PORT of BRISBANE
Here for the future

Origin Destination Study

Summary Report

2023

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Acknowledgement of Country

Port of Brisbane Pty Ltd acknowledges the Traditional Owners of the lands and waters on which we and our many customers and stakeholders operate, the Quandamooka, Turrbal and Yuggera peoples and pay our respects to their Elders past, present, and emerging.

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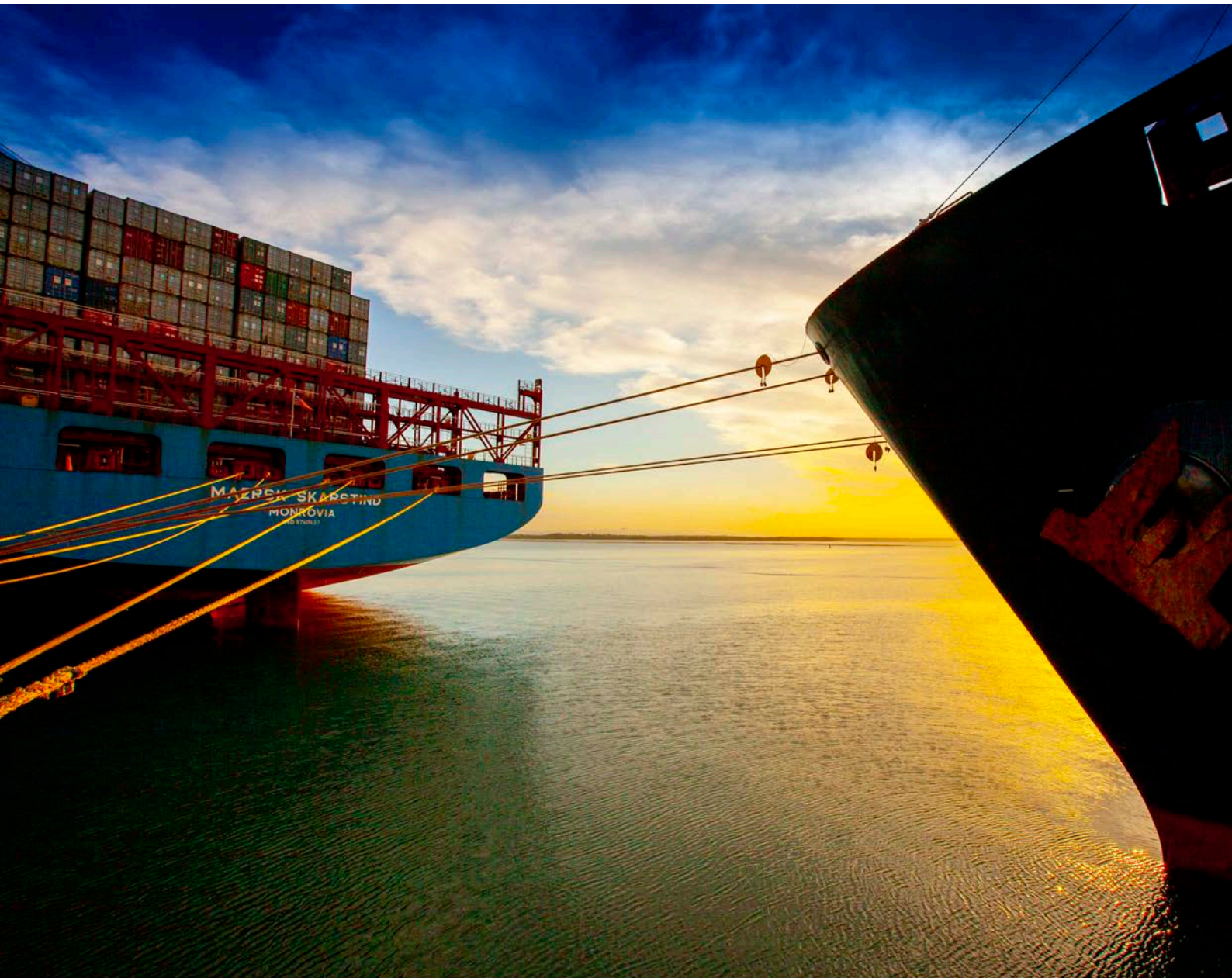

Glossary of terms

TERM	DEFINITION
A-Doubles	A vehicle comprising up to two 40-foot trailers, capable of carrying 3-4 TEUs with limited steering capacity and a maximum of 86 tonnes gross vehicle mass
Base year	First year for the estimates from the study (FY2021/22)
B-Double	A vehicle comprising a 20-foot trailer followed by a 40-foot trailer, capable of carrying 3 TEUs
BITRE	Bureau of Infrastructure, Transport and Regional Economics
Bulk run	Pre-arranged transportation of multiple empty containers between empty container parks and the stevedores on behalf of the shipping lines
Confidence range	An indication of the likely range from the estimated values in which the actual values might lie, with a particular level of confidence (e.g., 90%)
Container or shipping container	Standardised steel boxes (20 feet or 40 feet long and 8 feet wide and high) used to carry international import and export freight. Domestic freight containers also include 30, 45, 48 and 53-foot units
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
Container terminal	For this report, a container terminal is the port facility operated by stevedores, used to transfer containers between vessels and landside transport.
Container yard	A container yard /or transport yard is a road transport facility where containers pass through as part of the supply chain. Containers may also be stored or staged at the container yard.
Cross-Docked	Cross docking is moving freight from one truck to another with minimal delay.
De-hire	The process of returning an empty container to an empty container park (the container is 'de-hired' from the importer to the shipping line)
Destination	The location where containers are unpacked.
Domestic container	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, a return point to de-hire to shipping companies
Export	For the purposes of this study, export refers to the despatch of containers from a port by a vessel to an international destination
Exporter	A business operated primarily for the purpose of exporting freight, or of providing export-related services to other businesses
Freight forwarder	A business that arranges for the carriage of freight and associated formalities on behalf of a shipper, importer or exporter
Forecast years	Set of years for reporting forecasts of container movements and traffic conditions, these being 2025, 2030, 2035, 2040. The forecast model will go up to 2060.
GSP	Gross state product. A measure of the economic output from a state. The Qld GSP was used.
High Productivity Freight Vehicles (HPFV)	Freight vehicles designed using the Performance Based Standards scheme to acquire characteristics of increased length, mass or other capacity over 'standard' designs. In this report, a HPFV relates to vehicles able to carry up to 4 TEUs (includes Super B-doubles and A-doubles).
Import	For the purposes of this study, import refers to the discharge of containers at the port from a vessel which originates from an international point of origin

TERM	DEFINITION
Intermodal	Movement of containers interchangeably between transport modes (e.g., road and rail), where the equipment is compatible between the multiple modal systems
Landside movement	All the inland rail or road movements once a container is discharged from a vessel (for import containers) or before a container is loaded onto a vessel (for export containers)
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
On-hire	The process of collecting an empty container from an empty container park (the container is 'on-hired' to the exporter from the shipping line
Origin	Location where containers are packed
Pack	the process of packing cargo into a container
Passenger car unit (PCU)	Indicates the influence which a vehicle class (e.g., rigid truck) has on road traffic operations, relative to a 'standard passenger car'
Port	Port of Brisbane
Rail Terminal Operator	A business that engages in the loading and unloading of freight and containers on and off trains
Reefer	Refrigerated container designed to transport refrigerated or frozen freight
Repositioning	The export of an empty container to an overseas destination as directed by the owner of the container (usually a shipping line)
SEQSTM	South East Queensland Strategic Transport Model operated by Transport and Main Roads (TMR)
Sideloader	A trailer specially designed to carry containers which is fitted with a lifting device to independently load or unload the container
Staging	Containers are stored prior to delivery to importers, ECPs, exporters or prior to delivery to 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 the loading and unloading of ships' cargo
Super B-Double	A vehicle comprising two 40-foot trailers, capable of carrying 4 TEUs and up to 109 tonne gross vehicle mass
TEU	A measure of the Standard 20-foot shipping container (Twenty foot Equivalent Unit – a measure where 1 TEU = a 20 foot container and 2 TEU =a 40 foot container)
Transhipments	A distribution method whereby containers or freight are transferred from one vessel to another via the port (sea-to-sea) to reach their final destination, compared to a direct service from the load port of origin to the discharge port of destination.
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.
Triangulation	Empty container triangulation is the practice of an un-packed import container being re-packed with exports without transiting an ECP.
Unpack	The process of unpacking cargo from a container

Scope and limitations

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The Model is a representation only and does not reflect reality in every aspect. The Model contains simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Model. Accordingly, the outputs of the Model cannot be relied upon to represent actual conditions without due consideration of the inherent and expected inaccuracies. Such considerations are beyond GHD's scope.

The information, data and assumptions ("Inputs") used as inputs into the Model are from publicly available sources or provided by or on behalf of the Port of Brisbane Pty Ltd, (including possibly through stakeholder engagements). GHD has not independently verified or checked Inputs beyond its agreed scope of work. GHD's scope of work does not include review or update of the Model as further Inputs becomes available.

The Model is limited by the mathematical rules and assumptions that are set out in the Report or included in the Model and by the software environment in which the Model is developed.

The Model is a customised model and not intended to be amended in any form or extracted to other software for amending. Any change made to the Model, other than by GHD, is undertaken on the express understanding that GHD is not responsible, and has no liability, for the changed Model including any outputs.

Assumptions

Much of the data utilised in this report was sourced from the Port of Brisbane Pty Ltd, Government entities and industry which has not been independently verified. However, it is the best data available and is assumed to be accurate as inputs for this report.


PORT OF BRISBANE

1. Introduction

1.1 Study background

The Port of Brisbane is a major container and general cargo port in the state of Queensland, owned and operated by Port of Brisbane Pty Ltd (PBPL). PBPL has a principal objective to drive trade and business growth through the Port, working with customers and other stakeholders to deliver efficient and innovative outcomes and to capture new commercial opportunities.

PBPL appointed GHD in association with the Container Trade Alliance Australia (CTAA), to undertake a refresh of the previous Port of Brisbane Container Logistics Chain Study (Study) completed in 2013.

PBPL is a privately owned company which derives its revenue from developing, leasing and managing Brisbane port land and engaging in commercial management activities. The company employs approximately 180 full-time equivalent staff and is administered from its head office in Port of Brisbane, Queensland. A key trade growth initiative for PBPL is to integrate the Port operations with land-based supply chain functions which is a key driver and growth initiative for the development of the Port of Brisbane Import/Export Logistics Chain Study (the Study).

The aim of the study is to provide PBPL with robust data and information on:

1. Container and bulk freight movements and volumes
2. Logistics chain operations and changes since the 2013 logistics chain report
3. Trade and traffic volumes
4. Factors influencing current and potential future supply-chains

The study will help inform long-term planning for the Port, the freight industry and transport requirements in south-east Queensland by providing a comprehensive overview of the current container supply chain characteristics and potential future needs. This will enable PBPL and other stakeholders to make informed decisions about the future of the freight industry and transport in south-east Queensland.

1.2 Study aims and objectives

The Study has been prepared to assess the current movements, patterns and locations where containers and freight passing through the Port of Brisbane are transported, how they are managed, and to inform PBPL of current trends which can assist further planning and development of the port. The study brings together data from a range of businesses associated with the container based import/export logistics chains to provide a detailed view of the overall movements of containers between the Port of Brisbane, the suburban areas and the hinterland and regions it supports. Understanding the current operations of the landside supply chains will support planning processes and the community. The study identifies:

1. Key routes used for import/export freight as well as transport network use
2. Landside movement of selected non-containerised commodities
3. Import/export container contents and movement to and from pack/unpack locations
4. Key traffic forecasts for import/export containers and selected non-containerised commodities that can support future transport investment decisions

1.3 Study methodology

The Study methodology is based on the collection and alignment of logistics supply chain data from the Port of Brisbane, and major industry participants, including road and rail transport operators who link the logistics chain between the port and major pack and unpack locations. This methodology required a solid foundation of data governance to manage the scope and protection of data and a well-defined stakeholder engagement and communications approach. The stakeholder engagement strategy was a key initial focus to collect relevant data and build the analytical models required to produce results for the Study. The summary below provides an overview of key elements of the study.

Approach summary

The import/export and domestic container movements addressed in Sections 4, 5 and 6 required large samples of detailed high-integrity data on container movements, complemented with datasets detailing individual transport businesses and their freight operations. An overview of the methodology is provided on page 10.

Assessment of PBPL container trade data to determine a suitable sample period

A sample period was chosen to lessen the administrative strain on data sourcing given the volume of containers that pass through the port. In order to record as many full container cycles as possible: including containers arriving at the Port as imports, departing as exports, an eight-week timeframe was chosen. To select an appropriate sample period a detailed assessment of PBPL's container data was undertaken to determine:

- Seasonality – peaks and troughs in commodity types. For example, where peak seasonal products such as grain exports may occur.
- Unforeseen events – given the retrospective nature of the study, (as data was to be selected from the 2021/22 financial year) the sample period was selected outside events such as the 2022 Brisbane floods.
- Commodity diversification and stability – assessment of the number of commodities moving through the Port in any given month.

Based on these factors, the period from the 1st August 2021 to 31st September (inclusive) was used as the data sample period.

Establishment of a data governance strategy

For the purposes of this project, data is defined as any information from reports or reporting organisations including databases and industry collected data during the sample period. A Data Governance and Management framework was developed to support appropriate management and confidentiality of commercially sensitive data during the project. The framework has provided a decision-making structure and set of rules and processes which define the accountability and authority for data-related matters.

Data collection

The Study's success is based on industry participation, with stakeholders and industry, associations, and businesses, providing container movement statistics.

The following associations and government departments assisted by either supporting in the collection of data or providing data for Container Transport Alliance Australia (CTAA), The Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA), The Bureau of Infrastructure and Transport Research Economics (BITRE)

The following parties contributed to data collection during the Study; PBPL – data for annual throughput of containers for each trade sector and by commodity for the FY2021/22 period, container terminal vehicle booking system (1-Stop) – anonymised data on truck and container movements through terminal gates, transport operators – provided data for container movements between nodes in the container chain, empty container park truck notification system (ContainerChain) – similarly to 1-Stop, supplied anonymised data on truck and container movements through their clients' facilities. Data was collected for all five ECPs and DITRDCA/BITRE – supplied anonymised trade data for international trade of import and export containers which supplemented data supplied by others.

Data extrapolation and model development

The data collected from the sample period was processed through a cleansing process and validated using statistical methods to assess the data for any inconsistencies in container journeys.

Once confirmed and aligned to other sample period data, an extrapolation process was applied to annualise the sample period data to estimate and align to the known full container movements for FY2021/22.

Based on this core dataset, a supply-chain model was developed to provide visibility and represent the highly complex container system. The stochastic nature of the model provides a level of probability based logic which reflects the intricacies of real-world supply-chain behaviour and activities throughout the container chain. This model will also provide a basis for further studies and examination of the PBPL container logistics chain.

2. Overview of import/export container movements

2.1 Port throughput

In FY2021/22, the Port's total container throughput was 1,434,212 containers (TEUs).

- 730,302 containers (TEUs), full and empty, were imports
- 703,910 containers (TEUs), full and empty, were exports
- Approximately 99% (1,434,212 TEUs) of the import and export containers (full and empty) were transported by road to and from the Port
- Less than 1% (10,722 TEUs) were transported by rail to and from the Port (Table 1)

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

		IMPORTS		EXPORTS		TOTALS	
		TEUs	**%**	**TEUs**	**%**	**TEUs**	**%**
ROAD	Full containers	668,012	91%	331,145	47%	999,157	70%
	Empty containers	62,290	9%	362,043	51%	424,333	30%
	Subtotal — Road	730,302	100%	693,188	98%	1,423,490	99%
		IMPORTS		**EXPORTS**		**TOTALS**	
		TEUs	**%**	**TEUs**	**%**	**TEUs**	**%**
RAIL	Full containers	0	0%	10,722	2%	10,722	1%
	Empty containers	0	0%	0	0%	0	0%
	Subtotal — Rail	0	0%	10,722	2%	10,722	1%
TOTAL ROAD & RAIL		**730,302**	**100%**	**703,910**	**100%**	**1,434,212**	**100%**

2.2 Summary of import/export containers moved by road

This section focuses on containers that were transported by road to and from the Port. In 2021/22 financial year, 1,423,000 full and empty import/export containers (TEUs) were transported by road:

- 47% (668,000 TEUs) were full import containers which on average required 1.7 transport movements between stevedores and importers (unpack locations)
- 4% (62,000 TEUs) were empty import containers that moved directly from stevedores to ECPs
- 23% (331,000 TEUs) were full export containers which on average required 1.7 movements between export packing locations and stevedores
- 25% (362,000 TEUs) were empty export containers for repositioning which were transported directly from ECPs to stevedores

Within these overall container movements:

- 18% (123,000 TEUs) of full import containers were transported directly from stevedores to importers
- 13% (44,000 TEUs) of full export containers were transported directly from exporters to stevedores
- 82% (545,000 TEUs) of full import and 87% (287,000 TEUs) of full export containers were staged at transport yards
- 95% of import containers were unpacked and 51% of exports were packed within 100 km of the Port
    - 36% of containers were transported by A-doubles and B-doubles; 36% by semi-trailers, 28% by side loaders A/B-doubles and 2% by Super B Doubles
    - The average number of containers (TEUs) carried per truck was 1.9 TEUs

Table 2 indicates the variances in geographic origins and destinations between the 2021/22 financial year. The increase in regional and interstate exports is representative of positive agricultural outcomes with record production in commodities including grain and cotton.

Table 2 - Total import/export containers moved by road and rail

	FY2021/22					
	IMPORT		EXPORTS		TOTAL	
	TEUs	%	TEUs	%	TEUs	%
BRISBANE AND ADJACENT STATISTICAL AREAS	647,780	97%	231,098	66%	878,878	86%
REGIONAL QUEENSLAND	16,576	2%	102,963	29%	119,539	12%
INTERSTATE	4,350	1%	18,213	5%	22,563	2%
TOTAL	**668,706**	**100%**	**352,274**	**100%**	**1,020,980**	**100%**

2.3 Understanding import/ export container movements

The key movements in each node of the import/ export logistics chains are summarised in Figure 1 (some minor movements are not shown). This diagram is used throughout Section 5 to highlight and quantify each container logistics chain component.

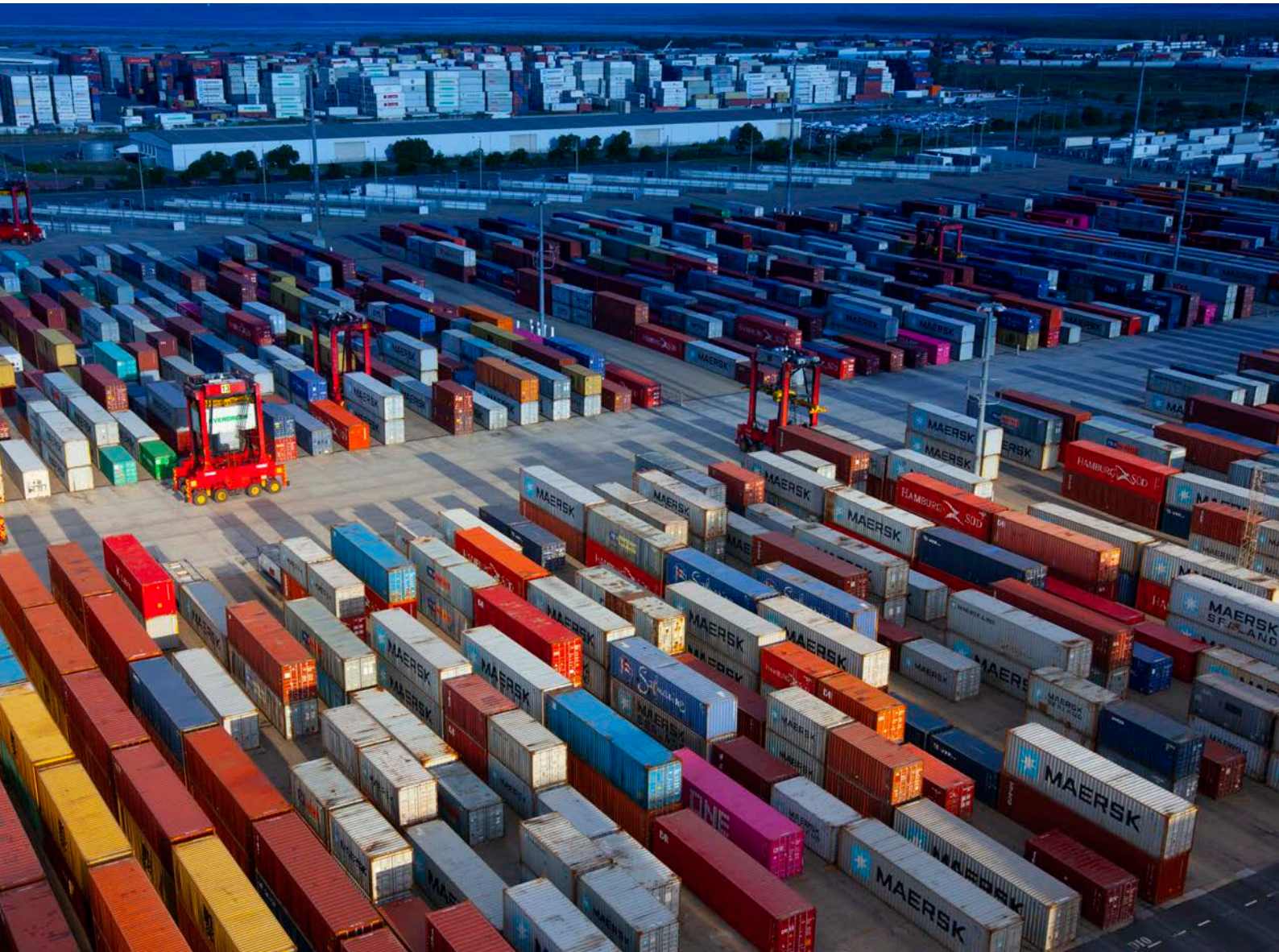
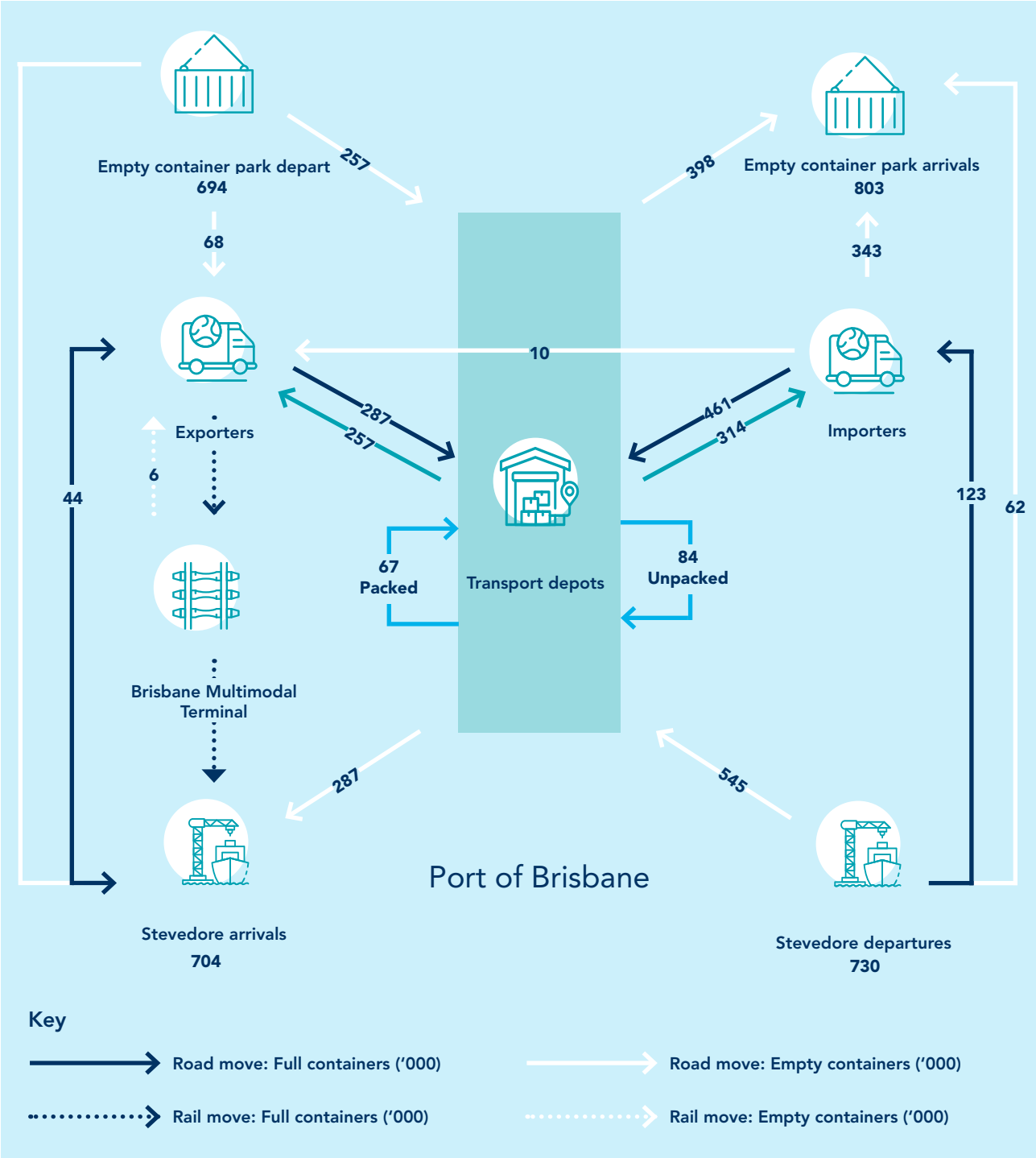


Figure 1 - Movements of full and empty containers in the import/export logistics chain



The following explanatory information pertains to Figure 1:

- **Legend** — blue lines and arrows show full containers, light blue lines and arrows show empty containers and black-hatched lines show rail movements.
- **Geographic scope** — applies to metropolitan, regional and interstate containerised freight.
- **Full container import chain** — is shown on the right-hand side of Figure 1. Full containers can be transported in one of four ways:
  - From stevedores to importers
  - From stevedores to transport yards for unpacking
  - Indirectly from stevedores to importers via transport yards (staging)
  - To the BMT for transport by rail to regional areas
- **Empty container import chain** — is shown on the far right-hand side and at the bottom of the figure. Empty containers are imported to be packed with export freight. They can be transported:
  - From the stevedore directly to the ECP
  - Via the BMT, by rail, to the exporter in regional Queensland1
- **Full container export chain** — is shown on the, left hand side of Figure 1. Full containers can be transported in one of four ways:
  - From the exporter to the stevedore
  - Indirectly from the exporter to the stevedore via a transport yard (staging)
  - From the regional exporter, by rail, via the BMT to the stevedore; shown by a black (dashed) line
- **De-hire and on-hire** — empty container de-hire and on-hire is shown along the base of Figure 5. The right-hand side shows the movement of empty containers after the imported freight has been unloaded, and the container is then de-hired at the ECP. At this stage, empty containers in a satisfactory condition are ready for reallocation (on-hire) and repacking with export freight. The left-hand side shows the movement of empty containers to exporters or transport yards (for packing) or to stevedores for empty container repositioning.
- **Empty container export chain** — is shown on the far left-hand side and at the bottom of the figure. Upon the direction of the shipping lines, empty containers are moved from the ECP to the stevedore for global repositioning.

2.4 High-level changes observed since 2013

- Rail mode share has declined from 5% to 1% since 2013 due to heavy vehicles offering more cost-effective transportation solutions. Moreover, an efficient rail option is currently unavailable to cater to areas like Moree in Northern New South Wales as they are not connected to the wider rail network at the current time.
- There are a greater number of empty exports due to the increase in imports resulting in an imbalance between imports and exports. Additionally, many export commodities use 20ft containers because of the heavy cargo weight however, imports which are commonly lighter usually prefer 40 ft containers leading to a mismatch and adding to the excess of empty export containers. The mismatch is simply because we import more than we export, not container size
- The study indicates a decline in exports being packed within 100km of the port. This trend can be attributed to the use of transport yards and third-party packing facilities situated closer to regional areas, as well as a seasonal variation this year compared to the previous study, which saw larger volumes of agricultural products being exported.
- There is an increase in the use of side-loaders, which typically indicates that importers and exporters are seeking ways to improve efficiency, especially when they are limited by the appropriate equipment required to handle containers.
- The percentage of staging of imports and exports has almost doubled since 2013, which is an efficiency measure for trucks to access rather than adding to congestion. This strategy improves supply chain management and planning, allowing for more efficient movements to and from the Port.

The increasing number of exports packed interstate reflects the growth in agricultural grain and cotton products in northern New South Wales since the 2013 report. It is worth noting that there are also additional volumes from Northern New South Wales being packed in areas such as Toowoomba or the Darling Downs.

3. Import/export container movements by road

3.1 Introduction

This section provides estimates and analysis for the import/export container movements by road and discusses the implications for the Port's planning and operations. It is presented according to each stage of the container logistics chains including:

- Movements for full and empty import containers
- Movements for full and empty export containers
- Geographic destinations (for import containers) and origins (for export containers)
- Trip distances, truck types, truck utilisation and routes
- Daily, hourly and elapsed times for container arrivals and departures

3.2 Geographic areas

This section of the report describes the geographic origins and destinations of containers transported through the Port.

Specification for geographic areas

The Australian Statistical Geography Standard (ASGS) is the geographical standard now used by the ABS for reporting census data and several levels of mapping specifications. The number of containers and their particular origins (for exports) and destinations (for imports) have been categorised in the following way:

- Brisbane area – the extent of the Brisbane North, Brisbane South, Brisbane East (excluding Stradbroke Island) and Brisbane West are shown in Figure 2

Figure 2 - Geographical boundaries of the Brisbane area

- Brisbane and adjacent statistical regions – the statistical regions were used at this level are SA4 in the ASGS and are based on labour markets considering the labour supply (where people work). These include Ipswich, Logan – Beaudesert, Moreton Bay – North and South and the Sunshine Coast.
- Regional Queensland and interstate – these areas are SA2 in QLD and SA3 in NSW, as specified in the ASGS. 'Regional centres' used in the maps are based on the names for the SA2 and SA3 areas.

3.3 Geographic destinations – import containers.

In FY2021/22 the total number of full import containers transported by road for unpacking across the Port hinterland was 668,000 TEUs. Details of the destinations for containers transported by road are discussed below.

The pattern of import container destinations (i.e. where containers were unpacked) shows a high concentration at the Port and key industrial areas of Brisbane, although many were transported to other destinations across Brisbane generally and to the city's adjacent statistical regions at lower volumes. Only a small proportion of import containers were distributed by road across regional Queensland and interstate.

The destinations for full import containers are summarised below:

- 26% were unpacked in the Port or the contiguous industrial suburbs (for example, Lytton, Hemmant Murarrie)
- 55% were distributed to destinations across Brisbane
- 42% distributed to adjacent statistical regions
- 2% were distributed further across regional Queensland
- 1% were transported interstate, mainly to northern NSW

Import container destinations – Brisbane suburbs

Over half (64%) of the import containers were unpacked at the Port or one of 14 Brisbane suburbs that lie within 40 km of the Port, as summarised in Table 3 and Figure 3.

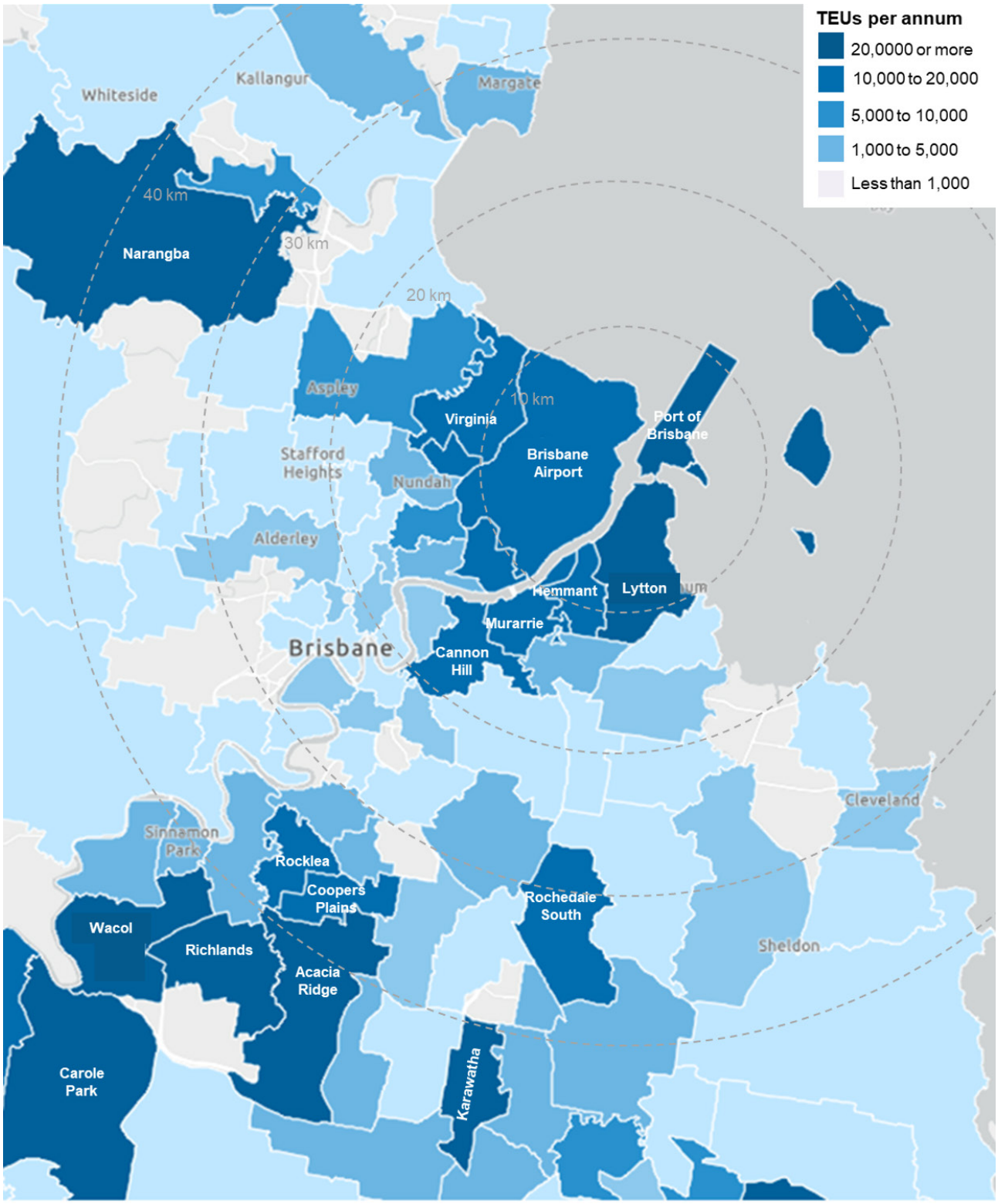
- 26% were unpacked at the Port or the general Port area, which includes the contiguous industrial districts of Lytton, Hemmant and Murarrie; most went to the general port area and Lytton (22% of all import containers), requiring minimal container movement from the wharf.
- 37% were distributed to 12 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.

Table 3 - Import container destinations–- Brisbane suburbs[1]

	RELATED SUBURBS	TEUS (2013)	%	TEUS (FY2021/22)	%
PORT AND CONTIGUOUS AREAS	Port of Brisbane and Lytton	66,618	14.6%	146,842	21.5%
	Hemmant	36,145	7.9%	16,822	2.5%
	Murarrie	13,140	2.9%	11,599	1.7%
OTHER SIGNIFICANT BRISBANE AREAS	Coopers Plains	18,461	4.0%	12,730	1.9%
	Rocklea	17,623	3.9%	18,036	2.6%
	Virginia	15,267	3.3%	11,308	1.7%
	Wacol	15,033	3.3%	28,445	4.2%
	Hendra	15,005	3.3%	9,847	1.4%
	Acacia Ridge	15,004	3.3%	54,306	8.0%
	Eagle Farm	13,886	3.0%	13,241	1.9%
	Richlands	11,730	2.6%	21,272	3.1%
	Spring Lakes	-	-	26,235	3.8%
	Redbanks	-	-	17,163	2.5%
	Cannon Hill	-	-	13,272	1.9%
	Karawatha	-	-	23,626	3.5%
TOTAL		**237,912**	**52.0%**	**344,448**	**62.3%**

1 These map Stat Suburbs which approximate suburbs in urban areas. State suburbs can be made up of aggregations of ABS SA1-Level. See Section 5.4.1 for details

Figure 3 - Map of import container destinations–- Brisbane suburbs[2]



2 The TEUs for 'Key Destinations' are shown in Table 5.

Import container destinations – Brisbane and adjacent statistical regions.

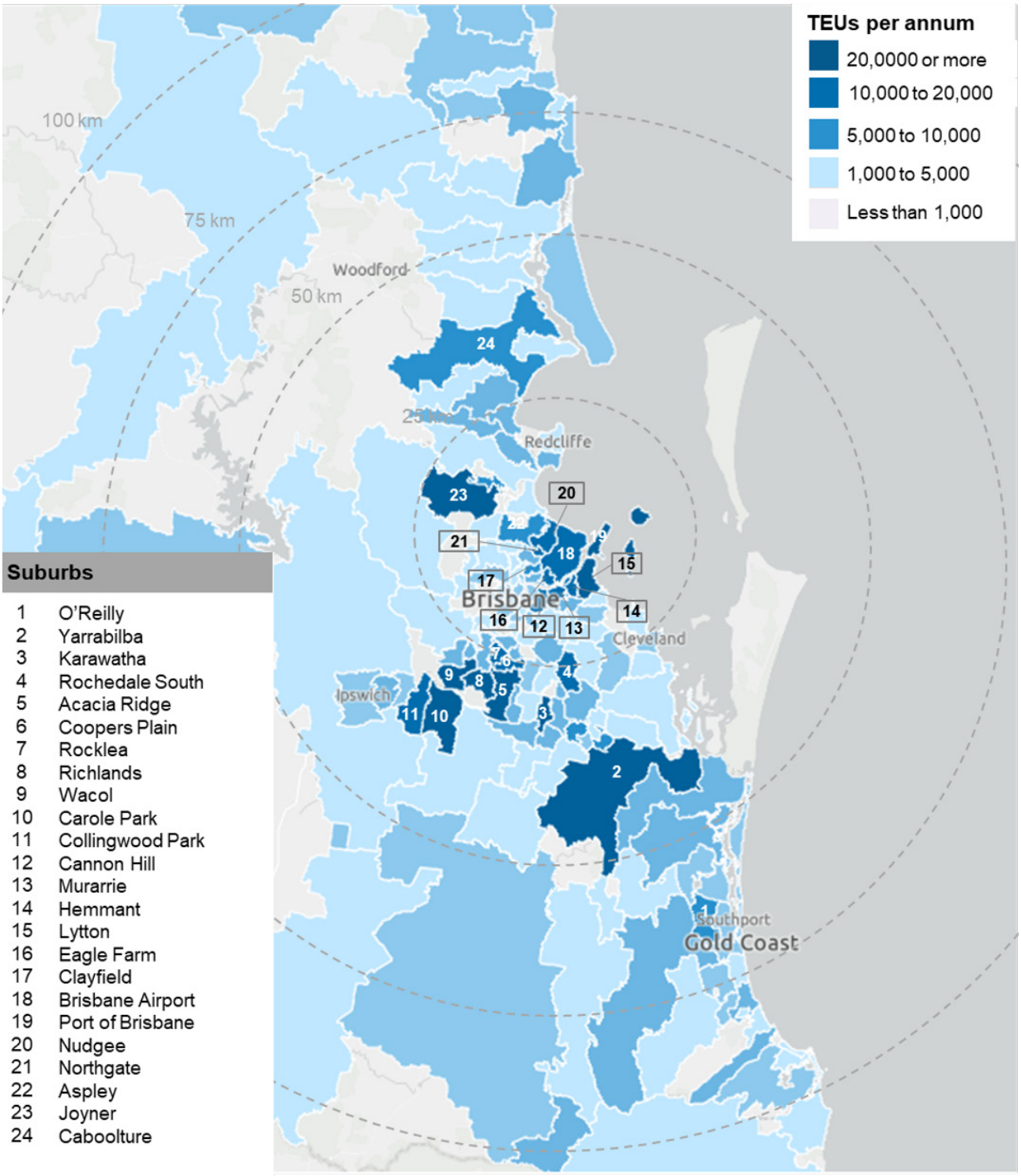
Brisbane and the adjacent statistical regions were destinations for 97% of import containers, summarised in Table 4 and Figure 4, which clearly establishes the Port's primary hinterland for the container import chain.

- 55% of container destinations were in Brisbane and the most significant areas were Brisbane East (including the Port), Brisbane South and Brisbane North; only 2% were delivered to suburbs across the metropolitan area other than those identified in the previous section
- 42% of import containers were distributed to the adjacent statistical regions
- Ipswich (15%) was the single most significant greater Brisbane area, which reinforces the magnitude of the south-west flow of containers from the Port

Table 4 - Import container destinations - Brisbane and adjacent suburbs

DESTINATION		TEUs (2013)	%	TEUs (FY2021/22)	%
BRISBANE	Brisbane–- East	122,299	26.7%	170,707	25.6%
	Brisbane–- South	85,712	18.7%	110,597	16.6%
	Brisbane–- North	62,101	13.6%	62,729	9.4%
	Brisbane–- West	2,227	0.5%	6,509	1.0%
	Brisbane Inner City	28,711	6.3%	13,965	2.1%
ADJACENT STATISTICAL REGIONS	Gold Coast	32,777	7.2%	54,789	8.2%
	Ipswich	50,361	11.0%	97,012	14.5%
	Logan–- Beaudesert	19,434	4.2%	63,351	9.5%
	Moreton Bay–- South	11,237	2.5%	43,712	6.5%
	Moreton Bay–- North	6,625	1.4%	17,176	2.6%
	Sunshine Coast	4,076	0.9%	7,233	1.1%
TOTAL		**425,560**	**93.0%**	**647,780**	**97.0%**

Figure 4 - Import container destinations – Brisbane and adjacent statistical regions



Import container destinations – regional Queensland and interstate

Only 3% of import containers were distributed across regional Queensland and interstate as shown in Table 5 and Figure 5, with most locations within 750 km of the Port.

- 2% of import containers were distributed across regional Queensland; the most significant regions were around Toowoomba and Wide Bay with the number of containers being 7,549 and 7,250 TEUs respectively
- 1% were distributed interstate; the most significant states were NSW (0.5%) and Victoria (0.2%) and the most significant destinations

Table 5 - Import container destinations – regional Queensland and Interstate

DESTINATION		TEUs (2013)	%	TEUs (FY2021/22)	%
REGIONAL QUEENSLAND	Cairns	435	0.1%	55	0.0%
	Darling Downs–-Maranoa	1,861	0.4%	603	0.1%
	Fitzroy	1,444	0.3%	0	0.0%
	Mackay	1,402	0.3%	169	0.0%
	Queensland–-Outback	83	0.0%	30	0.0%
	Toowoomba	4,053	0.9%	7,549	1.1%
	Townsville	2,687	0.6%	154	0.0%
	Wide Bay	2,611	0.6%	7,250	1.1%
	Central Queensland	0	0.0%	766	0.1%
ADJACENT STATISTICAL REGIONS	ACT	28	0.0%	44	0.0%
	New South Wales	9,602	2.1%	3,133	0.5%
	South Australia	214	0.0%	3	0.0%
	Tasmania	14	0.0%	3	0.0%
	Victoria	6,349	1.4%	1,057	0.2%
	Western Australia	1,008	0.2%	110	0.0%
TOTAL		**31,791**	**7.0%**	**20,926**	**3.1%**

3.4 Changes in geographic import container destinations since 2013

- These findings highlight the efficiencies in business locations and container unpacking in the import logistics chain for full and empty container movements due to the high concentration of businesses and logistics facilities at the Port and the contiguous industrial districts which are continuing to expand.
- Observations show a decrease in the number of imports being unpacked interstate, falling from 4% in 2012 to 1% in 2021/22.
- Since 2013, there has been an increase in areas of import unpack significance across Brisbane, which reflects the growth of imports and associated land use constraints such as Acacia Ridge. Additional significant suburbs include Spring Lakes, Redbanks, Cannon Hill and Karawatha. As businesses continue to move into adjacent suburbs, it is important to monitor this trend as population and residential areas grow, as it may lead to potential land use conflicts, amenity issues and urban encroachment.
- As imports are unpacked in more suburb's, warehouses may move further away from key arterials and this may extend last mile movement and increase the use of minor roads. This further highlights the need for appropriate industrial land supply.
- The percentage of import containers being unpacked in Greater Brisbane and Southeast Queensland regions, specifically in Logan-Beaudesert and Moreton Bay-South, has increased, rising from 4.2% to 9.5% and 1.4% to 2.6% respectively. These regions offer convenient access to major transportation routes such as highways and rail lines (there are no imports on rail from the Port), making it easier for importers to unpack their containers closer to point of consumption.
- A shift has been observed in the import destinations in Regional Queensland, with Toowoomba and Wide Bay receiving a greater number of imports, while Darling Downs–-Maranoa and Townsville have experienced a decrease. These changes can be attributed to the growth of regional centres and their increasing demand for imported products. Furthermore, the consolidation of packing facilities and transport yards in proximity to Toowoomba has contributed to this trend for commodities such as retail products and inputs to industrial processes, including ag manufacturing.

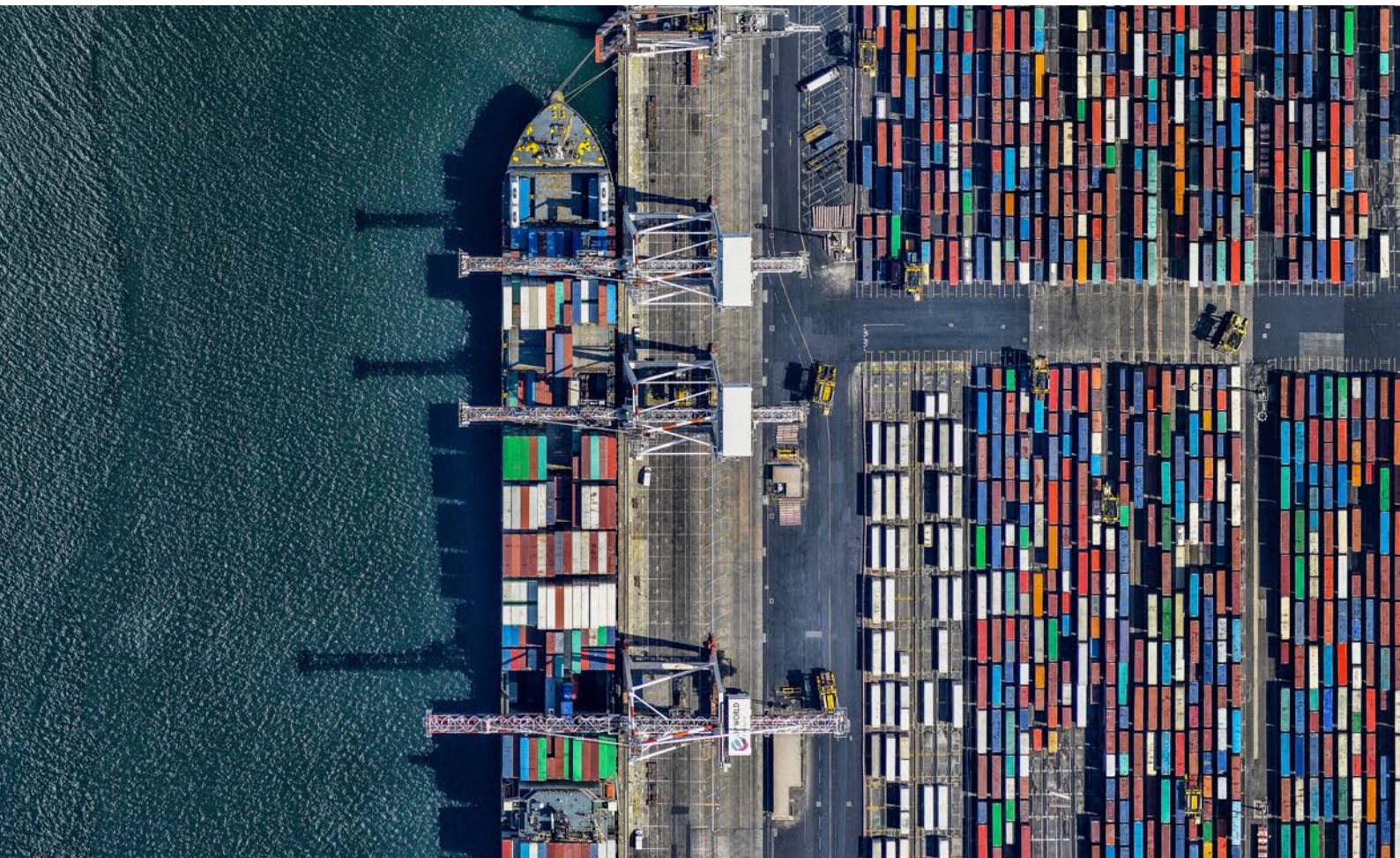
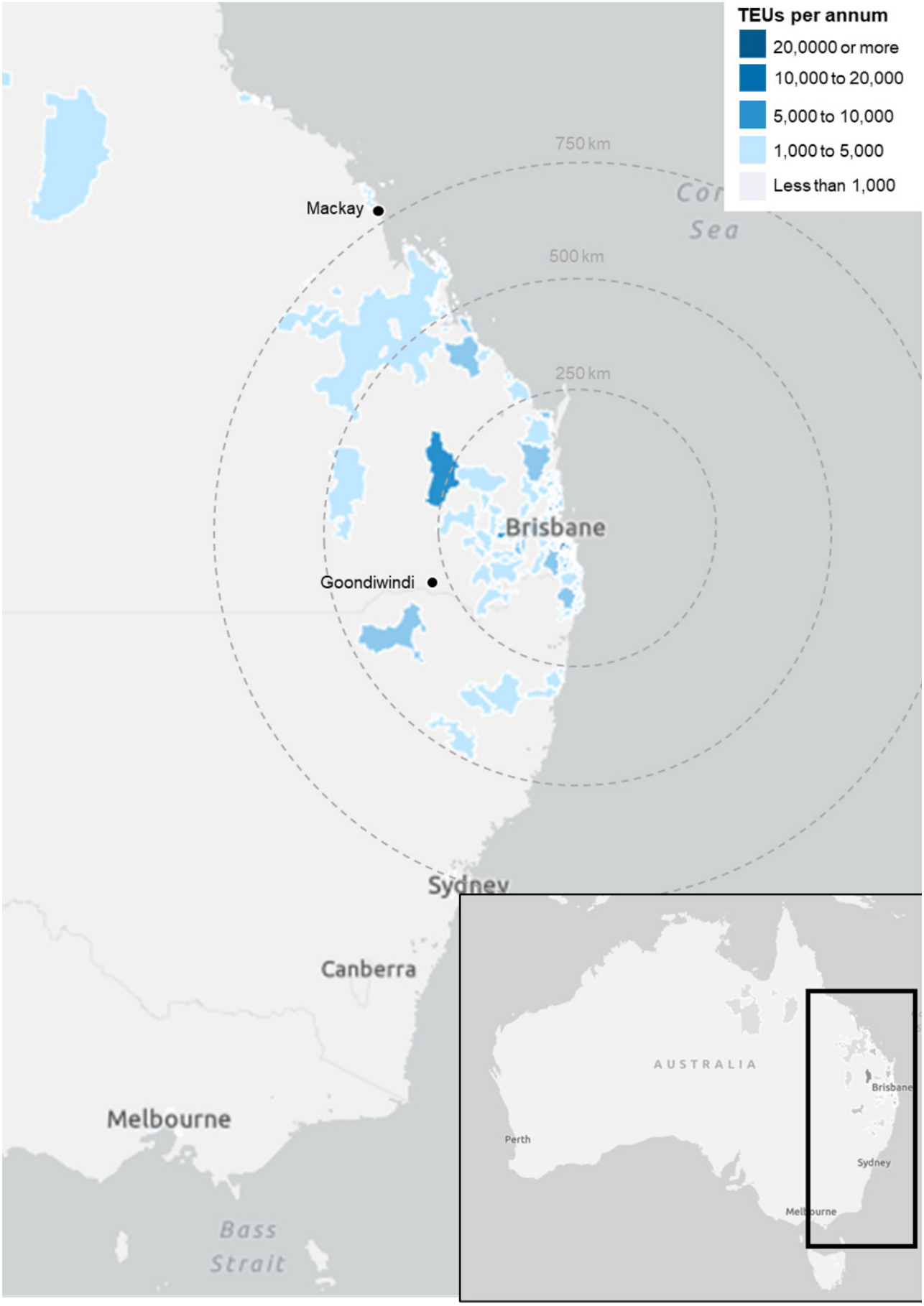


Figure 5 - Import container destinations – regional Queensland and interstate



3.5 Geographic origins – export containers

In 2021/22 the total number of full export containers transported by road through the Port to reach international markets was 331,000 TEUs. An additional 11,000 TEUs were transported by rail through the BMT and are described in Section 6.

The pattern of export container origins (i.e. where they were packed) shows a high concentration in a limited number of locations across the Port's hinterland in Brisbane:

- Approximately 56% of export containers were packed in five key areas across Queensland — Ipswich (15%), Darling Downs – Maranoa (12%), Toowoomba (9%), Port of Brisbane and Lytton (11%), and Hemmant (8%).
- 17% of export containers were packed in four other locations — Wide Bay, Wacol, Moreton Bay North (Moreton Bay North covers a large area, including suburbs such as Redcliffe, North Lakes, Caboolture, and Bribie Island) and Yatala.

In a regional context:

- 20% of export containers were packed in the immediate area around the Port
- 28% were packed in other Brisbane suburbs and in the statistical areas adjacent to Brisbane
- 29% originated in regional Queensland
- Less than 5% originated from interstate

Export container origins – Brisbane suburbs

The container packing locations for full export containers were highly concentrated in a few suburbs in Brisbane as indicated in Table 6:

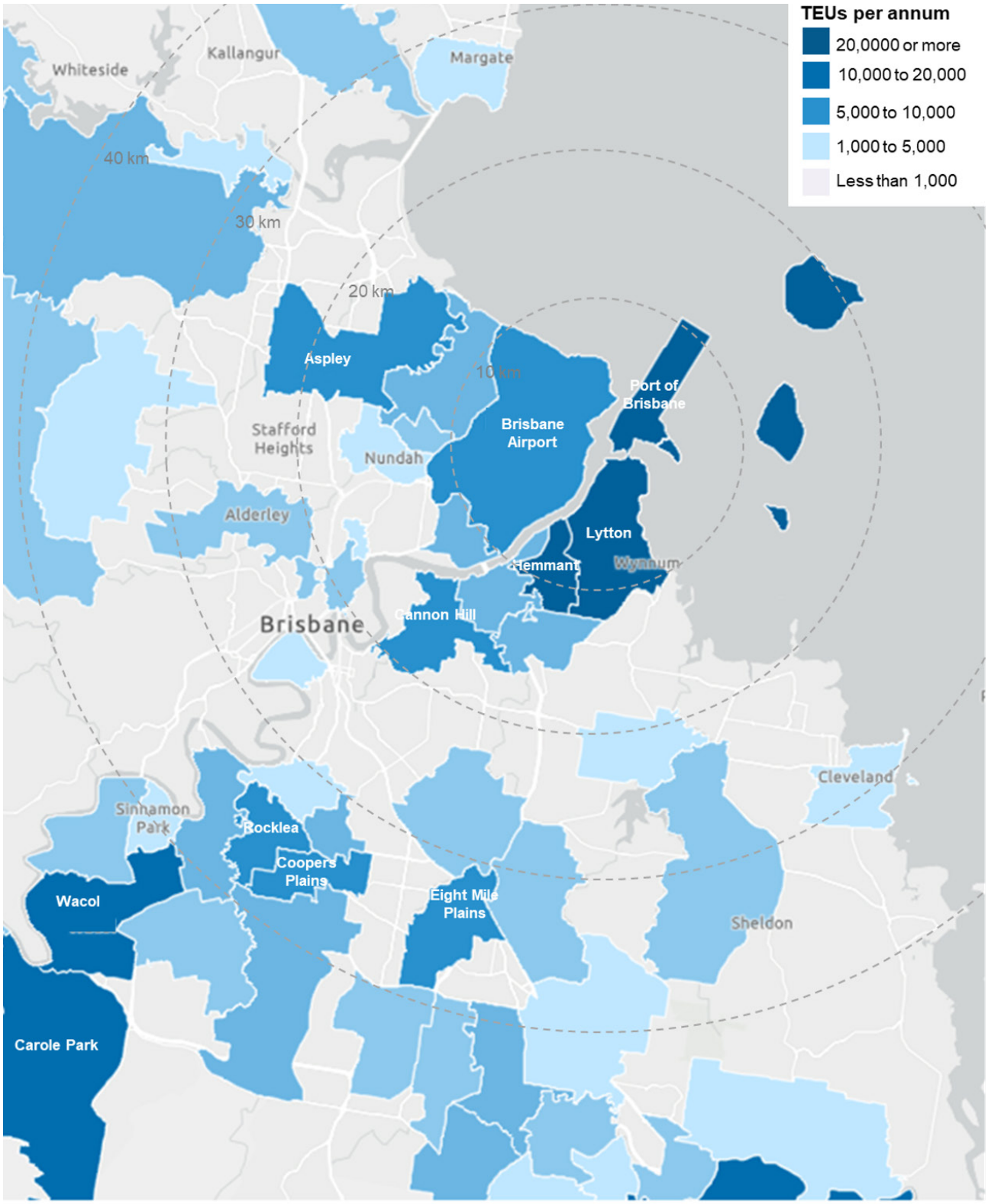
- Areas around the Port of Brisbane and Lytton - which includes the expanded port precinct areas between Fishermans Island and the Gateway Bridge -was the most significant location within Brisbane and the origin of 11% (39,000 TEUs) of all export containers transported through the Port.
- 20% (70,000 TEUs) containers were packed near the port in the contiguous areas of Port of Brisbane and Lytton (11%, 39,000 TEUs), Hemmant (8%, 27,000 TEUs) and Murarrie (1%, 4,000 TEUs).
- In Brisbane South, Rocklea and Cooper Plains were the origins for 5% of container (17,000 TEUs).
- In Brisbane North, Pinkenba and Aspley were the origins for 3% (12,000 TEUs) for full export containers.

The geographic distribution of the export origins within Brisbane were along the main arterial road corridors, (e.g. Gateway, Logan an Ipswich Motorways) providing efficient access to the Port. These arterial corridors are demonstrated in Section 5.9.

Table 6 - Export container origins–- Brisbane suburbs

DESTINATION		TEUs (2013)	%	TEUs (FY2021/22)	%
PORT AND CONTIGUOUS AREAS	Port of Brisbane and Lytton	34,504	11.3%	38,739	11.0%
	Hemmant	38,918	12.7%	26,659	7.6%
	Murarrie	15,044	4.9%	4,110	1.2%
OTHER SIGNIFICANT BRISBANE AREAS	Cannon Hill and Morningside	3,164	1.0%	5,799	1.6%
	Rocklea	11,521	3.8%	9,117	2.6%
	Heathwood and Acacia Ridge	2,686	0.9%	2,070	0.6%
	Wacol	1,254	0.4%	12,998	3.7%
	Hendra	3,761	1.2%	-	-
	Eagle Farm	3,403	1.1%	2,041	0.6%
	Richlands	1,075	0.4%	819	0.2%
	Pinkenba	1,015	0.3%	6,093	1.7%
	Northgate	1,015	0.3%	863	0.2%
	Eight Miles Plain	-	-	6,061	1.7%
	Coopers Plains	-	-	8,258	2.3%
	Logan Central	-	-	2,176	0.6%
	Aspley	-	-	5,971	1.7%
	Salisbury	-	-	1,305	0.4%
	Carole Park	-	-	10,229	2.9%
	Riverview	-	-	9,786	2.8%
	Oxley	-	-	1,839	0.5%
	Yatala	-	-	12,307	3.5%
TOTAL		**117,360**	**38.4%**	**167,240**	**47.5%**

Figure 6 - Export container origins – Brisbane suburbs



Export container origins – Brisbane and adjacent statistical regions

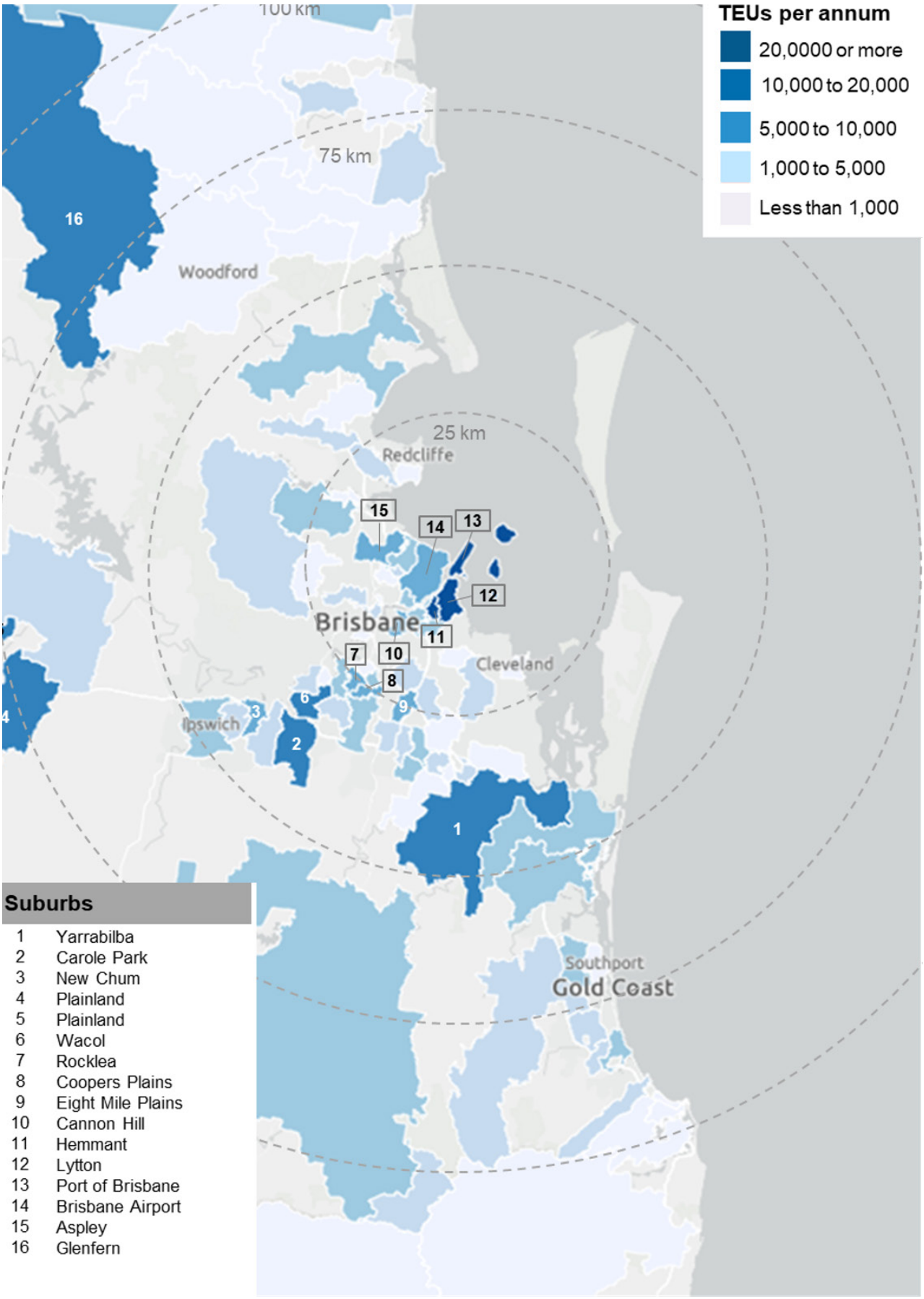
Brisbane and the adjacent statistical regions cover a significant region of the Port hinterland as shown in Table 7 and Figure 7.

- Approximately 66% of export containers originated in Brisbane and adjacent statistical regions (231,000 TEUs) of export containers 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 75,000 containers (TEUs)

Table 7 - Export container origins–- Brisbane and adjacent regions

DESTINATION		TEUs (2013)	%	TEUs (FY2021/22)	%
BRISBANE	Brisbane–- East	89,185	29.2%	71,762	20.4%
	Brisbane–- South	18,267	6.0%	33,627	9.5%
	Brisbane–- North	7,283	2.4%	17,171	4.9%
	Brisbane–- West	5,014	1.6%	2,324	0.7%
	Brisbane Inner City	537	0.2%	788	0.2%
ADJACENT STATISTICAL REGIONS	Gold Coast	35,877	11.7%	20,881	5.9%
	Ipswich	44,891	14.7%	53,873	15.3%
	Logan–- Beaudesert	9,074	3.0%	7,262	2.1%
	Moreton Bay–- South	298	0.1%	5,981	1.7%
	Moreton Bay–- North	14,446	4.7%	14,415	4.1%
	Sunshine Coast	119	0.0%	3,014	0.9%
TOTAL		**224,991**	**74%**	**231,098**	**65.6%**

Figure 7 - Export container origins – Brisbane and adjacent statistical regions



Export container origins – regional Queensland and interstate.

The balance of origins for full export containers from regional Queensland and interstate are indicated in Table 8 and Figure 8.

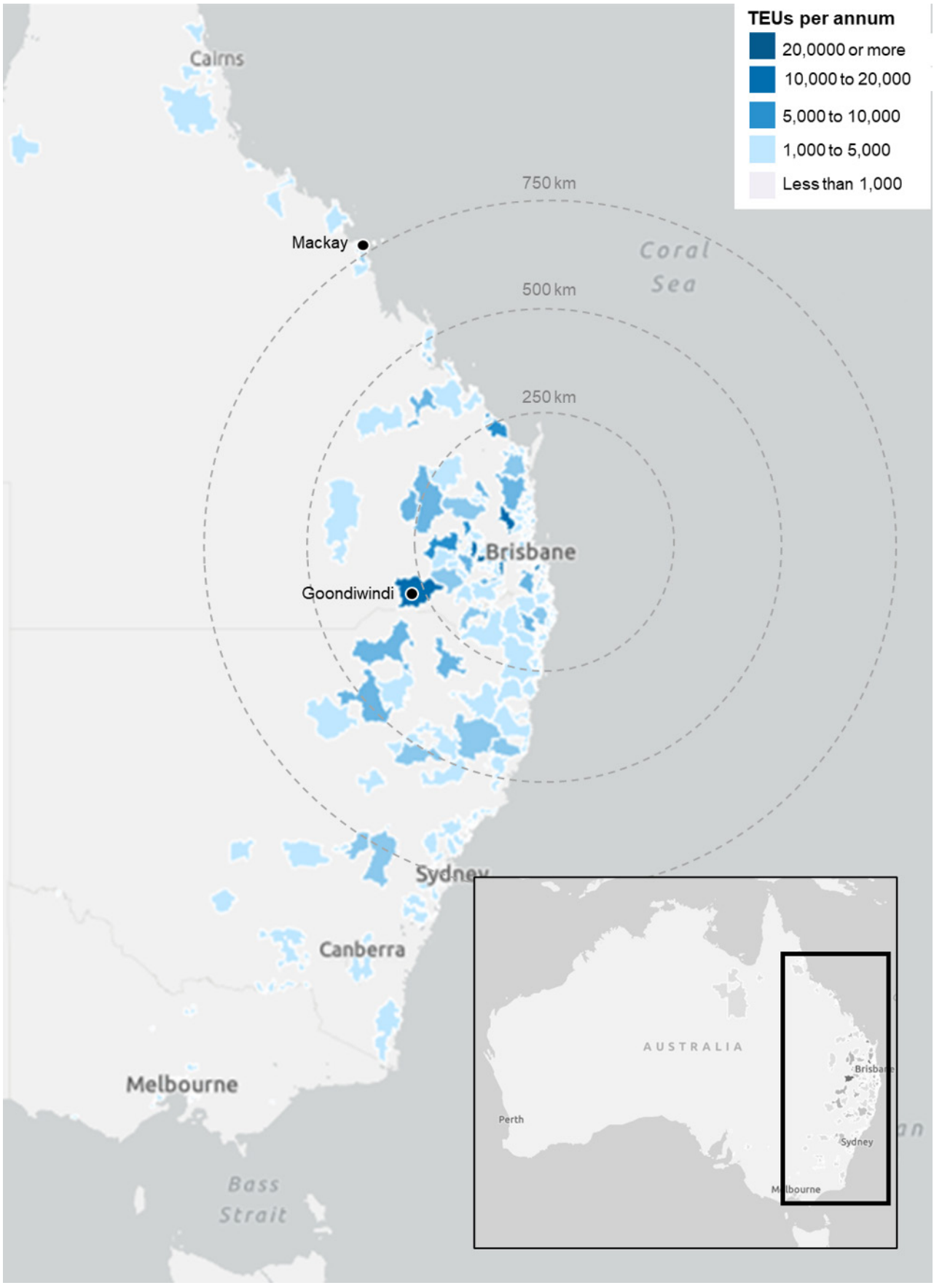
- 29% of export containers originated from regional Queensland in areas located within 250km of the Port
- Approximately 5% of export containers originated from interstate locations

The data collection survey indicated that additional export commodities (e.g. grain and cotton) are sourced from as far afield as Moree, Narrabri and Tamworth in New South Wales. Some of the freight is transported to container packing locations in the Brisbane area, many located on or near the Port.

Table 8 - Export container origins–- regional Queensland and interstate

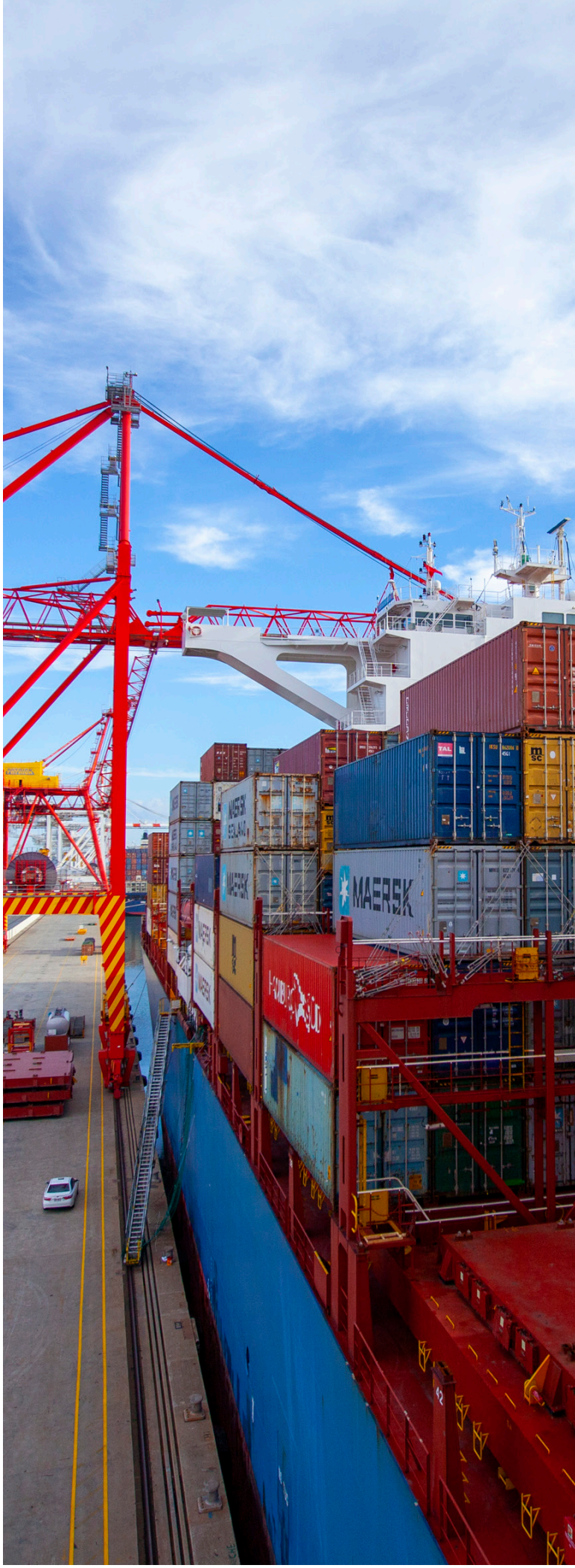
DESTINATION		TEUs (2013)	%	TEUs (FY2021/22)	%
REGIONAL QUEENSLAND	Darling Downs–- Maranoa	48,055	15.7%	43,866	12.5%
	Queensland–- Outback	119	0.0%	44	0.0%
	Toowoomba	12,178	4.0%	33,182	9.4%
	Wide Bay	15,342	5.0%	20,636	5.9%
	Cairns	-	-	1,987	0.6%
	Central Queensland	-	-	2,298	0.7%
	Mackay	-	-	295	0.1%
	Mid North Coast	-	-	140	0.0%
	Townsville	-	-	515	0.1%
ADJACENT STATISTICAL REGIONS	New South Wales	4,656	1.5%	16,074	4.6%
	South Australia	-	-	1,450	0.0%
	Tasmania	-	-	206	0.4%
	Victoria			417	0.1%
	Western Australia	-	-	29	0.1%
	ACT	-	-	37	0.0%
Total		**80,350**	**26.3%**	**121,176**	**34.4%**

Figure 8 - Export container origins – regional Queensland and interstate



3.6 Changes in geographic export origins since 2013

- It can be noted that there has been a considerable expansion in certain areas, such as Wacol and Carole Park, where the percentage of total full exports has increased from 0.4% to 6.6%. This growth is attributed to the rise of export-oriented businesses, warehousing, and logistics operations in the region. Additionally, there has been an increase in export volumes associated with agricultural products being packed in Pinkenba.
- The expansion of the south west corridor in terms of both exports and imports will put additional demand on key transport corridors such as the Gateway and Logan Highway and provide increased opportunities for rail.
- A general trend of declining export container origins in Brisbane and adjacent statistical regions has been observed, with a 10% decrease overall. This trend reflects the shift in regional logistics operations, as more products are being packed in regional areas. Additionally, seasonal variations may be a factor, especially regarding record grain and cotton products.
- Since 2013, there has been a limited number of export products that originated from the Gold Coast, while Ipswich's export products have remained relatively consistent. It should be highlighted that the Gold Coast had experienced significant export growth between 2012 and 2013, which later stabilised.
- The high throughput for the agricultural industry in northern New South Wales has led to a significant increase in interstate exports, accounting for 4.6% of total full exports compared to 1.5% previously. Toowoomba has emerged as a major packing location for agricultural products in the region. It is important to note that some additional products are being transported in bulk and packed in Southeast Queensland which are not represented in these statistics.



4. 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 200km). This is consistent with the fact that containers transported over long distances are often transported by rail rather than road.

4.1 Full container import chain

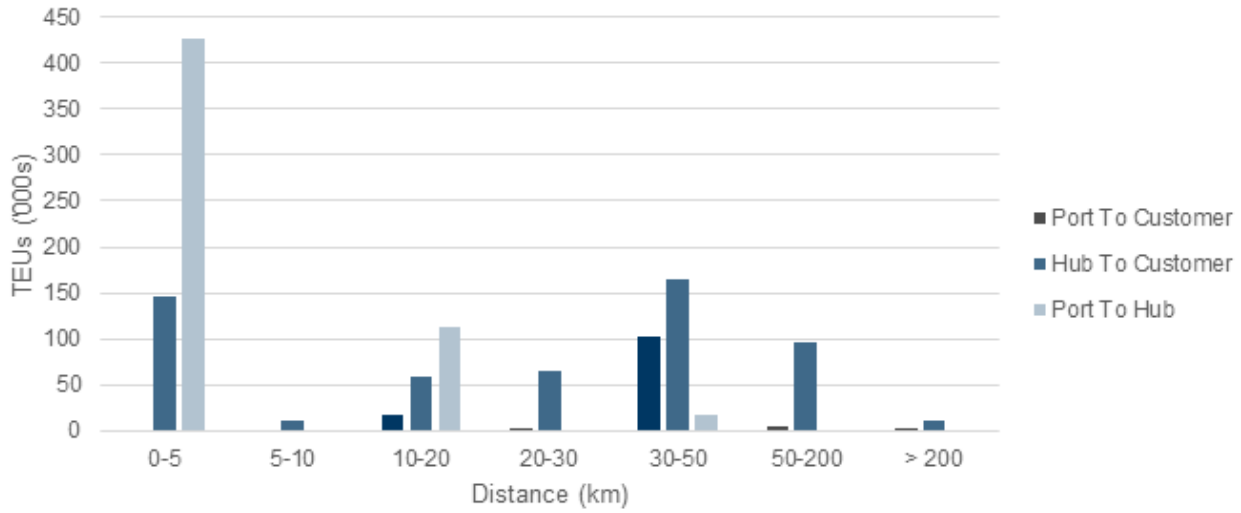
The main movements in the full container import chain are from:

- Port to transport depots (hubs) for staging or intermediate unpack locations
- Port directly to import customers warehouses and distribution facilities
- Transport depots to import customers

The estimated trip distances for trucks carrying full import containers are shown in Figure 9.

- Most of the movements from stevedores to transport depots were less than 5 km, due to the close proximity of transport hubs to the Port
- For containers moved from hubs to import customers or directly from port to import customers, the trip distances ranged from 5 km to 200 km with 39% travelling between 30 km and 50 km
- Estimates of the truck types engaged in the movement of full import containers, shown in Figure 8, indicate that A-doubles are likely to be the most commonly used for short movements (0 km to 5 km) from the Port to hub – only on Fishermans Island

Figure 9 - Trip distance for movements of full import containers



4.2 Full container export chain

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

- Export customers to port
- Export customers to transport depots (hubs) for staging
- Transport depots (hubs) to port with larger truck configurations a focus from regional locations

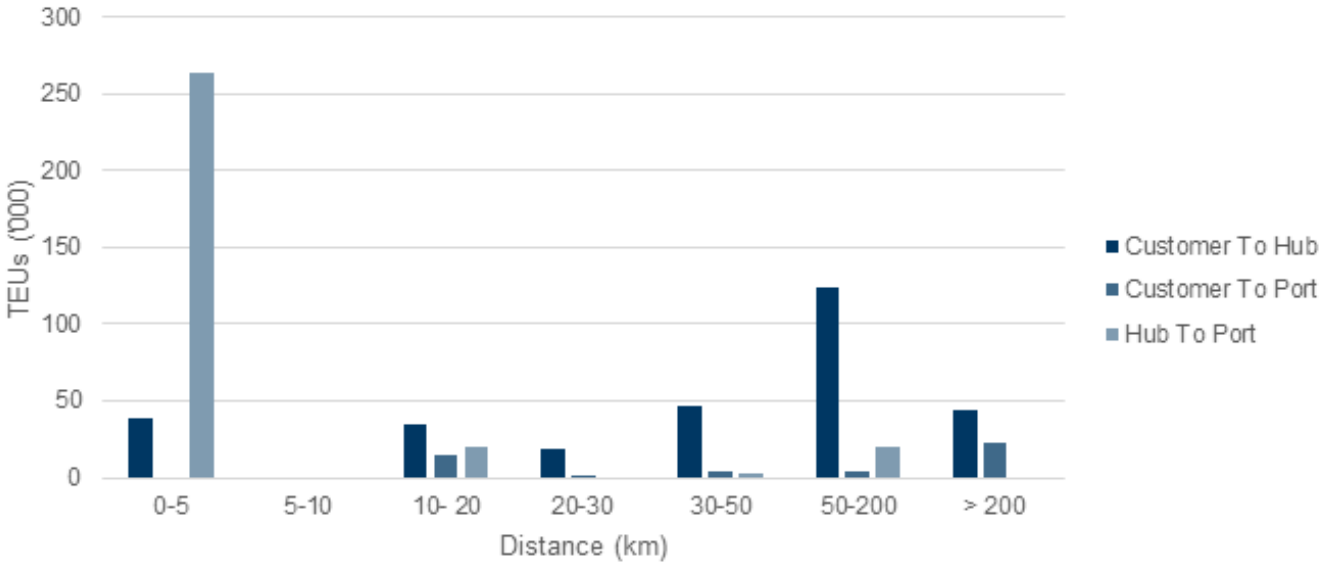
The estimated distances for truck trips of full export containers are shown in Figure 9.

- A high proportion (87%) of full export containers were staged at transport depots or packed at transport yards
- Most of the containers movements (86%) from transport depots/transport yards to port were less than 5 km, due to their close proximity
- For containers moved from exporter customers to transport depots the distance ranged from 5 km to 200 km
- For containers moved directly from exporters to port, 48% of containers travelled in excess of 200 km, mainly from regional areas

4.3 Changes in trip distances since 2013

- The growth of the agricultural industry in northern New South Wales has resulted in a substantial rise in interstate exports, comprising 4.6% of the total full exports, up from 1.5% previously. Toowoomba has become a significant packing location for agricultural products in the area. However, a portion of these products are being transported in bulk and packed in Southeast Queensland.
- Since 2013, A-doubles have become more common for shorter trips within the port precinct. This shift may be due to several factors, including changes in technological advancements, and operational efficiency capacity, greater flexibility and manoeuvrability, which makes them more suitable for navigating urban roads.

Figure 10 - Trip distance for the movement of full export containers



5. Major truck routes and traffic conditions

The geographical spread of importers and exporters indicates that businesses are positioned close to major arterial motorways and freeways. However, some local roads are also used to access key destinations.

The South East Queensland Strategic Transport Model (SEQSTM) is an agent-based simulation tool that can identify network impacts as a result of existing and future traffic. Similarly, the SEQSTM considers committed future network infrastructure upgrades to measure impacts and benefits and the lowest cost travel path. The model allocates routes based on this. Through the SEQSTM it is possible to:

- Estimate average daily volumes (vehicles per day)
- Assign volumes to the arterial road network
- Mapping outputs that demonstrating volumes and congestion on corridors

It is important to note that the SEQSTM only looks at weekday movements when evaluating network capacity and Level of Service, which is explained further in the next section.

5.1 Applying the SEQSTM for the purposes of the study

An interface between the supply-chain model used to determine container journeys for the study and the SEQSTM was developed to estimate traffic conditions and capacity on major arterials.

Origin-Destination matrices representing port freight origins and destinations were extracted from the Supply Chain Model. The matrices were imported into SEQSTM, and the freight trips were assigned to the network using the lowest cost path. These trips were then overlayed onto the 'background[3]' trips already generated in SEQSTM.

The SEQSTM interprets heavy vehicles by converting them into a comparable number of passenger cars, which is determined by the size of the truck and these are expressed as passenger car units (PCU) within the model. A PCU is a term that refers to a standardised unit of measurement used to express the capacity of passenger vehicles. PCUs are used in the SEQSTM to estimate the capacity of roads, based on the number and types of vehicles that are expected to use them. In this study, the heavy vehicles have been converted into passenger vehicle equivalents, and their capacity has been expressed in PCUs.

This section summaries the outputs generated by the SEQSTM when considering the heavy vehicle movements generated by port volumes.

Figure 11 summarises the volumes across the network and demonstrates that since the 2013 study:

- The movement of import and export containers remain heavily reliant on motorways and major arterial roads in Brisbane and adjacent statistics areas, more notably on corridors such as the:
  - Port of Brisbane, Gateway, Logan and Pacific Motorways which remains unchanged from the 2013 study
  - Bruce and Warrego Highways remain a key corridor for regional movements from areas such as Ipswich and Toowoomba
  - The local road network still plays a significant role to access importers, exporters and transport yards in areas such as Hemmant, Murrarie, Rocklea, Cooper Plains and Acacia Ridge

3 Background trips are non-port related vehicle trips

Figure 11 - Freight movements and traffic volumes in 2021 – Port of Brisbane precinct (average weekday trips)

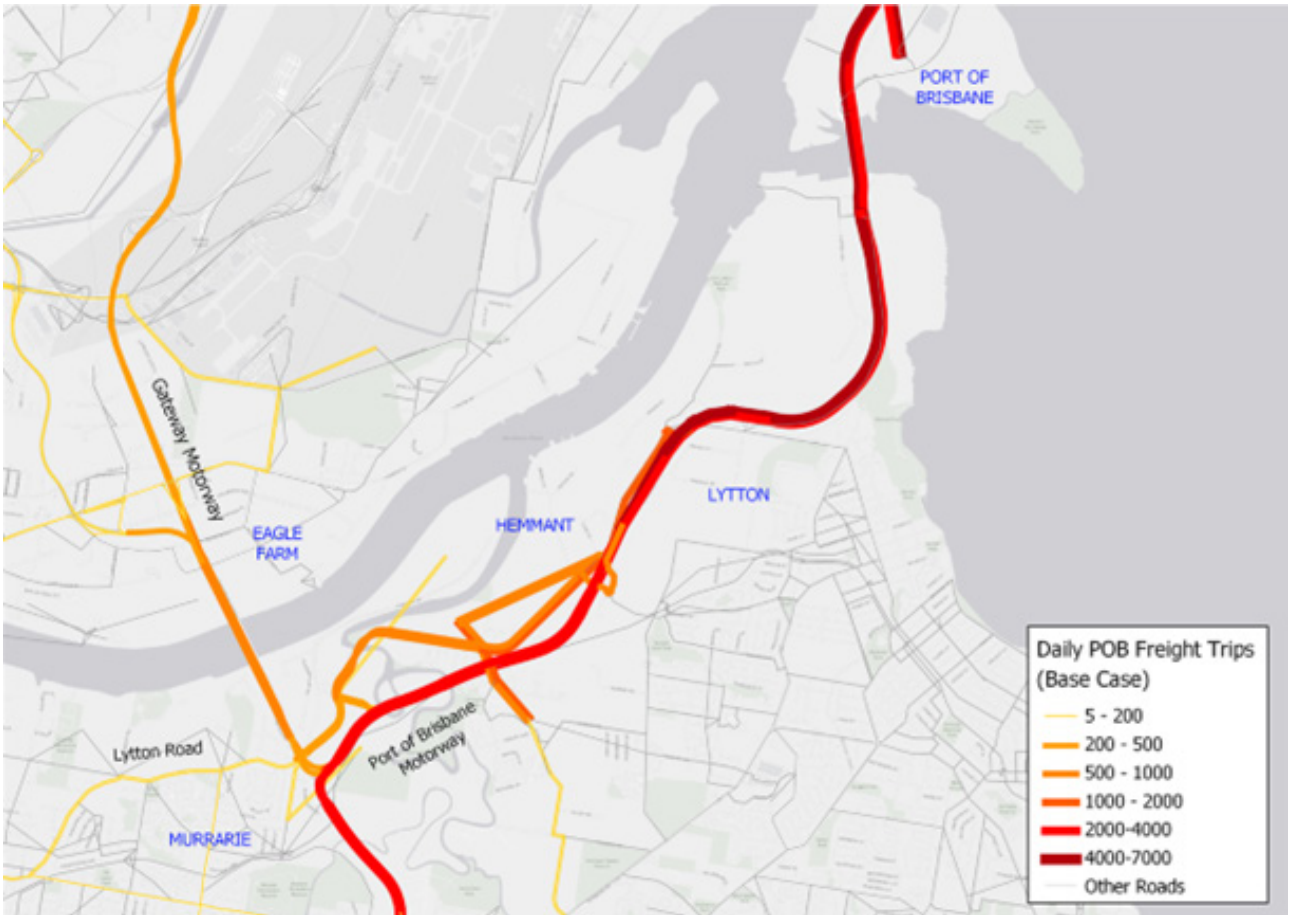


Figure 12 - Freight movements and traffic volumes in 2021 (average weekday trips)

6. Hourly container arrivals and departures

This section describes the patterns of container arrivals and departures for each hour of the day for major businesses in the logistics chain, shown in Figure 13 to Figure 22. The following findings relate specifically to the hourly patterns.

6.1 Stevedores and transport yards

The container arrival and departure times at stevedores are shown in Figure 13 and Figure 14.

- The pattern of hours over the week reflects the 24-hour operation of stevedores on weekdays.
- Volumes on weekends were relatively light with operating hours reflecting the stevedore's day shift from 6 am to 3 pm on weekdays.
- Departure of full import containers from stevedores was most prevalent between 7:00am and 2:00pm. There was also a steady flow of containers departing the port in the afternoon hours through to midnight, before dropping to lower levels in the early hours of the morning.
- The peak times for arrival of full export containers to the port (stevedores) was split into two sets of 4-hour blocks where volumes gradually increase across a four hour period from 7:00am before dropping at 11:00am only to then gradually increase for another four hours.

Figure 13 - Departure time of day from stevedores for full import containers (daily average)

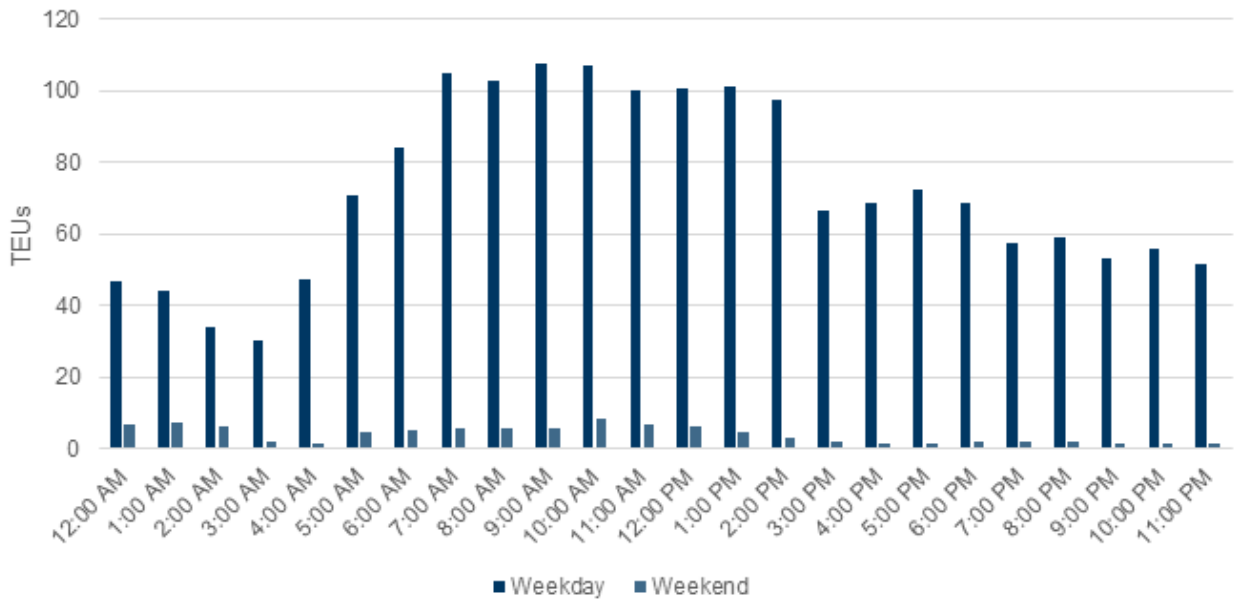
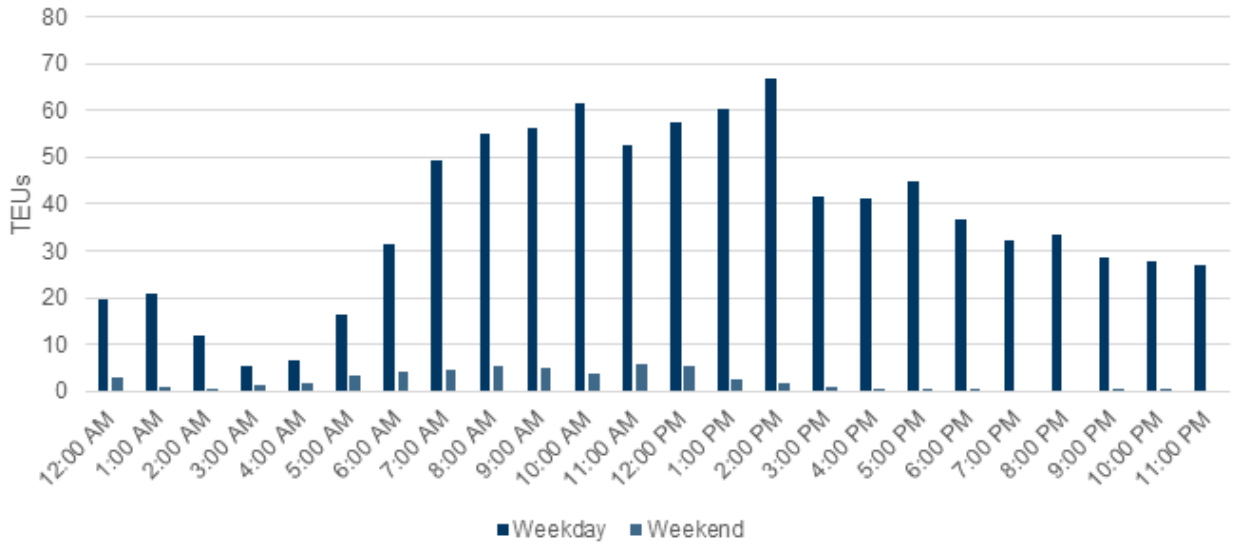


Figure 14 - Arrival time of day at stevedores for full export containers (daily average)



6.2 Transport yard movements — imports

The hourly arrival and departure times for import containers at transport yards are shown in Figure 15 and Figure 16.

- The arrival patterns for transport yards mirror the departure patterns from stevedores, spread across the hours of the weekdays and lower on Saturday and Sunday. A contributing factor for this is the close proximity of hubs to the port, as discussed in section 4.1
- The departure patterns are constrained by the variance of work hours across businesses in the logistics chain. The peak window for container departures commences earlier in the day from 5:00am, which can be attributed to the greater variation in customer distances from hubs, when compared to Port-Hub movements. From 2:00pm onwards the number of departures reduces to lower levels.

Figure 15 - Arrival time of day for full import containers at transport yards (daily average)

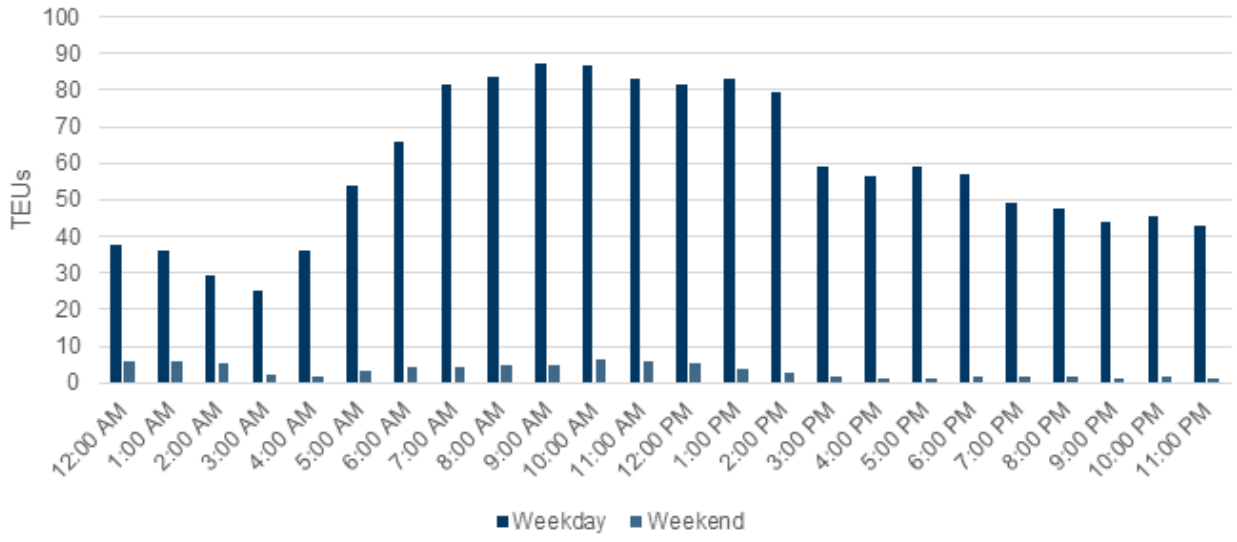
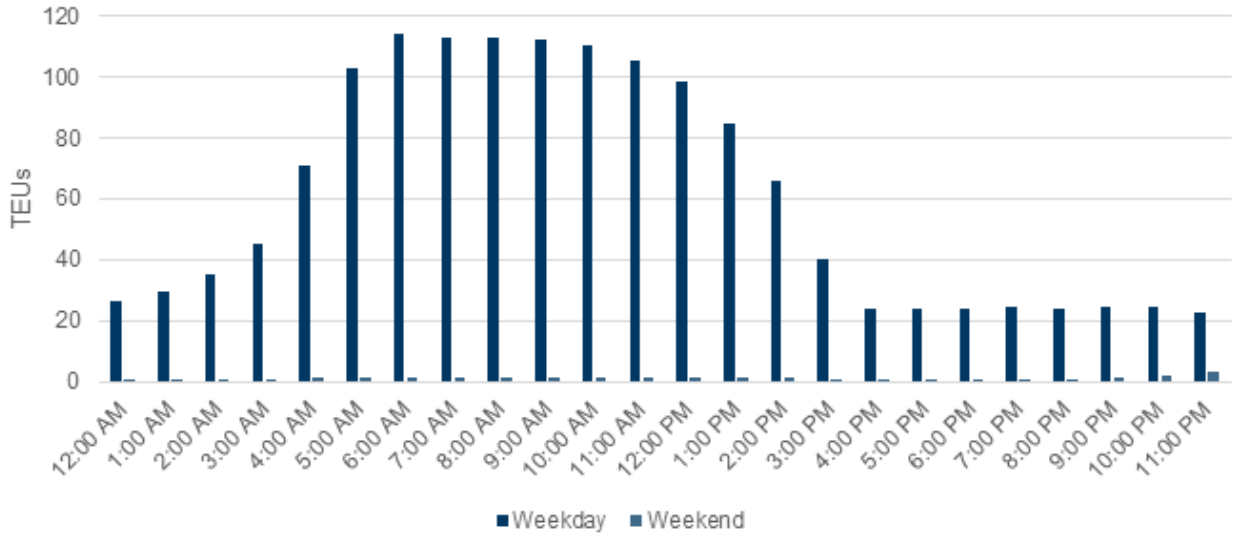


Figure 16 - Departure time of day for full import containers from transport yards (daily average)



6.3 Transport yard movements — exports

The hourly arrival and departure times for export containers at transport yard are shown in Figure 17 and Figure 18.

- The arrival patterns for containers to transport yards is low in the early morning hours after midnight before gradually increasing from 7:00am through to a peak at 3:00pm. In the afternoon hours through to midnight, container volumes progressively taper off.
- The departure patterns from transport yards mirror the arrival patterns at stevedores, spread across the hours of the weekdays and lower on Saturday and Sunday. A contributing factor for this is the proximity of hubs to the port, as discussed in section 4.2.

Figure 17 - Arrival time of day for full export containers at transport yards (daily average)

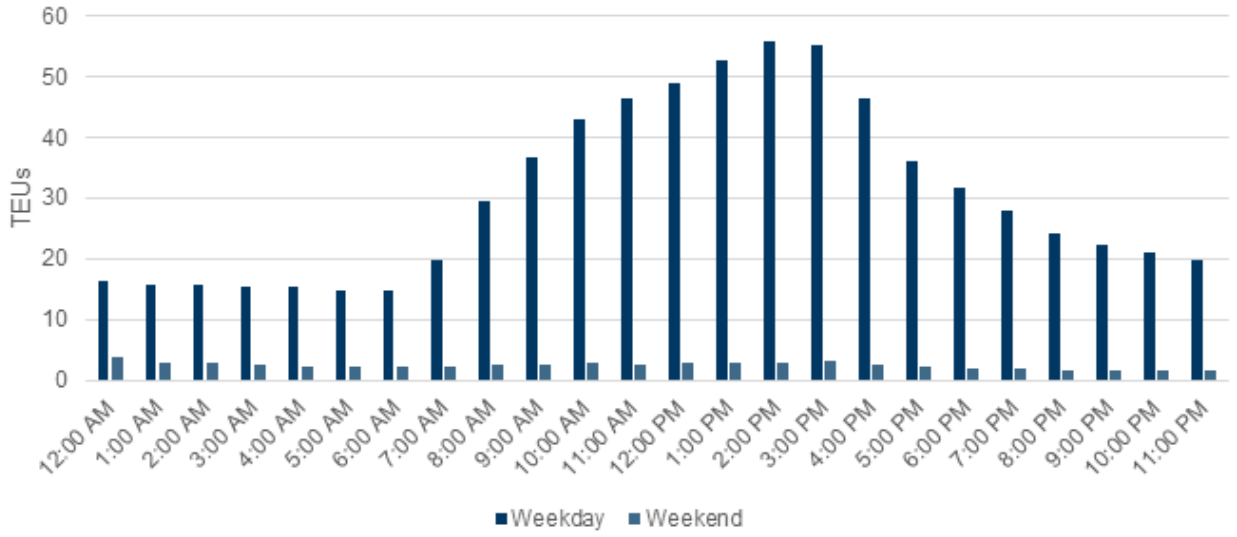
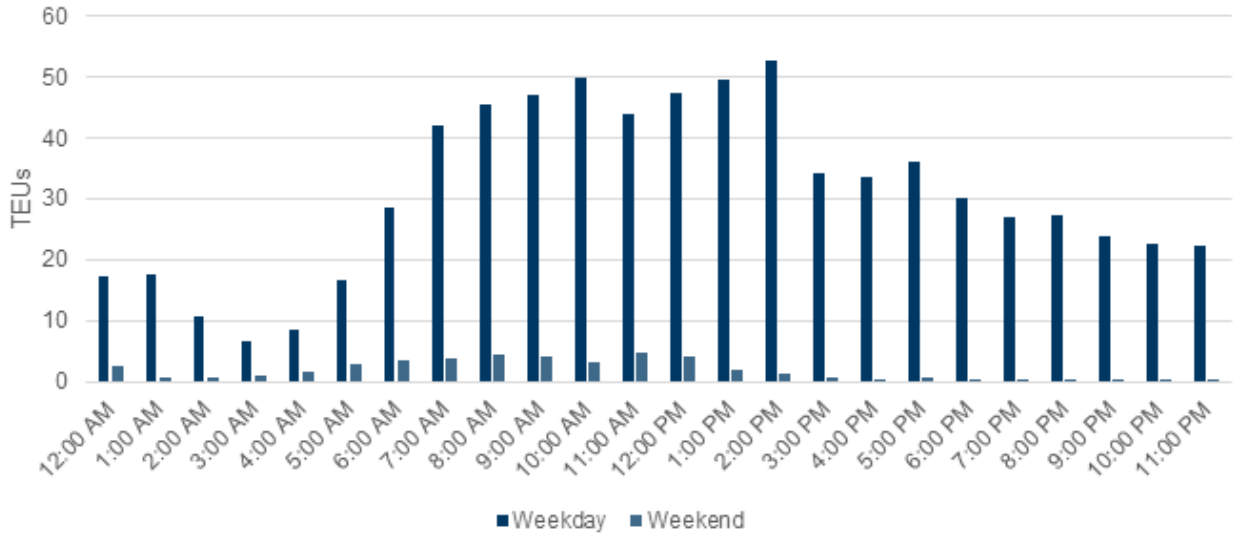


Figure 18 - Departure time of day for full export containers from transport yards (daily average)



6.4 Arrival and departure at importers and exporters

The hourly arrival and departure patterns at importers and exporters are shown in Figure 19 to Figure 20.

- The arrival times reflect for full containers reflect business hours of major warehousing facilities and unpack facilities and the opportunity to deliver key loads early in the morning to avoid traffic. Import and export businesses have restricted opening hours compared to stevedores and transport yards.
- Arrival times at importers and exporters on weekdays were largely from 5-7 am, reflecting the constraints in receival hours given that most of these businesses operate.
- The pattern of full arrivals (to) and empty departures (from) importers show similar characteristics with the majority of container flows occurring between 5 am and 3 pm (4:00pm for empty departures) with low levels outside these hours.
- The trend for arrival and departures to/from exporters was a narrower peak window than what was exhibited at importers. For the arrival of empty containers to exporters the peak period from 6 am to 2 pm and for the departure of full containers 7am to 3pm.

Figure 19 - Arrival time of day for full containers at importers (daily average)

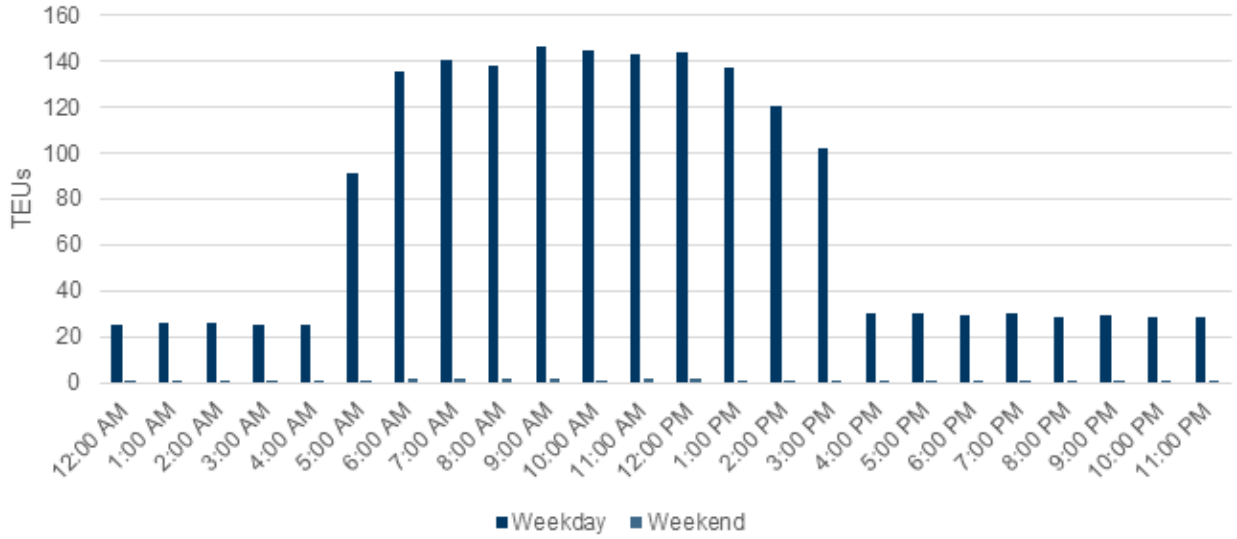
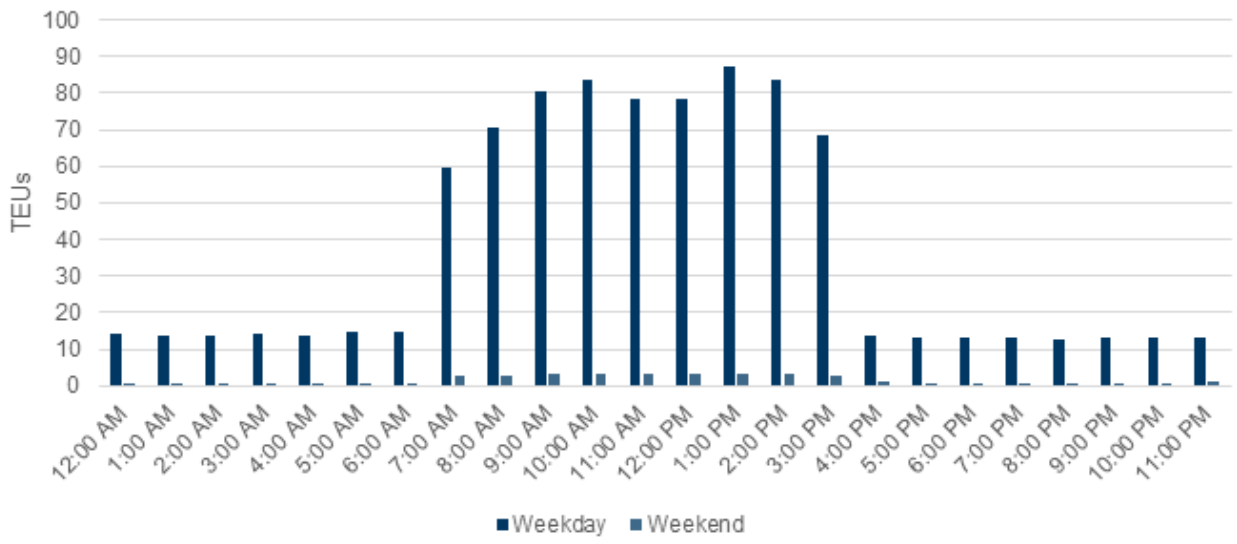


Figure 20 - Departure time of day for full export containers from exporters (daily average)



6.5 Hourly arrivals and departures for TEUs and trucks at stevedores

This section looks at daily arrival and departure times together for weekdays and weekends separately. The pattern of arrivals and departures at stevedores according to the daily average number of trucks and TEUs for each hour are shown in Figure 21 for weekdays and Figure 22 for weekends.

- The pattern of arrivals and departures for trucks and the average container loads was similar across hours of the day for weekdays and weekends.
- The relativity to broader operations across the logistics chain where some entities including import unpack locations and exporters are open with a focus on core business hours is reflected in the key throughput trends during this period.

Figure 21 - Arrival and departure times (Mon-Fri) of TEUs and trucks for stevedores (daily average)

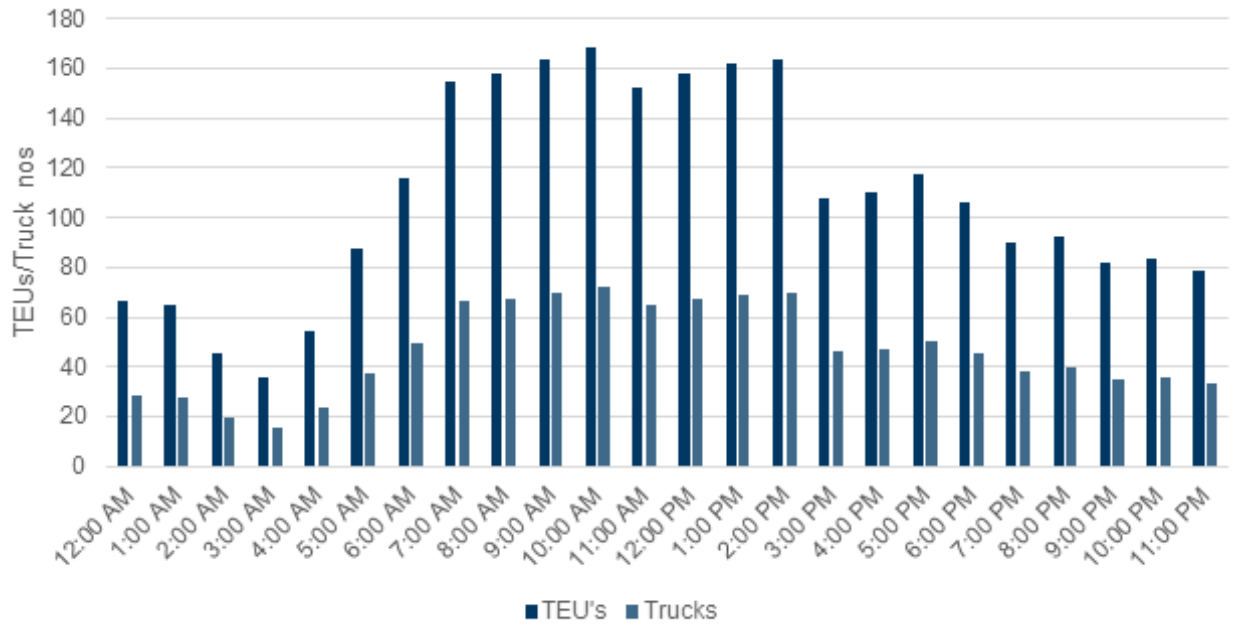
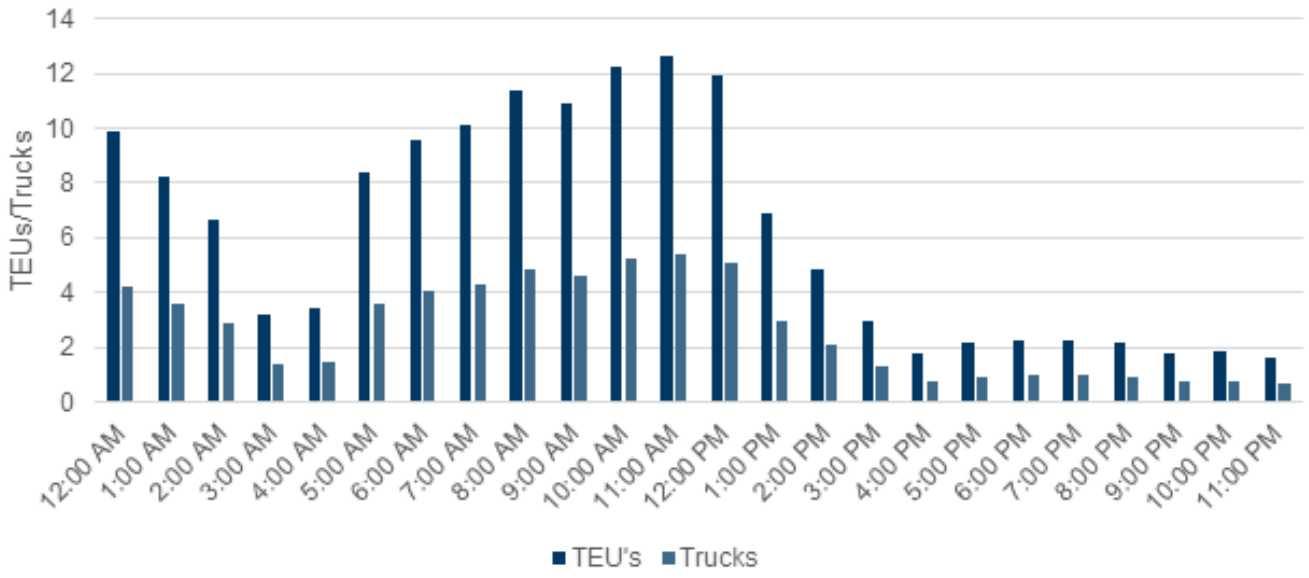


Figure 22 - Arrival and departure times (Sat-Sun) of TEUs and trucks for stevedores (daily average)



6.6 Changes in hourly container arrival and departures since 2013

In contrast to the 2013 analysis, there is a relative decrease in the number of truck movements to and from stevedores on weekends. However, there has been an increase in the transfer of containers between 6am and 3pm, leading to higher peaks. This trend is in line with the growth in container volume observed over the past decade. This increased concentration of day time week day activity could be as a result of increased stevedore landside productivity during the day (more vehicle slots available) however this would need to be validated.

The prevalence of movements during weekday daytime may be symptomatic of a supply-chain that is not significantly impacted by congestion and where there may be disincentive to operate more on weekends and night times such as driver shortages and penalty rates and availability of fewer truck slots on weekends.

The arrival and departure times at importers and exporters are highly concentrated. This is driven by constrained packing and unpacking hours likely due to higher cost for labour outside of weekday daytime hours. This constraint necessitates the staging of containers at transport yards prior to or before delivery or pick up from importers and exporters.

The arrival and departure times on weekends are quite concentrated however, there is a number at midnight and the early hours which suggests these are contiguous operations from Friday night into early Saturday morning to clear containers from the wharves before they incur storage charges over the weekend.

7. Export non-containerised commodity movements

7.1 Bulk export commodities - grain and cotton seed

The two key bulk products exported from the Port of Brisbane are grains and cotton.

Grains can be exported as bulk shipping and containerised product. During the FY2021/22 period, the Port of Brisbane exported 2.036 million tonnes of grain as bulk exports and 900,000 tonnes, which equates to 38,097 TEU of containerised grains.

In 2021/22, cotton products were exclusively exported as containerised commodities, amounting to a total of 481,856 export tonnes, which were shipped in the form of 41,223 TEU of containerised lint. Additionally, 9,463 TEU of containerised products were made up of cotton seeds.

Grain

There are two major bulk grain storage facilities at the Port of Brisbane, one located on Fisherman's Island operated by GrainCorp with access to rail loadout facilities from the port rail sidings, and the second facility further upstream on the Brisbane River operated by Queensland Bulk Terminals. Both of these terminals also pack grain into containers to meet demand in the containerised trade.

The Port of Brisbane bulk grain exports increased to 2 million tonnes exceeding the previous port export record by 17%.

Bulk grain exports were dominated by the two major terminal operators at the Port of Brisbane with GrainCorp and Queensland Bulk Terminals exporting 58% and 27% of the bulk export trade respectively (although both operators also provided services for third parties).

There were also two new mobile grain loader operations which entered the market in 2021–22, likely in response to the record demand for shipping capacity. The BCS and Wagner group operations loaded bulk grains from the Pinkenba wharves accounting for 12% and 2.4 % of the bulk grain export task respectively.

The Port of Brisbane grain exports are generally sourced from the Western Downs, Surat Basin and Darling Downs areas to the east and south east of Toowoomba but also includes grains from Northern NSW trucked in as bulk loading or for container packing.

The main grain growing areas and major container packing locations are included on Figure 23.

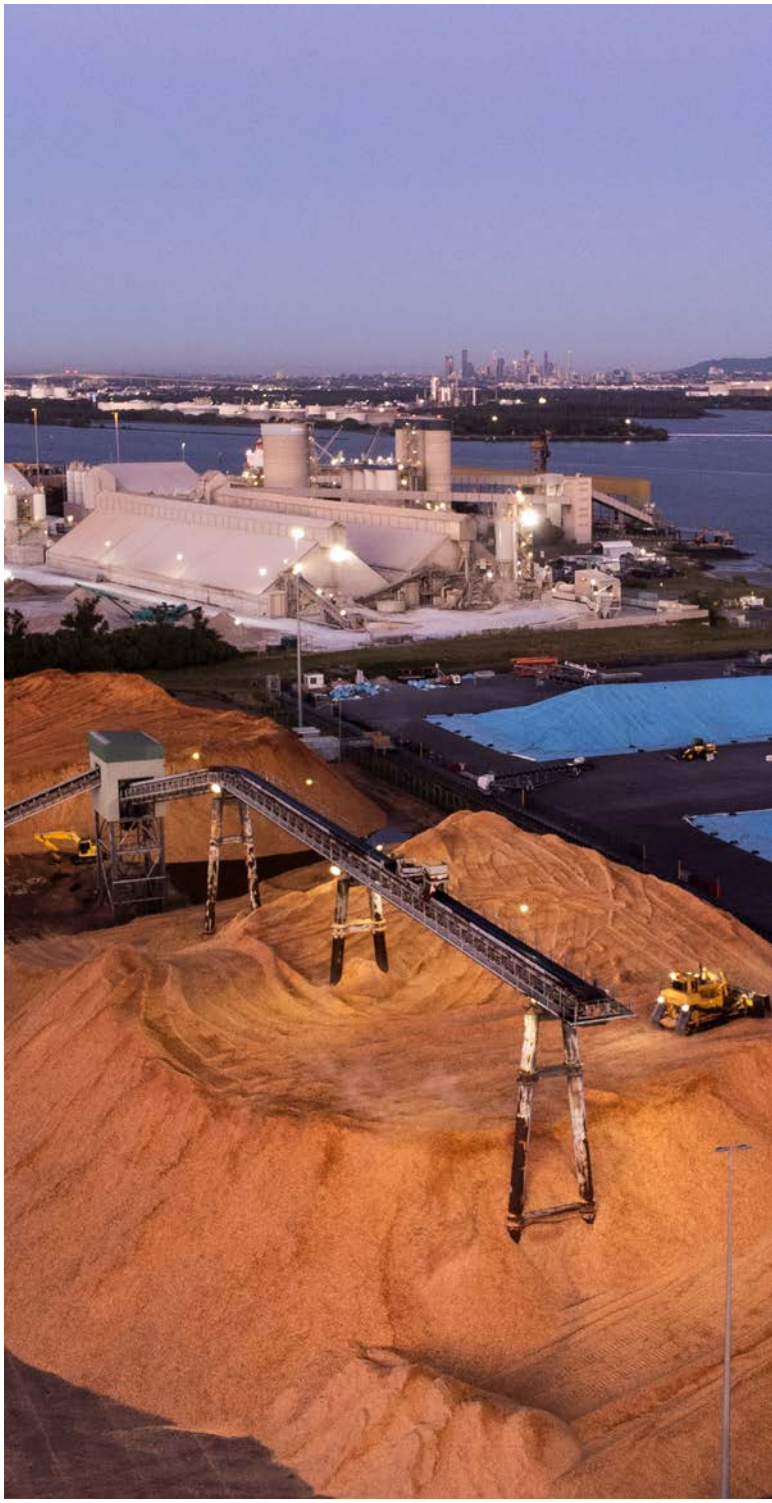
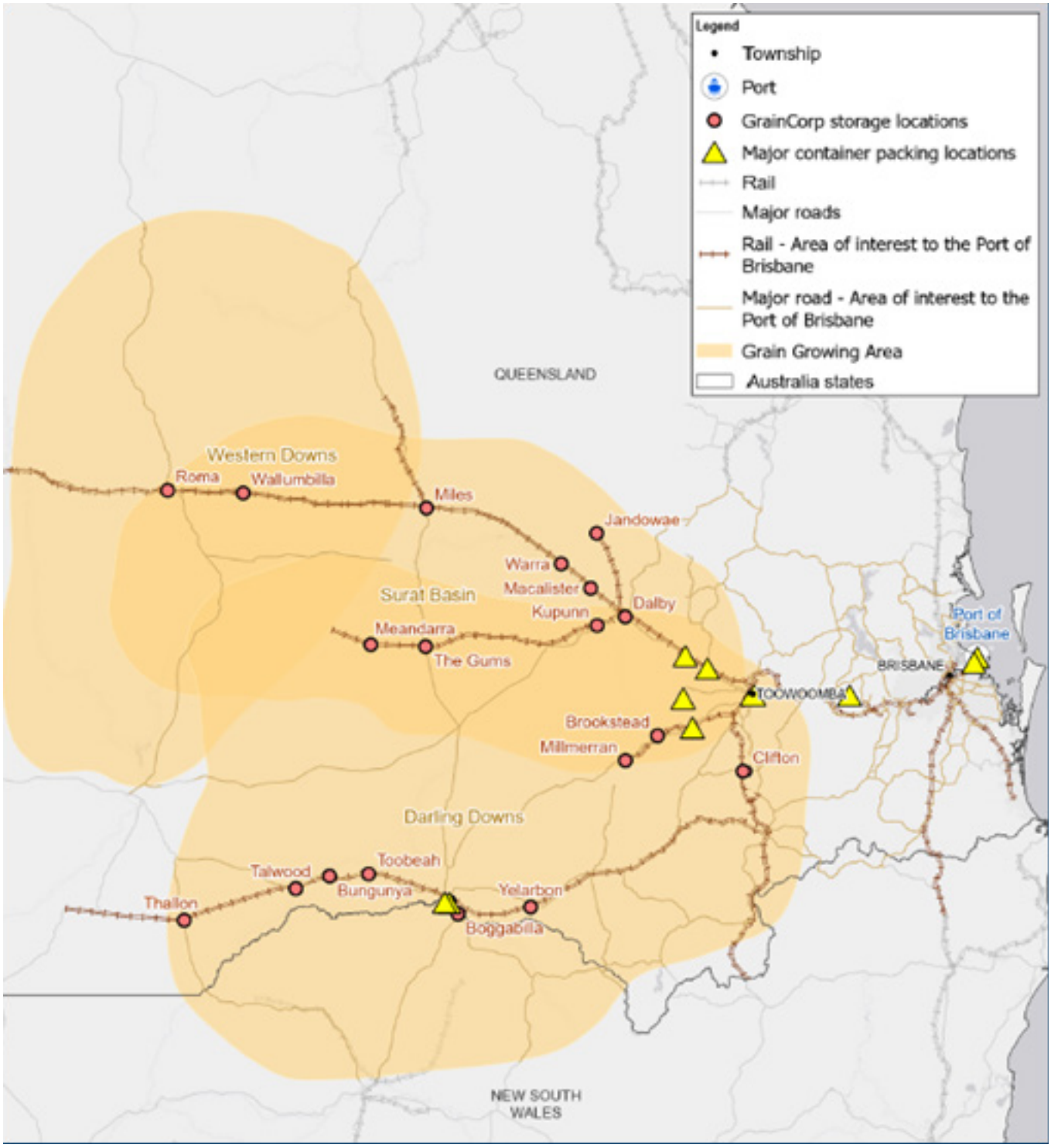


Figure 23 - Grain harvesting areas within the Port of Brisbane catchment[4]



Typical grain supply chains

The shift in export market demand has resulted in the creation of two distinct supply chains for exporting grains. Figure 24 and Figure 25 present an overview of both the bulk supply chain, which involves packing at the port precincts and fewer journeys, and the containerised supply chain. The primary difference between the two is the number of trips involved.

4 GrainCorp data and study data

Figure 24 - Bulk Grain Supply Chains[5]

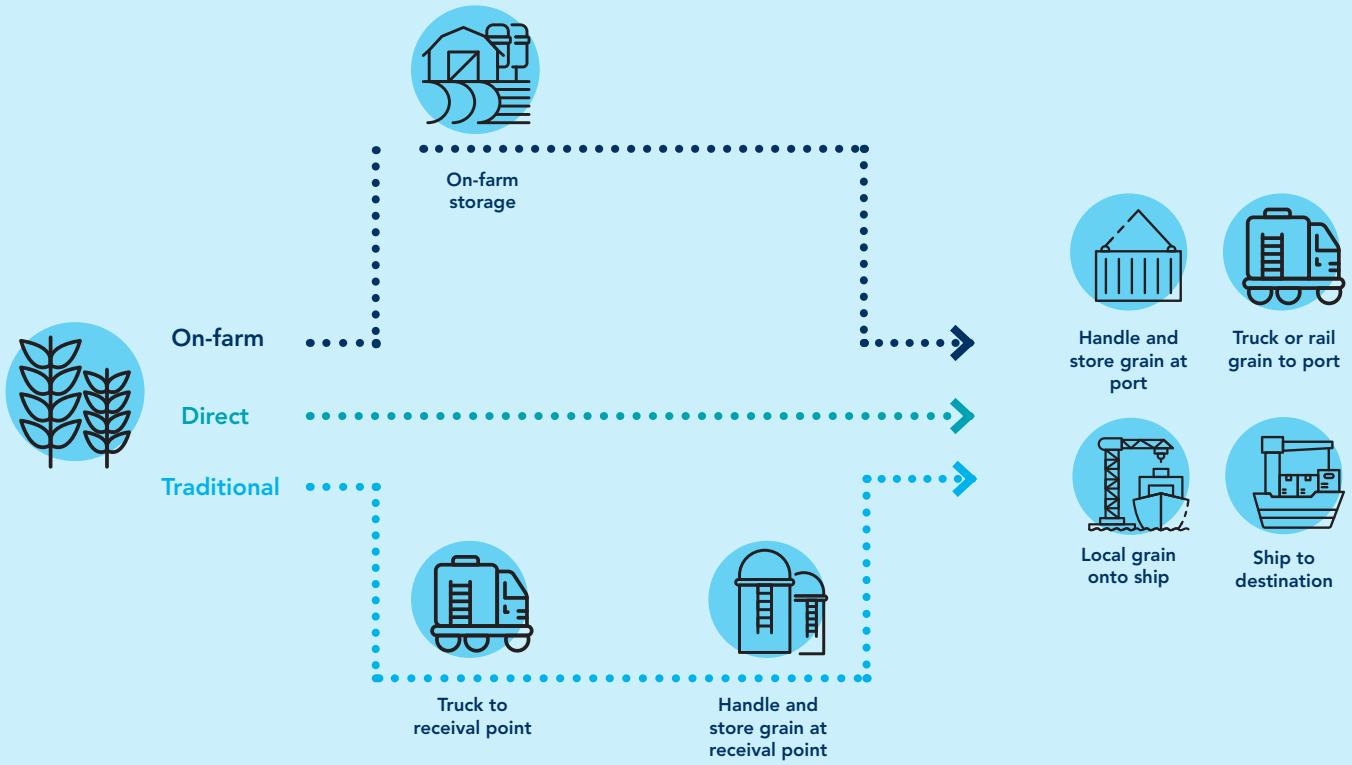
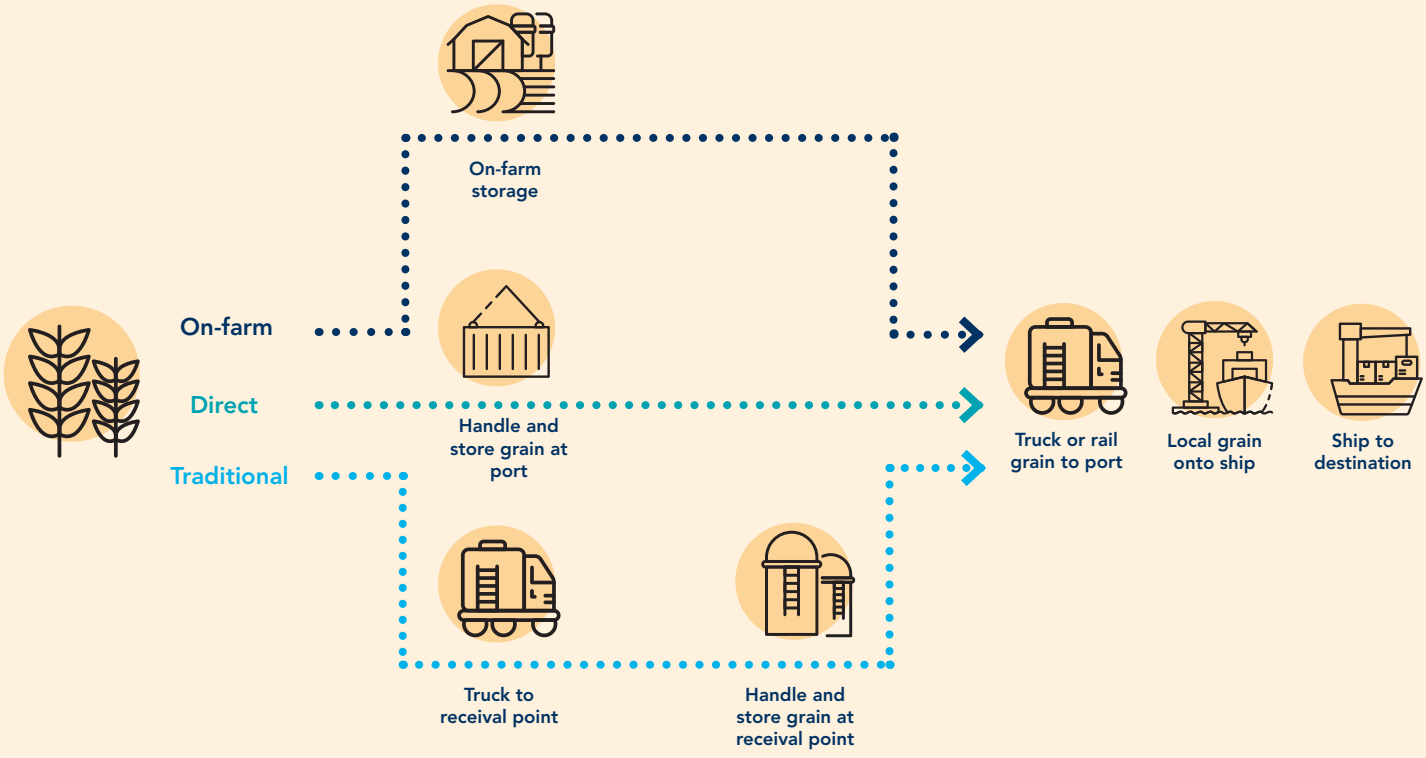


Figure 25 - Containerised Grain Supply chains

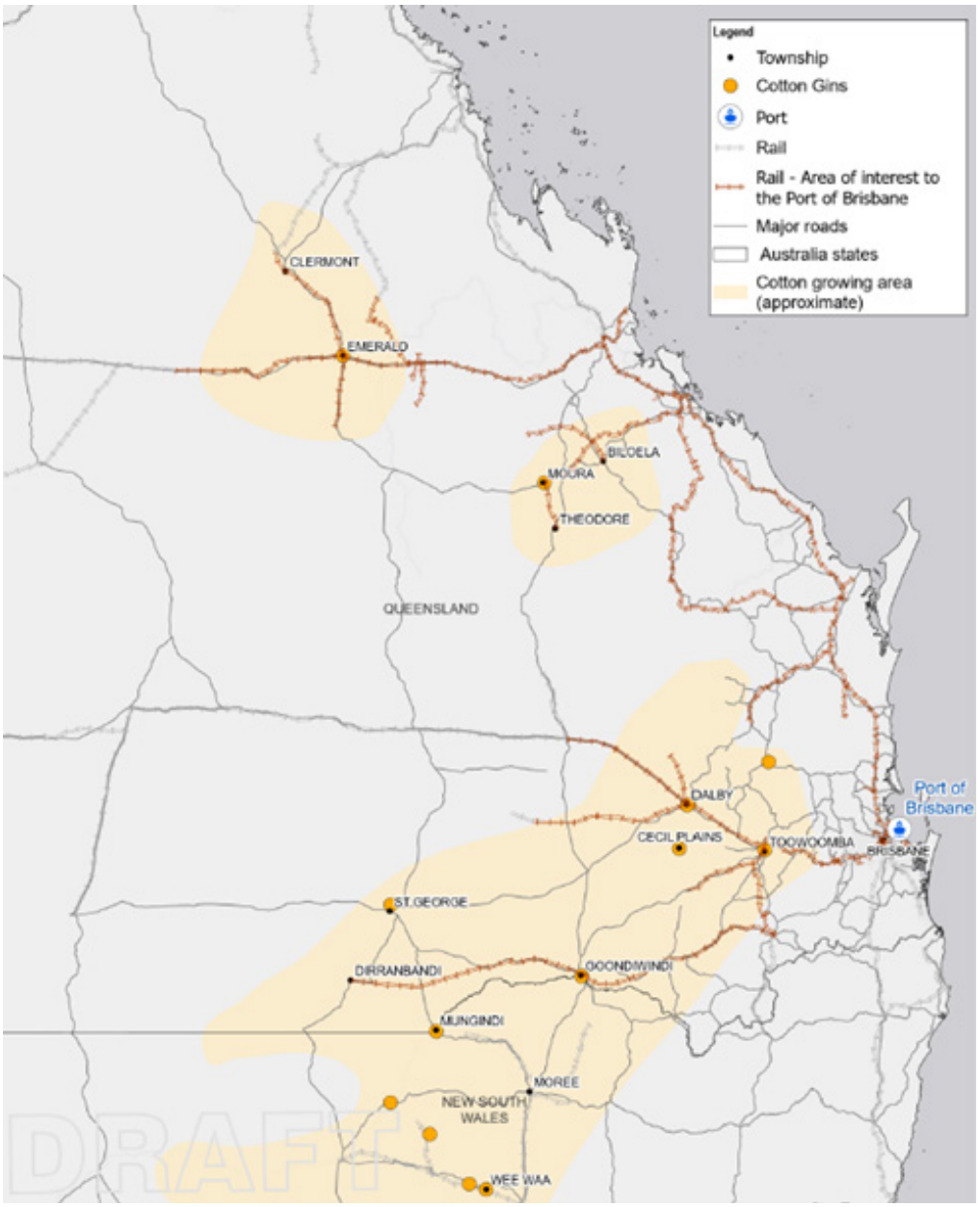


5 Source AEGIC

Cotton

In 2021/22, cotton exports achieved nearly record-breaking quantities, marking a continued recovery from the drought conditions of 2019 and 2020. The major cotton-growing regions associated with the Port of Brisbane are situated in the Darling Downs and Northern regions of New South Wales, with newer areas emerging further north near Emerald and Moura, as shown in Figure 26.

Figure 26 - Cotton growing areas northern NSW and Queensland[6]



Major cotton processing facilities in Northern NSW and Southern Queensland are operated by three companies:

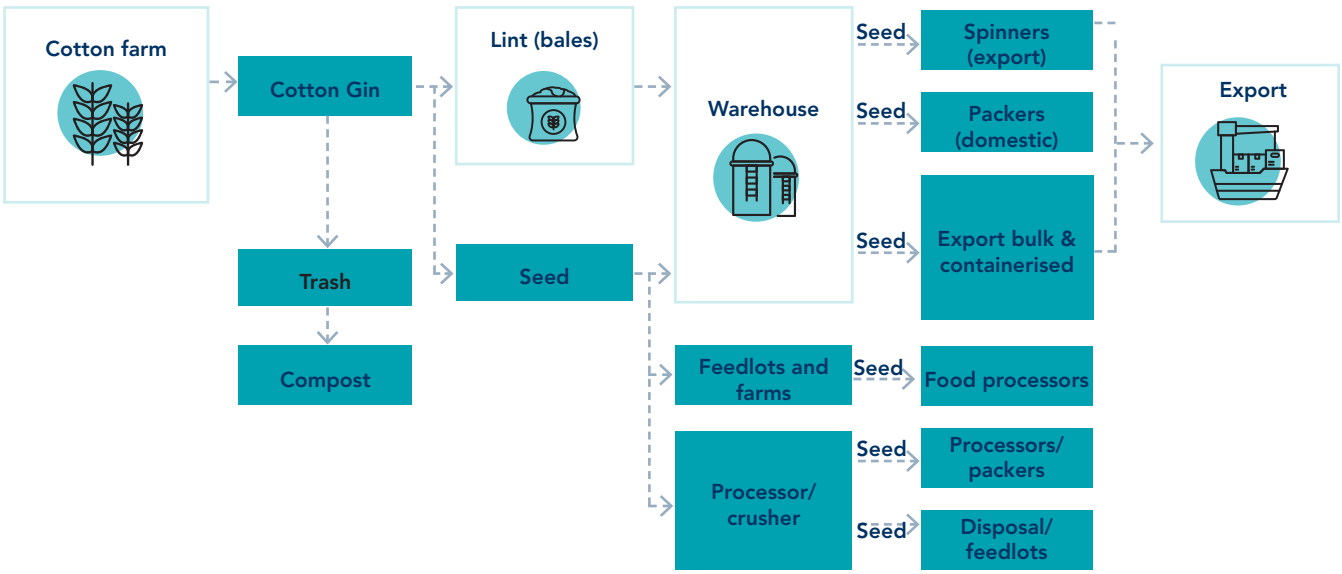
- Namoi Cotton–- as the largest cotton processor in Australia which has facilities across NSW and Queensland at most of the locations on the map above including several cotton gins and warehousing for both cotton lint and cotton seed

6 Source AEGIC

- Queensland Cotton–- also operates across the region with facilities in the Dalby, Cecil Plains area west of Toowoomba and a Cotton Gin and farms in the Moura and Theodore region south-east of Rockhampton.
- Louis Dreyfus Cotton–- operates a cotton business, with its main office located in the town of Emerald. The company has been involved in the Queensland cotton industry since the mid-1990s, and has built up a significant presence in the region over the years. Major warehousing facilities are located in McIntyre (Goondiwindi), Toowoomba and Moura to the north which support the containerised export of cotton lint and cotton seed, although some seed is exported in bulk form direct to ship. Container packing facilities are located in the Goondiwindi and Toowoomba areas and on Fishermans Island at the port.

Figure 27 illustrates a typical cotton supply chain, showcasing various domestic products, as well as the export of containerised bales of cotton lint and cotton seed.

Figure 27 - Cotton supply chain



Since there are no cotton spinners left in Australia, the focus of the cotton supply chain is primarily on export outcomes. Processing takes place through Cotton Gins, which separate the cotton seed from the cotton lint. Both products then proceed to warehousing and container packing for export. Some of the cotton seeds undergo processing through crushers for food processing, with offtakes to feedlots and farms. Cotton lint and cotton seed are crucial export markets, with Australian cotton being well-regarded for the quality of its products.

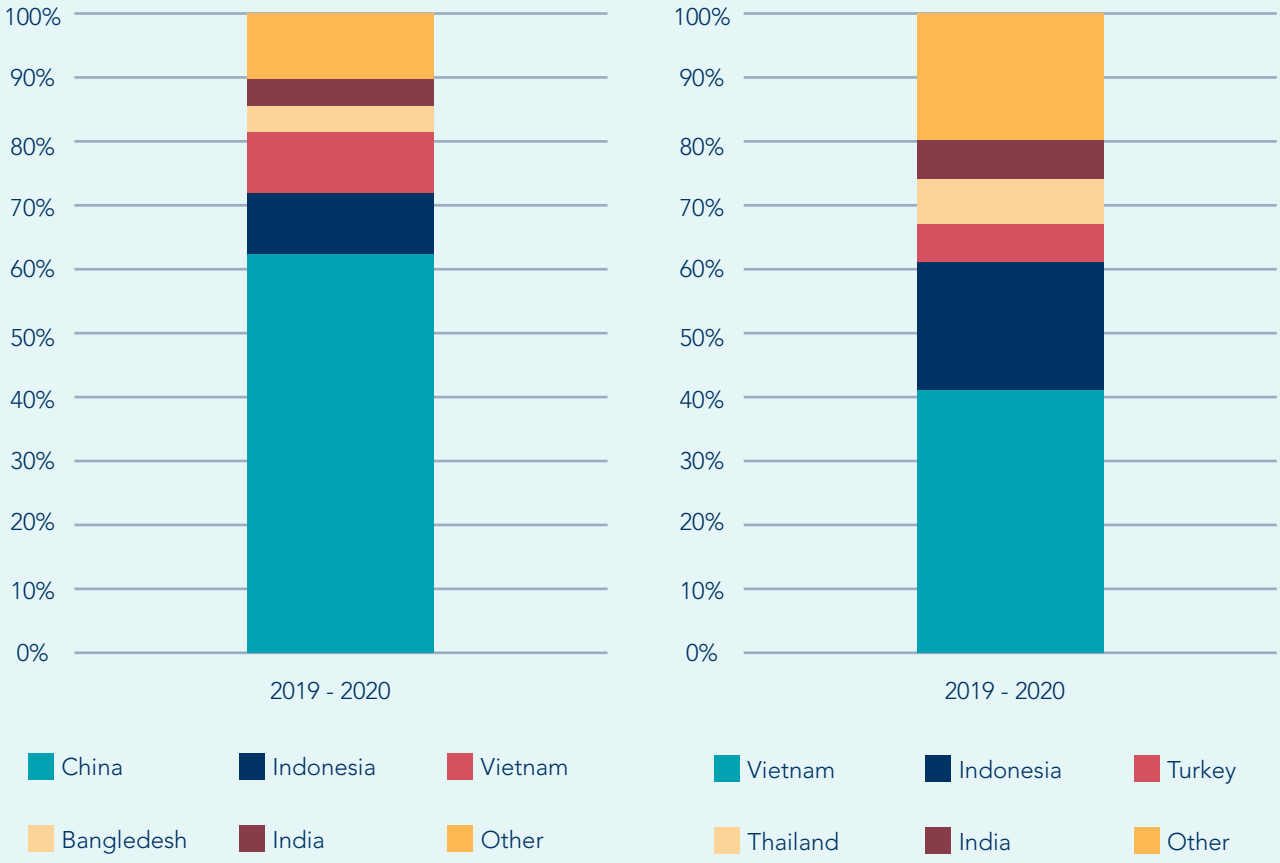
Production seasonality

The production of cotton is subject to the availability of water and irrigation in relevant areas, resulting in significant variability. Seasonality also plays a critical role in determining the total production levels and eventual export outputs. Although the 2018/19 and 2019/20 cotton productions were adversely impacted by droughts, the 2021/22 production levels were above average.

The 2022/23 production is also expected to be positive, but the recent east coast flooding may affect the forecast for that year. The seasonality and variability of annual production volumes have a direct impact on the size of export volumes. The export volumes for 2021/22 reached near-record levels, but it is essential to consider the 5-year and 10-year average production outputs when forecasting future years.

Australian cotton provides approximately 10-15% of the global production and is widely exported as lint for spinners to produce cotton threads. The export markets have changes significantly with constraints in the Chinese market and further diversification of exports in 2021/22 as shown in Figure 28.

Figure 28 - Australian cotton export destinations, 2019-20 and 2021-22



8. Future transport network impacts

8.1 Container trade growth impacts on the transport network

Container volumes are expected to grow rapidly which has subsequent impacts to truck volumes and the traffic conditions on the road network. The SEQSTM was used to assign forecast vehicle demand to the road network. This was achieved by developing an output workflow from the simulation model that flows to the SEQSTM. The process involved the following:

- Determining the annual TEUs from the forecast model
- Running the supply chain model to determine number of TEUs between nodes in the supply chain and likely truck types
- Estimating the total number of trucks for a given year
- Determining the average number of containers carried by a particular truck type. For example some heavy vehicles can transport up to four TEUs
- Converting truck types to PCUs[7] to be recognized by the SEQSTM
- Designating truck types based on different legs and journeys
- Grouping results into off-peak and peak periods to generate results that are compatible with the SEQSTM

The SEQSTM is capable of forecasting network movements up to 2042. The model also considered committed and funded network and infrastructure upgrades which have been provided in Appendix 1.

Table 10 presents the conversion rates of TEUs to trucks that were utilized to simulate the movement of containers in South East Queensland. The table also provides a comparison to the 2013 assumptions, indicating that the projected number of TEUs and trucks for this study in the coming years is slightly higher.

7 A passenger car unit (PCU) is a term that refers to a standardised unit of measurement used to express the capacity of passenger vehicles. PCUs are used in the SEQSTM to estimate the capacity of roads, based on the number and types of vehicles that are expected to use them. In this study, the heavy vehicles have been converted into passenger vehicle equivalents, and their capacity has been expressed in PCUs.

Table 9 - Conversion of TEUs to trucks

	2013		2021/22	
YEAR	TEUs (2013)	WEEKDAY TRUCK TRIPS	TEUs	WEEKDAY TRUCK TRIPS
2025	-	-	1,605,696	6,292
2030	1,881,762	6,656	2,005,897	7,466
2035	-	-	2,387,948	8,949
2040	2,414,447	8,540	2,778,429	10,001

The estimated average weekday container truck movements and volumes for 2040 are shown in Figure 28. When comparing the to the existing network congestion in Section 5.9, it is observed that:

- There will be a significant increase in traffic entering and exiting the Port, particularly for corridors surrounding the Gateway Motorway, Lytton Road and Port of Brisbane Motorway;
- Despite improvements in infrastructure and the expected population and demand growth, the key routes that are likely to experience congestion by 2040 have remained unchanged since the 2013 report, which is what would typically be anticipated.. These routes include :
  - Port of Brisbane Motorway
  - Warrego Highway
  - Gateway Motorway
- There is likely deterioration of traffic conditions on the Logan Motorway with a change from a LOS D to LOS F on the east-west section
- There is likely deterioration of traffic conditions on the Gateway Motorway with a change from a LOS E to LOS F for the north-south section between Wynnum Road and Mount Gravatt Capalaba Road

The Pacific Motorway corridor is projected to experience a rise in the number of heavy vehicles using it, which corresponds to the development of regions like Yatala and the Gold Coast. Note: The SEQSTM allocates vehicles to the fastest route based on network constraints however, this means it may disproportionately allocate trucks to fewer routes where in reality more routes may be utilised for various reasons and in response to congestion or disruption on a particular day.

Figure 29 -Forecast container vehicle routes to and from the Port in 2040 (average weekday trips)

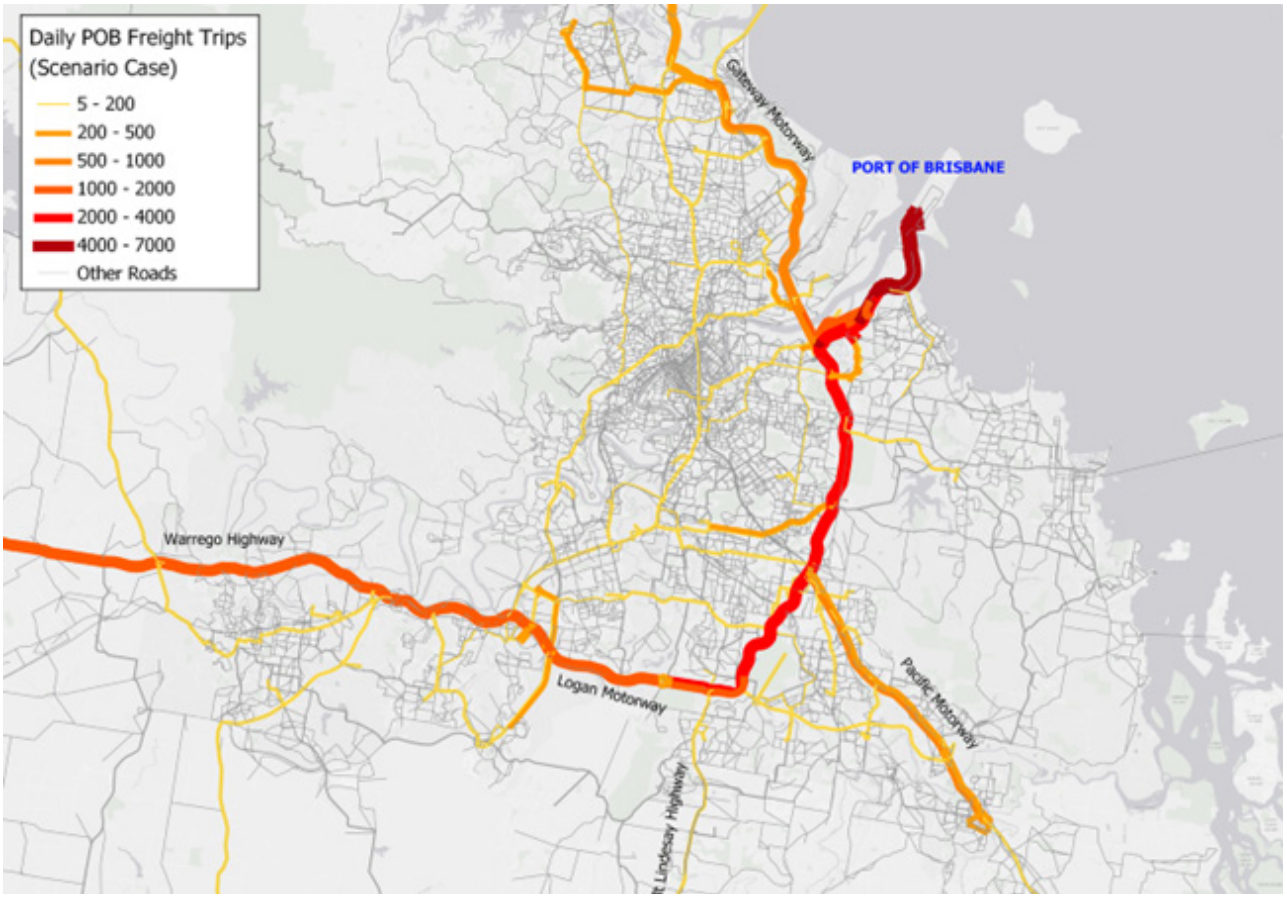
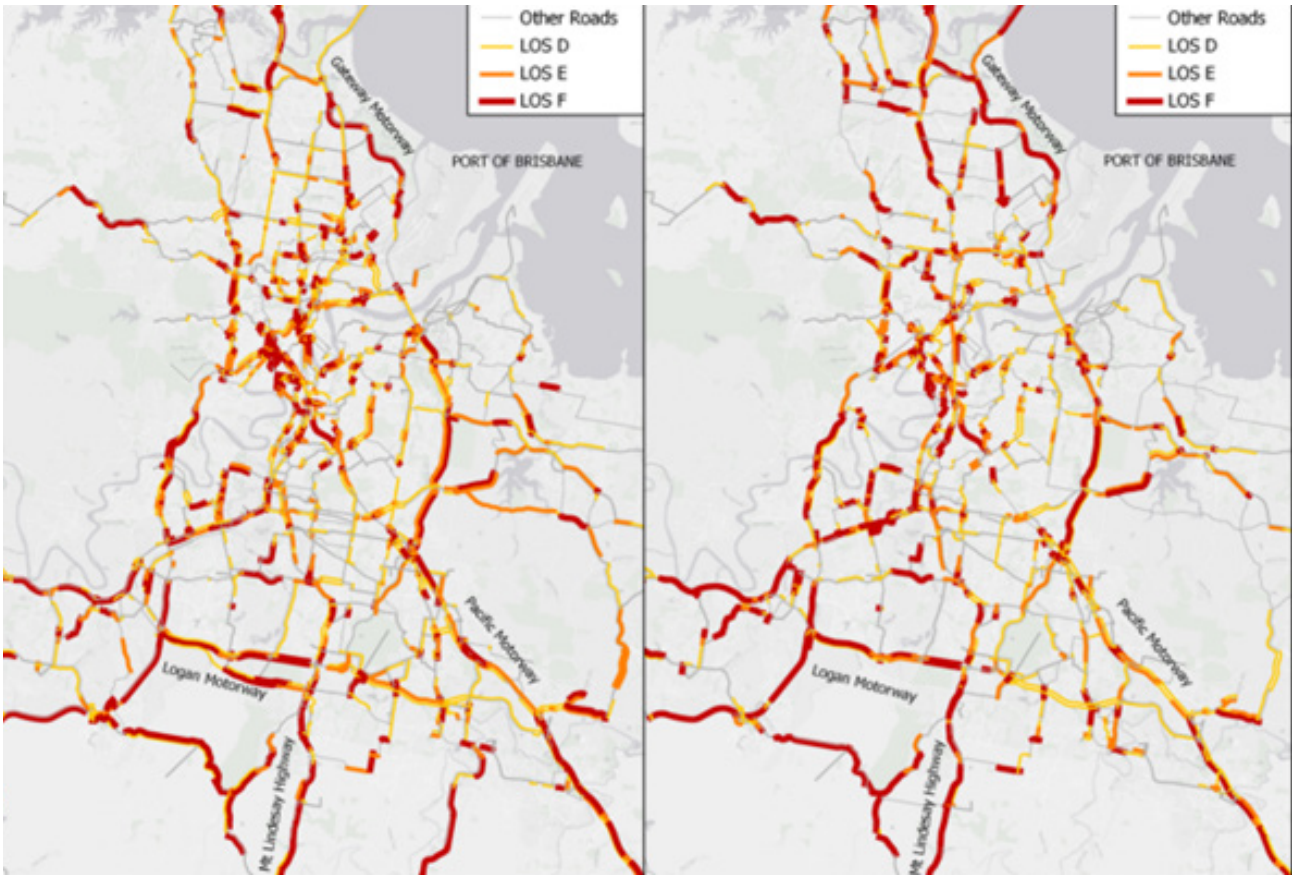


Figure 30 - Estimated Level of Service for 2040, AM (left) and PM (right) peaks



7.2 Expected changes to the road network

- The concentration of port trucks on the Gateway, Logan or Warrego Highway is efficient from an asset maximisation and amenity impact reduction standpoint however, it makes the port supply-chain susceptible to disruption with minimal alternative routes available.
- As per the previous study's traffic forecast findings, the AM peak (7am-9am) is anticipated to have higher congestion levels compared to the afternoon peak, and there is typically a greater presence of port-related traffic during this period. This aligns with the previous study's conclusions.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APPENDIX 1

Summary of changes and observations since the previous study

Table A1 - Summary of significant changes since the previous study

Import/export container movement trends	Rail mode share has declined from 5% to 1% since 2013 due to heavy vehicles offering more cost-effective transportation solutions. Moreover, an efficient rail option is currently unavailable to cater to areas like Moree in Northern New South Wales as they are not connected to the wider rail network at the current time.
	There are a greater number of empty exports due to the increase in imports resulting in an imbalance between imports and exports. Additionally, many export commodities use 20ft containers because of the heavy cargo weight however, imports which are commonly lighter usually prefer 40 ft containers leading to a mismatch and adding to the excess of empty export containers. The mismatch is simply because we import more than we export, not container size.
	The study indicates a decline in exports being packed within 100km of the port. This trend can be attributed to the use of transport yards and third-party packing facilities situated closer to regional areas, as well as a seasonal variation this year compared to the previous study, which saw larger volumes of agricultural products being exported.
	The percentage of staging of imports and exports has almost doubled since 2013, which is an efficiency measure for trucks to access rather than adding to congestion. This strategy improves supply chain management and planning, allowing for more efficient movements to and from the Port.
	Although there has been a significant increase in the number of imported containers since 2013, the relative proportion of full and empty import containers has remained constant.
	Although there has been a significant increase in the number of imported containers since 2013, the relative proportion of full and empty import containers has remained constant.
Geographic destinations – import containers	The data suggests a decline in the number of containers being unpacked at transport depots (cross-docking). This can be attributed to the strategic location of large retail importers in proximity to transport yards in Hemmant, Lytton and Murrarie. As a result, containers are being directly moved to these locations to be unpacked in warehouses.
	These findings highlight the efficiencies in business locations and container unpacking in the import logistics chain for full and empty container movements due to the high concentration of businesses and logistics facilities at the Port and the contiguous industrial districts which are continuing to expand.
	Observations show a decrease in the number of imports being unpacked interstate, falling from 4% in 2012 to 1% in 2021/22.
	Since 2013, there has been an increase in areas of import unpack significance across Brisbane, which reflects the growth of imports and associated land use constraints such as Acacia Ridge. Additional significant suburbs include Spring Lakes, Redbanks, Cannon Hill and Karawatha. As businesses continue to move into adjacent suburbs, it is important to monitor this trend as population and residential areas grow, as it may lead to potential land use conflicts, amenity issues and urban encroachment.
	As imports are unpacked in more suburb's warehouses may move further away from key arterials and this may extend last mile movement and increase the use of minor roads. This further highlights the need for appropriate industrial land supply.
	The percentage of import containers being unpacked in Greater Brisbane and South-east Queensland regions, specifically in Logan-Beaudesert and Moreton Bay-South, has increased, rising from 4.2% to 9.5% and 1.4% to 2.6% respectively. These regions offer convenient access to major transportation routes such as highways and rail lines (there are no imports on rail from the Port), making it easier for importers to unpack their containers closer to point of consumption.
	A shift has been observed in the import destinations in Regional Queensland, with Toowoomba and Wide Bay receiving a greater number of imports, while Darling Downs–-Maranoa and Townsville have experienced a decrease. These changes can be attributed to the growth of regional centres and their increasing demand for imported products. Furthermore, the consolidation of packing facilities and transport yards in proximity to Toowoomba has contributed to this trend for commodities such as retail products and inputs to industrial processes, including ag manufacturing.
Geographic destinations – export containers	The increasing number of exports packed interstate reflects the growth in agricultural grain and cotton products in northern New South Wales since the 2013 report. It is worth noting that there are also additional volumes from Northern New South Wales being packed in areas such as Toowoomba or the Darling Downs.
	A greater number of empty export containers are being staged through transport yards, aligning to trends seen at other major ports such as the Port of Melbourne This provides interim storage solutions closer to the Port.

Geographic destinations – export containers	It can be noted that there has been a considerable expansion in certain areas, such as Wacol and Carole Park, where the percentage of total full exports has increased from 0.4% to 6.6%. This growth is attributed to the rise of export-oriented businesses, warehousing, and logistics operations in the region. Additionally, there has been an increase in export volumes associated with agricultural products being packed in Pinkenba.
	The expansion of the south west corridor in terms of both exports and imports will put additional demand on key transport corridors such as the Gateway and Logan Highway and provide increased opportunities for rail.
	A general trend of declining export container origins in Brisbane and adjacent statistical regions has been observed, with a 10% decrease overall. This trend reflects the shift in regional logistics operations, as more products are being packed in regional areas. Additionally, seasonal variations may be a factor, especially regarding record grain and cotton products.
	Since 2013, there has been a limited number of export products that originated from the Gold Coast, while Ipswich's export products have remained relatively consistent. It should be highlighted that the Gold Coast had experienced significant export growth between 2012 and 2013, which later stabilised.
	The high throughput for the agricultural industry in northern New South Wales has led to a significant increase in interstate exports, accounting for 4.6% of total full exports compared to 1.5% previously. Toowoomba has emerged as a major packing location for agricultural products in the region. It is important to note that some additional products are being transported in bulk and packed in Southeast Queensland which are not represented in these statistics.
	Only approximately 1.5% of unpacked import containers are re-packed without transiting an ECP. Triangulating is a very efficient way of reducing costs and unnecessary transport trips.
Trip distances	The increased demand for agricultural export products in regional areas has led to empty containers being transported over longer distances between transport yards and exporters.
Truck types and utilisation	There is an increase in the use of side-loaders, which typically indicates that importers and exporters are seeking ways to improve efficiency, especially when they are limited by the appropriate equipment required to handle containers.
	Since 2013, there has been a shift from the use of Super B-doubles to A-doubles for shorter trips between the Port and nearby transport yards and ECPs. This change could be aligned to the improved performance of A-doubles offering operational efficiency capacity, greater flexibility and manoeuvrability, which makes them more suitable for navigating urban roads.
	The truck utilisation above is comparable to levels at larger ports such as Port of Melbourne and is and can be attributed to the greater use of 4 TEU HPVs.
	In situations where road infrastructure such as bridges impose restrictions on truck weights and lengths, and where importers and exporters are unable to accommodate large truck manoeuvring, truck utilisation tends to be lower. However, with the emergence of new truck combinations like the A-Triples, which can handle up to 6 TEUs on Fishermans Inland, it is anticipated that truck utilisation will increase in the future.
Container weights	Average export container weights have remained unchanged since the 2013 study. However, there has been a reduction in the average weight of general and refrigerated cargo imports.
Container movement profiles	The low levels of weekend moves are similar to other container ports of similar size for example, Fremantle, however it is significantly less than the bigger ports such as Melbourne and Sydney. As network congestion during weekdays increases, it is likely expected that more container truck trips will occur during weekends.
	In contrast to the 2013 analysis, there is a relative decrease in the number of truck movements to and from stevedores on weekends. However, there has been an increase in the transfer of containers between 6am and 3pm, leading to higher peaks. This trend is in line with the growth in container volume observed over the past decade. This increased concentration of day time week day activity could be as a result of increased stevedore landside productivity during the day (more vehicle slots available) however this would need to be validated.
	The prevalence of movements during weekday daytime may be symptomatic of a supply-chain that is not significantly impacted by congestion and where there may be disincentive to operate more on weekends and night times such as driver shortages and penalty rates and availability of fewer truck slots on weekends.
	The arrival and departure times at importers and exporters are highly concentrated. This is driven by constrained packing and unpacking hours likely due to higher cost for labour outside of weekday daytime hours. This constraint necessitates the staging of containers at transport yards prior to or before delivery or pick up from importers and exporters.

Container movement profiles	The operating hours of ECP's can often be the subject of contention with transport operators as they seek to operate more at night and on weekends. Given the lack of weekend and night-time movements at importers and exporters the opening hours of ECP's do not appear to be the main point of movement constraint.
	The arrival and departure times on weekends are quite concentrated however, there is a number at midnight and the early hours which suggests these are contiguous operations from Friday night into early Saturday morning to clear containers from the wharves before they incur storage charges over the weekend.
Elapsed times	There is a growing trend among transport operators to offer storage as a service to importers and exporters, either through on-site container storage facilities or by providing container storage for import and export purposes for both full and empty containers.
	The trend of longer container empty stays at import and export locations has been on the rise, possibly due to COVID-related disruptions in the supply chain. In 2013, the majority of empty containers were at these locations for six hours or less, while now many are staying for more than 12 hours in an ECP. Extended stays increase the risk of demurrage charges from shipping lines.
	Containers are being processed more rapidly through ECPs as compared to the previous 2013 study, which could be linked to the enhanced efficiency of the supply chain and the seasonal demand for agricultural export products.
Major import and export commodities	Export commodities such as cotton can either be packed near the source (point of harvest) or the cotton can be moved closer to the port for packing. Since the previous study there has been an increase in the volume being packed closer to the port. This may be due to infrastructure provided at the port which reduces time and cost.
Forecast and network impacts	The South-West Greater Brisbane region is an identified industrial land growth corridor in Queensland Government land use plans. Industrial areas near Ipswich (i.e., Ebenezer) and further south at the Strategic Development Area of Bromelton have significant growth capacity and enable good secondary distribution options into Gold Coast and Brisbane.
	The concentration of port trucks on the Gateway, Logan or Warrego Highway is efficient from an asset maximisation and amenity impact reduction standpoint however, it makes the port supply-chain susceptible to disruption with minimal alternative routes available.
	As per the previous study's traffic forecast findings, the AM peak (7am-9am) is anticipated to have higher congestion levels compared to the afternoon peak, and there is typically a greater presence of port-related traffic during this period. This aligns with the previous study's conclusions.


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