

OCR171902
PILBARA FREIGHT STUDY



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4.0 Definitions

Break-bulk	General cargo carried in loose form and not in containers
Broken stowage:	The spaces lost and unoccupied between each side of an undivided parcel of cargo while being stowed in a hold, container, van or other cargo conveyance.
Cargo equipment:	Equipment used to move freight such as containers, tanks, bolsters and flat-racks
Common carrier:	A person or firm who undertakes to everyone's goods, provided space is available on board the vessel or other conveyance. Some goods may be legally refused due to safety or other regulation.
CTO:	Cargo Terminal Operator. An approved facility with customs controls.
FIFO:	Fly In Fly Out. A system of rostered workforce at a site using non-local employees
FOB:	Free On Board. The risk of loss or damage to the freight generally passes from seller to buyer when the goods pass onto the ship, aircraft, truck or other conveyance at the place of loading.
Freight:	For the purpose of this study the term freight means all types of merchandise goods, whether for consumer or industrial consumption, unitised supplies, packaged or unitised chemicals or additives as well project freight, being large machines, construction materials, tanks, pods or similar shipments.
Geared:	Shipping vernacular for vessels fitted with cranes.
General cargo:	Shipping term for all types of general freight cargo (as opposed to dry-bulk, liquid bulk, bulk chemical, logging or bulk gas cargoes).
HWL:	High Wide Load. Road-haul term for oversize road freight.
Liner service:	Service provided by a shipping company where cargo-carrying ships are operated between scheduled, advertised ports of loading and discharging on a regular basis.
Liner terms:	Qualification to a freight rate which signifies it consists of the ocean carriage and the cost of cargo handling at the loading and discharge ports according to the custom of those ports.
MPP:	Multi-purpose project general cargo ship. A type of small to medium size cargo ship of flexible design to carry both containers and break-bulk cargo or dry-bulk shipments. The vessel is typically fitted with two or three heavy lift cranes.
MTOW:	Maximum Take-Off Weight (of an aircraft).
NVOC:	Non-vessel owning carrier.
NVOCC:	Non-vessel owning common carrier.
OOG:	Out of Gauge (cargo). Term used for oversize rail, road or sea freight.
OSOM:	Over Size Over Mass (cargo).
PAM:	Pre-Assembled Module.
PMC:	Aviation freight pallet 244cm x 318cm maximum gross weight up to 6,800 kg.
RORO:	Cargo vessel using the ROLL ON-ROLL OFF stevedoring method using a ramp.
SOC:	Shipper-owned container.
THC:	Terminal Handling Charge. In either aviation or shipping it is a charge for a combined freight handling service such as loading/unloading of freight and transfer to and from stack.
UDL:	Uniform Distributed Load
ULD:	Unit Load Device. A series of container and pallet types used for aircraft freight.

5.0 Executive summary

In November 2018 the City of Karratha commissioned Australian Floating Decks Pty Ltd to examine the Pilbara freight task and the logistics systems and networks used to move freight in and out of the region. A significant consideration of the study has been options for direct international freight service connectivity.



Freight into the Pilbara consists of the complete range of goods required to sustain the resource industries as well as a modern, developed community. The Pilbara must import everything from medical supplies to steel.



The study identifies the Pilbara freight task as 6.54 million tonnes per annum for the present period of reduced construction.



Inbound freight **4.80 million tonnes**



Outbound freight **1.74 million tonnes**



90% of the Pilbara freight task, or 5.9 million tonnes per annum, moves through Perth. General freight carried between Perth and the Pilbara is exclusively by road haul. A tiny exception is air freight - just 1,500 tonnes per annum.

Perth provides critical industry support for the resource industry including comprehensive supply, maintenance, fabrication and re-manufacturing facilities for major equipment.

Perth is also the key entry point for Western Australia for both domestic and international freight. The city is linked to the trans-Australian railway and has extensive international shipping and aviation links. Pilbara industry is connected to Perth by a highly efficient and competitive road haulage industry and substantial aviation services.

This study finds, however, that the further sustainable development of Pilbara industry and the Pilbara community will benefit significantly from the development of direct maritime and aviation freight links to Asia. These new connections will complement the existing essential logistics networks based around Perth.

The direct freight service links will provide an alternative for Pilbara business that can reduce freight costs, improve delivery schedules and introduce liner shipping container and cargo equipment services directly into the Pilbara for the first time.



The study shows the direct services can reduce freight costs by up to 50% and delivery times by up to 70%. Apart from freight cost savings the shorter, reliable service network direct to Asia will allow the

development of new freight supply chains with critical advantages for existing business sustainability. Recycling, building products, machinery, industrial supplies and consumables are just some of many Pilbara freight categories that can benefit from direct services.

Export opportunities that might be stymied due to impractical and expensive supply chains, or new opportunities in agri-business, fisheries, the pastoral industry and other sectors can benefit from direct freight service schedules, whether by sea or air, at affordable back-haul rates.



\$ EVERY ADDITIONAL STEP TO MOVE FREIGHT FROM THE SUPPLIER TO THE BUYER ADDS COST

Asia via Melbourne



8+ more steps than direct service

Asia via Fremantle



4+ more steps than direct service



Singapore to Pilbara direct saves freight distance

Ex-Asia via Fremantle: 3,000 km longer
 Ex-North Asia via Melbourne: 8,000 km longer



The shortest supply chains to Asian suppliers and trans-shipment ports (connecting to North America and Europe), whether by air or sea, improve inventory management, costs and supplier options for Pilbara business.



More containerisation and a reduction in logistics actors means less chance of breakage. This directly assists the quality assurance of business service delivery.



A reliable schedule around which supply chains can be designed improves timeliness of business service delivery schedules and allows reductions in inventory requirements and costs. It also improves business supplier options and opportunities to grow freight exports.



Fewer logistics actors means less chance of wrong delivery or missing freight. This is a positive for the quality assurance of business service delivery.

The study involved extensive engagement with industry, including small to medium enterprises resident in the Pilbara.



The study finds considerable opportunity and demand for new direct sea freight links to the major Asian trans-shipment ports in the near international region, particularly Singapore. From its initial market contact the study identified a cargo aggregation of 300 TEU per fortnight just from the sample of industry contacted. This forms a viable base for the development of small cargo liner ship operations.

The study identified that the demand from industry is for a genuine liner shipping service operating to a reliable, published schedule. Industry can then model supply chains around the shipping schedule.



The study finds that there is substantial productivity gain for many Pilbara businesses to have low cost access to containers and cargo equipment through a direct liner shipping service to the Pilbara.

At present many Pilbara businesses cannot access containers and other cargo equipment in a cost effective and practicable way. These Pilbara businesses miss out on the benefits of containerisation and unitisation of cargo that are an essential part of most modern freight supply chains worldwide.



The study finds that a RORO *liner cargo* shipping service operating to a reliable, published schedule can be readily established with existing port infrastructure and port services at Dampier.

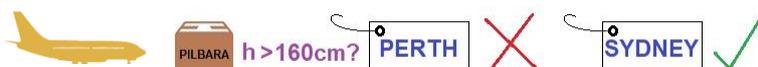


A quarantine wash-down bay is required at Dampier but can be rapidly developed on an identified site at a recoverable cost to the trade.

The RORO service is preferred because it can operate both containers and break-bulk cargo efficiently and achieve a fast turnaround. The service can be utilised for cold chain with both chiller and freezer containers. (If the vessel is equipped with cranes it can operate to Port Hedland subject to berth availability).



This study finds a conventional geared vessel can be operated to Dampier on a *regular* schedule using a trans-shipment system and, when available, the Dampier Cargo Wharf. It can also operate to Port Hedland.



The study finds that there are considerable air freight logistics inefficiencies that can be improved with direct services. For example, there are no wide-bodied scheduled freighter aircraft operating to Perth

airport. The study finds that oversized air freight is flown into Sydney on a weekly basis then transported by rail or truck to Perth, then north by truck to the Pilbara.



The study finds there is significant interest from major cargo interests servicing the Pilbara and northern Australia in developing a direct service for air freight to Karratha - including an option for triangulation over Perth and the transport of perishable cargo. Operating options for air freight may include passenger services. The study refers to the Toowoomba Wellcamp operation as a successful example of the development of triangulation to provide a weekly direct air freight service to Asia for growers.



Karratha airport can be adapted in a short period to receive scheduled international air freight services but will require on-going access to customs and quarantine resources.

A 2% change in Pilbara transport expenditure is \$20m per annum – enough to operate a direct maritime and direct air service.



\$6m - \$7m per annum



\$13 - \$14m per annum



This study finds that just a 2% change in the current Pilbara freight task can provide a viable cargo base for the development of direct services.

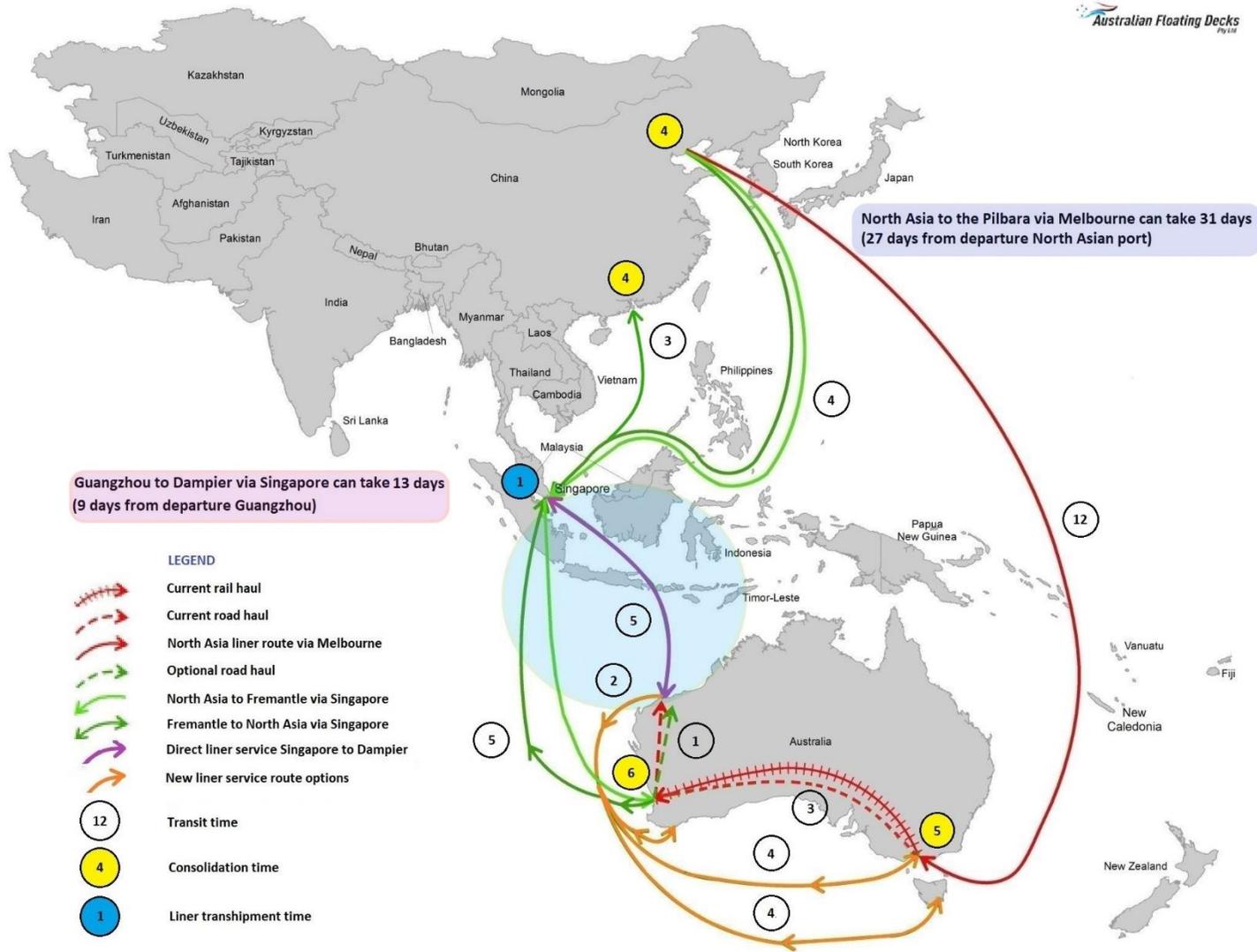


Figure 1: North Asia - Dampier maritime freight supply chain routes

Existing Freight supply chain: Intermodal Asia – Melbourne – Perth – haulage to Pilbara



Existing Freight supply chain: Intermodal Asia – Fremantle – haulage to Pilbara



Proposed Freight supply chain: Containerised or breakbulk Asia – Pilbara direct



Figure 2: Sea freight supply chain steps - inbound freight to Dampier ¹

¹ AFD, 2018.

6.0 Introduction

The Pilbara region is a tremendous Australian success story generating A\$50 billion in regional exports² from one of Australia's most remote areas. The Pilbara is world-renowned, famous for the scale of its resource production and exports. The growth of the Pilbara has created some of the world's major maritime trading routes with a network of connections handling vast quantities of bulk exports. The maritime supply chains to key overseas commodities markets are extremely specialised and efficient. The Pilbara is an integrated part of the global commodities supply chain and in terms of its export markets, Pilbara industry is as connected to Asia as any other part of the Australian economy.

The Pilbara resource exporter seeks direct and efficient logistics links to its overseas markets as critical to the successful sale of its commodities. Any delays due to logistics congestion, deviations, extra handling, re-consolidating or other interference to the supply chain is unacceptable to the resource exporter. In the pursuit of competitiveness and profit the Pilbara export commodity supply chains are managed to a scientific level including the use of the latest technology to achieve ever higher shipping optimisation.

The scale of the construction, development and operation of the Pilbara resource export industries requires millions of tonnes of freight each year. This critical industrial freight, together with freight for the towns and communities, must all be brought into the region from elsewhere in Australia or overseas. This report shows that more than 90% of the Pilbara freight task of 6.54 million tonnes³ originates from or passes through Perth.

The development of the Pilbara resource industry has a critical reliance on Perth as a supply base. Perth is the gateway for freight into Western Australia. Perth Airport, the Port of Fremantle and the trans-Australian railway connect Perth and the Pilbara with national and global suppliers. Much of Perth's industrial base and service industry is integrated with the requirements of the Pilbara resources industry. The logistics networks provided by the highly competitive road haulage industry are so efficient that much of the inventory required by Pilbara industry can remain in Perth. Giant mining machinery can be mobilised between Perth and the Pilbara in a few days.

The establishment of the new industrial ports and port facilities in the Pilbara have not been accompanied by developments in significant multi-user facilities suitable for the import of freight. The emergence of the oil and gas industry in the northwest introduced a competing supply chain for berth space at the limited multi-user facilities available. During the resources boom, for example, offshore supply vessels would vie with general cargo shipping at the Dampier Cargo Wharf – in AFD experience berth cancellations were common. These constraints in the Pilbara contributed to the reliance on logistics based around Perth.

Despite the excellent industrial service base and communications links that Perth provides, the fact remains that it is on average 1,600 km by road from the key towns and mine sites in the Pilbara. This forms an extended supply chain for essential freight that extends further than that of any other major

² REMPLAN economy profile, Pilbara Development Commission, 2018.

³ AFD, 2018.

industrialised area in the country. For the procurement of goods at Perth the distance is all part of operating in a remote part of a continental nation. For some freight, however, supply chains could be improved by direct freight links between the Pilbara and the near Asian region.

The modern Australian economy relies heavily on merchandise imports of manufactures, particularly from Asia. Freight imported from Asia to the Pilbara via Fremantle will *pass by* the key ports of Port Hedland or Dampier on the voyage a further 1,600 km south before *returning* a further 1,600 km by road north. Imported freight from North Asia through Melbourne to the Pilbara travels a further 8,000 km (the width of Russia) to reach its destination compared to a direct service route into the Pilbara.

Such extended freight networks do result in additional costs and longer delivery schedules for Pilbara business and the community. Furthermore, the option of using contemporary containerisation and cargo unitisation for transport can be restricted and expensive. Many Pilbara businesses are disadvantaged by a lack of access to cargo equipment, such as sea containers, for moving freight at a viable cost. This creates extra freight consolidation costs for the Pilbara business compared to its metropolitan counterpart.

The industrial development of the Pilbara has been accompanied by population growth and the development of new towns. If Pilbara communities are to be sustainable then small to medium-sized businesses within them must also be sustainable. This will in part depend on access to affordable and efficient freight networks.

If a region as remote as the Pilbara has the challenge of long distances and extended freight supply networks, then direct maritime and air links to Asia can address these constraints by:

- Reducing freight transit times;
- Reducing freight costs;
- Reducing freight handling and consolidation;
- Reducing the number of logistics players;
- Offering competitive and affordable access for Pilbara business to containers and cargo equipment.

Pilbara businesses can use the benefits of the direct freight service links to develop new supply chains that may allow options for efficiencies in procurement, inventory management, supplier terms, materials costs, quality assurance and other internal operating processes as well as competitiveness in sales and exports.

Such access will also be essential for the creation of new industry opportunities, whether it is in the development of local industrial goods and services supply, including on-site manufacturing, or entire new operations in agri-business, seafood exports and other sectors.

7.0 The Pilbara

The Pilbara region is of critical importance to the Australian economy. The Pilbara accounts for 36% of Australia's *primary product* exports by value.⁴ Its principal exports, LNG and iron ore, are to the North and East Asian commodity markets.

The Pilbara region is of great size – it has a land area⁵ of almost 508,000 km², more than twice the size of the United Kingdom. Road distances from Karratha to Newman and inland areas of the region can extend 600 km or more.

The Pilbara is a geographically remote region of Australia. The nearest major city is Perth 1,600 km to the south. Darwin is 2,600 km by road to the northeast. Access to the cities of the Australian east coast, whether by air or land, is via Perth and involves distances of 5,000 km or more.

The resident population is just 59,000 people⁶ but the practice of industry in using rostered workforces from Perth or interstate, commonly known as FIFO, means that there are significant movements of people in and out of the region each year. In 2017, a total of 1.24 million passengers used Karratha, Port Hedland, Paraburdoo and Newman airports.⁷

7.1 Economy

The economy of the Pilbara region is dominated by the extraction and export of natural resources through mining and oil and gas production. At an average price of A\$80.50 per tonne, the iron ore production in the Pilbara amounted to over 748 million tonnes in 2018.⁸ In the same year, 60 million tonnes of LNG and petroleum products were produced in the coastal region and ocean areas of the northwest.⁹

The size of the resource industry means the GRP figures are large - the real GRP of the Pilbara in 2017 was A\$33.985 billion and the value of *regional* exports from the Pilbara was A\$49.365 billion¹⁰ (the measurement is an inflow of money into the Pilbara). A significant aspect of resource production in the Pilbara is construction, fabrication and engineering support. Together with mining these categories represent more than 96% of regional exports and more than 87% of overall output.¹¹

The Pilbara economy figures are sometimes compared with those of nation states. If the Pilbara was a nation state it would surely have direct transport links to Asia as a priority.

⁴ REMPLAN, economy profile, Pilbara Development Commission. 2018.

⁵ REMPLAN, economy profile, Pilbara Development Commission. 2018.

⁶ REMPLAN, economy profile, Pilbara Development Commission. 2018.

⁷ Bureau of Infrastructure, Transport and Regional Economics. Airport Traffic Data, 1985 to 2017.

⁸ WA Department of Mines, Industry, Regulation and Safety, Statistics Digest, 2017-18.

⁹ WA Department of Mines, Industry, Regulation and Safety, Statistics Digest, 2017-18.

¹⁰ REMPLAN, economy profile, Pilbara Development Commission. 2018.

¹¹ REMPLAN, economy profile, Pilbara Development Commission. 2018.

In 2017, there were 63,850¹² jobs in the Pilbara region with about half, or, 31,935 jobs being filled by FIFO arrangements or other, non-resident labour.

Value of commodity production – ores, metals, minerals and others ¹³	
Pilbara Region	2017-18 value (Australian dollars)
Iron Ore	60,219,016,785
Gold and Silver	842,968,513
Manganese ore and Salt	490,414,918
Copper	262,516,623
Construction materials	31,933,544
Other	534,873,219
Pilbara Total	62,381,723,602

Table 1: Pilbara – value of commodity production – ores and metals

Value of commodity production – offshore petroleum and gas ¹⁴	
Offshore Petroleum and Gas	2017-18 value (Australian dollars)
Crude Oil and Condensate	5,539,042,506
Liquefied Natural Gas	19,077,592,020
Natural Gas and LPG Butane and Propane	1,932,626,608
Offshore Total	26,549,261,134

Table 2: Pilbara - value of commodity production - oil and gas

The Pilbara has a small resident population but has developed, sophisticated service sectors, particularly around the major townships.

The combined household and government consumption is more than \$4.859 billion.¹⁵

The transport sector is significant and is the fifth largest category of output in the regional economy - the total combined regional imports and exports in the Transport, Postal & Warehousing category is over \$860 million and total production is \$1.34 billion.¹⁶

2%

Just a 2% change in the expenditure patterns of the Transport, Postal and Warehousing sector would mean around \$20 million could be spent on direct freight services between the Pilbara and Asia.

7.11 Sustainability and economic change

The Pilbara is and will continue to be affected by changes from the fourth industrial revolution – increased digitisation, automation and the development of new occupations. These developments are recognised in the Pilbara Development Commission Regional Investment Blueprint.

Connectivity in the new economy has a direct relationship with relevance and productivity. A community that is not efficiently connected, both in cyberspace and the physical world, risks being

¹² REMPLAN economy profile, Pilbara Development Commission. 2018.

¹³ WA Department of Mines, Industry Regulations and Safety, 2018.

¹⁴ WA Department of Mines, Industry Regulations and Safety, Statistics Digest, 2017-2018.

¹⁵ REMPLAN, economy profile, Pilbara Development Commission. 2018.

¹⁶ REMPLAN, economy profile, Pilbara Development Commission. 2018.

uncompetitive. The development of direct maritime and aviation freight links between the Pilbara and the near Asian region are a necessary change to support a sustainable community in the new age.

Technological changes appear to be developing new options for production of goods on site. In the support industries for resource production, such as engineering and fabrication, the use of digitisation, nanotechnology and robotisation may make cost effective production practicable close to the site of production. In such an arrangement the raw materials and components for the manufacturing are brought to site, rather than an imported finished item.

This new supply chain design is a complete reversal of many contemporary industrial supply chains where finished items have had to be imported from production facilities that may be located across the world. For the Pilbara, the distances to import manufactures are especially great and a major cost of doing business.

A Pilbara engineering firm is conducting research to manufacture on site and participate in more valuable supply work. This will involve the use of sophisticated, automated production equipment. A cost competitive supply chain of the shortest practicable distance for raw materials and components is essential for the business model to work. Direct freight links to Asia will support this business model.

2018 \$ Australian-grade steel can be priced at A\$1,600 per tonne in Perth.
Cost of 20 tonnes plus transport: A\$32,000.

2018 \$ Australian-grade steel can be purchased for A\$1,000 per tonne in Singapore.
Cost of 20 tonnes plus transport A\$23,000.

Saving A\$9,000

The development of both air and sea freight direct links to Singapore and other near Asian region trans-shipment airports and ports can offer new, practicable supply chains for pastoral, agri-business and fisheries products that can be grown in the Pilbara. Singapore, for example, is a major export market for Australian fruit. Horticulture development outcomes from the Transforming Agriculture in the Pilbara Project¹⁷ or the Pilbara Oyster Farm Project¹⁸ would be assisted by direct freight service links.

7.2 Key industries

Iron ore is the dominant commodity mined in the Pilbara. It is mined by the world's largest iron ore producers. The mining sector is however diversified with smaller producers of ores and minerals including gold, silver, manganese and copper. LNG is the main product of the oil and gas sector but also crude petroleum, condensates, natural gas and LPG. On the Burrup Peninsular anhydrous ammonia and ammonium nitrate is produced as part of downstream gas processing.

¹⁷ "Fruit tree trial enhances hopes for outback Pilbara....". ABC News. 06 December 2018.

¹⁸ "Pilbara oyster farm project ready to hit the water." Pilbara News. 28 August 2017.

Construction, predominantly for the resources sector, is a major industry sector with nearly A\$9 billion in output.¹⁹

The principal towns all have light industry areas providing support services to the resource industry. These services include: electrical and structural engineering; maintenance; fabrication; industrial supply; warehousing and equipment hire. Dampier has the largest supply base facilities for oil and gas in the northwest and, together with sites in Karratha, has significant forward inventory storage areas for the supply of the offshore fields, as well as technical services such as diving services and survey.

Transport is a very significant sector including port services, aviation and road-haul.

The support of the population and the community also creates other sectors of industry and consumption such as the following categories provided by REMPLAN – output from these sectors is A\$3.5 billion.²⁰

Administrative and Support Services;
Electricity, Gas, Waste and Water Services;
Accommodation and Food Services
Public Administration and Safety
Wholesale Trade
Other Services
Education and Training
Health Care and Social Assistance
Retail Trade
Financial and Insurance Services
Information Media and Telecommunications
Arts and Recreation Services

An agriculture, forestry and fishing sector produces over \$110 million in output.²¹

¹⁹ REMPLAN economy profile. Pilbara Development Commission. 2018.

²⁰ REMPLAN economy profile. Pilbara Development Commission. 2018.

²¹ REMPLAN economy profile. Pilbara Development Commission. 2018.

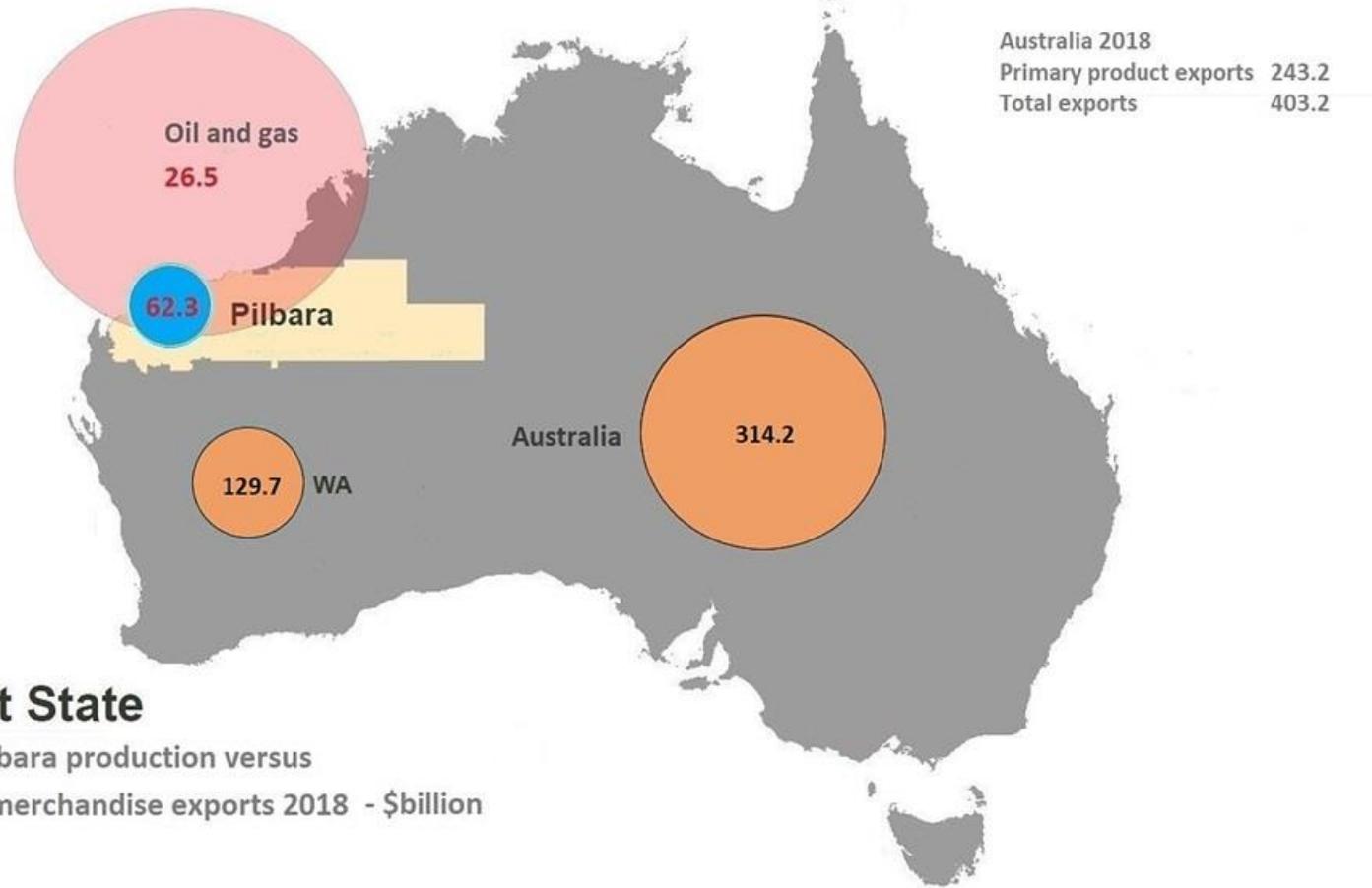


Figure 3: Value of Pilbara production ²²

²² Department of Foreign Affairs and Trade, Monthly Trade Data, November 2018 and WA Department of Mines, Industry Regulation and Safety, Statistics Digest 2018.

7.3 Population statistics

The Pilbara had a permanent resident population in 2016 of 59,554.²³

Pilbara resident population plus non-resident employment numbers ²⁴		
Ashburton	13,026	21.8%
East Pilbara	10,591	17.8%
Karratha	21,472	36.1%
Port Hedland	14,465	24.3%
Total resident	59,554	100.0%
Additional non-resident employment	31,935	
Total	91,489	

Table 3: Pilbara resident and non-resident population statistics

In 2017, there were 63,850 jobs in the Pilbara region, of which 31,915 jobs were filled by resident workers and the balance of 31,935 jobs being filled by FIFO arrangements or other, non-resident labour²⁵.

The data in table 3 suggests that at any one point in time there are 90,000 to 100,000 people in the Pilbara region including personnel on offshore installations.

Significant surges in workforce numbers can occur with major projects. The WHEATSTONE project, for example, built a village with 3,800 beds at its Ashburton site in 2012-14 to support its construction workforce.²⁶

Karratha is the largest town with the largest population in the Pilbara followed by Port Hedland. Together these two towns have more than 60% of the resident population of the Pilbara region.²⁷ The other significant townships include Paraburdoo, Newman, Onslow and Tom Price.

²³ Australian Bureau of Statistics 2016 Census of Population and Housing and REPLAN economy profile 2018, PDC.

²⁴ Pilbara Development Commission, 2018.

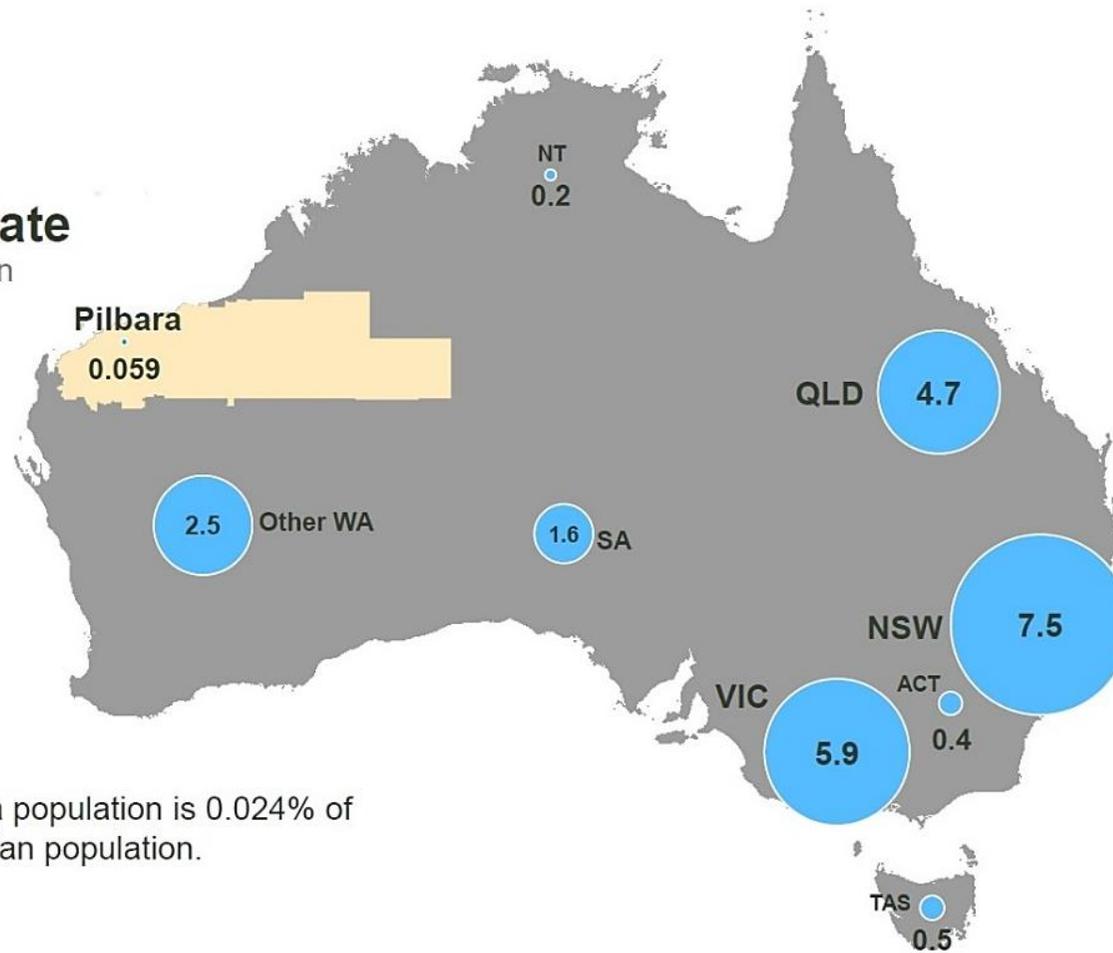
²⁵ REPLAN economy profile, Pilbara Development Commission. 2018.

²⁶ JOHN HOLLAND website, 2018.

²⁷ Pilbara Development Commission, 2018.

Current State

Population, million



The Pilbara population is 0.024% of the Australian population.

Figure 4: Pilbara population²⁸

²⁸ REMPLAN economy profile, Pilbara Development Commission. 2018 and Australian Bureau of Statistics 2016 Census of Population and Housing

7.4 Key distances

The Pilbara is almost as close by ocean transport to the key Indonesian port city of Surabaya as it is to Fremantle. Singapore is the world’s greatest trans-shipment hub with connecting shipping services across the world. For a small general cargo ship operating at modest sailing speeds Singapore is just 4 to 5 days steaming away from Dampier or Port Hedland allowing the prospect of a fortnightly general cargo liner service. A fully developed liner shipping service using a large liner vessel operating at higher speeds could reduce the steaming time to about 3.5 days. The table below shows that even at modest general cargo ship operating speeds, the farthest of the key Asian trading ports are only a week or so away from Dampier by sea.



Figure 5: Cargo ship steaming ranges at 14 knots from Dampier in days

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²⁹ AFD calculations using standard shipping routes from Reeds Marine Distance Tables, 13th edition, 2014.

Shipping distances – standard shipping routes - Port of Dampier <i>direct</i> to Asian ports ³⁰						
Voyage	Distance		At 14 knots		At 16 knots	
	Kilometres	Nautical miles	Hours	Days	Hours	Days
Dampier to:						
Fremantle	1,624	877	62.6	2.6	54.8	2.3
Surabaya	1,930	1,042	74.4	3.1	65.1	2.7
Tanjung Priok	2,548	1,376	98.3	4.1	86	3.6
Singapore	3,296	1,780	127	5.3	111.3	4.6
Port Kelang	3,676	1,985	141.8	5.9	124.1	5.2
Ho Chi Minh City	4,111	2,220	158.6	6.6	138.8	5.8
Manila	4,254	2,297	164.1	6.8	143.6	6.0
Kaohsiung	5,104	2,756	196.9	8.2	172.3	7.2
Hong Kong	5,212	2,814	201	8.4	175.9	7.3
Shanghai	5,999	3,239	231.4	9.6	202.4	8.4
Shanghai	6,188	3,341	238.6	9.9	208.8	8.7
Busan	6,606	3,567	254.8	10.6	222.9	9.3
Osaka	6,632	3,581	255.8	10.7	223.8	9.3

Table 4: Steaming times from Dampier at small general cargo ship operating speeds

Shipping distances – liner cargo shipping routes – select port to port ³¹						
Voyage	Distance		At 17 knots		At 20 knots	
	Kilometres	Nautical miles	Hours	Days	Hours	Days
Ho Chi Minh City to Singapore	1,195	645	37.9	1.6	32.3	1.3
Guangzhou to Singapore	2,676	1,445	85.0	3.5	72.3	3.0
Dampier to Singapore	3,297	1,780	104.7	4.4	89.0	3.7
Shanghai to Singapore	4,060	2,192	128.9	5.4	109.6	4.6
Singapore to Fremantle	4,121	2,225	130.9	5.5	111.3	4.6
Osaka to Sydney	7,978	4,308	253.4	10.6	215.4	9.0
Hong Kong to Sydney	8,297	4,480	263.5	11.0	224.0	9.3
Busan to Sydney	8,469	4,573	269.0	11.2	228.7	9.5
Shanghai to Sydney	8,586	4,636	272.7	11.4	231.8	9.7
Hong Kong to Melbourne	9,029	4,875	286.8	12.0	243.8	10.2
Busan to Melbourne	9,516	5,138	302.2	12.6	256.9	10.7
Shanghai to Melbourne	9,584	5,175	304.4	12.7	258.8	10.8
Osaka to Melbourne	9,779	5,280	310.6	12.9	264.0	11.0

Table 5: Select Asian and Oceania steaming distances and times at large cargo liner speeds.

Railway distances – between east/west corridor intermodal freight terminals ³²	
Sector: Perth to -	Distance - kilometres
Adelaide	2,637
Melbourne	3,468
Sydney	4,137

Table 6: National east/west corridor railway distances between interstate freight terminals

³⁰ Reeds Marine Distance Tables, 13th edition. 2014.

³¹ Reeds Marine Distance Tables, 13th edition. 2014.

³² Australian Infrastructure Statistics - Yearbook 2018.

Perth to Australian east coast (great circle) air distances³³ and flight times at commercial jet speeds			
Based on average speed of 750 km/h plus 0.3 hrs for approach and taxi. Excludes flight transfer time			
Sector:	Flight distance		Flight time
Perth to -	Kilometres	Nautical miles	Hours
Brisbane	3,615	1,952	5.1
Sydney	3,284	1,773	4.7
Melbourne	2,706	1,461	3.9
Adelaide	2,120	1,145	3.1

Table 7: Perth to East Coast air distances and flight times

Select Pilbara domestic and international air distances³⁴ and flight times at commercial jet speeds			
Based on average speed of 750 km/h plus 0.3 hrs for approach and taxi. Excludes flight transfer time			
Sector:	Flight distance		Flight time
Karratha to -	Kilometres	Nautical miles	Hours
Perth	1,247	673	2.0
Surabaya	1,536	830	2.4
Jakarta	1,949	1,052	2.6
Singapore - direct	2,810	1,517	4.1
Kuala Lumpur	3,072	1,659	4.1
Melbourne - direct	3,293	1,778	4.7
Sydney - direct	3,684	1,989	5.2
Manila	3,923	2,118	5.5
Melbourne – via Perth	3,953	2,134	5.6
Singapore – via Perth	4,531	2,447	6.6
Sydney – via Perth	4,531	2,447	6.6
Hong Kong	4,769	2,575	6.7
Newman to -			
Perth	1,017	549	1.7
Port Hedland to -			
Perth	1,308	706	2.1

Table 8: Select Pilbara domestic and international air distances and flight times

Australia east coast to Perth road freight haulage distances³⁵ and times³⁶			
Assumes single driver operation, mandatory rest periods and 1.5 hours for loading and 1.5 hours for unloading			
Sector: Perth to -	Distance - kilometres	Driving time - hours	Haulage time - days
Brisbane	4,563	53.7	5
Sydney	3,935	46.3	4
Melbourne	3,418	40.2	3.5

Based on average highway speed of 85 km/h.

Table 9: Australia east coast to Perth road freight haulage distances and times

³³ Australian Infrastructure Statistics - Yearbook 2018.

³⁴ Australian Air Distances Directory. Department of Infrastructure, Regional Development and Cities, BITRE. 2018

³⁵ Australian Infrastructure Statistics - Yearbook 2018.

³⁶ AFD industry contact 2018 and Road Transport (Long Distance Operations) Award 2010.



Figure 6: The continental distances of Pilbara imports via the east coast

Perth to Pilbara general freight haulage distances³⁷ and times³⁸			
Based on average highway speed of 85 km/h. <i>Single driver operation</i> . Including rest periods.			
Sector: Perth to -	Distance - kilometres	Driving time - hours	Haulage time - hours
Newman	1,194	14.1	26.1
Onslow	1,389	16.3	28.3
Cape Preston	1,497	17.6	29.6
Tom Price	1,535	18.1	30.1
Paraburdoo	1,537	18.1	30.1
Karratha	1,541	18.1	30.1
Pannawonica	1,538	18.1	30.1
Wickham	1,562	18.4	30.4
Port Hedland (via Gt. Northern Hwy)	1,638	19.3	31.2

Table 10: Perth to Pilbara general freight haulage distances and times

Cartage and haulage distances within the Pilbara region are significant. Pilbara residents are used to travelling great distances by vehicle for their general communications. A return day trip from Karratha to Onslow is the equivalent of driving from Melbourne to Goulburn.

Dampier to Pilbara general freight cartage and haulage distances³⁹ and times		
Based on average highway speed of 80 km/h. Excluding stopovers.		
Sector: Dampier to -	Distance - kilometres	Haulage time - hours
Karratha	20	0.5
Wickham	71	1.0
Port Hedland	263	3.3
Pannawonica	199	2.5
Paraburdoo	544	6.8
Pannawonica	199	2.5
Onslow	311	3.9
Newman	633	7.9
Cape Preston	114	1.4

Table 11: Dampier to Pilbara general freight cartage and haulage times

³⁷ Distance Book, Edition 13. Main Roads Western Australia. 2018.

³⁸ AFD industry contact 2018 and Road Transport (Long Distance Operations) Award 2010.

³⁹ Distance Book, Edition 13. Main Roads Western Australia. 2018.

8.0 The Pilbara Freight Task

The massive quantities of exports from the Pilbara are produced in a region that is almost entirely dependent on supplies being brought in from elsewhere in Australia and overseas. These supplies are for every facet of community life, construction and industrial operations. To support such large enterprise, the annual freight task is in the millions of tonnes. The major producers of natural resources for export can each have freight tasks of a hundred thousand tonnes or more, multiplied further through the activities of the huge range of contractors and activities supporting them. In provisions alone, the Pilbara requires a *minimum* of 400 tonnes⁴⁰ *per day* of food and beverages to support the population. Up to 150 kg⁴¹ of medical stores and pharmaceuticals *a day* is flown into the Pilbara for distribution to hospitals and health centres.



INBOUND FREIGHT: 4.5 MILLION TONNES
OUTBOUND FREIGHT: 1.4 MILLION TONNES

42



INBOUND FREIGHT: 307,000 TONNES
OUTBOUND FREIGHT: 335,000 TONNES

43



INBOUND FREIGHT: 1,280 TONNES
OUTBOUND FREIGHT: 220 TONNES

44



TOTAL INBOUND AND OUTBOUND FREIGHT: 6.54 MILLION TONNES

The freight figures shown in this report reflect a current operating environment for the Pilbara resources industry that is principally focussed on production compared to previous years where there were additional major construction projects such as GORGON and WHEATSTONE.

⁴⁰ AFD Industry contact, 2018 and Australian Health Survey: Nutrition First Results – Foods and Nutrients 2011-12. Australian Bureau of Statistics, 2014.

⁴¹ AFD industry contact, 2018.

⁴² AFD derivation from Main Roads WA road counts (2016-18) and consultation with Western Roads Federation (2018).

⁴³ PPA general cargo statistics, Port Hedland and Dampier, 2018

⁴⁴ AFD industry contact, 2018.

Freight into the Pilbara can be broadly categorised into:

- Freight required to support the townships and community;
- Freight required to support on-going industrial services, production and operations; and,
- Freight for construction and new projects.

Industrial consumables



This category covers a wide range of materials and goods used in resource production, conveyance, processing and export. It also includes materials used by the maintenance and services contractors on site. It covers the complete range of engineering, mechanical, hydraulic, electronic and electrical spares required for fixed plant and machinery or mobile equipment. For the oil and gas industry it includes barite, muds and drill pipe. For the mining industry it includes flocculant, mill ball and other grinding media. It will also include safety gear, paint, lifting gear, gaskets, fasteners, filters, bearing material, belts, greases and the complete range of products supplied by the specialised industrial suppliers. A large mining operation may have direct industrial consumables requirements of tens of thousands of tonnes per annum with additional thousands of tonnes utilised by its major contractors. At present, the great majority of industrial consumables are collected from Perth by road-haul. Some consumables originate from the east coast of Australia. Many products originate overseas: although purchased and supplied locally in Australia the products are imports.



Explosives

The mining industry in the Pilbara uses large amounts of explosives. Prior to 2016, all explosive materials were delivered from Perth. As the YARA TAN plant is now in production, a 70 to 30 per cent split has been assumed, with the larger part being delivered from CSBP at Kwinana. A freight task of 500,000 tonnes per annum engages around 500 trailers per week.

General Freight



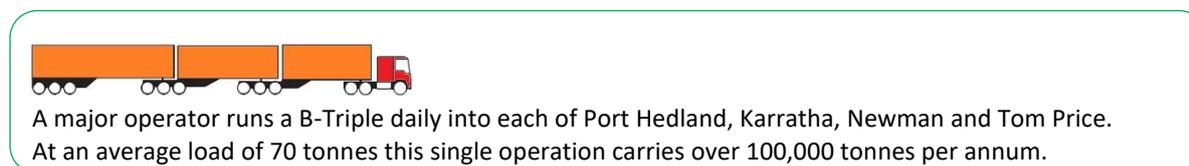
This is another very wide-ranging category of freight. It includes all freight delivered for the community and townships, light industry, service companies, utilities and government services. This category includes: freight for the transport industry; food for the mining camps, sites and offshore facilities; fuel and lubricant deliveries; building materials and equipment for both private and public works; fast moving consumer goods; cars; postal freight; supermarket and wholesale freight.

Food and beverages for the population is divided into two distribution streams: one supply network is for the retail outlets in the townships and the community, the other for the camp sites. Food for the townships has been derived using the average daily food and beverage consumption per head in

Australia of 3.1 kg.⁴⁵ Food and beverages for the camps is assessed at 5.5 kg per non-resident working person on the advice of hauliers. One forwarder suggested 7.5 kg per person applied at some camps including hospitality consumables - this figure was verified by a major resource producer. Assuming 3.1 kg per head for the resident population and 5.5 kg per head for the non-resident population, and using the population statistics in table 3, the total food and beverage freight task is at least 130,000 tonnes per annum. Food is collected from Perth, but some processed food originates in North Asia and enters the country via Melbourne.



In 2012, it was identified that about 1.2 million tonnes *per annum* of fast-moving consumer goods were distributed across Western Australia’s regions.⁴⁷ On a permanent resident per capita basis this would suggest equivalent freight in the Pilbara of 134,000 tonnes per year (using the 2012 trade level). AUSTRALIA POST and a large freight forwarder have confirmed growth in parcel freight as Pilbara residents use on-line purchases. Food supply and fast-moving consumer goods together constitute 265,000 tons per year of freight - this is equivalent to 283 trailers per week at an average of 18 tonnes. It is notable that a *single* large forwarder and operator despatches more than 500 trailers per week from Perth to the Pilbara. This operation alone handles more than 500,000 tonnes per annum in general freight.⁴⁸ Another large operator averages 1,200 pick-ups *a day* in Perth for the Pilbara – ranging from a satchel to 10 tonne equipment.⁴⁹



Mining equipment

This category forms the largest category by weight as it includes all the oversize and over mass equipment hauled between Perth and the Pilbara. This can include mobile equipment such as dumpsters, excavators and cranes as well as large components such as drill rig towers. New equipment is usually supplied through Perth where it is prepared by the manufacturers or suppliers’ local facilities and agents prior to road-haul. Used equipment is brought from the mine sites to Perth for

⁴⁵ Australian Health Survey: Nutrition First Results – Foods and Nutrients 2011-12. Australian Bureau of Statistics, 2014.

⁴⁶ AFD Industry contact, 2018 and Australian Health Survey: Nutrition First Results – Foods and Nutrients 2011-12. Australian Bureau of Statistics, 2014.

⁴⁷ Department of Transport & Hyder Consulting Ltd, 2011. Summary of Stakeholder and Industry Perspectives, Western Australia Regional Freight Transport Network Plan.

⁴⁸ AFD industry contact, 2018.

⁴⁹ AFD industry contact, 2018.

maintenance and return, or for shipment overseas. The major equipment suppliers have major maintenance or re-manufacturing services in the Perth metropolitan area.

A major haulier advised that they moved 4 dumpsters a week from the Pilbara to Perth for maintenance *and return*. A CAT 793 dumpster has a tare weight of 163 tonnes, so the contractor’s movements alone amount to nearly 68,000 tonnes a year. Crane supplier, Monadelphous, advised that the mobilisation of a 750 gross tonnes crawler crane requires seven 50 tonne floats plus sixty 12 metre trailers.⁵⁰



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Project and construction freight

This category covers any freight, small or large, that is brought into the region for new projects, expansions and related construction. It may include modular and pre-assembled sections of large size. It may also include temporary accommodation, machinery and even smaller freight and consumables that is to the account of the project. The contemporary figure for this freight is more subdued than in the years of major construction, especially in oil and gas projects, where estimates reached 1.4 million tonnes per annum or more. Planned projects, such as BHP Billiton’s South Flank mine development in the central Pilbara,⁵³ will provide a boost to project and construction freight volumes over the coming years.

Categories of Pilbara freight movements in mass tonnes				
Category	Total freight	Ratio ¹	Inbound freight	Outbound freight
Industrial consumables	700,000	0.09	700,000	-
General freight	700,000	0.09	500,000	200,000
Explosives	500,000	0.06	500,000	-
Mining equipment	3,750,000	0.05	2,550,000	1,200,000
Project & construction freight	750,000	0.09	550,000	200,000
Recyclables	100,000	0.01	-	100,000
	6,500,000	0.90	4,800,000	1,700,000

¹ Each category is compared to the 2018 combined oil and gas and *iron ore* production figures of 810 million ⁵⁴tonnes.

Table 12: Freight movements in mass tonnes⁵⁵

⁵⁰ Monadelphous, 2018.

⁵¹ AFD industry contact, 2018.

⁵² Liebherr website, 2018

⁵³ BHP makes ‘biggest investment of decade’, The West Australian, 15 June 2018.

⁵⁴ WA Department of Mines, Industry, Regulation and Safety, Statistics Digest, 2017-18.

⁵⁵ AFD industry contact, 2018.



PILBARA FUEL

3 BILLION LITRES PER ANNUM

1.54 BILLION LITRES IMPORTED TO PORT HEDLAND

0.82 BILLION LITRES IMPORTED TO DAMPIER

56



PILBARA FUEL

A triple road train averages 80.0 litres of fuel per 100km

1.28 tonnes of fuel: Perth to Karratha

190,000 tonnes of fuel a year to deliver Pilbara freight

57



EXPLOSIVES

700,000 TONNES OF MATERIALS PER ANNUM

500,000 TONNES TRANSPORTED FROM FREMANTLE BY ROAD.

58

8.1 Freight statistics derivation

Use of mass tonnes

In this report, the freight task is described in mass tonnes. The actual practice of measuring revenue freight is by using *revenue (freight) tons*. Revenue or freight tons is a revenue *charge structure* applied on freight mass or volume whichever is the greater. Sometimes, (as applied in the road haulage industry for general freight or in the marine industry for large oversize cargo), the application of a divisor (such as a factor of 3) applied to cargo that is more volumetric than heavy. The determination of the relative proportions of volume freight or mass tonnes freight in a trade can be most useful for understanding the charging mechanism, transport revenues and mode utilisation among other points. As not all data provided by the market, however, has been on a revenue ton basis this report has reduced all reference to freight in terms of *mass tonnes*.

The term volume is expressly used in this report in its strict meaning of cubic measurement.

Trailer weight estimates



Consultation with industry has revealed widely ranging data on trailer weights and container weights. Some trailers will be consolidated with cargoes, such as steel product, and achieve the trailer limit of

⁵⁶ The West Australian, "PLUTO LNG to be trucked to Pilbara mines", 02 February 2017 and PPA freight statistics, 2018.

⁵⁷ Australian Bureau of Statistics, Survey of Motor Vehicle Use, March 2017, and, AFD derivation assuming 1600 km road haul and 4.5 million tonnes using double trailers at 12 tonnes each.

⁵⁸ AFD market contact, 2018.

22 tonnes. Other trailers might be loaded with modular buildings and not exceed 7 tonnes per trailer. The use of the highway system to transport very large machinery means individual road haul of high mass weight. Supply freight for the oil and gas industry, aside from muds, may consistently use 10 - 12 tonnes of the trailer capacity and be more volumetric.

To determine a mean weight for freight task assessment the report has selected 12 tonnes per standard road trailer. A weight of 12 tonnes allows for a balance between the more volumetric freight and the heavy mass freight.

In AFD experience, the *average* TEU container weight in regional liner shipping trades carrying the a very wide range of general merchandise imports is about 12 tonnes.

Use of road count data

The use of road counts provides highly detailed and accurate data on which to base freight derivations. The source locations of the road count instruments have been carefully chosen to cover the main highway access points into the region and to avoid areas where there are routine intra-region movements of heavy vehicles, especially ore haulage.

AFD consultation with some of the largest hauliers to the Pilbara and the Western Roads Federation, determined the use of two standard road trailers as an average truck configuration for each road count statistic used by AFD for its derivation. (Some of the major hauliers advised AFD that they do only operate triple trailer consists).

Data comparison

The results of the AFD road count-based derivation, together with the PPA marine freight statistics, were compared to freight statistics provided by some of the Pilbara's largest producers and contractors. In determining separate categories of freight, a comparison was made to the ratios by HYDER consulting in 2012.⁵⁹

Use of TEU equivalents

The reference to TEU equivalents is a mathematical approach to break-bulk freight assessment that assists comprehension of the freight task by reducing the overall cubic measurements into numbers of TEU containers. The use of freight tons does not mean that the break-bulk cargo is physically packed into containers.

This report has been privileged in the confidential data support provided by some of the largest resource producers and exporters in the Pilbara. This has allowed an assessment of the ratio of freight inputs to production outputs.

Treatment of fuel movements

Fuel for the Pilbara is predominantly imported through Port Hedland and Dampier from Singapore. The statistics for fuel importation are provided in this report but the imports, being fuel in bulk

⁵⁹ Northwest Bound Freight Movements: a consultancy to identify the potential for a partial shipping solution, HYDER Consulting, 2012. Freight and Logistics council of WA.

volume, are not classified as freight. Fuel that is brought into the Pilbara by road haulage is included in the general freight figures.

Treatment of explosives

Based on a demand for explosives of 700,000 tonnes per annum a 70:30 split between Kwinana supply and Pilbara supply has been assumed with the road-haul task being 500,000 tonnes into the Pilbara.

Treatment of scrap and recycling materials

Scrap metal and other recyclables is treated as part of general freight.



The marine freight statistics are taken directly from the Pilbara Port Authority statistics database for the Ports of Port Hedland and Dampier provided courtesy of its website. The statistics are provided by the Port Authority in tonnes. It is assumed the figures are mass tonnes and not freight tons (which would include consideration of volume as well as weight). The statistics include intra-national and intra-region movements, particularly at Dampier where a considerable amount of inbound and outbound freight movement recorded is between the port and offshore installations in coastal waters. Dampier and Port Hedland are the ports that handle virtually all marine general cargo in the Pilbara.



Air freight statistics are not available for the major Pilbara airports and the air freight data is derived directly from extensive industry consultation including with forwarders, logistics companies, scheduled carriers and air charterers. Several major resource producers and exporters provided detailed information on their annual air freight task. Derivations were also made using publicly available reports on the Australian air freight industry.



The derivation of the road-haul freight task is based on formal road traffic count data recorded at key points on the Northwest Coastal Highway and the Great Northern Highway. The road traffic count data as a database is extensive and highly accurate. Heavy vehicles are recorded not by weight but by measurement between the axles. For details see section on Methodology in this report.



The rail-haul freight task is based on detailed publicly available statistics and reports as well as extensive consultation with major forwarders and users of intermodal services.

Current State
Sea freight statistics
Road freight derivation

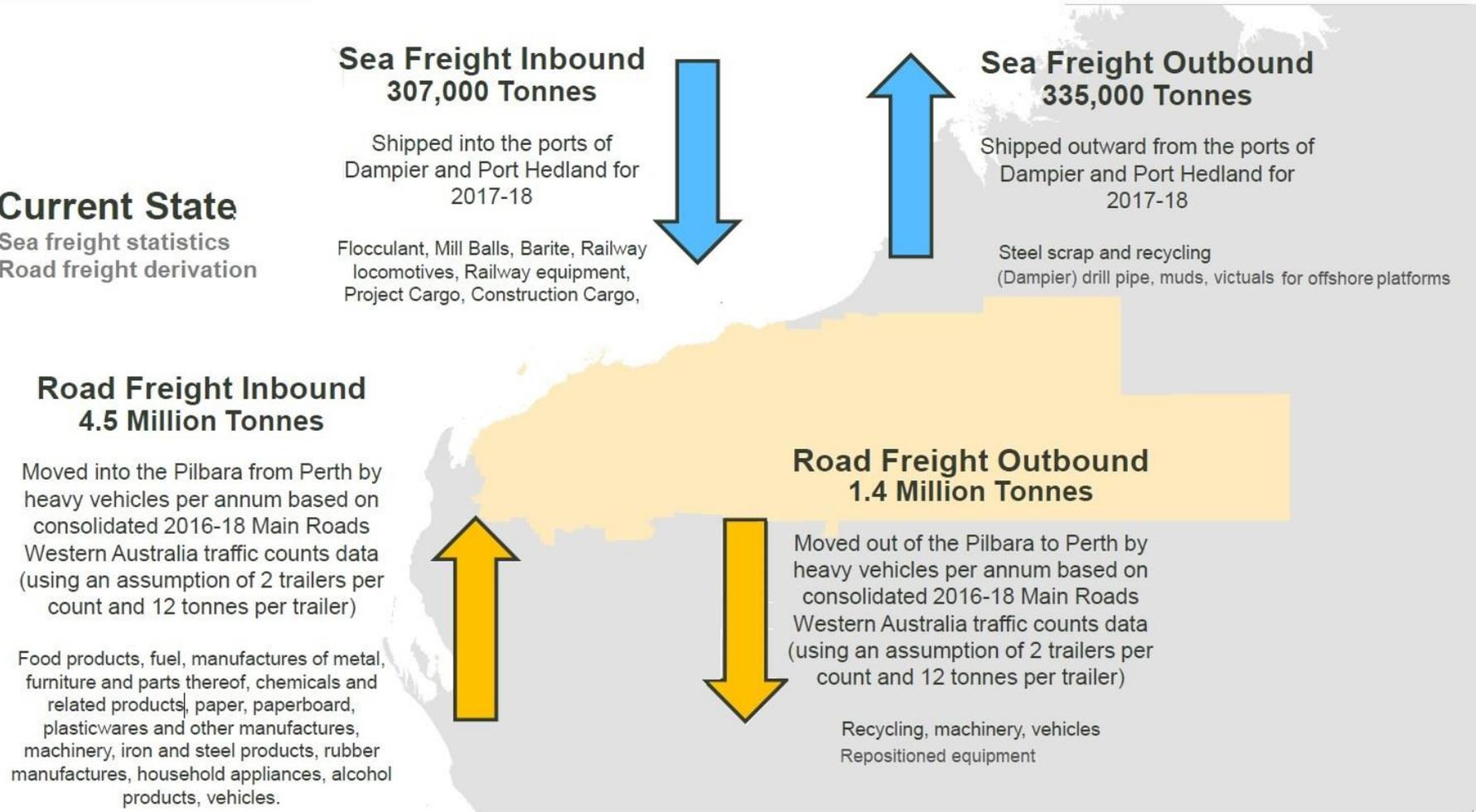


Figure 7: Pilbara road and sea freight movements

⁶⁰ AFD derivation from Main Roads WA (2018), Western Roads Federation (2018) plus reference to PPA port general cargo statistics (2018).

9.0 Pilbara Freight Logistics

9.1 Background

From a freight perspective, the Pilbara has been developed primarily using a land-based supply network based around Perth and the Port of Fremantle. The supply chains also extend from Perth to the east coast as well as overseas by air and sea logistics networks. Perth, with its communication links, services and industry has been the key base for the development of Western Australia and the Pilbara. When large-scale resource development commenced in the 1960s, the remoteness of the Pilbara region, its sparse population and the absence of transport infrastructure inevitably emphasised the importance of Perth for freight logistics despite its great distance. The small, dispersed coastal communities in the northwest at the time relied on the State shipping service, unsealed highways and limited air services for communications. As the resource industry developed, so did a focus on sealing the two major highways servicing the Pilbara and the highly capable road-haulage industry emerged as a critical link for freight supply to industry. The State shipping service, with its four-week sailing schedule, could not compete with truck haulage transit times of a day or two and availability at short notice.⁶¹ Improvements in aviation facilities and services progressively allowed large workforces to be employed on rosters for construction and operations. The airliner operations allowed regular shipments of more time critical parcel freight.

The high cost and logistics considerations of establishing industrial services and supply in a region that, at the time had limited services, was always a consideration for the industrial resource producers and their suppliers. The efficiency of the road-haulage network, however, allowed key inventory, maintenance and freight consolidation facilities to remain in Perth and develop in line with the expansion of production in the Pilbara. The development of comparatively small forward inventory points, such as the supply base lots at King Bay for the oil and gas industry, enabled critical supply chains to be maintained with the back-stop of 'hot shot' truck operations and, if necessary, air freight.

The reliance on Perth for industrial supply and freight consolidation has been further driven by the procurement practices of the industrial resource producers that outsource inventory services, maintenance and related logistics to key suppliers. A focus on costs, quality and reliability of service has meant Perth, with its large population, connectivity and industrial base has remained an attractive place from which to support the Pilbara.

The evolution of Pilbara freight logistics might have been quite different if the development of the ports in the Pilbara had included investment in an appropriate scale of multi-user, inwards general cargo infrastructure. Such infrastructure would have developed options for a much greater use of both coastal shipping and overseas shipping freight supply chains. The establishment of the spectacular export infrastructure now seen at Port Hedland and Dampier was mostly carried out by the industrial resource exporters. The focus was on building commodity export capacity and not on direct import

⁶¹ Northwest inbound freight movements: a consultancy to identify the potential for a partial shipping solution, Freight and Logistics Council of Western Australia, June 2012.

sea-freight capacity. Port Hedland was slightly more fortunate having two general cargo berths inherited from BHP port operation days, but Dampier has only had the small Dampier Cargo Wharf originally designed as a temporary project wharf for WOODSIDE's original oil and gas developments and subsequently passed onto the State. As the two leading ports in the Pilbara, neither, port could cope with the operations congestion that occurred over these facilities in the last resource boom: Dampier particularly had a conflict with the competing mixed use of the Dampier Cargo Wharf by both the oil and gas industry as well as general cargo shippers. Issues such as congestion at these ports only reinforced the importance of Perth as a supply base and its highly developed land-haul links.

The large-scale procurement of manufactured items and consumables from overseas, particularly from Asian sources, is a feature of the modern Australian economy. The export of Pilbara commodities is a highly specialised and managed process to ensure that sea transport takes the shortest, most practicable route to the buyer. For imported freight, however, the cargo must first enter Australia on the East Coast or through Perth and the Port of Fremantle: a physical detour of many thousands of kilometres compared to the alternative option of direct entry to the Pilbara.

Offshore oil and gas exploration rigs and production platforms require spares, stores, fuel and victuals. These items are inventoried and supplied at land-side bases or port bases known in the industry as supply bases. The use of supply bases is not just the use of physical sites but a *function* in the oil and gas supply chain. The supply base function supporting contemporary oil and gas industry in the northwest of Australia utilises forward supply bases in the Pilbara, particularly at King Bay and Gap Ridge in Dampier, the Perth metropolitan area and even overseas. King Bay has the principal marine supply base facilities in the Northwest of Australia operated by WOODSIDE and TOLL. There are new facilities at Beadon Creek, Onslow, operated by AGILITY LOGISTICS and Ashburton has a new multi-user facility available for small cargo ships. The freight to supply the offshore platforms is specialised. It consists of much pipe and tubular cargo. For technical reasons, the industry does not use TEU containers to transfer freight to the rigs but has its own standard of smaller containers and cargo equipment. This freight is carried offshore by specialist vessels that are expensive to operate and charter.

9.2 Modes and networks

The freight task in and out of the Pilbara is predominantly carried by the extensive road-haul network based out of Perth. This network has been the principal freight supply system for the Pilbara since the development of large-scale industrial operations in the 1960s. As the scale of the resource export industry has grown and the highway network improved so the haulage industry has developed with hundreds of road trailers being despatched from Perth by single large operators each week. The haulage of freight into a region such as the Pilbara entails a diverse range of trailer equipment and capability ranging from refrigerated goods, bulk liquids, (the complete range of) general freight, vehicles, machines, prefabricated structures and very large oversize freight.

Compared to the highly integrated marine export supply chains of commodities, the use of maritime services for international freight imports into the Pilbara is modest. Freight is ordinarily brought to the Pilbara through the ports of Port Hedland and Dampier. It is carried by chartered general cargo vessels

typically arranged on a short-term or voyage charter basis. The usual charterers are the large industrial corporations or their agents.

Air freight forms a niche but critical service for the Pilbara community and industry. The air freight network is predominantly reliant on scheduled airline services where freight is incidentally carried as part of the main passenger service task. The network is based at Perth and to some extent the East Coast where the major airports such as Sydney are principal points of import for air freight that cannot be brought to Perth on scheduled services. Perth is also the principal base for air-freight charter options with other direct charter support available from Broome, Darwin and Singapore. Considerable air freight is transferred to trucks at Perth for road-haul into the Pilbara.

The Pilbara is the site of some of the world's largest industrial railways, each privately owned and operated as part of the commodity export infrastructure. The Pilbara is not linked by rail infrastructure to the national freight rail network but rather through long-distance road-haul to Perth and its inter-modal terminals. This road-rail connection provides an important link to East Coast suppliers.

9.3 The role of Perth

Perth, the fourth biggest city in Australia, has been the principal communications and logistics hub for the State of Western Australia throughout the state's development. Perth has nearly 80 per cent⁶² of the State's population. Perth has the fourth busiest airport in Australia⁶³ measured by passenger numbers, Port of Fremantle is the nation's fourth busiest⁶⁴ and the city is linked to the east coast by the trans-Australian standard gauge railway.

Prior to the development of the Pilbara, Perth had the heaviest concentration of industry in the State. As the population of the city has grown so has the size and capability of the service industry, including in industrial services. The development of mining in Western Australia has occurred in all regions of the State. As the scale of the resource production and export industry has grown so has the interdependence with Perth-based service industry.



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Figure 8: Heavy equipment is transported to Perth for major maintenance

⁶² Australian Bureau of Statistics, Regional Population Growth 2016-17, April 2018.

⁶³ The Busiest Airports of Australia, World Atlas, August 2017.

⁶⁴ Fremantle Shipping News, September 20, 2018.

⁶⁵ Courtesy of Regal Transport

The particularly extensive mining development of the Goldfields and the Pilbara, as well as the extensive oil and gas operations of the Northwest Shelf, stimulated many different services based in the metropolitan area including intermodal transport, maintenance services, parts suppliers, inventory management, specialist engineering services and a vast range of other firms and capabilities needed to support the remote industrial supply chains. Major international supplier firms to the mining industry such as HITACHI have re-manufacturing plants in Perth - in the case of HITACHI, a \$100 million investment in Armadale.⁶⁶

The population of Western Australia is noticeable for its decrease north of Meekatharra. Labour becomes scarce and relatively expensive in the distant regions: for industrial projects labour has had to be flown in. Perth, on the other hand, has continued to be the principal logistics and service base for much activity in the State. Connected by an excellent road-haul network the big industry in the regions has been able to rely on and develop off the key service industry and international transport connections that Perth offers.

9.4 The role of the Port of Fremantle

The Port of Fremantle is Australia's fourth largest container port and since its inception has been the primary gateway for general cargo in and out of Western Australia. The Port of Fremantle is the only port in Western Australia with the facilities for truly mass volume container handling and consolidation. The Port also handles the great majority of vehicle imports into the State as well as general cargo trades.

The Port is connected by rail to the standard gauge trans-national railway and by main roads to key logistics terminals and cargo consolidation areas in the Perth metropolitan area.

The Port of Fremantle has extensive infrastructure for handling a great range of cargoes including cruise operations, bulk commodities, petroleum, gas and livestock.

Fremantle is a port of call for major liner shipping companies with route connections to Singapore, Jakarta and Port Klang and through the Australian east coast main ports to Oceania and the global liner shipping network.

Liner companies that service Fremantle⁶⁷ include:

- MSC;
- MAERSK;
- CMA-CGM (ANL);
- OCEAN NETWORK EXPRESS (ONE) which includes NYK Line, K Line and MITSUI OSK;
- OOCL;
- APL/NOL;
- WALLENIIUS WILHELMSSEN

⁶⁶ Mining Monthly, 08 December 2016.

⁶⁷ Sturrock Grindrod, 2018.

The development of the Port of Fremantle has been critical to the development of Perth and much of the rest of the State, including the Pilbara. For the Pilbara resource industry, whether mining or oil and gas, the Port of Fremantle and its general cargo services provide critical access to international supply chains for merchandise imports and construction and project freight. At the time of this report, there are no liner services or shipping options in the Pilbara that can provide anywhere the reliability, scale or connections that are available for general freight at Fremantle.

The Port of Fremantle is also the site of key marine facilities such that support the local fabrication of modular cargo and the consolidation of large project cargo. The Australian Marine Complex at Henderson enables the loading of large pre-fabricated modules.⁶⁸

There is a cluster of specialist fabrication and support services companies for oil and gas at Henderson and industrial estates at nearby Bibra Lake and Jandakot. The WHEATSTONE project at Barrow Island off the Pilbara coast and at Ashburton undertook extensive barging operations from both the Australian Marine Complex Common User facility and the Inner Harbour to support construction.

The categories of containerised merchandise imports into the Port of Fremantle reveal the types of goods that are distributed into Western Australia including the townships and industry of the Pilbara.

Port of Fremantle - major commodities ⁶⁹ imported by container: 2017-18	
Commodities	Containers - TEUs
Manufactures of Metal	31,020
Furniture and Parts Thereof	27,978
Chemicals and related products	24,827
Paper, paperboard	21,897
Plastic wares and other manufactures	21,334
Machinery	18,872
Iron and steel products	18,279
Rubber manufactures	18,000
Household appliances	16,063
Alcohol products	13,653
Total	211,923
Percentage of Total Full TEU imports	57.6%

Table 13: Port of Fremantle - major imports by container: 2017-18

10.0 Road freight logistics

10.1 Background

The road haulage industry in Western Australia has been fundamental to the development of the resource industry and the townships of the Pilbara. Road haul is the only practicable transport system for freight distribution across the Pilbara region, whether it is local cartage from the ports and within the townships, haulage within the Pilbara or long-distance haulage from Perth, Darwin or the Australian east coast. The road haulage industry has a highly developed capability for moving oversize

⁶⁸ Australian Marine Complex website, 2018.

⁶⁹ FPA annual report, 2018.

freight such as mining dumpsters and modules for construction. Road haulage from Perth to support the townships and regional sites of the Pilbara offers an overnight service that is efficient enough to compete with regional air freight and was more than competitive with the former coastal shipping service. Road haulage, whether through scheduled runs or the ad hoc 'hot shot' services can provide a high level of delivery required by industry.



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Figure 9: Heavy haulage between Perth and the Pilbara

The principal operators for road haulage of general freight dealing in large volumes into the Pilbara include:

- CENTURION TRANSPORT;
- TOLL;
- REGAL TRANSPORT;
- LINFOX

Other operators include:

- SHAWS Transport;
- SADLEIRS

These principal operators, or forwarders that use the service, have their own major freight consolidation facilities in the Perth metropolitan area in locations such as Hazelmere, Forrestfield, Welshpool and Kewdale. These sites are located close to both Perth airport and the trans-national railway.

Each of these operators will work intermodal freight with the trans-national rail. There is some domestic export of scrap metal from the Pilbara to Adelaide using bins suitable for both road trailer and rail carriage.

As occurs elsewhere in the Australian road haulage industry, there are smaller operators in the market: some of these are locally based in the Pilbara townships such as Karratha.

The long haulage from Perth or Darwin into the Pilbara makes economies of scale in trailer configuration and the efficient loading of trailers essential. In general, scheduled haulage will consist

⁷⁰ Courtesy of Regal Transport

of at least two standard 12-metre trailers. Many carriers operate triple road trains. Project freight, such as heavy machinery or modular buildings, is hauled using a variety of specialised trailers.

The schedule and reliability of the road haulage system into the Pilbara is critical to maintain all aspects of industry and community. Road haul is elemental to key industrial supply chains and is the mode used for virtually any and all types of freight, including project freight, brought into the region. A major haulage operator with a specialist haulage capability advised that a large part of their freight task was cycling heavy mining machinery between the Pilbara and Perth for maintenance.

Road haulage will remain as the core freight transport mode for the Pilbara and long-distance haulage services from Perth will continue to be critical to support the Pilbara industry and townships. The development of direct sea freight services into ports such as Port Hedland or Dampier will increase the requirement for road freight services to and from those ports to the Pilbara region. This will involve substantial haulage tasks but over shorter distances of up to 500 km.

10.2 Road network

Principal access to the Pilbara is provided by the Northwest Coastal Highway providing sealed road access to all the principal ports of the Pilbara and the Great Northern Highway that passes through the hinterland towns of Newman and Tom Price and then onto Port Hedland and the Kimberley. Both highway systems require ongoing upgrade however the roads reliably support a very large number of heavy truck movements including specialist heavy haulage. There are occasional disruptions by temporary flooding and bushfires and, as for the rest of life in the Pilbara, there is the seasonal impact of cyclones. TOLL is a key carrier of food for camp caterers COMPASS and SODEXO. CENTURION is a key carrier for COLES and WOOLWORTH. The ABS statistics suggest 3.1 kg per day in Australia as the per capita average food and beverage consumption for each person over 2 years of age.⁷¹ A major supplier to camps suggest the consumption rate of food and beverages is from 5.5 kg per day to up to 7.5 kg per day.

10.3 Freight-haul Perth to the Pilbara



11.0 Rail freight logistics

⁷¹ Australian Bureau of Statistics, Australian Health Survey, Nutrition First Results – Foods and Nutrients, 2011-12 (2014)

⁷² AFD market contact, Perth, 2018.

11.1 Background

The standard gauge trans-national railway system forms part of the inter-modal land-bridge logistics system supporting the Pilbara.

The standard gauge network provides critical land-bridge freight connections for Western Australia to the main ports and cities of the east coast of mainland Australia via the road haulage/rail intermodal terminals at Forrestfield and Kewdale in metropolitan Perth.

The freight system is highly developed with US-style double-stacked container trains operating to Perth west of Parkes in NSW and from Adelaide. The intermodal services include refrigerated cargo.

The standard gauge network terminates at Perth: from Forrestfield there is a 28 km extension to the Port of Fremantle North Quay Rail Terminal. Key commodities transported by rail from the East Coast include processed foods and steel products from Newcastle, Port Kembla and Melbourne.⁷³



In 2016-17, Forrestfield in metropolitan Perth handled 31.0 million gross tonnes of freight on the standard gauge line in both directions, of which 9.94 million gross tonnes was classed intermodal.⁷⁵

In 2018, there were 22 return weekly intermodal services between Perth and the East Coast – on average 3 services per day inbound to Perth.

Trans-national railway transit times ⁷⁶					
Between intermodal terminals		Standard service		Fast premium	
	Distance	Transit time	Average speed	Transit time	Average speed
Sector: Perth to -	Kilometres	Hours	km/h	hours	km/h
Adelaide	2,637	39.4	67	-	-
Melbourne	3,468	55.8	62	46.9	83
Sydney	4,137	66.3	62	53.1	82

Note: Average speeds include dwell time

Table 14: East/West Intermodal corridor railway transit times

Rail access to the east coast ports supports supply chains from East Asia and North Asia. The freight rates and service schedule on the trans-national railway from Melbourne or Sydney to Perth are

⁷³ AFD market contact (2018). Trainline 6 Statistical Report (BITRE 2018).

⁷⁴ AFD market contact (2018). Trainline 6 Statistical Report (BITRE 2018).

⁷⁵ Trainline 6 Statistical Report (BITRE 2018).

⁷⁶ Trainline 6 Statistical Report (BITRE 2018).

therefore relevant to the cost of freight for some merchandise imports into the Pilbara and for an assessment of the alternative direct service from Asia.

Rail freight transport is competitive with road haulage over long distance.



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Figure 10: Trans-Australia railway indicative freight rates per TEU 2018

In addition to access to the trans-national railway, multi-user rail access in Western Australia is provided by the Western Australian freight rail network. This consists of the narrow-gauge network formerly operated by the WAGR. This track network extends as far as the Mid-West and is primarily used for moving grain, coal, iron ore, nickel and nickel products in the mid-west and southwest areas of the State. The furthest north the railway system is to Geraldton and its hinterland.

The Pilbara is the home of some of the world’s largest industrial railway systems. These railways consist of privately developed and operated infrastructure under the separate control of the major iron ore export operations: RIO TINTO, BHP BILLITON, FMG, ROY HILL and the proposed BBI GROUP operation. These ore carriage railways are highly specialised, bespoke engineering systems quite distinct from the rest of the national railway networks. The ore railways are used in some cases to distribute fuel to the mines they service.

⁷⁷ AFD market contact, Perth 2018.

11.2 The Trans-Australian railway connection

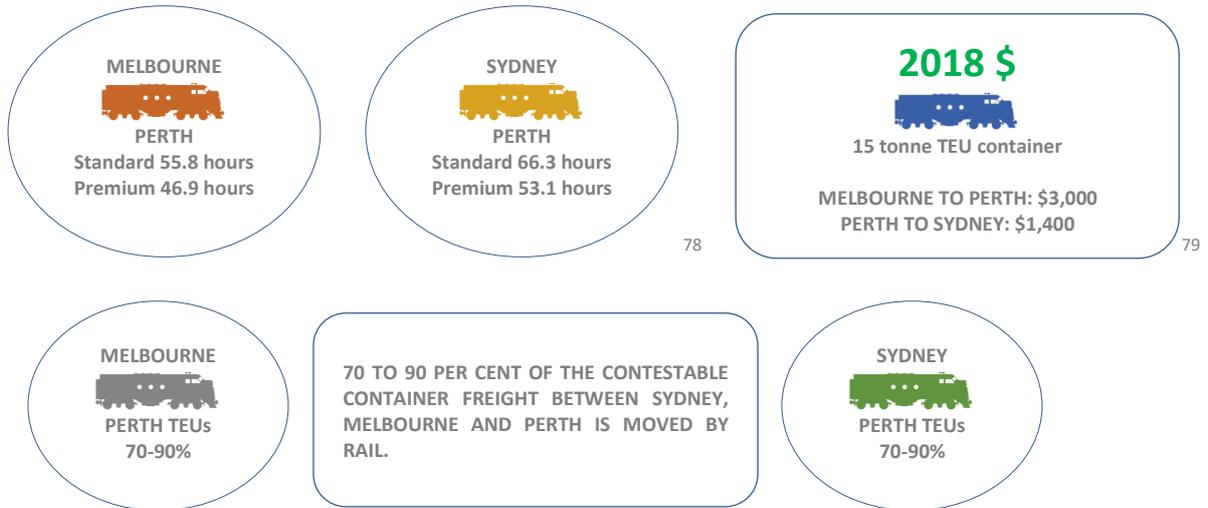


Figure 11: Double container stacking capability on the Trans-Australian freight rail network⁸⁰

⁷⁸ Trainline 6 Statistical Report (BITRE 2018). AFD market contact, 2018.

⁷⁹ AFD market contact, 2018.

⁸⁰ Trainline 6 Statistical Report (BITRE 2018). AFD market contact, 2018.

12.0 Sea freight logistics

12.1 Background

The routine movement of freight by sea in and out of the Pilbara is limited. This is notable for the logistics of a region that is so close to both key Asian supply markets and Asia's trans-shipment links to the globe.

A true liner shipping freight service operates strictly to a published schedule. International container shipping lines are examples of these operations. Schedule slippage for the leading operators is minimal: shipping schedules are published months in advance as reliable notice for customers. The leading liner shipping services make possible the worldwide industrial supply chains that distribute the vast range of goods required by the global community. There are no true liner shipping freight services operating into the ports of the Pilbara. There have never been true liner shipping freight services operating into the ports of the Pilbara on international service. There have occasionally been regular services, however these have not been able to operate as a true liner services and maintain their schedule. For example, services to the Northwest also calling at Christmas Island could experience extensive disruption to the schedule of days or weeks if heavy swell conditions prevented cargo exchange at Christmas Island.

In contrast, Darwin has been connected to Singapore by reliable, direct liner freight services since the 1970s. The key Far North Queensland ports also have long established direct liner shipping freight services to Asia and Oceania. The Australian urban main ports all have multiple liner shipping freight services direct to the global liner shipping network.

Freight (or as commonly referred to in shipping as general cargo) is brought into both Port Hedland and Dampier through inducement calls and voyage charters primarily for the major resource producers. For example, RIO TINTO will import into Dampier railway locomotives, ore wagons and track equipment. These shipments are all part of ad hoc charters or inducement calls and not as part of a scheduled, on-going general freight operation. Similarly, there are backloads or outgoing occasional shipments of steel scrap. These are consignment loads arranged with buyers such as in Vietnam and through ad hoc voyage or time charters. Flocculant and mill ball are brought into Dampier for CITIC PACIFIC magnetite producing operations at Cape Preston.⁸¹

Shipowners that provide ships for these occasional charters to the Pilbara include:

- SPLIETHOFF;
- ASC GROUP;
- THORCO SHIPPING;
- AAL;
- BBC CHARTERING.

⁸¹ AFD market contact, Pilbara, 2018.

As a business model, these companies specialise in chartering out bespoke-design MPP-type general cargo ships that can carry a range of break-bulk cargoes, including large project freight, as well as general containers.

12.2 Ports

The development of modern ports in the Pilbara has been driven by the resource production and export industry, be it mining or oil and gas. The industry has funded and created most of the port infrastructure, including entire new ports, to provide access for the marine export of commodities. The ports of the Pilbara are industrial ports, derived from the demand to export, and each port facilitates mining or resource production in the port hinterland and in some cases offshore oil and gas developments in the exclusive economic zone.

The ports or major independent private port complexes of the Pilbara are:

- Barrow Island
- Ashburton;
- Onslow;
- Cape Preston;
- Dampier;
- Port Walcott (Cape Lambert);
- Port Hedland.

The resource production and export industry has spent vast sums on export facilities in the Pilbara ports including stockyards and connecting railways or pipeline infrastructure. The result has been some of the largest dry bulk export ports in the world and some of the largest LNG processing and export hubs. The export infrastructure in ports such as Port Hedland, Dampier, Cape Lambert and Ashburton is profit-driven. These facilities enable tens of millions of tonnes of shipments per annum - in the case of iron ore the figures are hundreds of millions of tonnes. Port operations, such as at Port Hedland, use the latest in technology and research to optimise vessel sailings and support the massive export task.

The development of each of the ports in the capital cities of Australia, including Perth, had their origins in the original colonial settlements and then subsequent developments of population centres, agriculture, the pastoral industry and mining. Each port became the key communication point for a wide and expanding region. This communication role included facilitating the import of supplies and the export of produce. In time, each of the capital city mainland ports developed as major general cargo ports and, with containerisation, as major container ports. The progressive development of these ports had, and has, as a focus the facilitation of *both* inwards as well as outbound freight. 'Over decades, with the decline in domestic manufacturing, Australia's capital city ports have become the cheapest way to import goods directly to where the *majority* of Australians live'.⁸²

In contrast, the development of the Pilbara ports has been almost entirely focussed on the export of commodities. Aside from Port Hedland (which was progressively developed by BHP in the twentieth

⁸² Inquiry into National Freight and Supply Chain Priorities – March 2018

century), much of the present development of the Pilbara ports was not commenced until the 1960s or later. This was in a region with a tiny population and with small-scale, self-contained industries. There was a minimal general cargo task in the region that principally relied on the communications link provided by the former State Shipping Service.

The development of the new port infrastructure by private industry included the construction of limited project berth facilities, loading docks and ramps to facilitate the construction of mines, processing plants, railheads, tank farms and wharves. The Heavy Load Out berth at Dampier and the Dampier Cargo Wharf, for example, were both constructed by WOODSIDE and its partners as *temporary facilities* for the construction works of the LNG processing plant and export wharf infrastructure.

Port Hedland was the principal township and communications centre for the Pilbara and received routine freight calls by the State Shipping Service. The port was developed with three conventional general cargo berths for smaller cargo ships. Dampier, however, had no common user berths for general cargo until the Dampier Cargo Wharf was transferred to the State. This *temporary* structure is still in use today - forty years later - as a principal general cargo facility for the region.

Since the development of port infrastructure has in each case been bespoke to the requirements of the project it was built to support there is little option for adaptation to handle general freight. For example, the development of the Parker Point and East Intercourse Island iron ore export facilities by Hammersley Iron at Dampier has a rail head, conveyors, stockpiles and wharves specifically established for the commodity export. It is an area restricted to the public and unsuitable for general cargo operations. It is a similar case for the LNG exporting facilities that are restricted sites designed purely for the processing and export of oil and gas. Marine solar salt exporting facilities operate on a much smaller scale to the ore exporters with facilities and wharf infrastructure designs that are bespoke to their business.



From the 1970s the development of the oil and gas industry selected Dampier as a convenient hub to support operations on the Northwest Shelf. This created a new freight supply chain taking stores and spares from the support bases, known as supply bases, out to the offshore platforms. Marine supply bases were constructed at King Bay in Dampier to facilitate this support. These are specialised, private facilities providing services to offshore operations and are not suitable for multi-user, general cargo import/export liner operations using larger ships. At Dampier, oil and gas freight moves through the supply bases but also over the Dampier Cargo Wharf. New supply base capability has been established at Beadon Creek, Onslow and Ashburton has a new multi-user berth suitable for small general cargo ships. Dampier and the support facilities at Karratha remain however the principal support base in the northwest.

12.21 Barrow Island

Barrow Island forms a part of the giant GORGON LNG project with an LNG plant on the island. Crude oil is also exported via tankers on buoyed moorings. It is a private port facility and has a regular domestic freight exchange by landing craft with Dampier as a supply base hub and with recent

developments at Beadon Creek, the option of the Port of Onslow. Freight includes machinery, food, industrial consumables, fuels, spares and provisions into the island and used equipment and rubbish removal as return freight. During the construction of the LNG plant, a tug and barge service operated a scheduled service for several years from Fremantle for logistics support.

12.22 Ashburton

The WHEATSTONE LNG project near Onslow is the site of one of the world's largest on-shore LNG processing plants. The new Port of Ashburton, located 12 km southwest of Onslow, has an export facility for LNG carriers as well as a tug base and a sheltered common-user berth. Combined the LNG facilities at Barrow Island and Ashburton form the largest LNG production and export facility in the world. Since the end of construction there have been no cargo exchanges of general freight of any significant quantity recorded at the Port of Ashburton.⁸³

12.23 Onslow

The Port of Onslow is located about 300 km southwest of the Port of Dampier. It has a single salt export berth established for the solar marine salt export facility close to the town. The berth is a specialised conveyor supporting structure and not suitable for handling general freight. At Beadon Creek, a local Onslow waterway, the first stage of the Onslow Marine Support Base is operating. According to operator AGILITY LOGISTICS the facility is offered as an alternative supply base to Dampier for oil and gas industry logistics servicing the North Carnarvon Basin.⁸⁴

12.24 Cape Preston

CITIC PACIFIC has developed a private port facility at Cape Preston 60 km southwest of Dampier for the export of magnetite from its SINO IRON Project. The Project is the largest magnetite mining and processing operation in Australia.⁸⁵ Export operations use trans-shipper barges: there is no developed infrastructure for on-going marine freight operations. Consumables are brought into the operation via Port Hedland, Dampier or Perth.

12.25 Dampier

The port and township of Dampier was established in the mid-1960s to provide a marine export facility for iron ore from a connecting ore-haul railway to Tom Price and Paraburdoo. In the 1970s, the progressive development of the Northwest Shelf saw the establishment of LNG processing and export facilities on the Burrup Peninsular and oil and gas supply bases and function at King Bay.

Dampier has a unique role in northwest Australia and the Australian economy. Dampier is:

- The world's second largest bulk export port;⁸⁶
- A leading LNG, oil and gas products export port;
- A regional oil and gas supply base hub;

⁸³ PPA statistics, 2018.

⁸⁴ AGILITY LOGISTICS website, 2018.

⁸⁵ SINO IRON website, 2018.

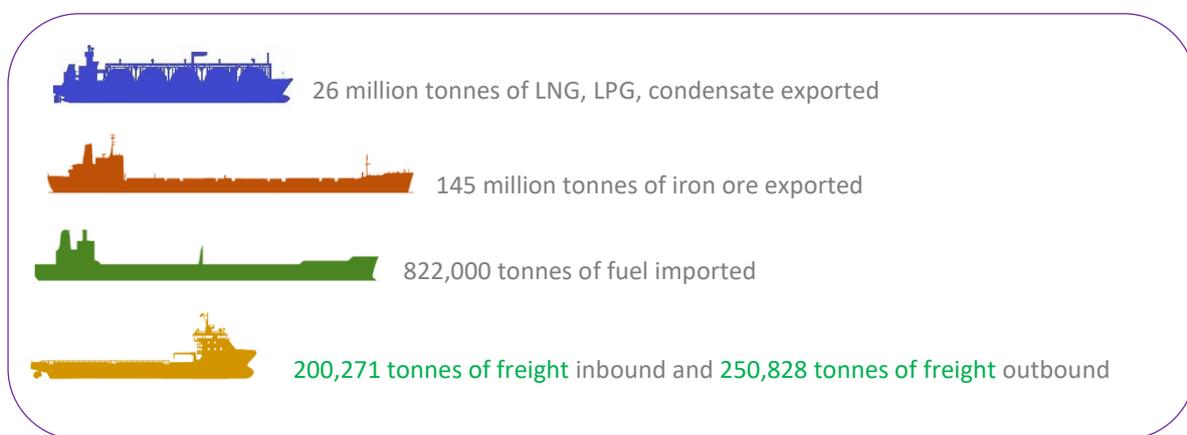
⁸⁶ PPA website, 2018.

- The Pilbara’s principal freight port;
- An important port for fuel importation and distribution;
- A project cargo port with facilities for importing PAMs and giant cargo;
- A repair base with light ship repair facilities;
- A support base with a developed aggregate of light industry and industrial services at Karratha; and,
- The site of LNG downstream processing industry with a technical ammonium nitrate plant.

A marine solar salt production and export facility owned by RIO TINTO supplies global markets.⁸⁷

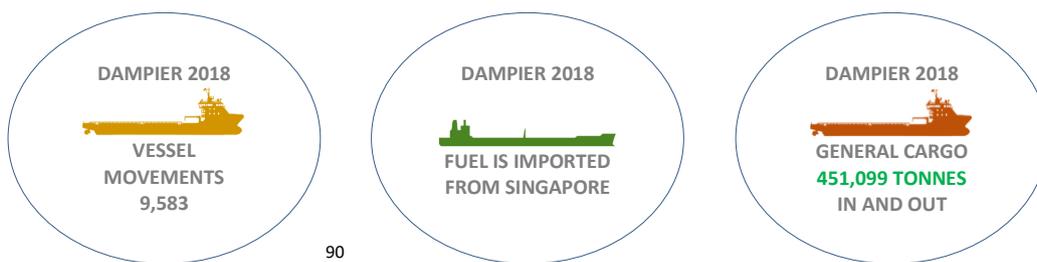
The nearby town of Karratha is the Pilbara’s largest town by population.⁸⁸

Freight movements include both merchandise imports and exports as well as domestic outbound and inbound freight between the port and the offshore platforms.



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Figure 12: Dampier – key cargo statistics – 2018



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⁸⁷ RIO TINTO website, 2018.

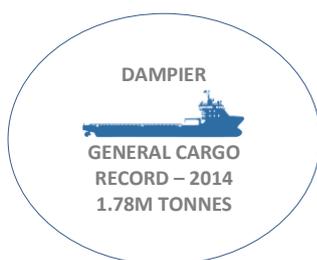
⁸⁸ Pilbara Development Commission, 2018.

⁸⁹ PPA tonnage statistics, 2018.

⁹⁰ PPA vessel movement statistics, 2018.

Port of Dampier general cargo exchange – common cargo types ⁹¹				
Cargo	Customer	Import	Export	Package
Railway rolling stock/track equipment	Iron ore producer	Asia		Break-bulk
Flocculant	Magnetite producer	China		Bulka bags
Mill ball	Magnetite producer	China		Bulka bags
Barite	Oil and gas supply	Southeast Asia		Bulka bags
Steel scrap	Recycler		Vietnam	Bulk
Project cargo	Mining and oil/gas	Southeast Asia		Break-bulk
Construction cargo	Mining and oil/gas	Southeast Asia		Break-bulk

Table 15 :Port of Dampier – general cargo categories



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12.26 Port Walcott

Port Walcott includes the private port complex of Cape Lambert for iron ore exports operated by RIO TINTO. Port Walcott is located about 40 km north of Karratha and both the towns of Karratha and Wickham are key points of service, accommodation, industrial service support and communications. The Cape Lambert facility has a capacity of 205 million tonnes per annum of iron ore. Freight is received by road haul: project freight for upgrades and construction may also be handled as domestic freight using an on-site barge landing facility.

12.27 Port Hedland

Port Hedland is the world's largest bulk export port.⁹³ It is by far the largest export port for iron ore in the Pilbara - by some of the world's largest iron ore producers. Almost 98 per cent⁹⁴ of the cargo shipped through the port in 2018 was iron ore. In 2017, Port Hedland accounted for about 60% of Australia's total iron ore exports.⁹⁵

Port Hedland is the gateway to the eastern Pilbara and has always provided a critical communications link for the Pilbara region and the northwest of Australia. In addition to its huge iron ore export operations, the port is an important point of import for fuel. There are significant exports of copper, manganese, chromite, salt and now lithium. Port Hedland historically also provided a link to the outside world for the cattle stations of the northwest and livestock exports.

⁹¹ AFD market contact, 2018.

⁹² PPA tonnage statistics, 2018.

⁹³ PPA website, 2018.

⁹⁴ PPA cargo statistics, 2018.

⁹⁵ Business Insider, 09 April, 2018.

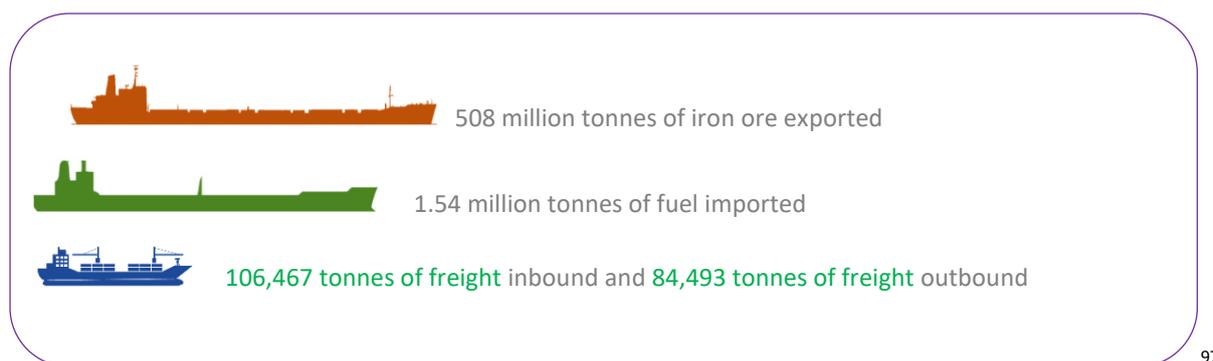
As an alternative to Dampier, Port Hedland provides the other Pilbara general cargo facility available for imports and exports.

General cargo imports are of a similar mix to Dampier and include mining consumables including flocculant, mill ball and chemicals as well as railway equipment and project and construction cargo. Some steel scrap is exported and now lithium by break-bulk to China. There is a proposal to bring large earth moving equipment tyres directly into Port Hedland from Japan.⁹⁶



Port Hedland is accessed by a single deep-water shipping channel that extends for about 40 km. The Pilbara Port Authority schedules the movements of very large bulk carriers in the channel across the tidal window using its vessel traffic services system. Due to the criticality of the large bulk carrier movements, smaller tonnage commercial vessel movements must be scheduled to fit in with the deep draught vessel movements in the channel.

Port Hedland has three common user berths in the Inner Harbour that can be used for general cargo.



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Figure 13: Port Hedland - key cargo statistics – 2018



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⁹⁶ AFD market contact, 2018.

⁹⁷ PPA tonnage statistics, 2018.

⁹⁸ PPA vessel movement statistics, 2018.

Port Hedland general cargo and container vessel voyages by origin and destination – (2017) ⁹⁹			
Inwards general cargo and container vessel voyages by country of origin			
	Vessel calls		
Total inwards calls	41		
Leading origin countries		% of inwards calls	Outwards backload
China	18	44	No
Australia	5	12	No
Singapore	6	15	No
Total Southeast Asia	10	24	No
Total Southeast and North Asia	29	71	No
Outwards general cargo and container vessel voyages by country of destination			
	Vessel calls		
Total outwards calls	11		
Leading destination countries		% of outwards calls	Inwards load
Vietnam	4	36	No
Australia	2	18	No
Total Southeast and North Asia	6	55	No

Table 16: Port Hedland general cargo voyages by origin and destination

12.28 New port developments

Proposed ports for the Pilbara include projects at:

- Cape Preston East for iron ore exports. Located 60 km to the southwest of Dampier.
- Balla Balla for iron ore exports. A proposed trans-shipment port facility 100km east of Karratha.
- Anketell for iron ore exports. Located 30 km east of Karratha with a scale of up to 350 million tonnes per annum.

12.3 Sea freight imports



⁹⁹ PPA cargo by destination summary statistics, 2018.



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The Pilbara is integrated with its international markets for the export of commodities by an ocean carriage logistics system using the Pilbara ports and offshore facilities. The Pilbara ocean carrier export supply chain into Asia forms one of the world's great seaborne trade routes.

The ports of Dampier and Port Hedland both handle the import of general cargo. Inbound cargo includes:

- Industrial consumables such as flocculant, mill ball or barite
- Occasional railway rolling stock and equipment;
- Tubular cargo;
- Construction materials;
- Miscellaneous project cargo such as oil and gas mooring equipment (Dampier).

This freight is brought in by chartered general cargo vessels arranged by the major industrial resource producers or their agents. A major Pilbara resource exporter regularly charters a vessel to call into Dampier or Port Hedland from China to discharge industrial consumables.

The use of these chartered general cargo vessels can be an inefficient process. The agent for a major Pilbara resources exporter advised AFD that arranging a suitable vessel to meet the client's required freight schedule could be challenging. Most chartered vessels into the Pilbara have only one revenue voyage leg: the ship either arrives loaded and departs empty, or, arrives empty to be loaded with outbound freight. (A direct liner service, on the other hand, would enable both inwards and outwards revenue voyage legs to be readily used by shippers).

The chartered general cargo ships used are small to medium-sized cargo ships of the MPP-type. These are specialised ship designs fitted with medium to heavy-lift cranes and a capability to take mixed general cargo and heavy point loads.

The charter market for the ad-hoc Pilbara freight shipments attracts some of the world's leading MPP-vessel fleet operators. These companies include:

- SPLIETHOFF;
- ASC GROUP;
- THORCO SHIPPING;
- AAL;
- BBC CHARTERING.

¹⁰⁰ PPA cargo statistics, 2018.

12.4 Sea freight exports



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Outbound freight cargo is commonly recyclables for Asian markets, such as scrap metals for Vietnam.¹⁰²

13.0 Air freight logistics

13.1 Background

Aviation services are critical to the functioning of Pilbara industries and the community. One major scheduled airline alone operates some 200 sectors a week into Pilbara destinations. More than 1.2 million passengers used the four leading Pilbara airports in 2017.¹⁰³ The great majority of aircraft operations is focussed on the movement of people as part of the service to the townships and in support of industry. The scheduled aviation networks are almost entirely based around Perth.

¹⁰¹ AFD market contact, Pilbara, 2018 and PPA cargo statistics, 2018.

¹⁰² The Dampier outward freight figures provided by the PPA include local freight movements for the oil and gas industry to the production platforms in northwest coastal waters: they are therefore not pure export numbers.

¹⁰³ Airport Traffic data 1985 to 2017. Department of Infrastructure, Regional development and Cities and BITRE. 2018.

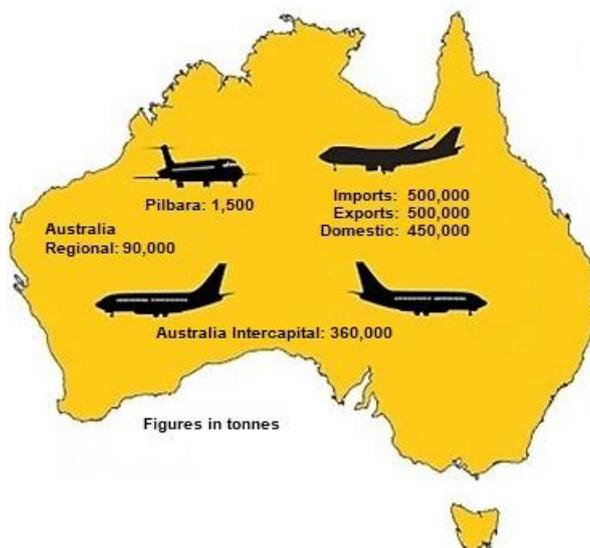


Figure 14: Australian air freight in tonnes - 2018

In common with the rest of the national aviation network, air freight into the Pilbara forms a very small part of the overall freight task by mass - but is of high value. Australia’s domestic and international air freight task is just 0.1 per cent by volume of the national freight task.¹⁰⁵

Domestic air freight system

The Australian air freight network is predominantly a system operating in the southern part of the country and around the major population centres of the southeast. Sydney is the main entry international gateway for international air freight: Melbourne has the larger share of the domestic air freight market.



The national air freight networks are concentrated on sectors between the capital cities: these routes carry 80% of the national air freight task of 450,000 tonnes¹⁰⁶. This leaves just 90,000 tonnes of air freight either carried across Australia between the major regional townships and remote sites, or, to these regional areas from the capital cities. This figure includes air freight carried between: Brisbane and the principal towns of Queensland; Sydney and rural NSW; Melbourne and regional Victoria; Melbourne and northern Tasmania; Sydney, Melbourne, Adelaide and Darwin to the interior; Adelaide

¹⁰⁴ AFD market contact, Australian Infrastructure Statistics Yearbook 2018 (BITRE).

¹⁰⁵ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

¹⁰⁶ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

to regional South Australia; and Perth to regional Western Australia. It also includes small air freight to service remote communities across the north of the country.



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International air freight system

Perth airport has regular scheduled airline connections with large aircraft to Africa, Asia, the Middle East and Europe. These services are routinely used by Pilbara shippers for parcel air freight. The development of wide-bodied scheduled airliner services into the major Australian capital cities, including Perth, has added substantially to air freight capacity. ‘Nationally, only 17 per cent of scheduled international air cargo carried to and from Australia is on dedicated freighter aircraft while the rest is on passenger aircraft’.¹⁰⁸

According to BITRE, “Sydney, Melbourne and Brisbane are currently the only airports in Australia with markets large enough to sustain dedicated international freighter services, except for one weekly service operating from Toowoomba Wellcamp Airport.”¹⁰⁹



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Furthermore, ‘The amount of air freight that can be carried and the destinations served depend significantly on the passenger aircraft routes; as these expand or contract, so do the opportunities for air freight exports.’¹¹¹

¹⁰⁷ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

¹⁰⁸ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

¹⁰⁹ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

¹¹⁰ AFD derivation (2018) based on assumed mass tonnes air freight and value of \$150,000 per tonne.

¹¹¹ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

13.2 Airports

The Pilbara has four of Australia’s top 40 airports by passenger numbers¹¹² - Karratha, Port Hedland, Newman and Tom Price – of which Port Hedland and Karratha airports are the leading airports in the region. Major mine sites have established airfields that are the base of daily scheduled flights. Other mine sites in the regional Pilbara areas have their own airstrips to accept charter flights including freight.

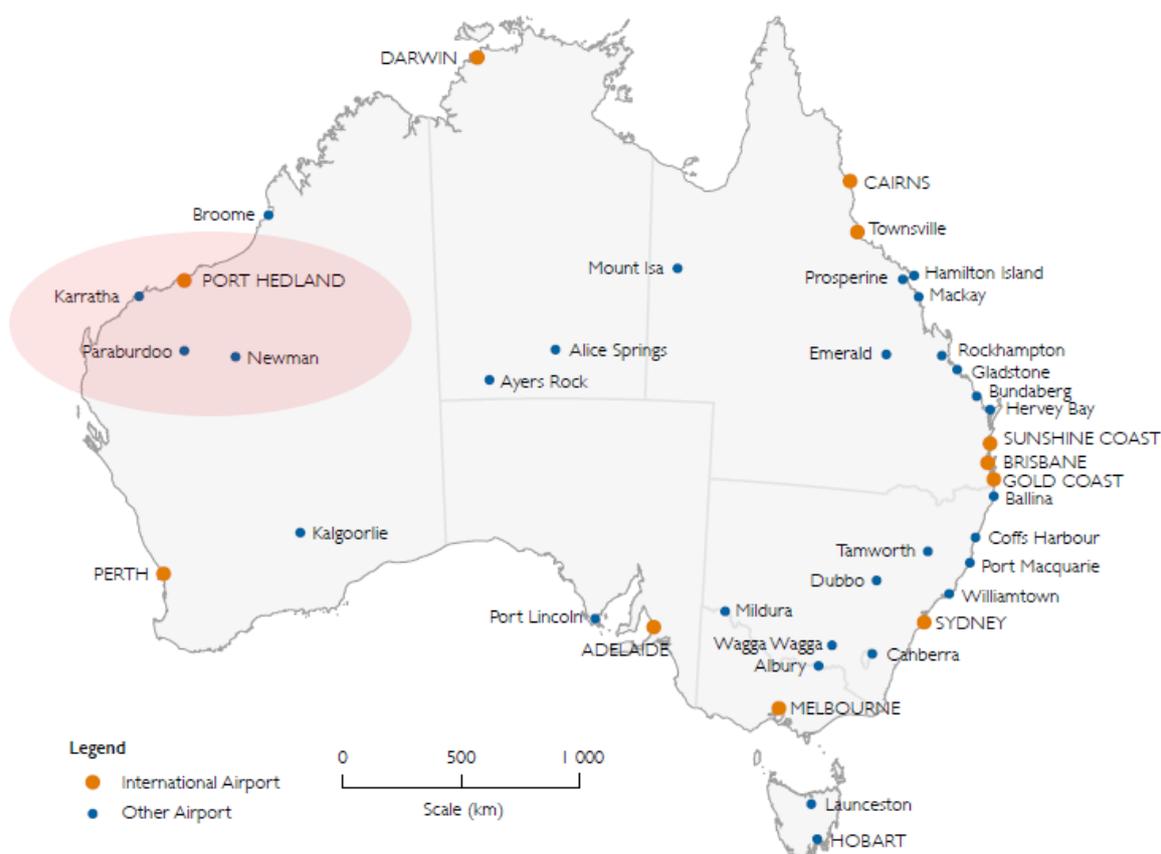


Figure 15: Australia's Top 40 airports¹¹³

¹¹² Australian Infrastructure Statistics Yearbook 2018 (BITRE)

¹¹³ Australian Infrastructure Statistics Yearbook 2018 (BITRE).

Key Pilbara airports – airline aircraft movements - 2017 ¹¹⁴									
Key Pilbara airports – airline aircraft movements - 2017 ¹¹⁵									
Airport	Domestic (includes regional)			International			Total Aircraft Movements		
	In	Out	Total	In	Out	Total	In	Out	Total
Karratha	3,128	3,093	6,221	-	-	-	3,128	3,093	6,221
Newman	1,993	1,986	3,979	-	-	-	1,993	1,986	3,979
Paraburdoo	1,244	1,234	2,478	-	-	-	1,244	1,234	2,478
Port Hedland	2,321	2,244	4,565	49	48	97	2,370	2,292	4,662
Total	8,686	8,557	17,243	49	48	97	8,735	8,605	17,340

Table 17: Key Pilbara airports - airline aircraft movements – 2017

Key Pilbara airports – airline revenue passenger numbers - 2017 ¹¹⁶									
Airport	Domestic (includes regional)			International			Total airline passengers		
	In	Out	Total	In	Out	Total	In	Out	Total
Karratha	219,366	219,681	439,047	-	-	-	219,366	219,681	439,047
Newman	138,682	146,951	285,633	-	-	-	138,682	146,951	285,633
Paraburdoo	82,481	83,653	166,134	-	-	-	82,481	83,653	166,134
Port Hedland	173,027	173,931	346,958	3,620	3,719	7,339	176,647	177,650	354,297
Total	613,556	624,216	1,237,772	3,620	3,719	7,339	617,176	627,935	1,245,111

Table 18: Key Pilbara airports - airline passenger numbers - 2017

Port Hedland

Port Hedland has the second busiest airport in the Pilbara in both aircraft movements and passenger numbers. The airport is unique in the Pilbara in being an international airport (it is officially termed Port Hedland International Airport) with weekly passenger services operated by VIRGIN AUSTRALIA to Denpasar, Bali. The airport is fully equipped for international passenger operations with appropriate quarantine and customs arrangements. The main runway at Port Hedland is one of the longest in the Pilbara at 2,500 metres long and can take aircraft of up to 100 tonnes MTOW.¹¹⁷ Most jet aircraft operating routinely to the airport are in the 47 to 63 tonne range such as the BOEING B717, FOKKER F100, BAE 146, AIRBUS A320 and the BOEING B737. The airport has accepted BOEING B767 and AIRBUS A330 aircraft and has hosted occasional visits by large freighters such as the ANTONOV AN-124. Port Hedland International Airport also hosts general aviation and helicopter operations.

Airlines operating services to Port Hedland International Airport include: QANTAS, QANTASLINK, VIRGIN AUSTRALIA, SKIPPERS (charter only), ALLIANCE AIRLINES (charter only). A licensed international freight CTO – PILBARA CARGO TERMINAL – operates at the airport together with the major air freight operators: QANTAS FREIGHT, STARTRACK, TNT, TOLL and VIRGIN AUSTRALIA CARGO.

Karratha

Karratha has the busiest airport in the Pilbara by passenger numbers and aircraft movements and the second busiest airport in Western Australia that handles scheduled flights. The airport is not an international airport but according to the airport management the re-developed terminal building can

¹¹⁴ Airport Traffic data 1985 to 2017. Department of Infrastructure, Regional development and Cities and BITRE. 2018

¹¹⁵ Airport Traffic data 1985 to 2017. Department of Infrastructure, Regional development and Cities and BITRE. 2018

¹¹⁶ Airport Traffic data 1985 to 2017. Department of Infrastructure, Regional development and Cities and BITRE. 2018.

¹¹⁷ Port Hedland International Airport website. 2018.

be adapted for international operations with limited works (the indication is from 3 to 6 months for the works and approvals). The expanded terminal has a capacity to service up to 1.2 million passengers per annum.¹¹⁸

Karratha Airport is routinely serviced by the following airlines: QANTAS, QANTASLINK, VIRGIN AUSTRALIA, VIRGIN AUSTRALIA REGIONAL AIRLINES, AIR NORTH and ALLIANCE AIRLINES.

Scheduled airline operations are similar to Port Hedland with jet aircraft in the 47 to 63 tonne size range. The airport can accept AIRBUS A330, BOEING B767, BOEING C17 and ANTONOV AN-124 aircraft.

Karratha Airport hosts general aviation operations and significant helicopter operations for the oil and gas industry.

As the airport is not operating international services it has airport security services only. Any development of international freight through Karratha Airport will require a licensed CTO facility (any development of passenger services will also require access to customs and quarantine services). The airport has various freight sheds that could be adapted for international freight. The airport does not have cold storage facilities.

Newman

Newman is the third busiest airport in the Pilbara. Newman is serviced by QANTASLINK and VIRGIN AUSTRALIA flights from Perth. The airport also hosts general aviation. Aircraft operated to Newman include the FOKKER F100, BOEING B717 and BOEING B737.

Paraburdoo

Paraburdoo Airport is the fourth airport in the Pilbara that together with Port Hedland, Karratha and Newman airports make the list of the top 40 busiest airports in Australia. QANTAS, QANTASLINK and VIRGIN AUSTRALIA REGIONAL AIRLINES service Paraburdoo Airport.

13.3 Air freight task and services

Routine air freight for the Pilbara is carried in the cargo holds of scheduled passenger aircraft flying to the major towns and mine site airstrips.

There are no scheduled freighter aircraft services from Perth into Port Hedland or Karratha. The last service ceased operations in 2016.¹¹⁹ This means that some oversize air freight must be flown into Sydney and then moved by rail or road to Perth and then by road-haul to the Pilbara. Some scheduled jet aircraft services operating to regional Pilbara airfields rarely carry air freight.

¹¹⁸ Karratha Airport website. 2018.

¹¹⁹ AFD market contact, 2018.

A leading freight forwarder with extensive operations in the northwest indicated that their average annual air freight task across all clients was 100 tonnes. This included direct air freight into the Pilbara and air freight flown into Sydney or Perth and then road-hauled to the Pilbara.

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Estimates for Pilbara air freight per annum - 2018 ¹²¹		
Category A	General postal and forwarder air freight inbound	365 tonnes
Category B	General postal and forwarder air freight outbound	220 tonnes
Category C	General air freight for industrials	500 tonnes
Category D	Large domestic jet freighter charter inbound	100 tonnes
Category E	Small aircraft charter freight inbound	100 tonnes
Category F	Large international jet charter direct	200 tonnes

Table 19: Estimates for Pilbara air freight per annum

The categories equate to 1,500 tonnes per annum.

13.31 Derivations

In 2017, 80.0% of the national domestic air freight task of 450,000 tonnes occurred from the main airport in one capital city to the main airport in another capital city.¹²² The remaining air freight of 90,000 tonnes was carried throughout regional Australia.

In 2017, the population of regional Australia was 8,043,165 ¹²³ The derivation for air freight mass per head of population in regional Australia in 2017 shows 11.2 kg per person.

This equates to 661 mass tonnes of air freight based on a permanent *residential* population in the Pilbara of 59,000. In comparison, our figure for Category A and B totals 585 tonnes. Categories A and B are more relevant to the town populations. The other categories are applicable to the industrial operations.

Category C reflects contact with two major forwarders with major resource export clients across the northwest. These companies provided similar amounts of annual air freight details: the results were combined and extrapolated to include other similar scale operations.

Category D is derived from the use of a Perth-based B737 operator for 5 freight flights per annum and at the maximum 20 tonne payload. ¹²⁴

Category E is a distribution of 1.2 tonnes of freight per 30-day month across 6 different Perth-based charter operators.

¹²⁰ AFD market contact, Perth, 2018.

¹²¹ AFD market contact, Perth and Pilbara, 2018.

¹²² Source: Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018

¹²³ Australian Bureau of Statistics, Regional Population Growth, Australia 2016-17 (2018).

¹²⁴ AFD market contact, 2018.

Category F allows for four large international jet charter operations to either Port Hedland or Karratha with a payload of 50 tonnes.

Further indication for Categories A, B and C comes from the advice of the leading air charter business in Western Australia. During the resources boom the company operated the entire *scheduled* air freight task into the Pilbara (apart from freight in the airliner holds) and carried from 1 to 1.2 tonnes per day.¹²⁵

13.32 Air freight diversity

The Pilbara requires virtually a complete range of foodstuffs, consumer and industrial goods to be brought in each day to sustain the community and industry. This includes medical equipment, medical supplies and pharmaceutical products Nationally, and historically, air freight has consisted of, “goods (that) are typically characterised as high value, time sensitive and perishable.”¹²⁶. AFD’s contact with leading industry suppliers of air freight services confirm that key categories of inwards routine air freight to the Pilbara include:

- Medical and pharmaceutical supplies – daily shipments are carried by a leading forwarder forming a major part of its daily air freight business of around 200 kg (Medicinal and pharmaceutical products are the second highest value category of air freight imports into Australia via Sydney and are distributed nationally);
- Postal and parcel freight for the townships and industrial site administration. Parcel freight includes consumer goods and on-line purchases;
- Machines, spare parts, equipment and critical inventory items for the industrial supply chain.

13.32 Impact of road -haul

The competitive and efficient road-haul industry, with its high service volumes into the Pilbara from Perth, provides a single day transit option worked overnight. Shared driving allows road trains to operate a service into many parts of the Pilbara at a price and schedule that is competitive with air freight. The return cost of a light aircraft with a payload of from 1 tonne may be \$12,000 to \$14,000 plus GST¹²⁷. These aircraft may take 3 to 4 hours flying time to reach the Pilbara. Allowing for cartage from the supplier, consolidation of the freight, loading and discharging the cargo the overall time for the loaded sector may be more like 7 hours.

This compares with an overnight northbound road haulage cost of \$3,500 to \$4,000¹²⁸ per trailer with a capacity of around 22 tonnes. Freight imported by air may be cleared into a Perth warehouse and then consolidated with other freight for road-haul and delivery direct to the Pilbara site. The result is that the road-haul network carries much of the parcel freight into the Pilbara that could otherwise be carried as air freight. An air charter services operator advised their business had been engaged

¹²⁵ AFD market contact, 2018.

¹²⁶ Source: Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

¹²⁷ Jandakot flight Centre, 2018.

¹²⁸ AFD market contact, 2018.

regularly during the 2010-2014 resources boom where there was sometimes insufficient road-haulage capacity. After 2014 the business was challenged by competition from road-haul into the Pilbara and ceased regular freight charters to the region.

The road-haulage network also allows ready conveyance of oversize freight at short notice. Aircraft for charter may not be as readily available compared to the 'hotshot' option where trucks are ready to dispatch at short notice. For Pilbara shippers, the road-haul network provides the only practicable option for large oversize air freight imported to Australia and that cannot be broken down to fit into domestic aircraft.

13.33 Scheduled aircraft constraints

Intra-state

In contrast to the Goldfields and the Mid-West region where there is the option of shorter-range propeller-driven aircraft for freight or passengers, the Pilbara relies largely on jet aircraft. Various types of mid-size jet aircraft are used for scheduled passenger and FIFO services, typically with a 100-seat configuration. These aircraft include the FOKKER 80, FOKKER F100, BOEING B717 and the BRITISH AEROSPACE Bae 146 and variants. These aircraft are all configured to optimise passenger transport not freight. The passenger service requirements allow little payload capacity for freight other than small quantities of parcel freight. Furthermore, aircraft types such as the Fokker 100 do not allow the operation of forklifts under the cargo door. This requires freight to be packed and un-packed directly into the hold – this method suits parcel freight not large and heavy items. A major operator of more than 200 flight sectors¹²⁹ a week to the Pilbara state that they only occasionally move shipments of up to one tonne maximum on passenger flights to the Pilbara. The shipment must be broken down to fit through the cargo door and stowed.

Trans-Australian

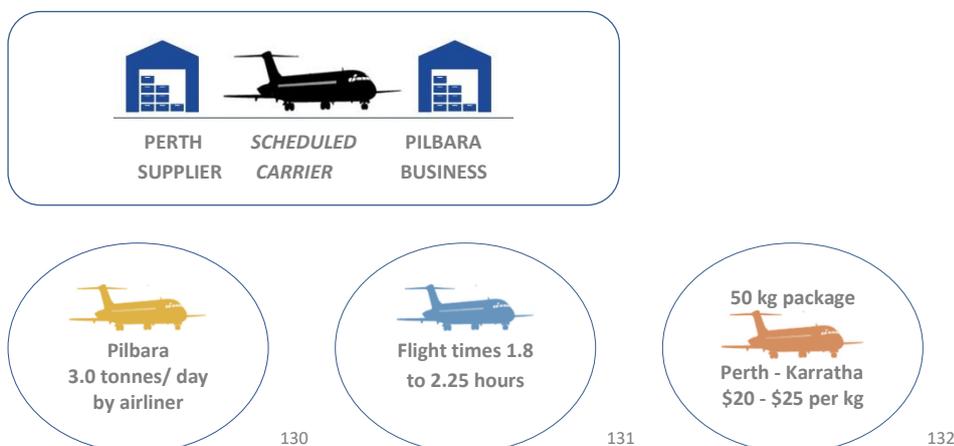
The Boeing B737F freighter aircraft operated by TOLL and IPEC between the Australian east coast and Perth are predominantly used for parcel freight and are unable to carry larger oversize air freight brought into Australia by wide-bodied freighters.

International

International passenger services to Perth Airport are routinely operated by large passenger aircraft including the AIRBUS A380. Freight can be stowed in the belly compartments of these aircraft but there are limitations on freight capacity depending on passenger loads. The international passenger services are also restricted from carrying oversize air freight such as freight in excess of 160 cm in height. As the services are configured for optimising passenger load factors then the availability of freight space is variable. A large freight forwarder that routinely ships air freight for Pilbara resource producers advised that space is not always available on international air services to Perth.

¹²⁹ AFD market contact, 2018.

13.5 Scheduled domestic airline freight service



The numerous scheduled air services by jet aircraft into the major Pilbara towns and mine sites provide capacity for small parcel freight such as movements for Australia Post. Both QANTAS and VIRGIN AUSTRALIA scheduled passenger aircraft flights are used by services such as AUSTRALIA POST (StarTrack Express), TNT and TOLL IPEC to move small parcel freight daily into Port Hedland and Karratha. Air freight movements are typically focused on one or two scheduled services per day. Indicative quantities from AFD market contact are shown in table

Average daily Post Office air freight to the Pilbara:	500 kg
Average daily forwarder air freight to the Pilbara:	500 kg
Average daily Pilbara to Perth parcel air freight:	600 kg

Table 20: Pilbara daily parcel air freight

Services to remote centres operated by ALLIANCE AIRLINES and NETWORK AVIATION also carry small parcel freight. The aircraft used, such as the FOKKER 100, have a typical seat arrangement for 100 passengers. A major scheduled operator servicing the mine sites with F100 aircraft¹³³ advised that the carriage by special arrangement of air freight loads of 1 tonne on its services occurred only occasionally. Scheduled airline services used to carry small freight are operated by:

- QANTAS and its regional subsidiary QANTAS LINK;
- VIRGIN AUSTRALIA and its regional subsidiary VARA;
- NETWORK AVIATION;
- ALLIANCE AVIATION

Key forwarders on the services to Port Hedland and Karratha include:

- STARTRACK EXPRESS;

¹³⁰ AFD market contact, 2018.

¹³¹ Scheduled carrier websites, 2018 and AFD market contact, 2018.

¹³² Scheduled carrier websites (air freight), 2018.

¹³³ AFD market contact, 2018.

- TNT; and,
- TOLL IPEC

13.6 East Coast supplier air-freight services



Air freight services such as TOLL IPEC and StarTrack (AUSTRALIA POST)/QANTAS FREIGHT use Boeing 737 freighter aircraft daily from the East Coast into Perth up to 5 days per week. This network provides the option of ready transfer of air freight onto scheduled airline services to the Pilbara. The network does not enable the carriage of oversize freight higher than 160 cm.¹³⁵

13.7 Scheduled airline services via Perth to the Pilbara



Perth airport provides the international gateway hub for passenger traffic into Western Australia with direct services to Europe, the Middle East, South Africa and Asia, including Singapore. These scheduled airline services support the flow of international parcel freight and the option to transfer the freight on arrival at Perth on to scheduled domestic airline services into the Pilbara.

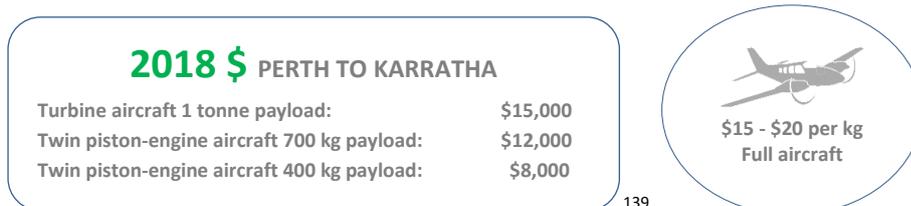
¹³⁴ AFD market contact, 2018. Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

¹³⁵ Airline freight service websites, AFD market contact.

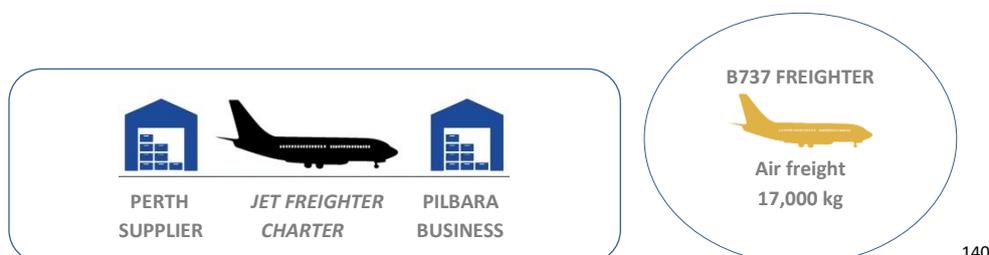
¹³⁶ AFD market contact, 2018.

¹³⁷ AFD market contact, 2018. Air Charter Service, Sydney, 2018.

13.8 Perth-based charter air-freight service



Propellor-driven aircraft are available to be used for freight charter: these are predominantly based at Perth’s Jandakot airport and one operator is at Perth airport. Aircraft types used for charter freight include the propellor-driven FAIRCHILD METROLINER, BEECHCRAFT SUPER KING AIR, PILATUS PC-12, CESSNA CARAVAN, CESSNA 402 and the BEECHCRAFT BARON. Some aircraft such as the SUPER KING AIR can receive palletised loads. Mission critical small parcel freight can also be carried by small jet aircraft such as the LEARJET 35A. A Jandakot operator advised that local air freight charters to the Pilbara had greatly reduced since the downturn in oil and gas activity with charters being described as monthly rather than weekly.



The major national air freight services TOLL and StarTrack (AUSTRALIA POST)/QANTAS FREIGHT each have BOEING B737 aircraft operating into Perth. A BOEING B737 is available for special freight charter into the Pilbara airports. The operator advised average use at 5 services per annum.¹⁴¹

¹³⁸ AFD market contact, Jandakot, 2018.

¹³⁹ AFD market contact, Jandakot, 2018.

¹⁴⁰ AFD market contact, 2018. Air Charter Services, Sydney, 2018.

¹⁴¹ AFD market contact, Perth, 2018.

13.9 Pilbara direct international charter air-freight services



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Port Hedland and Karratha have each received occasional movements of international air freight by special charter. This has included the operation of ANTONOV AN-124 specialised freighter aircraft that can discharge freight from a rear door.¹⁴³ Other freighters based on airliner designs may require a special unloading unit to discharge the freight. Charters of large freighter aircraft from overseas are expensive and are more likely to occur for special projects.

14.0 Intermodal freight logistics

14.1 Background

The reliance of the Pilbara on land haul logistics out of Perth means most imported sea freight for the region enters Australia through the port of Fremantle or the ports of the east coast. Larger sized freight, such as mining equipment, can be readily handled at the general cargo berths of Fremantle's inner harbour and then taken to sites in metropolitan Perth for preparation for road haul into the Pilbara. Some equipment needs weeks of pre-assembly in Perth before it is ready for road transport to the mines. There is also the alternative of the common user facility at Henderson for the handling and preparation of project freight. From the east coast ports, cargo that can be handled by train or road-haul is brought across to Perth for consolidation for the final road-haul to the Pilbara.

¹⁴² Air Charter Service, Sydney, 2018

¹⁴³ Karratha Airport management, 2018.

14.2 Intermodal rail-truck freight - Australian east coast to the Pilbara



Freight from suppliers on the east coast of Australia can be moved by either the Trans-Australian railway or road-haul. If the freight is moved by container across the country it will likely be re-consolidated into loose shipments at Perth for consignment by road-haul. Freight arriving by train will be handled at the intermodal facilities at Forrestfield.

14.3 Sea-Land intermodal freight logistics via Fremantle



Freight for the Pilbara that enters Australia through the Port of Fremantle is consolidated into road-haul shipments. This intermodal freight includes large break-bulk items such as mining equipment. The Port of Fremantle is connected to global liner shipping networks with calls by some of the world's leading operators including:

- MSC
- MAERSK
- CMA-CGM (ANL)
- OCEAN NETWORK EXPRESS (ONE) – (NYK Line, K Line & Mitsui OSK Line joint venture)
- OOCL
- APL/NOL¹⁴⁶

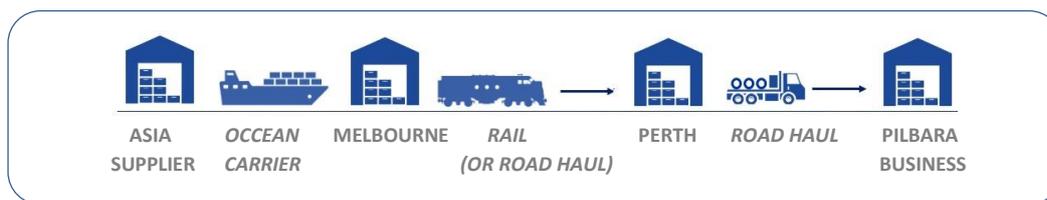
A specialised, round the world RORO connection is provided by WALLENUS WILHELMSSEN. Due to the high cost and restricted availability of using containers into the Pilbara, much of the imported freight is consolidated into 'loose' freight shipments for road trailers.

¹⁴⁴ Compiled from driving times and required single driver rest periods: Road Transport (Long Distance Operations) Award 2010 (as amended).

¹⁴⁵ Sturrock Grindrod, Perth, 2018.

¹⁴⁶ Sturrock Grindrod, Perth, 2018.

14.4 Sea-Land intermodal freight logistics via the Australian east coast



2018 \$ SHANGHAI TO SYDNEY
1 TEU CONTAINER
FREIGHT RATE: \$1,600



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Freight is also imported through east coast ports such as Melbourne. The east coast main ports of Sydney, Melbourne and Brisbane have Australia's most extensive liner cargo connections to the global liner network including Asia and the USA. The volume of liner trade to southeast Australia can deliver discount rates particularly in shipments from North Asia. Pilbara freight imported through these ports is moved across Australia by road or rail to Perth and then consolidated for road-haul to the Pilbara.

14.5 Air-land intermodal freight logistics

Air-land intermodal freight networks are common in the supply chains of much Pilbara freight. Freight is also flown routinely into Sydney for transfer to train or truck.¹⁴⁸

14.51 Scheduled air carrier to road-haul via Perth



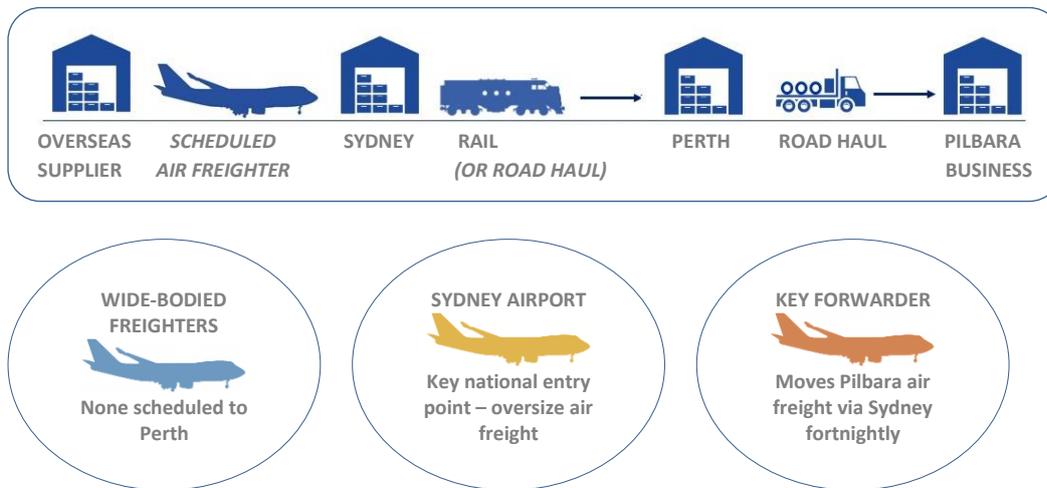
The competitiveness of road-haul means that parcel freight arriving by air from overseas is often consolidated into road shipments after clearance and delivery into store in Perth. For larger freight consignments this can be a more cost-effective method than using the domestic scheduled carrier from Perth to the Pilbara while still achieving a delivery time within a few days of the freight arrival at Perth airport. For larger individual freight there may be no choice other than to use road-haul.

¹⁴⁷ FLIS (Australia) Pty Ltd, Brisbane, 2018.

¹⁴⁸ AFD market contact, 2018.

¹⁴⁹ Western Roads Federation, 2018.

14.52 Special requirements for over-size air freight



Over-size air freight means any air freight that exceeds the maximum allowable dimensions and mass for scheduled airliner services. This includes any air freight 160 cm or more in height. The scheduled jet airliners operating to the Pilbara are not able to carry oversize air freight. There may also be restrictions on the carriage of oversize freight by domestic freighter aircraft between the East Coast and Perth: the B737 freighter aircraft are narrow body aircraft. There are no wide body freighter aircraft operating scheduled services to Perth airport.¹⁵⁰

A key forwarder for a Pilbara energy exporter advised that the limitations of the air freight network compelled their routine use of Sydney airport, then rail to Perth and road-haul to the Pilbara.

15.0 Cargo equipment in the Pilbara supply chain

15.1 Background

Modern economies are fundamentally reliant on the highly efficient logistics, and especially intermodal logistics, that is made possible by the ubiquitous TEU and FEU containers. These containers and other international standard cargo equipment such as flat-racks, open-top containers, bolsters and iso-tainers, are carried on freight trains, trucks and cargo ships across the globe. The international freight supply chains are built around this cargo equipment unitisation. Businesses and communities across the world expect access to this standardised cargo system and the benefits it brings. The container logistics revolution of the 1960s introduced all the benefits shown in figure 15 and allowed massive economies of scale.

Containers and other standardised cargo equipment are extremely adaptable for a great many cargoes termed as 'freight'. This includes agricultural products, dry bulk products, bulk liquids as well as manufactures and other goods.

¹⁵⁰ Air Charter Services, Sydney, 2018.

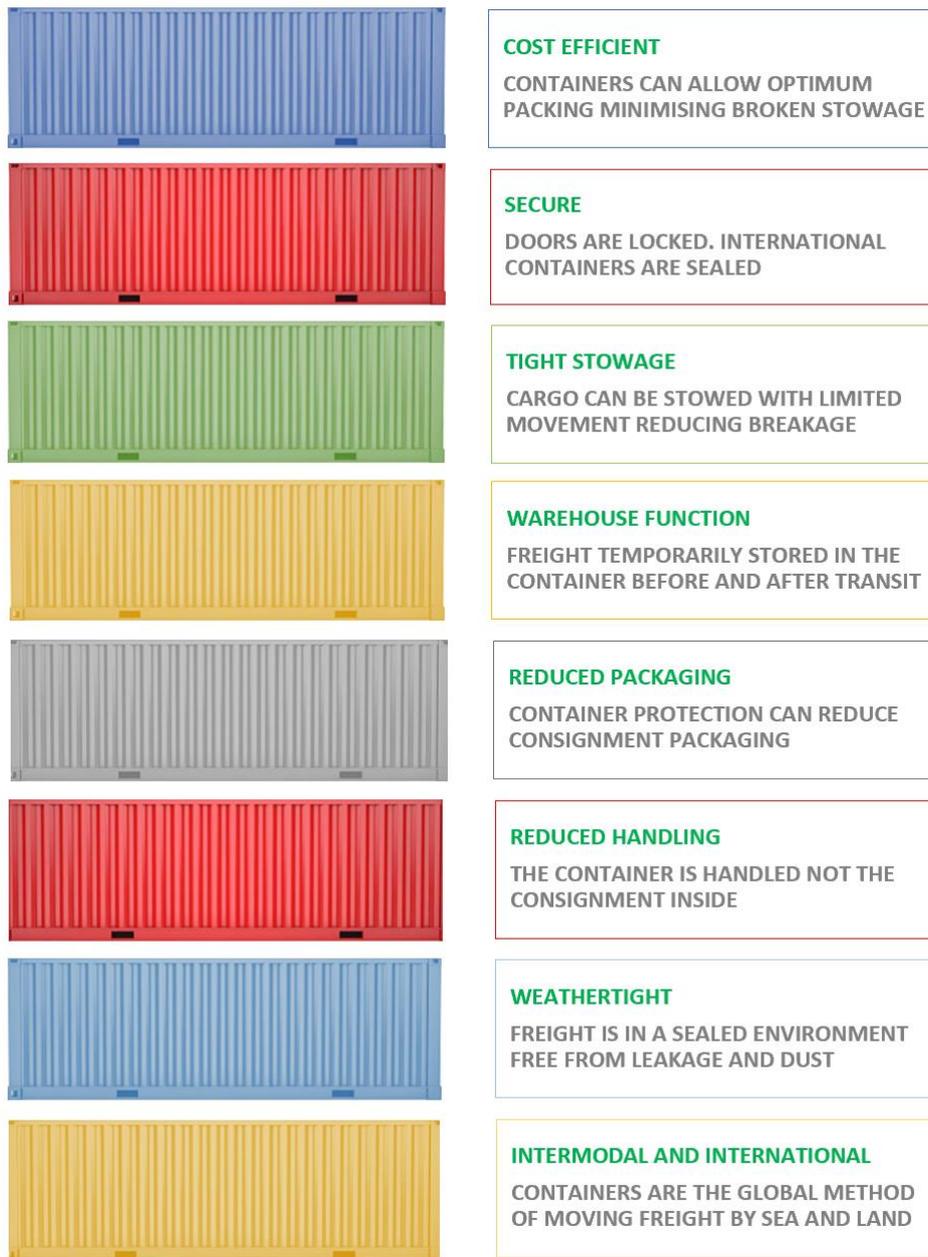


Figure 16: Advantages of containerisation for Pilbara business

The use of cargo equipment for freight is so prevalent that most leading liner shipping services are completely designed around the use of containers. For these shipping operators, it is essential that the freight markets they service are provided with adequate containers and equipment. The largest liner operators and the container leasing companies have equipment fleets in the millions of units

For many businesses in Australia and overseas, access to containerised and unitised logistics is essential to the proper functioning and competitiveness of their operations. This is especially so for businesses engaged in importing and exporting.

Not all freight can be containerised or otherwise configured on cargo equipment. This non-unitised freight, or break-bulk, can include a whole range of other types of freight including construction materials, project materials and over-size machinery and equipment. The carriage of this freight may require special road-haul equipment or general cargo vessels designed to carry break-bulk cargo.

15.2 Current restrictions in the Pilbara

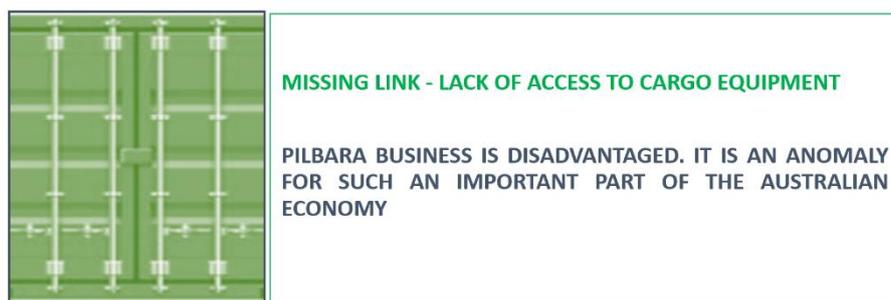
The development of industry in the Pilbara has required all manner of transport and logistics equipment and methodology. Construction projects have utilised all types of cargo equipment.

The on-going Pilbara freight logistics supply chains however, being largely based around road-haul over long distances, are notable for the lack of cargo equipment utilised and particularly the absence of containers. Carrier-owned containers are utilised by the larger operations that can afford their use: some hauliers provide their own containers to shippers however the logistics network does not readily suit the movement of international containers for import or export purposes.

General freight TEU and FEU container movements through the Port of Dampier are rare: the small amount of international freight is virtually all break-bulk.

Many smaller Pilbara-based businesses contacted by AFD advised that they had never used containers but only received freight by consolidated 'loose' loads by road-haul. A number were unsure of the process of using containers if they were provided.

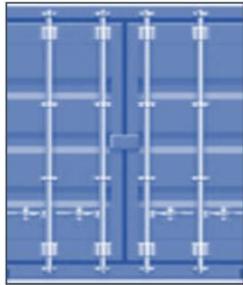
A lack of access to cargo equipment for freight in the current Pilbara freight logistics networks means that Pilbara businesses miss out on the advantages of containerisation as shown in figure 4, particularly those businesses importing freight.



There are various reasons why there is a more limited access for cargo equipment including:

- **Demobilisation cost**
Carrier or fleet containers brought into the Pilbara for freight must be returned to the cargo equipment owner. This will typically mean that the shipper must pay for the empty container to be returned to Perth. This could be an additional charge of \$1,000. There is not enough back-freight out of the Pilbara to enable an efficient cycling of containers in the freight market that would enable off-hire at Karratha or Port Hedland for single sector line-haul;
- **Hire and demurrage cost**

Containers supplied by liner shipping companies will typically offer from one to two weeks free use of the container by the shipper to un-stuff the freight. This is normally carried out in the metropolitan area. Beyond this time, if the container is not returned, demurrage is charged at rates as high as A\$140 per day. *If* the shipper is permitted to take the container to the Pilbara then clearly the shipper will need to get it cleared, transported, unstuffed and returned without delay otherwise significant penalties accrue. A top ten global logistics firm providing forwarding services in the Pilbara advised AFD that for some project construction it is cheaper to buy container fleets than risk losses through demurrage.



DEMURRAGE CHARGES: \$140 PER DAY

CONTAINER HIRE RATES

TEU CONTAINER \$3.00 PER DAY MINIMUM HIRE 30 DAYS

TEU CONTAINER \$5.00 PER DAY MINIMUM HIRE 30 DAYS

Exc.GST

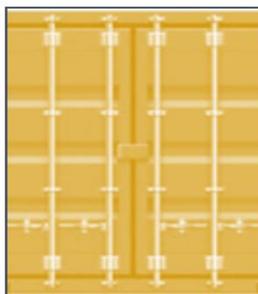
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- **Handling requirements**

If containers are to be un-stuffed and held at the shipper's premises for a few days, then the containers are likely to be required to be unloaded from the trailer they were carried on. This means lifting equipment needs to be available at the shipper premises, or, the container is delivered locally by side-lifter. Most businesses will not have this equipment available and it would need to be hired in at substantial cost. Nor will the businesses commonly have the alternative of a loading dock for the trailer such as used at COLES or WOOLWORTHS premises.

- **Perth consolidation**

The practice of consolidating freight in Perth for on-forwarding by road to the Pilbara is very well established, even for freight that was originally imported by container. The transport focus by the road-hauliers is to achieve revenue optimisation of trailer loads. Each TEU container has a tare weight of 2.5 tonnes. This weight is a deduction from the available freight payload of a standard trailer (22 tonnes). Unless the shipper is prepared to pay the haulier a full revenue rate for the container (the rate will vary according to the weight) then the haulier will find it more efficient to consolidate freight shipments into van trailers for the road train. There are some businesses in the Pilbara that receive multiple small shipments from different sources: these shipments are suited for consolidation in the road-haul service.



DIRECT LINER SERVICE - IMPROVED ACCESS FOR SHIPPERS

COST EFFECTIVE ACCESS TO CARGO EQUIPMENT INCLUDING CONTAINERS WILL BE PART OF A DIRECT SERVICE BETWEEN SINGAPORE AND THE PILBARA

¹⁵¹ AFD market contact, Perth, 2018.

- Point of import**
 Most freight brought into the Pilbara is collected by road-haul from Perth whether it has been imported or locally supplied. For imported freight brought in by an ocean carrier or NVOC, the carrier, forwarder or their agent will want the container emptied and returned to its container fleet system within a week. The container owner may not want its equipment sent to the Pilbara.

15.3 Requirements for improved cargo equipment access

The use of cargo equipment, such as containers, to adequately support a freight market requires empty equipment to be supplied for use by freight shippers and then the empty equipment to be returned after use.

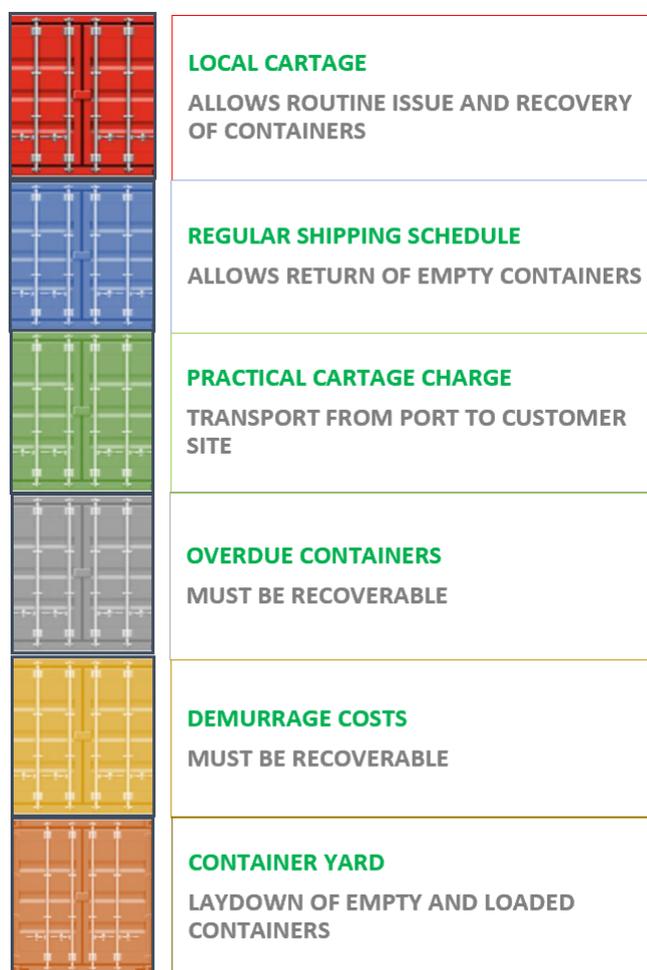


Figure 17: Requirements for cargo equipment supply

As with any short-term equipment hire or leasing arrangement, this cycle of hire and off-hire must be efficient. Slippage in the return of off-hired containers adds to the logistics costs of the carrier or the container lessor as ultimately more containers are required in the fleet to service the market. This in turn impacts on the viability of servicing the freight market and the freight rates or equipment hire

rates paid by shippers. Each container or piece of cargo equipment is an asset that requires maintenance and survey: an ongoing cost. The liner shipping companies and container leasing companies therefore closely manage the cycling of their containers to ensure optimum utilisation of each container asset. The great majority of global shippers use cargo equipment temporarily provided by the equipment lessor, carrier or freight service they are using.



2018 \$
CARTAGE
DAMPIER PORT TO KARRATHA
INDICATIVE RATE FOR DIRECT SHIPPING SERVICE
\$300 PER CONTAINER

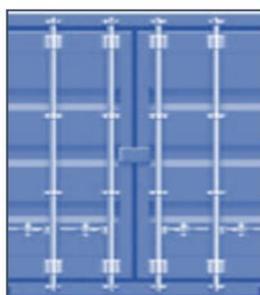
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DANGEROUS GOODS

THE LAYDOWN YARD REQUIRES STORAGE AND SEGREGATION AREAS FOR SOME CLASSES OF DANGEROUS GOODS.

THE CONTAINER, AS A RIGID ENCLOSURE, ASSISTS IN MEETING SEGREGATION REQUIREMENTS



COLD CHAIN

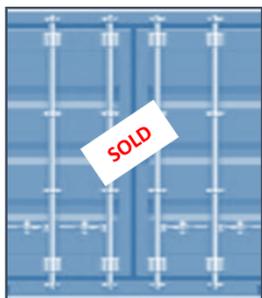
COLD CHAIN INTEGRITY REQUIRES REEFER CONTAINERS WITH CHILLED OR FROZEN FREIGHT TO BE CONSTANTLY POWERED DURING CARTAGE AND LAYDOWN.

A direct liner shipping service between Asia and the Pilbara will facilitate the extension of cargo equipment supply into the Pilbara. The first reason is because the suppliers of the cargo equipment will be able to rely on the key requirements necessary for them to establish supply. The Pilbara has the agency infrastructure, lay-down facilities, stevedores, cartage services and port infrastructure to realise this service.

The second reason is because the ocean carrier will need to supply cargo equipment to assist and attract freight shippers.

¹⁵² AFD market contact, local haulage.

A fortnightly shipping cycle would enable an effective cycle time for containers to even the most distant regional shippers in the Pilbara. The quality of business in the Pilbara and its economy would be expected to give the cargo equipment owners the required confidence in commercial risk to establish the equipment supply terms on a similar basis to Australia’s other major international freight trades. Direct access to the Asian markets such as through Singapore could mean that containers are supplied by the shipping company, NVOCs, NVOCCs, forwarders or lessors.



BUYING CARGO EQUIPMENT

CONTAINERS CAN BE BOUGHT BUT IF USED FOR FREIGHT CARRIAGE MUST REMAIN IN SURVEY AND GOOD CONDITION: THIS IS A COST. MOST SHIPPERS OF FREIGHT USE CONTAINERS PROVIDED BY THE CARRIER OR HIRER FOR SHORT TERM USE ONLY.

A brand new TEU can be bought in China for about USD\$2,000.¹⁵³

15.4 What are the benefits?

Improved and more cost-effective access to cargo equipment offers Pilbara businesses the opportunity to enjoy the benefits of containerisation. It provides greater choice to Pilbara businesses in how their freight is managed and new options for accessing cargo services that are only available to businesses in metropolitan areas. Supply chains around the world for businesses large or small are designed, or re-designed, around the use of containers or other equipment.

16.0 Cold supply chain

Another feature of the Pilbara freight supply chain networks is the absence of significant cold storage facilities in the major townships. The cold supply chain network extends back to Perth with freight delivered daily by refrigerated trailers operated by the major cold chain hauliers such as CENTURION TOLL and SANDS. The townships rely on the major food retailers, COLES and TOWNSHIPS, and miscellaneous small outlets for freezer and chiller supplies. The camps supporting the industrial sites are operated by industrial caterers such as SODEXO and COMPASS and have their own refrigeration facilities as do the offshore platforms.

COLES and WOOLWORTHS each have their own highly specialised distribution networks specifically modelled for their businesses based around very large consolidation and warehousing facilities in Perth and the eastern states.

¹⁵³ QINGDAO RAYFORE CONTAINER INDUSTRY Co. Ltd, 2018.

Industry and the community therefore rely on extended cold supply chains extending 1,600 km back to Perth. This is a noticeable contrast with Darwin which is just as isolated and has substantial cold storage warehouse facilities in town including up to 2,000 m².

Beyond the supermarkets and camps cold storage facilities in the Pilbara are limited. For example, in Dampier, only the providers SEALANDS and SINWA LOGISTICS have independent cold stores at the Light Industrial Area and these are of modest size.

A direct liner shipping service from Singapore to the Pilbara would offer the opportunity for businesses to consider direct import of some refrigerated cargo. A large importer of processed foods advised AFD that if a direct shipping service were to be established then it would consider construction of a large cold store in the Pilbara.

17.0 Productivity

For any business there is an impact on costs in some way due to freight. Freight costs affect the delivery of virtually any service or the supply of any good. For some businesses, such as those operating in remote regions like the Pilbara, where virtually everything must be transported into the region, freight can be a significant part of business costs and sustainability. Our market contact included both the biggest companies and local SMEs.

In virtually every case, the efficiency of freight delivery and cost of freight was cited as a key factor for operations. Industry should speak for itself: the following written comments were part of the codified response from the AFD survey.¹⁵⁴

"Regular (weekly) general sea freight from Dampier to various global ports would improve productivity of their operations in the Pilbara."

"An intermodal facility at the airport would assist their operations in the Pilbara."

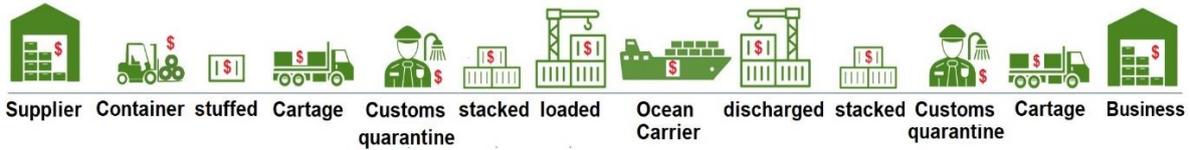
"We are currently looking at an opportunity to manufacture products in the Karratha Region and a seaborne freight option from the Pilbara could open up international markets for our products."

"More general daily deliveries to the area" would assist their operations in Dampier/Karratha."

"Container freight into Dampier direct from Singapore / Asia would be massively beneficial."

"Greater freight efficiency would mean: significant improvement in the cost competitiveness of manufacturing, ability to locally import raw materials for processing, much more cost competitive raw materials."

¹⁵⁴ AFD online survey with Pilbara business conducted November-December 2018.



\$ EVERY ADDITIONAL STEP TO MOVE FREIGHT FROM THE SUPPLIER TO THE BUYER ADDS COST

Asia via Melbourne



8+ more steps than direct service

Asia via Fremantle



4+ more steps than direct service



Singapore to Pilbara direct saves freight distance

Ex-Asia via Fremantle: 3,200 km longer
Ex-North Asia via Melbourne: 8,000 km longer



The shortest supply chains to Asian suppliers and trans-shipment ports (connecting to North America and Europe), whether by air or sea, improve inventory management, costs and supplier options for Pilbara business.



More containerisation and a reduction in logistics actors means less chance of breakage. This directly assists the quality assurance of business service delivery.



A reliable schedule around which supply chains can be designed improves timeliness of business service delivery schedules and allows reductions in inventory requirements and costs. It also improves business supplier options.



Fewer logistics actors means less chance of wrong delivery or missing freight. This is a positive for the quality assurance of business service delivery.

17.1 Comparative freight delivery supply chains

The movement of freight into the Pilbara can originate from the other side of the globe and involve many differences in how the freight is delivered. Factors include the nature of the goods, the dimensions, required schedule, packaging, handling requirements, whether it is temperature

controlled, and so on. The following are some simple examples to demonstrate some of the relative complexity and cost of different pathways freight may take to get to the Pilbara. The rates shown are indicative of real costs¹⁵⁵ at December 2018¹⁵⁶. The costs for a new direct service have been developed from AFD modelling.¹⁵⁷

¹⁵⁵ The charges do not include any additional customs, quarantine or other charges that might apply to individual freight.

The charges do not reflect discounts that might apply for large scale shippers.

¹⁵⁶ For Australian sector charges GST would be added for a real transaction

¹⁵⁷ AFD developed modelling for this report, 2018.

Example 1: Consignment of heavy container Singapore to Karratha via Fremantle

Container transported to Karratha
Container returned to Fremantle.



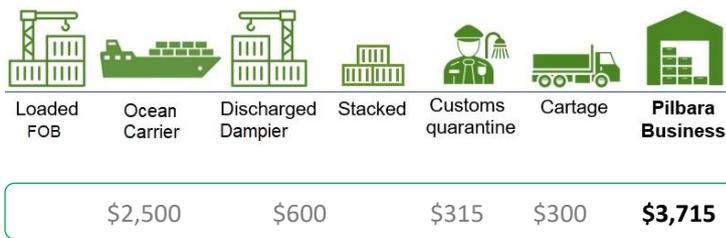
FOB Singapore: TEU container. Tare = 2.40 t, freight 21.60 t, **gross mass 24 tonnes**



Pilbara business cost = **\$7,465**



FOB Singapore: TEU container. Tare = 2.40 t, freight 21.60 t, **gross mass 24 tonnes**



Pilbara business saves **\$3,750 or 50%**

Example 1 shows the benefit of a direct service to Dampier by sea and introducing liner-type containerisation. In this case, a heavy container shipment requires, and is charged for, a full trailer from Perth. For the direct service the container is off-hired locally at Karratha to the carrier’s agent. A side-lifter is used to deliver the container. The liner rates are slot rates in both cases.

Example 2: Consignment of lighter container Singapore to Karratha via Fremantle

Container transported to Karratha business.

Container returned to Fremantle.



In example 2, the lighter container incurs a lower charge from Perth because half the remaining capacity of trailer can be used by the haulier for freight. Both liner carrier rates are slot rates.

The Pilbara business *may* be able to arrange back-load for the container to Perth further reducing costs. Not all business operations, however, are able to do this and back-haul to Perth across the freight industry has been assessed at 30 per cent. A container provided by an ocean carrier or NVOCC can have demurrage charges as high as \$150 per day once the free use period is completed. This is a risk for a Pilbara business where the freight must be moved over an extended distance from the Port of Fremantle.

The direct service allows for a much greater use of the container by the shipper at their premises during the free-use period and with less risk. Depending on the scale of the direct liner business there may be only a nominal fee for container collection: at the most the indicated cartage fee.

Apart from the reduced freight cost the direct service offers both a shorter freight delivery time and the option of direct and easy access to ocean carrier containers and cargo equipment.

Example 3: Consignment Singapore to Karratha

By container Singapore to Fremantle.
 Container off-hired at Fremantle.
 Freight consolidated for road-haul to Karratha.



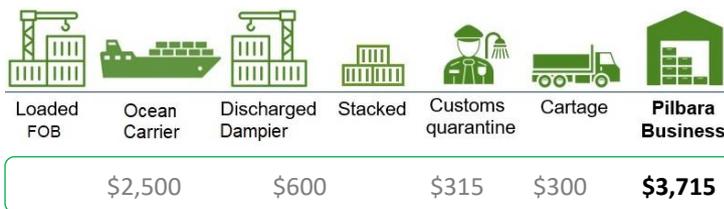
FOB Singapore: TEU container. Tare = 2.40 t, freight 21.60 t, gross mass 24 tonnes



Pilbara business cost = **\$7,590**



FOB Singapore: TEU container. Tare = 2.40 t, freight 21.60 t, gross mass 24 tonnes



Pilbara business saves **\$3,875 or 51%**

In example 3, the international freight is de-consolidated from the ocean carrier’s container and the container is off-hired at Fremantle within the free-use period. The Pilbara shipper has the extra cost of the consolidation of the freight into a shipment ready for road-haul. This process might be relatively simple if the sea container was packed with pallets or other unitised form. It might also be more complex if the freight is loose and needs to be further packaged for road-haul, located on pallets or split between Perth inventory and consignment. The costs of some of these de-consolidation, re-consolidation and preparation stages may be ‘disguised’ in the supply chain depending on the terms of shipment. For example, a free into site delivery for the Pilbara business may be arranged by a supplier so the receiving business has limited oversight, control or even interest in the delivery process provided the freight arrives. The cost of the freight process still must be covered and ultimately paid for by the business, its consumers and the region.

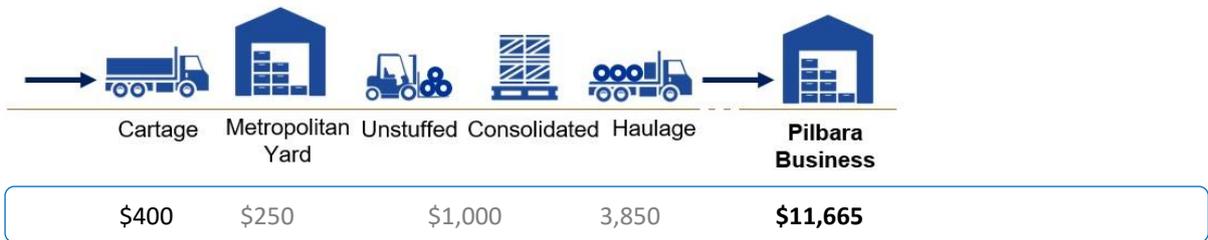
A direct liner service to the Pilbara can reduce the number of steps where freight is handled. Singapore may not be the port where the freight originates but it is the world’s leading trans-shipment port. Freight is often transhipped the same day, sometimes within a few hours. On arrival in Dampier the shipper can view the arrival of the freight at the port and have prompt delivery into store. This would be the case for LCL shipments as well.

Example 4: Consignment Guangzhou to Karratha

By container Shanghai to Perth via Melbourne.
 Container off-hired at Perth.
 Freight consolidated for road-haul to Karratha.



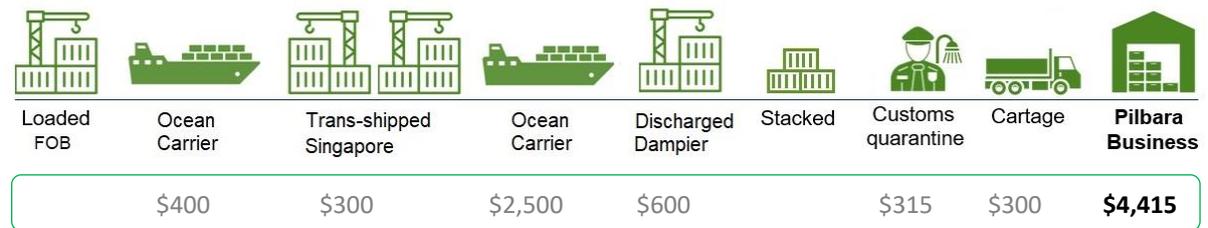
FOB Guangzhou: TEU container. Tare = 2.40 t, freight 12.60 t, gross mass 15 tonnes



Pilbara business cost = **\$11,665**



FOB Guangzhou: TEU container. Tare = 2.40 t, freight 21.60 t, gross mass 24 tonnes



Pilbara business saves **\$7,250 or 62%**

18.0 Marine Operating Case

A top ten global logistics firm providing forwarding services to leading energy resource exporters in the northwest of Australia has expressed interest in the prospect of direct marine freight services from Singapore to Karratha and perhaps other regional Asian destinations as well. They also consider that there are considerable logistics efficiencies to be gained for its clients in the oil and gas industry and other service industries if the appropriate direct marine freight link can be established.

18.1 Background

A direct liner shipping service can be facilitated for the Pilbara over Dampier with the option of calls at Port Hedland. A logical connection is with Singapore - the world's greatest trans-shipment hub. The study has identified considerable underlying demand for the establishment of a niche liner service that would complement the existing supply chains over Perth.

The market contact for this report provided an indication from local Pilbara companies on their prospective use of a direct liner service between Dampier and Singapore. The table above shows indicative TEU container numbers from a sample of businesses. The sample is a small representation of the overall number of businesses in Karratha alone. Additional interest has been shown in calls at Port Hedland and Broome.

The development of a direct service should benefit the entire Pilbara region and the northwest of the state. The development and growth of the service might include calls at several Pilbara ports and possibly Broome. That will be up to the final operators of the service to determine.

Dampier is proposed as the initial point of business development for the new service because it offers some advantages.

- Dampier is the largest general cargo port in the Pilbara;
- As the oil and gas hub of the northwest Dampier offers an additional element of freight interest and demand. Dampier is the site of one of the nation's premier LNG processing facilities and together with infrastructure at Ashburton and Barrow Island forms one of the world's largest LNG hubs. Dampier has the largest oil and gas supply bases in the northwest and an aggregate of industrial services in Karratha;
- Dampier has a unique mix of freight demand from different industries: oil and gas, mining, downstream gas processing, industrial supply, recycling as well as the community;
- Dampier has very large industrial operators that are reliant on the port and will benefit from direct shipping service opportunities;
- The Dampier/Karratha population is the largest for a Pilbara township;
- Dampier is well positioned geographically in the Pilbara. Cartage and road-haul links from the direct service can extend east to Cape Lambert and Port Hedland, inland to Newman and Tom Price, and south to Pannawonica, Paraburdoo and Onslow;
- The Dampier general cargo facilities have direct access to the national highway system unencumbered by mine export or oil and gas export infrastructure.

- Large scale industrial land sites suitable for cargo terminal operations are located within easy road distance direct from the port;
- Dampier has multiple channel access for a shallower draught cargo ship;
- The port has sheltered anchorages; and,
- Dampier has a unique RORO facility to support a direct RORO service to Singapore.

18.2 Demand

AFD market contact 2018 – marine freight aggregation sample ¹⁵⁸		
Company operations	Freight	TEU equivalents per month
Forwarding and industrial logistics	Drill pipe and spares	17
Recycler	Metal/rubber/plastics	40
Freight logistics	Industrial spares and equipment	20
Freight logistics	Muds	20
Construction materials	Civil works construction materials	40
Freight logistics	Lubes	10
Freight logistics	Industrial consumables	20
Freight logistics	Chemicals	20
Freight logistics	Industrial spares and equipment	10
General trader/importer	Tyres	10
Engineering services	Steel/industrial consumables	8
Recycler	Metal	40
Engineering services	Steel/industrial consumables	6
Landscaping and plant supply	Landscaping materials and ornaments	0.5
Forwarding and industrial logistics	Drill pipe/chemicals/muds/spares/equipment	20
Resource producer/exporter	Agricultural products	20
Industrial consumables and food	Industrial consumables/equipment/food	32
Resource producer/exporter	Industrial consumables/equipment	100
Building services	Building materials/sand/stone	1
General trader	Mining products	100-200
	Identified from market contact sample	534.5-634.5
	Indicative per fortnight	267-317

Table 21: AFD market contact – TEU container and TEU equivalent freight aggregation

18.3 Liner service versus regular service

Congestion at the main ports of Dampier and Port Hedland during higher activity levels have meant previous marine freight services that have routinely called at the northwest suffered substantial delays. This report suggests that a pure liner service be developed that enables a forward schedule to be published and relied upon. A liner service will enable the Pilbara shippers large or small to develop new supply chains around the reliable shipping service to improve business sustainability.

¹⁵⁸ AFD market contact conducted at the Pilbara and Perth, November - December 2018.

18.4 Open booking versus Take or Pay

In AFD experience, a take or pay expectation can be a disincentive for business development where large potential customers are requested to make commitments to underwrite a freight service by paying for slots that they may or may not use. These arrangements are intended to de-risk the development of the service by the carrier and lock in key customers. Large liner cargo shipping services often seek to lock in key customers to ensure an on-going minimum utilisation of freight capacity.

Some pre-booked space may prove necessary for the establishment and viability of the service. The study suggests however that significant capacity in the service should be offered as a common carrier to businesses large and small. There is no doubt that freight provided by the major resource exporters, being the largest businesses in the Pilbara, would be most welcome and valuable. We suggest, however, that the booking system should be open to all Pilbara businesses regardless of size. This arrangement enables small to medium-sized enterprises to routinely book space.

18.5 Route structure

It is recommended that the route structure be direct Singapore to Dampier with a call at Port Hedland (if berth space and cargo is available). Broome is also an option but the tidal and operational constraints at the wharf will need to be carefully planned for if a proper liner schedule is to be maintained. A service that includes calls to the Australian Indian Ocean Island possessions will not work due to operational constraints in heavy swell conditions. Triangulation over Darwin would extend the schedule - Darwin is over 1400 nautical miles steaming from Dampier – so impacting on the regularity of service for Pilbara shippers. Darwin is already serviced by direct shipping links to Singapore.

18.6 Schedule

This report suggests that a fortnightly service schedule into Dampier would be practicable for the initial service development phase. A fortnightly voyage cycle is achievable for a cargo ship operating at conventional service speeds of 13 to 14 knots to operate between Dampier and Singapore. Market contact during the study affirmed the general acceptance in industry of a fortnightly schedule.

Cyclone deviations and adjustments to the shipping schedule will be necessary from time to time. In AFD experience, schedule impacts will ordinarily be from one to two weeks per year and impact the operations of the entire region so there should be no net impact specific to the service.

18.7 Scope of service

It is suggested a RORO vessel of around 300 TEU is proposed for the niche, direct service. The economics of a vessel this size will work over the voyage length between Dampier and Singapore if there is commitment to the import sector of 200 to 250 containers at the higher import freight rate and backloading of some freight at the lower return freight rate. The vessel will be able to offer 600 TEUs, or the break-bulk equivalent, inbound per month and the same capacity outbound. Initiating

the service with a smaller vessel of this size should provide enough initial interest and capacity that can be expanded over time.

18.8 Marine infrastructure

Dampier

The current common user infrastructure available at the Port of Dampier suitable for general cargo operations is the Dampier Cargo Wharf or DCW. The wharf can be used to unload most general freight that would be expected in a liner service. The wharf accepts vessels of less than 35,000 tonnes displacement and is just under 210 metres in length.¹⁵⁹

There are two licensed stevedores, QUBE PORTS and LINKS CARGO CARE, that operate at the DCW.

At Dampier the FDTS facility is available for RORO operations. A smaller RORO cargo vessel can operate direct liner services to Singapore from this facility including container services. The use of this facility is proposed for the direct service as it can be routinely accessed without delay to the ship.

The FDTS facility also supports, and has been used for, the option of trans-shipment by barge from a cargo vessel at a port anchorage.

The FDTS facility has been used by vessels of up to 140 metres in length and 17,000 tonnes displacement.

Port Hedland

Port Hedland has three multi-user general cargo berths however two berths are also used to handle bulk products. The wharf decks are narrow and accessed to the hardstand by ramps. This can be a constraint for some general cargo operations.

The berth commonly used for general cargo operations, PH2, has a preferred maximum vessel length of 130 metres and a displacement limit of 40,000 tonnes.¹⁶⁰

The Port Hedland facility does have the advantage of an adjacent hard stand area for stacking cargo. For general cargo operations a service to Port Hedland would rely on ship's cranes for LOTO operations.

At Port Hedland QUBE PORTS is the licensed stevedore.

18.81 Dampier Cargo Wharf

The DCW is a conventional suspended deck wharf structure connected by a ramp to the lower MOF road area. The wharf provides critical common user access for shippers to the region. The wharf supports two quite different supply chains. The first is the charter of general cargo ships by the large

¹⁵⁹ PPA website, 2018.

¹⁶⁰ PPA website, 2018.

resource companies to import mining consumables, construction equipment, rolling stock and railway equipment. The same types of ships are used to export bulk shipments of steel scrap.

The second supply chain is the loading and unloading of the Offshore Supply Vessels that carry stores, consumables and spares between Dampier and the offshore oil and gas platforms.

18.82 Dampier FDTS berth

The Dampier FDTS berth is a 5-year old, \$35 million RORO and barge dock infrastructure that was initially constructed to receive giant modular cargo for the expansion of the YARA TAN plant. The berth face is 50 metres wide and can receive and has handled large modular transport ships and other specialised broad beam RORO vessels (see figure 19). The report writer has directly operated very large barges into the facility for project RORO cargo for the oil and gas industry. The barges have been used for trans-shipment operations within the port.



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Figure 18: Heavy RORO cargo discharged from a trans-shipment barge at the FDTS berth

The RORO berth face is adjustable to accommodate different types and sizes of vessel RORO ramps as well as portable ramp sections kept on site. The berth face has supported individual cargo loads of up to 3,000 tonnes and operations have been modelled for cargo loads of up to 4,500 tonnes.

The RORO berth backs onto a 1-hectare sealed site with a UDL of 100 kPa allowing multiple TEU container stacking. The current stevedoring equipment on site can handle 3 high TEU container stacks

¹⁶¹ Courtesy of QUBE PORTS

with space available for 200 plus containers and a quarantine wash-down bay. FEU containers can also be handled.



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Figure 19: Giant RORO cargo discharged at the FDTs berth.



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Figure 20: FDTs RORO berth and lay-down area in the background

¹⁶² Courtesy of QUBE PORTS

¹⁶³ Courtesy of QUBE PORTS

The FDTS berth pocket has received ships of up to 140 metres in length and 50 metres in beam (the RORO vessel shown in figure 18 at the FDTS berth is 135 metres in length and has a displacement of 17,000 tonnes.)

As shown in figure 19 the berth pocket is fitted with two large mooring dolphins spaced 50 metres apart that are engineered to provide safe breasting moorings for ships of up to 20,000 tonnes displacement. A buoyed anchor mooring is also located for long breast mooring lines.

The bathymetry at the FDTS berth is a declared depth of 5.10 metres¹⁶⁴. The mean sea level at the Port of Dampier is 2.70 metres¹⁶⁵. This means that the average depth of water at the FDTS berth pocket is 7.80 metres.

If an assumed average gross mass per TEU of 12 tonnes is used, then under the proposed model the RORO vessel attending the FDTS berth would have a cargo deadweight of 3,600 tonnes (300 TEU x 12 tonnes). This is a modest load in the general cargo trades – a vessel of the type shown in figure 17 has a draught of just 4.40 metres at a cargo deadweight of 3,600 tonnes.

The PPA apply a static under-keel clearance requirement of a minimum of 1 metre¹⁶⁶. At mean sea level this allows for a draught of 6.80 metres at the FDTS berth. This is more than an ample draught for a range of broad-beam RORO vessels up to a medium-size with a cargo deadweight of about 8,000 tonnes (around 650 TEU or TEU equivalents at 12 tonnes per TEU). If the vessel coincided with the neap tide range it could operate with a draught of 6.30 metres and satisfy the PPA under-keel clearance requirements. At 6.30 metres draught the study found:

1. A RORO carrier with a deadweight of 6,000 tonnes (500 TEU equivalents at 12 tonnes);
2. A RORO carrier with a deadweight of 8,000 tonnes (665 TEU equivalents at 12 tonnes);
3. A LOLO/RORO carrier with a deadweight of 6,000 tonnes;

A more specialised RORO design was examined with a deadweight of 10,000 tonnes on *5.3 metres draught*.

The FDTS facility is currently under private commercial lease from the PPA. The leaseholder has expressed a strong interest in facilitating the direct maritime service.

18.9 Constraints of the DCW facility at Dampier

The DCW was originally built as a private project wharf for the development of the North West Shelf oil and gas facilities. It was never designed for long-term use as a large volume, general cargo multi-user freight facility.

The DCW has provided critical logistics support for the development of Dampier but it's current use and configuration makes it unsuitable as a facility to support a pure liner service.

¹⁶⁴ Port of Dampier Handbook, PPA, review date 20/12/18.

¹⁶⁵ Australian National Tide Tables, AHO, 2018.

¹⁶⁶ Port of Dampier Handbook, PPA, review date 20/12/18.



Constraint of the DCW wharf deck:

The width of the wharf is restricted and there can be multiple shipping operations using the wharf. The port authority therefore does not allow the stacking or temporary lay-down of cargo – operations are crane to truck. Each truck must proceed out of the port gates to the shipper’s site. The wharf deck is also limited for heavier break-bulk cargo loads.

Opportunity:

The FDTs berth enables stacking and lay-down of cargo immediately after discharge and pre-positioning of cargo before loading. The ship is therefore not waiting for the extended movement of freight so the site acts as a ‘logistics shock absorber’. The FDTs site allows multiple container stacking.



Space constraint:

The DCW has no space close to the wharf that is by the port as a lay-down area. The ordinary practice is for the loaded truck to proceed out of the port area directly to the client or a temporary staging area.

Opportunity:

The FDTs site has a 1-hectare laydown area that can be used for container stacking and short term lay-down.



Stevedoring constraint:

DCW operations utilise crane to truck stevedoring methods for handling cargo. This can be a slow process in any port – it is exacerbated at Dampier by the limited numbers of trucks that can operate under the hook and the fact the trucks proceed out of the port gate with each load. The local stevedores are highly experienced with rigging lifts of break-bulk freight but the need to often change the lift due to different shapes and sizes of break-bulk can make for a slow operation. It is not unusual for a general cargo vessel to be alongside the DCW for four days.

Opportunity:

The use of a RORO stevedoring method at the FDTs means the proposed vessel can be turned around in 24 hours.



Berth congestion constraint:

The DCW can be busy with multiple operations or vessels can be delayed while alongside, causing other ships to wait. Delays can be extensive – this precludes the operation of a genuine liner service operating to a reliable, published schedule.

Opportunity:

The FDTS can provide immediate access to a liner cargo ship on arrival.



Quarantine constraint:

There are no quarantine approved premises to provide the necessary risk mitigation for the shipper of general freight on a scheduled service.

Opportunity:

An approved quarantine premises can be rapidly constructed at the FDTS site at a reasonable cost to the trade.



18.10 Proposed vessel types

For a niche, direct service to the Dampier FDTS berth, the vessel must be a RORO vessel. RORO operations can be used to achieve a high level of stevedoring efficiency and fast turnaround times at Dampier. If required, pontoon ramp sections can be located on the stern each time the vessel calls. The vessel can be handled by RORO or LOLO stevedoring method in Asia. In general, the RORO design works well for Dampier because it simplifies the stevedoring and handling task for break-bulk cargo.

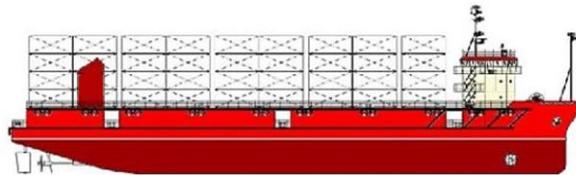


Figure 21: Small RORO vessel suitable for a mix of containers and break-bulk cargo

For Dampier Cargo Wharf operations, or trans-shipment operations, a vessel with offset cranes is required such as a medium-size MPP as shown in figure 21. This would be entirely a LOLO operation at Dampier and Asia. A vessel of this type could operate a regular, liner-type service with a high degree of schedule reliability *if* the trans-shipment methodology at Dampier is used as a back-up. Trans-shipment operations involving MPP vessels have been conducted in Port of Dampier waters for more than 30 years.

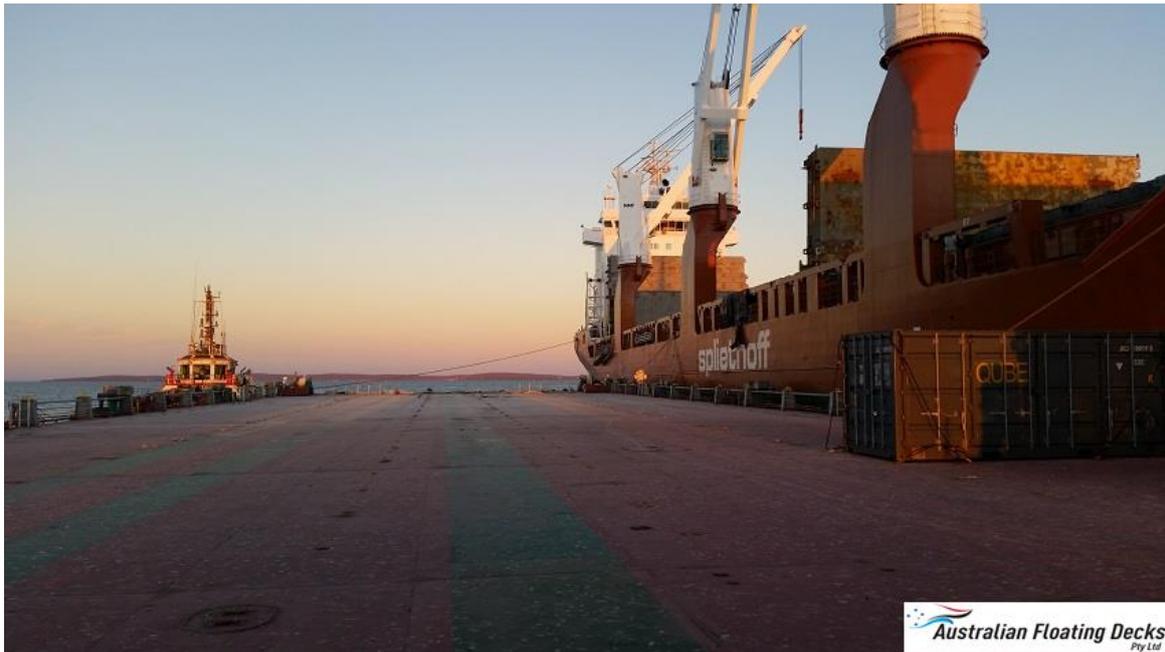


Figure 22: Large barge awaiting cargo trans-shipment from an MPP ship at a Dampier anchorage

18.11 Liner service barriers and opportunities



Barrier: A cargo liner needs access to a wharf facility *consistently on arrival* to maintain schedule. This has not been historically possible at Port Hedland or Dampier.

Opportunity: A direct smaller RORO operation into the existing FDTs site at Dampier can be operated as a liner service without any alterations required for the wharf infrastructure. If fitted with cranes, the same RORO vessel can also operate on inducement basis to Port Hedland (or Broome) using its gear to discharge at the general cargo berths.



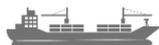
Barrier: A cargo liner needs access to stevedores on arrival at the berth, so the ship is not delayed.

Opportunity: Dampier and Port Hedland have licensed stevedores with handling equipment available.



Barrier: A cargo liner needs berth facilities of the right size and water depth to operate.

Opportunity: For a niche liner service based on direct RORO to Dampier, and using a broad beam design, the FDTs berth allows daily operations within limiting draught criteria. The FDTs berth has a hectare of lay-down area and, supported by other sites in Dampier and Karratha, can facilitate the liner trade including handling of heavy machinery and other large break-bulk cargo.



Barrier: The availability of trucks and cargo handling equipment needs to be adequate for the prompt turnaround of the ship.

Opportunity:

The Dampier FDTs site has adequate handling area for the cargo for each voyage. The import cargo can be progressively cleared and moved after the ship has sailed. In this way the FDTs area as a logistics “shock absorber” and does not delay the schedule. It works with the limited numbers of trucks available.



Barrier: The cycle times of trucks and other cargo handling equipment must be fast enough that the ship is not delayed. This has always been a constraint at the Dampier Cargo Wharf where cargo is handled onto trucks directly by the ship’s cranes which then progress to various sites outside of the port gates.

Opportunity: The Dampier FDTs site has the area to temporarily stack cargo for each voyage. There is no need for trucks to proceed directly out of the gates. The RORO stevedoring method is fast for both loading and discharge.



Barrier: Cargo must be presented and removed at the wharf side promptly to avoid delaying the ship. This has always been a constraint at the Dampier Cargo Wharf where cargo cannot be set down on the wharf deck due to its narrow section and light load limits.

Opportunity: The FDTs dock is designed for multi-thousand tonne modular shipments and has more than the required strength and area for general cargo operations.



Barrier: International liner cargo must be able to be landed at the port and not wait for pre-clearance of the freight. Further customs approval in the form of an ‘Cargo Terminal Operator’ approval for the FDTs berth and handling area could be required for the temporary lay-down of cargo awaiting clearance.

Opportunity: The FDTs berth and laydown area is within the Landside Restricted Zone of the Port of Dampier and is therefore already subject to security controls. The adaption of the site to meet ‘Cargo Terminal Operator’ requirements is readily achievable.



Barrier: For international cargo there needs to be quarantine compliance and risk mitigation.

Opportunity: The FDTS facility can be fitted with an approved quarantine wash-down facility to enable international cargo. A major logistics company has indicated interest in providing an approved wash-down facility for the proposed trade.



Barrier: A liner service cannot operate without cargo equipment efficiently cycled through the freight system for shippers.

Opportunity: Development of the direct cargo service establishes an economic and operational case for cycling containers cargo equipment into the Pilbara.

18.12 Marine operations model

RORO



A small RORO general cargo ship can offer a mixture of break-bulk and container cargo capacity. Stevedoring the RORO vessel at Dampier should be able to achieve 15 TEUs per hour. Break-bulk will also be rolled on and off using forklifts, top-lifters, side-lifters, conventional road trailers and the option of MAFI equipment. Heavy or oversize break-bulk will be able to be handled on multi-axle trailer equipment.

The RORO vessel would be expected to take 24 hours at Dampier for a complete cargo exchange. A similar turnaround time is anticipated at Singapore. Allowing for two days for stevedoring, a day for waiting times and manoeuvring and allowance of one day for schedule slippage, the RORO operation can operate a fortnightly service. *If* the vessel is also fitted with cranes, then the schedule design might also incorporate regular calls to Port Hedland (or Broome). It might also incorporate other Asian ports, such as Johor Bahru, as an alternative to Singapore.

The operation of the RORO vessel to the FDTS berth is efficient as there should be no port delays. There will be no competing use for the FDTS facility that will block access for the liner vessel.

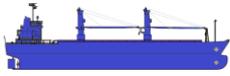
Trans-shipment operations

A potential operation is to utilise a large barge that receives the quarter ramp door of a RORO ship. Cargo is then exchanged by RORO between the barge and the ship and when ready the barge proceeds to the FDTS RORO berth. An option that has been considered is to berth the RORO vessel at the under-utilised Dampier bulk liquids berth and then moor the barge alongside the ship. On completion of cargo the barge is required to move only a short distance to the FDTS berth.

The disadvantage of this operation is the additional cost of the barge and cargo handling. Over a significant cargo shipment however the cost per tonne decreases and the overall liner rate might still be competitive for a direct service. Considerable operations design work has been undertaken for this system, but it has not yet been tried in practice.

The advantage is that the largest liner RORO ships can be operated to the port and with global service connections.

LOLO



Operations at the DCW

The use of a small MPP vessel in the trade allows access to the existing multi-user facilities at Dampier, Port Hedland (and Broome). From a technical perspective berthing at the DCW western berth face is routine. Stevedoring and handling rates are, however, much slower than RORO operations. Container handling rates should be at around 6 TEUs per hour and break-bulk rates will vary greatly because of differences in cargo size, configuration and lifting requirements. A full cargo exchange at the DCW could take up to three days. At Singapore, LOLO handling rates could be expected to be around 20 TEU per hour.

Aside from the slow stevedoring and handling rates at the DCW there is also the issue of berth congestion and the first past the post system means that the MPP cargo vessel can get caught behind another vessel that has extended time at the DCW. A pure liner service cannot operate consistently off such a facility if it is to maintain a reliable schedule. Operations over the last 30 years at this facility have repeatedly proved this point.

Trans-shipment operations

The FDTs RORO berth is designed to receive very large barges that can attend large cargo ships at designated trans-shipment anchorages in the port. The operations model gets around the constraints of the DCW by carrying cargo directly between the sheltered anchorage and the FDTs facility where it can be discharged without delay. Cargo can be moved rapidly on and off the barge by RORO stevedoring. Figure 17 shows this methodology. The system has been used multiple times for project cargo over the past four years, particularly for the oil and gas industry. Large barge equipment is available in the Dampier region for this work.

At the anchorage the cargo transfer can be by LOLO operations, as shown in figure 21, where an MPP-type vessel works cargo using the ship's cranes. A large barge can have a capacity of 300 TEU containers and a deck area of 3,000 m². This size enables discharged cargo to be stacked around the barge in large quantities before the barge is moved to the shore facility, so it is a considerably faster operation than stevedoring at the DCW. The trans-shipment operation using a LOLO system can achieve a turnaround for the required cargo scope in 1.5 days.

Trans-shipment systems for general cargo are a long-established methodology in many major ports around the world. This includes Hong Kong, the fifth largest container port in the world, which has very large and expanding barge trans-shipment systems.

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¹⁶⁷ 'How Hong Kong's port can stay competitive...' South China Morning Post, September 1, 2018.

The disadvantage of LOLO trans-shipment is that it adds an extra component of cost to the cargo system, compared to the RORO model, because of the barge expense and further cargo handling. The cost per TEU (or TEU equivalent) is however reduced as the size of the freight task grows. The overall liner freight rate could therefore still be competitive for a direct service marine model.

The advantage of the LOLO trans-shipment is that it can be used with a wide variety of geared general cargo vessels and avoids the DCW constraints.

18.13 Marine freight rates

The assessment of the trade costs by AFD (based on a small RORO direct service between Dampier and Singapore) suggest the following TEU retail slot rates:



Inbound: A\$2,500 per TEU plus \$915 handling/clearance Dampier plus local cartage \$300.

Rates are free out of terminal Singapore.



Outbound: A\$1,500 per TEU plus \$915 handling/clearance Dampier plus local cartage \$300.

Rates are free into Singapore terminal.

18.14 Customs and quarantine requirements

Cargo Terminal Operator

The FDTS RORO berth and lay-down area are within the port Landside Restricted Zone and therefore subject to the ISPS controls that apply to the port. This means that the berth and its land-side area are already subject to formal security regulations.

International cargo is routinely received at the adjacent Dampier Cargo Wharf (the accessway to the wharf forms a contiguous area with the FDTS site – with no fencing). The cargo is pre-cleared and is not stacked within the wharf gates but taken straight from the ship to site.

For the proposed liner shipping operation, freight will be stacked at the FDTS site. It may or may not be pre-cleared and could therefore be customs-controlled cargo while it is in the stack. To ensure compliance the FDTS licensee would apply for CTO approval from customs. If the trade scale warranted it a further CTO site would be sought outside the port gates and probably at Gap Ridge.

Quarantine

An approved quarantine wash-down bay will be required for the general freight that the liner service will bring in. The facilities have been routinely set up at Dampier as temporary facilities for various projects. A quarantine wash-down facility can be established at the site and can be funded from the trade.

18.15 Trade scale and future infrastructure

The report considers that the current port infrastructure at Dampier can accommodate a considerable growth in the scale of trade for liner freight without further modification. The study recommends that for the initial development of the direct service and the development of further scale there is optimisation of existing facilities.

Increasing the trade scale beyond the initial trade scope will eventually require further space for stacking the containers or laying down the break-bulk cargo after discharge and before loading. Further CTO sites can be located outside of the port gates to cater for larger freight shipments. CTO sites could be located at locations such as Gap Ridge or King Bay.

The freight task for the initial liner service, if fully utilised, would be around 20,000 tonnes per month based on 1,200 TEUs or TEU equivalents at an average of 16 tonnes per container. This equates to about a 4% change in the overall Pilbara freight task. This freight can be readily handled by the FDTs RORO berth and lay-down area. Further growth in the trade can be accommodated, if supported by an additional CTO site at King Bay or Karratha. The trade could be increased to 30,000 – 40,000 tonnes per month. The study conferred with one of Australia's largest logistics companies on the handling of this throughput. A freight flow of 40,000 tonnes a month represents an 8% change in the Pilbara freight task and a very considerable change from the current situation. This goal can be achieved using the current infrastructure.

Beyond this scope of freight, further infrastructure could then be justified to allow a larger scale trade development with potentially a full-size RORO service. RORO would be recommended for any future development of wharf infrastructure because of its suitability for efficient break-bulk and containerised/unitised freight.

19.0 Aviation Operating Case

19.1 Background

A strategy to improve the connectivity of the Pilbara must consider the current situation of aviation services and particularly aviation freight services. Just as with the marine freight task the logic of having a direct air connection to Asia seems strong given the remoteness of the Pilbara, the size of its freight task and the extended length of its freight supply chains. Air freight, though very important to the Pilbara, remains bound to the Perth logistics hub. Much air freight becomes road freight when it departs Perth. Some Pilbara air freight can only enter Australia via Sydney or Melbourne.

The reliance on intermodal air-land logistics over Perth may work for some supply chains. A representative from one of Australia's largest freight forwarders suggested Perth airport was very well serviced by air freight services.

A contrary view based on specific Pilbara requirements was expressed by two independent specialist forwarders for large resource exporters in the Pilbara. Their observation was that an absence of dedicated, wide-bodied freighter aircraft into Perth added significant cost and constraint to their business because oversize freight could not be carried by the scheduled airliners. In their respective cases fortnightly air freight shipments are being made to Sydney by scheduled freighter aircraft, trucked or railed to Perth and then onto the Pilbara by truck.

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19.2 Air freight rates

19.21 International

Air freight imports are primarily higher value merchandise products, reflecting the structure of the Australian economy, with its heavy reliance on primary resource production. The mean air freight value for Australia's international trade averaged \$130,000 per tonne in 2017.



The air freight capacity entering Australia is utilised by imported freight and commands a higher freight rate of US\$4-5 per kilogram¹⁶⁹ (A\$5.30 to 6.70) into Australia's major cities. We were advised in our market contact with a global aircraft charterer that in terms of the international freighter aircraft coming to Australia the capacity is fundamentally paid for by imports. In a similar manner to the way domestic road haul works in the Pilbara, departing freighter aircraft have spare capacity that can be offered at a lower cost back-haul rate. Export air freight rates from the major capital cities, including Perth, can be as low as US\$1.00 per kg (A\$1.33)¹⁷⁰.

¹⁶⁸ AFD market contact, 2018.

¹⁶⁹ Air Charter Service, Sydney, 2018 & AFD market review, 2018.

¹⁷⁰ Air Charter Service, Sydney, 2018 & AFD market review, 2018.

19.22 Domestic



Air freight rates to the Pilbara from Perth can vary considerably according to the weight and dimensions of the freight and the service priority that is required. The more economical rates with delivery times of up to two days range as low as \$10.00 per kg whereas the faster services may cost \$15 to \$25 per kg or higher. A leading freight forwarder for a major Pilbara resource producer indicated charge rates of \$52 per kg for ‘next flight’ service. In some cases where absolute priority is required the existing air freight service may charge much higher rates.

19.3 Operations models

A series of operational models are considered for a direct freight service from Singapore to Karratha.



A freight service using a B767-300F with 54 tonnes of freight capacity.



A direct freight service using a B737-300F with 16 tonnes of freight capacity.



A direct passenger service using a B737-800 from Singapore with 3 tonnes of freight.

In each case it is assumed that a single return service per week is operated.

Singapore is used in the models as an example of a destination within ready flying range of the type of jet aircraft that can operate from Karratha Airport and as an example of a strategic destination in Asia that provides global intermodal connections and access to Asian suppliers.

A top ten global logistics firm providing forwarding services to leading energy resource exporters in the northwest of Australia has expressed interest in the prospect of direct air freight services from Singapore to Karratha and perhaps other regional Asian destinations as well. They also consider that there are considerable logistics efficiencies to be gained for its clients in the oil and gas industry and other service industries if the appropriate direct air freight link can be established.

The Boeing aircraft are used in the models as they are commonly used in Australia and on regional international services to Australia. Boeing aircraft are operated by both QANTAS and VIRGIN in Australian service and 737 freighter aircraft are operated by TOLL and QANTAS FREIGHT. It is

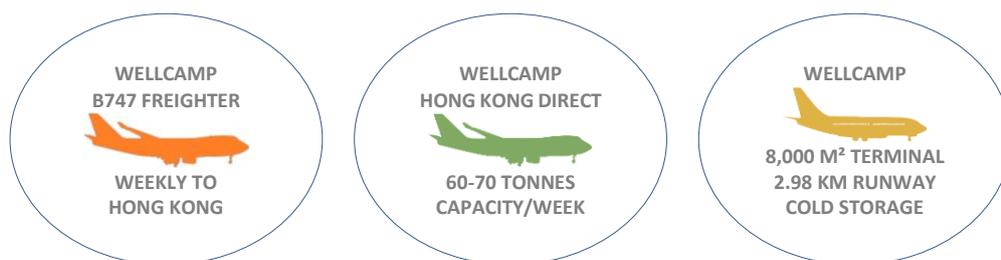
recognised that there are other aircraft types that might be used, particularly for the mixed passenger/freight model. The largest of the aircraft, the B767F, can operate from either Port Hedland or Karratha airports.¹⁷¹

19.31 Toowoomba Wellcamp

The Wellcamp airport at Toowoomba in Queensland is located 150 km west of Brisbane. It is an international airport handling both freight and passengers and includes a training base operated by QANTAS. This report suggests that the development experience of Wellcamp airport may have useful bearing on both current and future options for direct air freight services into Karratha. ‘The privately owned and operated Toowoomba Wellcamp Airport presents a new model for air freight in Australia.’

¹⁷²

Wellcamp is Australia’s largest airport development since the opening of Tullamarine in 1970. The airport has an 8,000 square metre terminal and handles Boeing B747-8F wide-bodied freighter aircraft.¹⁷³ Wellcamp has handled international charters of passenger flights including Airbus A330 passenger charters direct to China but is not yet operating international passenger flights. The airport handled almost 143,000 passengers in 2017¹⁷⁴, and 68¹⁷⁵ domestic passenger flights per week.



Wellcamp has been successful in attracting an international air freight service: a CATHAY PACIFIC B747-8F freighter aircraft operates a direct weekly service to Hong Kong with a capacity for 60-70 tonnes of freight.¹⁷⁶ This service has included the air freight of live animals. Wellcamp management advised AFD that the weekly service includes about 30 tonnes of chilled and frozen beef plus nuts, mangoes, chickens and some mining industry freight. To support this trade, Wellcamp has cold storage at the airport. The Wellcamp management advised the cold storage area is about 150 m² and able to store 18 PMCs.

The direct freight service utilises a freighter that initially calls at Melbourne from Asia with merchandise imports. The cost recovery for the return operation of large freighter aircraft from Asia to Sydney and Melbourne is mostly predicated on the imported freight sector.¹⁷⁷ The excess capacity on the return flight to Asia can be offered at a lower freight rate. This has made it possible for a

¹⁷¹ Karratha Airport Management, 2018.

¹⁷² Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018).

¹⁷³ The Weekly Times, 23 March 2017.

¹⁷⁴ Department of Infrastructure, Regional Development and Cities, Airport Traffic Data 1985-2017.

¹⁷⁵ The Weekly Times, 23 March 2017.

¹⁷⁶ The Weekly Times, 23 March 2017.

¹⁷⁷ Air Charter Service, Sydney, 2018.

freighter to fly from Melbourne to Hong Kong via Toowoomba and pick up agricultural exports for a lower freight rate. This triangular route structure is a win-win for the exporters and the carrier. The exporters can ship freight out to their markets at competitive freight rates and the carrier makes additional revenue on a sector that might otherwise be under-utilised. Triangulation in this report refers to this process.

Aside from at Toowoomba, other Australian exporters are utilising the lower cost back-haul air freight rates. 'Anecdotally, substantial volumes of fruit and vegetables are trucked to Brisbane, Adelaide and Melbourne, taking advantage of competitive trucking back haul rates, for subsequent air freighting to Southeast Asia (together with domestic capital city use).'¹⁷⁸

It is notable that Wellcamp airport is not a significant geographic deviation for a freighter returning from Melbourne to Hong Kong.

19.32 Asia – Perth freight service triangulation

AFD's contact with industry has included some of the largest logistics and forwarding companies operating in the region. These companies have major resource exporters as clients but also deal in other trades such as the export of perishables. Interest has been expressed by a top ten logistics operator in a triangulation route from Asia to Perth via Karratha. This route structure could be of a similar configuration to that operated through Wellcamp. Such a route would require a larger, wide-bodied aircraft such as a Boeing 767-300F.

If Singapore is used as the Asian main port, then the geographic deviation of the aircraft calling at Karratha from Perth is only several hundred kilometres compared to Perth to Singapore direct. For the direct service, Karratha is currently considered an alternate airport in the event of an emergency.

The comparison with Wellcamp is useful when considering logistics options for the development of new agricultural and fisheries industries in the Pilbara. The development of exports in live sea food, oysters, horticultural products, beef and goats would be facilitated by the triangulation out of Perth in the same way that the Darling Downs has been successful with its agricultural and pastoral exports. It is notable that, 'Just over \$1 billion worth of seafood (fish, crustaceans, molluscs and preparations thereof) were exported from Australia in 2016. Of this, almost half was exported from Western Australia, with Vietnam being the major overseas market.'¹⁷⁹ Prima facie, the prospects for developing a live seafood export industry in the Pilbara would be greatly facilitated if the freighter service can be developed.

An advantage of the route structure over Perth would be that it would re-introduce a wide-bodied freighter service into Perth airport as an option for merchandise importers. This would include key suppliers for Pilbara operations who are based in the metropolitan area.

¹⁷⁸ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018).

¹⁷⁹ Department of Infrastructure, Regional Development and Cities, Inquiry into National Freight and Supply Chain Priorities, Supporting paper No. 1, Air freight, March 2018.

The service would also offer an option for exporters of seafood and agricultural products from Perth and possibly some synergy with regional agricultural export development proposals such as in the Busselton region.

The Wellcamp business model for agricultural export works because the freighter aircraft to Melbourne is utilised for merchandise imports. A similar configuration over Perth would also require the freighter aircraft to have a high utilisation for imports.

Further requirements at Karratha or Port Hedland airports would include: cold storage for perishables to ensure integrity of the cold chain; various customs, quarantine and agriculture permits for the export of perishables; and appropriate ground handling equipment.

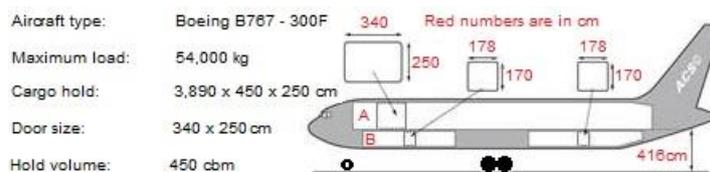
19.33 Operation of a Boeing 767 – 300F



The Boeing B767-300F is a wide-bodied freighter aircraft that can operate from Singapore or other near Asian airport into the Pilbara with about 50 tonnes of air freight capacity by mass and 438.5 m³ by volume. Freighter aircraft of this type, which are based on airliner designs, utilise standardised cargo equipment to carry freight. This cargo equipment, known as ULDs, includes containers and pallets of various sizes. The equipment range includes refrigerated units, dangerous good units and stalls for live animals.



Figure 23: Boeing B767-300F cargo aircraft



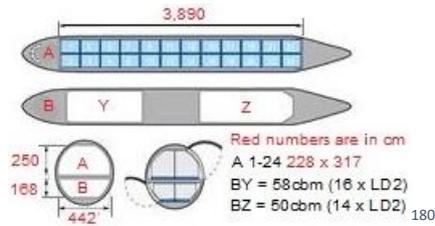


Figure 24: Boeing B767-300F cargo hold dimensions



Figure 25: Boeing 767F cargo hold

The current Pilbara air-freight services are mostly unloaded manually: freighters such as the B767-300F however require ground handling equipment. This equipment is not currently available at Karratha.

The required ground handling equipment would include tractors and dolly trailers for moving the ULDs, and a ULD unloader. Port Hedland airport already has facility for handling international freight. At Karratha airport there are cargo sheds that might be used for receipt and despatch of general freight with some possible modifications to suit customs and security requirements. For perishable product trades a small cold store would have to be constructed at the airport. This was the experience at Wellcamp.



¹⁸⁰ Air Charter Service, Sydney, 2018.



Figure 26: ULD equipment

The estimate for operating this aircraft on a return flight from Singapore to Karratha once per week is US\$189,000¹⁸¹. This price includes the build and break of freight at Singapore. At a 50,000 kg southbound payload this equates to US\$3.78 per kilogram if: (i) the entire cost recovery of the flight is to be covered by imports; and, (ii) return sector capacity can be offered at a low ‘export’ freight rate. The figure of about US\$4.00 per kilogram is comparable to the general air freight import rates of US\$4.00-5.00¹⁸² per kilogram to the main capital cities, including Perth. If the aircraft achieves only 30 tonnes of inbound freight with no back-load, then the per kilogram rate rises to US\$6.30 making it essential that the service has a high utilisation on the import sector or a significant back-load.

If the aircraft was fully utilised on the return sector to Asia at a combined freight rate and Pilbara THC of US\$1.50 per kilogram then an additional US\$75,000 in revenue would be earned. Whatever the mix of imports and exports the aircraft must earn at least US\$1.89 for each kilogram of aircraft freight *capacity* plus the Karratha THC if the service is to be viable.

Even if inbound freight costs per kilogram into Karratha or Port Hedland airports are higher on this service compared to those for Perth a careful comparison would need to be made because of the additional cost of moving air freight into Perth (or Sydney) and then by land mode to the Pilbara.

In addition to the operating costs for the return flight are the handling costs for the freight, or THC. In the main capital cities THC rates are A\$0.52¹⁸³ per kilogram for loose import freight. Our market contact has suggested rates could be A\$0.70¹⁸⁴ per kilogram in the Pilbara. An option at the capital city airports is for the shipper to remove the air freight pallet at a cost of A\$200¹⁸⁵ and then use their own labour to break down the freight. Such an arrangement might be useful in the Pilbara.

To support the development of air freight exports from the Pilbara to Asia, the service would be expected to offer lower cost freight rates of around US\$1.00 per kilogram. This would put the local

¹⁸¹ Air Charter Services, Sydney, 2018.

¹⁸² AFD market contact, Perth, 2018.

¹⁸³ Air Charter Services, Sydney, 2018.

¹⁸⁴ AFD market contact, Pilbara, 2018.

¹⁸⁵ AFD market contact, Perth, 2018.

exporters in a comparable position with exporters using the capital city airports. The lower freight rate would be essential to develop agricultural, fisheries and pastoral exports based on the experience of these sectors elsewhere in Australia.

THC rates for exports at the capital city airports is about A\$0.13 per kilogram. To support exports from the Pilbara a similarly lower figure would need to be offered at the Pilbara airports.

For the B767-300F service, the capital cost of ground handling equipment to unload the freighter could be US\$500,000 to US\$1,000,000 (A\$670,000 – A\$1,350,000)¹⁸⁶ even were used equipment to be sourced. At the higher end this would equate to a cost recovery rate over a year of A\$0.50¹⁸⁷ per kilogram assuming full inbound freight utilisation.

The cost recovery of the construction of new cold stores would likely be amortised over a longer period. Our estimate is A\$2.5¹⁸⁸ million for a new building providing 150m² to 175m² of storage and handling area. The building type would be of tilt slab construction with internal insulation and required external heat resistant treatment. Of this estimate about A\$300,000 would be for the refrigeration system. This building would be capable of storing around 20 PMCs: enough to cope with potential perishables trade growth. Each PMC can have a gross weight of 5 to 6 tonnes depending on the aircraft.

A B767-300F freighter service operating with an inbound freight load of 50 tonnes per week equates to 2,600 tonnes per annum. This is substantially more than the air freight identified by AFD as being currently *directly flown* into and out of the Pilbara each year: about 1,500 tonnes. Our market contact has however identified significant air freight for Pilbara industry that is flown to Perth or Sydney (or even Darwin) and then trucked to the Pilbara.

A realignment of this freight via an affordable direct freighter link from Asia to the Pilbara is notionally rational. The direct link would preferably be provided by a wide-bodied freighter aircraft, such as the B767-300F, if the realignment was to offer a more complete service alternative for industry. This is because part of the routine air freight can be significantly oversized. A leading forwarder advised AFD that one of its most recent air freight shipments through Sydney for the Pilbara weighed 10 tonnes. The saving using an established direct service to Karratha would be considerable. Our example 5 shows around A\$5,000 per shipment but also up to 2 weeks in time.

Two leading forwarders for the resource export industry have suggested that the B767-300F service option should be further analysed, under a commercial in confidence framework, with a proposed aircraft operator or its agent. One leading forwarder has suggested that the perishables trade, with which it is involved, should be modelled into a potential triangulation service.

¹⁸⁶ AFD research of used ULD handling equipment.

¹⁸⁷ Derivation: A\$1.35m amortised over 50 tonnes per week for a year.

¹⁸⁸ AFD market contact, Pilbara, 2018. Based on about A\$10,000 per m².

19.34 Operation of the Boeing 737 – 300F



Figure 27: Boeing B737-300F cargo aircraft

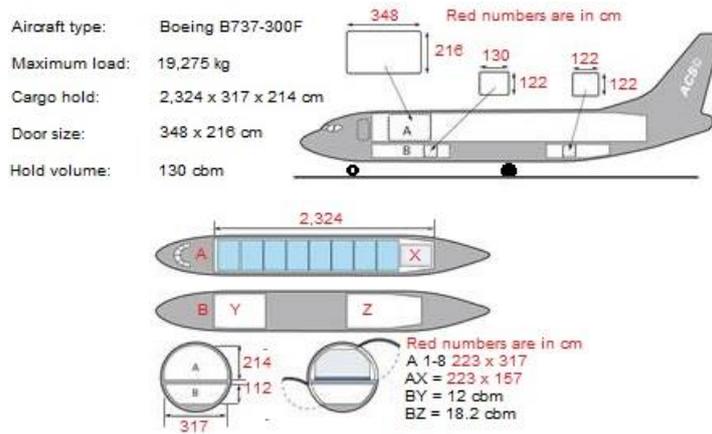


Figure 28: Boeing 737F cargo hold dimensions



Figure 29: Boeing 737F cargo hold

The Boeing B737-300F is a smaller aircraft than the B767-300F being a narrow-bodied type (the fuselage of the B737-300F is 1.25 metres narrower than the B767) based on the B737 airliner series

commonly used in Australia. For the flight sector Singapore to Karratha or return the aircraft would have a freight payload of about 16 tonnes and a volume for freight of 132.9 m³.

The estimate for operating this aircraft on a weekly return flight between Singapore and Dampier is US\$88,000.¹⁸⁹ This price includes the build and break of freight at Singapore.

As a smaller aircraft, the economies of scale are less efficient over the Singapore to Karratha sector. If the operating costs for the return flight were amortised over the import sector only, the freight rate would need to be US\$5.50 to cover operating costs, excluding a THC at Karratha. This price is higher than the US\$4.00 to US\$5.00 paid for imports into the capital cities and if the Karratha THC is A\$0.70, then the cost of the service without backload could be around US\$6 per kilogram. This price needs to be seen in the context of the alternative of flying freight to Perth and then onto air or road to the Pilbara. Even at discounted forwarder rates a 50 kg package landed at Perth for USD4.00 per kg could cost an additional A\$10 per kg to be flown on to Karratha on a scheduled airline.

The THC at Karratha is in addition to the operating costs for the return flight. We have assumed a rate of A\$0.70¹⁹⁰ per kilogram in the Pilbara and for exports about A\$0.13 per kilogram.

To be competitive with rates offered out of the capital cities, the air freight rate for exports from the Pilbara to Asia would be expected to be lower 'back-haul' rate: this is as low as US\$1.00 per kilogram.

The B737-300F service would require additional ground handling equipment for the aircraft to be unloaded at Karratha. The equipment would be of a smaller scale compared to that required for the B767. It is estimated that the cost could be in the range of US\$300,000 to US\$600,000 (A\$400,000 – A\$800,000)¹⁹¹ even if used equipment was to be employed. At the higher end this would equate to a cost recovery rate over a year of A\$0.96¹⁹² per kilogram assuming full inbound freight utilisation.

AFD discussions with two leading freight forwarders servicing the resource export industry have suggested that the B737-300F should be included in the modelling of their freight requirements for the Pilbara based on a Karratha-Singapore service.

The B737-300F is a smaller, lower cost freighter aircraft than the wide-bodied B767-300F. It is employed as a capable freighter aircraft in Australian service with QANTAS FREIGHT and TOLL. It does, however, have restrictions for oversize freight which is why road or rail haul must be used to regularly move international air freight for the Pilbara via Sydney.

The suggestion from a leading freight forwarder is that a direct airfreight service to the Pilbara might be used in conjunction with a direct marine service. The freight forwarder suggested that the inbound oversize freight that could not be placed on the B737 aircraft could be flown as far as Singapore and then loaded onto the direct shipping service bound for Dampier. The B737-300F aircraft should therefore be included as a second operating model, under a commercial in confidence framework, for consideration of the forwarder's freight requirements.

¹⁸⁹ Air Charter Services, 2018.

¹⁹⁰ AFD market contact, Pilbara, 2018.

¹⁹¹ AFD research of used ULD handling equipment.

¹⁹² Derivation: A\$1.35m amortised over 50 tonnes per week for a year.

19.35 Operation of the Boeing B737 - passengers and freight



The operation of a B737 aircraft with passengers provides an alternate revenue stream to reduce the reliance on large volume freight shipments. The concept would be for an aircraft operation that was ultimately adjustable for varying freight loads: each passenger not carried would provide an additional 80 kg of freight¹⁹³ capacity. Nominally the aircraft would have from 2 to 3 tonnes of freight capacity depending on the passenger load.

If the aircraft was to be operated as a two-class configuration it would have 162 seats: 12 business class and 150 economy seats. The average passenger baggage allowance would be 20 kg and 1 meal per sector would be provided.

Our estimate for the operating costs of this aircraft based on a weekly return flight between Singapore and Karratha is US\$125,000. This figure excludes passenger taxes.

The useful, three-ton capacity could be attractive to shippers of international parcel freight as an alternative to air freight delivered over Perth. AFD market contact suggests that once the service was established the major forwarders for resource producers in the Pilbara would utilise the space.

For the freight service to work, the rates would need to be competitive with international air freight rates offered at the capital cities. At the higher rate of US\$5.00 per kg, even at a full freight load, the contribution on the inbound sector would only be US\$15,000. If freight on the return flight sector was offered at US\$1.00 per kg, the overall freight contribution would be just US\$18,000, or around 9.5% of the base operating cost.

For the mixed passenger/freight service the passenger revenue will provide the main contribution. The basic economy *one-way* flexible airfare structure would be expected to be in the range of US\$700 (or around A\$930) plus taxes.

At a 70 per cent load factor for economy class only on both sectors, this would yield US\$147,000 or a gross surplus of \$22,000. If the freight space was fully utilised on each sector the gross surplus would be US\$40,000 per flight. This figure could be further improved by selling business class seats at US\$2,000 per sector: 2 occupants each sector would lift the gross surplus close to US\$50,000.

Under this cost structure, the breakeven point for the aircraft is a 59.5 per cent passenger load factor *if* there is no business class or freight revenue. If freight space is fully utilised then the required passenger load factor reduces to 50.9 per cent.

¹⁹³ Air Charter Services, 2018.

The City of Karratha has undertaken its own surveys and market research with the community regarding the interest in a direct service to Singapore. This included a measure of elasticity of interest were the price of an economy ticket to be pitched at around A\$900.

The appeal of a direct service is twofold: the opportunity for a reduced cost to connect with Asia and the reduction in time by avoiding the return journey to Perth.

Pilbara airfares – sector comparison – advanced booking and limited flexibility air tickets – A\$							
Destination	Karratha	Port Hedland	Newman	Onslow	Melbourne	Sydney	Singapore
Pilbara to Perth return	751	732	733	598			
Perth to Melbourne return					695		
Perth to Sydney return						724	
Perth to Singapore return							756

Table 22: Pilbara airfares - sector comparison¹⁹⁴

The airfares shown for Karratha, Port Hedland and Newman in the table above are the lower cost airfares based on advanced bookings with more restrictive ticket conditions. A more flexible ticket, or a ticket purchased with less advanced notice, is commonly between \$700 and \$1,000 *per sector*, i.e. between Perth and the Pilbara, or, the Pilbara to Perth.¹⁹⁵ The latter ticket structure is typically what would be used by a passenger that must travel to an adjustable timetable.

Based on the cheapest ticket structure, a passenger flying from Karratha to Singapore via Perth would incur a cost of \$1,507 excluding transfers. Depending on the timing of the flights, there might need to be at least one-night accommodation. The cost would increase significantly if a flexible ticket was used or a shorter-notice booking: assuming the same lower price Singapore fare was available the cost of the return Karratha to Perth sector could increase to around \$1,500 and the whole cost to \$2,200 to \$2,300. Even at the lowest fare structure a base return economy fare structure of \$1,800 would be a competitive option when the saving in travel time of up to a day is considered.

A leading freight-forwarder with extensive operations in the northwest indicated that part of its oversize air freight could be handled by a BOEING B767F direct service and, if necessary, larger air freight items could be placed on the vessel at Singapore after being flown in from Europe.

¹⁹⁴ The Cost of Doing Business in the Pilbara, Regional Development Australia, 2018.

¹⁹⁵ Advertised airfares on scheduled airline websites, 2018.

19.4 Demand

Direct air freight service

Contact with major freight forwarders that deal in industrial supply has identified strong interest in a direct air freight service to Karratha. This not only to improve the efficiency of industrial supply chains that are currently operating over Perth to the Pilbara but also to introduce other existing cargo interests, including in the perishables trade, to provide a more comprehensive change for Western Australia.

The forwarders advise that the industrial air freight supply chains are used primarily for high value, mission critical spares. This can include electrical and electronic equipment, mechanical spares, control systems, machinery components and entire machines. In general, the Pilbara is used for some forward inventory of spares for mining or oil and gas operations, but other inventory is in Perth, east coast sites and overseas. Periodically, shortages of spares can occur that must be addressed promptly to prevent acute impacts on operations. As a small example, the report writer had a recent experience with a failed impeller unit on a 500-kW generator that was an integral unit for a critical process on a Pilbara site. The replacement impeller units were A\$3,500 each and could only be sourced from the United States. Air freight was the only option to expedite delivery but any delays in the restoration of the generator exposed the operator to higher on-site costs and potential commercial damage.

Direct air charter services into the Pilbara from overseas are of impractical cost for most air freight and therefore the shipment of larger air freight items, using the constraints of the Australian domestic air freight must be very carefully planned. The freight schedule may involve weeks of travel from a departure point in say Europe. The large air freight item can be delivered easily to Singapore but then the challenge is how to get it into the Pilbara.

The forwarders have therefore identified a latent opportunity for the re-direction of existing industrial freight on to a direct international service between Singapore and Karratha. This re-direction can include:

- Industrial freight supply in the form of packages and parcels currently imported globally through Perth and flown or trucked to the Pilbara;
- General freight in the form of packages and parcels for both imported and exported items including small business and consumer purchases;
- Larger industrial freight (depending on the aircraft operating model).

Discussions with the forwarders suggest that there is some inelasticity on the direct service freight rate as a key advantage of the direct service is perceived to be a shorter schedule, less handling and reliable access to capacity. For the forwarder's clients these benefits in turn can offer considerable cost savings for their operations. Forwarders representing large resource freight interests in Northern Australia confirmed delays in getting suitable freight space into Perth was an ongoing operational constraint. A dedicated, scheduled service direct into Karratha removes uncertainty for them.

Existing forwarder air freight pool	Aircraft capability	Re-direction (tonnes per annum) ¹⁹⁶	
		Initial	Developed
General postal and forwarder air freight inbound	B737F or B767F	50	100
General postal and forwarder air freight outbound	B737F or B767F	30	60
General air freight for industrials	B737F or B767F	200	400
Total		280	560
Large air freight for industrials	B767F	50	50
Total		330	610

Table 23: Existing forwarder air freight pool – options for re-direction – direct air service

Table 23 indicates the amount of air freight identified with large freight forwarders during the study market contact that could be transferred to a direct air freight service to Karratha. The initial change amounts to 42% of the southbound capacity provided by a BOEING 737F operating a weekly service. This developed change amounts to 90% of the southbound capacity. High utilisation of the southbound capacity of the aircraft is critical as it attracts the higher freight rate and at present forms the greatest identifiable freight flow.

In addition to the latent opportunity for existing air freight supply chain improvement and change the forwarders have identified the opportunity of new industrial freight supply chains being developed. These may arise from new inventory management and procurement options that can be designed for their clients. An off-site receipting function, for example, in Singapore can be part of an inventory management system that extends through the direct air service back to Karratha. Importantly the de-centralised inventory management could rely on the back-up of the direct shipping service).

Providing an export load for the aircraft will be important for the viability of the service. Even if the aircraft is fully laden for the inbound freight flight the outbound freight will be important for the bottom line. The use of a lower cost air freight back-haul rate by agri-business is being used successfully across Australia. If this success can be replicated for the Pilbara, then there should be export opportunities for:

- Pastoral products. Chilled and frozen beef has long been exported from Australia’s east coast to North Asia. The Toowoomba Wellcamp direct flight to Hong Kong carries this product. There are new pastoral projects in the Pilbara focused on beef exports;¹⁹⁷
- Seafood. The study was informed by several businesses in the market contact phase of latent live and processed seafood export opportunity. If the seafood can be exported chilled and not frozen it can command a 30% premium in price;
- Horticultural products.

The proposed modelling with the freight forwarders and the air charter service will involve detailed contact with producers to determine service design and timelines for exports. Extended timelines may be required before agricultural exports can be prepared. If so, the forwarders’ suggestion of introducing Perth-air freight into a triangulated service allows export freight capacity to be progressively introduced into Karratha to suit grower’s business development timelines.

¹⁹⁶ AFD market contact, Perth and Pilbara, 2018.

¹⁹⁷ “Pilbara’s promising new market”. Meat and Livestock Australia. 28 June 2018.

The forwarders' suggestion of a triangulated service over Perth is based on the following points:

- Logistics constraints caused by the absence of a wide-bodied freighter aircraft service into Perth airport could be removed by introducing a service from Singapore to Perth over Karratha handling both Pilbara and Perth general freight;
- The aircraft would return with perishable freight from Perth to Singapore via Karratha. The aircraft would offer perishable cargo export capacity out of Karratha for progressive use by Pilbara growers.
- This is a similar operating model to that applied at Toowoomba Wellcamp.

The attraction of the triangulation operation is that it addresses a wider logistics constraint in state air freight services that impacts on the Pilbara. The service would also be based on a much larger cargo task yet giving Karratha and the Pilbara the key air freight capacity needed to improve international connectivity.

A major forwarder dealing with perishable freight in the Perth region expressed frustration in the lack of available export air freight capacity and indicated that growers were having to freeze export product and export at a discounted price due to delays in outbound service options.

Direct passenger and air freight service

Market contact in Karratha often included informal comment from businesses on a direct passenger air service. In line with the results of the City of Karratha's own research, the commentary generally revealed a strong, positive interest in the option of a direct passenger service to Singapore.

As part of a broad assessment, reference can be made to the number of trips that would be expected from the permanent resident population based on national statistics averages.

In 2017 Australians made 9,118,000 outbound international trips of which 5,115,000 were for vacations and the balance for visiting relatives, business trips, etc.¹⁹⁸ These figures equate to one outbound international trip for every 2.74 Australians and one overseas vacation for every 4.9 Australians.

For a permanent resident population in the Pilbara of 60,000 people these figures suggest, on a *straight per capita* basis, travel movement would be:

- 21,898 outbound international trips per annum (421 journeys per week); and,
- 12,245 overseas vacations (235 journeys per week).

The most preferred destinations overseas included Indonesia, Thailand, China and Japan which together constituted more than 27% of the total overseas travel destinations for Australians.¹⁹⁹ Travel

¹⁹⁸ Australian Tourism Statistics, Budget Direct Insurers, 2018.

¹⁹⁹ Australian Tourism Statistics, Budget Direct Insurers, 2018.

to these destinations would all be facilitated by a direct air connection to Singapore. For business travelers Singapore is also an ideal destination for global connections.

The total overseas visitors to WA in 2017 numbered 950,000.²⁰⁰ If just a *quarter of one per cent* of these visitor numbers could be encouraged to the Pilbara using a direct flight that would be an additional 46 passengers per week.

The Pilbara already has a direct international air connection from Port Hedland to Denpasar operated by VIRGIN with a BOEING B737-800 aircraft. According to ABS statistics in 2017 it was used by a total of 7,339 passengers on 97 flights (once weekly return service). This is an average of 76 passengers per sector. This indicates a load factor of just 50.7 per cent on a 150 seat aircraft based on economy seating utilisation only.

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The flight distance from Karratha to Singapore is 2,810 km and flying time 4. 1 hours. In comparison, the flight to Perth is 2 hours²⁰² one way plus transfers to the international terminal and possible overnight accommodation on one sector. Potentially about a day can be added to the travel time for a return trip to Singapore via Perth depending on connections.

Denpasar is 1,345 km from Port Hedland and 2 hours 20 minutes flying time. For connecting passengers, there are plenty of flights to Singapore but the flight time is 2 hours 40 minutes²⁰³ so with transfers at Ngurah Rai International Airport the journey is somewhat longer than a direct flight from Karratha.

For Karratha passengers using Port Hedland services, there is the additional round trip of 500 km and if airport parking is used then long-term this is \$17 per day.²⁰⁴

The lower cost flights to Denpasar are offered for about \$720 return²⁰⁵. Return flights from Denpasar to Singapore can be about \$300 return including taxes and charges.²⁰⁶ Flexible airfares are \$600 one way: a flexible return airfare from Port Hedland to Singapore via Denpasar would be about \$1,500.

On the basis of these competing air service cost structures, it would seem a *flexible* return air fare from Karratha to Singapore of \$1,800 could be considered for the model. The service modelling would clearly have to allow a certain percentage of seats to be sold at a discount *non-flexible* rate to encourage passenger numbers and forward bookings.

20.0 Strategic Alignment

²⁰⁰ Australian Tourism Statistics, Budget Direct Insurers, 2018.

²⁰¹ Australian Bureau of Statistics, Regional Airport Statistics, 1985 to 2017.

²⁰² Scheduled airline websites, 2018.

²⁰³ Air Asia, Wotif website, 2018. <https://www.wotif.com>

²⁰⁴ Port Hedland Airport website, 2018.

²⁰⁵ Travel service websites, 2018.

²⁰⁶ Travel service websites, 2018.

The WA State Government’s planning framework is the basis for coordinating and promoting land use planning, transport planning and land development in a sustainable manner, and for the guidance of public authorities and local governments.

In June 2014, the Western Australian Planning Commission (WAPC) produced the **State Planning Strategy** under this Framework during a period of sustained growth with a high level of public and private investment being channelled into infrastructure and development - a period of great promise and opportunity for all Western Australians.

While the level of growth at the time of publication of the State Planning Strategy has not been sustained, the elements of the Strategy that are central to the vision of growth and prosperity remain: a State of diversity, liveability, connectedness and collaboration.

A diverse State - offering a diversity of ecosystems, landscapes, enterprises, people and cultures

A liveable State - the place of choice for the brightest and best

A connected State - as connected to the rest of the world as any other place

A collaborative State - enabling alignments that progress the State’s sustained growth and prosperity

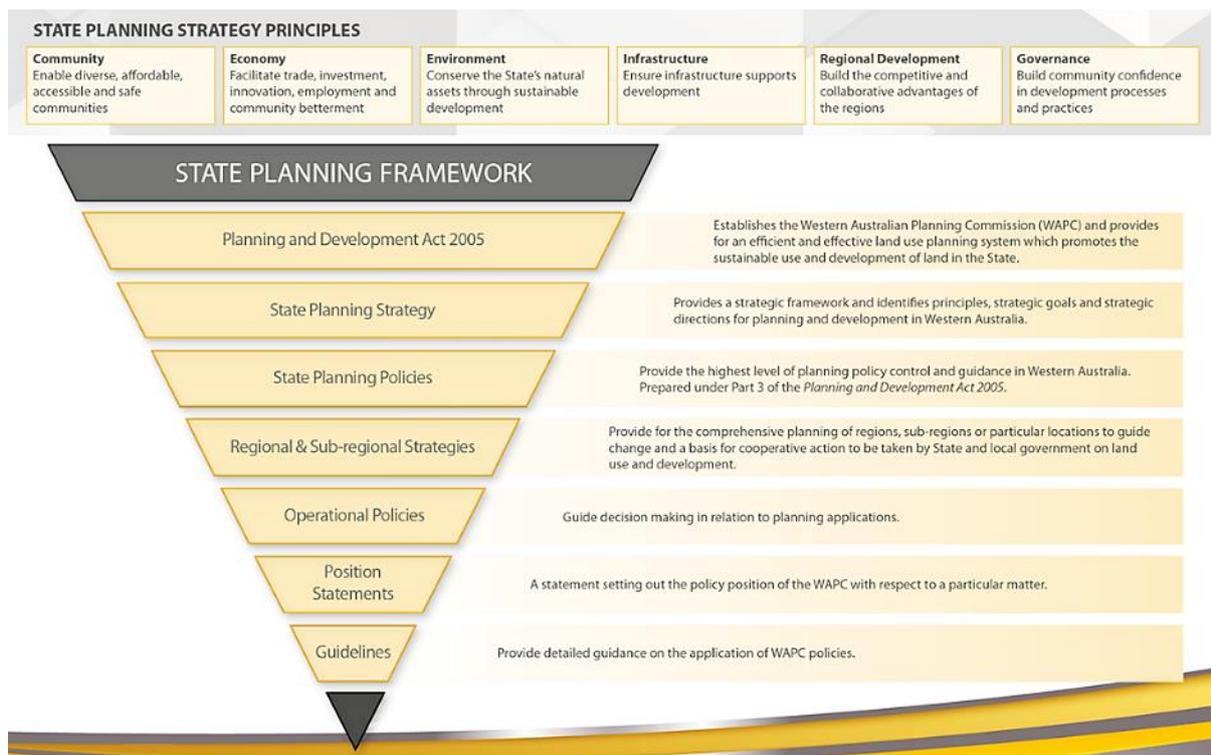


Figure 30: Western Australian Planning Framework²⁰⁷

²⁰⁷ Western Australian Department of Planning, Lands and Heritage, 2014.

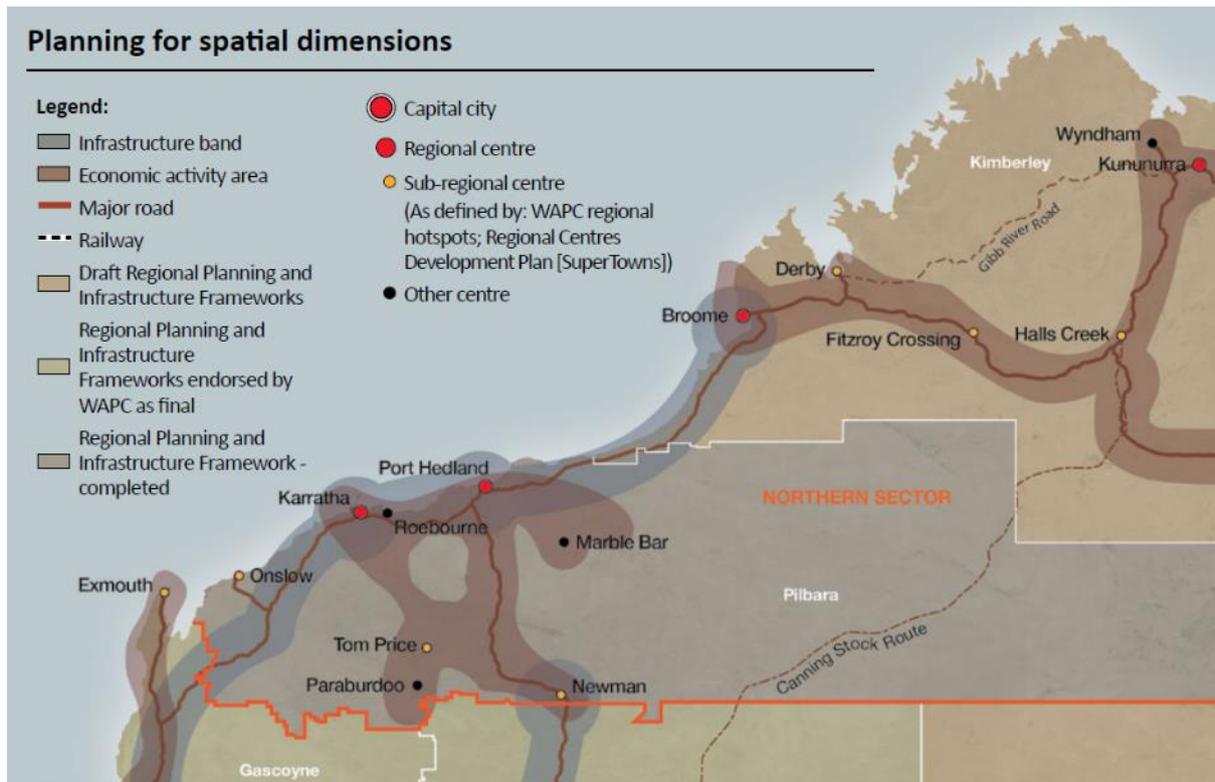


Figure 31: State Planning Strategy - Northern Sector²⁰⁸

The State Planning Strategy recognised that the Northern Sector was rapidly gaining importance in national and global trade, investment and commerce, driven by increasing resource demand. This is enhanced by further economic opportunities within the context of Northern Australia, particularly in tourism and agriculture.

The **Pilbara Planning and Infrastructure Framework**²⁰⁹ set the agenda for the physical development of the Pilbara. The Framework provided a response to many of the opportunities and challenges facing the region. It informed the 2014 State Planning Strategy and guides the preparation of local planning strategies and local planning schemes across the Pilbara.

The Framework recognised the primary Pilbara Cities of Karratha (Karratha and Dampier) and Port Hedland (Port Hedland and South Hedland), and the following key objectives relevant to this study:

- Air transport: Provide an efficient regional airport network that enables intra-regional, intra-state and interstate connections for passengers and freight.
- Promotion of multi-user port facilities with related land and facilities as an infrastructure priority.

The City of Karratha has more recently published its **2016 - 2026 Strategic Community Plan** which presents the community's vision for the future and states the actions the City needs to take to achieve

²⁰⁸ Western Australian Planning Commission, 2012.

²⁰⁹ Western Australian Planning Commission, January 2012.

the vision to be **Australia's most liveable regional city**. The new plan is also supported by financial management, asset planning and workforce commitments.

In developing the plan, the City listened to the community through Surveys, with the themes and desired results identified in terms of the City's Economy.

OUR OUTCOMES <i>The end result we would like to achieve</i>		OUR RESPONSE <i>What we can do to achieve the identified Outcomes</i>	
2.a	Diverse Industry	2.a.1	Key industry and business groups are partners in advocacy
		2.a.2	Business opportunities are highlighted and promoted
		2.a.3	Local procurement is prioritised internally and promoted externally
2.b	Reduce business costs	2.b.1	Red tape is minimised in line with leading business-friendly local governments
2.c	Good infrastructure to support business investment	2.c.1	Serviced land is prepared and available for a variety of new enterprise purposes
		2.c.2	Public private partnerships are in place for the development of key infrastructure
2.d	Role clarity	2.d.1	Local business leadership is identified, supported and enhanced
		2.d.2	A strong reputation as a business destination is established

Table 24: City of Karratha Strategic Community Plan - Economic Goals²¹⁰

Themes in the Strategic Community Plan around improved recycling and waste management are also relevant to this study.

The State Planning Strategy is due for review in 2019 at which time it will be relevant for the City to inform the State of its regional and local direction, its desire to become globally connected to achieve its Economic Goals, including freight system opportunities and benefits identified through this study, and set a new strategic direction for the Pilbara.

21.0 General Methodology

21.1 Literature review

An extensive review of the existing literature and publicly available information on the Pilbara freight task was undertaken. Key reports and information that were reviewed throughout this process are shown in the section [References](#) in this report.

21.2 Stakeholder engagement

Stakeholder engagement for the Freight Study was a key source of data, information about trends and industry perspectives for the study. The engagement facilitated discussion around the method, types,

²¹⁰ City of Karratha (2016)

quantities and movements of freight into and out of the Pilbara. It was conducted with multiple methods:

- Pro-active market contact including on site field work in the Pilbara and Perth;
- The use of industry associations and bodies the WA Freight and Logistics Council, the Western Roads Federation and the Karratha & Districts Chamber of Commerce & Industry;
- Formal personal interview;
- Electronic media and telephone interview;
- An online survey made open to general industry,
- A formal workshop in the Pilbara with key stakeholders.

21.3 Direct contact

Extensive direct contact was made with stakeholders. Stakeholders included:

- General hauliers;
- Specialist hauliers;
- Aviation scheduled carriers;
- Aviation charterers;
- Ship brokers;
- Logistics companies;
- Project and freight forwarders;
- Resource exploration, production and export companies in mining and oil and gas;
- Engineering companies;
- Providores and cold chain suppliers;
- Industrial services and suppliers;
- Stevedores;
- Chief pilots;
- Pilbara wholesale businesses;
- Pilbara retail businesses;
- Crane operators and suppliers;
- Civil works operators;
- Construction companies;
- Recycling companies;
- Industry associations and professional bodies;
- Ship agents;
- WA Government Departments.

The market contact sought detailed information from stakeholders regarding freight be it stakeholder freight, freight linked to stakeholder processes or Pilbara freight movements the stakeholder was otherwise either impacted by or was aware of the impacts on other stakeholders. Detail was requested around:

- Freight and freight service usage and requirements;
- Types of stakeholder freight;

- Frequency of freight transportation;
- Quantities of freight transported;
- The perceived challenges to movement of freight in and out of the Pilbara;
- Perceived opportunities for greater efficiency in the movement of Pilbara freight;
- Benefits that direct freight services from Asia to the Pilbara could provide.
- The opportunity to complete the online survey and participate in the upcoming workshop.

21.4 Survey

Typeform is an online software as a service (SaaS) company that specialises in online form building and online surveys. Its main software creates dynamic forms based on user needs. Typeform's software has been used by major companies such as Apple Inc., Airbnb, Uber and Nike, Inc. Typeform is used to produce millions of forms per month. The tool allows AFD to provide clients with customisable online surveys. The creation, design, sharing and administration of these surveys is all conducted within a standard web browser. These surveys can be shared online via email simply by following a link which takes them to a survey form. The implementation of programmable logic allows survey makers to guide respondents through the online survey forms in a logical manner, ensuring that all data required is collected appropriately. Once a response is collected, it is stored securely on Typeform's servers in CSV and Excel format and downloadable by AFD for post-processing and analysis.

An online survey was created using the survey platform TypeForm. The survey instrument included logic dividing respondents into three distinct categories:

- Transporters (hauliers, freight forwarders, carriers);
- Resource Producers (mining, oil and gas, downstream processing, agriculture);
- Suppliers (goods and services providers to towns, industry and government).

The purpose of the survey was to determine similar outcomes to the direct contact process, but in a more codified and standardised form. Qualitative and quantitative findings were used to inform the body of the report.

Invites to the survey, administered via a hyperlink directing respondents to the online form, were issued through direct contact with stakeholders or through professional bodies, associations and administrations including the WA freight and logistics council, the Western Roads Federation, the Karratha and Districts Chamber of Commerce and Industry, the Town of Port Hedland and the Shire of Ashburton.

Respondents to the survey were predominantly from companies or businesses with a turnover between \$1M – \$10M (57 percent). Three respondents had a turnover greater than \$100M: two of these companies are resource producers and exporters and one is a freight transporter.

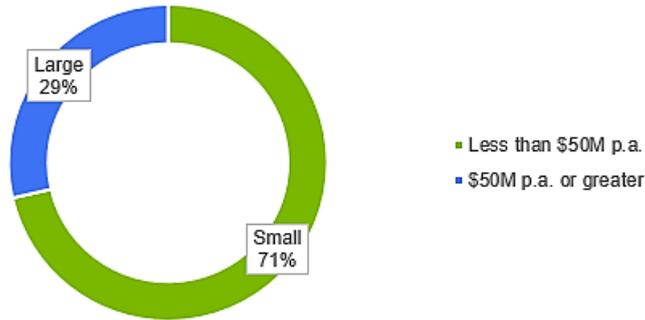


Figure 32: Composition of survey respondents by business size

Representation in the survey was split between transporters (13 percent), resource producers (31 percent) and suppliers (56 percent).

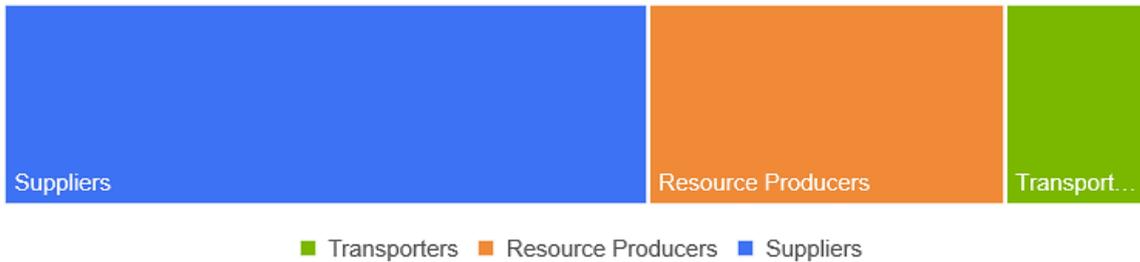


Figure 33: Split of survey respondents by type

In responding to the survey, 13 of 14 companies agreed that “greater freight efficiency will have a significant impact on the cost of general freight, consumables, equipment or other supplies or materials”, that support their production or business in the Pilbara. Of these 13 responses who agreed, 61 percent of respondents indicated a score of 9 or 10 (Strongly Agree).

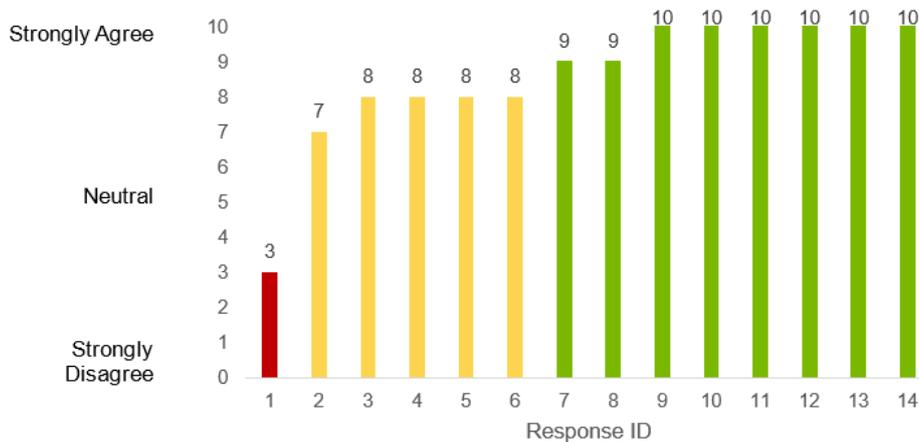


Figure 34: Survey response to question on freight service efficiency

The figure above shows survey responses to the question:

“Do you agree that greater freight efficiency will have a significant impact on the cost of general freight, consumables, equipment or other supplies or materials that support your business in the Pilbara?”

Comments captured from the survey – challenges of Pilbara freight movements
"Fuel costs" are a challenge facing business in using freight services to and from the Pilbara
"Refrigerated freight is very expensive which means we have to put our prices up for consumers"
"The majority of our freight profile is road freight between Perth and Dampier. The tyranny of distance cannot be reduced however the lack of infrastructure for truck drivers is a significant challenge for our road transport contractors which therefore affects us."
"Cost of fuel, cost of wear and tear, distance to closest hub"
"Cost and delays in receiving goods"
"Timing of ships is the biggest freight issue."

Figure 35: Survey comments – challenges of Pilbara freight movements

Comments captured from the survey – opportunities for Pilbara freight movements
"Regular (weekly) general sea freight from Dampier to various global ports would improve productivity of their operations in the Pilbara."
"An intermodal facility at the airport would assist their operations in the Pilbara."
"We are currently looking at an opportunity to manufacture stone products in the Karratha Region and a seaborne freight option from the Pilbara could open up international markets for our products."
"More general daily deliveries to the area" would assist their operations in Dampier/Karratha."
"Container freight into Dampier direct from Singapore / Asia would be massively beneficial."
Greater freight efficiency would mean: "Significant improvement in the cost competitiveness of manufacturing", "Ability to locally import raw materials for processing", "Much more cost competitive raw materials."

Figure 36: Survey responses - opportunities for Pilbara freight movements

21.5 Workshop

A Design to Innovate approach to the stakeholder workshop was used for the study. This involved using several relevant thinking tools which provide a disciplined inquiry-based approach to work through the multi-faceted challenge which, combined with the Survey, provided deep insight into stakeholder needs, challenges and opportunities. The tools and activities were designed to help navigate the complexity of the challenges in moving freight into and out from the Pilbara. In this way, the workshop was able to develop and deliver value-led solutions.

The Design to Innovate principles were delivered through the Design Wave, which is built on the overall intent to:

- build understanding by conducting research that provides us with a deeper appreciation of stakeholder needs and expectations;
- synthesise the research and transform that 'data' into useful and usable insights that will help shape choices;
- learn as we test and refine our choices with key stakeholders so we're well prepared and positioned to make better decisions.

This approach was used to provide the best possible value, extending beyond the outputs typically delivered to the outcomes achieved. Through the various stages of the workshop this ensured:

- the right problem/s was being addressed;
- a deeper understanding/appreciation of stakeholder needs could be achieved;
- decision making could be Informed, enhanced and de-risked.

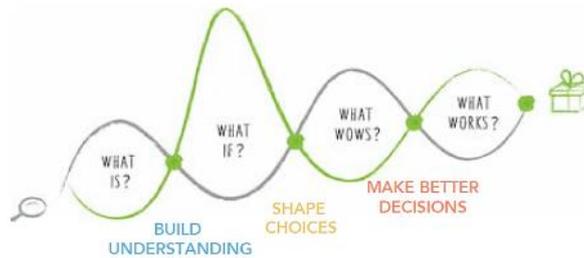


Figure 37: Design Wave Methodology

Ultimately, the workshop revealed a value proposition for exploring the business models for air and marine freight services direct to the Pilbara, testing these business models against the value criteria of Feasibility, Desirability and Viability.

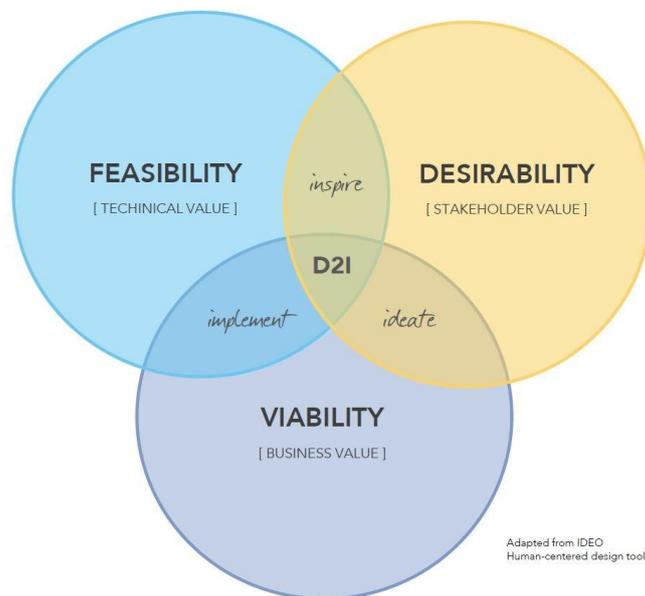


Figure 38: Design to Innovate approach to problem solving

21.6 Determination of Freight Volumes

The determination of freight volumes is from extensive formal research of statistics, journals, reports, periodicals and e-sources. It has relied on extensive industry contact and advice including from some of the Pilbara’s biggest operators. It has relied on developed professional networks across the freight industry for both intelligence on freight and technical advice. The stakeholders survey, and the workshop conducted in the Pilbara, provided additional specific information to support estimates.

21.61 Marine freight

The marine freight statistics are taken directly from the Pilbara Port Authority statistics database for the Ports of Port Hedland and Dampier provided courtesy of its website. The statistics are provided in tonnes, by which it has been assumed the figures are mass tonnes and not freight tons (which would include consideration of volume as well as weight). The statistics include intra-national and intra-region movements particularly at Dampier where a considerable amount of inbound and outbound freight movement recorded is between the port and offshore installations in coastal waters. Dampier and Port Hedland are the ports that handle virtually all marine general cargo in the Pilbara.

21.62 Air freight

Air freight statistics are not available for the major Pilbara airports and the air freight data is derived directly from extensive industry consultation including with forwarders, logistics companies, scheduled carriers and air charterers. Several major resource producers and exporters provided detailed information on their annual air freight task.

21.63 Rail freight

The rail-haul freight task is based on detailed publicly available statistics and reports as well as extensive consultation with major forwarders and users of intermodal services.

21.64 Road freight

The derivation of the road-haul freight task is based on formal, recent road traffic count data recorded at key points on the Northwest Coastal Highway and the Great Northern Highway. The road traffic count data as a database is extensive and highly accurate. Main Roads Western Australia provides (adjusted to per annum) daily averages of traffic counts across the state.²¹¹ The traffic counts data separates light vehicles and heavy vehicles based on their axle configurations and distances.²¹² In order to assess the number of heavy vehicles entering and exiting the Pilbara, several traffic counting locations were selected for analysis that represented key access points. The selection of these key access points effectively bounds all the principal road freight access into the Pilbara region. Assumptions used in this analysis were based on stakeholder engagement and AFD knowledge and experience.

²¹¹ Main Roads Western Australia (2018). Traffic Map. Available from: <https://trafficmap.mainroads.wa.gov.au>

²¹² Main Roads Western Australia (2018). Traffic Map: Frequently Asked Questions. Available from: <https://trafficmap.mainroads.wa.gov.au/faq>

Site No.	Site Name	Bordering Pilbara
50539	North West Coastal Highway (South of Onslow Rd)	To the south-west
50077	Great Northern Highway (West of Marble Bar Rd)	To the north-east
16291	Great Northern Highway (South of North West Coastal Highway)	To the south

Figure 39: Road count sites used for the Pilbara road freight flows²¹³

Stakeholder engagement informed the following assumptions to determine the amount of road freight being transported into the Pilbara:

- Each heavy vehicle counted was assumed to be a consist of two standard 12m trailers. It is recognised that many heavy vehicles are road trains with more than two trailers. Consultation with industry recommended a double trailer would be a useful representative of the *average* consist from which to develop freight figures.
- Road freight from Perth forms the principal route of land-haul into the Pilbara, both along the Northwest Coastal Highway and the Great Northern Highway. This was determined through stakeholder engagement with operators in the freight and logistics industry and other businesses.
- Road freight from the Pilbara overwhelmingly travels south to Perth. This was also determined through stakeholder engagement with operators in the freight and logistics industry and other businesses.
- Road transport inbound to the Pilbara from Perth is assumed to be fully utilised by volume or by weight. Stakeholder engagement revealed that freight northbound to the Pilbara from Perth operates in a competitive market so there is a high focus on optimisation. For the freight derivation all northbound heavy vehicles are therefore assumed to be full.
- Road transport outbound from the Pilbara to Perth has been determined to have a 30 percent load factor. This estimate was derived from key stakeholder engagement in the haulage industry.

It is recognised that apart from double, triple or longer road trains there are many other types of trucks and consists seen on the Pilbara highways. This includes specialised heavy haulage. The freight on these consists can be carried general break-bulk, oversize break-bulk, consolidated loose freight loads or enclosed (containers, ULDs, tanks, cylinders or for bulk liquid, barrels).

Consequently, there is reference to various freight unit equivalencies in the report to provide better clarification around the key dimensions of the freight task.

For the road freight derivation in the report we have assumed the following:

- Each heavy vehicle *count* is equivalent to a road train with two standard trailers;
- Each standard trailer is assumed to have a gross weight of 12 tonnes;
- Each standard trailer can carry 22 (Australian standard) loaded pallets;
- An empty standard trailer can carry two empty TEU containers.

²¹³ Main Roads WA, 2018.

Per annum	Inbound	Outbound	Total
Heavy vehicles	191,000 movements	199,000 movements	390,000 movements
At 2 x trailers	382,000 trailers	398,000 trailers	780,000 trailers
At 12t per trailer	4,584,000 tonnes	1,430,000 tonnes @30%	6,014,000 tonnes

Table 25: Road freight derivation - road counts

22.0 Summary - and next steps

The Pilbara is completely reliant on imported goods of every kind to support industry and community life - whether it is a toothbrush or a mining truck. Each year there is a flow in and out of the Pilbara region of more than 6.5 million tonnes of freight. This freight must necessarily be carried over great distances because of the remote geographic position of the Pilbara.

Perth is a critical logistics hub and supply base for the Pilbara - more than 90% of Pilbara freight is carried between Perth and the Pilbara. Much imported Pilbara freight, whether by sea or air, is moved through Perth.

For some Pilbara freight the extended supply chains over Perth means the cargo is carried over much greater distances than would be the case with more direct transport links. Some current Pilbara freight supply chains from North Asia via Perth are 3,000 km and up to 8,000 km longer compared to the alternative of a direct service into the Pilbara. The study finds that direct freight services between the Pilbara and Asia could deliver reductions in freight costs of up to 50% and delivery times of up to 70% as well as reduced handling. The proposed direct links can provide an affordable alternative for Pilbara business for both the import and export of freight.

The current extended freight supply chains make access to cargo equipment, such as containers, impracticable for many Pilbara businesses. As a result, Pilbara business misses out on the advantages of containerisation and cargo unitisation that are available to other businesses in freight supply chains all over the world. This lack of access to cargo equipment has many implications for the efficiency of freight improvements including higher re-consolidation and handling costs as the freight is moved between different transport modes. This study finds that a direct sea freight service could introduce cost-effective international containerisation services to the Pilbara for the opportunity of Pilbara business.

Improvements in the connectivity of the region are essential for the competitiveness of industry and the sustainability of the community – this is especially so in the era of the fourth industrial revolution. Shortening and simplifying extended freight supply chains can reduce freight costs, handling and delivery times for Pilbara businesses and residents. Just a 2% change in the current Pilbara freight movements will provide a viable cargo base for the business development of both direct sea and air services.

Industry feedback to this study shows a strong preference for a genuine liner shipping service for sea freight operating to a reliable, published schedule. A fortnightly service between Dampier and Singapore was identified as a preference with calls at Port Hedland and Broome also an option. The sea freight aggregation work indicates a viable cargo base for the business development of an initial small, direct liner cargo shipping service between Dampier and Singapore.

The study also confirms that major cargo interests serving the Pilbara and northern Australia desire direct air service links between Karratha and Singapore. The figures indicate a significant air freight task to support the business development of various direct air freight service operating models including the option of a triangulation service over Perth via Karratha and the carriage of perishable freight.

With respect to existing infrastructure the study finds that:

- Subject to the provision of a quarantine washdown bay and a CTO, direct international liner sea freight shipping services using RORO operations at Dampier can be established with an initial operating capability of up to 20,000 tonnes per month. A regular, geared vessel international sea freight service can also be operated to Dampier and Port Hedland;
- Direct international air freight services to Karratha airport can be developed with modest infrastructure changes including the establishment of a CTO.

Next steps

The next stage is recommended to be independent facilitation work to assist the business development of new direct sea and air freight services between the Pilbara and Asia. The facilitation role is to establish the connection between 'willing buyers' and 'willing sellers' so that business development can progress.

The key steps of the facilitation work are proposed to include:

- Definition and confirmation of the collective shipper interest. In addition to the market contact already established through the study there should be contact with the pastoral industry, agri-business, horticulture projects, fishing, aquaculture, proposed Pilbara industrial projects and other WA shippers (air freight triangulation) to further develop the collective shipper interest. Developed contact will also be required with principal cargo agents including forwarders. (Contact with the major freight forwarders is likely to include modelling of operating options together with proposed carriers.);
- Definition and confirmation of the collective carrier interest. This group includes established aviation service providers, aviation charter operators, shipping companies, NVOCs and NVOCCs. This work will include approaching potential carriers with the results of the freight aggregation work and to clarify the availability of suitable infrastructure for the business development of direct services;
- Definition and confirmation of the collective freight support service interest at Dampier and Karratha. This includes private quarantine services, airport ground services, CTOs, stevedores, cartage services, container services, agents and other freight and logistics services;
- The development and management of shared information exchange between the collective interest groups to assist with proposed service design. This work will include schedules, freight rate development, freight services (such as cold supply chain), storage and cargo equipment requirements;

- Confirmation of consolidation and trans-shipment marine freight arrangements at Singapore (or other proposed Asian trans-shipment port determined from engagement between the collectives);
- Assisting the marine freight carrier interests (and port site license) with technical information in the use of the Dampier port infrastructure – this will include ramp arrangements, mooring arrangements, stevedoring operations and proposed ship design-type;
- Confirming the customs and quarantine requirements for both international sea and air freight and its impact on existing infrastructure including the establishment of CTOs;
- Determination of the quarantine wash-down facility requirements for the Dampier FDTS site with the licensee including cost estimates and proposed cost recovery mechanisms for consideration by the collective interest groups;
- Assisting the collective interest groups on end to end sea freight cold supply chain integrity design;
- Liaison with various regulator stakeholders including the port authorities, airport management, customs and quarantine for regulations, protocols and processes that will impact the direct service operations;
- Confirmation of cargo equipment arrangements between Asia and the Pilbara including the use of non-carrier owned equipment. This work would include arranging a forum for advice to shippers on container hire requirements, cartage, consolidation and other distribution requirements. There has been considerable enquiry during the OCR171902 Study research from small to medium-sized businesses as to how to order and use cargo equipment;
- Assisting proposed carriers with the development of practicable schedules and operations models for the direct services.

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