 +	100,000 +	8 +
Gillman	Kerry Logistics	AZ/Qube/PN	Kerry Logistics	20,000 +	100,000 +	12 +
Outer Harbour	Flinders/ Qube	Qube/PN/ SCT	Flinders Ports	50,000 +	100,000 +	10 +

Note * GWA do not operate the Islington terminal but do purchase terminal services from Pacific National (PN). Throughput of 150,000+ TEU p.a. and 32+ services per week include both PN and GWA.

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

Table 15: Adelaide terminal features

Terminal	1500 m trains	Volume	Freight DCs & warehouses	Multiple operators	Inland Rail route	Domestic IMEX	Open access
Islington	Yes	Med	No	No	No	Domestic	No
Penfield	Yes	Low	Yes	No	No	Both	No
Gillman	Yes	Low	No	Yes	No	Both	Yes
Outer Harbour	No	Low	No	Yes	No	IMEX	Yes

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

The major domestic standard gauge intermodal terminal is Islington, operated by Pacific National. This terminal is also utilised by GWA for its Adelaide – Darwin business. Islington is a significant terminal for PN given the east west route is the major intermodal rail traffic route in Australia and dominates mode market share. The terminal functions to enable the consolidation of rail services inbound from east of Adelaide to be transformed from 1500 metre single stack to 1800 metre double stack train configuration.

Aurizon does not have its own terminal in Adelaide and uses the Gillman multi-user terminal at Port Flat near inner harbour for loading and unloading operations. This terminal is run by Kerry Logistics ('KL'). The loading is undertaken at Gillman and 1800 metre trains are assembled at the Dry Creek marshalling yard for transit to Perth.

SCT opened its Penfield facility in 2012, which provides for co-location with major customers, and meets the SCT business model combining high cube van freight and containerised freight. SCT can exit 1800 metre train services from the network and assemble services for travel to Perth, including double stacking any containers required to be transported on this route.

The Adelaide terminals on the standard gauge network are segregated from and not impacted by passenger rail curfews, and facilitate double stacking.

8.2.1 Adelaide Terminal Constraints

There are few significant terminal constraints in Adelaide. Islington has excess capacity but is subject to handling rakes of wagons as distinct from full length train services for loading prior to assembly. Gillman is adequate for Aurizon but services a number of different rail operators that constrain the flexibility of loading.

8.2.2 Adelaide Expansion and Development

While there may be scope to co-locate operations with customers at Islington or Penfield, Adelaide is not the source of the majority of the freight on the east west corridor. Most of the trade for Perth originates in Sydney or Melbourne making these centres the important locations for development of major freight hubs.

8.3 Needs Analysis

Table 16 outlines forecast demand for the in-scope terminals based on 2015 TEU volumes (confirmed by terminal operators) and growth rates under the IRBC. Given the limitations of data and the methodology applied, demand forecasts include through traffic freight volumes in addition to Adelaide intermodal OD volume.

Table 16: Demand forecast with and without Inland Rail – Adelaide terminals in scope

Project case	Category	Volume (TEU)/Year		
		2015	2025	2035
Without Inland Rail	Interstate	165,000	225,000	285,000
	IMEX	85,000	95,000	105,000
	Total	**250,000**	**320,000**	**390,000**
	Growth %		***28%***	***22%***
With Inland Rail	Interstate	165,000	235,000	295,000
	IMEX	85,000	95,000	105,000
	Total	**250,000**	**330,000**	**400,000**
	Growth %		***32%***	***21%***

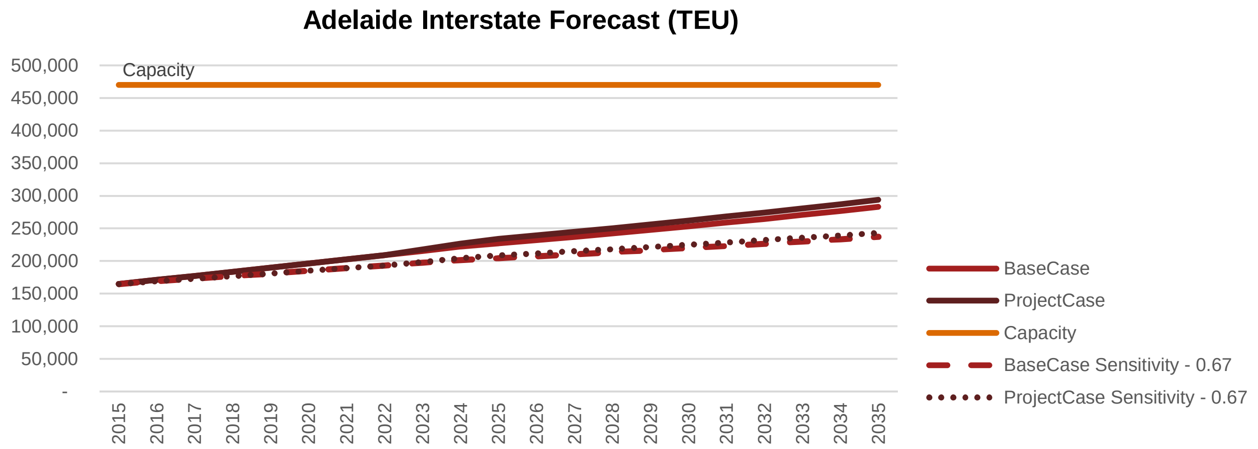
Source: Terminal operators (2015 throughput), Inland Rail Business Case (growth rates), PwC analysis.

8.3.1 Adelaide Interstate Intermodal

Interstate intermodal volumes projected here relate to throughput for the intermodal terminals at Islington, Gillman Terminal (Port Flat) and Penfield. There is negligible impact forecast from the Inland Rail project case scenario.

Figure 20 shows that no short-medium term capacity constraints under either base case scenario (with Inland Rail) or project case scenario (without Inland Rail) are likely to occur.

Figure 20: Adelaide Interstate Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis.

Key known constraints

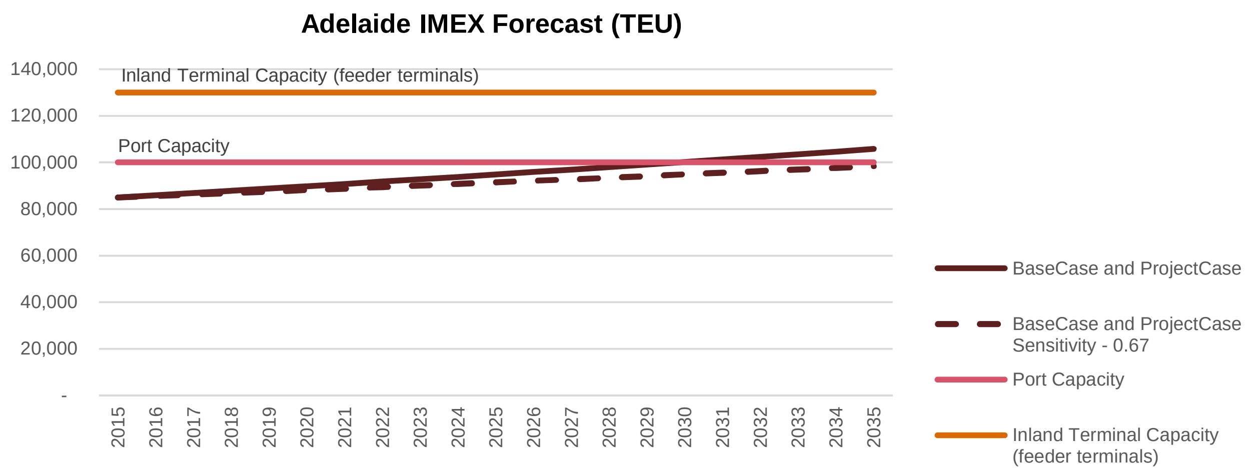
Not applicable. South Australia has the benefit of the ARTC standard gauge network providing a conduit for freight separate from the metropolitan broad gauge passenger network.

8.3.2 Adelaide IMEX Intermodal

IMEX demand volumes projected here relate to throughput for the terminals at Port Adelaide (Flinders and Qube) and Gillman Port Flat yard. The project case and base case scenarios are forecast to be equivalent (with and without Inland Rail).

Figure 21 shows that no short-medium term capacity constraints under either base case scenario (with Inland Rail) or project case scenario (without Inland Rail) are likely to occur.

Figure 21: Adelaide IMEX Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis.

9 Western Australia

Western Australia

9.1 Markets/destinations

9.1.1 Origin-destination pairs

Container freight is transported on the East-West Corridor from Brisbane, Sydney, Melbourne and Adelaide to Perth.

Under the current rail freight network, the key origin-destination pairs for Perth operate as follows:

- Perth – Adelaide or Melbourne (interstate)
- Perth (via Crystal Brook/Parkes) – Sydney or Brisbane

9.1.2 Key commodities

The range of products and market segments transported on Perth's intermodal services include:

- general freight eg clothing and footwear, furnishings and household equipment
- groceries and retail goods (eg food and beverages)
- produce and refrigerated goods
- industrial products
- removal freight (furniture removals).

9.1.3 IMEX markets

The Perth IMEX container market is a net receiver of freight with loaded import containers representing the largest proportion (international imports and some domestic sea freight). Exports include agricultural products such as containerised grain transported to the Port of Fremantle on behalf of the Co-operative Bulk Handling (CBH) Group. However, around 50 per cent of the export containers are empty for return to the origin markets.

9.1.4 Interstate

Key drivers of interstate volumes include retail turnover (following economic and population expansions), online retail (with increased popularity of internet shopping reliant on freight traffic from east-west), domestic manufacturing and the automotive industry (which will significantly decline by 2017 given Australia's factory closures).

Figure 22: Perth's Freight Operations and Terminals

Source: BITRE, 2012[25]

[25] BITRE, *Understanding Australia's urban railways*, Research Report 131, 2012, Canberra Act, p.71.

9.2 *Capacity analysis*

9.2.1 Perth Terminals

Intermodal terminals in the Perth region are as shown in Figure 22. The only other terminal on the interstate network is at Kalgoorlie. Any regional terminals on the narrow gauge network are out of scope for this study. The in-scope terminals are listed in Table 17.

Table 17: Perth terminal ownership and throughput

Terminal	Terminal operator	Rail operator	Terminal owner	Throughput TEU p.a.	Short term capacity TEU p.a.	Services per week
Kewdale	PN	PN	PN	400,000 +	500,000 +	21 +
Forrestfield	SCT	SCT	SCT	120,000 +	200,000 +	5 +
Forrestfield	AZ	AZ	AZ	100,000 +	200,000 +	5
Forrestfield	ILS/ICS	ILS/ICS	ILS/ICS	70,000 +	100,000 +	14 +
North Quay	ILS/ICS	ILS/ICS/PN	Port of Fremantle	105,000 +	200,000 +	14 +

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

Table 18: Perth terminal features

Terminal	1800 m trains	Volume	Freight DCs & w/houses	Multiple operators	Inland Rail route	Domestic IMEX	Open access
Kewdale	Yes	High	Yes	No	No	Both	No
Forrestfield (SCT)	Yes	Med	Yes	No	No	Domestic	No
Forrestfield (AZ)	Yes	Med	No	No	No	Domestic	No
Forrestfield (ILS/ICS)	No	Med	No	No	No	IMEX	Yes
North Quay	No	Med	No	Yes	No	IMEX	Yes

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

In Perth, intermodal rail operations are concentrated in the precinct around the Forrestfield marshalling yard. The major domestic standard gauge intermodal terminal in Perth is located at Kewdale and operated by Pacific National. This terminal underpins the PN service offer and has five long loading roads between 800 and 1150 metres to accommodate major rakes of wagons supported by a number of additional shorter sidings to accommodate the arrival and departure of a range of services to/from Melbourne and Sydney.

Both SCT and Aurizon have terminals at Forrestfield. These terminals are small relative to Kewdale and generally only handle a maximum of one 1800 metre double stacked train service per day.

PN's intermodal terminal at Kewdale has a large footprint, with extensive hardstand and overall siding length, and enjoys the significant benefits of co-location with major rail freight forwarders operating on the Perth route, including Toll, Linfox and K&S. Many customer warehouses and DCs (eg Woolworths) are located in the Kewdale precinct close to rail service providers.

The SCT Terminal has a van loading/unloading configuration supplemented by a small container loading hardstand area similar to its other terminal facilities. One of SCT's largest customers, Carlton and United Breweries (CUB) resides on land adjacent to the SCT terminal that allows seamless transfers to/from the rail to its warehouse.

The North Quay Rail Terminal ('NQRT') at Fremantle Harbour is a purpose built IMEX terminal at the Port of Fremantle. NQRT has direct connectivity from the rail unloading area to the Patrick and DPW berths at the Inner Harbour. A number of port shuttles mainly operating from Forrestfield, transfer containers to the Port. These services are supported by the Western Australian Government with an intent to achieve a mode share of up to 30 per cent of contestable freight for the port. The NQRT loading roads were expanded in 2014 from 400 metres to 690 metres to allow longer train configurations to operate to/from the Port. These services operate primarily on the dedicated freight network except for a small track section between Robb Jetty and Fremantle.

9.2.2 Perth Terminal Constraints

With Perth being the major Australian market serviced by intermodal rail services, the terminals are well developed and well positioned. All the Perth terminals are dead end configurations which reflect Perth being the end of the east west route. These terminals also require shunting to break the 1800 metre trains for placement into loading roads.

In addition, there is little further land available for immediate co-location on or adjacent to the terminal sites.

The Aurizon terminal is designed to accommodate 1800 metre services into two 900 loading roads at the terminal. These are dead end sidings that require Aurizon to arrive the train, break it and push the two rakes of wagons into the terminal.

9.2.3 Perth Expansion and Development

The Perth terminals are fit for purpose for their current tasks and demand. If additional capacity was required, upgrades could be undertaken at each of the terminals. These upgrades could encompass some of the following options.

- more loading equipment and deployment of RMGs
- additional loading roads
- longer loading roads
- locomotive release roads.

9.3 Needs analysis

Table 19 outlines forecast demand for the in-scope terminals based on 2015 TEU volumes (confirmed by terminal operators) and growth rates under the IRBC or Fremantle Port Authority.

Table 19: Demand forecast with and without Inland Rail – Perth terminals in scope

Project case	Category	Volume (TEU)/Year		
		2015	2025	2035
Without Inland Rail	Interstate	620,000	815,000	975,000
	IMEX	175,000	295,000	435,000
	Total	**795,000**	**1,110,000**	**1,410,000**
	Growth %		***40%***	***27%***
With Inland Rail	Interstate	620,000	845,000	1,005,000
	IMEX	175,000	295,000	435,000
	Total	**795,000**	**1,140,000**	**1,440,000**
	Growth %		***43%***	***26%***

Source: Terminal operators (2015 throughput), Inland Rail Business Case (interstate growth rates), Fremantle Port Authority (IMEX growth rates), PwC analysis.

An alternative forecast model has been applied for future IMEX volumes based on growth rates estimated by the Fremantle Port Authority.

The in-scope terminals (Forrestfield Aurizon, Forrestfield SCT, Kewdale and North Quay Rail Terminal) have estimated 2015 IMEX volumes at 175,000 TEU. These include both origin volumes at Forrestfield and Kewdale and destination volumes at North Quay Rail Terminal.

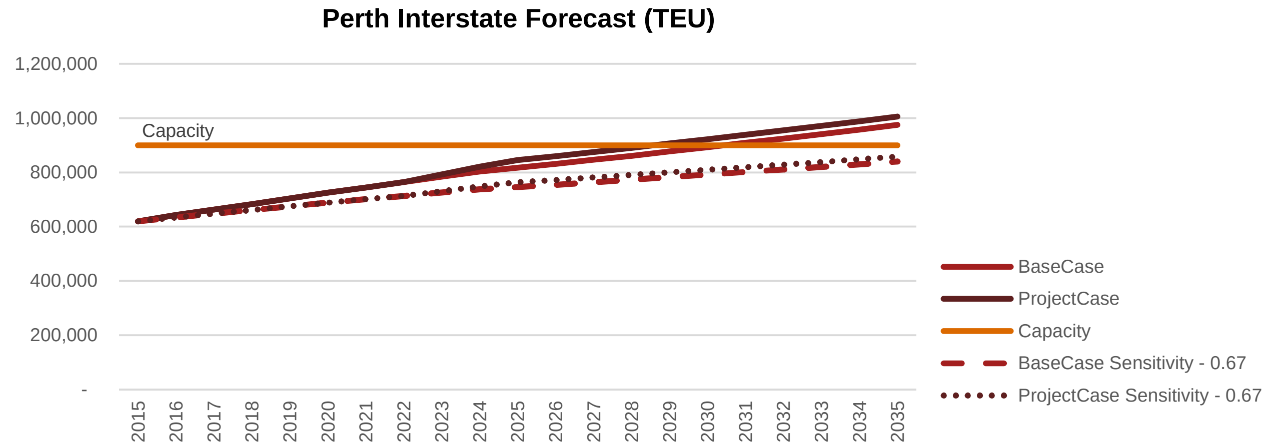
9.3.1 Perth Interstate Intermodal

Interstate intermodal volumes projected here relate to throughput for the intermodal terminals at Kewdale and Forrestfield (Aurizon and SCT). There is negligible impact by forecasts from the Inland Rail project case scenario.

The year-on-year growth rate starts at 3.7 per cent in 2015-16 and declines to steady at 1.7-1.8 per cent by 2025. The growth rates in the first ten years appear optimistic especially given recent growth experience around one per cent. Under a 67 per cent sensitivity, the capacity constraint is delayed from c.2028 to post-2035.

Industry and state government stakeholder analysis has indicated that interstate rail terminal capacity is considered to be sufficient until roughly 2050 given the infrastructure that is currently in operation by various operators at Kewdale and Forrestfield.

Figure 23: Perth Interstate Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis.

9.3.2 Perth IMEX Intermodal

IMEX intermodal volumes projected here relate to throughput for the terminals at North Quay (port-side) and Forrestfield ILS/ICS (inland). The year-on-year growth rate starts at 5.7 per cent in 2015/16 and declines to 4.7 per cent in 2021/22 and 3.0 per cent from 2031/32 onwards.

Throughput at the port-side terminal is higher than the feeder terminal given there are additional sources of freight beyond the feeder terminals in-scope for this study; it is assumed these additional volumes may relate to containerised grain. As a result, unlike the other regions, our analysis of capacity constraint has considered total capacity at the port and inland feeder terminals, which is estimated at 300,000 TEU. The needs analysis in Figure 24 indicates a capacity constraint around 2025 (or 2030 assuming 67 per cent sensitivity).

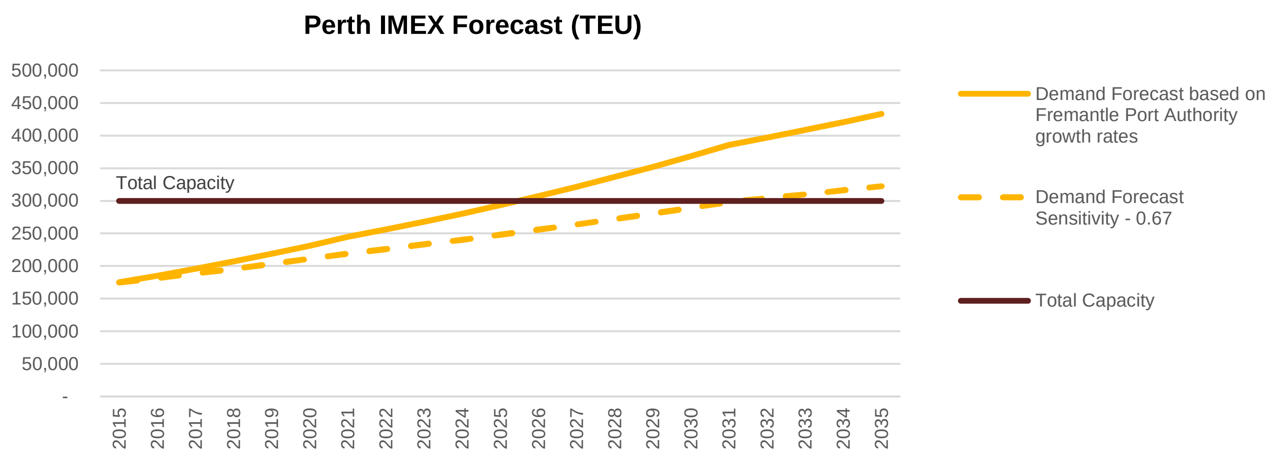
The capacity gap does not factor in the potential for increased freight on rail. The Western Australia (WA) government has a long term aspirational rail target of 30 per cent of contestable freight on rail.[26] Rail share in 2015/16 was approximately 14.5 per cent (104,000 TEU) and the target for 2016/17 is 15 per cent.[27]

The analysis does not pinpoint whether this constraint is port-side or at the feeder/receiver inland IMEX terminal. Industry stakeholders have indicated that Port terminal capacity at Fremantle is sufficient to meet demand over the quay line. Further to this, Port capacity for IMEX should remain sufficient into the long term given current intentions for future Outer Harbour planning. Beyond the port terminal, key industry issues include the lack of metropolitan based IMEX terminal capacity and the need to make rail more competitive (through scale economies).

26 During 2013-14, rail's market share at the Port of Fremantle was 14 per cent. http://www.fremantleports.com.au/Operations/Landside/Pages/Rail-Services.aspx, accessed 2017

27 Fremantle Ports, *Statement of Corporate Intent*, 2016/17.

Figure 24: Perth IMEX Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Fremantle Port Authority (IMEX growth rates), PwC analysis.

10 Northern Territory

Northern Territory

10.1 Markets/Destinations

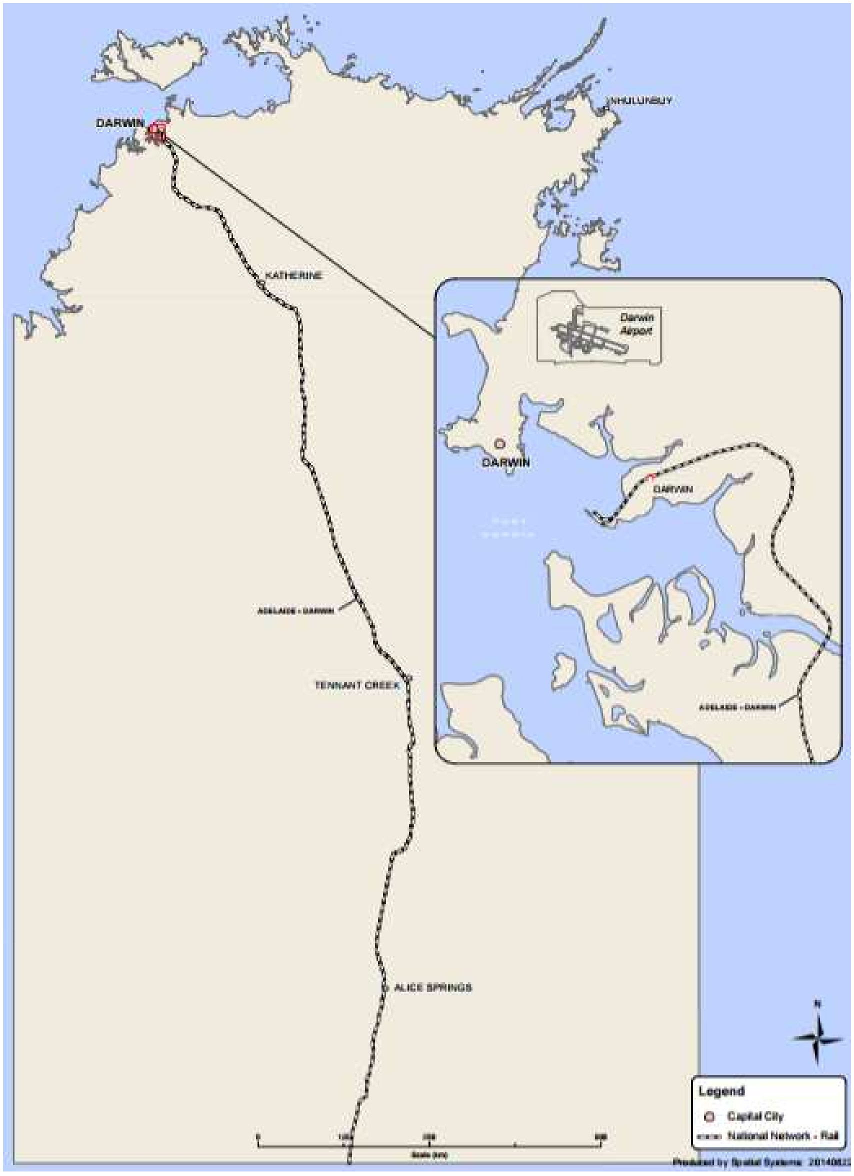
10.1.1 Origin-destination pairs

Under the current rail freight network, the key origin-destination pairs for Darwin operate as follows:

- Darwin– Adelaide (interstate) with connections to other major capital cities

The major Darwin Terminal is at Berrimah, near the port at East Arm shown in Figure 25.

Figure 25: Northern Territory Rail Corridor



Source: DIRD, 2014

10.1.2 Key commodities

Consistent with Adelaide, the range of products and market segments transported on Darwin's intermodal services include:

- groceries and beverages
- consumer goods
- containerised minerals.

10.1.3 IMEX markets

There is no IMEX recorded for containerised freight in Darwin. This is because the small population base and supply of household goods predominantly occur through Melbourne and Adelaide supply chains.

10.1.4 Interstate

Genesee & Wyoming Australia (GWA) is responsible for 2,200 kilometres of owned/leased track between Tarcoola to Darwin and is the freight rail operator on this route. Intermodal services depart Adelaide and Darwin 6 days per week with drop off/pick-up as required at Alice Springs, Tennant Creek and Katherine. Container services include refrigerated and general.

The in-scope terminal is listed in Table 20.

Table 20: Darwin terminal ownership and throughput

Terminal	Terminal operator	Rail operator	Terminal owner	Throughput TEU p.a.	Short term capacity TEU p.a.	Services per week
Darwin	GWA	GWA	GWA	70,000 +	340,000 +	6 +

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms.

Table 21: Darwin terminal features

Terminal	1800 m trains	Volume	Freight DCs & w/houses	Multiple operators	Inland Rail route	Domestic IMEX	Open access
Darwin	Yes	Medium	Yes	No	No	Domestic	Yes

Source: Terminal operator data, PwC Analysis – refer to Glossary for definition of terms

The current major intermodal service on the Tarcoola – Darwin Line is operated by GWA. This operates six (6) days per week to/from Adelaide (Islington), and provides drop-off and pick-up services to the three minor terminals en route as required.

The main terminal in Darwin at Berrimah, is a new terminal with an 1800 metre loading face. This makes Darwin the only full length terminal on the interstate network. There are no operating constraints and there is an ability to obtain land in close proximity to the terminal for freight forwarder or end customer facilities.

10.2 Needs analysis

Table 22 outlines forecast demand for the in-scope terminals based on 2015 TEU volumes (confirmed by terminal operators) and growth rates under the IRBC. Demand forecasts are not anticipated to be affected by the Inland Rail development (equivalent base case estimates as for project case).

Table 22: Demand forecast with and without Inland Rail – Darwin terminals in scope (Darwin Intermodal Terminal only)

Project case	Category	Volume (TEU)/Year		
		2015	2025	2035
With or Without Inland Rail	Interstate	70,000	110,000	170,000
	IMEX	–	–	–
	Total	**70,000**	**110,000**	**170,000**
	Growth %		***57%***	***55%***

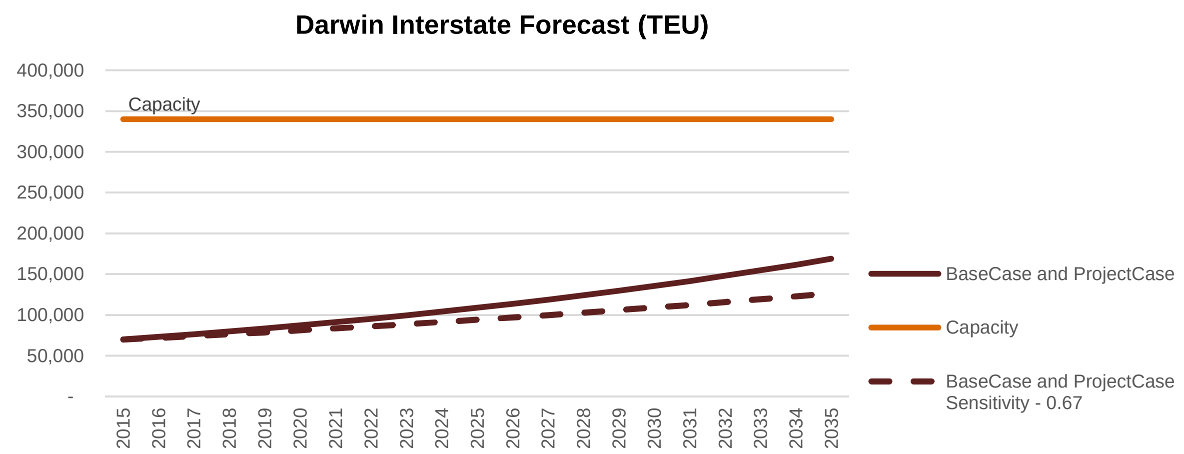
Source: Terminal operators (2015 throughput), Inland Rail Business Case (growth rates), PwC analysis.

10.2.1 Darwin Interstate Intermodal

Interstate intermodal volumes projected here relate to throughput for Darwin Intermodal Terminal only. There is no impact forecast from the Inland Rail project case scenario.

Figure 26 shows that there is significant spare short term capacity. No capacity constraints are forecast within next 20 years.

Figure 26: Darwin Interstate Needs Analysis



Source: Terminal operators (2015 throughput and capacity), Inland Rail Business Case (growth rates), PwC analysis.

11 Case studies – domestic and international

Case studies – domestic and international

There are many models for terminals in Australia and internationally, each of which has different characteristics. Not all terminals and the lessons learnt are immediately replicable in the Australian context.

Four (4) case studies have been selected to demonstrate a range of terminal functions and how they are fit for purpose within their respective markets:

- Fletcher Grain and Intermodal Freight Terminal ('Fletcher') – a case study of a small, owner operator, multi-product regional intermodal terminal based near Dubbo in New South Wales.
- Daventry Intermodal Rail Freight Terminal ('DIRFT') – a case study of a large, multi-user, multi-product regional intermodal terminal. It is the UK's largest rail-linked logistics development, handling around 200,000 containers per year.
- Pacific National (PN) Kewdale terminal – a case study of a large, single-user rail operator, multi-product metro terminal. It is the major rail intermodal terminal in Perth and has the greatest intensity of co-location of rail based supply chain participants in the terminal precinct.
- Logistics Park Kansas City ('LPKC') – a case study of a full serviced inland intermodal facility recently developed in the United States (U.S.). The terminal capacity is significant, currently accommodating 500,000 container lifts annually with volumes projected to increase to 1.5 million at full build out. It has no Australian equivalent in scale.

Figure 27. Locations of global case studies

Source: PwC

In this section we are demonstrating:

- The key characteristics of these terminals including their critical success factors
- The applicability of these characteristics to the Australian market.

11.1 Relevance to Australia

Table 23 below summarises key lessons learned from the case studies which are relevant to Australian terminal solutions.

Table 23: Key lessons learned for Australia

Category	Lessons learned
Terminal connectivity	A critical success factor for any intermodal terminal is its connectivity to the road and rail network. While the broader network infrastructure outside of the terminal envelope is not in scope for the purposes of this report, the case studies demonstrate the value of terminal precinct planning to optimise its configuration and operations. • In the case studies, intermodal terminals have been strategically positioned to service particular origin-destination markets. The terminal locations leverage existing road and rail network infrastructure and ensure points of access/egress are suitable for the freight task e.g. Permits have been granted for truck movements to the Fletcher terminal that facilitate more efficient truck freight and the delivery of higher payloads to the rail siding with direct access to road train routes. • Sidings have been appropriately sized relative to the reference train on the network. DIRFT, Kewdale and LPKC have maximised the payload of train services as a result of the reference train they can handle.
Co-location and their operating models	The case studies all show the benefits of co-location to reduce double-handling, improve the efficiency of coordinating supply chain moves and reduce operations costs. The case studies provide variations on a co-location operating model that can be applied in the Australian context. Long term partnerships have been established between the terminal operator and their customers. Terminal sites are leased by a single owner to multiple freight forwarders and/or end customers. • Fletcher has made its export regional rail successful by positioning the terminal close to its processing facilities. • End customers at DIRFT (retailers and logistics companies) have control over their intermodal terminals, which are set up adjacent to each other. Hence, freight handling is minimised between terminals and distribution centre facilities. • PN has access to the sites of the freight forwarders and vice versa. Kewdale's 'cargo link' concept reduces freight handling costs by providing a faster and more efficient transfer of freight direct into the customers' premises. • LPKC demonstrates that value-adding activities can be conducted under a co-location model which improves the efficiency and cost effectiveness of the supply chain for its customers e.g. Amazon's fulfilment centre and Triumph Group's manufacturing plant are located within the terminal precinct.
Vertical and horizontal integration	In addition to the benefits of co-location outlined above, providing additional services at terminals can be an opportunity to increase vertical integration. Vertical integration improves the efficiency of coordinating the transition points within the rail supply chain. • Fletcher undertakes multiple roles within its rail based supply chain; cargo owner, terminal owner and terminal operator. As a result, Fletcher has a greater degree of control, visibility and flexibility across its supply chain and can reduce its operations costs. • Horizontal integration also reduces operation costs by improving the economies of scale. LPKC in the U.S. is a far-reaching example of this potential scale. At scale, the terminal can compete more effectively with road haulage for large logistics and retail customers.

Category	Lessons learned
Ability to generate volume	Without sufficient scale, the cost effectiveness of rail freight can be marginal and subject to competition from both road and sea transport for intermodal freight tasks. The case studies demonstrate how a terminal's success is driven by its ability to generate throughput volumes. • Fletcher leverages the agricultural products in its regional catchment area to provide adequate volume to underpin the rail task
Investment in a rail supply chain that is fit-for-purpose	There is a risk that North American intermodal terminals are heralded as the optimal solution in achieving economies of scale. Kansas City Logistics Park is an example of significant private investment by BNSF in the freight network infrastructure and terminal precinct. However, the hub and spoke model is underpinned by a population base of 320 million and multiple internal major cities across the country that cannot be serviced by shipping. In the UK, DIRFT serves a population of 65 million Australia, on the other hand, operates a point to point supply chain and the resulting infrastructure and terminal set-up should be tailored to that model. Australian terminal operations typically serve a local market of 1+ million population. The scale of investment and operation should be fit-for-purpose.

Source: PwC/Ranbury

11.2 Regional IMEX Private Use Terminal, NSW – Fletcher Grain and Intermodal Freight Terminal

Fletcher Grain and Intermodal Freight Terminal is a multi-purpose private use regional rail terminal leveraging off the agricultural products that provide adequate volume to underpin the rail task. Fletcher has made its export regional rail successful by positioning the terminal close to its processing facilities. This has minimised the double handling of products and reduced the terminal PUD leg resulting in a rail OD pair between Dubbo and Port Botany.

11.2.1 Context

The terminal is owned by Fletcher International Exports which is a vertically integrated agricultural company with interests in primary production, meat processing, pet food manufacturing, commodity trading and freight forwarding. The majority of the cargo transported is owned by Fletcher, and is destined for international export markets. However, the terminal also provides transport services for the wider region's agricultural, forestry and mining commodities. Other cargo owners can book slots on the hook and pull service.

The company owns rolling stock and uses an accredited operator, Southern Short Haul Rail (SSR), to run three return train services per week to Port Botany. These port services can service all three stevedore's rail terminals at the ports (DP World, Qube and Hutchison) before collecting empty containers from MCS Cooks River for the return journey to Dubbo.

The rail freight terminal was first constructed in 2008 with development in 2009 to include grain handling facilities. The terminal has been recently expanded in 2016 with a second AB triple length weighbridge, 3 new high capacity bunker unloading machines and new high capacity quad container packing machine. The company's facilities include a 1500 metre dual entry/exit rail loading siding at the site, with storage facilities at the terminal for bulk grain and containers and warehousing at the Fletcher processing facility. The terminal has a 700 metre loading hardstand. The terminal is shown in the aerial map below in Figure 28.

Figure 28. Aerial shot of Fletcher Grain and Intermodal Terminal, Dubbo NSW

Source: Google maps

11.2.2 Markets/destinations

Fletcher provides port services for freight transport via Port Botany. Export traffic is complemented with cement and fertiliser backhaul freight. Figure 29 shows that the region is connected to capital city markets and ports through the national railway and highway network.

Figure 29. Location of Fletcher terminal relative to the ports

Source: DIRD, 2014

Key commodities handled at the terminal include:

- agricultural products – including meat, skins, wool, grain, and other farm exports from Fletcher's sheep abattoir and grain packing site
- cement imports – a purpose built cement powder blending and packing plant was constructed by Fletcher in 2014, providing tailored mixtures to customers requiring large volumes of cement products

- agricultural products (other businesses); grain, cotton lint and cottonseed, pulses and wine – Fletcher is an example of the broader emerging trend for containerisation of grain in the region, for export through Port Botany. Containerisation can reduce handling costs over the supply chain to delivery in export markets, making it an attractive transport option for some operators.
- forestry
- mining exports (including mineral commodities)
- fertilizer imports.

11.2.3 Terminal snapshot

Table 24 below summarises key features of the terminal.

Table 24: Terminal factsheet – Fletcher Grain and Intermodal Terminal

Criteria	Description of indicator
Terminal owner and operator	Fletcher International Exports logistics division
Rail operator	Southern Shorthaul Railroad/Fletcher's rolling stock
Average trains per week	3 return services to Port Botany (186 TEU slots per service)
Throughput	15,000 – 18,000 TEU
Reference train	1,280m Based on fleet of 3 x C44aci UGL 4500 horsepower locomotives, 62 x 60 foot CIMC wagons28
Loading sidings	• 1,500m dual entry/exit rail siding with a 700m hard stand loading area29
Lifting equipment	• 2 heavy Hyster forklifts • 1 Hyster reach stacker • 1 10 tonne Toyota container handler

11.2.4 Success factors

Key factors underpinning the terminal performance include:

Network connectivity

Fletcher terminal has 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. The terminal is serviced by a higher-grade road that allows quad-axle semi-trailer movements. Permits have been granted for truck movements to the terminal that facilitate more efficient truck freight and the delivery of higher payloads to the rail siding with direct access to road train routes. This has allowed containers to be loaded at optimum weights and significant freight savings to be passed along the logistics chain to export customers.

The terminal also has strong connections to existing rail transport networks, as Dubbo City lies on the Main West line, which links the intermodal terminal to port. The terminal has an estimated 48 hour cycle time to the Port of Botany. The great dividing ranges limit the cost-effectiveness of road freight, and in turn, improve the competitiveness of the rail mode.

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[28] http://www.fletchint.com.au/business-units/intermodal-freight-division, accessed 2016

[29] http://www.fletchint.com.au/business-units/intermodal-freight-division, accessed 2016

Achieving baseload volumes by aggregating demand and co-locating processing facilities

Fletcher grain and intermodal terminal is situated in Dubbo's industrial precinct close to the Fletcher abattoir (750m away), grain handling plant and cement powder blending and packing plant. There are facilities to containerise grain on site and re-position containers on site. The broader Fletcher operation generates sufficient baseload volumes to utilise rail based supply chains and they have effectively created a co-located freight precinct. The large site allows for economies of scale including greater segregation of goods (i.e. different kind of grains going to market) which is a competitive advantage.

The majority of the rail freight demand relates to export products to Port Botany. Empty containers are returned to Fletcher intermodal terminal. Inbound freight has been able to be sourced to complement the empty return capacity with full containers of cement imports (30,000 tonnes p.a) and fertiliser (5,000 tonnes p.a.).[30] These backload volumes are a critical success factor in order to increase asset utilisation and the overall efficiency of the train services.

Increased efficiency from vertical integration

Fletcher undertakes multiple roles within its rail based supply chain; cargo owner, terminal owner and terminal operator. Fletcher therefore has a greater degree of control, visibility and flexibility to coordinate multiple parts of the supply chain– these points of coordination otherwise represent potential efficiency losses.

11.3 Large Regional Multi-User Terminal, U.K. –Daventry International Rail Freight Terminal ('DIRFT')

Daventry International Rail Freight Terminal ('DIRFT') is a large, multi-user, multi-product regional intermodal terminal. It is the UK's largest rail-linked logistics development, handling around 200,000 containers per year. DIRFT demonstrates that establishing a freight hub where a combination of rail, road and distribution centres/warehouses are co-located increases the viability of rail as a mode. The rail operation is attractive to customers even though the maximum train length is limited to less than 800 metres. However, it is clear that the DIRFT model is facilitated by supplying rail connections between major population centres in Great Britain which has a population density of 65 million.

11.3.1 Context

DIRFT is located in the Midlands beside the West Coast Mainline ('WCML') linking London with Manchester, Liverpool and Glasgow and is close to the intersection of the M1, M6 and A14 motorways, providing road connections with West Yorkshire, Scotland and Felixstowe Port, respectively. A key benefit of the location on the WCML is that trains can reach DIRFT from all of the UK container ports and all of the existing and potential locations of rail freight interchanges along routes which are already used by freight services.

Figure 30 shows the current facility layout (DIRFT I and II), which includes an open-user rail terminal, a private rail terminal for Tesco, 39 hectares of warehousing and a further 18 hectares of rail-linked warehousing. DIRFT III is the next project phase with a further 72 hectares to provide a rail link from the existing terminal to a new replacement rail terminal. There will be future capacity to handle 500,000 containers a year. Construction is due to start in early 2017.

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30 http://www.fletchint.com.au/business-units/intermodal-freight-division, accessed 2016

Figure 30. DIRFT I and II terminal precinct facility

Source: Google Pro Image, PwC and Ranbury

The complex offers distribution and manufacturing floor space and has attracted major distribution and retailing occupiers. Warehouses can have sidings and be directly connected to rail. Key customers in DIRFT II include:

Tesco (domestic intermodal) – uses rail to transport ambient general merchandise from its National Distribution Centre (NDC) at DIRFT to its regional network of distribution centres around the country. Rail currently accounts for 50% of all outbound stock. The Tesco DC facility has a 220m long dedicated intermodal rail handling loading area with three embedded sidings. It receives and dispatches four trains a day to and from Wentloog in South Wales, Barking in East London, Mossend in Scotland and Teesport in the North East.

Sainsbury's (port intermodal) – receives trains transporting ambient general merchandise from the ports. By establishing its import centre and slow moving freight facility at DIRFT, Sainsbury's is not tied to one port, but can use the most appropriate port to meet its specific needs. The facility includes a 400m long dedicated intermodal rail handling loading area with two sidings on ballasted track. When trains arrive at DIRFT on the West Coast Mainline, they are shunted from the reception sidings to the Sainsbury's facility, where they are unloaded using electric-powered, rubber-tyred gantry cranes. Containers are then either stored on the terminal, discharged into the DC facility or transported off-site to another Sainsbury's distribution centre or third party location.

Eddie Stobart (domestic intermodal) – first entered the rail sector in 2006 and has a campus of four buildings at DIRFT. The new 420,000 square foot unit gives Eddie Stobart a dedicated intermodal hub from which it can service the logistics requirements of a number of customers. The facility, which completed in summer 2015, has a 350m canopied siding along the rear of unit, where forklifts can load and unload trains. This configuration is particularly suited to bulkier good such as wine, bottled water and automotive parts.

11.3.2 Markets/destinations

Inbound trains originate in Europe (via the channel tunnel) and UK deep sea ports (such as Felixstowe or Southampton). Containers are transported to the terminal and freight is discharged or cross docked with goods stored in large distribution centres housing many of the largest retailers and distributors in the UK. Some, such as Tesco, have private connections to the rail network. Containers are then transported to destinations across the UK, primarily by road, but in recent years logistics operators like WH Malcolm and JG Russell, in

partnership with Direct Rail Services (DRS), have been successful in establishing rail services taking a proportion of these freight flows by rail to Scotland.[31]

Key markets/destinations are summarised below:

- Domestic intermodal
- Port intermodal
- IMEX to/from Europe

Figure 31. UK intermodal map

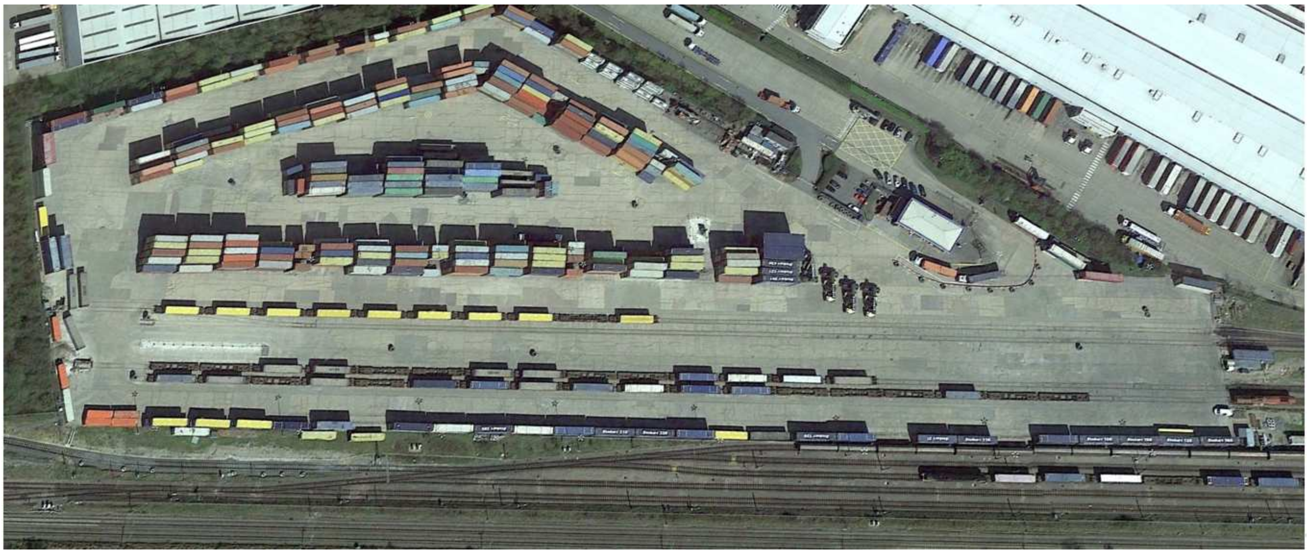
Source: Prologis RFI DIRFT

31 'Inquiry into Freight Transport in Scotland', SP Paper 772 6th Report 2015 (session 4), Infrastructure and Capital Investment Committee, Jun-2015

11.3.3 Terminal snapshot

The reception yard, shown in Figure 32 below, consists of five tracks each capable of holding a full length 775m train, and is linked to the WCML through single lead junctions at both the northbound and southbound ends. Single lead junctions allow one train at a time to enter or leave the reception yard. The two junctions together allow two trains to move simultaneously, one at each end.

Figure 32. Aerial of reception yard at DIRFT



Source: Google Pro Images, PwC and Ranbury

The main intermodal routes from the Channel Tunnel and Felixstowe to Crewe via London are currently cleared for 775m length (length enhancements from Southampton are in hand but not yet complete). Other routes can be more constrained, with some routes limited to no longer than 440 metres. [32] From the start DIRFT was designed to handle long 775m trains hauled by electric traction as well as diesel. A strategic freight network of W10 gauge cleared routes is also being developed by Network Rail. These routes can carry all of the main types of containers on standard container carrying wagons.

Table 25 below summarises key features of this case study terminal.

Table 25: Terminal factsheet – DIRFT

Criteria	Description of indicator
Markets served	Major centres in England, Scotland, Wales and Europe
Terminal owner	Prologis RFI
Terminal and rail operator	Malcolm Rail (WH Malcolm – third party logistics ('3PL'))
Average trains per week	140[33] (2015)
Throughput	200,000 containers/400,000 TEU per year[34]

32 'Future Potential for Modal Shift in the UK Rail Freight Market', AECOM, Arup, SNC Lavalin, Sept-2016

33 http://dirft.com/wp-content/uploads/22563-Rail-Freight-Briefing-Prologis-RFI-DIRFT-Technical-Insight2.pdf

34 http://www.parliament.scot/parliamentarybusiness/CurrentCommittees/90988.aspx

Criteria	Description of indicator
Reference train	775m (755m plus locomotive) This is the maximum train length permitted on Network Rail (on certain routes) and maximum train length permitted to and from Europe via the Channel Tunnel.
Loading sidings	**Malcolm Rail Terminal** • 4 x 400 metre loading embedded sidings • 4 x reach stackers **Tesco** • 4 x 260 metre dedicated intermodal terminal with three embedded sidings • 2 x reach stackers. **Sainsbury's** • Dedicated intermodal terminal with 2 x 400 metre sidings on ballasted track • 2 x rail mounted gantries • 1 x reach stacker **Eddie Stobart** • 350m canopied siding along the rear of the unit, where forklifts can load and unload trains **DHL Supply Chain** • 2 x 250 metre rail sidings with canopies enabling loading/unloading of wagons with forklifts into or out of storage

11.3.4 Success factors

Key factors underpinning the terminal performance include:

Network connectivity – part of an integrated rail supply chain

DIRFT is located in a prime logistics area, the 'Golden Triangle'[35], which is strategically positioned on the WCML with rail links to maritime ports and direct access to major UK and European destinations. Rail connections to/from the Channel Tunnel and the Port of Felixstowe provide an open access network which is serviced by four rail operating companies: Direct Rail Services, EWS, Freightliner and GB Railfreight. As a result of this connectivity, the intermodal terminal at DIRFT represents a valuable component of an integrated rail supply chain.

DIRFT is also centrally located with road connections to the M1 (adjacent) and M6/A14 interchange within 6.5 km. 98% of the British population can be accessed within the 4.5 hour drive-time limit, which is advantageous in contract fulfilment.

Effective partnerships with major end customers with co-located operations

The colocation of the rail network, key road junctions and distribution centres/warehouses increases the viability of rail as a mode and has successfully attracted major end customers including Tesco, Sainsbury's and Eddie Stobbart to the precinct. End customers lease and operate their own dedicated intermodal terminals with embedded sidings. This reduces the number of freight handling touchpoints and improves the cost efficiency of operations costs.

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35 The 'Golden Triangle' refers to the prime logistics area, located in the Midlands and bounded by the M6, M1 and M42 motorways

Reliability of train services

Traffic on the rail network is planned and has proven to be as reliable, if not more reliable, than road haulage. Tesco has been operating its rail network since 2006 and it achieves 98% on-time deliveries.

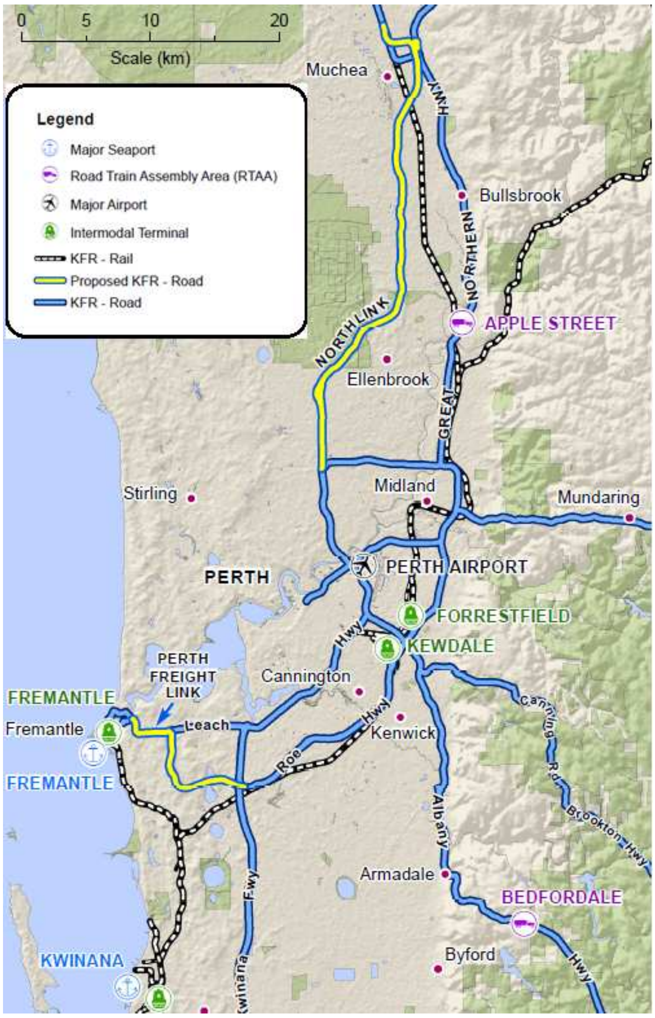
11.4 Major Metro Single-User Terminal, WA – Kewdale Intermodal Terminal

The Pacific National (PN) Kewdale terminal is a large, single-user rail operator, multi-product metro terminal. Kewdale has the greatest intensity of co-location of any intermodal terminal in Australia. Major customers (Toll, Linfox and K&S) have established freight depots adjacent to the terminal site. This allows direct access from the depots to the terminal, which reduces container handling times, results in more efficient delivery of freight and reduces freight handling costs. Freight forwarders currently consider the Kewdale model as the most efficient in Australia.

11.4.1 Context

Kewdale is the major rail intermodal terminal in Perth. It covers a large footprint, is located in the industrial/logistics hub of Perth, and is co-located with other major logistics operations and rail customers.

Figure 33. Location of Kewdale on key freight routes



Source: Transport Infrastructure Council, 2014

PN acquired land adjacent to its terminal under a long lease. PN's major customers are the major freight forwarders, with PN only providing rail line-haul services. Toll, Linfox and K&S have established forwarding depots on the PN terminal site. This allows direct access from the depots to the terminal allowing very short transfer times. Containers are transferred without the need to be loaded onto licensed trucks, driven via road and unloaded again. Freight containers are taken off the rail wagons by reach stackers and transferred onto Internal Transfer Vehicles (ITV's).

While not located on the PN site, a number of customers who are dependent on the rail supply chain to/from Perth are also located nearby in the Kewdale precinct. This includes Coles, Woolworths, Super Retail Group, Bunnings, multiple mid-size transport companies and industrial businesses.

11.4.2 Terminal snapshot

Table 26 below summarises key features of this case study terminal.

Table 26: Terminal factsheet – Kewdale

Criteria	Description of indicator
Markets/destinations served	Major capital cities (Melbourne, Sydney, Adelaide)
Terminal and rail operator	Pacific National
Average trains per week	21 return services per week
Throughput	400,000 – 450,000 TEU
Reference train	1,800m double stacked Train needs to be broken to access into the loading roads on the hardstand area.
Loading sidings	• 1,150m • 1,070m • 990m • 835m • 820m • 2x580m plus shorter useable sidings
Total internal length	7500m
Lifting equipment	• 10 reach stackers • 8 ITVs • 220 Skel trailers • 8 light vehicles

Figure 34. Aerial of Perth freight terminal

Source: Freight & Logistics Council of Western Australia, 2014

11.4.3 Success factors

Key factors underpinning the terminal performance include:

Reducing freight handling costs by co-locating and optimising the terminal configuration

Kewdale is part of an intermodal hub containing intermodal freight terminals and numerous complementary transport and logistics related businesses. The terminal is home to a number of major PN line haul freight forwarding customers including Linfox, K&S Freighters and Toll.

The interstate standard gauge network effectively ends in the PN terminal. PN can directly place loading/unloading rakes of wagons in the terminal for treatment and processing. Freight can be immediately stripped and transferred into the freight forwarders' facilities for cross docking and delivery to end customers. This integrated approach reduces container handling times and results in more efficient delivery of freight. This provides both PN and the freight forwarders with a significant competitive advantage over other transport operators.

Maximising payloads with alignment of network and terminal capability

There are no impediments and this is currently the largest and most efficient train service configuration in Australia enabling 1800m double stacked from interstate.

Improving the reliability of train service

In the past, cancellations and variations to weekly rail plans have caused significant additional costs to Pacific National and their customers. PN designed and implemented projects to make freight available to customers on time 95% of the time and improve planning processes associated with train cancellations and variations. The improved reliability increases the attractiveness of rail supply for PN's customers and helps to generate additional throughput demand.

Investment in technology

PN has a number of customer IT applications such as the FreightWeb Smartphone Application and FreightWeb online enhancements (including Freight tracker and KPI reporting to customers). These allow for more efficient tracking and handling of end customer freight.

11.5 Major North American Metro Terminal – Logistics Park Kansas City ('LPKC') Intermodal Facility

The LPKC Intermodal Facility has 8 x 2400 metre loading roads with rail mounted gantries and highlights the benefits of having major co-located facilities on the major rail and road routes. This increases the efficiency and decreases handling and operations costs.

However, this model is underpinned by a population base of 320 million and a multiple internal major cities across the country that cannot be serviced by shipping as a mode. The annual intermodal rail task in freight flows is estimated at 28 million TEU per annum.

11.5.1 Context

Logistics Park Kansas City ('LPKC') is a 685 hectare inland distribution hub that includes a public private partnership and Burlington Northern Sante Fe ('BNSF') intermodal facility. This case study focuses on BNSF's intermodal facility, shown in Figure 35 which accounts for 180 hectares of the total precinct footprint.

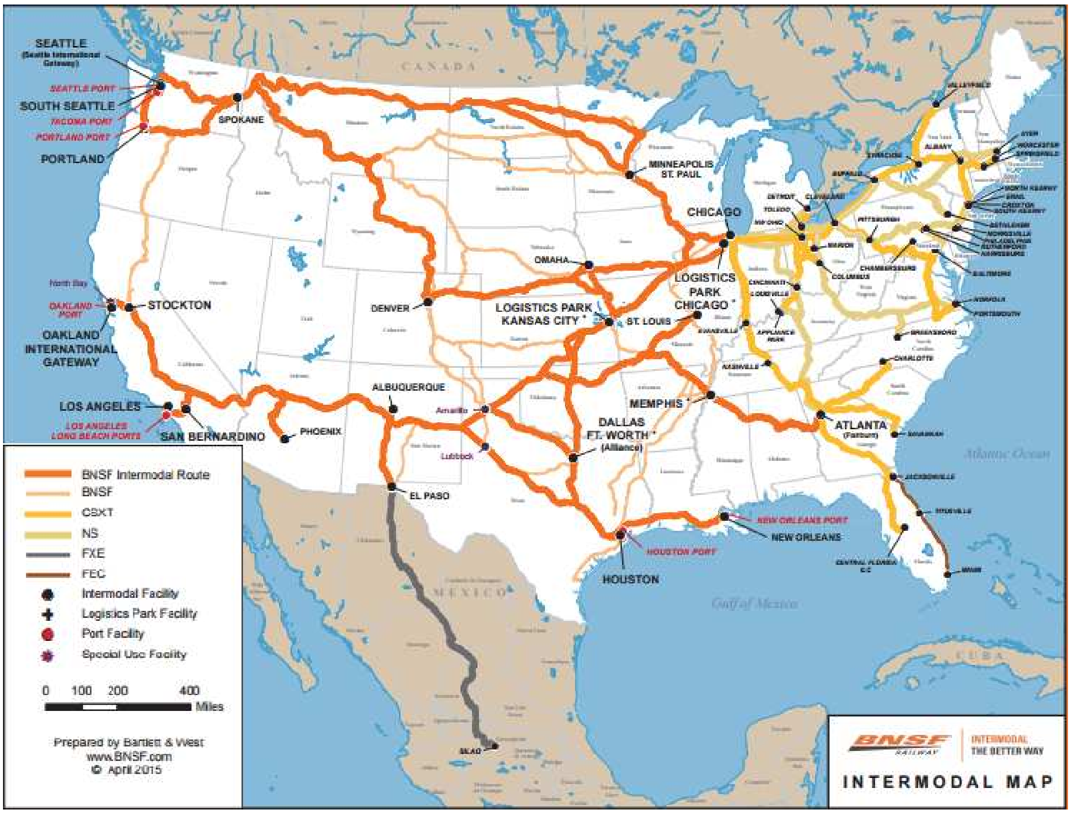
Figure 35. Terminal conceptual site plan

Source: http://www.logisticsparkkc.com/, accessed 2016

LPKC Intermodal Facility opened in September 2013 as the only full-service facility in the western two-thirds of the U.S. offering international and domestic intermodal services, as well as direct-rail and carload services. The terminal capacity is significant, currently accommodating 500,000 container lifts annually (1,000,000 TEU) with volumes projected to increase to 1.5 million (3,000,000 TEU) at full build out. LPKC Intermodal Facility handles transfer freight from Southern California, the Pacific Northwest and the Midwest.

The terminal and rail operator, BNSF, is one of the big four class 1 railway owners/operators in the U.S. (together with Union Pacific ('UP'), CSX and Norfolk Southern). Figure 36 shows that BNSF dominates the western part of the U.S. while the CSX and NS networks mainly serve the densely populated east. BNSF is a market leader in terms of the contribution of intermodal traffic to its rail freight revenues.

Figure 36. U.S. intermodal map



Source: BNSF, 2015

BNSF rail network

The majority of international and domestic containers are moved on double-stack trains. Since the 1980s, U.S railways have invested in clearing the loading gauge of rail lines to allow for double-stack operations. In 2014 and 2015, BNSF invested US$11 billion in its network to improve train flows and efficiency by adding about 300km of double-track, about 1,600km of centralized traffic control to help manage rail traffic, 16 new sidings and 24 extended sidings.

Alongside UP, BNSF performs the particularly long hauls between the west coast and the strong economic regions in the centre. On these corridors, they can benefit from train payload and length parameters. Table 27 summarises the key performance indicators of intermodal trains in the U.S. While the standard train length across the U.S. is 1340m, the typical BNSF train length on its west-coast corridors is 1800 – 2400m.

Table 27: General and key performance indicators of intermodal trains in the U.S

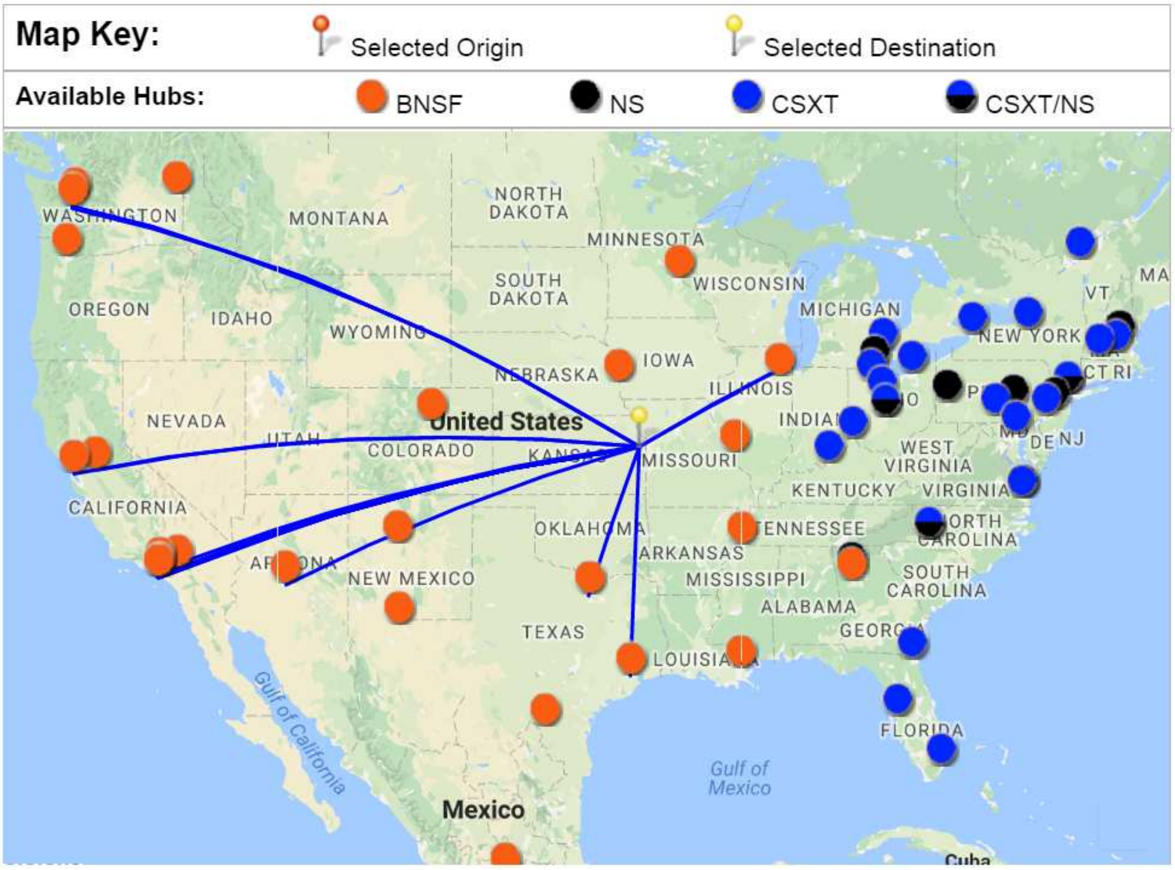
Performance measurements		
	Max	***Standard***
Max train length (m)	3050	1340
Max speed (km/h)	113	96
Max axle load (tonnes)	32	
	East	***West***
Loading capacity (TEU)	250 – 350	450 – 600
Length of haul (km)	1000 – 1200	2500 – 3500

Source: AAR, BNSF, UP, KombiConsult research, 2009

11.5.2 Markets/destinations

LPKC Intermodal Facility is strategically located at the crossroads of highway and rail traffic, with access to the West and East coast of the US. From Kansas City, freight traffic can reach 80% of the US in less than 2 days; 100% within 3 days.[36] Freight movements include domestic intermodal, international intermodal and direct and carload services. Figure 37 illustrates the key origin-destination pairs.

Figure 37. BNSF intermodal services with LPKC as selected destination



Source: BNSF Railway website, accessed 2017

Commodities include consumer goods such as clothes, computers, electronics, automobiles, packaged goods and paper products.

There are two main service levels:

- Expedited service for trailers and containers; intermodal trains typically haul 885-1125km per day
- Premium service primarily for containers; services average more than 800km per day.

Tenants of the LPKC include Amazon, ColdPoint Logistics, DeLong Grain, DEMDACO (household, fashion and paper products), Excel Industries (garden turf care products), Jet.com (online consumer goods), Kubota Tractor Corporation, Smart Warehousing and Triumph Group (aviation and industrial equipment).

- In August 2016, Amazon opened its fulfilment centre at LPKC which will pick, pack and ship large items to customers. Unlike Australia, the U.S. freight operates under a hub-and-spoke model, by which cargo is collected from the point of origin (the tips of the spoke) and transported back to a central processing facility (the hub). The shipment is then either warehoused or distributed directly from the heart of the network.

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[36] 'Kansas City: the Crossroads of Connectivity', BNSF,

Larger-scale companies such as Amazon operate several hub-and-spoke systems. The advantages include improved shipment tracking and more streamlined coordination of shipping activity.

- ColdPoint Logistics has built a storage distribution facility in the North Park site adjacent to the LPKC Intermodal Facility. The site is strategically positioned given its proximity to where animal protein and other Midwestern food products are produced. In addition, the roads surrounding LPKC are designated as a heavy haul corridor to support truck traffic for non-standard heavy loads, which is beneficial to agri-business exporters.
- Smart Warehousing is a third party logistics firm; Smart Warehousing serves about 1,000 clients nationwide from 25 warehouse and distribution facilities in 14 metro markets. It has consolidated 5 of its warehouses onto one site at LPKC.
- Triumph Group (aviation and industrial equipment) has relocated its operations from Grandview Missouri and built a manufacturing plant within LPKC to machine and assemble aircraft components. The move is expected to complete by June 2017.

11.5.3 Terminal snapshot

Table 28 summarises key features of this case study terminal.

Table 28: Terminal factsheet – LPKC Intermodal Facility

Criteria	Description of indicator
Terminal and rail operator	BNSF
Throughput	• 750,000+ annual unit capacity • Potential for 1.5 million lifts per year at full build-out
Reference train	1800 – 2400m On some routes to west-coast ports, BNSF have introduced trains reaching over 3000m in length.[37]
Loading sidings	• 8 x 2400 metre strip tracks
Total length	19,500 metres
Terminal envelope	• 685 hectares – total LPKC freight precinct of which BNSF's intermodal facility accounts for 180 hectares • 1810 paved parking spaces for trailers • 4300 container stacking spots
Lifting equipment	• 8 wide span all-electric cranes which significantly reduce the number of trucks needed to move containers in the rail yard
Automation	• Automated gate system which reduces entrance delays and minimizes truck idling • Biometric technology (fingerprint checks for drivers to enter the facility) • Global positioning systems

37 'Benchmarking Intermodal Rail Transport in the United States and Europe', DIOMIS and International Union of Railways (UIC), 2009, p.61

11.5.4 Success factors

Network connectivity

The terminal is optimally positioned at the centre of major rail corridors spanning coast to coast across the United States and extending from Canada to Mexico (NAFTA Railway). Kansas City is also located at the crossroads of four of the nation's major interstate highways (I-35, I-70, I-29 and I-49).

Freight leaving Kansas can quickly and efficiently reach the international ports on either coast or the NAFTA trade partners to the north and the south. The Logistics Park has direct access to I-35 via the new Homestead Lane and Double Diverging Diamond Interchange reduces idling, braking and emissions.

Terminal configuration

U.S. railways have been forced to shift from diesel handling equipment to electrically powered rail mounted gantry cranes and reduce or even eliminate terminal internal tractor movements. This was initially driven by environmental policy but has led to an efficient terminal concept featuring a fairly compact layout of handling modules composed of wide-span cantilever gantry cranes and a set of handling tracks under the crane portal. Trucks have direct access to cranes; yard live-lifts can also be carried out. Nested gantry cranes perform the transfer between trucks and interim storage space for containers. Containers can be stacked which raises the efficiency of land use.

Demand for inland port hubs

LPKC capitalises on a global trend with more shippers establishing hubs at inland ports. These freight hubs/inland ports streamline companies' supply chain operations by enabling them to ship cargo inland from coastal seaports more efficiently. Freight is transferred directly to an inland port rather than storing freight at seaport storage facilities (avoiding bottlenecks).

For example, ColdPoint Logistics operate a temporary high-velocity, refrigerated cross-dock facility at LPKC. With 15 loading bays, the United States Department of Agriculture ('USDA' inspected facility has capacity for hundreds of transactions per week and handles export, domestic and import loads. The inland port offers a competitive advantage for perishable goods compared to on/near dock facilities where perishable products may be susceptible to labour and congestion problems. Products can get anywhere in U.S. within four days from Kansas City. It is a cost-effective central consolidation point that presents opportunities for shippers throughout the Midwest.

Local Government incentives

The City of Edgerton has an agreement with BNSF and NorthPoint Development that warehouse and distribution facilities that locate within LPKC will be eligible for a 10-year net-effective 50% property tax abatement.

Regulatory framework – foreign trade zones

Kansas has adopted the new Alternative Site Framework (ASF) foreign trade zone designation. As a result, a company in the designated region is not restricted to a site specific FTZ, as the entire county is eligible for FTZ benefits under the ASF designation. This streamlined approach offers a quicker turnaround time and lower cost, allowing grantees to locate zone designation where companies are located.[38]

[38] http://www.kansascommerce.com, accessed 2016.

12 Determining the need for an intermodal terminal

Determining the need for an intermodal terminal

The first consideration in establishing the need for an intermodal terminal is whether a rail based supply chain solution is optimal for the freight to be transported. While rail and road are competing transport modes, not all freight tasks are contestable for rail. In some instances, road based freight supply chains may provide a superior freight point to point solution compared to rail, which negates the need for investment in intermodal terminals.

This section provides a high level preliminary decision making framework to ascertain whether there is a need for an intermodal terminal. It is designed to be used by Government in conjunction with the terminal fact sheets. It is not intended to be exhaustive – recognising that terminal investment proposals will be unique in each region – but to provide a high level framework for decisions.

At a high level, there are a number of basic principles that need to exist before a detailed assessment should be undertaken. The suitability of the rail solution for a freight task is determined by cost, timeliness and reliability. Drivers of choice of a rail freight solution include:

- The volume of the freight task is sufficiently high to warrant a rail freight solutions.
- Commodities are suitable to be transported on a rail supply chain.
- Customers are willing to contract a rail solution.
- A rail operator will be willing to contract to undertake the haulage task.
- The rail solution is competitive relative to road transport – price, timeliness, service frequency, reliability, responsiveness.

While the answer to this question will largely be determined by the task and individual circumstances of the freight customer, there are certain conditions which must be consistently satisfied in order for rail to provide a preferred supply chain solution.

These pre-conditions for rail based supply chains and intermodal terminals are summarised below:

❶ What is the freight commodity and is it contestable for rail transport?

- Products to be transported
- Configuration of freight (e.g. intermodal or bulk)
- Size of consignments

❷ Does the commodity throughput meet minimum rail volume thresholds?

- Train load volumes of freight

❸ Does the rail supply chain solution meet minimum service criteria?

- Service frequency
- Service transit time
- Service reliability

❹ Does the seasonality of throughput support a rail solution?

- Is the demand profile subject to significant peaks and troughs?

❺ What is the proposed origin and destination for the rail task and is there the necessary rail infrastructure and facilities on the proposed route?

- Origin
- Destination

- Point to point operations
- Loading/unloading
- Shunting
- Line haul
- PUD component

❻ Is the rail operating model effective (optimal rail logistics configuration for the product and route) and can it meet rail demand requirements?

- Train length/payload/service frequency
- OD terminal configurations
  - Sidings
  - Hardstand
  - Lifting equipment
- Rail operational model/fleet requirements
  - Rail network considerations
  - Train length
  - Axle load
  - Train paths
  - Curfews
- Train cycle times/asset utilisation
- Access to load/unload facilities
- Rail operator
- Access/train paths

❼ What are the commercial arrangements for the task?

- Terminal owner/operator
- Rail operators
- Costs/stranding risks

Additional guidance on each of these questions is outlined below.

The following tables provide a high level preliminary decision making framework to ascertain whether there is a need for an intermodal terminal. It is designed to be used in conjunction with the terminal typology sheets.

It is not intended to be exhaustive – recognising that terminal investment proposals will be unique in each region – but to provide a high level framework for decisions.

Guidance on pre-conditions for rail-based supply chains and intermodal terminals

Q1 *What is the freight commodity and is it contestable for rail transport?*

Factors to consider:

i	Products to be transported	*Key factors to consider include the physical features of the commodity and the perishability/time sensitivity of transport requirements.*
ii	Configuration of freight	*Freight must be able to be loaded into containers in either bulk, bales, pallets etc.*
iii	Size of consignments	*Rail haulage has a higher carrying capacity than road haulage which can result in cost advantages.* *Rail freight is most competitive when carrying large volumes of heavy goods long distances. In this situation, the increased costs of interfacing with rail (terminals, pick-up and delivery etc.) are offset by higher carrying capacity, labour productivity and fuel efficiency.*

Q2 *Does the commodity throughput meet minimum rail volume thresholds?*

Factors to consider:

i	Train load volumes of freight	*Substantial volume in serviceable catchments is the critical driver for the financial and operational sustainability of an intermodal terminal. An intermodal terminal generally only becomes viable at around 10,000 loaded TEU's per annum, and preferably operates at 15,000 to 100,000 loaded TEU's per annum.* [39] *The size and density of an intermodal terminal service catchment area relates to the proximity of local demand generators ie agricultural region, local manufacturing or processing facility.* *Groups of medium sized cargo owners can coordinate volumes to support a terminal. For example, in regional NSW, 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 attracted ad hoc volumes from small shippers in the region.*

39 SD&D Consulting, Sea Freight Council of NSW 2004 Regional Intermodal Terminals – Indicators for Sustainability

Q3 *Does the rail supply chain solution meet minimum service criteria?*

Factors to consider:

i Service frequency

Minimum average of one service per week for a regional 'sweeper' service and two return services for a regional terminal. This is a trade off against volume per service.

ii Service transit time

Rail freight is typically more competitive where the transit time is not significantly inferior to road and cost requirements are more flexible.[40]

iii Service reliability

Many general freight products such as groceries must be supplied to meet a store replenishment cycle. If this cycle cannot be met, rail cannot compete effectively with road transport.

The reliability of the service is influenced by:

- *Travel distance and service frequency*
- *Impact of road congestion (especially in metropolitan areas)*
- *Sharing rail network (with passenger services such as Sydney)*
- *Level of investment in maintenance of rolling stock*
- *Network capacity*

Q4 *Does the seasonality of throughput support a rail solution?*

Factors to consider:

iv Is the demand profile subject to significant peaks and troughs

Production of some commodities in the region, like forestry, can be considered to be highly variable. Production can stop, start or shift in focus quickly, based on international competitiveness irrespective of multiyear contractual agreements. Shippers are reluctant to fund long term investments in their supply chain such as intermodal terminals.

Agricultural products such as grain and cotton remain susceptible to seasonal and weather impacts such as drought which does lead to significant variability of freight volumes year on year.

For intermodal terminals to serve seasonal freight, it is preferable to attract complementary cargoes to help offset the terminal to operate throughout the year.

[40] Road and rail freight: competitors or complements?' Information sheet 34, p.7 DIRD https://bitregov.au/publications/2009/files/is_034.pdf

Q5 *What is the proposed origin and destination for the rail task and is there the necessary rail infrastructure and facilities on the proposed route?*

Factors to consider:

i Origin	*Is the origin rail terminal close to or co-located with a production or freight source to minimise double handling?* *Is road access to the terminal efficient? eg Minimum B Double 19m length road access*
ii Destination	*Is the destination rail terminal close to the customer or port?*
iii Point to point operations	*Does the rail task enable an efficient connectivity between OD pairs with minimal double handling?* *Road freight operators can transport goods directly between origin and destination. Multiple/long pick-up and delivery ('PUD') legs make rail inefficient and unattractive compared to road transport.*
iv Loading/unloading	*Is there efficient loading/unloading facilities at both terminals?*
v Shunting	*Is the configuration of origin and destination terminals such that extensive shunting is required to assemble and break the train service for loading/unloading that decreases the ability to achieve efficient turnaround time and increases the operating costs and cycle times?*
vi Line haul	*How long is the line haul task? Average rail costs decline with increasing freight volumes and distances. Rail transport must offset high fixed costs by providing lower unit costs than road transport and this can be achieved by carrying large volumes of cargoes over longer distances.* *Some freight studies have indicated that there is a threshold distance for rail freight to be cost competitive with road – linehaul distances of at least 250-300 km from port for rail transport to be able to compete with road transport.*[41]
vii Pick-up and delivery (PUD) component	*Is the PUD task efficient?* *The location of the terminal should ensure that the PUD component of the freight journey should be minimised to enable modal shift from road to rail.*

41 Freight Intermodal Terminal Systems for Port of Brisbane, Melbourne and Sydney', Queensland University of Technology, 2006

Q6 *Is the rail operating model effective (optimal rail logistics configuration for the product and route) and can it meet rail demand requirements?*

Factors to consider:

i	Train length/payload/service frequency	*Does the volume, service frequency, and payload enable an efficient train cycle time?*
ii	OD terminal configurations	*Does the train configuration align with the terminal facility configuration?* *Sidings* • *Hardstand* • *Lifting equipment*
iii	Rail operational model/fleet requirements	*What are the key rail operating plan components?* • *Rail network considerations* • *Train length* • *Axle load* • *Train paths* • *Curfews*
iv	Train cycle times/asset utilisation	*Does the rail operating plan enable efficient cycle times and to achieve an acceptable asset utilisation?*
v	Access to load/unload facilities	*Is access to facilities available?*
vi	Rail operator	*Is a rail operator interested in undertaking the haul task?*
vii	Access/train paths	*Are suitable train paths available?*

Q7 *What are the commercial arrangements for the task?*

Factors to consider:

i	Terminal owner/operator	*Can access be procured on acceptable commercial terms?*
ii	Rail operator	*Are the haulage rates and contract terms acceptable?*
iii	Costs/stranding risks	*Are there significant stranding risks? Unlike shipping terminals which have limited mode competition, intermodal rail terminals are capital intensive and have significant stranding risk. Rail is subject to competition from road transport for intermodal freight tasks.*

13 Intermodal terminal typology

Intermodal terminal typology

Each intermodal terminal is a bespoke facility that reflects the nature of its location, envelope and site configuration, volume and composition of throughput, and train service frequencies.

A typology of intermodal terminals has been developed here. Given the bespoke nature of terminals, this typology is not intended to be definitive or exhaustive. The typology should be read within this context as a high level analysis of in-scope Australian terminals. Table 29 lists the terminal types defined in this report:

Table 29: Terminal types

Location	Terminal type
Regional	Intrastate IMEX – Regional Terminal
	Inland Rail – Regional Terminal
Metro	Small IMEX – Metro Terminal
	Major Interstate – Metro Terminal
Port	Port Terminal

Terminals have been categorised within this typology in order to:

- Describe the general characteristics of Australian intermodal terminals at a high level
- Describe those elements which may inform planning and investment decisions
- Provide a reference framework through which to analyse 'best in class' intermodal terminals

13.1 Regional Terminals

13.1.1 Overview

The regional category of intermodal terminals is determined primarily by their location and includes all intermodal terminals outside of capital city metropolitan areas.

Australian regional intermodal terminals generally serve agricultural and resource markets. Commodities include containerised grain, minerals, wine, meat, rice, cotton and paper products, depending on the state and regional specialism.

Regional terminals serve cargo owners within a defined catchment area to the terminal where there is strong road accessibility, thereby reducing the distance, frequency and cost of pickup and delivery (PUD) legs within the rail based supply chain. Regional terminals generally facilitate point to point rail access to their destination market (intrastate/IMEX/interstate).

While there is no definitive radius for a regional intermodal terminal's service catchments, a general rule of thumb is 100km[42] by road. Beyond this distance road is generally more cost effective than rail given the increased PUD cost.

Regional intermodal terminals have been categorised into two types: intrastate IMEX regional terminals and Inland Rail regional terminals.

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

13.1.2 Intrastate IMEX – Regional Terminal

This terminal type encompasses a broad range of terminal size, features and configurations. The majority of regional terminals in Australia fall into this category.

a Function

Rail freight flows are point to point; moving from the inland terminal stationed near an agricultural area or manufacturing/processing facility to the nearest port for export. Commodity regions on the state border may also move interstate such as Riverina agricultural commodities (grain, wine, rice) freighted from the Riverina to Port Melbourne.

The movement of freight typically relates to agricultural products, minerals from mining sites, paper products, and other industrial goods generated by processing facilities.

b Volume throughput

Regional intrastate IMEX terminals range in terms of throughput volume size:

- Low volume terminals such as Wodonga (VIC)
- Larger regional intermodal hubs such as Fletchers (Dubbo, NSW)

Regional intrastate IMEX terminals typically require a minimum throughput of 10,000 loaded TEU per annum to ensure short term viability although it is preferable to operate at more than 15,000 TEU per annum.[43]

c Infrastructure

The level of infrastructure is dependent on the size and function of the intrastate IMEX regional terminal.

- Low volume terminals are characterised by 1 or 2 short length sidings, limited hardstand and storage area with 1 or 2 x 30 to 40 tonne container forklifts/reach stackers for loading/unloading (often integrated with other operations)
- Higher volume terminals are characterised by co-located freight precincts with more extensive warehousing facilities.

d Service frequency

Intrastate IMEX terminals typically operate 2 + return services per week. Services may increase during times of peak season e.g. harvest.

Examples:

- Grain from Wimmera to Port of Melbourne
- Wine from Griffith in Riverina to Port Botany
- Meat products (Fletchers) from Dubbo to Port Botany

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

Regional Intrastate IMEX Terminal indicators

Indicators of REGIONAL terminal type – Regional Intrastate IMEX

Criteria	Description of indicator
Overview	Point to point freight transport for commodities with minimum baseload throughput. Typically transporting freight from an inland terminal located proximate (less than 100km from) to agricultural or resource production or manufacturing/processing facility to the nearest port for export.
Origin-destination pairs	Predominantly intrastate IMEX moving freight from the region of growth/production to the nearest port. Some IMEX crosses state borders depending on the region's geography eg Riverina grain transported to Port Melbourne
Throughput per annum	Minimum baseload threshold of 10,000 + TEU Throughput may be aggregated through multiple freight cargo owners.
Seasonality	Range from low seasonality (mineral concentrates and general freight) to high seasonality (agricultural products). Where seasonality is high, the minimum threshold throughput required will be higher and/or complementary container cargoes to support fixed rail/terminal costs.
Average service trains per week	2 + return services per week Services may increase during times of peak season eg harvest.
Reference train	Train configuration required to enable drop-off/pick-up from regional sidings and enter/depart port terminals efficiently. The reference train is network dependent eg NSW intrastate IMEX is typically limited by the range crossing from Western NSW into Sydney and Port capacity at Botany. Train length for Dubbo Fletchers to Port Botany is 600 metres to 1280 metres. Irrespective of capacity at the origin regional terminal, the train configuration can be limited by capacity at the destination Port. 1800m double stacking reference train (Inland Rail Business Case) is less applicable to IMEX.
Terminal configuration and lifting equipment	Lower range – single product, low volume terminal: • 1 siding • 1 load interface • Hardstand (stamped gravel/pavement limited to siding) • 1 reach stacker • Upper range – co-located freight precinct: • Warehousing facilities • Container washing and storage.

Criteria	Description of indicator
Operating model	The preferred operating model in industry is single-user where a rail operator can establish a customer service base in the region and build business volume over time. Lower range: • Privately owned land ie cargo owner • Commercial arrangement agreed with the line haul operator • 1 cargo owner may be servicing multiple cargo owners in the catchment area Upper range: • Integrated terminal & line haul operator • eg Pacific National, SCT, Aurizon or Qube

13.1.3 Inland Rail – Regional terminal

In the 2017-18 budget the Federal Government has committed to financing of $8.4 billion for the Inland Rail Project, which is to be delivered by the ARTC. This is in addition to earlier funding of $900 million for planning and land acquisition to support the project[44]. The Inland Rail project will create a rail linkage between Melbourne and Brisbane via Cootamundra and Parkes, providing a standard gauge freight railway with a high standard connection between Queensland and the southern and western States. Rail freight between Brisbane and Melbourne will no longer be required to transfer via Sydney.

Regional terminals under Inland Rail will be distinguished by their OD pairings (Melbourne-Brisbane and Parkes-Perth corridors) and the reference train (1800m double stack). Narribri, Moree and Parkes (Pacific National) are identified as potential terminals in scope for development in regional NSW alongside Inland Rail.

a Function

Inland Rail will link metropolitan intermodal terminals in Melbourne and Brisbane as well as regional terminals along the corridor. Inland Rail regional terminals will facilitate connectivity beyond intermodal terminals to ports, regional networks and other capital cities and locations on the standard gauge track.

Under Inland Rail, Parkes may serve a consolidation function for all service providers –not just SCT – although there are other locations which may be developed to serve this function if required.

b Volume throughput

Rail's share of the Melbourne to Brisbane market is projected to increase by 36% by 2049-50 which translates into an additional 3.1 million tonnes (64% increase) of rail freight compared to a base case without Inland Rail.

c Infrastructure

Inland Rail will provide the backbone infrastructure for complementary private sector investment which is expected to include double stack terminal capacity in Melbourne and Brisbane with an ability to accommodate 1800 m trains initially and up to 3600 m trains in future.

Regional terminals and loading facilities are expected to be required for development in regional NSW for regional/agricultural/coal freight.

d Service frequency

Service frequency will depend on the demand and size of train configuration for different products and tasks.

Examples:

- Moree (regional NSW)
- Cootamundra (regional NSW)
- Harefield (regional NSW)
- Goondiwindi (regional QLD)

[44] Source: http://minister.infrastructure.gov.au/chester/releases/2017/may/budget-infra_03-2017.aspx

Regional Inland Rail Terminal indicators

Indicators of REGIONAL terminal type – Regional Inland Rail

Criteria	Description of indicator
Overview	Regional terminals situated on the Inland Rail line supporting containerised freight transport along the Brisbane-Melbourne corridor and from Parkes to western states.
Origin-destination pairs	IMEX Interstate
Throughput per annum	10,000 + TEU
Seasonality	Range from: Low seasonality (mineral concentrates and general freight) High seasonality (agricultural products) Where seasonality is high, a higher minimum threshold throughput is required and/or complementary container cargoes to support fixed rail/terminal costs.
Average service trains per week	2 + return services per week
Reference train	Interstate Double stack 1800m initially and up to 3600m in the future IMEX Up to 1800m with potential to double stack or ability to cycle large volumes more efficiently on single stack
Terminal configuration and lifting equipment	Lower range – single product, low volume terminal: • 1 siding • 1 load interface • 1 reach stacker • Upper range – co-located freight precinct: • Warehousing facilities • Container washing and storage.
Operating model	Integrated terminal and line haul operator eg Pacific National, SCT

13.2 Metro Terminals

13.2.1 Overview

Metro intermodal terminals are located within the capital city metropolitan areas, typically up to 50km from the city centre. Metro terminals include both small IMEX terminals to/from the ports and major interstate terminals servicing freight transports along the North/South and East/West rail corridors.

The terminal type 'Metro' has been structured into two sub-components.

13.2.2 Small IMEX – Metro Terminal

Small metro terminals are categorised by their location and size; they are typically located within 0-35km of the capital city centre with low throughput volumes (< 100,000 TEU per annum).

a Function

Small metro terminals provide facilities for IMEX container movements.

b Volume throughput

Small metro terminals are categorised by their size with throughput of 30,000 – 100,000 TEUs per annum. The reference train is typically limited to <1,500m as a result of site constraints and rail track configurations.

c Infrastructure

Small metro terminals are generally characterised by:

- brownfield facilities
- multiple short sidings
- position in industrial catchment areas
- network access often from the passenger network.

d Service frequency

1 to 2 return services per day

Examples:

- Yennora (NSW)
- Minto (NSW)
- Cooks River (NSW)
- Villawood (NSW)
- Penfield (SA)
- Gillman (SA)
- Forrestfield (ILS/ICS) (WA)

Metro Small IMEX Terminal Indicators

Indicators of METRO terminal type – Small IMEX Metro

Criteria	Description of indicator
Overview	Terminals located in the metro area with throughput of 30,000 – 100,000 TEUs per annum.
Origin-destination pairs	IMEX
Throughput per annum	30,000 – 100,000 TEU
Seasonality	Driven by composition of service catchment of regional terminals servicing metro terminal. Exposure to seasonality is generally minimised though diversified commodity base.
Average service trains per week	Average 5 – 15 per week
Reference train	Typically < 1,000 metres Height restrictions apply in Melbourne with particular reference to bridges in the Inner West. Height restrictions apply in Sydney given network vertical clearance constraints preventing double stack containers.
Terminal envelope	Up to 25 hectares
Terminal configuration and lifting equipment	1 – 4 sidings, 300 – 900m length Fork lifts and reach stackers Some ancillary services eg container storage Co-located or adjoining customer premises
Operating model	Integrated terminal and line haul operator eg Pacific National, Qube, Aurizon, SCT

13.2.3 Major Interstate – Metro Terminal

Major metro terminals are categorised by their location and size; they are typically located within 0-50km of the capital city centre and provide freight precincts rather than rail-only facilities. Major metro terminals usually require direct access to the interstate rail network (standard gauge).

a Function

Ideally, major metro terminals can provide significant land for co-located logistics and general freight activities. This may facilitate improved access to generate terminal throughput in a 'back gate' setting and generate land uplift value for underwriting or terminal operational costs.

Brownfield major metro terminals located within the city centre can be significantly site constrained (e.g. Dynon terminals, Acacia Ridge etc.). More recent proposed developments outside of the city centre such as Moorebank and St Marys intend to provide a much larger terminal envelope to facilitate co-located logistics facilities.

Major metro terminals move both interstate and/or IMEX containerised freight although they will typically focus on one of these markets. Moorebank is an exception to this Australian trend; it is designed to build capacity for IMEX throughput volumes of 1 million TEU per annum and interstate volumes of 0.5 million TEU per annum.

b Volume throughput

Large metro terminals are categorised by their size with throughput of 100,000 – 400,000 TEUs per annum. Given the higher throughput volumes, it can be viable to invest further in rail mounted gantries (compared to reach stackers and fork lifts for small metro terminals).

c Infrastructure

Rail infrastructure is capable to meeting requirements to handle interstate superfreighter services of 1500 metres to 1800 metres. Loading roads range from circa 800 metres to 1200 metres. Connectivity with the national standard gauge network and marshalling yards or holding roads are essential to break larger train configurations into wagon rakes for load/unload operations.

d Service frequency

Frequency of services is driven by the demand

Examples:

- Chullora (NSW)
- Enfield (NSW)
- Moorebank (NSW under development)
- North and South Dynon (VIC)
- Altona (VIC)
- Somerton (VIC)
- Acacia Ridge (QLD)
- Bromelton (QLD under development)
- Kewdale (WA)
- Forrestfield (SCT and Aurizon, WA)

Metro Major Interstate Terminal Indicators

Indicators of METRO terminal type – Major Interstate Metro

Criteria	Description of indicator
Overview	Major metro terminals are evolving into freight precincts. They have traditionally been rail-only facilities. Opportunities to co-locate logistics and general freight activities can potentially generate throughput. This can result in a significant land value uplift.
Origin-destination pairs	Interstate
Throughput per annum	100,000 – 400,000 TEU
Seasonality	Not seasonal
Average service trains per week	Average 6 – 35 return services per week
Reference train	1500 metre or 1800 metre services Major metro terminals in Adelaide and Perth can cater for 1800m trains. Major metro terminals in Sydney and Melbourne are typically more constrained ≤ 1500m with some exceptions for longer services On some routes (eg east/west), major metro terminals outside of inner city clearance restrictions do have capacity to double stack
Terminal envelope	Up to 70 hectares excluding distribution centre/warehouse facilities
Terminal configuration and lifting equipment	Various bespoke configurations exist across the network 1-2 sidings, 900 – 1800m length; and/or 4 – 12 sidings, 150m – 900m length Fork lifts and reach stackers Rail mounted gantries in some instances eg Enfield, Chullora and South Dynon Ancillary services eg warehousing facilities, container washing and storage, warehousing, rollingstock provisioning, refuelling and servicing, marshalling yard Adjoining customer premises or in the immediate vicinity (not necessarily in the terminal envelope)
Operating model	Integrated terminal and line haul operator eg Pacific National, Qube, Aurizon, SCT

13.3 Port Terminals

13.3.1 Overview

Port terminals are categorised by their location; they are on-dock or near-dock terminals and, accordingly, they relate to IMEX container movements.

a Function

Import movements from the port to an intermodal terminal can occur by road, by dedicated port shuttle arrangements, as seen in ports like the Port of Botany and Fremantle, or as backhaul on export related rail movements. Rail's mode share varies by port. Rail is used to transfer containers from ports to inland terminals that are typically located within freight precincts.

Freight movements can be minimised when a rail service can travel directly to an intermodal terminal co-located with a freight precinct. Goods can then be transferred within the precinct and assembled into loads for onward movement to end destinations by road. If the intermodal terminal is not co-located with a freight precinct, additional onwards movements occur by road.

For export freight transported by rail, the outbound train may be broken up and reassembled in holding yards for direct transport to port, where stevedores load the cargo onto vessels.

b Volume throughput

Within Australia, terminal throughput volumes vary in scale from 50,000 TEU per annum (e.g. Brisbane Multi-Modal Terminal) to 600,000 TEU per annum (e.g. Port Botany including DP World, Qube and Hutchinson terminals).

c Infrastructure

Port terminals generally have multiple short sidings on or adjacent to stevedore facilities at the port.

d Service frequency

IMEX services in Australia are predominantly short haul i.e. bound for a destination within 50km of the port. Given the ratio of load to transport time, the key factor prized by operators is cycle frequency rather than upscaling the train load.

Port Terminal indicators

Indicators of PORT terminal type

Criteria	Description of indicator
Overview	Port terminals located on-dock or near-dock
Origin-destination pairs	IMEX Regional intrastate terminal to port Small metro terminal to the port
Throughput per annum	50,000 – 350,000 TEU
Seasonality	Seasonality of throughput at the port terminal reflects the seasonality of Australia's import/export market. A significant proportion of export and import containers are returned empty.
Average service trains per week	Up to 120 per week
Reference train	Typically < 1,000m 1800m double stacking reference is not applicable to IMEX due to handling constraints at the ports and metro networks
Terminal envelope	Up to 10 hectares
Terminal configuration and lifting equipment	1-4 sidings, 300 – 900m length Fork lifts and reach stackers Short term container storage Invariably port rail terminals can only accept short train services (due to short siding configurations) resulting in rail operators running short services that can directly enter the port sidings or having to find a yard to break larger services into shorter rakes of wagons.
Operating model	IMEX terminals are typically owned by port corporations and leased to container stevedores who operate them as part of port operations. Port terminals can be set up as a multi-user rail facility for inbound freight (where there is not necessarily an alternative). There is no natural inclination to have multi-user terminals for export shipping terminals. A multi-user terminal may be partially developed where the stevedore is not able or chooses not to establish rail operator capability.

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