Import/Export Logistics Chain Study

Summary Report

June 2013

QTLC
QUEENSLAND TRANSPORT AND LOGISTICS COUNCIL

PORT of BRISBANE
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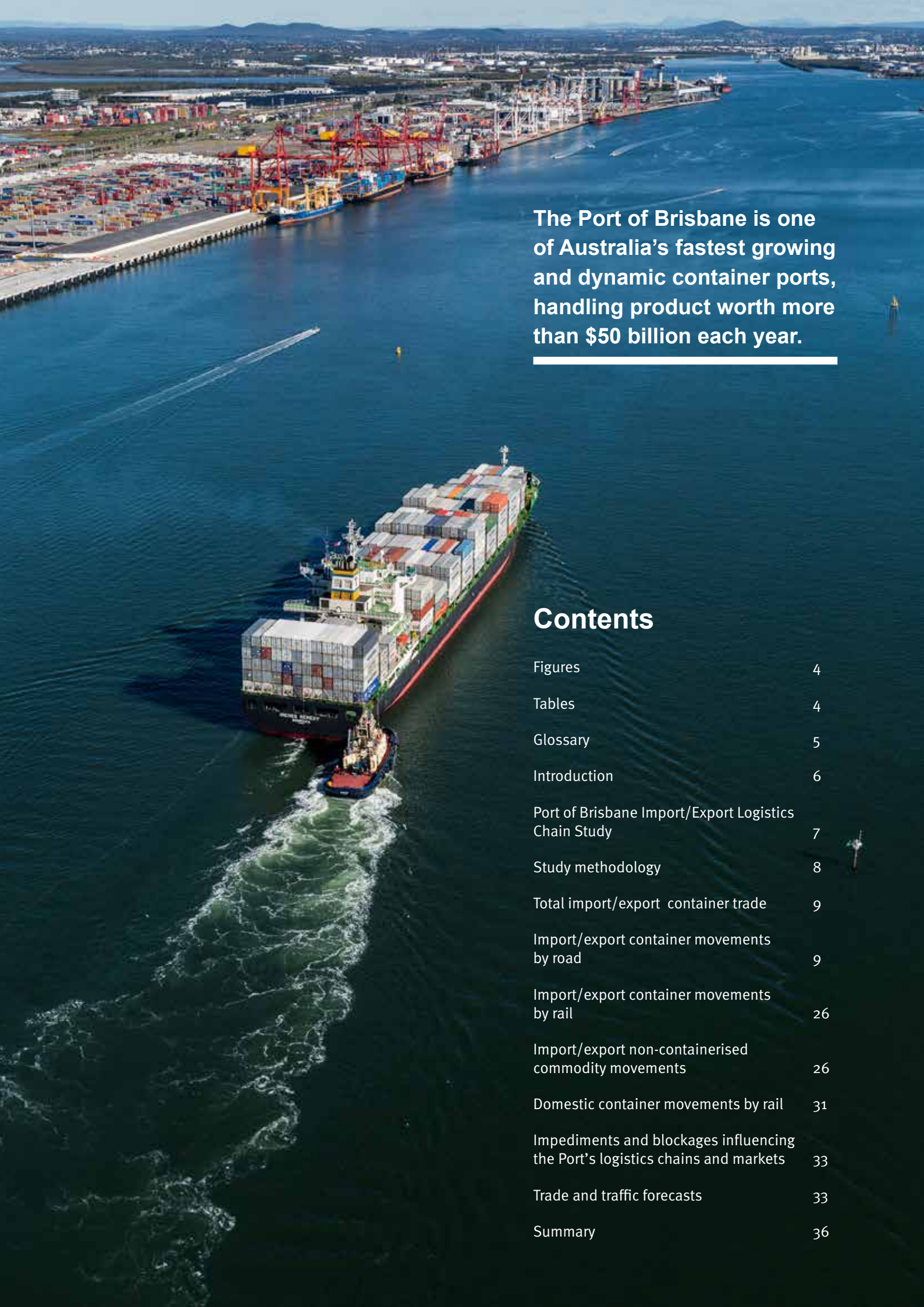
RELIANCE AND DISCLAIMER

This document has been produced solely for the Port of Brisbane Pty Ltd (PBPL), the Queensland Transport and Logistics Council (QTLC) and other member agencies of the Project Team.

The study relied on data supplied from a number of parties and it was necessary during the study to rely on the validity and accuracy of the data. The data and a number of analysis procedures were used to generate estimates of the items that are reported in this document. Appropriate professional practice has been used and the estimates contained in this document are expected to be suitable for management and planning by the member agencies of the Project Team. The estimates might not be suitable for investment grade decisions.

ACKNOWLEDGEMENTS

The Project Team and members of the study team wish to thank all businesses, industry associations and government agencies who provided valuable data and consultation time during the study.



The Port of Brisbane is one of Australia's fastest growing and dynamic container ports, handling product worth more than $50 billion each year.

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Term	Definition
Container or shipping container	Standardised steel boxes (20 feet or 40 feet long and 8 feet wide and high) used to carry import and export freight. Domestic freight containers also include 30, 45, 48 and 53-foot units.
Container freight stations (CFS)	A location where a third party may pack or unpack containers on behalf of the importer or exporter.
Container movement	The transport by road or rail of a container between two businesses in the import/export container chains or the domestic container chain.
Destination	The location where containers are unpacked.
Domestic container	A container used for the transport of domestic freight. Usually purpose-built and slightly larger than an international shipping container.
Empty container park (ECP)	A handling and storage facility for empty containers.
Importer	A business operated primarily for the purpose of importing freight, or for providing import-related services to other companies.
Intermodal	The movement of containers interchangeably between transport modes (e.g. road and rail), where the equipment is compatible with the multiple modal systems.
Level of service (LOS)	A qualitative measure describing operational conditions of a traffic stream. At LOS D, speed is restricted and at LOS F, queuing and delays occur.
Logistics chain	A logistics management system that integrates the sequence of activities from delivery of raw materials to the manufacturer through to the delivery of the finished product to the customer.
Origin	The location where containers are packed.
Passenger car unit (PCU)	Indicates the influence that a vehicle class (e.g. rigid truck) has on road traffic operations, relative to a 'standard passenger car'.
Port	Port of Brisbane
Repositioning	The export of an empty container to an overseas destination as directed by the owner of the container (usually a shipping line).
Staging	The process of storing containers prior to delivery to importers, ECPs, exporters or stevedores. Containers may be stored at transport yards, intermodal container terminals or inland/regional container terminals. Staging can apply to both empty and full containers.
Stevedore	A business that engages in loading and unloading ships' cargo.
TEU	A standard 20-foot shipping container.
TEU equivalent	The quantity of commodities that would come from an unpacked container or go to a packed location.
Transport yard	A location used by road service providers from where they manage their business, generally with capacity to sign-on employees, park vehicle fleets and stage containers, as required by their customers.

Introduction

The Port of Brisbane is one of Australia's fastest growing and dynamic container ports, handling product worth more than $50 billion each year.

As Queensland's largest multi cargo port – and Australia's third largest container port – the Port of Brisbane is driving economic growth throughout Queensland and Northern New South Wales. In 2012, it handled more than a million shipping containers, equivalent to 14% of Australia's total containerised trade (Figure 1).

Located approximately 20 km east of the Brisbane CBD, the Port is managed and developed by the Port of Brisbane Pty Ltd (PBPL), under a 99-year lease from the Queensland Government.

The Port provides and maintains infrastructure and facilities for general cargo as well as for containers, motor vehicles, and wet and dry bulk. Its world-class facilities include cargo-handling infrastructure, warehousing and storage areas, bulk handling, storage and wharf facilities and container parks.

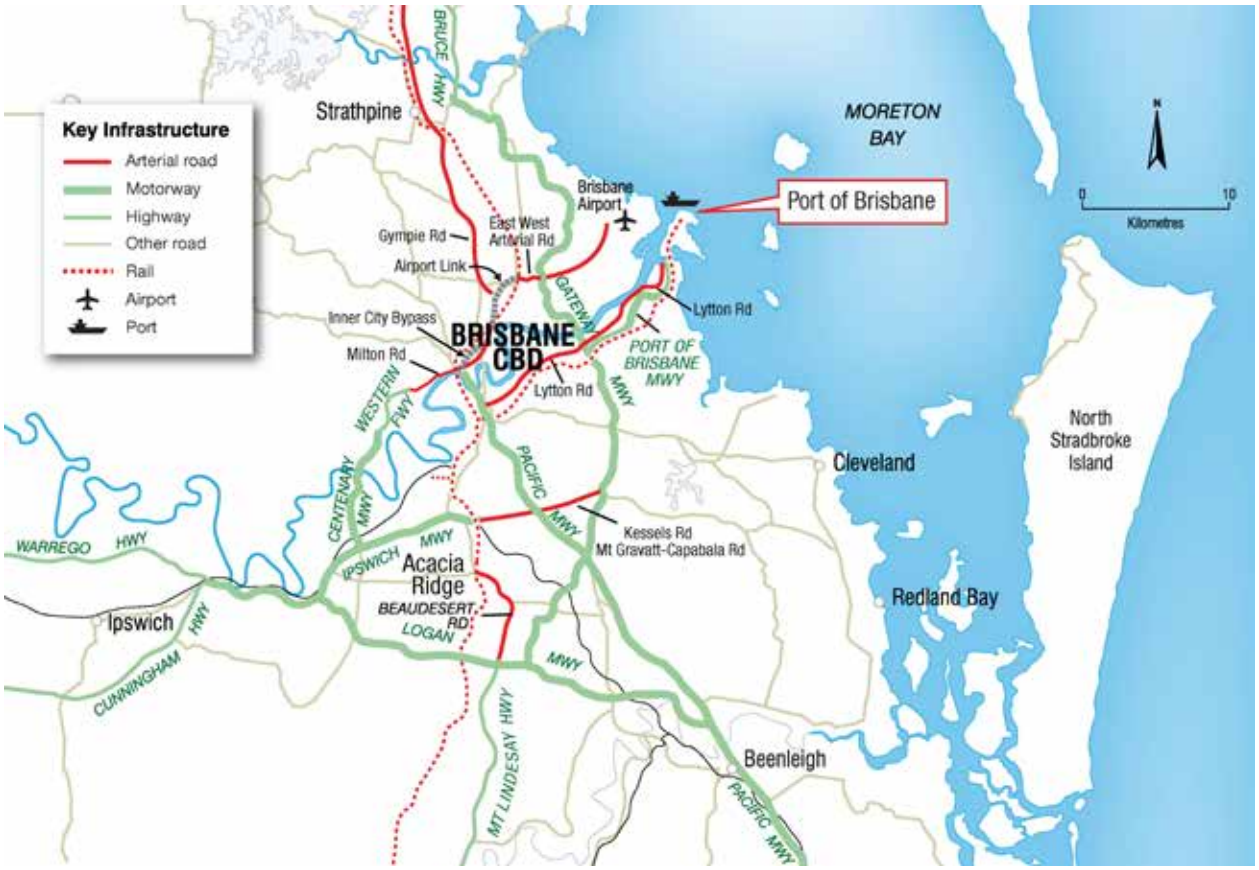
Extensive road connections link the Port to major growth areas, providing access to prime agricultural and mining regions. Rail freight is supported by the Brisbane Multimodal Terminal, a dedicated rail facility for general cargo and container movements into and out of the Port.

Effective road and rail networks, and seamless landside movement – now and in the future – are critical for the Port to continue to be an efficient, productive and sustainable link in the Queensland supply chain.

The Port of Brisbane Ltd, in conjunction with the Queensland Transport and Logistics Council (QTLC), has conducted an import/export logistics chain study to provide a detailed understanding of the main landside logistics chains serving the Port. This report will, in turn, help with medium and long-term transport and logistics planning for the Port as demand for its services continues to grow.

This document provides a high level summary of the final report.

Figure 1 Location of the Port and major road networks



Port of Brisbane Import/Export Logistics Chain Study

The specific objectives of the study were to describe and quantify the following components of the import/export and domestic logistics chains:

- landside movement of import/export containers by road and rail
- major routes used for import/export and domestic freight as well as traffic flows and conditions
- landside movement of selected non-containerised commodities
- import/export container contents and movement to and from pack/unpack locations
- logistics chains for selected commodity classes, including factors influencing freight volumes, movements and modal choice
- current and contestable boundaries for selected commodities and identification of barriers to entry
- landside movement of domestic containers through the intermodal terminals in Brisbane
- trade and traffic forecasts for import/export containers and selected non-containerised commodities.

This document provides a summary of the final report and is limited to the following areas:

- landside movement of import/export containers
- major container routes, volumes and traffic conditions
- landside movement of selected non-containerised commodities
- landside movement of domestic containers
- impediments and blockages influencing the Port's logistics chains and markets
- trade and traffic forecasts.

The study was undertaken by the Institute for Supply Chain and Logistics and Pekol Traffic and Transport. Information generated from the study will have value for infrastructure planning and management in Brisbane and regional Queensland by the participating agencies.

Study methodology

For this comprehensive assessment of import/export and domestic container movements, large samples of detailed high-integrity data were required, complemented by interview data from related businesses on their freight operations. Seventy-seven businesses participated in the study and provided large samples of data on container and non-containerised movements for a two-week period in September 2012. Data on import container destinations for the full September 2012 period was obtained from Australian Customs and Border Protection Services.

Detailed supporting data on freight operations was obtained from 32 of the businesses.

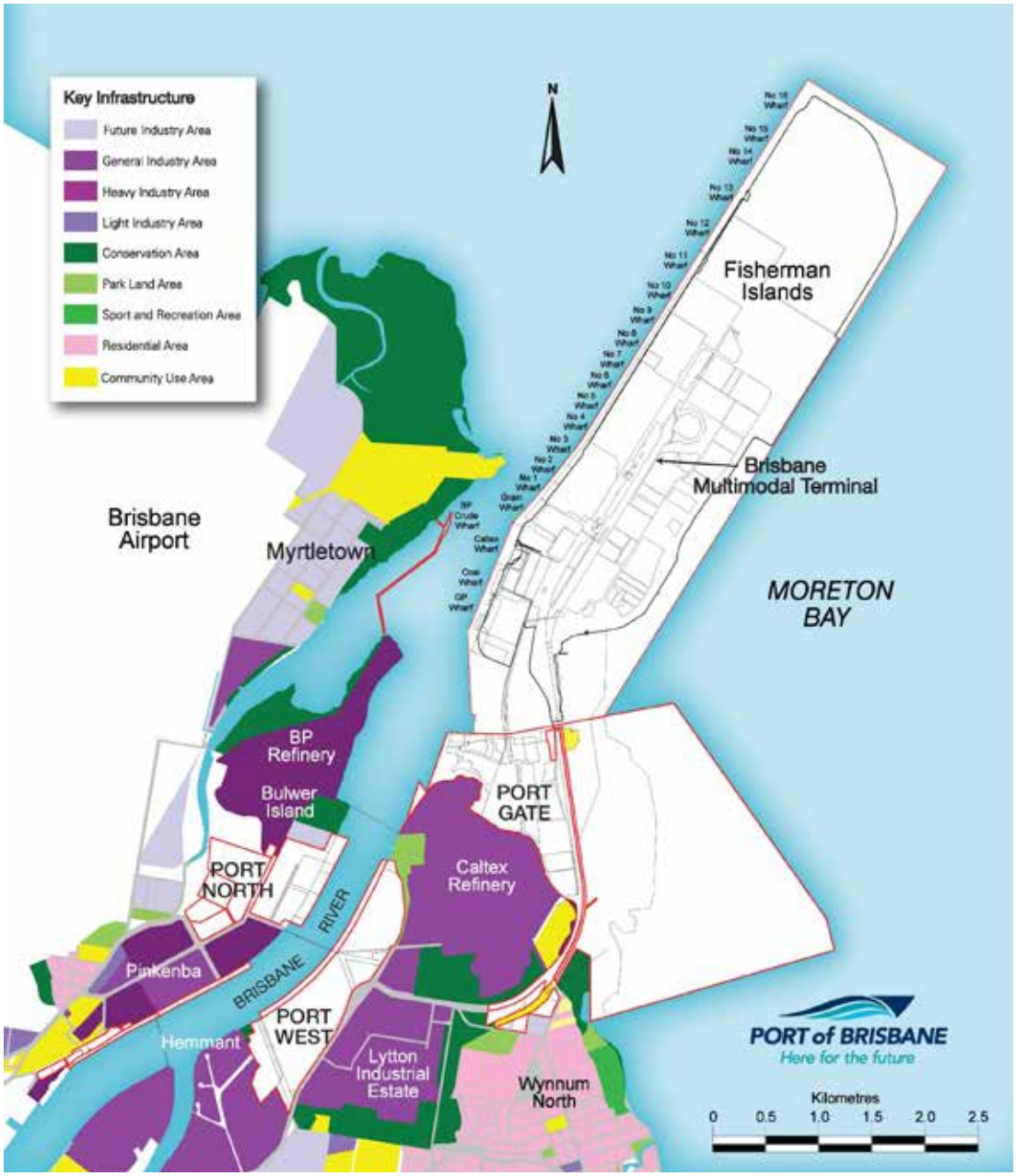
The data samples were of sufficient size to generate statistically reliable estimates for each component of the study.

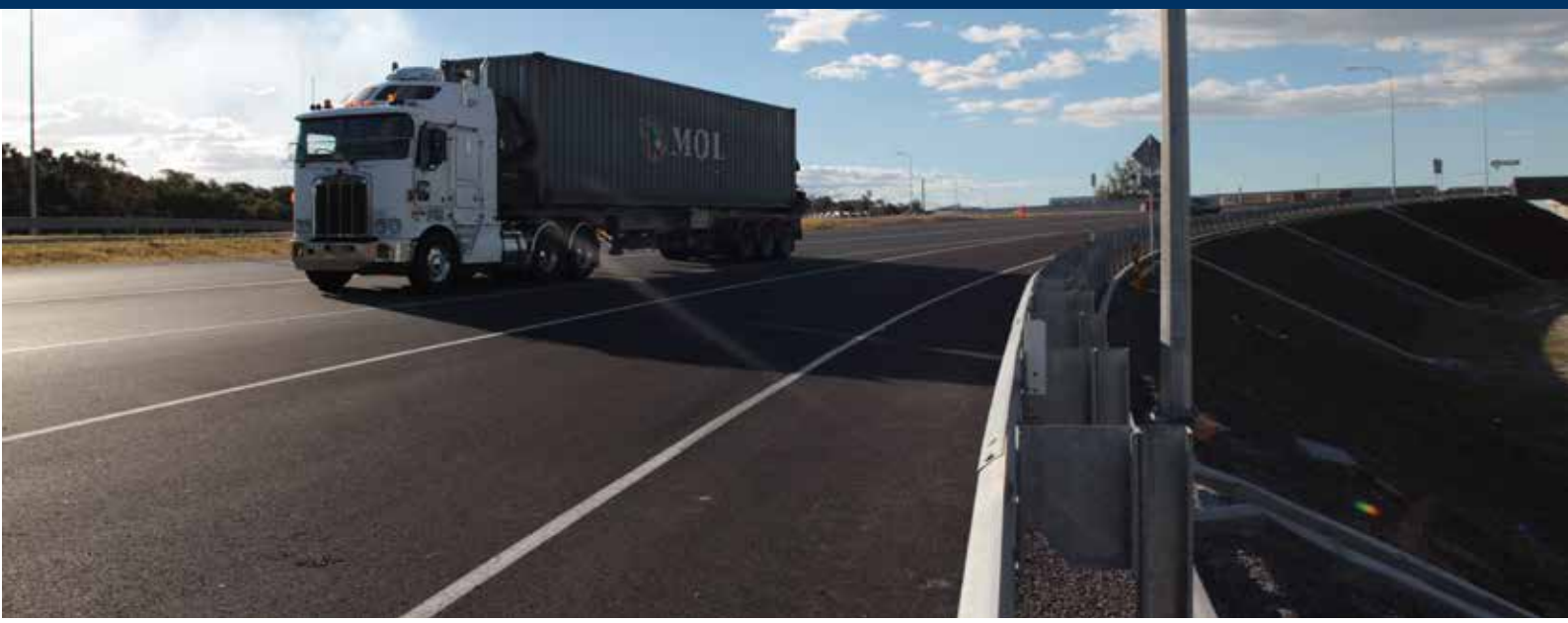
For the purpose of this study, the Port-related infrastructure and activities (Figure 2) included:

- Fisherman Islands and the adjacent Port Gate area, as well as Port North and Port West, located approximately 2 km upriver
- landside activity on the established arterial road network linking the Port to the Port hinterland
- movement of import/export containers through the Brisbane Multimodal Terminal to regional intermodal terminals.

There are three intermodal terminals located in the south-west of Brisbane that facilitate the movement of intra-state and interstate domestic containers.

Figure 2 The Port of Brisbane, Port North, Port West and adjacent suburbs





Total import/export container trade

In 2012, the Port's total container throughput was 1,031,000 containers (TEUs) as shown in Table 1. Of these:

- 45% (462,000) were full imports
- 32% (331,000) were full exports
- 23% were empty containers.

Of import/export containers, 95% were transported to/from the Port by road and 5% were transported by rail through the Brisbane Intermodal Terminal.

Figure 3 shows the breakdown between full and empty containers for 2012.

Import/export container movements by road

The proportions of full and empty import/export containers transported by road are shown in Figure 4 and indicate that:

- at 47% of total import/export movements, full import containers are the largest component
- 18% were empty export containers for repositioning overseas.

Of the containers transported by road:

- 21% of full import containers (94,000 TEUs) were transported directly to importers from stevedores
- 27% of full export containers (81,000 TEUs) were transported directly from exporters to stevedores
- 44% of full import containers (201,000 TEUs) were staged at transport yards
- 50% of full export containers (152,000 TEUs) were staged at transport yards
- 45% of containers were transported by Super B-doubles, A-doubles and B-doubles; 45% by semi-trailers; 9% by sideloaders; and less than 1% were transported by rigid trucks
- the average number of containers (TEUs) carried per truck was 2.1
- the estimated average moves of a container (in TEUs) across the total import/export chain is 4.34
- the operating hours of most businesses in the container logistics chain are 6 am to 6 pm Monday to Friday, and most container truck trips occurred within these periods
- 93% of import containers were unpacked and 74% of exports were packed within 100 km of the Port
- 60% of full export containers and 50% of full import containers remained less than 24 hours in transport yards, which is in line with other Australian ports
- the average elapsed times at empty container parks was 21 days
- turnaround times for all containers arriving into and departing from Australia (as full exports or part of the empty container repositioning chain) was generally in excess of 20 days.

Figure 3 Total import/export containers in 2012

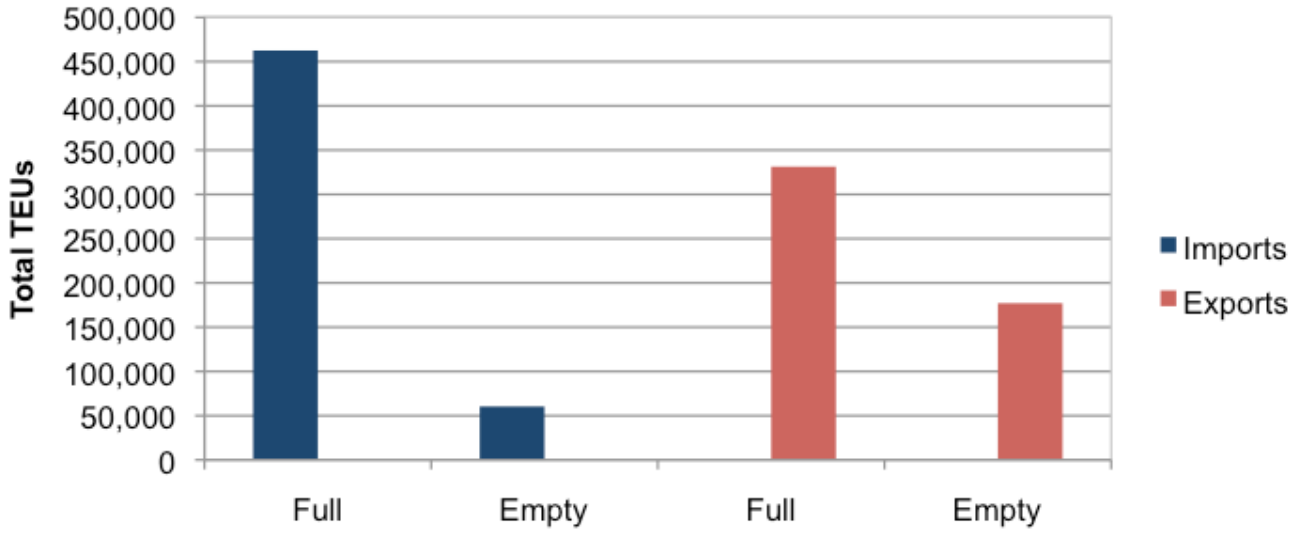


Figure 4 Proportions of full and empty containers transported by road

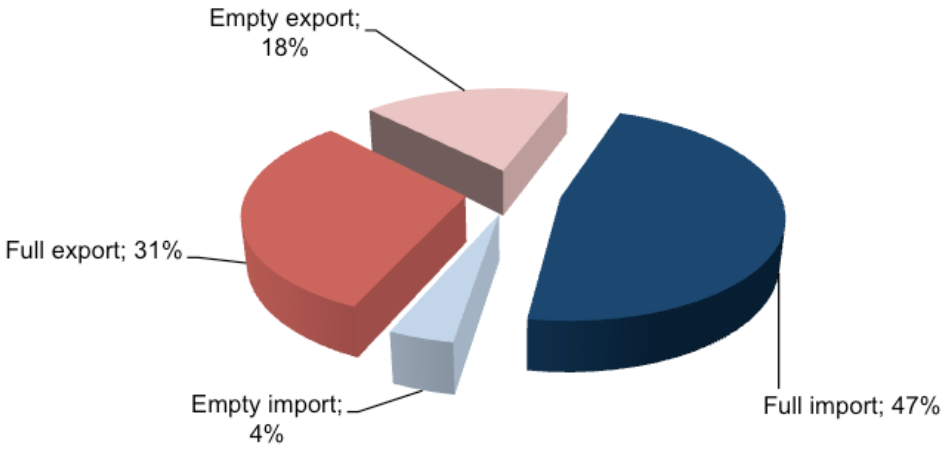


Table 1 Total import/export containers moved by road and rail

		Imports		Exports		Total	
		TEUs	%	TEUs	%	TEUs	%
Road	Full containers	457,350	87.5	305,342	60.1	762,692	78.2
	Empty containers	37,842	7.2	174,429	34.3	212,271	21.8
	Sub total — Road	**495,192**	**94.7**	**479,771**	**94.4**	**974,963**	
Rail	Full containers	5,171	1	26,023	5.1	31,194	55.2
	Empty containers	22,596	4.3	2,683	0.5	25,279	44.8
	Sub total — Rail	**27,767**	**5.3**	**28,706**	**5.6**	**56,473**	
Total – Road and rail		**522,959**	**100%**	**508,477**	**100%**	**1,031,436**	

Geographic destinations — summary for import containers

The destinations (i.e the unpack locations) for import containers (Figure 5) indicate that:

- approximately 25% are unpacked in or near the Port
- over 60% are unpacked in Brisbane, the majority being within 40 km of the Port
- over 90% are unpacked in Brisbane or the adjacent statistical regions, the majority being within 100 km of the Port
- the remaining small percentages are unpacked in other Queensland regions (3%) or interstate (4%), most of the latter being in northern New South Wales.

Import destinations — Brisbane suburbs

Over half (52%) of the import containers were unpacked at the Port or one of 11 Brisbane suburbs that lie within 40 km of the Port, as summarised in Table 2 and Figure 6.

- 25% were unpacked at the Port or the general Port area, which includes the contiguous industrial districts of Lytton, Hemmant and Murarrie; most went to Lytton and Hemmant (20% of all import containers), requiring minimal container movement from the wharf.
- 27% were distributed to eight additional suburbs in Brisbane geographically concentrated in three main areas (East Brisbane, South Brisbane and North Brisbane). Importers in these areas were typically located in corridors near the Gateway, Logan and Ipswich Motorways, the Warrego Highway and south along the Pacific Motorway; each area has a direct arterial road network connection to the Port.
- In 2012, Brisbane's 12 most significant (suburban) destinations for import containers each received more than 11,500 TEUs.

Import destinations — Brisbane and adjacent statistical regions

The geographic locations of the import container destinations in Brisbane and adjacent statistical regions are shown in Table 3 and Figure 7.

- 66% of container destinations were in Brisbane and the most significant areas were Brisbane East (including the Port), Brisbane South and Brisbane North; only 14% were delivered to suburbs across the metropolitan area other than those identified in the previous section.
- 27% of import containers were distributed to the adjacent statistical regions.
- Ipswich (11%) was the single most significant statistical area, which reinforces the significance of the south-west flow of containers from the Port.

Import destinations — regional Queensland and interstate

Only 7% of import containers were distributed across regional Queensland and interstate as shown in Table 4, with most locations within 750 km of the Port.

- 3% of import containers were distributed across regional Queensland; the most significant regions were around Toowoomba, Townsville, Wide Bay and the Darling Downs (Maranoa) and the number of containers per region varied from 1,800 to 4,000 TEUs.
- 4% of import containers were distributed interstate; the most significant states were NSW (2%) and Victoria (1%) and the most significant destinations were Sydney (8,400 TEUs) and Melbourne (5,700 TEUs).
- In New South Wales, the most significant destinations were Sydney (2%) and Richmond - Tweed (0.2%).

Table 2 Import container destinations — Brisbane suburbs[1]

Area	Destination	TEUs	%	
Port and contiguous suburbs	Port of Brisbane	11,893	2.6	25.3
	Lytton	54,725	12.0	
	Hemmant	36,145	7.9	
	Murarrie	13,140	2.9	
Other significant Brisbane suburbs	Coopers Plains	18,461	4.0	26.7
	Rocklea	17,623	3.9	
	Virginia	15,267	3.3	
	Wacol	15,033	3.3	
	Hendra	15,005	3.3	
	Acacia Ridge	15,004	3.3	
	Eagle Farm	13,886	3.0	
	Richlands	11,730	2.6	
Total		**237,913**	**52%**	

1. These statistics map state suburbs that approximate suburbs in urban areas. State suburbs can be made up of aggregations of ABS SA1-Level.

Figure 5 Full import container destinations

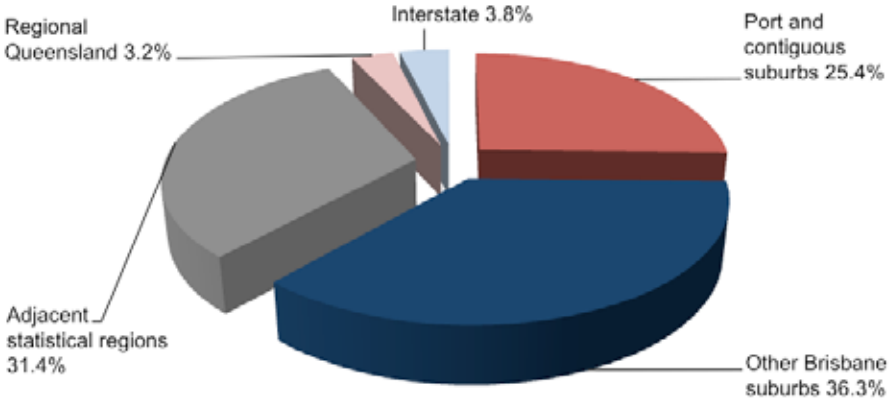
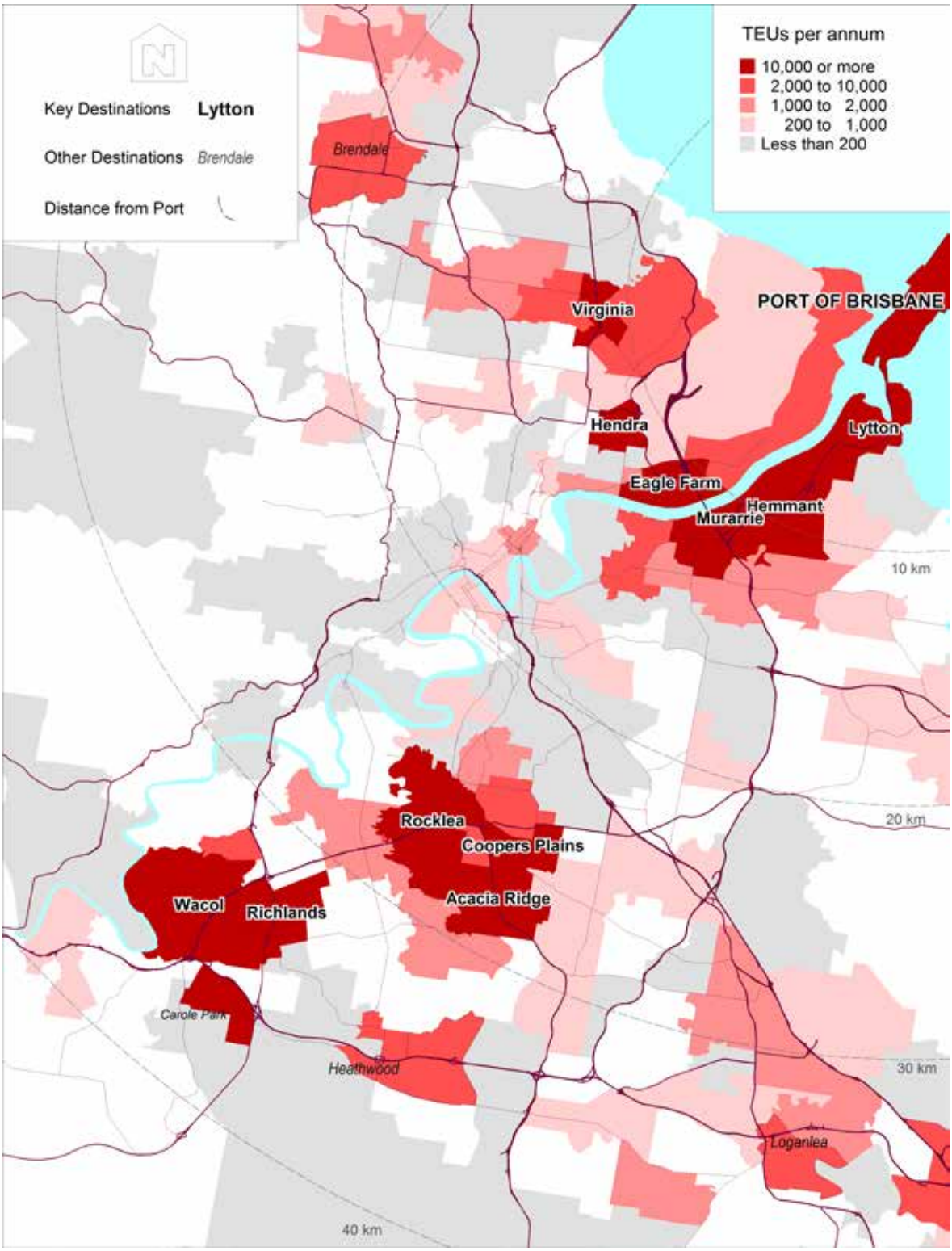


Table 3 Import container destinations — Brisbane and adjacent statistical regions[1]

Area	Destination	TEUs	%	
Brisbane	Brisbane - East	122,299	26.7	65.8
	Brisbane - South	85,712	18.7	
	Brisbane - North	62,101	13.6	
	Brisbane - West	2,227	0.5	
	Brisbane Inner City	28,711	6.3	
Adjacent statistical regions	Gold Coast	32,777	7.2	27.2
	Ipswich	50,361	11.0	
	Logan - Beaudesert	19,434	4.2	
	Moreton Bay - South	11,237	2.5	
	Moreton Bay - North	6,625	1.4	
	Sunshine Coast	4,076	0.9	
Total		**425,560**	**93%**	

1. Statistical areas are ABS SA4-Level. They are based on labour markets considering the labour supply (where people live) and demand (where people work).

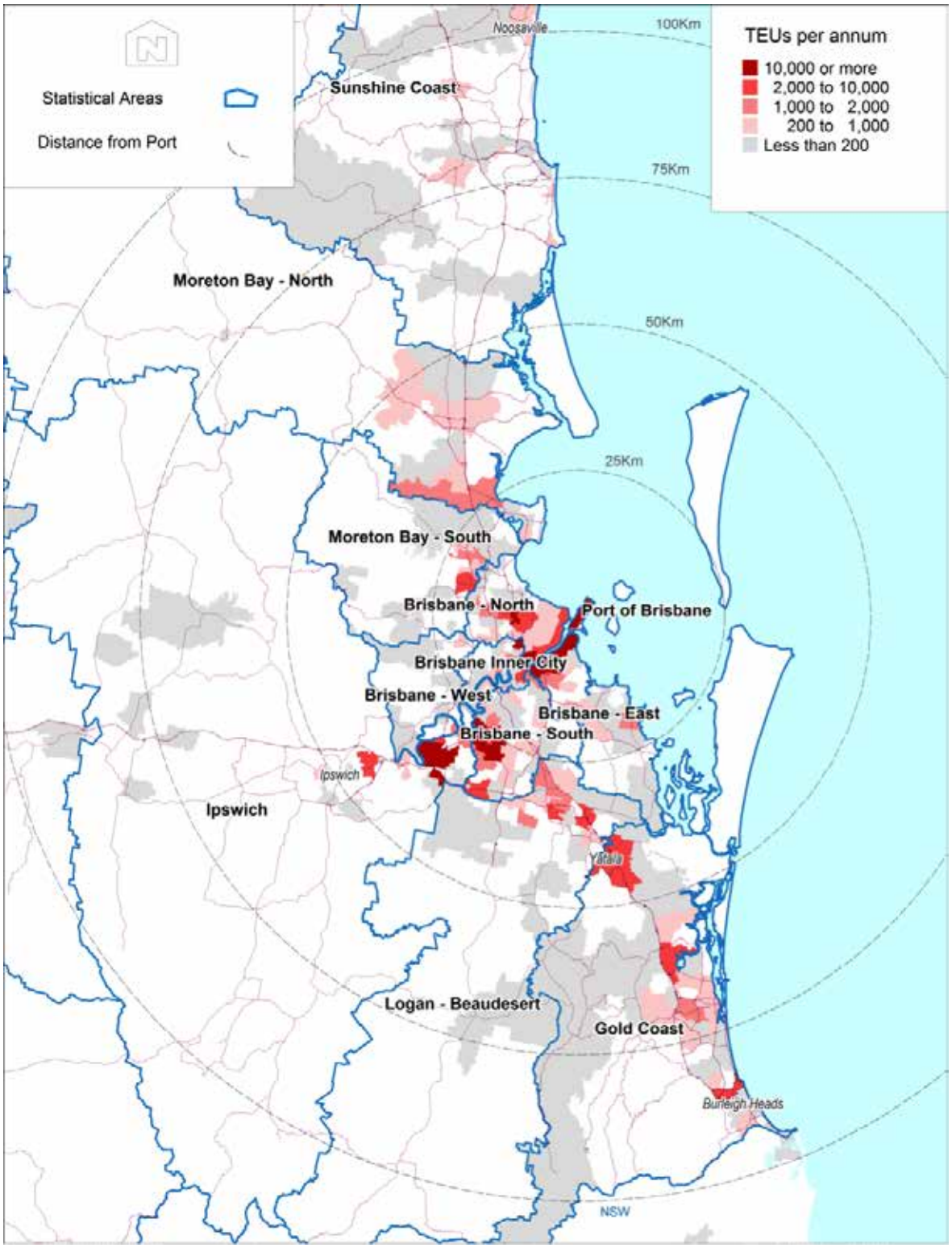
Figure 6 Map of import container destinations — Brisbane suburbs[1, 2]



1. This figure maps state suburbs that approximate suburbs in urban areas. State suburbs can be made up of aggregations of ABS SA1-Level.

2. The TEUs for key destinations are shown in Table 2.

Figure 7 Import container destinations — Brisbane and adjacent statistical regions[1]



1. Statistical regions are ABS SA4-Level. They are based on labour markets considering the labour supply (where people live) and demand (where people work). The actual coloured areas are state suburbs.

Table 4 Import container destinations — regional Queensland and interstate[1]

Destination		TEUs	%	
Regional Queensland	Cairns	435	0.1	3.2
	Darling Downs - Maranoa	1,861	0.4	
	Fitzroy	1,444	0.3	
	Mackay	1,402	0.3	
	Queensland - Outback	83	0.0	
	Toowoomba	4,053	0.9	
	Townsville	2,687	0.6	
	Wide Bay	2,611	0.6	
Interstate	ACT	28	0.0	3.8
	NSW — Sydney	8,352	1.8	
	NSW — Other	1,250	0.3	
	SA	214	0.0	
	TAS	14	0.0	
	VIC — Melbourne	5,658	1.2	
	VIC — Other	691	0.2	
	WA	1,008	0.2	
Total		**31,790**	**7.0%**	

1. Statistical areas are ABS SA2-Level in Queensland and ABS SA3-Level in New South Wales.

Geographic origins — summary for export containers

The origins (i.e. the pack locations) for export containers (Figure 8) indicate that:

- approximately 30% are packed in or near the Port
- over 40% are packed in Brisbane, the majority being within 40 km of the Port
- approximately 75% are packed in Brisbane or the adjacent statistical regions, the majority being within 100 km of the Port
- approximately 25% are packed in other Queensland regions and the remaining small percentage (1.5%) interstate, most of the latter being in northern New South Wales.

Export origins — Brisbane suburbs

The container packing locations for full export containers were highly concentrated in a few suburbs in Brisbane as indicated in Table 5 and Figure 9.

- Hemmant was the most significant location within Brisbane and the origin of 13% (39,000 TEUs) of all export containers transported through the Port.
- 8% of containers (23,000 TEUs) were packed at the Port.
- 21% of containers (65,000 TEUs) were packed near the port in the contiguous areas of Hemmant (13%, 39,000 TEUs), Murarrie (5%, 15,000 TEUs) and Lytton (4%, 11,000 TEUs).
- In Brisbane South, Rocklea was the origin of 4% of containers (12,000 TEUs).
- In Brisbane North, Hendra and Eagle Farm were the origins for 2% (7,000) of full export containers. The number of containers coming from other suburbs in Brisbane was relatively low.
- The geographic distribution of export origins within Brisbane was along the main arterial road corridors, (e.g. Gateway, Logan and Ipswich Motorways) providing efficient access to the Port.

Export origins — Brisbane and adjacent statistical regions

Brisbane and the adjacent statistical regions cover a significant region of the Port hinterland as shown in Table 6 and Figure 10.

- Approximately 74% of export containers (225,000 TEUs) originated from these areas.
- In the adjacent statistical regions, the main areas of activity were Ipswich and the Gold Coast with a combined total of 27%.

Export origins — regional Queensland and interstate

The balance of origins for full export containers from regional Queensland and interstate are indicated in Table 7.

- 25% of export containers originated from regional Queensland in areas located within 250 km of the Port.
- Less than 2% of export containers originated from interstate locations, with the current hinterland extending to Richmond - Tweed in New South Wales.

Trip distances between business types

The distance over which a container is transported in a stage of the logistics chain is an indication of the transport efficiency of the chain. Ideally, trip distances are short.

Trip distances for container movements by road confirm the pattern of concentrated activity at or near the Port in Brisbane and the adjacent statistical regions (within 200 km). This is consistent with the fact that containers transported over long distances are often transported by rail rather than road.

Full container import chain

The main movements in the full container import chain are from:

- stevedores (ST) to transport yards (TY) for staging or unpack at container freight stations (CFS) using mainly high productivity freight vehicles
- stevedores (ST) directly to importers (IM)
- transport yards (TY) to importers (IM).

The estimated trip distances for trucks carrying full import containers are shown in Figure 11.

- Most of the movements from stevedores to transport yards were less than 5 km, due to the close proximity of transport yards to the Port.
- For containers moved from transport yards to importers, or directly from stevedores to importers, the trip distances varied widely from 5 km to 200 km.

Estimates of the trip distance for the truck types engaged in the movement of full import containers, indicate that:

- super B-doubles were used for short movements from stevedores to transport yards
- other truck types were used over the full range of distances.

Full container export chain

The main movements in the full container export chain are from:

- exporters (EX) to stevedores (ST)
- exporters (EX) to transport yards (TY) for staging
- transport yards (TY) to stevedores (ST) using mainly high productivity freight vehicles.

The estimated distances for truck trips of full export containers are shown in Figure 12.

- A high proportion of full export containers were staged at transport yards or packed at CFS.
- Most of the movements from transport yards/CFS to stevedores were less than 5 km, due to their close proximity.
- For containers moved from exporters to transport yards, or directly from exporters to stevedores, the distances varied widely from 5 km to 200 km.

Estimates of the trip distances for truck types engaged in the movement of full export containers, indicate that:

- super B-doubles were engaged on short movements from stevedores to transport yards
- other truck types were used over the full range of distances.

Figure 8 Full export container origins

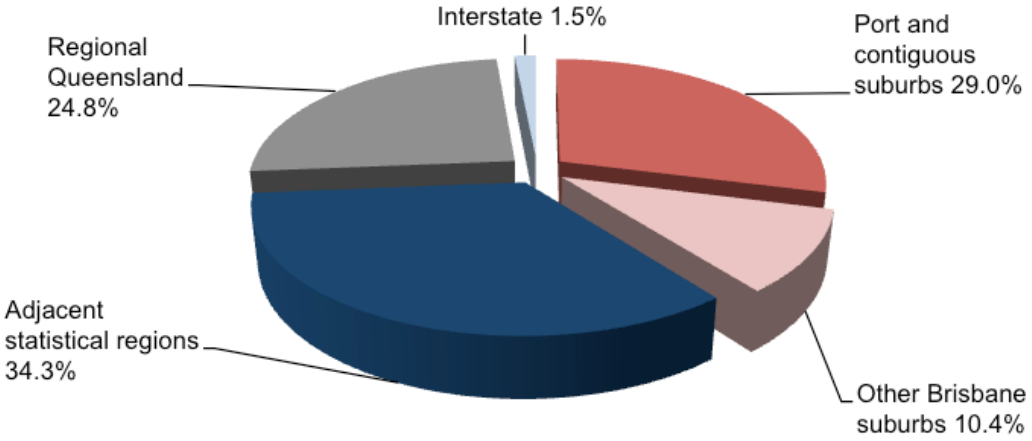


Table 5 Export container origins — Brisbane suburbs

Area	Origin	TEUs	%	
Port and contiguous suburbs	Port of Brisbane	23,489	7.7	29.0
	Hemmant	38,918	12.7	
	Lytton	11,015	3.6	
	Murarrie	15,044	4.9	
Other significant Brisbane suburbs	Rocklea	11,521	3.8	9.5
	Hendra	3,761	1.2	
	Eagle Farm	3,403	1.1	
	Cannon Hill	2,089	0.7	
	Heathwood	1,373	0.4	
	Acacia Ridge	1,313	0.4	
	Wacol	1,254	0.4	
	Richlands	1,075	0.4	
	Morningside	1,075	0.4	
	Pinkenba	1,015	0.3	
	Northgate	1,015	0.3	
Total		**117,360**	**38.4%**	

1. These statistics map state suburbs that approximate suburbs in urban areas. State suburbs can be made up of aggregations of ABS SA1-Level.

Table 6 Export container origins — Brisbane and adjacent statistical regions[1]

Area	Origin	TEUs	%	
Brisbane	Brisbane - East	89,185	29.2	39.4
	Brisbane - South	18,267	6.0	
	Brisbane - North	7,283	2.4	
	Brisbane Inner City	5,014	1.6	
	Brisbane - West	537	0.2	
Adjacent statistical regions	Ipswich	44,891	14.7	34.3
	Gold Coast	35,877	11.7	
	Logan - Beaudesert	9,074	3.0	
	Moreton Bay - North	14,446	4.7	
	Moreton Bay - South	298	0.1	
	Sunshine Coast	119	0.0	
Total		**224,991**	**73.7%**	

1. Statistical regions are ABS SA4-Level. They are based on labour markets considering the labour supply (where people live) and demand (where people work).

Table 7 Export container origins — regional Queensland and interstate[1,2,3]

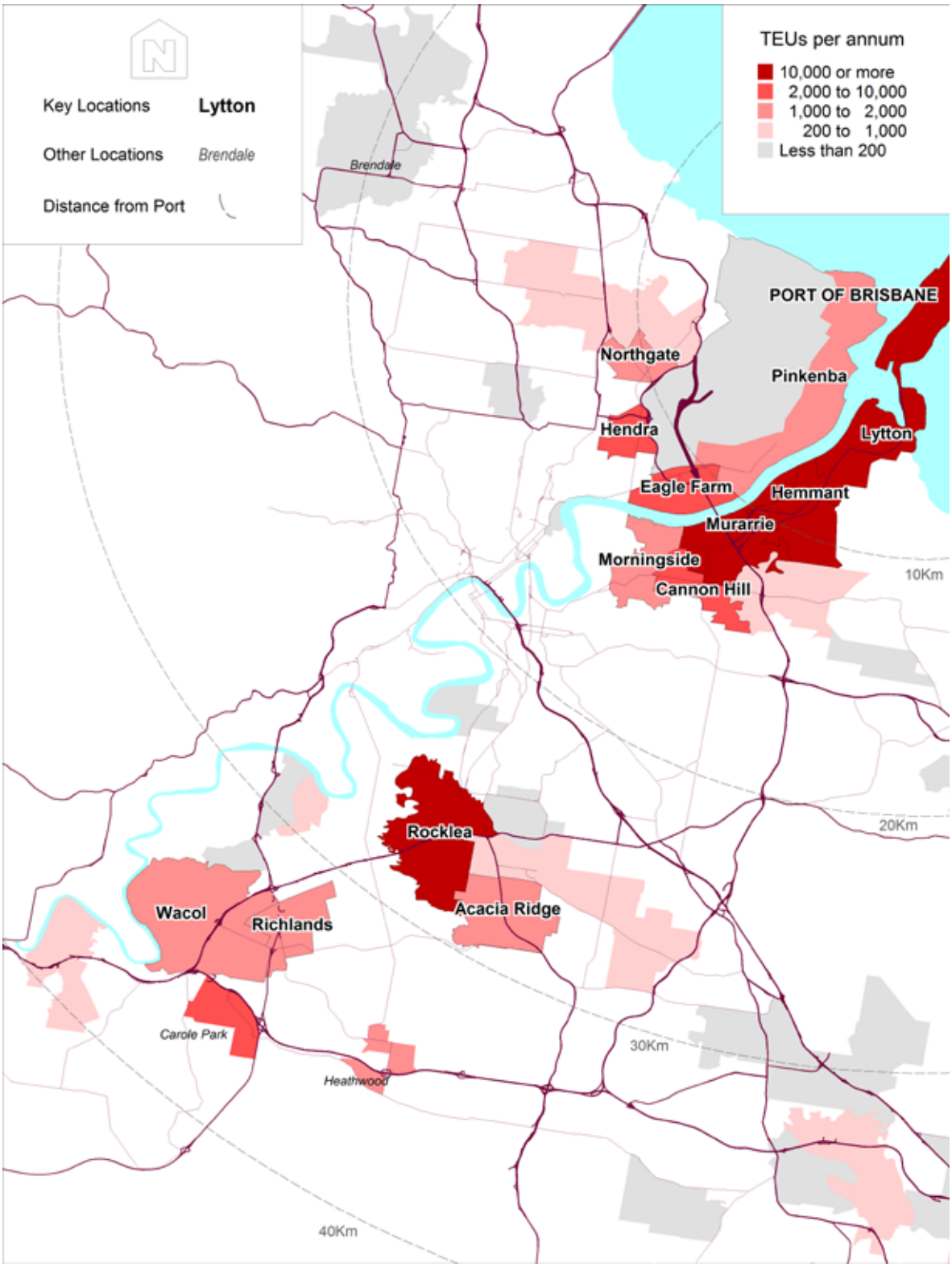
Area	Origin	TEUs	%	
Regional Queensland	Darling Downs - Maranoa	48,055	15.7	24.8
	Queensland - Outback	119	0.0	
	Toowoomba	12,178	4.0	
	Wide Bay	15,342	5.0	
Interstate	Richmond - Tweed	4,656	1.5	1.5
Total		**80,350**	**26.3%**	

1. Statistical areas are ABS SA2-Level in Queensland and ABS SA3-Level in New South Wales.

2. Darling Downs - Maranoa includes Dalby, Pittsworth, Millmerran, Allora and Goodiwindi.

3. Richmond - Tweed includes Casino.

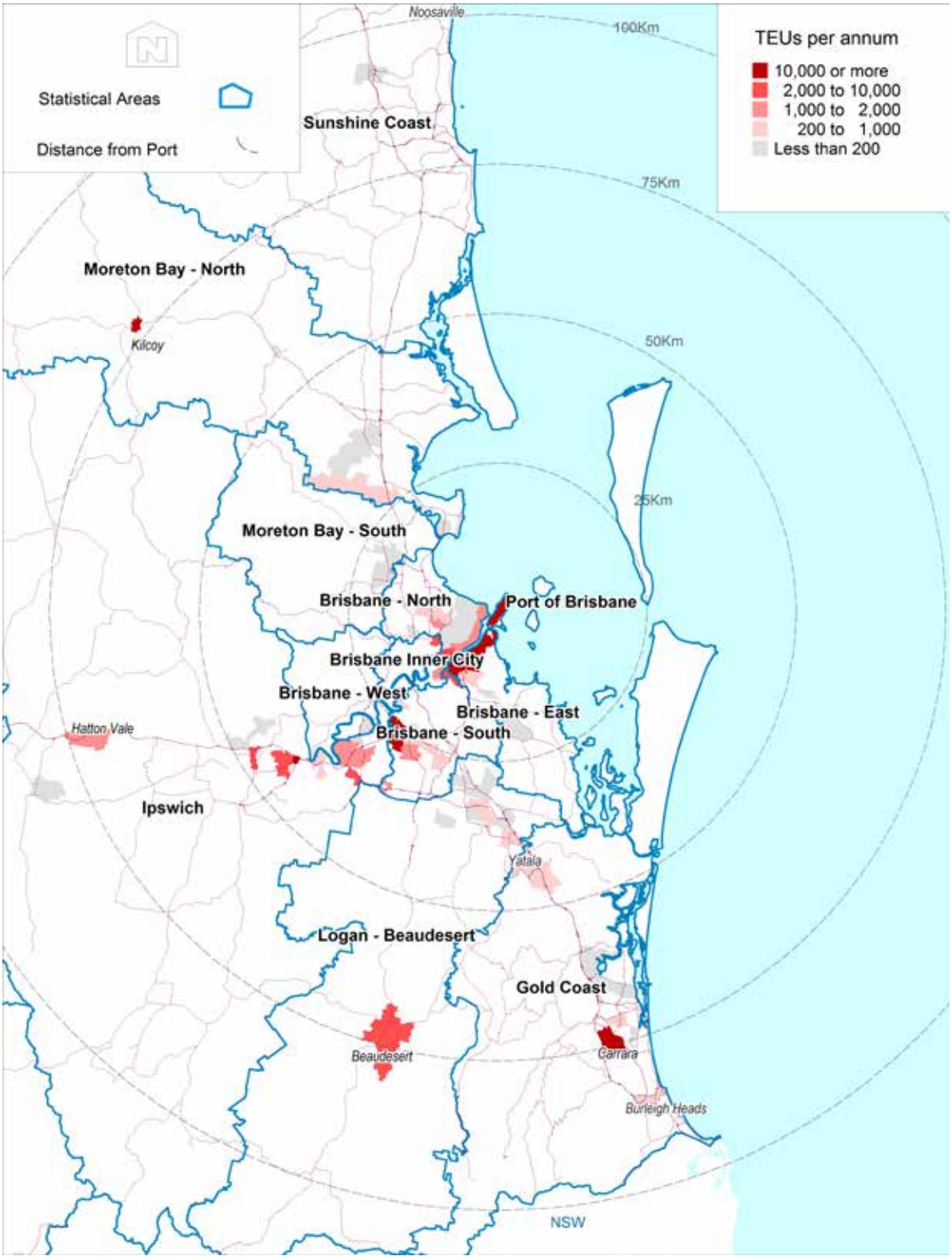
Figure 9 Export container origins — Brisbane suburbs[1]



1. This figure maps state suburbs that approximate suburbs in urban areas. State suburbs can be made up of aggregations of ABS SA1-Level.

2. The TEUs for key destinations are shown in Table 5.

Figure 10 Export container origins — Brisbane and adjacent statistical regions[1]



1. Statistical regions are ABS SA4-Level. They are based on labour markets considering the labour supply (where people live) and demand (where people work). The actual coloured areas are state suburbs.

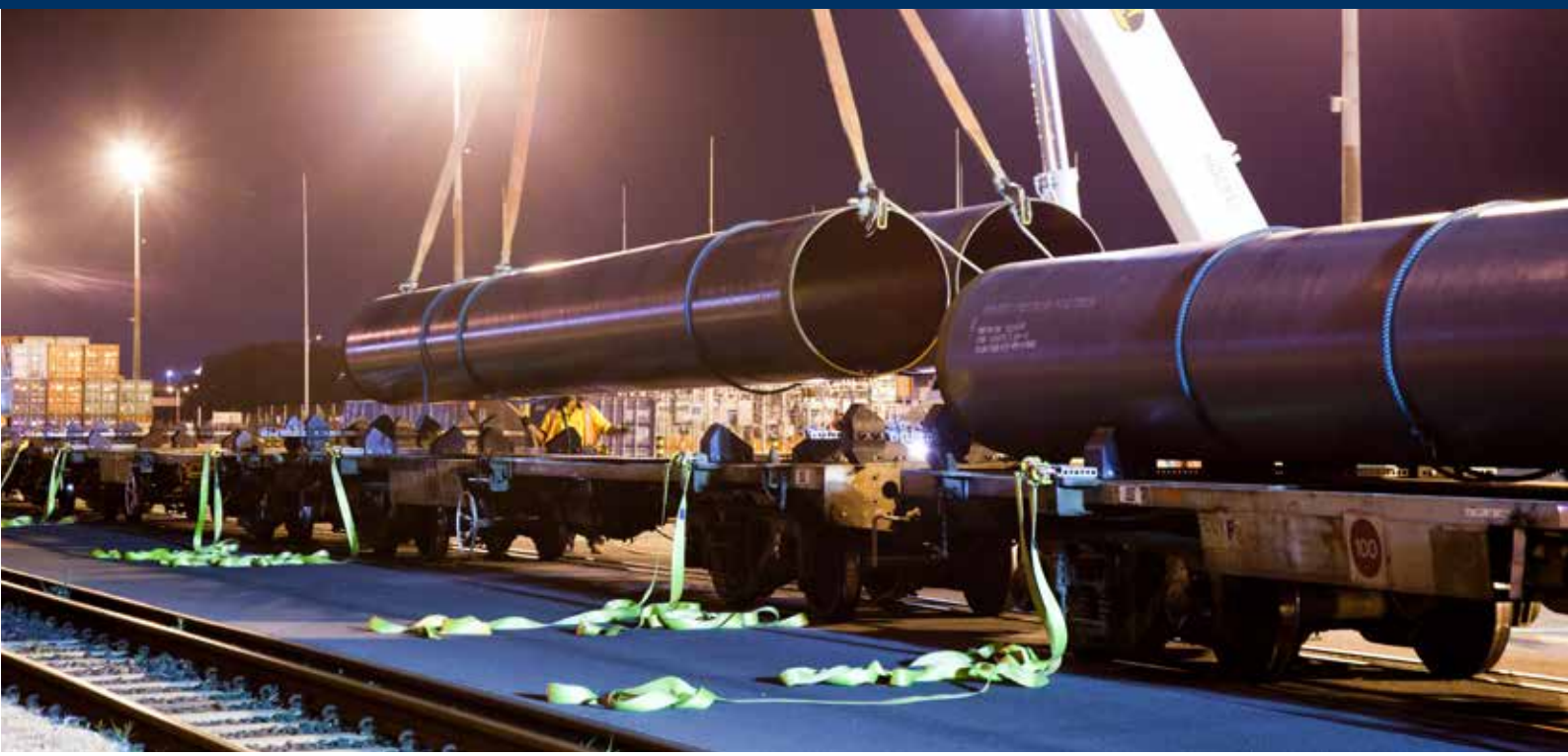


Figure 11 Trip distance for movements of full import containers

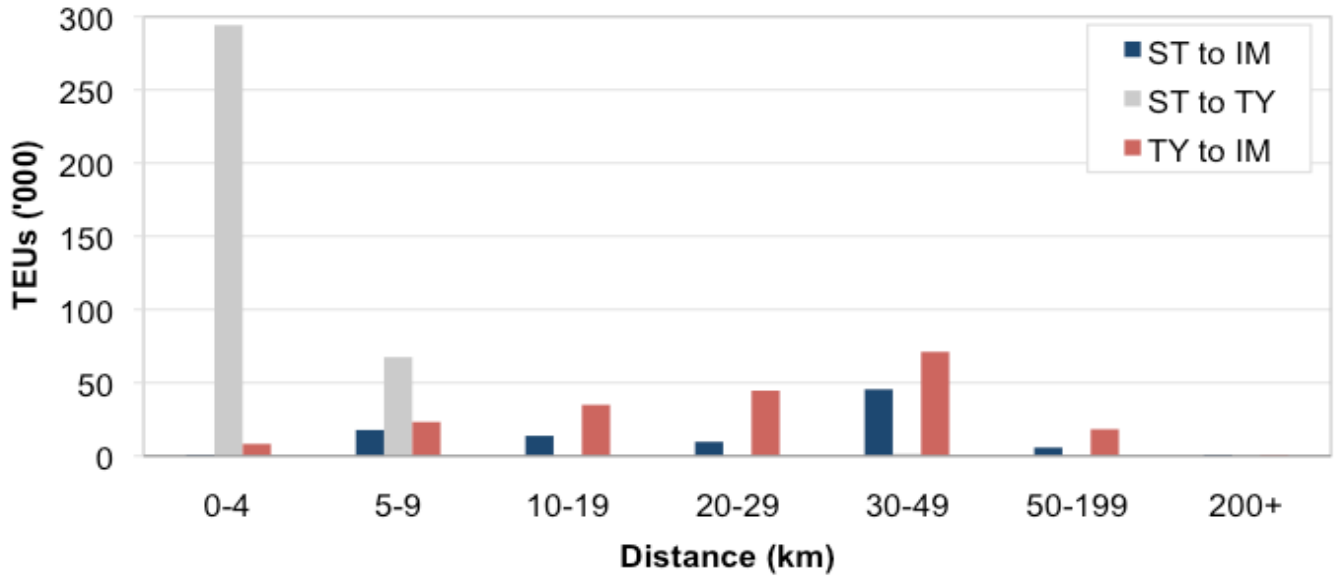
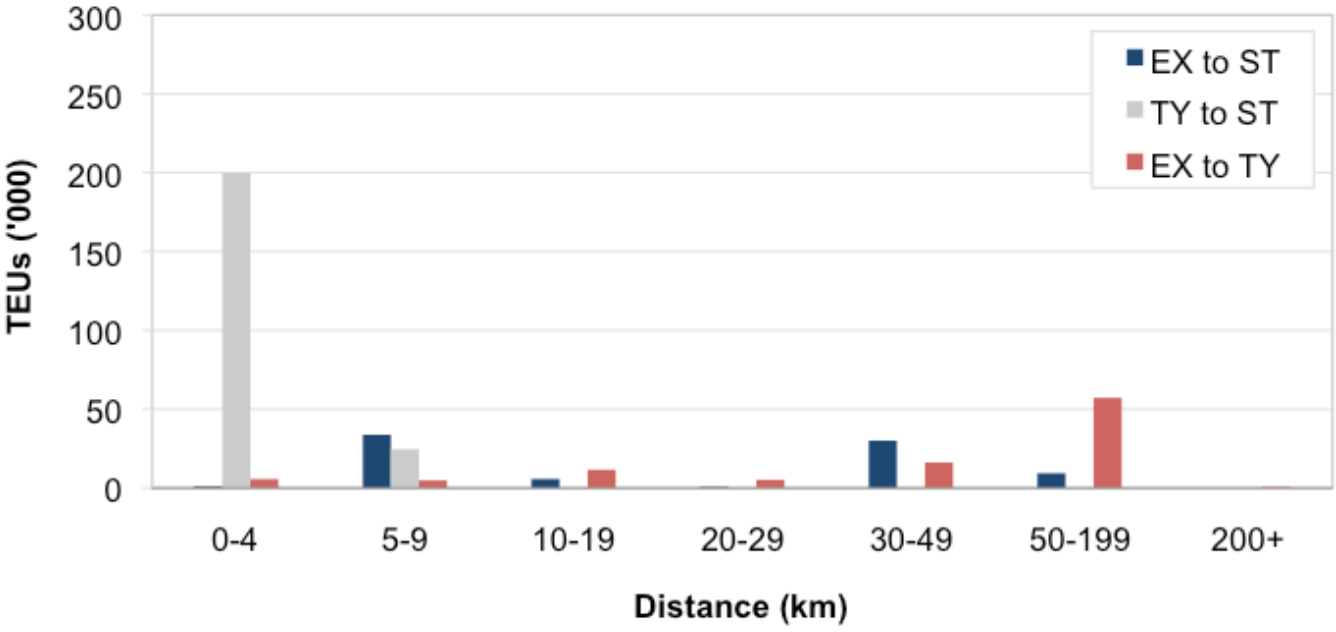


Figure 12 Trip distances for the movements of full export containers



Container arrival and departure times

The arrival and departure times for containers at businesses along the full container import and export chains are strongly influenced by the operating hours of the stevedores, importers and exporters.

In the import chain:

- departure times from stevedores are spread over hours of the weekdays (Figure 13) and, to a lesser extent on weekends (Figure 14), reflecting the 24 hour operation on weekdays and 6am-3pm shift on Saturday
- arrival times at transport yards tend to mirror the departure times from stevedores but the arrival times at importers are strongly constrained by the operating hours of these businesses (Figures 13 and 14)
- the net effect of the mismatch in operating hours along the chain is that nearly half of all full import containers were staged at transport yards.

In the export chain:

- arrival times at stevedores (Figures 15 and 16) show a similar spread to the departure times for full import containers (Figures 13 and 14)
- departure times from exporters and transport yards (Figures 15 and 16) show a similar spread to the arrival times for full import containers (Figures 13 and 14).

Figure 13 Departure times for full import containers from stevedores and arrival times at transport yards and importers — Monday to Friday

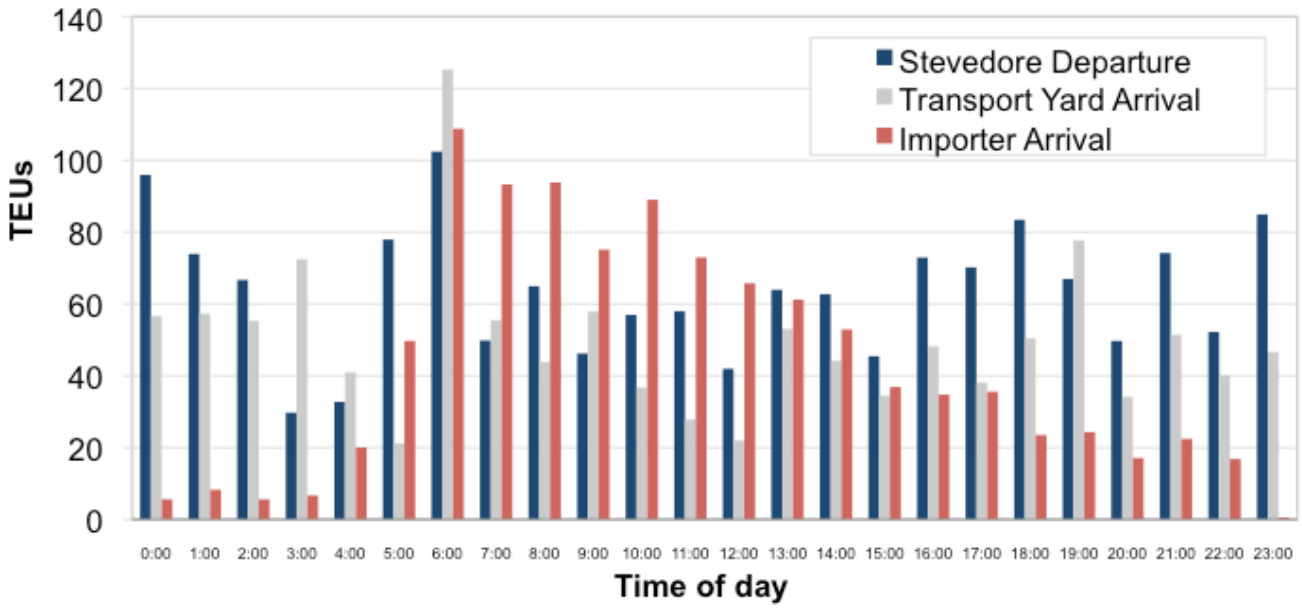


Figure 14 Departure times for full import containers from stevedores and arrival times at transport yards and importers — Saturday and Sunday

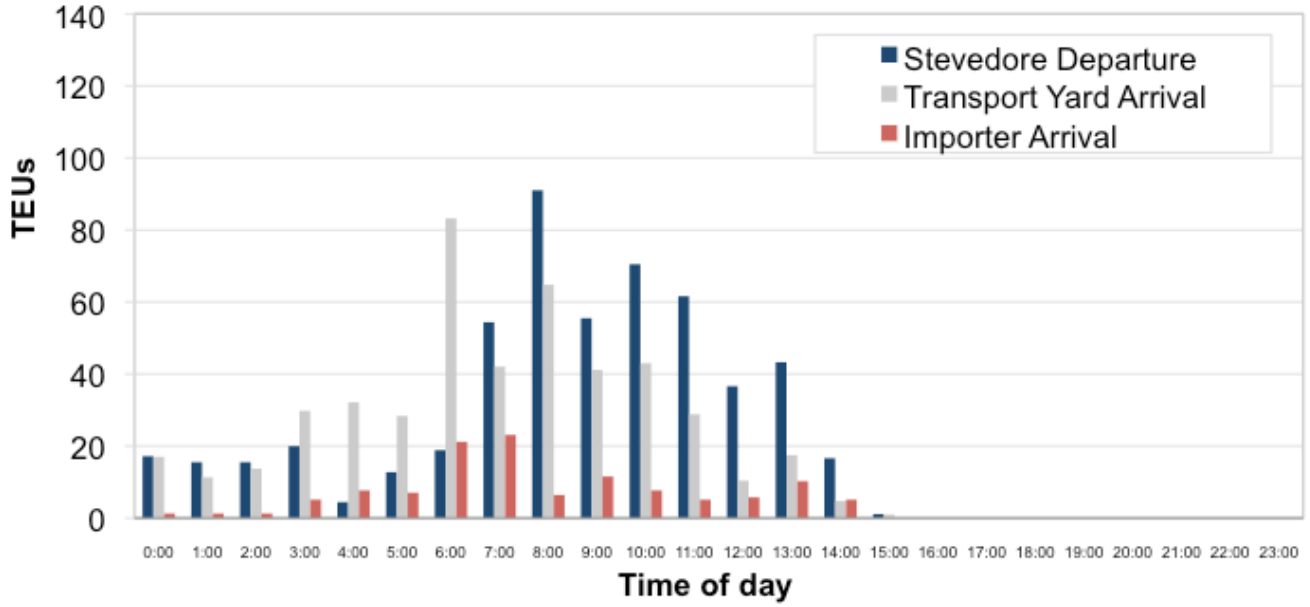


Figure 15 Arrival times for full export containers at stevedores and departure times from exporters and transport yards — Monday to Friday

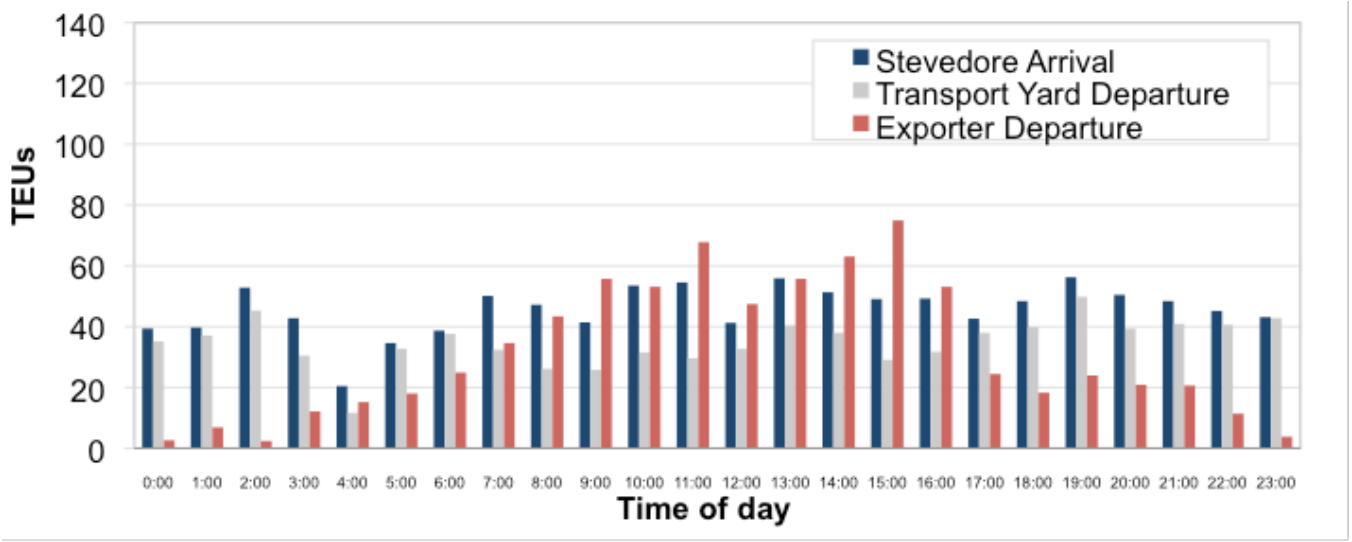
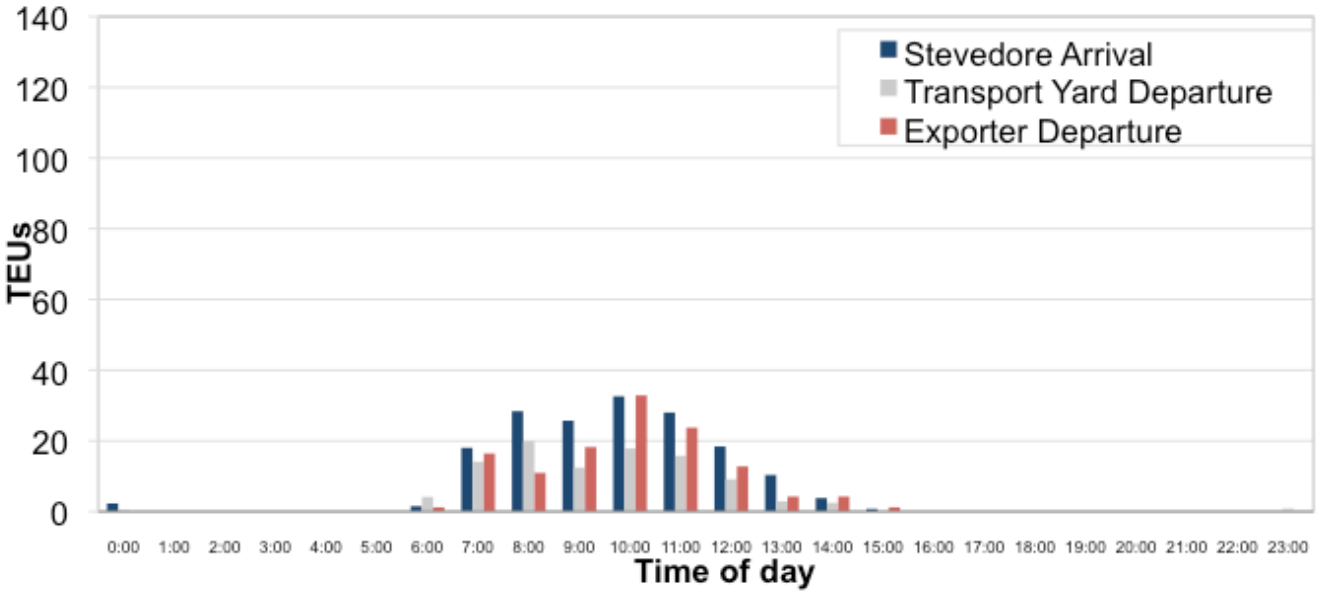


Figure 16 Arrival times for full export containers at stevedores and departure times from exporters and transport yards — Saturday and Sunday



Major container routes, volumes and traffic conditions

The distribution of import container destinations and export container origins leads to container trucks using most sections of the major road network in and beyond Brisbane, and the local road networks for access to/from the container destinations and origins.

The total traffic operating conditions on sections of the road network connecting the Port to importer and exporter locations are approaching high congestion levels.

The mismatch in operating hours between stevedores, transport yards and importers-exporters causes significant numbers of containers to be moved during normal business hours on weekdays and this is likely to contribute to peak period traffic congestion in Brisbane now and the future.

The quality and capacity of the road network to meet the growing freight task is critical to the Port's ability to optimise freight efficiency.

The major routes and estimated container truck volumes for 2012 are shown in Figures 17 and 18.

Figure 17 Truck routes and volumes for import/export container movements in 2012 (average weekday one-way volumes)

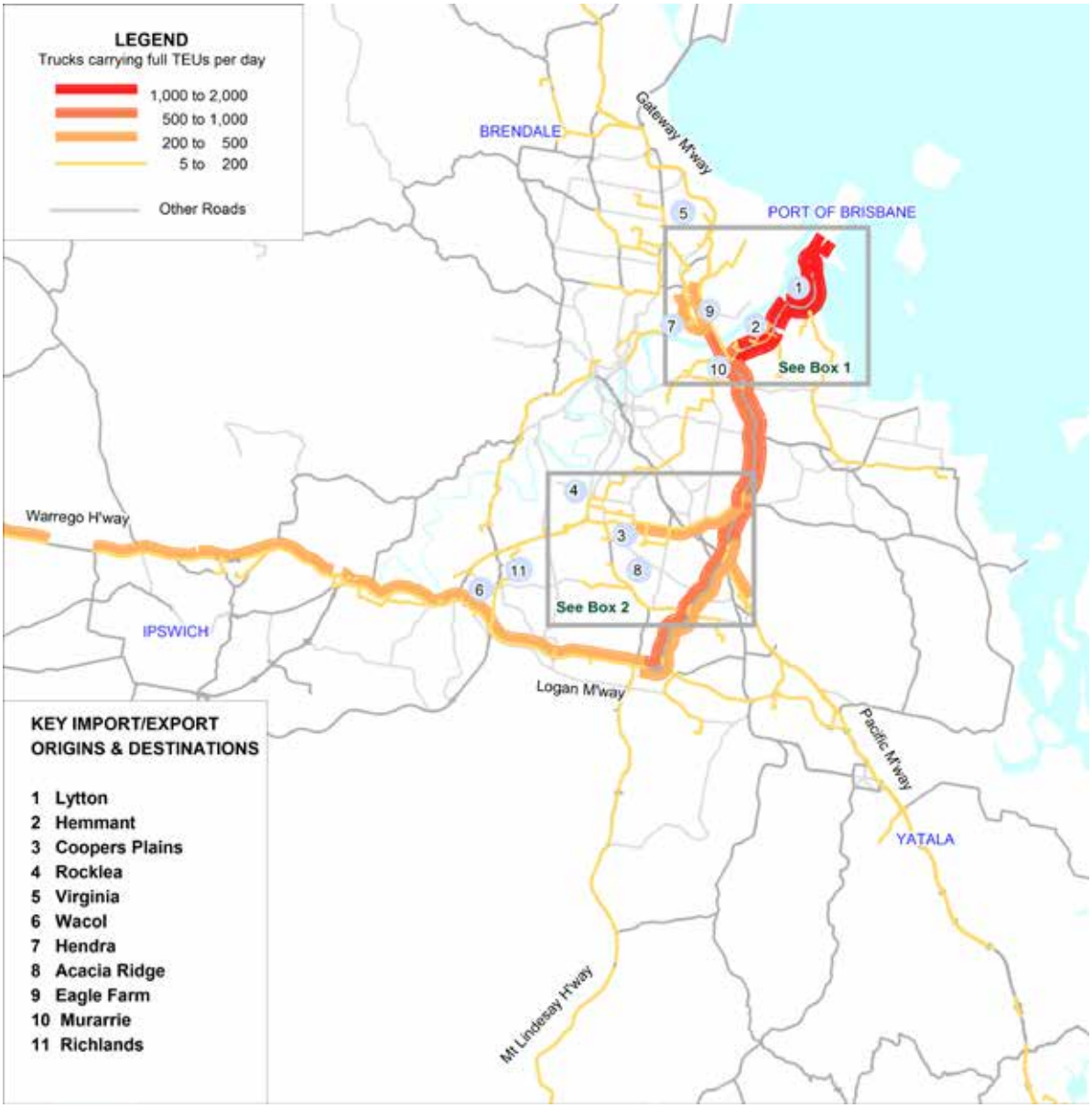
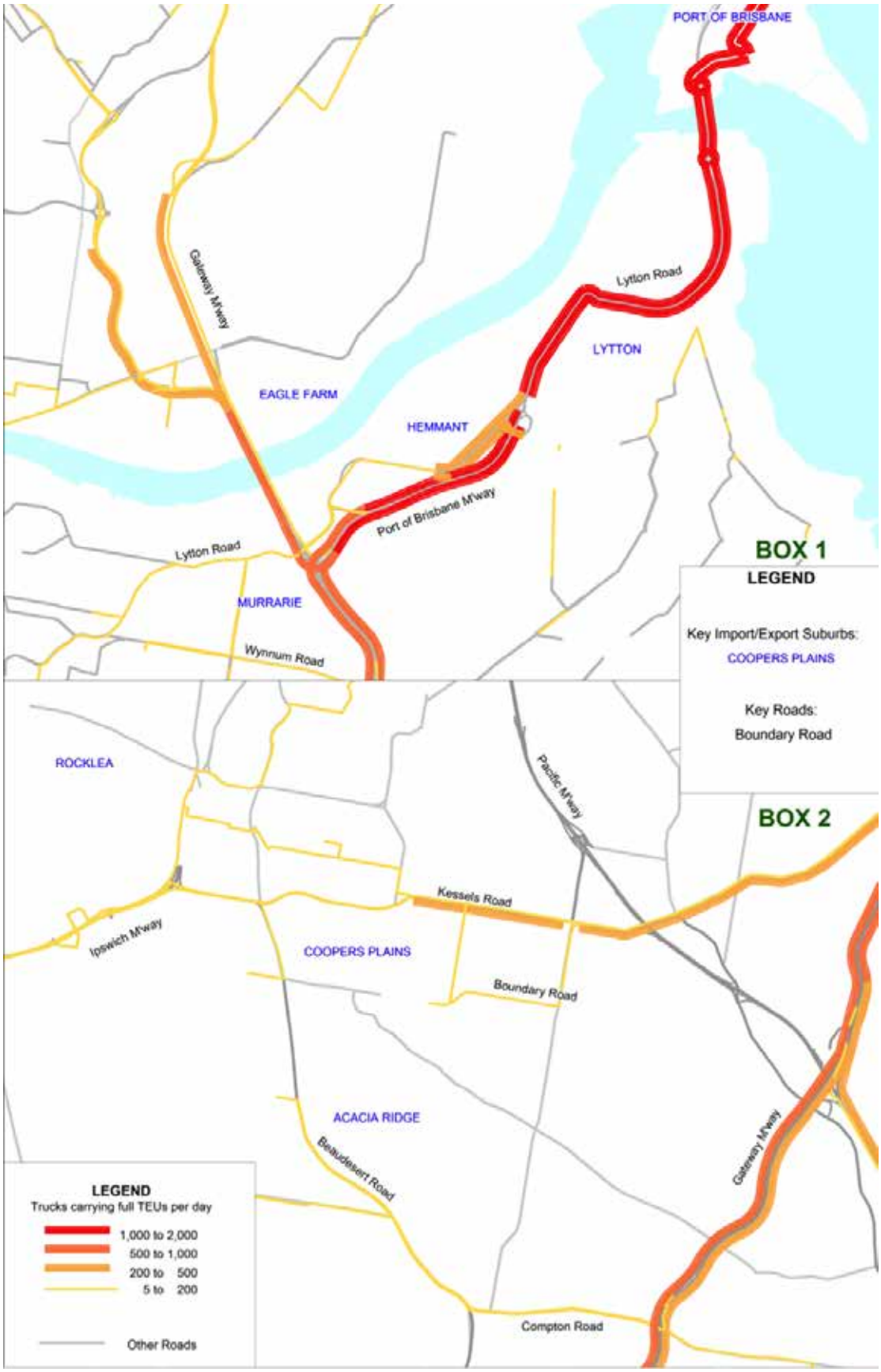


Figure 18 Truck routes and volumes for import/export container movements in 2012 — detail map (average weekday one-way volumes)



Import/export container movements by rail

Containers transported by rail through the Brisbane Multimodal Terminal in 2012 represent only 5% of total containers (57,000 TEUs) transported to and from the Port, which is low by comparison with other Australian container ports. These containers were transported to/from rail terminals in regional Queensland at Goondiwindi, Gladstone, Rockhampton, Mackay, Townsville and Cairns as shown in Figures 19 and 20.

Of the containers transported by rail:

- full import containers were approximately 1% of total full import containers through the Port
- full export containers were approximately 8% of total full export containers through the Port.

Import/export non-containerised commodity movements

A significant volume of non-containerised freight was moved through the Port in 2012 as shown in Table 8 and accounts for a significant component of all trade through the Port.

Imported motor vehicles

In 2012, 229,000 motor vehicles were imported through the Port with numbers increasing since the global financial crisis. These vehicles were mainly distributed across Brisbane (72%) with 18% to regional Queensland and 10% interstate as summarised in Table 9.

Imported break bulk steel

In 2012, 425,000 tonnes of break bulk steel were imported through the Port. Nearly 50% was transported to Acacia Ridge, a further 20% was distributed near the port and most of the remainder was transported to other destinations in Brisbane.

Figure 19 Full import/export containers transported by rail

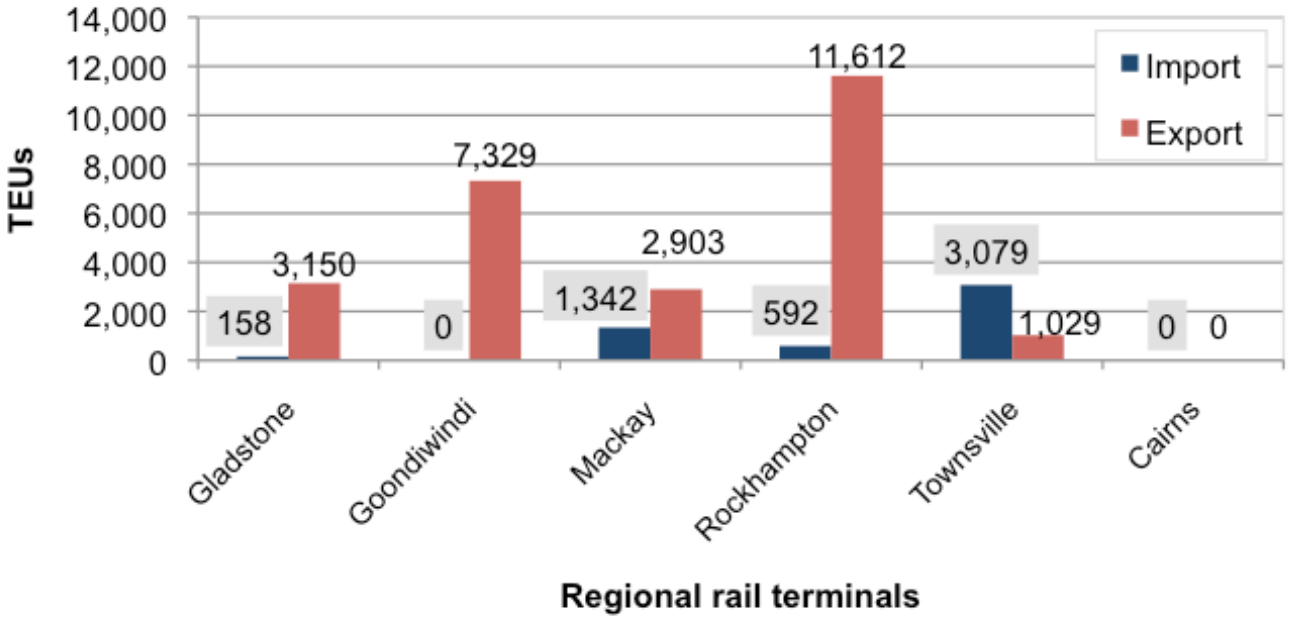


Table 8 Import/export non-containerised commodities in 2012

Category	Commodity	Unit	2012
Imports	Motor vehicles	Vehicles	228,518
	Steel	Tonnes	425,447
	Project cargo	Units	32,447
Exports	Grain - road	Tonnes	1,117,865
	Grain - rail	Tonnes	599,746
	Coal – rail	Tonnes	8,863,959

Table 9 Distribution of imported motor vehicles

Destinations	Units transported	%	Vehicles used
Metropolitan Brisbane	163,776	72	27,070
Rest of Queensland	40,061	18	5,201
New South Wales	16,911	7	2,352
South Australia	824	0	155
Victoria	6,513	3	930
Western Australian	196	0	24
Northern Territory	235	0	27
	228,516	100%	35,759

Figure 20 Empty import/export containers transported by rail

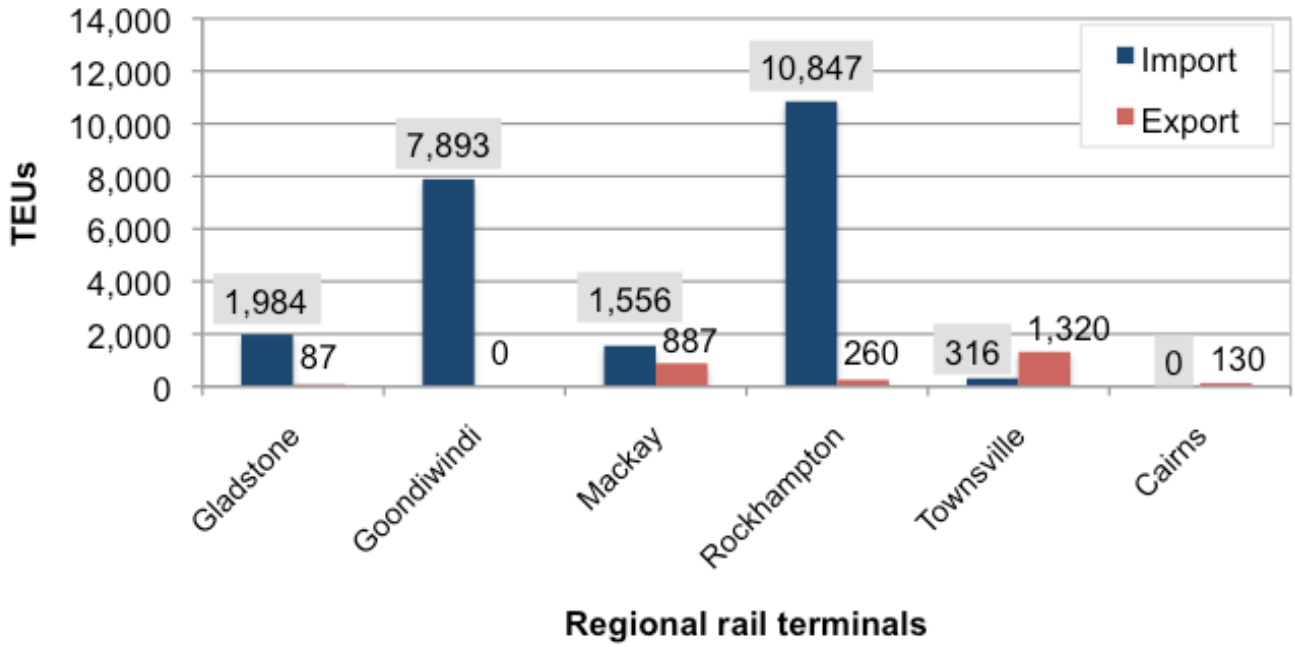


Table 10 Distribution of imported steel to suburban destinations by semi-trailer

Destination	Tonnes transported	%	Truck trips	Distance (km)	Travel time (hrs)
Acacia Ridge	192,935	45.3	7,197	37	1.0
Pinkenba	43,006	10.1	1,799	23	0.5
Lytton	36,412	8.6	2,199	9	0.5
Augustine Heights	32,006	7.5	2,119	58	1.0
Darra	23,031	5.4	1,839	41	1.0
Northgate	15,034	3.5	960	24	0.5
Hemmant	13,145	3.1	1,279	12	0.5
Crestmead	12,563	3.0	520	45	1.0
Loganlea	10,703	2.5	600	41	1.0
Alberton	9,654	2.3	560	54	1.0
Marcoola	6,906	1.6	320	127	2.0
Collingwood Park	6,014	1.4	320	54	1.0
Narangba	4,211	1.0	200	54	1.0
Geebung	3,682	0.9	160	28	0.5
Jacobs Well	3,043	0.7	160	68	1.0
Wacol	2,907	0.7	120	46	1.0
Seventeen Mile Rocks	2,883	0.7	120	43	1.0
Miles	2,199	0.5	120	367	5.5
Meadowbrook	1,987	0.5	80	90	1.5
Banyo	1,290	0.3	40	25	0.5
Aspley	920	0.2	40	31	0.5
Eagle Farm	920	0.2	40	18	0.5
Total	**425,447**	**100%**	**20,790**		

Imported project cargo

Most imported project cargo is distributed to wholesalers, importers, construction and mining sites and agricultural businesses. Transportation of this cargo is largely over-dimensional, requires specialised road transport equipment and is subject to significant regulation and restrictions.

In 2012, 32,447 units of project cargo were imported through the Port. Of this cargo, 66% was distributed to industrialised areas within 60 km of the Port and 34% was distributed across regional Queensland (with 19% to Mackay).

Bulk coal export

The total volume of coal handled for the 2012 calendar year was 8.9 million tonnes. Of this, 92% originated from mines north-west of Toowoomba and 8% was mined east of Toowoomba. All export bulk coal was transported to the Port by rail.

Bulk grain export

In 2012, 1.7 million tonnes of grain and other cereals were exported through the Port. Of this amount, 65% (1.1 million tonnes) was transported by road, mainly in B-doubles, and 35% (600,000 tonnes) was transported by rail from growing areas in southern Queensland and northern New South Wales. While the transportation of bulk grain by rail has historically been the most cost effective mode, increasingly there has been a shift to road transport due to the decline in reliable rail services from the grain growing areas to the Port.

There is a large number of bulk storage terminals throughout the grain growing district (some of which are shown in Figure 21) but only a small proportion are connected to Queensland's narrow gauge rail network.

Table 11 Distribution of imported project cargo[1] to destinations by specialised transport

Destination	Units moved	%	Truck trips	Distance (km)	Travel time (hrs)
Archerfield	8,385	28.8	8,385	37	1.0
Mackay	5,530	19.0	5,530	984	20.0
Brendale	3,211	11.0	3,211	41	1.0
Crestmead	3,033	10.4	3,033	45	1.0
Rocklea	2,631	9.0	2,631	37	1.0
Dalby	1,472	5.1	1,472	233	4.5
Toowoomba	2,007	6.9	2,007	155	3.0
Gladstone	669	2.3	669	547	10.0
Wacol	446	1.5	446	46	1.0
Willawong	312	1.1	312	42	1.0
Eagle Farm	268	0.9	268	18	0.5
Lytton	268	0.9	268	9	0.5
Fisherman Islands	178	0.6	178	3	0.5
Hendra	178	0.6	178	21	0.5
Brisbane Airport	134	0.5	134	21	0.5
Acacia Ridge	89	0.3	89	37	1.0
Crows Nest	89	0.3	89	187	3.0
Hemmant	89	0.3	89	12	0.5
Northgate	89	0.3	89	24	0.5
Burpengary	45	0.2	45	56	1.0
Total	**29,124**	**100%**	**29,124**		

1. Project cargo is defined as machinery and large pieces of break bulk

Figure 21 Map of grain growing areas in Queensland

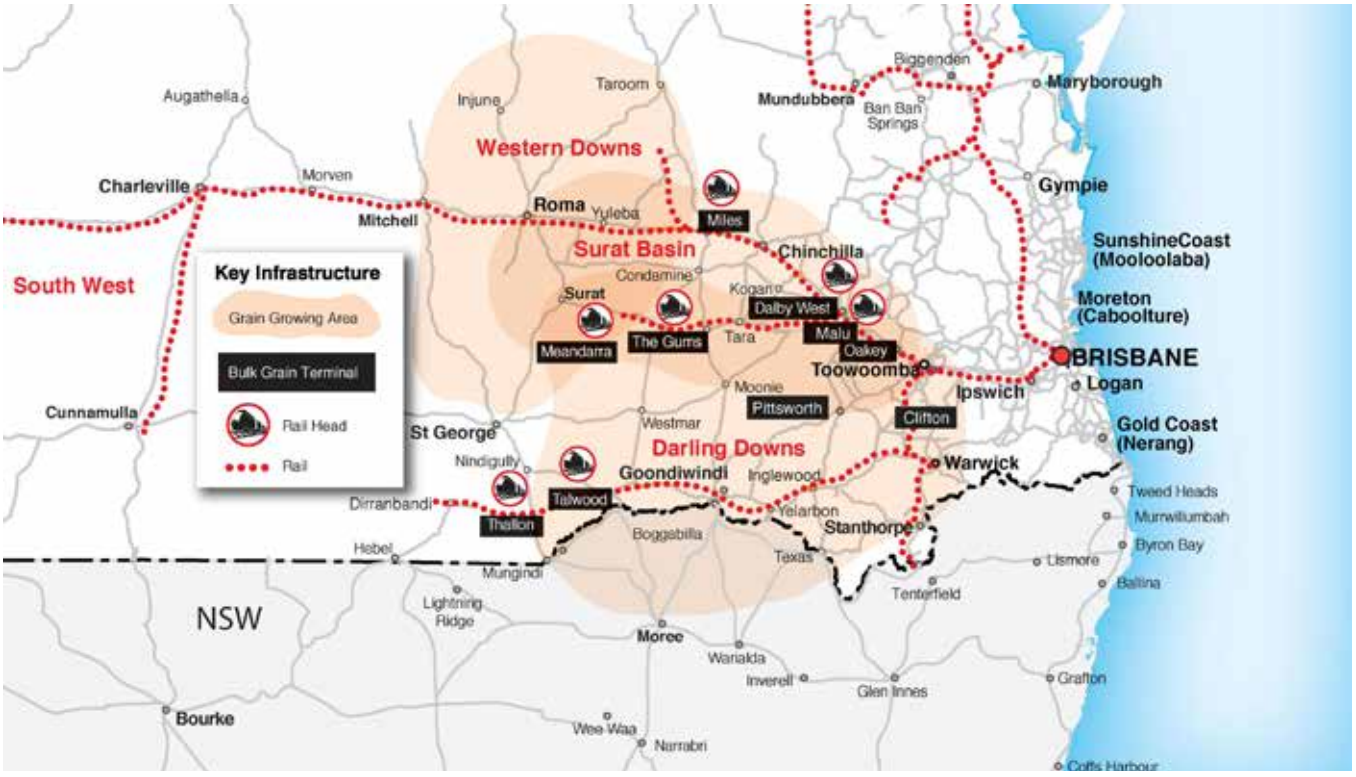


Table 12 shows the tonnage transported by rail through each of the bulk grain rail terminals and the area serviced. The available information indicates that, as with road transport, there is a mix of grain types moved by rail from this area, and the origins before receival into the bulk grain rail terminal (i.e. on farm or upcountry storage), extend as far south as the Moree area.

Table 13 shows the type of product transported by rail and road during 2012 to the Port by GrainCorp only. For the total grain (1,717,000 tonnes) through both facilities, 65% was transported by road and 35% by rail. The proportion transported by road has increased in recent years due to the deterioration of rail and the improvement of road infrastructure.

Table 12 Summary of tonnages transported by rail

Origin/rail head	Tonnes transported	%	Area serviced
Thallon	176,396	29	Southern Queensland and Northern New South Wales
The Gums	105,838	18	Surat Basin
Meandarra	105,838	18	Western Downs
Miles	105,838	18	Western Downs and Surat Basin
Talwood	35,279	6	Southern Queensland and Northern New South Wales
Dalby West	35,279	6	Darling Downs
Malu	35,279	6	Darling Downs
Total	**599,746**	**100%**	

Table 13 Summary of bulk products transported by road and rail — GrainCorp data only

	Road		Rail	
Product	**Tonnes**	**%**	**Tonnes**	**%**
Wheat	330,687	42	513,630	86
Sorghum	172,558	22	80,789	13
Pulse	124,008	16	5,327	1
Maize	11,457	1	-	-
Cottonseed	145,493	19	-	-
Total	**784,203**	**100%**	**599,746**	**100%**

Domestic container movements by rail

In 2012, 547,000 containers (TEUs) were moved by the intra-state and interstate rail networks as shown in Table 14.

Intra-state rail

In 2012, the seasonally adjusted total number of containers moved through the intra-state rail network was 306,000 containers (TEUs); 71% full and 29% empty. Table 15 shows Brisbane's outbound and inbound services. The outbound services to regional Queensland carried mainly full containers (97%), while the return trip to Brisbane carried an equal share of full (47%) and empty (53%) containers.

Interstate rail

In 2012, the seasonally adjusted total number of containers moved to and from the Brisbane Freight Terminal on the interstate rail network was 241,000 TEUs. Table 16 shows that effectively 100% of inbound trains carried full containers.

Figures 22 to 25 show the seasonally adjusted total number of full and empty containers (TEUs) for 2012, to and from the Brisbane Freight Terminal to the interstate intermodal terminals.

- Melbourne represented the main origin of the container movements with more than 90,000 mainly full containers (TEUs) moving north to Brisbane.
- The north-south imbalance of full container movements is clearly shown in that only 55,000 full and 7,000 empty containers (TEUs) were transported to Melbourne.
- Of less significance were freight flows to and from freight terminals in Sydney, Perth, Adelaide and Ettamogah (near Albury).

Table 14 Total domestic containers in TEUs

	Outbound		Inbound		Total	
	Full	Empty	Full	Empty		%
Intra-state	145,535	8,507	70,849	81,408	306,299	56
Interstate	96,745	11,157	132,577	413	240,892	44
Sub total	**242,280**	**19,664**	**203,426**	**81,821**		
Total	**261,944**		**285,247**		**547,191**	**100%**

Table 15 Total intra-state container movements

	Outbound (from Brisbane)		Inbound (to Brisbane)		Total	
	TEUs	%	TEUs	%	TEUs	%
Full	145,535	94.5	70,849	46.5	216,384	70.6
Empty	8,507	5.5	81,408	53.5	89,915	29.4
Total	**154,042**	**100%**	**152,257**	**100%**	**306,299**	**100%**

Table 16 Total interstate container movements

	Outbound (from Brisbane)		Inbound (to Brisbane)		Total	
	TEUs	%	TEUs	%	TEUs	%
Full	96,745	72	132,577	99.7	229,322	95.2
Empty	11,157	28	413	0.3	11,570	4.8
Total	**107,902**	**100%**	**132,990**	**100%**	**240,892**	**100%**

Figure 22 Destinations of outbound containers from the Brisbane Freight Terminal (annual volume)

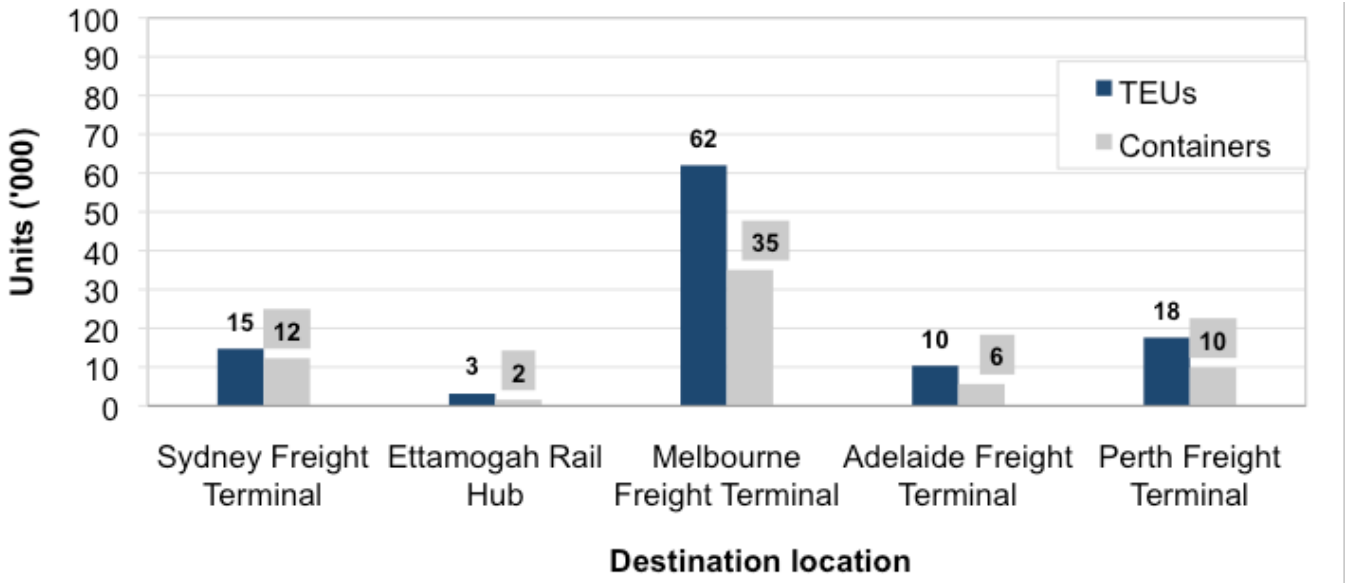


Figure 23 Origins of inbound containers to the Brisbane Freight Terminal (annual volume)

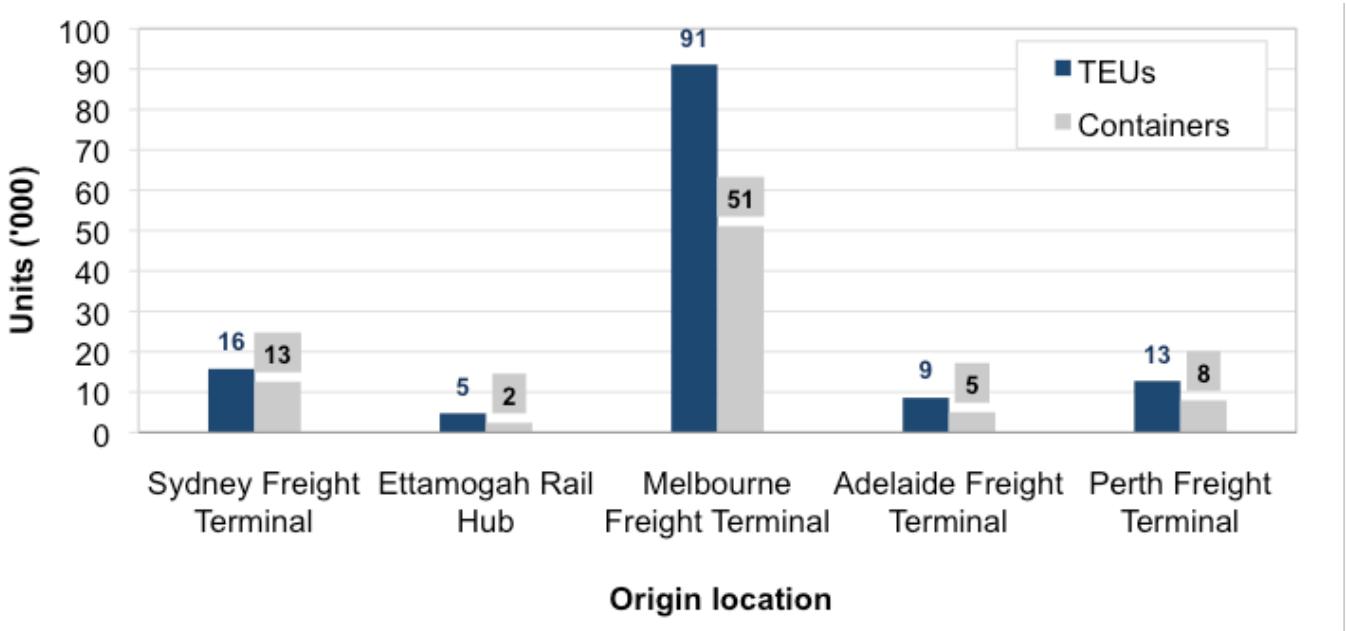


Figure 24 Destinations of outbound full and empty containers from the Brisbane Freight Terminal

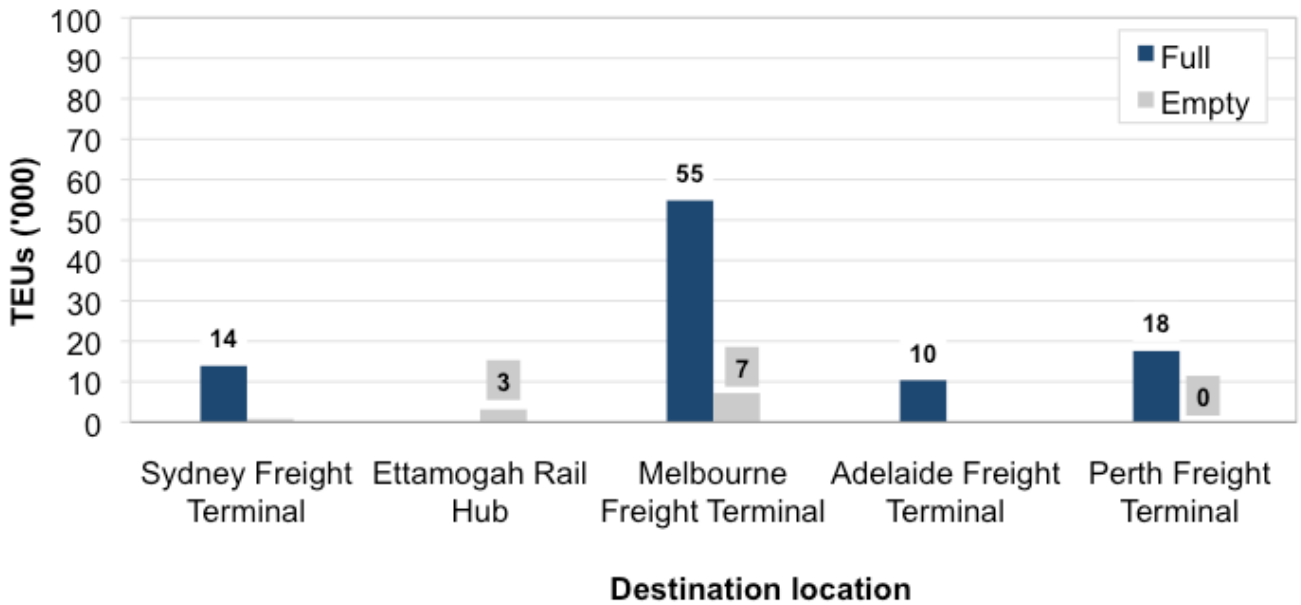
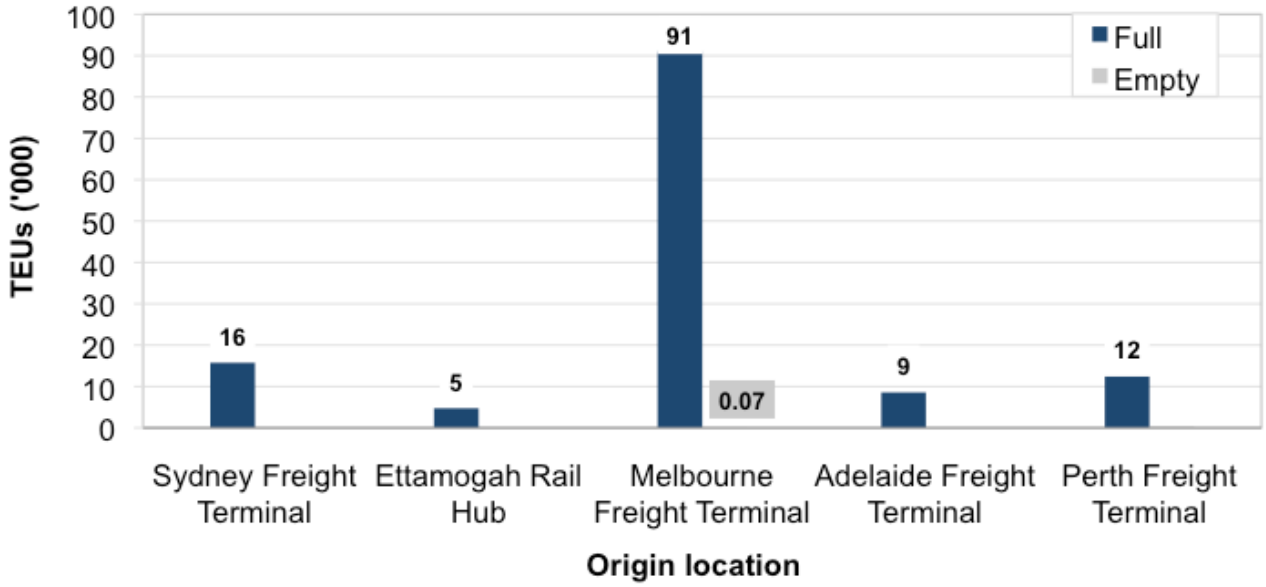


Figure 25 Origins of inbound full and empty containers to the Brisbane Freight Terminal



Impediments and blockages influencing the Port's logistics chains and markets

The study indicated that the most significant impediments and blockages in the Port's logistics chains and markets are:

- road congestion and infrastructure conditions on sections of the Brisbane and regional road network, which increase travel times and operating costs
- the condition of rail infrastructure and lack of connectivity, which restrict rail access to the Port
- regulations for heavy vehicle operations on some regional routes, resulting in some commodities experiencing high port access costs.

Improvements in Queensland's transport infrastructure, especially rail, will increase the opportunity for additional freight (both bulk and containerised) to flow through the Port. Improved infrastructure results in faster travel times, and heavier axle loadings for road and rail, will result in increased efficiency and lower transport costs. These improvements could lead to further penetration into northern New South Wales for export freight such as grain and cotton.

Trade and traffic forecasts

The study included:

- reviewing reported Port demand models and forecasts
- developing demand models for the Port using data from 2001 to 2011
- forecasting Port demand to 2040, using forecasts of the relevant demand variables
- identifying the primary routes likely to be used for import/export container movements in 2031, estimating the change in traffic volumes and conditions from 2012.

Review of previous Port demand forecasts

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) reported on the primary development and application of import/export demand models for the Port in 2006 and 2009. Table 17 shows a summary of the actual data used in the two BITRE studies and the resulting forecasts for full container movements through the Port.

Table 17 BITRE actual and forecast full import container movements[1]

Year	BITRE 2006 - TEUs ('000)		BITRE 2009 - TEUs ('000)	
	Full imports	Full exports	Full imports	Full exports
2000-01	153	194		
2001-02	174	199	174	199
2002-03	223	193	223	193
2003-04	262	205	262	205
2004-05	292	227	292	227
2005-06	308	242	321	246
2006-07	329	283	364	257
2007-08	377	304	412	255
2008-09	413	328	403	253
2009-10	432	355	362	243
2010-11	466	379	361	244
2011-12	506	400	384	251
2014-15	621	489	478	286
2019-20	893	647	634	373
2024-25	1283	856	737	505
2029-30			861	702

1. Data and forecasts are in TEUs. Actual TEUs used for each study are shown in red and forecasts in black.

Import/export freight demand models and forecasts

BITRE (2006) forecasts were prepared before the global financial crisis (GFC). BITRE (2009) used data that was only just starting to show the effect of the GFC. Three additional annual data points, including updates of economic forecasts, were available for this IMEX study. This provided a firmer indication of the impact of the GFC and the beginning of the recovery. These addditional data points indicated that the post-GFC recovery has been faster than expected at the time of the BITRE (2009) analyses and forecasts.

Statistically rigorous models for Port import/export demand were developed using container and non-container volume data for the 2001 to 2011 period from the Port of Brisbane Pty Ltd, and relevant economic data from suitable sources. Table 18 shows forecasts of import/export growth to 2040 generated using the models. Comparison with the corresponding volumes in Table 17 indicates:

- the global financial crisis impact was lower than forecast by BITRE
- full imports have a similar growth trend to BITRE until about 2021, then a slightly higher trend
- full exports have a similar trend to BITRE until about 2021, then a lower trend.

Table 18 Full and empty container forecasts in '000s[1]

Year	Full TEUs		Empty TEUs	
	Imports	Exports	Imports	Exports
2001	158.6	191.9	74.7	41.4
2007	392.8	232.1	64.7	225.4
2008	399.1	254.9	63.7	207.9
2009	348.8	260.8	63.6	151.6
2010	399.1	272.6	54.8	181.3
2011	436.2	307.2	61.8	190.8
2015	498.5	333.3	60.5	225.8
2020	614.5	395.0	58.1	277.5
2025	778.6	463.6	55.3	370.3
2030	935.5	544.1	52.0	443.4
2035	1084.0	639.6	48.1	492.5
2040	1223.6	753.5	43.4	513.4

1. Data and forecasts are in TEUs. Actual TEUs used for each study are shown in red and forecasts in black.

The primary growth forecasts for containers and non-container demand are as follows.

- Full import containers are expected to grow by 3.6% a year (compound) and full export containers will grow by 3.1% a year (compound) to 2040.
- For total full container movement, this equates to a 154% increase or 2.5 times the current amount.
- Total movements of full and empty containers to and from the Port are expected to grow by 2.9% a year, which is an increase of 2.3 times by 2040.
- The models developed for the non-containerised import/export trade indicate that, on average, trade is expected to grow by 2.1% a year or an 85% increase in trade by 2040.

There are typically significant variances in the forecasts of variables and parameters used in port demand models, as well as in the resulting growth rates in import and export demand. Sensitivity tests with the full import container model indicated that, with increases in the per capita gross state product (GSP) parameter (within the variances for the model parameter), forecasts of full import TEUs could be significantly higher than the forecasts shown in Table 18. These forecasts have implied growth rates comparable to those observed in recent years.

PBPL trade forecasts

Consultations with the Port of Brisbane management indicate that the Port's internal forecasts are significantly higher than the IMEX forecasts in Table 18. Management has advised there are a number of factors underlying the the Port's forecasts of full import containers, in particular:

- container growth in the 2013-2040 period will reflect growth rates that have been seen historically over the last 20 years
- container growth has averaged 1.6 times Queensland's GSP over 2002-2012 and it is expected that this will continue at multiples of Queensland's GSP
- it is likely that domestic manufacturing will continue to decline, resulting in an increase in containerised imports.

It is likely that a primary cause of the differences between the Port of Brisbane and IMEX forecasts is that the former assumes that variations in exchange rates do not influence full import container demand, while the latter assumes that exchange rates are a driver of full import container demand. Sensitivity tests with the IMEX full import container model indicated that – with increases in the GSP parameter (that fall within the variances for the model parameter) – forecasts of growth rates for full import TEUs could be of the order of the observed rates in recent years. This means the Port of Brisbane forecasts are possible.

Truck-to-container relationship and port truck traffic forecasts

Estimates of the number of trucks required to move the forecast container demand for future years are essential to aid planning of the road network, particularly on the network adjacent to the Port.

Total vehicle volumes generated by the Port are expected to grow by just over 3% a year (compound) until 2040 and are shown in Table 19. These are two-way running volumes including full and empty trucks. The passenger car unit (PCU) equivalent traffic is expected to grow by just over 3.1% a year, due to a slightly higher heavy truck content in the traffic. It is the growth in PCUs that will reflect the future demand for road vehicle capacity near the Port.

Forecast traffic volumes and conditions to 2031

Figures 26 and 27 show the estimated average weekday key container truck routes and volumes for 2031. The expected traffic operating conditions can be best indicated by a volume/capacity (V/C) ratio or level of service parameter, which are based on daily traffic.

The estimated values of the V/C in 2031 are shown in Figure 28. An indication of the possible growth in volumes and changes in traffic conditions can be seen by comparing the volume estimates and V/C ratios for 2031 with the estimates for 2012. When compared with the corresponding estimates for 2012, the primary observations include the following.

- There will be a significant increase in truck volumes on the major routes to and from the Port, with increased spread to other routes from those used in 2012.
- Although the container truck volumes will increase in the future, the traffic operating conditions for roads connecting to the Port precinct remain unchanged due to upgrades such as Port Connect.
- The north and south freight corridors show some decrease in performance on the Pacific Motorway and Gateway South, where recent upgrades and proposed projects could be expected to provide relief until 2030 or beyond.
- On sections of the regional network (e.g. Warrego Highway and Bruce Highway) there is likely to be deterioration in traffic conditions (i.e. increased V/C values above the 2012 values). As a result, there is a risk that traffic conditions for import/export movements will deteriorate without improvements.

Esimtates of the container-related traffic volumes and V/C condiions are likely to be materially higher than those reported above if container forecasts above those in Table 18 and comparable to the PBPL forecasts occur.

Table 19 Conversion of TEUs to trucks and PCUs[1]

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Year	TEUs	Weekday container trucks	Non container trucks	Total trucks	Total vehicles	PCUs
2001	426,672	1,509	1,563	3,072	6,599	13,339
2011	937,395	3,316	3,091	6,406	12,462	26,516
2012	1,030,254	3,644	3,368	7,013	13,528	28,913
2020	1,281,686	4,534	4,121	8,654	16,414	35,401
2030	1,881,762	6,656	5,916	12,572	23,303	50,885
2040	2,414,447	8,540	7,510	16,050	29,417	64,630

1. Data and forecasts are in TEUs. Actual TEUs used for each study are shown in red and forecasts in black.

Summary

The study involved a comprehensive assessment of movements for import/export containers and selected non-containerised commodities and domestic containers. This required large samples of detailed data on container and non-container movements collected during a two-week period in September 2012 and supporting data and information from a range of businesses engaged in the Port and domestic supply chains.

The data and analyses provided robust estimates of a wide range of items relevant to future Port planning and management, with the following primary items.

- The Port is the third largest container port in Australia, with a total container throughput of 1,031,000 TEUs in 2012. Of these, 45% were full imports, 32% were full exports and 23% were empty containers.
- The majority of the containers (95%) are transported to/from the Port by road, with the remainder being transported to regional centres through the Brisbane Multimodal Terminal.
- For import containers, approximately 25% are unpacked at the Port or the adjacent areas, 60% are unpacked within Brisbane and 90% within 100 km of the Port.
- For export containers, approximately 30% are packed at the Port or the adjacent areas, 40% are packed within Brisbane and 75% within 100 km of the Port.
- Departure and arrival times of containers for stevedores, transport yards, importers, exporters and empty container parks are spread over the days of the week and hours of the day. However, there is often a mismatch between the operating hours for many importers and exporters and those for stevedores, which causes high levels of staging of container movements at transport yards.
- The distribution of import container destinations and export container origins leads to container trucks using most sections of the major road network and some sections of local road networks to access destinations or origins. The traffic operating conditions on some of the road sections connecting to the Port are approaching high congestion levels.
- Significant volumes of non-containerised freight were moved through the Port in 2012, comprising:
    - 229,000 motor vehicles
    - 425,000 tonnes of break bulk steel
    - 29,000 units of project cargo
    - 1.7 million tonnes of grain and other cereals
    - 8.9 million tonnes of coal.
- There are a number of impediments and blockages in the Port's logistics chains, in particular:
    - road congestion and infrastructure conditions
    - rail infrastructure condition and lack of connectivity
    - regulation for heavy vehicles on some routes.
- There is likely to be significant growth in containerised and non-containerised trade through the Port to 2040 (e.g. 3.6% a year compound growth in full import containers). This growth will lead to significant increases in truck volumes on major routes to and from the Port, with increased spread to other routes. There is a risk that traffic conditions for import/export freight movements will deteriorate unless further transport network improvements occur.

Figure 26 Forecast container vehicle routes to and from the Port in 2031 (average weekday one-way volumes)

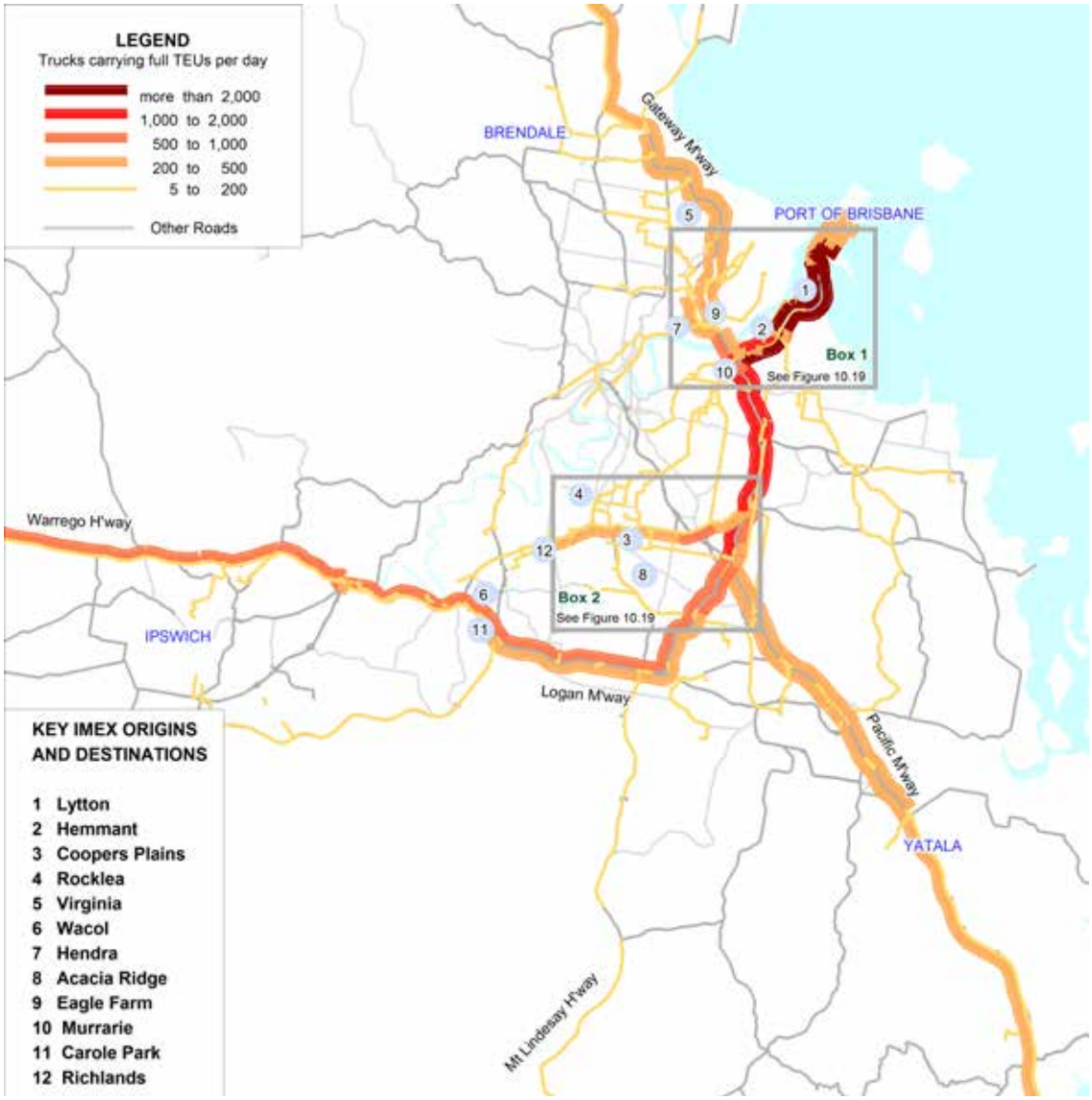


Figure 27 Forecast container routes and volumes in sub-areas in 2031 (average weekday one-way volumes)

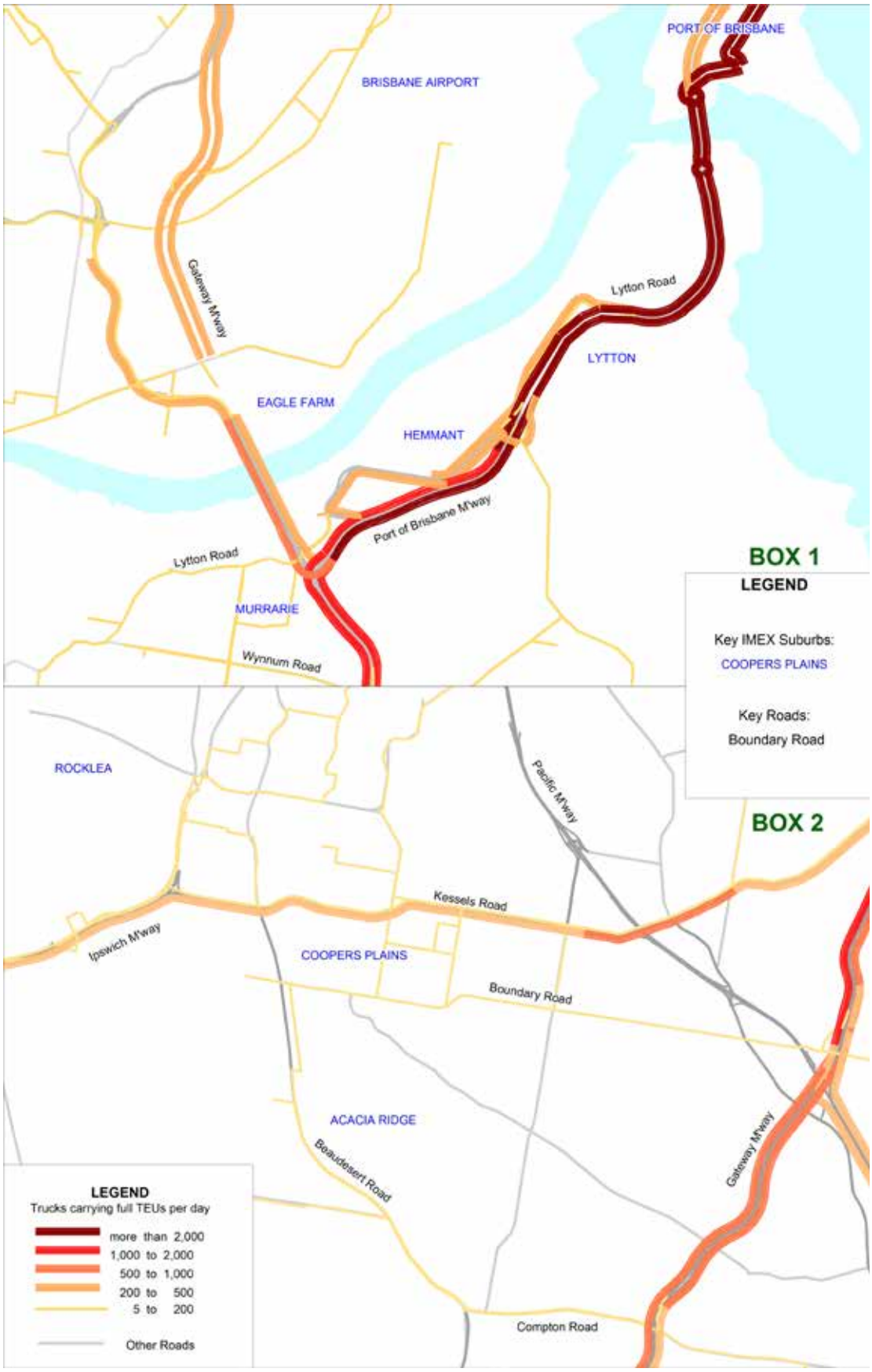
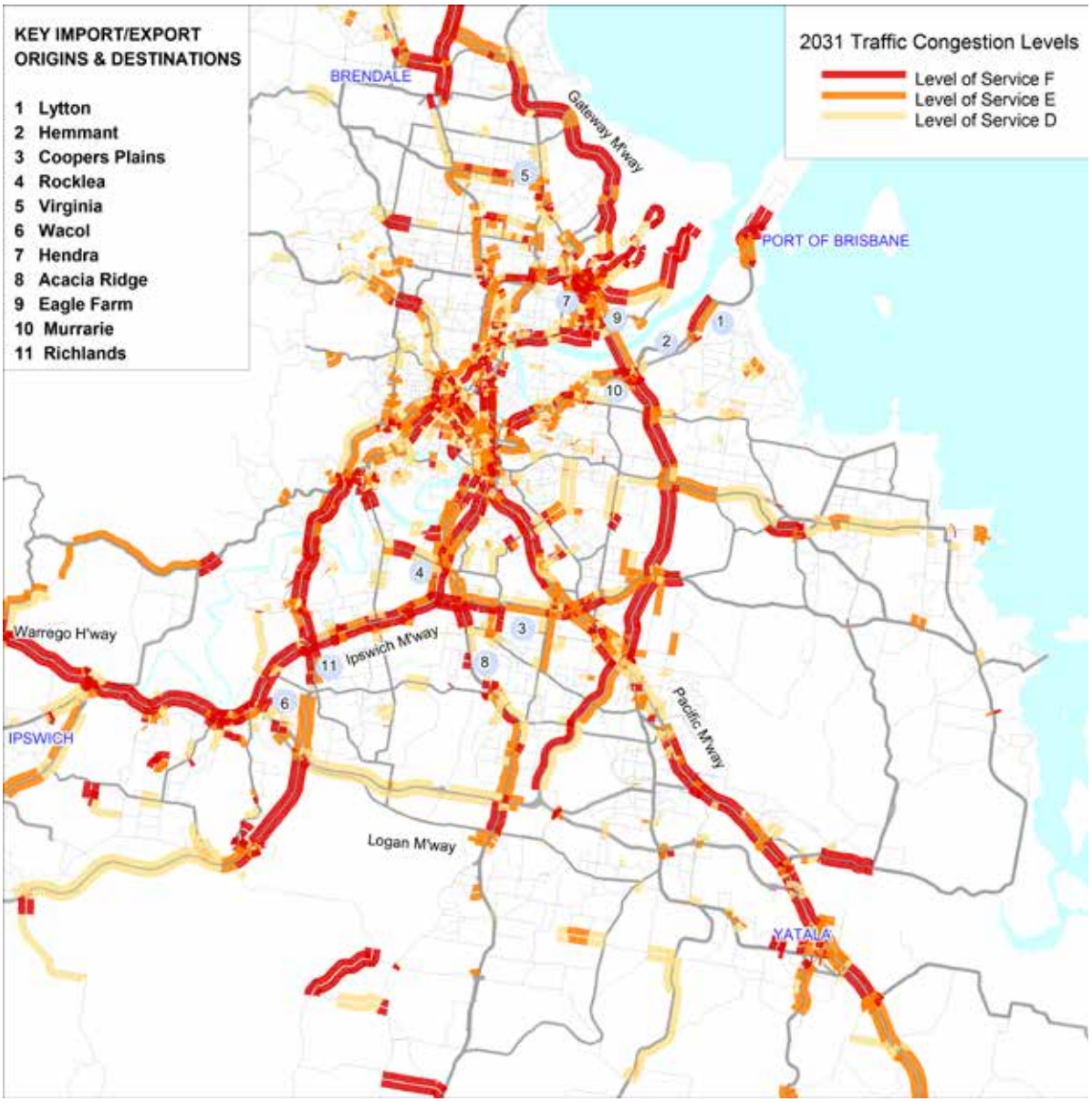


Figure 28 Estimated level of service for Brisbane and adjacent regions for 2031



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Summary Report

June 2013