Optimising the use of rail in landside port transport networks

Department of Infrastructure and Regional Development

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Executive summary

PricewaterhouseCoopers (PwC), in collaboration with Ranbury Management Group Pty Ltd (Ranbury), was engaged by the Department of Infrastructure and Regional Development (DIRD) to undertake a study on optimising the use of rail in landside port transport networks.

The study outlines the operational conditions required for successful short haul rail services and presents an evaluation framework based on those essential operational requirements.

In the Australian context, short haul rail relates to intrastate regional rail services and cross metro port shuttles. The framework is applied to case studies for cross metro port shuttles in Melbourne and Brisbane, which represent the bookend terminal locations for the Inland Rail project.

Emerging trends and infrastructure challenges
The study outlines six key emerging industry trends and infrastructure challenges which will influence the uptake and operational viability of short haul rail and cross metro rail in Australia. These include:

- Co-location
- Multi-user terminals
- Congestion on the metropolitan rail network
- Dedicated freight lines
- Increasing tonne-axle loads
- Governance – supply chain coordination

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.

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.

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 (including access to dedicated freight lines) 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.
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Multi-user terminals

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

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 Brisbane Multimodal Terminal (BMT) at the Port of Brisbane and the North Quay Rail Terminal at Fremantle Harbour are notable exceptions. Advantages to this model include:

- longer load interfaces which enable greater payloads and an ability to leverage rail’s advantage in economies of density
- reduced need to break trains up and shunt between stevedores which reduces some handling costs
- reduced time lost to loading and unloading at multiple terminals within the port, thereby improving overall train cycle times.

All major container ports in Australia have internal terminals (either on dock or near dock). In Sydney and Melbourne (Australia’s largest container ports by throughput) these are operated by Pacific National (PN), DP World Australia (DPWA), Qube and ACFS (Melbourne only). Significant capital investment would be required to retrofit a multi user terminal within these port environments. Consideration would need to be given to:

- the cost of retrofitting port terminals for this solution
- the location of the terminal within the port gates given that:
  - some stevedores may gain a cost advantage if the terminal is located closer to their dock – effectively creating an on dock solution for some stevedores and a near dock solution for others
  - the need to balance land assets within city ports where additional area is at a premium
- support for the multi user terminal given the relinquishing of supply chain control by stevedores and additional costs incurred through third party management of the terminal.

Congestion on the metropolitan network

Metropolitan rail networks are largely shared passenger-freight networks. Freight movements across shared networks face the following challenges:

- Linehaul services can fall under multiple operational jurisdictions en route to the port.
- Priority is given to passenger movements on shared networks. This can impact the ability of the linehaul service to meet the stevedoring windows at the port through:
  - unavailability of suitable paths to port and the imposition of operational curfews that do not align with shipping windows as the frequency of passenger services increases to meet growing demand but investment in network capacity does not keep pace
  - dynamic scheduling on day of operations that prioritises passenger services over freight services.
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**Dedicated freight lines**

Dedicated freight network and freight lines are a means of overcoming congestion on the metropolitan passenger network. At present, the major dedicated metropolitan freight lines on the eastern seaboard are limited to:

- Brisbane’s Dutton Park to Port of Brisbane (via the dual gauge track)
- Sydney’s Metropolitan Freight Network and the Southern Sydney Freight Line – connecting Port Botany
- Melbourne’s Albion to Broadmeadows, South Kensington to West Footscray, Newport to Sunshine Lines – connecting Port of Melbourne.

Key advantages of a dedicated freight network include:

- Prioritisation of freight in path allocation and scheduling and the ability to interface paths and schedules with stevedore windows. This improves both the frequency and the reliability of the rail service and assist the shipper in avoiding additional costs incurred if the stevedoring window is missed, such as freight diversion and storage.

- Improving the suitability of terminal sites for a short haul or cross metro service by improving access and egress to the site (removing the impacts of passenger curfew issues such as those experienced by Minto in Sydney and Lyndhurst in Melbourne).

**Increasing tonne-axle loads**

Rail’s competitive advantage is derived in part from the ability for a cargo owner to exploit economies of density over long distances. The capability of the rail line to sustain substantial payloads is a key determinant of the economy of density.

Maximising tonne axle loads such that they are fit for purpose to attract and retain freight volumes improves linehaul economics and potentially reduces the sweet spot for rail distance by maximising train payload.

The opportunity to improve tonne axle loads is generally more prevalent in regional rail networks supporting intrastate freight movements to Port. A key challenge facing network managers is that these lines typically have low traffic and the case for investment may not be easily justified based solely on additional volumes attracted to the line.

**Governance – supply chain coordination**

IMEX supply chains are fragmented and the actions of individual participants can impact overall supply chain efficiency. There are a number of mechanisms available to improve the co-ordination and efficiency of the rail based supply chain. These include:

- developing a clear governance structure whereby supply chain coordination strategies can be discussed and aligned such as:
  - nominating an independent central coordinator for day-to-day planning and scheduling
  - negotiating a memorandum of understanding or charter between participants to clarify respective roles and responsibilities
  - stakeholder forums with access to nominated representatives in government for the escalation and resolution of policy and regulatory concerns
Executive summary

- developing an operational plan to outline protocols for the functional interfaces, scheduling and path access
- agreeing operational performance standards
- enforcing compliance with standards
- introducing common IT management systems such as booking systems and platforms to share real time network information.

There are relatively few examples of IMEX supply chain coordination in Australia. The key example considered in this study is the Port Botany Cargo Movement Coordination Centre (CMCC) which coordinates both road and rail IMEX supply chains.

Ultimately, the key triggers for considering a coordination role include:

- **Complexity and fragmentation of the supply chain** – there is greater need for a coordinating role where there are many supply chain participants with limited vertical integration. Supply chain coordination at the port can help to improve reliability by enforcing common protocols, and creating conditions whereby participants are driven to adapt upstream supply chains to meet their windows.

- **Demand for rail services** – where road congestion is high, demand for rail services increases and consequently the need for a supply chain coordination role. The CMCC at Port Botany has been motivated by the level of road congestion in Sydney, and its remit includes coordination of both road and rail based supply chains.

**Optimal operational conditions for short haul rail**

When considering short haul rail, the operational evaluation must account for the interdependence of terminal, port and rail operations. Operational conditions for viable short haul rail are summarised below:

- Value-adding activities and co-location of freight services in the same terminal are critical to, and improve, the viability of short-haul rail. Terminal sites must fit with customer requirements.

- The rail service must be able to provide a comparable service offering, even if it is able to achieve a lower cost base.

- Rail services can be successful where they attract some backload volumes and/or effectively integrate empty container services into the rail supply chain. Achieving efficient two-way loading is difficult in Australia given the nature and seasonality of the country’s import/export freight task.

- Maximising a train’s payload, including longer double-stacked trains, can improve costs per TEU.1 Double stacking is not currently possible to the major ports (Melbourne, Sydney, Brisbane) due to network constraints. However the priority for import and export (IMEX) freight should be high frequency short cycle services with rapid load/unload operations to maximise efficiency and asset utilisation.

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1 TEU is an acronym for ‘twenty-foot equivalent unit’.
• On-dock rail facilities (as opposed to near-dock) are important but not critical to viable short haul IMEX services. They require a trade-off between rail operation efficiency and use of valuable quay side space.

• Vertical integration of terminal and stevedore operations can support the success of regional IMEX and port shuttle services.

• A governance structure that supports coordination and integration of the multiple activities within the supply chain is a valuable tool in short haul viability to improve the efficiency and competitiveness of rail.

Preconditions for port shuttle services

A previous PwC/Ranbury study on the future of intermodal terminals included a high level preliminary decision making framework to ascertain whether there is a need for an intermodal terminal. The framework has been adapted here, specific to port shuttle services.

<table>
<thead>
<tr>
<th>Pre-conditions</th>
<th>Factors</th>
</tr>
</thead>
</table>
| 1 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 |
| 2 Does the commodity throughput meet minimum rail volume thresholds? | • Train load volumes of freight |
| 3 Does the rail supply chain solution meet minimum service criteria? | • Service frequency  
• Service transit time  
• Service reliability |
| 4 Does the throughput profile support a rail solution? | • Is the demand profile subject to significant peaks and troughs? |
| 5 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 metro/hinterland terminal  
• Destination port terminal  
• Point to point operations  
• Efficient loading / unloading facilities  
• Streamlined network/terminal access (e.g. minimal shunting)  
• Efficient linehaul operation  
• Co-location to minimise the pick-up and delivery (PUD) component and cost |

2 PwC/Ranbury, Future of Intermodal Terminals, March 2017.
Pre-conditions | Factors
--- | ---
6 Is the rail operating model effective (optimal rail logistics configuration for the port shuttle products 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

7 What are the commercial arrangements for the task? | • Terminal owner/operator
• Rail operators
• Costs / stranding risks

8 Is the port shuttle rail solution competitive with road transport costs?

**Case Studies**

**Cross Metro Short Haul Rail in Melbourne: Somerton – West Swanson Intermodal Terminal (WSIT)**

This case study was selected because a port shuttle service has not previously succeeded from the Somerton terminal despite appearing to satisfy a number of conditions of short haul viability. The case study provides an opportunity to consider lessons learned and alternative ways of developing port haul services within the existing infrastructure.

The Somerton terminal has reinforced a number of principles that are essential or contribute to successful short haul operations. These include:

- **Co-location** - Dominant freight customers are located at Somerton or in the Somerton catchment area.

- **Minimise PUD costs** - Somerton will potentially reduce the PUD costs for customers co-located on site at the Austrak Business Park and the surrounding catchment area if an efficient rail service to/from the port is established.

- **Avoid road congestion** - Somerton provides an alternative point of discharge for containers from the north Melbourne catchment area that allows road or rail services to terminate at Somerton avoiding potential congestion issues between Somerton and WSIT. Congestion on the Ring Road or Citylink Toll Road appears to be increasing over recent years.

Most of these conditions have existed in recent years but a viable port shuttle service from Somerton has not been achieved. DP World Australia (DPWA) is optimistic that the port shuttle service to WSIT will be efficient and competitive for a number of reasons identified during our stakeholder engagement process. These include:
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• **Control of both the metro and port terminals by a stevedore and integrated booking and transfer systems** - The ability to collect or drop off containers at Somerton and have DPWA handle and coordinate transfers to/from the port for shipping services increases service reliability with DPWA operating both terminal facilities.

• **Direct rail access to WSIT and to quay-side** - Improvements to WSIT through the closure of Coode Road will provide a more streamlined container transfer operation from rail to the berth reducing rail supply chain costs.

• **Proposed scale operations with backhaul volumes** – DPWA anticipates full container loads both inbound and outbound from the Port i.e. exporting freight on behalf of agricultural exporters and importing freight for big anchor customers to de-stuff containers, sort and pack into store or customer loads from their national distribution centres.

• **Value-adding activities** – DPWA anticipates that there will be increased demand for empty container parks in the northern suburbs. Integration of empty container services / repositioning as part of the rail supply chain will provide a seamless solution for customer IMEX transport requirements. The proposed capability is designed to minimise truck movements, reduce the pressure of container shortfalls, and reduce supply chain costs.

Challenges for the operation will be:

• **Negotiating direct rail access from the south** - 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. These negotiations are more complex because of the overlap standard gauge and broad gauge track infrastructure between VicTrack, V/Line and ARTC.

**Cross Metro Short Haul Rail in Brisbane: Redbank – Port of Brisbane**

A number of sites has been proposed in Brisbane for the purpose of developing a metro port shuttle terminal (with varying degrees of confirmed intent). These sites include Acacia Ridge, Ebenezer, Bromelton, Redbank and Charlton (Interlink SQ).

This study has nominated Redbank as a case study given the key proponents are relatively advanced in terms of planning the operation and have been willing to provide the details of their investigations and issues potentially impacting the proposed operation.

The concept is being developed by DB Schenker (freight forwarder) and Goodman (property developer). Consent for the operation has yet to given. The proposed port shuttle is a new initiative in South East Queensland with no substantive operation having operated in the past. DB Schenker is investigating options to enhance the efficiency and competitiveness of the proposed shuttle service.

The proposed port shuttle operation aims to leverage the following site advantages. These are:

• **Co-location** – current lease holders on the Goodman Redbank site include the logistics providers; TNT, DB Schenker and Northline.

• **Minimising PUD costs** – planning for the terminal aims to minimise PUD costs due to the proximity of customers in the Redbank development and integrating the operations.

• **Building service demand** - there are some significant freight customers at Redbank and in the surrounding catchment area. The proposed service is
endorsed by a potential anchor customer to contribute to the minimum volume targeted by the operation. There is potential to secure additional volume from customers in the catchment.

- **Excellent connectivity** - with the road and rail freight networks. The recently upgraded Ipswich Motorway is located within one kilometre of the terminal and provides direct toll free access via an A-double and B-double approved link road. The Logan Motorway Interchange is also within five kilometres.

- **Available network and port rail terminal capacity** – the Brisbane Multi-Modal Terminal at the Port of Brisbane is under-utilised and is not capacity constrained.

- **Value adding** - some potential value adding activities appear possible in terms of empty container services / repositioning.

Challenges for the operation will be:

- attracting additional customers to the rail operation to increase scale and efficiency

- competing for customer demand against alternate industry sites such as Bromelton and Ebenezer, which are intermodal terminal sites nominated to potentially align with the Inland Rail route

- achieving a two way loading freight profile with disparate products and freight categories (current concept is limited to imports given DB Schenker’s customer base)

- remuneration of the capital investment associated with the establishment of the terminal facility

- confirmation of the suitability of the existing track infrastructure external to the terminal that will be required for exiting the network and efficiently placing and loading the rail services

- establishing rail schedules that have to accommodate the constraints associated with passenger service peak period curfews

- ongoing improvements to the road network in south east Queensland and the potential approval of increased heavy vehicle combinations

- Competition for track access along the existing rail path from Redbank to Yeeronga through to the Port of Brisbane given prospective freight coming off the Inland Rail route and accessing the port from Yeeronga, as well as freight from the narrow gauge Queensland North Coast Line freight.

**Considerations for Government**

This study has provided an operational evaluation framework which is designed to inform Government’s considerations when reviewing proposals for port shuttle operations. Further to this framework, there are potential roles for Government (at various levels) to consider.

- State and Federal Government could consider planning for the design, construction, financing and ongoing management of dedicated freight lines within Metropolitan areas. Congestion impacts (frequency, transit time, reliability) on shared rail networks is a proven deterrent to freight on rail and contributes to substantial volumes of heavy vehicles on the corresponding road network. Examples of projects may include the Western Sydney Freight Corridor.
State and local government could play a role in preserving and protecting sites for terminals of state and local significance which may impact the ability of the supply chain solution to meet service requirements.

An example is the reservation of a Northern and/or Western Interstate Freight Terminal in Melbourne which could leverage existing direct port access and potential future Inland Rail to generate sufficient volumes to underpin a cross metro service.

State and Federal Government could consider planning and potentially financing the upgrade of tonne axle load limits on intrastate and interstate rail networks. This will be particularly important in networks such as South Western Queensland networks where an uplift in volume is forecast in relation to Inland Rail.

State Governments could consider upgrades to existing infrastructure or investment in new infrastructure to provide dedicated tracks for freight traffic (thereby avoiding constraints on path availability and the risk of prioritisation in favour of passenger rail on a shared passenger/freight network).

State Governments could consider interim funding support (against clear and measurable objectives with sunset clauses) until rail volumes grow to viability.
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1 Introduction

PricewaterhouseCoopers Consulting (Australia) Pty Limited (‘PwC’) and Ranbury Pty Ltd (‘Ranbury’) were engaged by the Department of Infrastructure and Regional Development (‘DIRD’) to undertake a study on optimising the use of rail in landside port transport networks.

1.1 Study Objectives

There are a number of important preconditions for short haul rail to be a viable alternative to road based freight. This study is designed to:

- review the preconditions for short haul rail which are articulated in the Bureau of Infrastructure, Transport and Regional Economics’ (BITRE) Research Report 139 and refine these further within the Australian context.
- outline the operational conditions required for successful short haul rail.
- develop an evaluation framework based on operational requirements that are essential to provide a successful short haul rail service and enable a high level assessment of the operational viability of prospective short haul development proposals.

1.2 Study Scope

1.2.1 Short Haul Rail Services in Australia

This study has assessed the following rail operations in Australia, with a view to identifying key issues relevant to the short haul metropolitan port shuttle rail task:

- short haul rail services in Perth and Sydney
- prospective cross metro port shuttles that will operate on metropolitan routes to the Ports of Melbourne and Brisbane and interface with the existing and future network infrastructure.

1.2.2 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 (e.g. grain and mineral concentrates) and these are in-scope for this study.

1.3 BITRE Research Report 139

In March 2016, the Bureau of Infrastructure, Transport and Regional Economics (‘BITRE’) released its Research Report 139 titled ‘Why short-haul intermodal rail services succeed’ (‘Report 139’).
Report 139 introduced the concept of a ‘sweet spot’, “where rail’s lower line haul costs counter road’s advantage of lower drayage\(^3\) and terminal costs”\(^4\) with an underlying assumption that pickup and delivery (PUD) and terminal costs are considered to be negligible for road operations. This distance was generally considered in the report around 1,000 kilometres but alternative citations ranged from 350 kilometres to 1,500 kilometres.

The report then considered the “circumstances that can make short-haul urban and regional rail port shuttles viable and whether the circumstances are able to be replicated”\(^5\) i.e. the circumstances by which this ‘sweet spot’ distance could be shortened.

Four key components were considered as part of short-haul rail viability:

1. Pick-up and delivery (PUD) costs
2. Terminal handling costs (hinterland / maritime)
3. Line haul costs
4. Motivations of various participants

These factors are shown in Figure 1 using port rail as an illustrative example.

**Figure 1. Key components of port rail intermodal economics**

![Figure 1. Key components of port rail intermodal economics](image)

Source: PwC

Figure 2 shows that the equivalent road haulage can provide a simpler model of freight flow with a direct movement between the origin and destination site.

**Figure 2. Road movement direct to the port**

![Figure 2. Road movement direct to the port](image)

Source: PwC

Report 139 considers the economic theory underlying the relative viability of road and rail haulage and conditions under which rail viability can be optimised. Case

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\(^3\) The term ‘drayage’ is used in the BITRE Report 139 but is referred to as PUD in this study.

\(^4\) BITRE 2016, p.1

\(^5\) BITRE 2016, p.iii
studies apply this theory in practice with reference to Australia, New Zealand, North America, Europe and China.

1.4 Report Structure

The four key components of short haul rail as identified in the BITRE Report 139 provide a useful framework to conceptualise the viability of short haul rail. This report applies the same four factor framework and is structured as follows:

- The four key components of the short haul rail framework analysis
  - Pick-up and delivery costs
  - Terminal handling costs
  - Linehaul costs
  - Motivation of various participants

For each component this report considers:

- Analysis and perspectives on the BITRE Research Report 139 including discussion of key success factors for short haul rail in the context of the Australian market.

- Key themes in landside infrastructure gaps.

- Emerging trends in lifting infrastructure capacity with reference to the inland terminal, port terminal, rail network and the governance of the supply chain.

- With reference to the last component (motivations of various interest groups), potential supply chain coordination strategies are discussed in light of existing Australian models and the ability to improve the efficiency of freight movement.

- Cross metro port shuttles in Australia - this section includes an outline of port shuttle services which are either currently in operation (Perth and Sydney) or planned (Brisbane and Melbourne). Regional policies and port rail strategies are outlined for each city with key success factors considered in Perth and Sydney. Key constraints are discussed for all cities.

- Operational Evaluation Framework – this section introduces a high level preliminary decision making framework to ascertain whether a port rail shuttle solution can be viable and compete with the alternative road transport options. It is designed to provide guidance for Government when considering proposals for port shuttle operations.

- Case Studies – the operational evaluation framework is applied for two detailed case studies in Melbourne and Brisbane, which are potential intermodal terminals offering prospective port rail shuttle services:
  - Port of Somerton (Melbourne)
  - Redbank (Brisbane).
2 Pickup and delivery costs

2.1 Summary of Report 139

Pickup and delivery (PUD) costs are defined as the road task between the customer’s facility (factory or warehouse) and the intermodal terminal i.e. the local truck pick-up and delivery task.

Figure 3. Pickup and delivery within the short haul rail supply chain

Source: PwC

Report 139 outlines the following key factors impacting these costs:

- PUD productivity on the road
- PUD productivity in the terminal
- value adding activities at hinterland
- PUD distance.

Table 1 provides an extract of key messages regarding drayage costs and reducing the ‘sweet spot’ distance.

Table 1 Extract from Report 139 – Drayage costs – Key Messages

- Drayage costs are a far greater concern for viable short-haul than for longer-distance haulage.
- Options for reducing those costs include:
  - improving rail vehicle productivity, such as upgrading terminal-access roads and raising permitted drayage-vehicle standards and improving systems of vehicle-turnaround at hinterland terminals.
  - better siting of terminals and adding terminals (while noting that this has to be balanced with train economics considerations).
  - having the hinterland terminal as part of the production and logistics chain, so that the drayage is perceived as part of the wider value-adding process than as a pure intermodal transport costs.
  - value-adding at or around the terminal also encourages shippers to co-locate near the rail terminal, which also reduces drayage.
- Rail intermodal freight essentially incurs no drayage at maritime rail terminals – a distinct advantage over domestic intermodal freight.
Substantial value-adding processes at hinterland terminals can remove shipper-hinterland drayage costs – no matter how large they are – from the intermodal operation and can provide invaluable freight consolidation that boosts rail’s viability. This changes the economics of intermodal in a fundamental way.


2.2 Analysis of Report 139

The PUD costs from the maritime terminal to the port berth, as shown in Figure 1, can be minimised / eliminated where the rail terminal is sufficiently close to the quay (on-dock) to avoid a road movement. Instead movements can be performed by internal terminal vehicles (‘ITVs’), although this relies on the maritime terminal configuration. The Somerton case study in Melbourne demonstrates plans to integrate rail terminal operations with the quay side terminal by closing the public road (Coode Road) and hence reducing PUD costs.

Section 3.2 considers on-dock and near-dock rail facilities in further detail.

Value-adding activities and co-location of freight services in the same terminal are critical to, and improve, the viability of short-haul rail

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.

Providing additional services at terminals can be an opportunity to increase vertical integration for rail operators or customers/terminal owners. As a result, double handling costs can be removed and the transport / production functions merged to reduce total operating costs.

Part of integrating transport tasks includes investment in technology such as freight tracking and traffic management systems, which simplify the road-based flow of goods at terminal and offer improved customer service. The pressure from transport operators 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.

Sites for co-location must meet customer requirements

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

For co-location with 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 inbound moves by road, rail network connectivity and proximity to population centres to attract a skilled workforce. Private roads within terminal sites can further increase efficiency, allowing for the use of high productivity freight vehicles within the terminal precinct.

For metropolitan and IMEX terminals, co-location is most easily achieved in new terminal developments if land is available at sites that address the needs of
different freight and logistics industries. The composition of co-locating industries will be determined by the needs of customers, services (e.g. AQIS) or configuration of the IMEX or interstate supply chains.

Development potential for co-location at existing brownfield terminals tends to be constrained either through site limitations, industrial or urban encroachment or terminal lease terms that limit tenure and payback on investments. 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.

The trend for co-location in rail has intensified with recently developed sites such as Kewdale in Western Australia. New terminal investment is likely to be led by rail/terminal operators, or by property developers, who are seeking to expand the role of the terminal site with those of related industry (e.g. customers and suppliers).

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.

### 2.3 Emerging Trends and Challenges

#### 2.3.1 Availability of sites suitable for co-location

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.

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 (including access to dedicated freight lines) 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.
3 Terminal handling costs

3.1 Summary of Report 139

Report 139 outlines that key terminal handling costs include:

- container handling
  - loading/unloading containers
  - sorting/storing containers
- train activities
  - breaking trains and shunting railway wagons to facilitate container handling (loading/unloading)
  - assembly/splitting trains for linehaul movements.

![Figure 4. Terminal handling within the short haul rail supply chain](Source: PwC)

Table 2 provides an extract of key messages regarding terminal handling costs and reducing the ‘sweet spot’ distance.

**Table 2 Extract from Report 139 – Terminal handling costs – Key Messages**

- The advent of the container has brought down the double-handling costs of intermodal rail relative to previous non-unitised handling systems. Nonetheless, terminal costs are a barrier to rail’s competitiveness, especially on shorter-distance movements.
- Terminal costs can be reduced by improving performance of the two key tasks: container handling and train activity levels.
- Investment in high productivity container handling systems is warranted only when there is high-volume throughput.
- In general, the optimisation of terminal operation is location-, market-, and train formation-specific.
- The use of unit – fixed-formation – trains minimises train actions, notably the costly practice of shunting wagons. However, use of unit trains is best when the freight flows are substantial, continuous and relatively balanced.
Terminal handling costs

- Railed containers usually incur additional handling – moves, lifts and intermediate storage – relative to road, and this increases railed-container costs and time.

- Maritime terminal design and layout often compromises operational efficiency with land constraints. Terminal provision is also typically based on legacy decisions dating from before containerisation, before technological advances, and with much lower port throughputs.

- It is desirable to have on-dock rail terminals because they eliminate box shifts across congested public roads, do not require trucks for shifting boxes, reduce intra-port box-transfer distances and so reduce container handling costs. However, the terminals absorb vital port land, can result in multiple rail terminals (which may not be efficient for train operations) and terminal operations are more likely to be compromised by land constraints.

- The local factors at play with the provision of various maritime rail terminals mean that we cannot say whether on-dock is superior to near-dock. In that context, we also cannot say whether a single maritime rail terminal is superior to provision of terminals for each container terminals. However, legacy provision of rail infrastructure may not now be optimal.

Source: BITRE Report 139, p.47

### 3.2 Report 139 Analysis

This PwC/Ranbury report provides an outline and detailed case studies to highlight various considerations as to how short haul rail can be operationalised focusing on the handling, loading/unloading and storing of containers as well as train handling and shunting. Each of these factors have a cost implication for a rail supply chain operation.

The operational evaluation framework provided in Section 7 and Appendix B discusses:

- terminal operations
- rail operations
- rail interfaces
- port-side operations.

This report reinforces a number of key issues contained in the previous PwC/Ranbury ‘Future of Intermodal Terminals Study’ which included requirements for successful intermodal terminals.

Each terminal is bespoke; an operational evaluation must consider the interdependence of terminal, port and rail operations

A key principle is that each terminal is a bespoke operation. As a result, the terminal configuration and operation must be tailored to the task to minimise the terminal operating costs. Reduced shunting and cycle times may warrant the use of unit trains. High productivity container handling systems are warranted only for high terminal throughputs (given the high fixed costs in this scenario).

While the evaluation framework provides a checklist of factors to consider, the key takeaway is to understand the relationship between these factors and whether, in combination, they support, and increase, the viability of the short-haul service.
On-dock rail facilities (as opposed to near-dock) are a trade-off between rail operation efficiency and use of valuable quay side space. One of the key findings of this PwC/Ranbury report is that inevitably, the existing major ports are primarily configured for road operations. With the majority of container movements to/from the ports being a road task, the berth infrastructure tends to optimise transfers by road.

Rail supply chains may be subject to additional movements to transfer the rail freight to the berth and consequently additional costs may be incurred. It is for this reason that the BITRE Report 139 suggests that on-dock rail is desirable, although recognising that “this will depend on port-specific circumstances”.

For near-dock terminals, there is a trade-off between the extra container-handling transfer costs and the potential benefits from larger near-dock rail facilities including capacity for longer train services, potential for more efficient train handling and improved processes for container sorting.

Conversely, on dock rail is a trade off in terms of utilisation of valuable quay side space. On dock rail facilities that can accommodate a unit train and does not have to be broken and shunted will increase the efficiency of the rail operations even more.

Initiatives are being developed to address these matters including ITV transfers or integration of rail terminals to increase berth productivity (e.g. closure of Coode Road at the West Swanson Intermodal Terminal in Melbourne).

Details are provided as part of the case studies in sections 8 and 9.

### 3.3 Emerging Trends and Challenges

#### 3.3.1 Multi User/Aggregating 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. There are few working examples of multi user terminals in Australia. The Brisbane Multimodal Terminal (BMT) at the Port of Brisbane and the North Quay Rail Terminal at Fremantle Harbour are notable exceptions.

For example the BMT is a central dual gauge terminal serving the three stevedoring operations. The BMT is owned and operated by Port of Brisbane Pty Ltd (PBPL), and is multi-user facility that has open access subject to commercial terms and can be used by any rail operator.

Some of the key advantages to this model include:

- longer load interfaces which enable greater payloads and leverage rail’s advantage in economies of density

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6 BITRE Report 139, p.67
• reducing the need to break trains up and shunt between stevedores which reduces some handling costs

• reducing the time lost to loading and unloading at multiple terminals within the port, thereby improving overall train cycle times.

3.3.2 Infrastructure Challenge - Retrofitting Terminals

All major container ports in Australia have internal terminals (either on dock or near dock). In Sydney and Melbourne (Australia’s largest container ports by throughput) these are operated by PN, DPW, Qube and ACFS (Melbourne only).

Significant capital investment would be required to retrofit a multi user terminal within these port environments. Consideration would need to be given to:

• the cost of retrofitting port terminals for this solution

• the location of the terminal within the port gates given that:

  – some stevedores may gain a cost advantage if the terminal is located closer to their dock – effectively creating an on dock solution for some stevedores and a near dock solution for others

  – the need to balance land assets within city ports where additional area is at a premium

• support for the multi user terminal given the relinquishing of supply chain control by stevedores and additional costs incurred through third party management of the terminal.
4 Linehaul costs

4.1 Summary of Report 139

Linehaul costs are defined in Report 139 as the costs of transporting goods over a route (but not loading or unloading).

Figure 5. Linehaul within the short haul rail supply chain

Source: PwC

Report 139 outlines that linehaul costs for rail are impacted by:

- train payload (volume/scale)
- infrastructure charges (access paths)
- train capital charges (return on assets).

Linehaul costs for road are impacted by:

- permitted truck capacity (volume and weight per route)
- truck transit speeds and transit time
- length of haul (factory/warehouse to port)
- container backhauls.

Table 3 provides an extract of key messages regarding terminal handling costs and reducing the ‘sweet spot’ distance.

Table 3 Extract from Report 139 – Linehaul costs – Key Messages

- Rail’s relatively low energy consumption and low labour requirements provide inherent linehaul operating cost advantages over road.
- These linehaul operating cost advantages rely on train economies of density: high train and wagon payloads.
- Hinterland terminals for international traffic provide key attractors for activity that brings about the necessary linehaul traffic consolidation and the necessary attractive end-node for traffic deconsolidation.
- Hinterland terminals create opportunities for capturing linehaul economies through consolidation and deconsolidation, but, terminal-rail operations need to address slow traffic build-up when terminals open, they need to address any traffic imbalances (traffic backhaul issues) and they need to address
seasonal traffic flows.

- Track economies of density also exist: high traffic levels are required to recover the infrastructure capital costs. Outside of North America, the access charges for using the tracks rarely do recover those costs.

- Spreading the high train (locomotive and rolling stock) capital costs across the linehaul operations requires high asset utilisation. That is, equipment should not stand idle.

- There is a balance between operating longer trains (capturing train economies of density) and the need to serve the market with sufficiently frequent trains. Large train volumes with relatively low service frequency may be possible when the hinterland terminal serves a high-volume single shipper and connecting single vessel.

- Higher train frequency may be required when moving boxes from smaller, multiple shippers, to connect with the range of international vessel movements. This may mean running trains of less-than-optimal length.

- Increasing the wagon payload area (notably by double-stacking) can improve train payloads but only if the payload is then not constrained by track axle load limits.

- Linehaul economics are influenced by traffic balance, and empty backhauls can skew intermodal and truck viability. Rail can be relatively less impacted by backhaulage issues.

- Rail sweet spot distance is reduced when truck productivity is undermined by road and maritime terminal congestion. A particular discontinuity arises when the truck driver cannot make a day-return region-port return journey.

- Rail may not have linehaul cost advantages when new facilities open without major anchor shippers. Initial operations are more sustainable when the hinterland terminal is based around existing shippers.


4.2 **Report 139 Analysis**

There are a number of critical factors that impact linehaul costs within the context of the Australian market. These considerations affect the relative success of rail based supply chains (compared to road) and apply to both long-haul and short-haul rail. A summary is provided below. Refer to Appendix A for additional details.

**The rail service must be able to provide a comparable service offering, even if it is able to achieve a lower cost base**

Interstate services between Sydney-Melbourne (c.960 kilometres) and Sydney-Brisbane (c.990 kilometres) are borderline between short-haul and long-haul using the BITRE 1000 kilometres distance threshold.

However, the relative competitiveness of freight rail is challenging even with these linehaul distances. Rail transit times and speeds are typically inferior to road. The rail services on these inter-capital routes do not provide the overnight transit services provided on road. In these circumstances, rail services may not be suitable for customers even if a superior linehaul cost can be achieved. Rail can compete most effectively where the commodity is not sensitive to transit time (e.g. steel) or can meet a defined customer replenishment cycle.
Port shuttle distances are considerably shorter than the ‘sweet spot’, reinforcing the criticality of co-location and value-adding activities. Applying the BITRE definition of short-haul as a linehaul distance less than 1,000 kilometres, Table 4 summarises short-haul rail services in the Australian context.

Table 4 Short haul rail in Australia

<table>
<thead>
<tr>
<th>Rail service</th>
<th>Example</th>
<th>Linehaul distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land-bridging</td>
<td>eg between Adelaide and Melbourne</td>
<td>c. 820 kilometres</td>
</tr>
<tr>
<td>Regional intrastate import/export (IMEX)</td>
<td>eg Griffith, NSW, to Port Botany or Port of Melbourne</td>
<td>c. 100 – 650 kilometres</td>
</tr>
<tr>
<td>Cross metro port shuttles</td>
<td>eg Forrestfield (ILS/ICS), Perth, and Fremantle Port</td>
<td>c.15 – 100 kilometres</td>
</tr>
</tbody>
</table>

Source: PwC/Ranbury

Excluding interstate intercapital superfreighter rail services, the distance for many short-haul IMEX rail services and port-haul rail shuttles in Australia are significantly shorter than the ‘sweet spot’ of 1,000 kilometres identified in the BITRE Report.

Cross metro port shuttles are particularly challenging given the ratio of PUD and container handling time to transit time relative to the competing road alternative. Again, port shuttle viability with short haulage tasks is improved where co-location occurs with customers (e.g. Minto and CBH/Forrestfield). There are relatively few overseas case studies provided by Report 139 with very short linehaul distances.

Cross metro port shuttles are running in Perth and Sydney. Analysis of these markets is discussed in section 6. Cross metro port shuttles, as proposed in Brisbane and Melbourne, are further reviewed in the detailed case studies in sections 8 and 9.

Maximising a train’s payload, including longer double-stacked trains, can improve costs per TEU. Double stacking is not currently possible to the major ports (Melbourne, Sydney, Brisbane) due to network constraints. But the priority for IMEX freight should be high frequency short cycle services with rapid load/unload operations to maximise efficiency and asset utilisation.

A train’s payload can be increased in many ways including increasing the axle load, reducing the wagon tare weight, or double-stacking containers. Report 139 highlights a trade-off when double-stacking containers between the lower linehaul costs and the higher terminal costs.

In the case of regional IMEX and, particularly, cross metro port shuttles, rail operators understand that a high frequency, short cycle time service is essential to:

- maximise annual capacity haulage (rapid load/unload operations can transport significant TEUs per annum)
- maximise the cost per TEU (with low capex and opex costs per TEU).

Maximising the train pay load consistent with the defined reference train configuration (load and length) will also reduce the cost per TEU. 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. Longer train services will be required to find a yard to break
larger train wagon consists into shorter rakes of wagons for shunting into terminals.

Echoing the sentiments of Report 139, the deployment of longer double-stacked trains needs 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 needs 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.

**Achieving efficient two-way loading is difficult in Australia given the nature and seasonality of the country’s import/export freight task.**

As with any transport operation, the most efficient operation is one that is tailored to the task. This includes

- minimising operating and capex costs
- maximising asset utilisation
- efficient integration with the other supply chain components

A challenge for all Australian transport operations is achieving efficient two way loading. The bulk of imports transit through the major port facilities to predominantly capital city regions. This freight can be lighter freight that is transported in a 40 foot container which is equivalent to two TEU.

Relative to Europe or the USA, Australia does not have major inland population centres. This results in a relatively small inbound freight task. Export tasks which are dominated by agricultural and mining products from inland regional areas tend to be heavy freight transported in 20 foot containers (one TEU). The export task also requires a greater number of empty containers to be repositioned into regional areas to enable future loading. The majority of transport revenue is generated from the forward/loaded leg of the journey.

With different origins and destinations for import and export containers and the requirement to achieve train load volumes on the forward leg, it is difficult to also achieve high levels of return / backhaul volumes on rail. The inland rail terminal for an export task is unlikely to be the ideal point in the supply chain for an import task. Despite this, once a viable terminal has been established, the opportunity exists to build backhaul volumes that supplement the forward leg and contribute to reducing variable operating costs per unit on the backhaul leg of the journey (e.g. Fletchers – Dubbo).

**Road has greater operational flexibility to pursue opportunities for backhaul triangulation. Nevertheless, rail services can be successful where they attract some backload volumes and/or effectively integrate empty container services into the rail supply chain**

Rail and road productivity is maximised when full loads are carried in both directions. As a general rule, subject to the linehaul distance associated with a specific task, road will be more efficient than rail (primarily undertaking a one way haulage task), if two way road loading can be sourced.

Unlike rail based supply chains, road has the potential flexibility to travel to other locations to collect a return load. This ability to triangulate a road haulage task to increase the overall revenue across both forward and return legs is one of the major competitive advantages that road has relative to rail.
Backhaul road haulage rates are often significantly below average cost and at times can be as low as variable cost. The truck (or train) has to return to its home location and any contribution to operating costs improves the overall margin on the return task. For rail services, there is a challenge in optimising the traffic imbalance because:

- demand for freight flows is not evenly balanced (particularly for a point-to-point rail service)
- the timing of outbound/inbound flows is unlikely to be synchronised
- containers cannot always be easily interchanged for forward and backward legs.

In addition, road has the flexibility to “run when ready” when a vehicle is loaded, allowing more road vehicle operational flexibility compared to rail. Rail services are limited to specific network train paths that determine the cut off time for loading freight before departure and freight availability at the destination terminal. Road services can depart early if loading is completed in advance of the minimum transit time. This results in a staggered departure profile for road services. The larger scale of intermodal rail services which may be loading 70 to 400 TEU depending on the service, in comparison often has to wait for the “last box” booked for a service. Even if a train service was fully loaded before the nominated departure time, it is not generally feasible for rail to take an “adhoc train path” because other services on scheduled train paths have priority on the network.

As a result, there is a significant demand in Australia for rail tasks to provide pricing based on full forward legs and empty return haulage services or container services including container preparation and re-positioning.

Rail services can be attractive to customers if they are able to successfully incorporate empty container services as an efficient part of their freight flows, minimising truck movements, reducing the pressure of container shortfalls, and reducing supply chain costs.

Refer to Appendix A for additional details.

Australian road haulage benefits from vehicle size and mass limits which exceed those in Europe and North America. Lifting restrictions on heavy vehicle access to metropolitan areas and the ports could further erode the competitive advantage for IMEX and port shuttle services.

Linehaul economies for both rail and road are affected by the payload limits for train wagons and road vehicles respectively.

Australian road haulage is characterised by larger road vehicle size and mass limits which are permitted on its network. Larger vehicle combinations have been operating for many years in central Australian regional areas transporting products such as livestock and fuel. In these outback regions, no alternative mode has been available.

In more recent times, Governments have increased the size of vehicles allowed (length and mass) on various routes and larger vehicles can be driven to the outer limit of larger vehicle routes and be broken down for the final leg of the transport haulage task. General comparative permissible mass limitations for different international regions are summarised in Table 5.
Table 5 Vehicle mass limitations for different international regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Vehicle mass limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Typically B-doubles run to the ports with a 62.5t GML. Outside of metropolitan areas, even larger vehicle combinations such as road trains are allowed to operate on some routes. These have a general mass limit (GML) from 79.0t (A-double) to 115.5t (A-triple). Refer to Appendix A for additional details.</td>
</tr>
<tr>
<td>Europe</td>
<td>Intermodal containers carry 40 foot ISO containers with 44.0t mass limit (similar to a 6-axle semi-trailer in Australia).</td>
</tr>
<tr>
<td>United States</td>
<td>Baseline vehicles operate on the Interstate Highway System with a 36.3t gross mass limit (similar to a 5-axle semi-trailer in Australia).</td>
</tr>
</tbody>
</table>

Source: PwC/Ranbury analysis

As a result, heavy vehicle regulations in Australia promote the competitiveness of road since the truck payload can capture economies of density.

These larger truck combinations however provide substantial competition to the rail as a mode as access to more routes and highways are granted by state road authorities. The current limitations to access across metropolitan areas to ports appears to be a major factor in the retention of rail IMEX and port shuttle services.

The intermodal economics of cross metro shuttles may be further challenged if road access restrictions are lifted to allow larger, heavier vehicles (such as Performance Based Standards ‘PBS’ vehicles) to complete their freight movement directly to the port.

4.3 Emerging Trends and Challenges

4.3.1 Congestion on the metropolitan network

Metropolitan rail networks are largely shared passenger-freight networks. Freight movements across shared networks face the following challenges:

- Linehaul services can fall under multiple operational jurisdictions en route to the Port. For example, a line haul service originating in Merbein in Victoria en route to Port of Melbourne will fall under operational control of VLine, Metro Trains and ARTC at different points in the journey.

- Priority is given to passenger movements on shared networks. This can impact the ability of the linehaul service to meet the stevedoring windows at Port through:
  - Unavailability of suitable paths to Port and the imposition of operational curfews that do not align with shipping windows as the frequency of passenger services increases to meet growing demand but investment in network capacity does not keep pace.
  - Dynamic scheduling on day of operations that prioritises passenger services over freight services.

4.3.2 Dedicated freight lines

Dedicated freight network and freight lines are a means of overcoming these challenges. At present, the major dedicated metropolitan freight lines on the eastern seaboard include:
Linehaul costs

- Brisbane’s Dutton Park to the Port of Brisbane (via the dual gauge track)

- Sydney’s Metropolitan Freight Network (Sefton Park to Chullora, Flemington South to Belmore, Belmore to Marrickville, Marrickville to Port Botany and Dulwich Hill to Rozelle) and Southern Sydney Freight Line – connecting Port Botany

- Melbourne’s Albion to Broadmeadows, South Kensington to West Footscray, Newport to Sunshine Lines – connecting Port of Melbourne.

Key advantages of a dedicated freight network include:

- Prioritisation of freight in path allocation and scheduling and the ability to interface paths and schedules with stevedore windows. This improves both the frequency and the reliability of the rail service and assist the shipper in avoiding additional costs incurred through missing the stevedoring window such as freight diversion and storage.

- Improving the suitability of terminal sites for a short haul or cross metro service by improving access and egress to the site (removing the impacts of passenger curfew issues such as those experienced by Minto in Sydney and Lyndhurst in Melbourne).

**4.3.3 Increasing tonne axle loads**

Rail’s competitive advantage is derived in part from the ability for a cargo owner to exploit economies of density over long distances. The capability of the rail line to sustain substantial payloads is a key determinant of the economy of density.

Maximising tonne axle loads such that they are fit for purpose to attract and retain freight volumes improves linehaul economics and potentially reduces the sweet spot for rail distance by maximising train payload.

The opportunity to improve tonne axle loads is generally more prevalent in regional rail networks supporting intrastate freight movements to the port.

A key challenge facing network managers is that these lines typically have low traffic and the case for investment may not be easily justified based solely on additional volumes attracted to the line.
5 Motivations of various participants

5.1 Summary of Report 139

There are two principal categories of interest groups:

- those focusing on the viability of short haul (railway companies and governments)
- those who have commercial interests in the terminals (shippers and transport entities including freight forwarders, logistics companies, port owners and stevedores).

Figure 6. Motivations of various interest groups

Source: PwC

Table 6 Extract from Report 139 – Motivations of various interest groups – Key Messages

- Logistics involves multiple supply-chain interfaces that can reduce hinterland-port efficiencies; aligned self-interest motivations between agents are important for supply-chain coordination.
- Hinterland terminal – rail – port supply chain logistics require effective coordination, which works best when there is an alignment of common incentives for the logistics to work.
- Intermodal freight is particularly prone to coordination issues and diverse motivations. However, there is increased pressure to improve the supply chain when faced by inter-port, inter-stevedore and inter-shipping competition.
- Rail service viability is a derivative of the vibrant hinterland terminal. Terminal viability is driven by terminal entities wanting to increase throughput, by shippers wanting good links to the port, and by government entities seeking to boost regional economies and to divert freight from congested roads.
- Evidence from the case studies shows that where ports actively compete with each other, the hinterland terminal may be used to make incursions into competing port catchments, or as a mechanism to protect the catchment. In this way the port can take an active role in supporting hinterland links.
- There are a range of formal structures of cooperation between supply chain agents, such as vertical integration within the supply chain, joint ventures and joint ownership. Such structures can align incentives for operating as well as mechanisms for sharing capital investment expenditure and risk.
Motivations of various participants

- Regional and urban short-haul is fostered by a range of agents who share a common interest in viable hinterland-port operations.


5.2 Report 139 Analysis

Report 139 clearly articulates the many interfaces and participants in the rail supply chain compared to road. Inevitably, the more interfaces, the greater the risk of service issues. A rail supply chain may include some or all of the following interests:

- end customers
- freight forwarders
- rail operators
- network managers
- terminal operators
- stevedores
- shipping customers
- port owners
- landside logistics operators.

The issue of multiple rail interfaces is accentuated in the rail supply chain with rail operations where a large number of customers may be on a rail service (e.g. interstate superfreighter service) or a large number of containers for a single customer (e.g. IMEX service). The consequences of service delays or failures are consequently magnified significantly compared to road operations.

Importantly, Report 139 highlights that good co-ordination of the supply chain works best when the interests are aligned and common incentives exist. The greater the alignment of the parties, the more likely that integrated outcomes are achieved either through co-operation of parties, vertical integration, joint ventures, or joint ownership structures.

Vertical integration of terminal and stevedore operations can support the success of regional IMEX and port shuttle services

It is considered that both regional IMEX short haul services and metro port shuttle operations are more likely to be successful if driven and underpinned by the stevedores. The stevedores have incentive to increase throughput at their port facilities and are pursuing strategies that will capture more of the regional and metro IMEX task. If the IMEX supply chain is integrated, the various facilities will be an input or cost centre for the stevedores, rather than as stand-alone profit centres that seek to make a margin in an intensely competitive transport market.

Recent events in the market point to the establishment of connections and networks throughout the rail supply chain are being established and an increase in competition. Qube has committed to the development of the Moorebank facility in Sydney and has an ownership stake in Patrick. DP World Australia (DPWA) has taken over the Somerton terminal lease and intends to commence port shuttle operations this year. These connections will streamline rail supply chain operations to the respective ports.
Motivations of various participants

Supply chain coordination is considered in further detail in Section 5.3.1.

### 5.3 Emerging Trends and Challenges

#### 5.3.1 Governance - Supply chain coordination

The *Australian Infrastructure Plan* released by Infrastructure Australia in 2016 has recommended an end-to-end consideration of nationally significant supply chains and the development of a *National Freight and Supply Chain Strategy* to guide investments and reforms. However, there are no fixed recommendations for the nature and form of the role of Federal and State government which can include regulation, planning, research and development, and investment/co-investment. The Government’s role will need to be tailored to specific markets pending the appropriate evaluation of reform and investment.

This section considers governance of the supply chain and potential coordination strategies given existing Australian models and the ability to improve the efficiency of freight movement.

#### 5.3.2 Why intervene?

IMEX supply chains are fragmented and the actions of individual participants can impact overall supply chain efficiency. Individual supply chain members will act in their own best interests which can lead to sub optimal supply chain efficiency and increased operating costs. Rail based IMEX supply chains are typically even more complex than road based IMEX supply chains since they include additional handling points.

Figure 7 highlights the fragmented nature of the IMEX supply chain, using Port Botany as an illustrative example.

![Figure 7: Port Botany IMEX supply chain](image)

Source: PwC 2017

A supply chain coordinator can facilitate efficient interactions between supply chain participants which leads to improved performance of the freight system and helps to optimise overall supply chain efficiency.
5.3.3 Coordination strategies
There are a number of mechanisms available to improve the efficiency of the rail based supply chain. These include:

- developing a clear governance structure whereby supply chain coordination strategies can be discussed and aligned such as:
  - nominating an independent central coordinator for day-to-day planning and scheduling
  - negotiating a memorandum of understanding or charter between participants to clarify respective roles and responsibilities
  - stakeholder forums with access to nominated representatives in government for the escalation and resolution of policy and regulatory concerns
- developing an operational plan to outline protocols for the functional interfaces, scheduling and path access
- agreeing operational performance standards
- enforcing compliance with standards
- introducing common IT management systems such as booking systems and platforms to share real time network information

5.3.4 Supply chain coordination in Australia
There are relatively few examples of supply chain coordination in Australia.

The key example considered in this study is the Port Botany Cargo Movement Coordination Centre which coordinates both road and rail IMEX supply chains.

Alternative supply chain coordination structures are considered with reference to coal chains (Hunter Valley and Dalrymple Bay).

5.3.5 Port Botany Cargo Movement Coordination Centre (CMCC)
The CMCC helps to coordinate both road and rail based supply chains at Port Botany. Refer to Figure 8 below.

The CMCC was established in 2014 by Transport for NSW as responsibility for the Port Botany Landside Improvement Strategy (PBLIS) was transitioned from Sydney Ports Corporation to state government.

[The CMCC] works with road carriers, rail operators, stevedores and related supply chain stakeholders to maximise use of the existing network capacity and continuously improve the efficiency of cargo movement through the port. The CMCC focuses on key supply chain
Motivations of various participants

interfaces – ports, roads, rail and intermodal terminals – for bulk commodities (such as grain and coal) and container freight.\(^7\)

The CMCC is a governing body responsible for implementing/monitoring the following initiatives:

- Mandatory performance standards for carriers and stevedores and financial penalties in the event of non-compliance (road based supply chain)

- The Operational Performance System (OPS) which is specific to road freight and used by registered stevedores and road carriers operating at Port Botany. It integrates stevedores’ processing data and truck tracking data to provide a record of operations of the landside interface at Port Botany.

- Stakeholder forums including the Port Botany Road Taskforce and Port Botany Rail Optimisation Group with representatives from key supply chain members. These forums consult and provide advice to Transport for NSW to optimise road and rail freight performance.

**Figure 8. Supply chain coordination at Port Botany (road and rail)**

Source: TNSW PBLIS Presentation (Undated). PwC update to account for changes under Cargo Movement Coordination Centre (formerly the PBLIS).

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Table 7 shows that supply chain coordination was forecasted to drive $156 million in efficiency benefits for participants at Port Botany over the period 2011 to 2030, including $55 million for road and $101 million for rail.

**Table 7 Estimated efficiency benefits derived from supply chain coordination at Port Botany**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Benefit Delivered Through Coordination</th>
<th>Total NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Road based</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevedores</td>
<td>Improved staff utilisation through lift and handling efficiencies, reduced cancellations, ability to evolve to 24/7 operations as Port throughput grows</td>
<td>$55 million</td>
</tr>
<tr>
<td>Carrier</td>
<td>Reduced transit time, reliability of booking time zones and slots, improved scheduling, fleet and staff utilisation</td>
<td></td>
</tr>
<tr>
<td>BFO</td>
<td>Improved just in time delivery</td>
<td></td>
</tr>
<tr>
<td>NSW Ports</td>
<td>Non asset capacity expansion as congestion reduces, ability to increase rental revenue as throughput grows</td>
<td></td>
</tr>
<tr>
<td>NSW Government</td>
<td>Improved asset value resulting from non asset capacity expansion, decongestion of road network</td>
<td></td>
</tr>
<tr>
<td><strong>Shipping Lines</strong></td>
<td>Reduction in demurrage</td>
<td></td>
</tr>
<tr>
<td>ARTC</td>
<td>Less track disruption, increased access revenue resulting from increased train frequency and payloads</td>
<td>$101 million</td>
</tr>
<tr>
<td>Terminal Operators</td>
<td>Increased access, lift and handling revenue as train frequency and payloads increase</td>
<td></td>
</tr>
<tr>
<td>Rail Operators</td>
<td>Increased hire and reward revenue as service frequency and reliability improvement translates to increased freight volume</td>
<td></td>
</tr>
<tr>
<td>BFO</td>
<td>Improved just in time delivery</td>
<td></td>
</tr>
<tr>
<td>NSW Ports</td>
<td>Non asset capacity expansion as congestion reduces, ability to increase rental revenue as throughput grows</td>
<td></td>
</tr>
<tr>
<td>NSW Government</td>
<td>Improved asset value resulting from non asset capacity expansion, decongestion of road network, realisation of made share policy objectives</td>
<td></td>
</tr>
<tr>
<td><strong>Shipping lines</strong></td>
<td>Reduction in demurrage</td>
<td></td>
</tr>
</tbody>
</table>


5.3.6 **Coal Supply Chain Coordination**

There are a number of alternative supply chain coordination frameworks to be considered. The examples below are both industry led in the coal chain.

**Hunter Valley Coal Chain Coordinator (HVCCC)**

The HVCCC is an independent legal entity which provides centralised planning, coordination, monitoring and capacity alignment services to maximise Hunter Valley coal chain efficiencies and exports. HVCCC membership includes all 11 producers (which own around 35 coal mines) as well as major service providers, including above and below rail operators, Newcastle Port and terminal operators.

The HVCCC Board has appointed an independent Chairman, CEO, and employs its own staff. Refer to Table 8 below for its strategic objectives.
Table 8 Strategic objectives of the HVCC

- To plan and schedule the movement of coal through the Hunter Valley Coal Chain in accordance with the agreed collective needs and contractual obligations of Producers and Service Providers;
- To ensure minimum total logistics cost and maximised volumes through the provision of appropriate analysis and advice on capacity constraints (whether physical, operational or commercial) affecting the efficient operation of the Hunter Valley Coal Chain; and
- To advocate positions, on behalf of Producers and Service Providers, to other stakeholders and governments on issues relevant to the efficient operation of the Coal Chain in order to maximise opportunities for improved co-ordination and/or further expansion of the Coal Chain.


HVCCC and service providers execute the daily rail plan, cooperatively manage disruptions and coordinate recovery initiatives. Trains work to specific ‘slots’ from the mine to the Port. These slots can be interchanged to isolate and minimise the impact of delays and maximise throughput.

Dalrymple Bay Coal Chain Coordinator (DCCC)
There are 14 mines in the Goonyella system in Queensland, owned by six different producers. Coal is transported to the Port of Hay Point for export where there are two export terminals:

- Dalrymple Bay Coal Terminal (DBCT) – a common user facility servicing several mines in the central Bowen Basin. DBCT is owned by the Queensland State Government and leased to DBCT Management (Brookfield Asset Management). A consortium of terminal users is responsible for the day-to-day operation of the terminal under the terms of the operating and maintenance contract.

- Hay Point Coal Terminal (HPCT) – privately owned and operated by BHP Billiton Mitsubishi Alliance (BMA). In 2009, BMA was quoted to be the largest producer in the Goonyella system with around 44 per cent of production. Hay Point Services Pty Ltd is responsible for the operation of the terminal.

A central coordination role was created for the DBCT following the recommendations of a joint Queensland Government and Queensland Resources Council supply chain review conducted by Stephen O’Donnell in 2007.

DCCC members currently include Rio Tinto, Peabody Energy, Pacific National (PN) and Glencore. Members have implemented an agreement and charter, which involved appointing a coordinator (currently PN) to act on behalf of all members in submitting orders to the port and the below rail operator. In 2014, the ACCC granted authority for coal transportation arrangements to be coordinated through the DBCT until 2019. BMA and Hay Point Services are excluded from central coordination.

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5.3.7 Who should be nominated?
The supply chain coordinator needs to be independent, and perceived to be independent, to achieve the objective of optimising supply chain efficiency without favouring individual interests. State governments, network managers or a central consortium of participants may typically best positioned for this role in terms of independence.

However, governments are not typically suited to fulfil an operational role. In the case of Port Botany’s CMCC, TfNSW provides a governance structure to support the implementation of mandatory road performance standards, resolve disputes in the event of non-compliance, review advice provided by the representative stakeholder forums and consider regulatory reforms to improve the efficiency of freight movements. The Vehicle Booking System is an operational tool which provides a platform for consolidating and coordinating stevedore and trucker data. But the government is not involved in day-to-day operations.

In the case of the HVCCC and DBCC, a consortium of participants has organised themselves to fulfil roles of day to day planning and scheduling as well as capacity planning and advocacy work. While HVCCC is a separate legal entity, the DBCC has a smaller membership base and is coordinated through a charter and contractual agreements.

The agency to fulfil the role of supply chain coordinator is generally a contentious issue. Many supply chain participants may argue against direct Government involvement or further regulation such as performance standards.

5.3.8 Conclusion
The CMCC at Port Botany and NSW/QLD coal supply chain coordinators illustrate that State government can support a supply chain coordination role in varying degrees – from an active governing role to a supporting regulatory body.

The key triggers for considering a coordination role include:

- **Complexity and fragmentation of the supply chain** – there is greater need for a coordinating role where there are many supply chain participants with limited vertical integration.

  In the case of the Somerton port shuttle services (refer to section 8), the supply chain system is relatively simple. DPWA acts as both inland terminal operator at Somerton and terminal operator/stevedore at the port side West Swanson Intermodal Terminal. DPWA still have to coordinate with multiple participants (above and below rail operators, the Port of Melbourne and local/state government) but the supply chain is even more complex for regional intrastate IMEX services which do not have the benefit of DPWA’s vertical integration.

  Supply chain coordination at the port can help to improve reliability by enforcing common protocols, and creating conditions whereby participants are driven to adapt upstream supply chain to meet their windows.

- **Demand for rail services** – where road congestion is high, demand for rail services increases and consequently the need for a supply chain coordination role. The CMCC at Port Botany has been motivated by the level of road congestion in Sydney, and its remit includes coordination of both road and rail based supply chains.

  Whether or not Federal and State governments undertake an active or supporting supply chain coordination role, this study provides guidance when considering proposals for port shuttle operations in the form of an operational evaluation framework. This report first considers the current success factors and constraints.
for cross metro port shuttles in Perth, Sydney, Brisbane and Melbourne (Section 6) before introducing the operational evaluation framework (Section 7).
6 Cross metro port shuttles in Australia

In the previous sections of this report, the analysis has considered the viability of short haul rail which includes both regional intrastate IMEX services and cross metro port shuttle services.

This chapter will now focus on cross metro port shuttles. Port shuttle services are in operation in Perth and Sydney but have limited (or nil) current services in Brisbane and Melbourne.

The development of Inland Rail is anticipated to induce demand for rail freight services in these regions, part of which includes port shuttles. At the Brisbane end, the core assumption in the IRBC is to achieve a double-stacked network to Acacia Ridge. The Port of Brisbane Extension is planned as a single-track, double-stacked dual gauge line with the ability to upgrade to double track in future.

This section includes the following:

- an outline of port shuttle services currently in operation and planned by city (Perth, Sydney, Brisbane & Melbourne)
- context of regional policies/ port rail strategies
- context of success factors (Perth & Sydney)
- key constraints (all regions).

6.1 Perth

6.1.1 Regional policies and strategies

The Western Australia (WA) government continues to focus on transferring freight from road to rail with a long term aspirational rail target of 30 per cent of contestable freight.\(^9\)

Rail share in 2015/16 was approximately 14.5 per cent (104,000 TEU) and the target for 2016/17 is 15 per cent.\(^{10}\)


\(^{10}\) Fremantle Ports, Statement of Corporate Intent, 2016/17.
Increasing rail share is a strategic priority for Fremantle Ports. The North Quay Rail Terminal (NQRT) at Fremantle Harbour is a purpose built IMEX terminal with direct connectivity from the rail unloading area to the Patrick and DPWA berths at the Inner Harbour. The loading roads were expanded in 2014 from 400 metres to 690 metres to allow longer train configurations. The $31.4 million project was funded by the Federal and State Governments.

A number of initiatives are underway to support the use of rail, including in the planning work associated with the future Outer Harbour and the supporting transport supply chain infrastructure.

6.1.2 Port shuttle services
Terminals providing cross metro port shuttle services are listed below:

Table 9 Cross metro port shuttle terminals to North Quay Rail Terminal (Port of Fremantle)

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Terminal Operator</th>
<th>Rail Operator</th>
<th>Terminal Owner</th>
<th>Throughput TEU p.a.</th>
<th>Services per week</th>
<th>Distance to the port (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forrestfield</td>
<td>ILS/ICS</td>
<td>ILS/ICS</td>
<td>ILS/ICS</td>
<td>70,000 +</td>
<td>14 +</td>
<td>41km</td>
</tr>
<tr>
<td>Kewdale</td>
<td>Pacific National</td>
<td>Pacific National</td>
<td>Pacific National</td>
<td>Limited IMEX services to/from North Quay Rail Terminal</td>
<td></td>
<td>41km</td>
</tr>
</tbody>
</table>

Source: Terminal operator data, PwC analysis

6.1.3 Critical success factors
Key success factors for the port shuttle operations in Perth are outlined below:

- State government subsidy – The subsidy was initially introduced in 2006/07 when the rail modal share of containers transported to and from the Inner Harbour was around 8 per cent. The rail modal share increased to around 15
per cent by 2008/09 and has remained around 14-15 per cent in recent years although volumes to the port have increased.\(^{11}\) The 2016 State Budget committed funding for the rail subsidy until 2021-22.”

- **Investment in the port terminal** - The North Quay Rail Terminal (‘NQRT’) loading roads were expanded in 2014 from 400 metres to 690 metres to allow longer train configurations to operate to/from the Port. This expansion project allows more containers per service and aligns with the narrow gauge reference train that operates on the ARC Infrastructure network in Western Australia.

- **Dedicated freight network** - Port shuttle services operate primarily on the dedicated freight network, except for a small track section between Robb Jetty and Fremantle.

- **Baseload volumes** – The port shuttle service has significant baseload export volumes in the form of containerised grain from CBH Group. CBH Group cleans and packs grain at the Metro Grain Centre in Forrestfield adjacent to the rail network.

### 6.1.4 Key constraints

Despite the state government subsidy, there are no other significant instances of port-shuttle services in the Perth region. Pacific National (PN) at Kewdale operates some services but, even with the potential for value-adding activities within the terminal precinct, these services are limited. The linehaul distances for the port shuttles are short (41 kilometres for Forrestfield ILS/ICS) and it is challenging to compete with shorthaul trucking.

### 6.2 Sydney

#### 6.2.1 Regional policies and strategies

The NSW Government has set out the following strategies in relation to freight logistics.

- **Long Term Transport Master Plan (2012)**
- **NSW Freight and Ports Strategy (2013)**
- **A Plan for Growing Sydney (2014)**

The NSW government plans to increase the share of containers moved through the port by rail from 14 per cent to 28 per cent by 2021.\(^{12}\) NSW Ports has set a longer term target to move three million TEU per year by rail by 2045, which represents around 40 per cent of forecast container volumes.\(^{13}\)

Current focus areas to achieve this modal shift include:

- Develop intermodal terminals and rail yards at key locations including Enfield, Cooks River and Moorebank.

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\(^{11}\) AECOM, *Increasing Rail Mode Share in Fremantle Inner Harbour*, May 2014.

\(^{12}\) Transport for NSW, *Strategic Action Program 2 – Network Capacity*, p.120.

• Enhance rail freight routes including duplication of the rail freight line between Port Botany and Enfield which currently includes a 2.84 kilometres section of single-track. This project is also flagged as a ‘high-priority’ initiative in the Infrastructure Australia Priority List.

• Improve the efficiency of cargo movements through the Cargo Movement Coordination Centre, governed by Transport for NSW (as outlined in Section 5.3.1). A number of initiatives have been implemented including an operational performance system to coordinate landside operations and stakeholder groups to investigate opportunities for improvement. The Port Botany Rail Optimisation Group (PBROG) is currently reviewing three key areas; stevedores productivity, number of containers per train and idle time within the port. Refer to Section 5.3.1 for further detail.

**Australian Rail Track Corporation (ARTC)**
ARTC has responsibility for managing access to the Metropolitan Freight Network (dedicated freight line extending from Port Botany), the standard gauge interstate rail network and Hunter Valley Network. ARTC developed a strategy for Metropolitan Rail in Sydney in 2015 with plans to refresh this work in 2017.

### 6.2.2 Port shuttle services
Terminals providing cross metro port shuttle services are listed in Table 10.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Terminal Operator</th>
<th>Rail Operator</th>
<th>Terminal Owner</th>
<th>Throughput TEU p.a.</th>
<th>Services per week</th>
<th>Distance to port (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minto</td>
<td>Qube</td>
<td>Qube</td>
<td>Qube</td>
<td>80,000</td>
<td>5 +</td>
<td>57</td>
</tr>
<tr>
<td>Yennora</td>
<td>Qube</td>
<td>Qube</td>
<td>Stockland</td>
<td>60,000</td>
<td>5 +</td>
<td>41</td>
</tr>
<tr>
<td>Villawood</td>
<td>Toll/DPWA</td>
<td>TBA</td>
<td>Toll</td>
<td>50,000</td>
<td>5 +</td>
<td>26</td>
</tr>
<tr>
<td>Cooks River</td>
<td>MCS</td>
<td>Various</td>
<td>MCS</td>
<td>50,000</td>
<td>5 -</td>
<td>10</td>
</tr>
<tr>
<td>Chullora</td>
<td>Pacific National</td>
<td>Pacific National</td>
<td>Pacific National</td>
<td>50,000</td>
<td>5 +</td>
<td>18</td>
</tr>
<tr>
<td>Enfield</td>
<td>Aurizon</td>
<td>Aurizon</td>
<td>Port Botany</td>
<td>Estimated 7,000 TEU p.a. related to port shuttle movements</td>
<td>TBA</td>
<td>18</td>
</tr>
<tr>
<td>Moorebank</td>
<td>Qube</td>
<td>Qube</td>
<td>MIC</td>
<td>Expecting up to 1,000,000 TEU p.a. ramping up from late 2018</td>
<td>TBA</td>
<td>33</td>
</tr>
</tbody>
</table>

Source: Terminal operator data, PwC/Ranbury analysis.
6.2.3 Critical success factors

Sydney has the most number of terminals providing cross metro port shuttle services in Australia. Key factors contributing to demand for port shuttle services in Sydney are outlined below. Of these, urban road congestion is potentially the most significant in encouraging the modal shift from road to rail.

- **Urban road congestion** – According to the Austroads ‘Congestion and Reliability Review’ in 2016, “morning and afternoon peaks [in Sydney] exhibit time delays up to 40 per cent”\(^\text{14}\). Sydney is one of the poorest performing cities in terms of average speed, reliability and travel time delay peaks. Rail in this capital city thereby benefits from the relative poor productivity of road haulage and provides a quicker, more reliable and cheaper supply chain solution. Sydney is uniquely positioned; neither Melbourne, Brisbane nor Perth currently incur the same congestion and hence trucked containers in these regions are relatively productive compared with Sydney.

The Vehicle Booking System (VBS) at Port Botany was an initiative introduced in response to road congestion. The VBS is an online vehicle management system whereby stevedores post slots which are booked by registered carriers. Booking rules are enforced at the port gates and penalties apply to changes

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within 24 hours of booking. The coordination of the road supply chain is discussed further in Section 5.3.1.

- **Dedicated freight network** - Figure 10 shows the Southern Sydney Freight Line (‘SSFL’) which is a dedicated single track freight line from Sefton Park Junction to Macarthur. As outlined in ARTC’s ‘2015 Sydney Metropolitan Freight Strategy’, “[the SSFL] removes the constraints of shared operation with passenger services, particularly the peak period curfews”. However, there are metro terminals impacted by shared passenger/freight use outside of the SSFL, e.g. Yennora and Minto, and Pacific National have indicated an intention to establish a terminal facility at St Marys on the planned Western Sydney freight line.

### 6.2.4 Key constraints

There are a number of limiting factors to also consider within this region specific to the terminal handling costs:

- **Rail operations at inland terminals** – Metro terminals face various brownfield site constraints which have an adverse effect on the efficiency of rail operations. An example of this is the requirement for trains at Yennora must be split on the main loading roads to permit internal site road access.

  The new greenfield IMEX terminal development at Moorebank does not face this same site constraint of the smaller inner metro terminals given it was designed specifically for the IMEX task to Port Botany. Moorebank is expected to cater for IMEX throughput volumes up to 1,000,000 TEU per annum. Moorebank is anticipated to achieve the volumes through purpose built handling, loading and transfer facilities that integrate the terminal with adjoining warehouses and distribution centres.

- **Rail operations at Port Botany** - Port Botany terminals have length limitations for the various sidings (340m to 680m). Trains regularly have to be split and shunted into multiple dead-end sidings where loading is split between Stevedores which in turn results in delays, blockages in Botany Yard and additional safety inspections.

- **Slot management at Port Botany** – There are a number of issues identified at the terminal regarding the efficiency of allocating windows to multiple stevedores. Delays can occur when trains carry more/less than the assumed size of their window and there are difficulties in responding to late trains. Transport for NSW is looking to address real-time management of variability through the CMCC.

- **Container handling productivity at Port Botany** – Containers transported by rail incur additional lifts and moves at dockside to transport containers to the berth.

### 6.3 Brisbane

#### 6.3.1 Regional policies and strategies

The Department of Transport and Main Roads (TMR) and the Port of Brisbane are both supportive of freight on rail although there are no specific rail modal share targets in place.

The current focus for Queensland government and the Port includes:

- Inland Rail, for which the Australian Government has announced its commitment as part of the 2017-18 Budget and which has potential to start in
Cross metro port shuttles in Australia

2025. The initial Inland Rail Business Case (IRBC) included an extension to improve port access with a dedicated freight rail link from Acacia Ridge to the Port of Brisbane. This would avoid the need for freight trains to share the metropolitan network with passenger services. Refer to Figure 11 below for options considered as part of the Inland Rail Business Case.

Figure 11. Rail freight corridor options to the Port of Brisbane considered as part of the Inland Rail business case

The Port of Brisbane extension is considered an adjunct to the core Inland Rail business case and will require a separate options evaluation and funding approval process. A follow-up study has been jointly initiated by the Federal and State government regarding landside capacity and demand at the Port of Brisbane, especially in light of the potential configuration of Cross River Rail. Key stakeholders will include the Port of Brisbane, Queensland Rail and ARTC.

- Toowoomba Range tunnel lowering – Currently the preferred containers for transporting cotton (9 foot 6 inches) are not able to fit through the tunnels on the Western Line (8 foot, 6 inches). Cotton exports are currently all transported via road to the Port of Brisbane. Queensland Rail has funded a project to lower the floor of the existing 11 rail tunnels on the Toowoomba Range and Little Liverpool Ranges to provide clearance for international standard size containers (high cube containers up to 10 foot 6 inches).

The project was approved by the former State government and previously included building 2 new crossing loops on the range. The overlap in project definition with Inland Rail was discussed and the extra crossing loops were deleted from the scope by the current Government. But the project to lower the tunnels has been reconfirmed. It is at an advanced detailed design stage with an
intended construction contract award in June 2017 and construction completion by early 2018 (February).

Hence the rationale is to get freight back on rail sooner rather than later, in the knowledge that the Inland Rail project will ultimately make the tunnel lowering redundant, when the new route is developed with new tunnels for double-stacking. The old route still will have its axle load constraint (15.75TAL).

- Toowoomba Second Range Crossing (TSRC) – all freight travelling from Toowoomba to the Port of Brisbane is currently transported by road. Further investment in the road network has been committed with an alternative crossing to be provided via a 41 kilometre toll road. The TSRC is designed for commercial vehicles to improve freight efficiency and driver safety and relieve pressure on roads in Toowoomba and the Lockyer Valley. Time savings are estimated up to 40 minutes. The TSRC is due to be completed and operational by late 2018. Therefore, any modal shift before this date will be positive for freight on rail in general as well as the Inland Rail project specifically.

6.3.2 Port shuttle services

There are currently no cross metro port shuttles operating in Brisbane.

There are regional IMEX services which operate on the narrow gauge line from Central/North Queensland to the Brisbane Multi-Modal Terminal (BMT) at Fisherman Islands. The BMT is a central dual gauge terminal serving the three stevedoring operations. The BMT is owned and operated by Port of Brisbane Pty Ltd (PBPL), and is multi-user facility that has open access subject to commercial terms and can be used by any rail operator.

A number of sites have been proposed for the purpose of developing a metro port shuttle terminal (with varying degrees of confirmed intent). These sites include Acacia Ridge, Ebenezer, Bromelton, Redbank and Charlton (Interlink SQ). This study has nominated Redbank as a detailed case study to apply the operational evaluation framework in practice given the key proponents are relatively advanced in terms of planning the operation and have been willing to provide the details of their investigations and issues potentially impacting the proposed operation.

Redbank

Redbank is a new rail facility proposed by DB Schenker (freight forwarder) in partnership with the Goodman Group (property developer). Further details of this case study are included in section 9.

Acacia Ridge

Acacia Ridge is located 25 kilometres south of Brisbane. Port shuttle services have operated periodically in the past but are no longer running. Acacia Ridge has both narrow gauge and standard gauge terminals and is predominantly focused on intrastate and interstate freight flows. Most domestic interstate container movements are destined for the South East Queensland market and hence terminate at Acacia Ridge and are not on-forwarded to the Port of Brisbane.

According to the Department of Transport and Main Road, “...currently over 20 per cent of Port of Brisbane container imports (full) have a destination within 10
kilometres of the Acacia Ridge Rail Terminal”. A port shuttle could be potentially be supported by the Acacia Ridge facility assuming that the rail service was price competitive with road. However the shuttle service faces some hurdles, as outlined in 3.3.3 including the availability of urban road capacity, significant investment in road infrastructure and permitted truck capacity. In addition, a port shuttle would require the allocation of a loading road slot in one of the two terminals that is likely to conflict with existing train loading requirements.

Port shuttle services from Acacia Ridge would also currently be constrained by shared passenger/freight use on the Salisbury to Dutton Park section of the rail network.

**Bromelton**

Bromelton was declared a State Development Area in 2008 with rail designated precincts that aimed to leverage off the access to the interstate standard gauge rail network. ARTC has recently purchased land at this site and SCT has built a new terminal. The site is located near Beaudesert approximately 46 kilometres south of Acacia Ridge on the current ARTC national standard gauge network. The first interstate service from Melbourne to the new SCT Terminal commenced in January 2017.

While there is potential to develop a port-shuttle service, there are no immediate plans – interstate services are the current priority for the terminal operations.

**Ebenezer**

Ebenezer is a potential future site for an intermodal terminal, just west of Ipswich on the Inland Rail route. While the site is well connected in terms of the road network (access via the Cunningham Highway to the four-lane Ipswich Motorway), it will not be developed or have a rail connection prior to the delivery of the Inland Rail project.

Future demand for rail services at Ebenezer is also dependent on the future location of key distribution centres and logistics businesses. The Queensland Government’s ‘South East Queensland Regional Plan 2009–2031’ has identified the area of Ebenezer as a regional development area. The area has the potential to accommodate manufacturing and logistics businesses and large footprint industries.

There may be a trade-off in the development of terminal facilities between Bromelton and Ebenezer. The relative attractiveness of the Ebenezer site for a major terminal facility will be contingent on the extent to which major rail facilities are established in advance of Inland Rail at Bromelton, the approval of Inland Rail, the provision of a dedicated standard gauge rail connection to the Port and the ultimate location of manufacturing and logistics businesses.

**InterlinkSQ / Charlton Terminal**

InterlinkSQ is a new intermodal transport and logistics development with construction due to start early in 2017. The site is designed to include an intermodal freight terminal and inland port facilities. It will be an open access terminal incorporating grain and commodities storage, processing and loading facilities, rail maintenance and provisioning and a large container handling and storage area.

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It is located 13 kilometres west of Toowomba along the proposed route of the Melbourne to Brisbane Inland Railway. Bonded facilities are planned to enable direct export of containerised products through to the Port of Brisbane via a port shuttle service. However, prior to the completion of Inland Rail, significant upgrades will be required on the existing narrow gauge railway tunnels to increase the structure gauge (train clearance) across the 12 Toowoomba Range tunnels and addressing bridge structures that limit the West Moreton rail system to 15.75 tonne axle load (TAL).

This site has not been included as a case study because it represents a regional IMEX terminal rather than a cross metro port shuttle and start-up operations would be impacted by the timing of the infrastructure upgrades. The height restrictions and axle load limits of the existing narrow gauge rail network, which currently limit the regional IMEX rail opportunities in south west Queensland, are discussed below.

### 6.3.3 Key constraints

Rail operations are impacted by the following issues:

- **Height restrictions and axle load limits for rail network** – While there are plans to lower the tunnel floors across the Toowoomba Range, the axle load issue is not yet resolved. The axle load limitations of 15.75 TAL result in an inefficient payload i.e. only one heavy 20 foot grain container per wagon.

- **Lack of competition from rail operators** – Rail access is managed by Queensland Rail. There are relatively few above rail operators who have the bespoke light axle load narrow gauge rollingstock required for the regional IMEX tasks other than Aurizon. Aurizon is currently the only rail operator in the South West (coal and grain) which is a legacy of the relatively low volumes for various products and the inherent infrastructure limitations across the region. Hence, rollingstock specific to low axle loads (15.75 TAL) and narrow gauge is a major constraint.

- **Closures on rail corridors for maintenance affecting availability** – The current QR network maintenance regime relies on periodic total network closures of various branch systems in South East Queensland (SEQ). These closures impact path availability across the network and impact freight operations.

- **Availability of urban road capacity** – In comparison to Sydney which has seven of the ten ‘most delayed roads’ according to the Austroads study, Brisbane had the most entries into the list of ‘least delayed roads’.

- **Road investment and truck capacity** – Investment in road infrastructure continues to be a state government and local council priority to minimise traffic congestion in anticipation of forecast growth in road usage. Current projects include:
  - Logan Motorway: 30 kilometres project to connect Logan with Ipswich in the west, the Gold Coast in the south as well as the Port of Brisbane, Airport and Australia Trade Coast precincts in the north
  - Gateway Motorway: upgrade to widen the motorway from four to six lanes between Nudgee and Bracken Ridge
  - Inner City Bypass upgrade: widening the Inner City Bypass between Legacy way and the RNA tunnel
  - Wolston Creek Bridge: upgrade at Wacol
Completion of the TransApex: cross-city road network

There are also projects underway that may facilitate larger and heavier PBS trucks to have access to the port, further improving the relative competitiveness of road compared to rail. Upon the completion of the new Toowoomba road range crossing, it is likely that AB triple heavy vehicle combinations will be able to head east of the range and potentially to the port on the motorway network.

6.4 Melbourne

6.4.1 Regional policies and strategies

The Federal and Victorian governments have indicated their support for port rail shuttles with a combined allocation of funds totalling $58 million towards asset and project facilitation. The funds were allocated in 2014 but the project was suspended until the lease of the Port of Melbourne was finalised.

Port of Melbourne

Under the terms of the Port of Melbourne lease transaction, the Port of Melbourne operator must prepare a rail access strategy within 3 years which must set out:

- options for rail infrastructure projects for improving rail access for the movement into and out of the Port of Melbourne
- a commercial assessment of each identified option including current and projected transport infrastructure requirements

One of the options set out in the first Rail Access Strategy is for the development of a port rail shuttle. The Rail Access Strategy will be submitted by 2019 and every rail infrastructure option must be capable of being implemented within 5 years after submission.

The Rail Access Strategy has not been finalised. In consultation, the Port has flagged the following key items for consideration:

- rail terminal options to be developed including potential for a common user terminal.
- there is a potential requirement for rail storage or holding roads for queuing purposes (either near port or on the regional/metro boundary) – this may include holding tracks (in a similar manner to Sydney) and there are options to do this both at Tottenham and immediately to the north of the Port.

ARTC

ARTC is in the early stages of developing a metropolitan freight strategy for Melbourne. Preliminary analysis has indicated the following key areas for investigation:

- increasing the efficiency of the rail/stevedore interface – experience has indicated that on-dock rail terminals can be more efficient than common user facilities that need to access the public road network
- increasing the efficiency of the Dynon terminals (particularly with regard to shunting 1800 metre trains) while avoiding the risk of stranded investment once the terminal leases expire
- determining future rail infrastructure needs to cater for potential port shuttle services.
In the event that demand for port shuttle services does increase, ARTC anticipates that additional track capacity is likely to be required on the single line sections of the ARTC interstate network, north between Tottenham and Somerton and south west between Tottenham and Altona.

Specific requirements have not been assessed in detail and will need to be considered in the context of broader network demand for various rail traffic segments including interstate, regional freight and passenger services. Line sections from Albion to Jacana (connecting to Somerton) and Tottenham/Brooklyn to Newport on the VLine broad gauge could also be upgraded to dual gauge or duplicated with standard gauge track to increase capacity to meet future demand in these areas.

### 6.4.2 Port shuttle services

Melbourne has a limited number of cross metro port shuttles in operation.

Similar to Brisbane, Melbourne also has a number of regional IMEX services bringing agricultural and industrial products to the Port of Melbourne for export.

Terminals providing cross metro port shuttle services are listed in Table 11.

**Table 11 Cross metro port shuttle terminals to the Port of Melbourne**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Terminal Operator</th>
<th>Rail Operator</th>
<th>Terminal Owner</th>
<th>Throughput TEU p.a.</th>
<th>Services per week</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altona</td>
<td>SCT</td>
<td>SCT</td>
<td>SCT</td>
<td>Target of 15,000 TEU p.a.</td>
<td>1 +</td>
<td>12</td>
</tr>
<tr>
<td>Somerton</td>
<td>DPWA</td>
<td>Pacific National</td>
<td>DPWA</td>
<td>Expecting 18,000 – 45,000 TEU p.a. from April 2017</td>
<td>5 +</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: Terminal operator data, PwC analysis

**Somerton**

Port shuttle services are planned to commence in April 2017. The services will be provided by DP World Australia (DPWA) between the Port of Somerton and West Swanson Intermodal Terminal (WSIT) at the Port of Melbourne. Further details of this case study are included in section 8.

**SCT Altona**

Wimmera Container Line previously operated container trains into Altona but trucks were needed to finalise the last leg of the journey to the Port of Melbourne. While direct rail avenues were available to the port, SCT had limited access to these due to contractual arrangements. An agreement was made with DPWA, which has allowed SCT to deliver rail freight directly to the DPWA WSIT rail facility.

A weekly port shuttle was initiated in mid-2016 with partners SCT and DPWA. There is a target of 15,000 TEU p.a. from Altona to West Swanson Intermodal Terminal (‘WSIT’). However, the service is currently discretionary, predominantly operating at weekends and hence throughput volumes are low. The site is very close to the port (c.12 kilometres) and given the short road haulage distance it is difficult to see the service being viable over the longer term,
Lyndhurst
Lyndhurst has been considered as a potential intermodal terminal site. Lyndhurst is located near Dandenong with warehousing on-site including a 50,000 square metres warehouse for Bunnings.

The terminal has not been constructed yet. There is interest from the property owner (Salta Properties) to develop a rail facility and provide shuttle services to the Port of Melbourne along the broad gauge passenger rail line from Packenham and Cranbourne. It has been indicated by the Government that there are rail access issues to be addressed including a potential grade separation related to the access road near the proposed site.

Western Interstate Freight Terminal (WIFT)
The Western Interstate Freight Terminal has been identified as the preferred location for a new interstate rail facility by the Victorian Government over recent years. It is envisaged that the existing terminals will need to be relocated from Dyunon when the existing leases from VicTrack expire or to accommodate the proposed larger train configurations associated with the Inland Rail project. The proposed location at Truganina is considered close to industry in the west of Melbourne. However, new connections will be required to the ARTC interstate network near Werribee and Sunshine. Alternative terminals locations to the north of Melbourne have also been suggested in the Craigieburn or Beveridge areas.

6.4.3 Key constraints
In the Melbourne metropolitan precinct, aspirations have existed to establish port shuttle operations to the Port of Melbourne for many years. The major issues that have constrained the viability of potential shuttle services include the following.

- **Road congestion** – has been limited in recent years as a result of the delivery of major road projects such as the western and metropolitan ring roads that have provided connectivity between the Port, the Princess Freeway to Geelong and the Hume Highway to Sydney. New road upgrade projects continue to be rolled out including the upgrade to the Tullamarine Freeway and Western Distributor.

- **Location of industry relative to road and rail network** - The majority of industry is located in the west/south west of Melbourne in suburbs including Altona, North Laverton, Brooklyn, and Tottenham. Road access to the port precinct has been good with many freight forwarders and customers establishing major warehousing, distribution centres and other facilities in the precinct.

- **Short travel distances and radial road network** - rail has struggled to compete with road operations in Victoria given the relatively short travel distances and radial road network from Melbourne to outer suburbs and regional areas.

Despite these constraints, there is a likelihood that port rail shuttles will eventually emerge as an increasingly viable option. This outcome is likely to be driven by:

- increasing congestion overtime resulting from the proximity of the Port to the Melbourne CBD

- the Victorian Government has indicated a desire to move the interstate rail operations out of the Dynon precinct adjacent to the port

- the markets have already been relocated from the port precinct

- inner land holdings are scarce and is likely to significantly increase in value over time
• rail as well as road will be required in the port precinct and planning in the port precinct should seek to address port rail requirements.

Currently, increasing or optimising rail in the port precinct is one of a number of freight and passenger rail projects being undertaken by the Government in Victoria. The Government is also waiting for the delivery of a Rail Access Strategy from the Port of Melbourne. These matters and competition for funding of rail projects plus a perception that Inland Rail may not necessarily deliver a significant change to the nature or volume of the IMEX rail task has limited progress on port shuttle planning and IMEX initiatives in the port rail precinct.
7 Operational evaluation framework

This section introduce a high level preliminary decision making framework to ascertain whether a port rail shuttle solution can be viable and compete with the alternative road transport options. It is designed to provide guidance for Government when considering proposals for port shuttle operations.

In developing this operational evaluation framework, PwC/Ranbury have considered:

- the short haul rail framework provided by the BITRE Report 139\(^\text{17}\) (and analysed in sections 2, 3, 4, and 5)
- the success factors and constraints specific to Australian IMEX markets (as outlined in section 6)
- a separate study performed by PwC/Ranbury on behalf of DIRD regarding the future of intermodal terminals in Australia\(^\text{18}\)
- consultations with industry and government stakeholders – these consultations were held during the course of both PwC/Ranbury studies, firstly regarding the future of intermodal terminals and secondly focusing on port shuttle operations.

7.1 Operational evaluation framework

To consider the establishment of a short haul rail operation that will facilitate container transfer services from a metropolitan terminal to a port terminal, it is important to determine:

1. Are there suitable terminal facilities at both the port and within the metropolitan catchment area that can efficiently accommodate the proposed operation?

2. Is the task suitable for a rail based supply chain solution?

3. Is the port shuttle solution optimal for the freight products to be transported to/from the port?


4. Is there potentially high volumes of product able to be serviced by a rail solution at the hinterland/metro terminal or at least a minimum critical mass of product?

5. Is the rail port shuttle solution competitive with a road transport solution?

6. Are the components of the rail solution able to be assembled to operationalise the service?

The operational evaluation framework has been documented in Appendix B and has been applied to two case studies in this report: Port of Somerton (section 8) and Redbank (section 9).

The framework should be considered in conjunction with the information derived from the Melbourne and Brisbane port shuttle case studies. It is not intended to be exhaustive, but recognises that each potential port shuttle proposed operation will be unique in terms of catchment, volume, facilities, customers, infrastructure and operations. As such the framework is intended to provide a high level framework for evaluation purposes.

7.2 Determining the need for a port shuttle service

The first PwC/Ranbury study on the future of intermodal terminals included a high level preliminary decision making framework to ascertain whether there is a need for an intermodal terminal. It was designed to be used by local government in conjunction with terminal typology info sheets.

The framework has been adapted here, specific to port shuttle services. At a high level, there are a number of basic principles that need to exist before a detailed assessment should be undertaken. These are:

- There is a high volume commodity transport task
- The products can be transported on a rail supply chain
- A customer is willing to contract a rail solution
- A rail operator will contract to undertake the haulage task
- The rail solution is competitive relative to road transport.

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.
## Operational evaluation framework

<table>
<thead>
<tr>
<th>Pre-condition</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| 1 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 |
| 2 Does the commodity throughput meet minimum rail volume thresholds? | • Train load volumes of freight |
| 3 Does the rail supply chain solution meet minimum service criteria? | • Service frequency  
• Service transit time  
• Service reliability |
| 4 Does the throughput profile support a rail solution? | • Is the demand profile subject to significant peaks and troughs? |
| 5 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 metro/hinterland terminal  
• Destination port terminal  
• Point to point operations  
• Efficient loading / unloading facilities  
• Streamlined network/terminal access (e.g. minimal shunting)  
• Efficient linehaul operation.  
• Co-location to minimise the PUD component and cost. |
| 6 Is the rail operating model effective (optimal rail logistics configuration for the port shuttle products 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 |
| 7 What are the commercial arrangements for the task? | • Terminal owner/operator  
• Rail operators  
• Costs / stranding risks |
| 8 Is the port shuttle rail solution competitive with road transport costs? | |
8 Case Study: Port of Somerton

8.1 Overview

The Austrak Business Park is located 23 kilometres north of Melbourne (30 kilometres by road) within an established 106 hectare business park owned by Austrak AFM Pty Ltd and GPT Nominees Pty Ltd (Austrak). Refer to Figure 12 below.

Major companies have located their distribution centres at the Austrak Business Park. There are nine existing major long term tenants at Somerton which handle approximately 90,000 TEU per annum. These include national retailers, warehouse and distribution services, and agricultural exporters.

This case study was selected because a port shuttle service has not previously succeeded from the Somerton terminal despite appearing to satisfy a number of conditions of short haul viability. Indeed, Somerton was included as a case study in the BITRE Report 139:

...Somerton ostensibly presents an ideal situation where short-haul should work. The leaseholders of the Somerton rail facilities noted that the site had a strong natural catchment area of large shippers, closely located around the terminal, with a range of value-adding logistics tasks... and yet the terminal has never seen regular rail shuttles.19

The Austrak Business Park was developed by Austrak in 1998 as a potential terminal for interstate or port rail services, in advance of Austrak entering into arrangements with potential tenants on the balance of the site. Qube leased the terminal since 2005 but predominantly used it for road transfer operations from the Port of Melbourne.

The case study provides an opportunity to consider lessons learned and alternative ways of developing port haul services within the existing infrastructure.
8.2 Rail concept

In late 2016, DP World Australia (DPWA) agreed to plans with Austrak to further develop Austrak’s intermodal freight hub at Somerton inclusive of short haul rail services to its West Swanson Intermodal Terminal (WSIT) including:

- daily port rail shuttles
- expansion to include empty park facilities
- regional train services

Port rail shuttles

Under this concept, the Port of Somerton will be treated as an inland port, i.e. an extension of the existing facility at WSIT. This means that cut-off times for receiving containers will be identical between the two facilities, allowing transport operators to avoid the extra travel distance and congestion on the way to and at the port. The proposed service will be subject to approvals as will the supporting infrastructure upgrades and operational changes at both ends.
Empty park facilities
Access to empty containers for repositioning to regional areas is a critical component of an efficient IMEX supply chain. Port of Somerton will provide empty container services whereby local shippers, cargo owners, transport companies and freight forwarders can drop off laden export containers, pick up empty export containers, dehire empty import containers and pick up full import containers. Figure 17 shows how empty container services will be integrated into the rail supply chain.

Regional and interstate train services
The Somerton facility provides potential for transfer operations such as in the steel supply chain from the broad gauge network (Stoney Point/Frankston line from Hastings) to the standard gauge network.

Figure 13 to Figure 17 provide a visual overview of proposed developments for the Port of Somerton and WSIT. These are discussed in further detail in Table 13.

Figure 13. Austrak Business Park including proposed development for the Port of Somerton
Case Study: Port of Somerton

Figure 14. West Swanson Terminal and West Swanson Intermodal Terminal within Port of Melbourne

Source: Google images, PwC adaptation based on DP World Australia presentation
Figure 15. Rail tracks within the Port of Melbourne

Source: DP World Australia
Figure 16. Proposed development at WSIT

Source: DP World Australia, 2017 Port of Somerton Presentation
Figure 17. Port of Somerton capabilities

Source: DP World Australia, Port of Somerton Presentation
The following table outlines critical issues, as identified in Report 139 affecting the viability of the short-haul service, with an update for the proposed Port of Somerton concept.

**Table 12 Summary of critical issues for port shuttle services operating from Somerton Terminal**

<table>
<thead>
<tr>
<th>Summary issue identified in Report 139</th>
<th>Update for the Port of Somerton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relatively high port terminal costs at West Swanson compared to East Swanson rail facility (rail incurred port terminal handling charge that did not apply to road)</td>
<td>Under the previous port shuttle arrangement, Qube did not have the direct connection between Somerton and either East or West Swanson Dock; a road transfer was needed from Victoria Dock to the Swanson Dock container terminals. This last mile cost was high; theoretically it could cost $400 to move freight from Mildura to Appleton but $275 to transfer from Victoria Dock to WSIT.</td>
</tr>
<tr>
<td>Under the Port of Somerton model, DPWA are responsible for both inland and port-side terminals. DPWA has a competitive advantage in managing the end-to-end scheduling and arrival/ departure windows at both ends. There are efficiencies from using the same terminal operating systems for planning and tracking purposes and quickly responding to late schedule variations.</td>
<td></td>
</tr>
<tr>
<td>Indirect track alignment at Somerton; shuttles leaving Somerton have to travel north before reversing in order to reach the port</td>
<td>This issue remains currently unresolved; 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.</td>
</tr>
<tr>
<td>Trucking efficiency remains relatively high (do not incur the same level congestion as Sydney-Port Botany), reducing viability of rail shuttles in Melbourne</td>
<td>The concept of Somerton as an extension to the WSIT port terminal encourages customers to make use of the shuttle service and avoid the round-trip to the port, irrespective of the relative trucking efficiency. It is expected that road congestion may become worse with significant proposed roadworks and increased toll costs; CityLink road tolls for trucks increased significantly as of 1 April 2017.</td>
</tr>
<tr>
<td>Truck productivity also relatively high due to location of Melbourne’s empty container parks (road operators do not require all vehicles to return to the port)</td>
<td>DPWA anticipates that there will be increased demand for empty parks in the northern suburbs. DPWA works in partnership with 1-Stop and seeks to provide customers with an efficient empty container service which is integrated into the overall supply chain. Figure 17 demonstrates the proposed capability which should minimise truck movements, reduce the pressure of container shortfalls, and reduce supply chain costs.</td>
</tr>
<tr>
<td>Import-distribution centre deconsolidation tasks may be less suited to short haul rail than export-logistics consolidation</td>
<td>DPWA anticipates containers will be full both ways i.e. exporting freight on behalf of agricultural exporters and importing freight for big anchor customers to de-stuff containers, sort and pack into store or customer loads from their national distribution centres.</td>
</tr>
</tbody>
</table>

Source: PwC and Ranbury
8.3 Operational evaluation summary

The following Table 13 provides a completed example of the operational and infrastructure summary for Somerton.

Table 13 Operational evaluation framework for Somerton

<table>
<thead>
<tr>
<th>Cross metro port shuttle case study – Port of Somerton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail concept</td>
</tr>
<tr>
<td>The Port of Somerton will be fully customs bonded and will</td>
</tr>
<tr>
<td>connect Somerton directly by rail shuttle to the DPWA</td>
</tr>
<tr>
<td>Melbourne container terminal in the Port of Melbourne. It is</td>
</tr>
<tr>
<td>designed as an open access common user terminal offering four</td>
</tr>
<tr>
<td>tracks of up to 800 metres in length. The Port of Somerton is</td>
</tr>
<tr>
<td>located within a 106 hectare Austrak Business Park and</td>
</tr>
<tr>
<td>surrounded by industrial precincts. It is planned to become a</td>
</tr>
<tr>
<td>regional freight hub, and an extension of the DPWA container</td>
</tr>
<tr>
<td>handling terminal at Port of Melbourne.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 23 hectares (terminal envelope within 106 hectare business park)</td>
</tr>
<tr>
<td>• 2.5 hectares (hardstand) with plans to expand to 9.5 hectares by mid-2017</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length and number of siding roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 4 loading roads ranging from 550 to 800 metres</td>
</tr>
<tr>
<td>• Only one terminal loading road is currently directly accessible from the concrete hardstand (another is adjacent to gravel area)</td>
</tr>
<tr>
<td>• There are plans to extend the existing hardstand</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicative costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Outside the terminal envelope</strong></td>
</tr>
<tr>
<td>• Anticipated that upgrades to track access to enable an exit directly to south, scope of work under negotiation</td>
</tr>
<tr>
<td>• <strong>Inside the terminal envelope</strong></td>
</tr>
<tr>
<td>- Extensions to the existing hardstand are a key part of the proposed further development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upgrades / improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrades/improvements for the port shuttle service will affect both the Port of Somerton and WSIT.</td>
</tr>
<tr>
<td>• <strong>Port of Somerton</strong></td>
</tr>
<tr>
<td>- Hardstand extension</td>
</tr>
<tr>
<td>- Reefer Points</td>
</tr>
<tr>
<td>- Quarantine Wash Bay</td>
</tr>
<tr>
<td>- Addition Rail sidings</td>
</tr>
<tr>
<td>• <strong>WSIT</strong></td>
</tr>
<tr>
<td>- Capacity for 2 additional lines</td>
</tr>
<tr>
<td>- Track extension (currently limited to 560m)</td>
</tr>
<tr>
<td>- Additional siding(s) are being considered for development on the north-side parallel to the one existing siding. There are planning issues to consider given the proximity of a power substation and the bike path. The power substation will need to be relocated and the bike path may constrain building of the 3rd siding. Refer to Figure 16.</td>
</tr>
<tr>
<td>- Closure of Coode Road to avoid crossing public road. A Development Application has been submitted by DPWA to Port of Melbourne Corporation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminal operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal operator</td>
</tr>
<tr>
<td>DP World Australia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Open / closed access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open access</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Throughput volume (short and long)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Short term (Year 1) minimum 18,000 - 25,000 TEU</td>
</tr>
<tr>
<td>• Year 2 onwards forecast throughput 60,000 TEU</td>
</tr>
<tr>
<td>• Terminal has capacity for up to 500,000 TEU</td>
</tr>
</tbody>
</table>
Case Study: Port of Somerton

Cross metro port shuttle case study – Port of Somerton

Throughput estimates assume 5 services per week with 70 TEU capacity and potential to increase to 15-20 services per week based on existing capacity.

Import versus export, forward vs. backload

Anticipating relatively even balance of imports and exports including:
- Agricultural exports
- Consumer import goods

Road network

Close proximity to major arterials including the Western Ring Road, Citylink and Hume Freeway connecting Melbourne & Sydney, as well as the Craigieburn Bypass.

Rail operations

<table>
<thead>
<tr>
<th>Rail operators</th>
<th>To be appointed following a tender and negotiation process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of service options</td>
<td>Initial start-up services planned at 540m (70 TEU) using one train set with scope to expand.</td>
</tr>
<tr>
<td>Service frequency</td>
<td>Minimum 1 service per day (Monday-Friday)</td>
</tr>
<tr>
<td>Standalone versus integrated</td>
<td>DPWA are not planning to run rail services. They will rely on rail operators to provide rail capacity.</td>
</tr>
<tr>
<td>Rollingstock – own/leased?</td>
<td>Rail service provider will own the rollingstock for the port shuttle operation</td>
</tr>
<tr>
<td>Service provisioning</td>
<td>Rail service provider will perform service provisioning on their own rollingstock with potential for some work to be undertaken at the Port of Somerton</td>
</tr>
<tr>
<td>Rail access charges</td>
<td>Rail access charges will be negotiated with the service provider</td>
</tr>
<tr>
<td>Rail paths</td>
<td>Standard gauge to Port of Melbourne on the ARTC freight network</td>
</tr>
<tr>
<td></td>
<td>ARTC freight line to Sydney</td>
</tr>
<tr>
<td></td>
<td>Victorian broad gauge access</td>
</tr>
<tr>
<td>Commercial terms e.g. take or pay</td>
<td>Subject to negotiation with the rail service provider.</td>
</tr>
<tr>
<td>Comparative road service cost</td>
<td>DPWA anticipate that the cost will be comparable to road.</td>
</tr>
</tbody>
</table>

Rail interfaces

| Access options | Terminal access is indirect; shuttles leaving Somerton have to shunt to the north before heading south to the port |
| | The terminal has dead end roads with loco release. Rakes of wagons may have to be pushed into terminal. |
| Upgrade options | Crossover/signalling upgrades to be confirmed |
| | Potential to upgrade track access with direct access to terminal from the south. |
| Network access | Network access is provided by ARTC |
| Train paths | No significant issues noted with train path availability especially |
### Cross metro port shuttle case study – Port of Somerton

#### including availability

- Given access to the freight network. Proposed rail windows during weekdays include:
  - 07:15 departing Port of Somerton
  - 08:20 rail window starts WSIT
  - 12:00 departing WSIT
  - 12:50 arriving Port of Somerton

Additional rail window proposed as follows:
- 16:00 departing Port of Somerton
- 17:15 rail window starts WSIT
- 21:00 departing WSIT
- 21:50 arriving Port of Somerton

Weekend shuttles to be coordinated on demand.

---

<table>
<thead>
<tr>
<th><strong>Any constraints for ad-hoc paths?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>DPWA have determined that additional adhoc train paths can be obtained on the ARTC network.</td>
</tr>
</tbody>
</table>

There are no noise curfews implemented in Victoria. Noise obligations are regulated by environmental legislation and state government guidelines although they are specific to passenger, rather than freight rail. The Victorian government may investigate policy options given forecast freight volumes under the Inland Rail project. The Victorian government will be able to consider lessons learned from the NSW Strategic Noise Action Plan (developed in 2012).

---

### Network infrastructure issues

- **Rail network**
  - Height clearance does not allow for double-stacking
  - Only one loading line at WSIT
  - Shunting across the Dock Link Road at West Swanson
  - Long trains would need to be broken outside of the Port precinct

- **Road network**
  - DPWA need to close Coode Road

---

### Port-side – West Swanson Intermodal Terminal (‘WSIT’)

<table>
<thead>
<tr>
<th><strong>Port access / services</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>West Swanson Terminal is operated by DPWA</td>
</tr>
<tr>
<td>1 x 560m dual gauge loading siding at West Swanson (one dead end siding with limitations on train configuration and run-around of the locomotive)</td>
</tr>
<tr>
<td>Placing of rail wagons in the loading siding requires shunting across Dock Link Road.</td>
</tr>
<tr>
<td>Potential extension to existing rail track with additional or extended sidings. Total siding length could reach 1200 – 1800m with these developments.</td>
</tr>
</tbody>
</table>

---

### Stevedore charges

Certain charges are incorporated as part of the road transfer from WSIT across Coode Road (West) to the DPWA container terminal at West Swanson Terminal (WST). Transfers to other container terminals and depots do incur a last-mile road transfer cost.

---

### Number and type of lifts/transfer

- Coode Road (West) (road under the control of Port of Melbourne Operations) currently divides the rail facility at WSIT from the port-side West Swanson Terminal (‘WST’). Coode Road (West) is expected to be closed to public access later in 2017 to allow DPWA vehicles and machinery direct access between the WSIT rail shuttle and WST quayside.
- Potential for automation and rail mounted gantry depending on
Case Study: Port of Somerton

**Cross metro port shuttle case study – Port of Somerton**

*volume and market demand*

Source: Terminal operator data, PwC analysis

Table 14 below compiles the relevant, and multiple, stakeholder entities associated with the operations of the Somerton case study. The matrix highlights the complexity of assembling a port shuttle in the rail supply chain and provides a grounded example of the fourth component of the BITRE Report 139 (motivations of various interest groups).

### Table 14 Stakeholder motivations with regard to Somerton port shuttle

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Case Study</th>
<th>Motivations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hinterland terminal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hinterland terminal owner</td>
<td>Austrak</td>
<td>• Improve returns on initial investment in the Austrak Business Park (originally developed with intention as interstate/port shuttle terminal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improve lease value of Austrak Business Park lots</td>
</tr>
<tr>
<td>Hinterland terminal operator</td>
<td>DP World Australia</td>
<td>• Achieve scale of volume to improve asset utilisation and productivity of existing infrastructure and operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide differentiated service to customers and thereby increase customer demand and protect/consolidate market share</td>
</tr>
<tr>
<td><strong>Intermodal companies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Benefit from competitive supply chain costs as a result of integrated terminal to stevedore service</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improve reliability of service by avoiding road congestion through metropolitan Melbourne</td>
</tr>
<tr>
<td><strong>Maritime terminal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maritime owner</td>
<td>Port of Melbourne</td>
<td>• Use Somerton/WSIT as proof of concept for port shuttle services to/from the Port of Melbourne. Useful reference for development of Rail Access Strategy (consider challenges and lessons learned)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increase number of shipping containers via the Port of Melbourne and thereby increase revenue from port charges earned per container</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Protect/increase market share of total Australian sea freight</td>
</tr>
<tr>
<td>Stevedores (maritime terminal operator)</td>
<td>DP World Australia</td>
<td>• Improve reliability of scheduling by avoiding road congestion through metropolitan Melbourne</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improve ability to manage delays and coordinate transfers with the integrated booking and transfer system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improve productivity of port-side container handling tasks</td>
</tr>
<tr>
<td><strong>Rail operations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track infrastructure company</td>
<td>ARTC</td>
<td>• Increase access revenue for network manager</td>
</tr>
<tr>
<td>Rail operator</td>
<td>To be confirmed</td>
<td>• Increased revenue by expanding existing intermodal rail freight services to/from Somerton</td>
</tr>
</tbody>
</table>
Stakeholder | Case Study | Motivations
--- | --- | ---
**Government / councils** | | |
Local council | City of Melbourne (Port of Melbourne) | • The City of Melbourne has refreshed its Future Melbourne plan with consultation from a wide range of community stakeholders. The Future Melbourne 2026 Plan provides a strategic guide to the Council which includes priorities for effective freight solutions and greenhouse gas targets
  - Priority 6.4: Implement innovative and effective urban freight solutions.
  - Priority 1.3: Emit zero greenhouse gases. Melbourne will become a zero net emitter of greenhouse gases.

| | City of Hume (Somerton) | • The City of Hume has outlined its economic development strategy with strategic goals to position and promote Hume as a place for business to prosper and develop sustainably and build and maintain a globally competitive economic infrastructure. The desired future state for Hume City includes a high proportion of businesses actively involved in import replacement and export delivery. The Hume City Plan 2030 includes an objective by 2024 to facilitate effective, integrated road and rail networks to support industry growth and the creation of job opportunities.

| **State government** | Economic Development, Jobs, Resources and Transport | • Increase in rail mode share for freight
• Use Somerton/WSIT as proof of concept for port shuttle services to/from the Port of Melbourne. Useful reference when evaluating future applications for the Victorian port rail shuttle fund and/or assessing the need for state subsidies.

Source: PwC/Ranbury

### 8.4 Conclusion

The Somerton terminal has reinforced a number of principles that are essential or contribute to successful short haul operations. These include:

- **Co-location** - Dominant freight customers are located at Somerton or in the Somerton catchment area.

- **Minimise PUD costs** - Somerton will potentially reduce the PUD costs for customers co-located on site at the Somerton Austrak Business Park and the surrounding catchment area if an efficient rail service to/from the port is established.

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Avoiding road congestion - Somerton provides an alternative point of discharge for containers from the north Melbourne catchment area that allows road or rail services to terminate at Somerton avoiding potential congestion issues between Somerton and WSIT. Congestion on the Ring Road or Citylink Toll Road appears to be increasing over recent years. The terminal is located on the HPFV A Double Network which enables high productivity vehicle access from North Victoria and North Melbourne which makes it a logical transfer point from HPFV to rail.

Most of these conditions have existed in recent years but previous attempts to establish a viable port shuttle service from Somerton have not succeeded. DPWA are optimistic that the port shuttle service to WSIT will be efficient and competitive for a number of reasons outlined in the stakeholder engagement process. These include:

Control of both the metro and port terminals by a stevedore and integrated booking and transfer systems - The ability to collect or drop off containers at Somerton and have DPWA handle and coordinate transfers to/from the port for shipping services increases service reliability with DPWA operating both terminal facilities.

Direct rail access to WSIT and to quay-side - Improvements to WSIT through the closure of Coode Road will provide a more streamlined container transfer operation from rail to the berth reducing rail supply chain costs.

Proposed scale operations with backhaul volumes – DPWA anticipates containers will be full both ways i.e. exporting freight on behalf of agricultural exporters and importing freight for big anchor customers to de-stuff containers, sort and pack into store or customer loads from their national distribution centres.

Value-adding activities - DPWA anticipates that there will be increased demand for empty parks in the northern suburbs. Integration of empty container services / repositioning as part of the rail supply chain will provide a seamless solution for customer IMEX transport requirements. The proposed capability is designed to minimise truck movements, reduce the pressure of container shortfalls, and reduce supply chain costs.

Challenges for the operation will be:

Negotiating direct rail access from the south - 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.

Dealing with multiples parties in the supply chain - These negotiations are more complex because of the overlap standard gauge and broad gauge track infrastructure between VicTrack, V/Line and ARTC with multiple stakeholder involvement.

Potential congestion of services in/around the Dynon port precinct

Length of train consist at WSIT – the siding at WSIT is currently limited to 560 metres although there are plans to extend and duplicate this siding with a total siding length of 1200 to 1800 metres. The proposed Western Distributor / West Gate Tunnel Project will potentially impact on any WSIT rail developments as part of the structure crosses over the WSIT terminal boundary.
9 Case Study: Redbank

9.1 Overview

The case study relates to a proposed intermodal rail facility to provide port shuttle services to the Port of Brisbane for customers on the Goodman Redbank site.

The existing rail facility was a major Queensland Rail (QR) maintenance workshop that was transferred to Aurizon upon the separation of the freight and passenger rail businesses. Aurizon has withdrawn from the majority of freight services in SEQ reducing the requirement for the facility. The site has been sold to Goodman Group who have already developed major freight warehousing and distribution centres on a site at the rear of the Redbank rail facility. Part of the Redbank workshop site is leased to Aurizon and sub-leased to Progress Rail who undertake limited rail maintenance tasks at the site.

It is proposed that the site will be developed by Goodman Property Services (property developer) in partnership with DB Schenker (freight forwarder) who is a major Goodman tenant in the adjoining precinct.

The project is currently at the concept stage of assessment and is still under development. The site has access to the SEQ narrow gauge rail network enabling connectivity to the Port of Brisbane. Goodman and DB Schenker are considering preliminary configuration options for the location of a terminal facility on the site. The feasibility assessment is expected to be finalised by Dec-2017.

Location

The landholding is 58 kilometres by road (via the Logan Motorway) from the Port of Brisbane and 46 kilometres by rail. Figure 18 shows the site location with respect to the Port of Brisbane and other intermodal terminal locations (SCT Bromelton, Acacia Ridge, Brisbane Multi-Modal Terminal at the port and potential Ebenezer site).

Figure 18. Port of Brisbane master plan

Source: Port of Brisbane, Business Review 2016, PwC update
Goodman Redbank landholding
The total precinct envelope has an area of approximately 200 hectares which can accommodate over 140 hectares of industrial facilities (94,000sqm is already developed). Figure 19 shows that the cumulative holding is dissected by a 16 hectare land dedication to the Department of Transport and Main Roads (TMR) for the potential Goodna Bypass Corridor. The proposed site for the rail facility is highlighted in the south west corner.

Figure 19. Goodman land holding

Source: Goodman Property Services Redbank brochure

Commercial objectives
DB Schenker is an existing tenant at the Goodman Redbank site. It provides freight forwarding services /warehousing & distribution services to customers including major whitegoods/brown goods manufacturers, consumer/retail distributors, healthcare product distributors as well as others. DB Schenker is a key driver of the plan to develop a port shuttle rail facility with two key objectives:

- Reduce carbon emissions – DB Group has a target to reduce carbon emissions by 20 per cent by 2020. If the freight transport is converted from road to rail, emissions for that task are estimated to reduce by two thirds
- Scalability – a rail service supported by reach stacker equipment would provide a quicker cycle time for heavy freight movements.

Rail facility development
An initial terminal area of between 3 and 5 hectares is proposed for the terminal development together with upgraded rail track infrastructure and road infrastructure to connect the intermodal facility to adjacent distribution centres/warehouses/customer fulfilment centres.
9.2 Rail Concept

The rail concept under current consideration includes:

- a port rail shuttle
- site container storage.

Port rail shuttle

Shuttles will travel from the Brisbane Multi-Modal Terminal (at the Port of Brisbane) to the Redbank intermodal terminal. Freight flows will be predominantly import based given service demand from DB Schenker’s customer base. It is assumed 75 per cent of containers will be 40 foot and remaining 25 per cent will be 20 foot.

DB Schenker’s cost modelling has indicated that the minimum volumes required are 12,000 – 13,000 TEU per annum based on an initial 3 services per week with 74 TEU per train. DB Schenker are proposing to minimise start-up costs by leveraging the existing rail infrastructure wherever possible. The existing rail siding inside the landholding can accommodate a train length of 430-500m without the need to break the train. Track infrastructure in the Redbank siding adjacent to the rail network may need to be extended /upgraded outside the precinct to optimise the rail service operation.

Container storage

MRC\(^2\)\(^2\) has indicated it would lease a hardstand area (1.2 hectares) adjacent to the rail facility for storage purposes. MRC is a distributor of pipe, valve and fitting products.

Other opportunities

Other opportunities for consideration include:

- Empty container services – Similar to those proposed at the Port of Somerton, Redbank could provide empty container services which are integrated as part of a rail supply chain solution. Empty container storage would be cheaper inland compared to the Port of Brisbane and could enable cost savings for container repositioning (which can otherwise be a significant cost)

- Cotton warehousing and exports – Redbank could offer storage space and export services for regional cotton producers originating from south west Queensland. The volumes of cotton moving from south west Queensland to the port for export are significant – 34,214 TEU of containerised cotton and 23,379 TEU of containerised cottonseed were exported from the Port of Brisbane in 2012/13\(^2\)\(^4\). There are however issues with the rail infrastructure west of Toowoomba including:

  - Height restrictions within the tunnels - the preferred 9 foot 6 inch containers for transporting cotton are not able to fit through tunnels on the

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\(^2\) MRC Global serves the oil and gas industry across the upstream, midstream and downstream sectors as well as the mining & mineral processing, chemical, and gas distribution market sectors in Australia.

\(^4\) Arthur Spellson, Cotton’s Export Freight Task, 2013
Western Line (height of 8 foot, 6 inches). As noted previously, Queensland Rail has funded a project to lower the floor of the existing 11 rail tunnels on the Toowoomba Range and Little Liverpool Ranges to provide clearance for international standard size containers (high cube containers up to 10 foot 6 inches). Construction is expected to be complete by early 2018 (February).

- Axle load limits will continue to be restricted to 15.75 tonne axle load.

The Toowoomba Range rail crossing would be redundant with the completion of Inland Rail. Inland Rail is to be dual gauge on the Queensland end, and remove the tunnel height and axle load constraints along its route. The narrow gauge feeder lines in Queensland will still need to have their low axle load constraints dealt with if the traffic warrants.

- JBS (meat packer and exporter) – The Dinmore processing plant is located 7 kilometres west of the Redbank site. It is the largest beef plant in the southern hemisphere and currently receives livestock to its abattoir by rail (Aurizon is the rail operator). The potential freight volumes for processed meats to the Port of Brisbane are significant and rail would have an advantage in its payload (compared to road which has an 85 tonne gross vehicle mass limit at the port). However, there would be complexity in designing an efficient PUD transfer between the Dinmore processing plant and the Redbank rail facility. The rail concept would also need to be adapted to cater for phase power refrigerated containers required for export processed meat.

- Regional and interstate train services - In the longer term, there is potential to provide services to North Queensland and develop services for longer line haul routes from Redbank on the North Coast Line (NCL) to destinations in North Queensland.

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Figure 20. Indicative rail facility development

Source: Aurizon indicative port shuttle plan
9.3 Operational evaluation framework

The following Table 15 provides a completed example of the operational evaluation framework for Redbank.

Table 15 Operational evaluation framework for Redbank

<table>
<thead>
<tr>
<th>Cross metro port shuttle case study – Redbank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terminal options</strong></td>
</tr>
<tr>
<td><strong>Rail concept</strong></td>
</tr>
<tr>
<td><strong>Area</strong></td>
</tr>
<tr>
<td>There is a total precinct development envelope area of 200 hectares which is divided into 2 major land holdings (separated by a road corridor reserve held for potential development of motorway route). Three to five hectares are proposed for the intermodal rail facility with upgraded road infrastructure and terminal configuration to connect intermodal facility to adjacent distribution centres/warehouses/customer fulfilment centres. Refer to Figure 20 site plans including:</td>
</tr>
<tr>
<td>• 2.4 hectares loading/unloading area (hardstand)</td>
</tr>
<tr>
<td>• 1.2 hectares MRC yard (hardstand)</td>
</tr>
<tr>
<td>• 2.1 hectares future expansion</td>
</tr>
<tr>
<td><strong>Length and number of siding roads</strong></td>
</tr>
<tr>
<td>The current preliminary draft terminal layout plan has scope for a 500m loading siding that would require pushing the Port Shuttle into the terminal. Initial lifting equipment for terminal operations to include 1 reach stacker and heavy forklift.</td>
</tr>
<tr>
<td><strong>Indicative costs</strong></td>
</tr>
<tr>
<td>Initial capex estimates of the required terminal infrastructure are $20m. This excludes track infrastructure (i.e. relates to road infrastructure and pavement upgrades).</td>
</tr>
<tr>
<td><strong>Terminal operations</strong></td>
</tr>
<tr>
<td><strong>Terminal operator</strong></td>
</tr>
<tr>
<td>• In the short term, DB Schenker will assume responsibilities of terminal operator in order to commence port shuttle services</td>
</tr>
<tr>
<td>• In the long term, the model of terminal operation will depend on the scale of operations and interest from other transport companies</td>
</tr>
<tr>
<td>• DB Schenker is also investigating a multi-skilled approach whereby staff responsible for rail operations could become trained to operate heavy lifting equipment and take on responsibilities for loading/unloading the train</td>
</tr>
<tr>
<td>• Goodman will be the asset manager.</td>
</tr>
<tr>
<td><strong>Open / closed access</strong></td>
</tr>
<tr>
<td>Likely to be open access to enable other Redbank tenants to transfer freight by rail. Commercial arrangements will be confirmed subject to negotiation.</td>
</tr>
<tr>
<td><strong>Throughput volume (short and long term)</strong></td>
</tr>
<tr>
<td>Minimum viable start up volumes considered to be in the region of 12,000 – 13,000 TEUs assuming three services per week with each train carrying 55-74 TEU.</td>
</tr>
</tbody>
</table>
### Cross metro port shuttle case study – Redbank

- **Proposed turnaround time for load/unload operations** will be 4 hours.

#### Import versus export, forward vs. backload
- **Predominantly import** given DB Schenker’s customer base.
- There are limited opportunities for backloading under the current DB Schenker rail concept but they could be developed as part of services for cotton warehousing/exports, JBS meat exports or empty container repositioning.

#### Road network
**Network connectivity**
- Ipswich Motorway is located within 1 km - the recently upgraded Ipswich Motorway provides direct toll free access via an A-double (two 40-foot containers on one vehicle) and B-double approved link road.
- Logan Motorway Interchange is within 5 km

**Within the terminal**
- A-double road infrastructure within terminal precinct
- Plans for connecting road between Weedman Street to Robert Smith Street (connecting the 2 land holdings)

### Rail operations

#### Rail operators
- Initial consultations were held with three rail operators (Pacific National, Aurizon and Southern Shorthaul Railroad (SSR) with each showing differing levels of interest.

#### Length of service options
- Initial proposal for a 425m port shuttle – length is limited by the rail siding at Redbank (430-500m).
- Brisbane Multi-Modal Terminal at the Port of Brisbane can cater for a train length of 900 metres (dual gauge).

#### Service frequency
- 3 trips per week

#### Standalone
- Rail is currently envisaged as a standalone linehaul task.

#### Rollingstock – own/leased?
- Rollingstock will be provided by the rail operator.
- Supply of narrow gauge rollingstock is constrained.

#### Service provisioning
- To be confirmed by the rail operator

#### Rail access charges
- To be confirmed in consultation with Queensland Rail (QR).

#### Rail paths.
- To be confirmed in consultation with QR. Paths are available.

#### Commercial terms
- Depending on final negotiations, rail services are likely to be contracted on a take-or-pay arrangement predicated on 12,000 – 13,000 TEU per annum.

### Rail interface

#### Redbank access options
- Current access from the QR network requires access into Redbank arrival roads and shunting into the Redbank facility. Condition and length of holding roads to be confirmed.
- Under the current track configuration, trains would need to be pushed into the terminal and rail siding. This could be a shunt-intensive operation.

#### Upgrade options e.g. signalling, crossings, alignment
- Upgrades to be confirmed
- Condition of the arrival roads to be confirmed.

#### Network access
- Initial consultations have been held with Queensland Rail (QR)
### Cross metro port shuttle case study – Redbank

<table>
<thead>
<tr>
<th>Train paths including availability</th>
<th>Narrow gauge capacity to the Port of Brisbane is currently available.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any constraints for ad-hoc paths? e.g. passenger curfews or priority</td>
<td>Shared passenger/freight network between Redbank and Dutton Park. The return journey also generally entails use of the shared narrow gauge track from Lytton Junction to Yerongpilly. Work day morning and afternoon passenger peak periods involve a freight curfew. Noise curfews are also a constraint for Brisbane, both on the corridor to the port and around the terminals at Acacia Ridge and Moolabin (not at the Port itself). Both terminals generate noise complaints, with some sensitivity around the intensity of late night working. Acacia Ridge has a very large noise barrier erected on the western boundary (residential side) to ameliorate noise impacts. While there is no formal curfew, the State Government has a restriction on the total coal freight train paths from the west to the Port of Brisbane (currently paths able to be contracted by QR are limited to 87 each way), which is partly dictated by trying to limit the number of late night freight trains to manage community noise complaints.</td>
</tr>
</tbody>
</table>

### Port-side

<table>
<thead>
<tr>
<th>Port access / services</th>
<th>Brisbane Multi-User Terminal (BMT) terminal owned and operated by the Port of Brisbane Pty Ltd (PBPL) Multi-user terminal with current user Aurizon. Pacific National has run services in the past.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading slots</td>
<td>Significant capacity likely to be available. Current IMEX traffic to the port is limited to 6 IMEX narrow gauge services per week from Central / North Queensland. Inland Rail will result in a significant lift in the number of regional port shuttles from south west Queensland.</td>
</tr>
<tr>
<td>BMT / Stevedore charges</td>
<td>BMT operations are undertaken internally by PBPL for the Aurizon rail services. Terminal lift rates are published online. As at 01-Nov-2016, rates per TEU (20’ foot equivalent unit) and FEU (40’ foot equivalent unit) were published as follows: $61 per TEU (excluding GST) $72.75 per FEU (excluding GST)27 In addition, a transfer is required from the BMT to the Stevedore berths. DB Schenker is investigating the use of subcontractors at the BMT. 3 stevedores include DPWA, Patricks and Brisbane Container Terminals (part of Hutchison Port Holdings). Task load between these 3 is roughly 50:40:10.</td>
</tr>
<tr>
<td>Number and type of lifts/transfers</td>
<td>• Transfer between the berth and the terminal • Lift on/off</td>
</tr>
</tbody>
</table>

Source: Terminal operator data, PwC/Ranbury analysis

Table 16 below compiles the relevant, and multiple, stakeholder entities associated with the operations of the Redbank case study. The matrix highlights the complexity of assembling a port shuttle in the rail supply chain and provides a grounded example of the fourth component of the BITRE Report 139 (motivations of various interest groups).

### Table 16 Stakeholder motivations with regard to Redbank port shuttle

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Case study - Redbank</th>
<th>Motivations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hinterland terminal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hinterland terminal owner</td>
<td>Goodman Group</td>
<td>• Create competitive advantage (compared to Sydney/Melbourne) in order to attract international customers to develop sites in Redbank, Brisbane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increase occupancy of vacant sites at Redbank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improve lease value of Redbank lots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enhance partnerships with major customers to secure long-term commercial relationships</td>
</tr>
<tr>
<td>Hinterland terminal operator</td>
<td>DB Schenker</td>
<td>• Support DB Group objectives to reduce CO2 emissions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Enable delivery of customer product; Eco Solutions which allows customers to reduce, compensate for or avoid CO2 emissions along the entire supply chain (including CO2-free product for rail transport)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Leverage in-house technical and operational knowledge within DB Group to develop intermodal port haul rail service as competitive advantage</td>
</tr>
<tr>
<td><strong>Intermodal companies</strong></td>
<td>Logistics providers</td>
<td>• DB Schenker provides third party logistics to its customer base. Goods are unpacked, sorted, stored and picked for delivery to retailers such as Harvey Norman, malls, hospitals, government offices, police departments and homes. A customer fulfilment centre has been developed for Officeworks.</td>
</tr>
<tr>
<td></td>
<td>including DB Schenker, TNT and Northline</td>
<td></td>
</tr>
<tr>
<td><strong>Maritime terminal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maritime owner</td>
<td>Port of Brisbane Pty Ltd ('PBPL')</td>
<td>• Increase number of shipping containers via the Port of Brisbane and thereby increase revenue from port charges earned per container</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Protect/increase market share of total Australian sea freight</td>
</tr>
<tr>
<td>Stevedores (maritime terminal operator)</td>
<td>DPWA Patrick Brisbane Container Terminals (Hutchison)</td>
<td>• Improve productivity of port-side container handling tasks</td>
</tr>
<tr>
<td><strong>Rail operations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Track infrastructure company</td>
<td>Queensland Rail</td>
<td>• Increase access revenue for network manager</td>
</tr>
</tbody>
</table>
Case Study: Redbank

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Case study - Redbank</th>
<th>Motivations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail operator</td>
<td>TBA</td>
<td>• Expansion of intermodal rail freight services into new markets by DB Schenker (who currently use shuttle services operating to Port Botany)</td>
</tr>
</tbody>
</table>

**Government / councils**

<table>
<thead>
<tr>
<th>Local council</th>
<th>City of Ipswich</th>
<th>• Promote investment and economic development projects to support the city council’s economic development plan (2009 – 2031) including:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- City growth;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Create one of the largest job and industry growth zones in Australia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Target new investment from industries that export products and services from the City</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Build sector competitiveness or add capabilities to existing industry clusters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Build competitive local supply chains and build industry capacity through technology uptake</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- City competitiveness;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Develop trade and export links to support long term competitiveness in the economy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Proactive investment in transport and other infrastructure to meet industry and employee expectations and city growth targets</td>
</tr>
</tbody>
</table>

| State government          | State Development Department of Transport and Main Roads | • Increase in rail mode share for freight |

Source: PwC/Ranbury

### 9.4 Conclusion

The Redbank/BMT port shuttle concept is a new initiative in South East Queensland with no meaningful operation having operated in the past. While approval for the operation has not been achieved at this point in time, the proposed port shuttle operation reinforces a number of principles from the BITRE Report 139 that are essential or contribute to successful short haul operations.

DB Schenker and Goodman are investigating all options to increase the efficiency and competitiveness of the shuttle. The proposed port shuttle operation aims to leverage off the following advantages. These include:

- **Co-location** – current lease holders on the Goodman Redbank site include the logistics providers; TNT, DB Schenker and Northline.

- **Minimising PUD costs** – planning for the terminal aims to minimise PUD costs due to the proximity of customers in the Redbank development and integrating the operations.

- **Building service demand** - there are some significant freight customers at Redbank and in the surrounding catchment area. The proposed service is endorsed by a major core customer with 50 per cent of the minimum volume
available for the operation. There is potential additional volume from the service in the catchment.

- **Excellent connectivity** - with the road and rail freight networks. The recently upgraded Ipswich Motorway is located within one kilometre and provides direct toll free access via an A-double and B-double approved link road. The Logan Motorway Interchange is also within five kilometres.

- **Available network and port rail terminal capacity** – the Brisbane Multi-Modal Terminal at the Port of Brisbane is under-utilised.

- **Value adding** - some potential value adding activities appear possible in terms of empty container services / repositioning.

Challenges for the operation will be:

- attracting additional customers to the rail operation to increase scale and efficiency

- competing for customer demand against alternate industry sites such as Bromelton and Ebenezer, which are intermodal terminal sites nominated to potentially align with the Inland Rail standard gauge route

- achieving a two way loading freight profile with disparate products and freight categories

- remuneration of the capital investment associated with the establishment of the terminal facility

- confirmation of the suitability of the existing track infrastructure external to the terminal that will be required for exiting the network and efficiently placing and loading the rail services

- establishing rail schedules that have to accommodate the constraints associated with passenger service peak period curfews

- ongoing improvements to the road network in south east Queensland and the potential approval of increased heavy vehicle combinations

- competing for track access along the existing rail path from Redbank to Yeerongpilly through to the Port of Brisbane given prospective freight coming off the Inland Rail route and accessing the port from Yeerongpilly, as well as freight from the narrow gauge Queensland North Coast Line freight.
10 Considerations for Government

This study has provided an operational evaluation framework which is designed to inform Government’s considerations when reviewing proposals for port shuttle operations. Further to this framework, the table below outlines potential roles for Government (at various levels) to consider.

Table 17 Potential roles for Government

<table>
<thead>
<tr>
<th>Pre-condition</th>
<th>Role for Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 What is the freight commodity and is it contestable for rail transport?</td>
<td>No role for any tier of Australian Government</td>
</tr>
<tr>
<td>2 Does the commodity throughput meet minimum rail volume thresholds?</td>
<td>No role for any tier of Australian Government</td>
</tr>
<tr>
<td>3 Does the rail supply chain solution meet minimum service criteria?</td>
<td>Potential role for State and Federal Government to plan for the design, construction, financing and ongoing management of dedicated freight lines within Metropolitan areas where congestion impacts (frequency, transit time, reliability) on shared rail networks is a proven deterrent to freight on rail and contributes to substantial volumes of heavy vehicles on the corresponding road network. Examples of projects may include Western Sydney Freight Corridor. Potential role for State and local government to preserve and protect sites for terminals of state and local significance which may impact the ability of the supply chain solution to meet service requirements. An example is the reservation of a Northern and/or Western Interstate Freight Terminal in Melbourne which could leverage existing direct port access and potential future Inland Rail to generate sufficient volumes to underpin a cross metro service.</td>
</tr>
<tr>
<td>4 Does the throughput profile support a rail solution?</td>
<td>No role for any tier of Australian Government</td>
</tr>
<tr>
<td>5 What is the proposed origin and destination for the rail task and is there the necessary rail infrastructure and facilities on the proposed route?</td>
<td>As above (3), there is a potential role for State and local government to preserve and protect sites for terminals of state and local significance which may impact the ability of the supply chain solution to meet service requirements.</td>
</tr>
<tr>
<td>Pre-condition</td>
<td>Role for Government</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>6 Is the rail operating model effective (optimal rail logistics configuration for the port shuttle products and route) and can it meet rail demand requirements?</td>
<td>As above (3), there is a potential role for State and Federal Government to plan for design, construction, financing of dedicated freight lines within Metropolitan areas. Potential role for State and Federal Government to plan and potentially finance the upgrade of tonne axle load limits on intrastate and interstate rail networks. This will be particularly important in networks such as South Western Queensland networks where an uplift in volume is forecast in relation to Inland Rail. Potential role for State Governments to consider upgrades to existing infrastructure or investment in new infrastructure to provide dedicated tracks for freight traffic (thereby avoiding constraints on path availability and the risk of prioritisation in favour of passenger rail on a shared passenger/freight network).</td>
</tr>
<tr>
<td>7 What are the commercial arrangements for the task?</td>
<td>Potential role for State Governments to consider interim funding support against clear and measurable objectives until rail volumes grow to viability. However the effectiveness of this option should carefully assessed in light of existing subsidies including the Perth port shuttle subsidy and the Victorian Mode Shift Incentive Scheme. Government funding would need to be targeted with clear objectives, measurable benefits and defined sunset clauses.</td>
</tr>
<tr>
<td>8 Is the port shuttle rail solution competitive with road transport costs?</td>
<td></td>
</tr>
</tbody>
</table>

Source: PwC/Ranbury
Appendices

Appendix A  Linehaul Efficiency Factors  85
Appendix B  Operational Evaluation Framework Template  92
Appendix A  Linehaul Efficiency Factors

Linehaul efficiency factors have first been discussed in Section 4. Further details are provided here with regard to:

- linehaul distance
- heavy vehicle mass limits
- backhauls and empty container services.

**Linehaul distance**

**Population distribution and density**
The geographic distribution and density of Australia’s population is distinct from Europe and North America. This is a significant driver for the type and nature of the resulting freight tasks.

The Australian Bureau of Statistics cited that at June 2015, around two-thirds of Australia’s population, 15.9 million people, lived in a Greater Capital City. Figure 21 shows the significant variation in population density across the country with the highest population density in the capital cities located on the coastline.

**Figure 21. Population density in Australia, June 2015 - Statistical Areas Level 2 (SA2)**

![Population density map of Australia](image)

Source: Australian Bureau of Statistics

Figure 22 illustrates that, in comparison to Australia, Europe has a relatively high density of population that is more consistently spread within its continental land area. Similar to Australia, North America has a number of key capital cities located on the coastline next to a port but, unlike Australia, its population distribution is also characterised by a number of significant inland 'hubs' which represent population and economic centres.
Linehaul Efficiency Factors

Figure 22. Population density across the world (estimated 2015)

![World population density map showing estimated data for 2015. The map uses different shades to indicate population density levels, ranging from light orange to dark brown.](image)

Source: Population Density World Map

**Competitiveness of sea freight**

Given Australia’s population centres are densely focused around the ports in its capital cities, freight movements can be made by sea or land (rail/road). Coastal shipping freight rates are highly competitive. As a result, sea freight has attracted a growing market share of domestic freight, which has led to a shift from rail to sea freight e.g. on the east-west corridor between eastern states and Perth.

**Land-bridge**

Melbourne has acted as a rail extension, ‘land-bridge’, to Adelaide with the 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 (e.g. Appleton Dock) while other train movements are to South Dynon intermodal terminal (with containers then conveyed to the stevedore container stacks by road vehicles).

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

**Regional IMEX**

Regional IMEX services in Australia are weighted towards exports; they typically move freight from the inland terminal stationed near an agricultural area or manufacturing/processing facility to the nearest port. Commodities include containerised grain, minerals, wine, meat, rice, cotton and paper products, depending on the state and regional specialism. The point to point rail service is more suited to export since goods are consolidated within their catchment area and conveyed in one shift by train to the port.

Regional centres in Australia are relatively small compared to the major inland population centres in North America and Europe. Corresponding regional IMEX services in North America may in fact relate to long-haul journeys rather than short-haul flows. For example, the San Pedro Bay rail operations include a short haul movement (between the on-dock and inland terminals) before transferring to a long-distance rail service.

**Cross metro port shuttles**

Cross metro port shuttles relate to freight movements between an intermodal terminal and a dedicated or shared port terminal facility. This category of short-
haul can be challenging because the line-haul distance is so short (typically up to 60 kilometres). The ratio of drayage and container handling time to transit time can adversely affect the competitiveness of rail economics compared to road.

There are relatively few overseas case studies provided by Report 139 with such a short linehaul distance. One is the Port of Göteborg in Sweden which offers a 12 kilometres shuttle service between the Norra terminal in Central Göteborg and the Göteborg Norra container terminal at the port. Another is the Wiri Inland Port shuttle train which provides a metropolitan rail shuttle over 25 kilometres between Wiri and the Ports of Auckland in New Zealand.

Cross metro port shuttles are running in Perth and Sydney. Further analysis of these markets is discussed in section 6.

**Heavy vehicle mass limits**

Linehaul economies for both rail and road are affected by the payload limits for train wagons and road vehicles respectively.

Australian road haulage is privileged by the larger road vehicle size and mass limits which are permitted on its road network. General comparative permissible mass limitations for different international regions are summarised in Table 18.

<table>
<thead>
<tr>
<th>Region</th>
<th>Vehicle mass limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Typically B-doubles run to the ports with a 62.5t GML. Outside of metropolitan areas, even larger vehicle combinations such as road trains are allowed to operate on some routes. These have a general mass limit (GML) from 79.0t (A-double) to 115.5t (A-triple). Refer to Appendix A for additional details.</td>
</tr>
<tr>
<td>Europe</td>
<td>Intermodal containers carry 40 foot ISO containers with 44.0t mass limit (similar to a 6-axle semi-trailer in Australia).</td>
</tr>
<tr>
<td>United States</td>
<td>Baseline vehicles operate on the Interstate Highway System with a 36.3t gross mass limit (similar to a 5-axle semi-trailer in Australia).</td>
</tr>
</tbody>
</table>

Source: PwC/Ranbury analysis

**Australia heavy vehicle regulation**

While weights and dimensions are controlled by State Governments, national processes have led to a high degree of uniformity in weights and dimensions, especially for vehicles up to around 46 tonnes.

While road trains can provide valuable payload efficiencies for long-haul services (124.5t higher mass limit (‘HML’) for an A-triple), their access within metropolitan areas is restricted. B-doubles are more common in transporting freight to the ports and still have a significant GML of 62.5t (9-axle B-double).
Figure 23. Common heavy vehicle combinations in Australia

**Europe heavy vehicle regulation**

EC Directive 96/53/EC of 25 July 1996 defines the maximum dimensions and weights for trucks used in border crossing transport in the EU. Member states are obliged for market reasons to respect the same length maxima for trucks in national transport, but may set other limits for height, weight and axle loads.

Current EU law limits the maximum permissible vehicle mass to 40 tonnes, except for intermodal transports using 40-foot containers which are allowed a maximum weight of 44 tonnes.

**United States heavy vehicle regulation**

In the United States, there is a mix of Federal and State regulation; Federal requirements for vehicle weights and dimensions are applied to the Interstate Highway System, and vehicles on other roads are subject to State regulations. Federal regulations permit a gross vehicle mass of 36.3t.

Figure 24 illustrates the baseline vehicle combinations in the United States (a 5-axle tractor-trailer and a tractor plus two 28 or 28.5-foot trailers).
Higher productivity vehicle configurations are allowed on some highways (including the Rocky Mountain Double, Triple Trailer Combination, and Turnpike Double) which have a gross vehicle weight between 45.4t and 63.5t. Figure 25 highlights the road network which allows for vehicles with a combination longer than 60 feet (18.3m).

28 Longer and Heavier Vehicles: An Overview of Technical Aspects, JRC Scientific and Technical Reports, Guillaume Leduc, 2009
**Backhauls and empty container services**

Report 139 discusses the impact of backhauls on the relative competitiveness of road and rail.

As an overall market, Australia is characterised by significantly more full import containers than full export containers, and greater use of forty-foot containers for imports than for exports. Consequently, a large volume of containers are exported empty.\(^\text{29}\)

Both road and rail suffer from back haulage issues where freight flow imbalances can lead to empty return movements; “having balanced freight flows is a key, but often-unstated, element of efficient haulage.”\(^\text{30}\) Report 139 indicates that this issue can affect road freight more due to that mode having higher linehaul costs.

Ideally, rail and road productivity is maximised when full loads are carried in both directions. However, there is a challenge in optimising the traffic imbalance because the demand for freight flows is not evenly balanced, the timing of outbound/inbound flows is unlikely to be synchronised and lastly, the containers cannot always be easily interchanged. However, road is more flexible in chasing and gathering backloads, but less interested in empty containers.

As a result of which there is a significant demand in Australia for empty container services including container preparation and re-positioning.

**A container fit for purpose**

Container dimensions and features are specific to the commodity being transported. Various types of containers include:

- standard dry cargo containers for hardware and consumer goods
- “reefer” containers for goods that need to be transported at a constant temperature above or below 0°C e.g. transporting meat, fruit, vegetables, dairy products, chemicals, pharmaceuticals etc.
- open top containers equipped with removable top covers
- flat rack containers for loading from the top or sides
- bolster platform containers used for transporting large/heavy cargo such as industrial machinery.

For example, grain is typically transported in 20’ containers because of its greater logistical efficiency (each 20’ container can hold around 26-28 tonnes of grain whereas a 40’ container has a loading capacity of 30 tonnes but occupies twice the shipping volume). Cotton, on the other hand, is typically packed in 40’ containers.

**Empty container parks**

Empty container parks provide services such as:

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\(^{29}\) Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2014, *Containerised and non-containerised trade through Australian ports to 2032-33*, Report 138, Canberra ACT

\(^{30}\) BITRE Report 139 p.26
- consolidation of import containers to one location (stock control)
- detailed examination of containers by qualified inspectors (to check for damage, maintain it to internationally accepted standards, determine suitability of reuse for an export booking)
- provision of export containers to an exporter’s nominated carrier.

**Triangulation**

Triangulation is an agreement whereby a container can be unpacked from an importer and handed directly to an exporter for re-packing, without the container being transported empty to an empty container park.

Triangulation is a relatively new concept. A trial was tested in 2006 in the Port of Melbourne by Murray Goulburn Co-operative and Patrick Port Services. Bypassing the empty container park process proved to be problematic but the study recognised that it could lead to time and cost-saving benefits if the pre-conditions could be realised.
Appendix B  Operational Evaluation Framework Template

A blank template of the operational evaluation framework has been provided below Table 19.

Table 19 Operational evaluation framework

<table>
<thead>
<tr>
<th>Terminal options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual layout</td>
</tr>
<tr>
<td>Area</td>
</tr>
<tr>
<td>Length and number of siding roads</td>
</tr>
<tr>
<td>Indicative costs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Terminal operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal operator</td>
</tr>
<tr>
<td>Open / closed access?</td>
</tr>
<tr>
<td>Throughput volume (short and long term)</td>
</tr>
<tr>
<td>Import versus export, forward vs. backload</td>
</tr>
<tr>
<td>Road network</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rail operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail operators</td>
</tr>
<tr>
<td>Length of service options</td>
</tr>
<tr>
<td>Service frequency</td>
</tr>
<tr>
<td>Standalone</td>
</tr>
<tr>
<td>Rollingstock – own/leased?</td>
</tr>
<tr>
<td>Service provisioning</td>
</tr>
<tr>
<td>Rail access charges</td>
</tr>
<tr>
<td>Rail paths.</td>
</tr>
<tr>
<td>Commercial terms e.g. take or pay</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rail interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access options</td>
</tr>
<tr>
<td>• Existing track infrastructure</td>
</tr>
<tr>
<td>• New access options</td>
</tr>
<tr>
<td>• Direct vs. shunting</td>
</tr>
<tr>
<td>Upgrade options e.g. signalling, crossings, alignment</td>
</tr>
</tbody>
</table>

Existing track infrastructure
New access options
Direct vs. shunting
Upgrade options e.g. signalling, crossings, alignment
Network access

Train paths including availability

Any constraints for ad-hoc paths?
e.g. passenger curfews or priority

Port-side

Port access / services

Loading slots

BMT / Stevedore charges

Number and type of lifts/transfers

Source: PwC/Ranbury