



Photo source: Flinders Ports

Port Price Benchmarking Study, 2017

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The Port Price Benchmarking Study, 2017

1.1 Background

GHD Advisory has been engaged by the Essential Services Commission of South Australia (ESCOSA), the economic regulator of certain South Australian (SA) ports, to undertake a comprehensive benchmarking study of port prices (or ship visit costs or charges) at SA ports against comparable interstate (or non SA) port prices.

The findings and insights from this study are intended to inform the 2016-17 Ports Access and Pricing Review in accordance with work tasks under the Maritime Services (Access) Act 2000 (the MS(A) Act).

ESCOSA has been responsible for the economic regulation of certain SA ports since September 2002. The MS(A) Act covers the common user terminals (“proclaimed ports”) at Port Adelaide, Port Giles, Port Pirie, Port Lincoln, Wallaroo, Thevenard, and previously also Ardrossan. The proclaimed ports are all privately operated by Flinders Ports Pty Ltd.

This benchmarking study is an update of the key components of the 2012 port price benchmarking study, which was also undertaken by GHD for ESCOSA.

1.2 Scope and Approach

The scope of the study and the approach used consisted of:

- Comparing the port charges (prices) of the proclaimed SA ports of Port Adelaide, Port Giles, Port Lincoln, Port Pirie, Thevenard and Wallaroo with the prices of inter-state comparator ports of Brisbane, Bunbury, Fremantle, Geelong, Geraldton, Gladstone, Melbourne*, Newcastle*, Port Kembla*, Portland, Sydney* and Townsville. Those ports marked above with an asterisk (*) have been privatised since the 2012 study.
- Use of a common set of commodity groups (ship cargoes) as comparators: Grain (in bulk), Dry bulk – general, Dry bulk – concession, Liquid bulk, Motor vehicles, Containers, and Livestock.
- Use of a common set of ‘model’ ships applicable to the carriage of the comparator cargoes: two bulk Grain vessels (Handymax and old-Panamax), two dry bulk vessels for other bulks (Handymax and Handy size), Tanker, Pure Car Carrier, Containership (4,250 TEU size), and a livestock carrier.
- Total port-call costs compared using a model ship call for a given cargo exchange quantity, and an assumed time in port.
- Port charges grouped into Essential Maritime Services (EMS) charges (i.e. navigation, harbour & cargo) and non-EMS (i.e. pilotage).
- Five-year price changes comparing published 2012 price data (FY 2011-12) with 2017 current prices (FY 2016-17).



Overview of Current Ports

2.1 Changes in the comparator ports since 2012

The six proclaimed SA ports, and the inter-state ports of Brisbane, Geelong, Melbourne, Port Kembla, Portland and Sydney are all privately owned with the remaining ports of Bunbury, Fremantle, Gladstone and Townsville currently operated by state government owned corporations. Since the 2012 study, the ports of Melbourne, Newcastle, Port Kembla and Sydney have been privatised with Sydney-Port Botany and Port Kembla part of the same privatisation. Fremantle had been earmarked for sale by the previous (pre-March 2017 election) WA government, and the current Queensland government suspended the plans of the previous government to sell the other main ports in Queensland.

Due to the slowing of the world economy, the trade-mix at the ports covered in the study has generally not dramatically changed since 2012 with minor growth in most commodities. This implies that the volume-base for the ports' charging schemes remains broadly the same as in the 2012. Exceptions concern ports handling project cargoes for major resource projects with the sector having peaked in the last five years together with a number of the major projects moving from the construction phase to operations.

Table 1 Summary of trade-mix at each comparator port, 2017

	Grain- Handymax	Grain- Panamax	Dry Bulk- general	Dry Bulk - concession	Liquid bulk	Motor vehicle	Container	Livestock
Port Adelaide	Y	Y	Y	Y	Y	Y	Y	Y
Port Giles	Y	Y	N	N	N	N	N	N
Port Lincoln	Y	Y	Y	N	Y	N	N	N
Port Pirie	N	N	Y	N	N	N	N	N
Thevenard	Y	Y	N	Y	N	N	N	N
Wallaroo	Y	Y	Y	N	N	N	N	N
Brisbane	Y	Y	Y	Y	Y	Y	Y	N
Bunbury	N	N	Y	N	Y	N	N	N
Fremantle	Y	Y	Y	Y	Y	Y	Y	N
Geelong	Y	Y	Y	N	Y	N	N	Y
Geraldton	Y	Y	Y	Y	Y	N	N	Y
Gladstone	N	N	Y	Y	Y	N	N	N
Melbourne	Y	Y	Y	N	Y	Y	Y	N
Newcastle	Y	Y	Y	Y	N	N	N	N
Port Kembla	Y	Y	Y	N	Y	Y	N	N
Portland	Y	Y	Y	N	N	N	N	Y
Sydney	N	N	Y	N	Y	N	Y	N
Townsville	N	N	Y	Y	Y	Y	N	Y

Y = Yes / N = No

Source: GHD analysis of port Annual Reports & Trade Statistics.



Overview of Current Ports

2.2 Trade developments at the comparator ports

An overview of trade developments helps to provide an understanding of the importance of certain trades, and their associated costs and revenues, to particular ports and how this may influence (drive) changes in port pricing over the last five years – see Tables 2 and 3.

Table 2 Summary of trade throughputs at the comparator ports, FY 2010-11 & 2014-15 (Mln. Mass Tonnes)

Port:	FY 2010-11 (Million Mass Tonnes)				FY 2014-15 (Million Mass Tonnes)			
	General Cargo		Bulk Cargo	Total	General Cargo		Bulk Cargo	Total
	Containers	Break-bulk			Containers	Break-bulk		
Port Adelaide	3.48	0.25	8.99	12.72	4.31	0.35	9.93	14.59
Port Giles	-	-	0.88	0.88	-	-	0.63	0.63
Port Lincoln	-	-	2.93	2.93	-	-	2.11	2.11
Port Pirie	-	-	0.55	0.55	-	0.04	0.63	0.67
Thevenard	-	-	3.03	3.03	-	-	2.74	2.74
Wallaroo	-	-	0.91	0.91	-	-	0.68	0.68
SA Total 6 ports:	3.48	0.25	17.29	21.02	4.31	0.39	16.72	21.42
Brisbane	8.24	1.09	23.92	33.25	9.29	0.85	40.16	50.30
Bunbury	-	0.07	13.93	14.00	-	0.03	16.23	16.26
Fremantle	5.88	0.50	13.86	20.24	7.23	0.88	27.73	35.84
Geelong	-	1.50	10.32	11.82	-	1.68	10.35	12.03
Geraldton	-	0.04	9.96	10.00	-	-	16.93	16.93
Gladstone	-	0.15	76.25	76.40	0.10	0.63	98.56	99.29
Melbourne	22.25	2.32	7.76	32.33	23.60	3.10	8.00	34.70
Newcastle	0.20	0.60	113.78	114.58	0.12	0.37	165.23	165.72
Port Kembla	-	7.31	22.67	29.98	-	1.61	21.19	22.80
Portland	-	0.32	3.66	3.98	-	-	6.46	6.46
Sydney (incl. Botany)	15.83	-	13.90	29.73	16.33	-	7.20	23.53
Townsville	0.68	0.44	9.48	10.60	0.82	0.50	9.17	10.49

Source: GHD analysis of Ports Australia trade statistics (re. website)



Overview of Current Ports

Review of the trade developments at the comparator ports shows that some specific trades have changed negatively and some positively with a general net positive change (growth) in total throughput (and hence revenue) over the period.

For the SA 6 proclaimed ports, the changes at the bulk grain ports changes reflect the cyclical nature of grain harvests with overall state-wide small trade growth due to positive developments at Port Adelaide and Port Pirie.

Container trades at the capital-city ports have shown good growth underpinning overall throughput (revenue) at these ports with the exception of Port Kembla (decline in break-bulk shipments) and Sydney (bulk cargoes with the refinery closure). However, Port Kembla has seen a growing new motor vehicles import trade (NSW gateway).

The strong growth in break-bulk at Gladstone reflects the construction of the gas-related export projects.

Given some exceptions in specific cargo sectors, the generally healthy developments in overall throughputs suggests that there is little pressure to increase tariffs due to overall declines in revenue (i.e. insufficient volumes to cover fixed costs). It is difficult to measure to what extent expanding trades have resulted in the need for additional capital investments possibly resulting in the need to increase tariffs apart from noting that the East Coast capital-city ports have invested in some new or upgraded infrastructure during the five year period.

Table 3 Summary of trade developments at the comparator ports, % changes (growth), 2014 vs. 2010 throughputs

Port:	% Change in Mass Tonnes (2014 vs. 2010)			
	General Cargo		Bulk Cargo	Total
	Containers	Break-bulk		
Port Adelaide	24%	40%	10%	15%
Port Giles	-	-	-28%	-28%
Port Lincoln	-	-	-28%	-28%
Port Pirie	-	-	15%	22%
Thevenard	-	-	-10%	-10%
Wallaroo	-	-	-25%	-25%
SA Total 6 ports:	24%	40%	-3%	2%
Brisbane	13%	-22%	68%	51%
Bunbury	-	-57%	17%	16%
Fremantle	23%	76%	100%	77%
Geelong	-	12%	0%	2%
Geraldton	-	-	70%	69%
Gladstone	-	320%	29%	30%
Melbourne	6%	34%	3%	7%
Newcastle	-40%	-38%	45%	45%
Port Kembla	-	-78%	-7%	-24%
Portland	-	-	77%	62%
Sydney (incl. Botany)	3%	-	-48%	-21%
Townsville	21%	-	-3%	-1%

Source: GHD analysis of Ports Australia trade statistics (re. website)

Overview of Current Ports

2.3 Port charging schemes for EMS

The components of port charging schemes covering EMS at the comparator ports remain the same in 2017 as five years ago (see Table 4 below).

Table 4 Summary of port charging components for EMS, 2017

Port	Navigation charges				Harbour services			Wharf charges					
	Navigation Services	Tonnage	Deep vessel surcharge	Conservancy	Harbour Services	Berthage	Mooring	Cargo Service	Harbour improvement due	Port Infrastructure Charge	Wharfage	Harbour dues (cargo based)	Facility hire/Site occupancy
Adelaide	x		x		x			x					
Port Giles	x				x			x					
Port Lincoln	x				x			x					
Port Pirie	x				x			x					
Thevenard	x				x			x					
Wallaroo	x				x			x					
Brisbane				x		x	x				x	x	
Bunbury	x					x	x			x			
Fremantle		x				x	x		x		x		x
Geelong	x		x			x	x						x
Geraldton		x					x		x		x		
Gladstone				x		x	x					x	
Melbourne		x				x	x			x	x		
Newcastle		x					x				x		x
Port Kembla		x					x				x		x
Portland		x				x	x				x		
Sydney	x						x				x		x
Townsville		x		x			x				x		

Source: GHD analysis of published port authority charges/tariffs.

2.4 Non-EMS Port charges

Although ESCOSA does not have any direct input on the magnitude of maritime charges outside of the EMS outlined above, for benchmarking purposes ESCOSA is interested in covering all port charges faced by users. This allows for a more complete picture and recognises that parts of port pricing are outside the control of ESCOSA. The non-EMS charges included in the study are limited to the more significant cost items of pilotage and towage.

Port Charge Changes – over last 5 years

3.1 Comparison of Port Charges – 2017 versus 2012 levels

A comparison of the published port charges of the comparator ports over the last five years (2017 with 2012) shows that:

1. The published EMS port charges of the six SA proclaimed ports have increased the least compared with the other comparator inter-state ports. This is possibly caused by the relatively stable ownership of and port activities at these SA ports.
2. The increases in the EMS port charges of the six SA proclaimed ports appear to be at or slightly above CPI. This appears to further support the reasoning offered in point 1 above.
3. There have been large general increases in the EMS port charges of Geelong, Geraldton, and Melbourne. Geelong channels have seen investments over the period, and Melbourne experienced the privatisation process.
4. The Navigation (Port Phillip channel) charges of Melbourne have seen a dramatic increase – a tripling of 2012 levels. The reason (driver) is not transparent apart from noting the backdrop of the privatisation process.
5. Pilotage charges have generally increased around Australia in excess of 20% with the largest increases at Port Kembla, Sydney, and Fremantle. The Pilotage charge increase at SA ports (26%) is around the mid-point of the comparator ports. The reason for the above CPI increases is possibly due to the exclusive and strategic nature of the labour (pilots) involved.

Table 5 Five-year Increase in Port Charges (2017 vs. 2012)

5-YEAR INCREASE	EMS			non-EMS
	Navigation Charges	Harbour Charges	Wharf Charges	Pilotage Charges
Adelaide	15%	11-14%	10%	26%
Port Giles	15%	11-14%	10%	26%
Port Lincoln	15%	11-14%	10%	26%
Port Pirie	15%	11-14%	10%	26%
Thevenard	15%	11-14%	10%	26%
Wallaroo	15%	11-14%	10%	26%
Brisbane	18-41%	13-20%	13-15%	22%
Bunbury	23%	81-136%	16-52%	24%
Fremantle	21%	21%	21%	29-50%
Geelong	41-276%	23%	21-25%	16%
Geraldton	113%	23%	77-215%	Incl. Navig.
Gladstone	Incl. Harbour	16-34%	17%	22%
Melbourne	19-301%	68%	36-68%	16%
Newcastle	16%	16%	5-6%	17-33%
Port Kembla	27%	18%	18-38%	53-59%
Portland	22%	22%	18-42%	25%
Sydney	26%	22%	7-25%	50-55%
Townsville	Incl. Harbour	37-57%	26-27%	12-22%

<=CPI
CPI+
CPI++

Sources: GHD analysis of published port authority charges/tariffs, VRCA, MSQ, and third-party pilotage companies.



Total Port Call Costs for vessels and cargoes, 2017

This section presents the analysis of total port call costs for vessel/cargo types. The same results are also shown in terms of EMS and Total Cost per Revenue Ton in Appendix E.

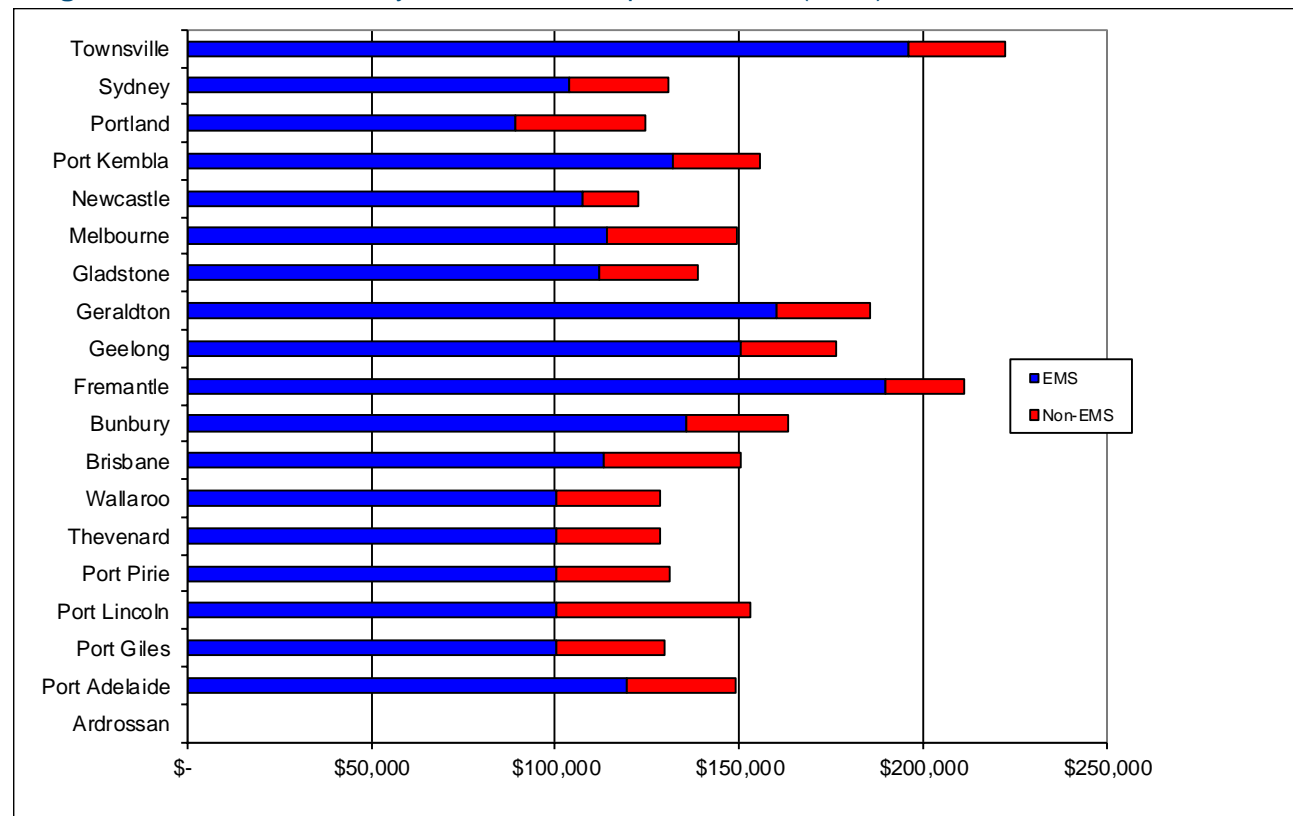
4.1 Total port call costs for Bulk Grain – Handymax vessel

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a Handymax bulk carrier loading grain at the comparator ports is shown in Figure 1 below.

The modelling of total port call costs for a Handymax grain vessel shows that:

1. Four of the six SA proclaimed ports offer total port call costs lower than the key grain export ports in WA, NSW (Port Kembla) and Victoria with the exception of Portland. The reason is possibly due to the higher volumes of grain at SA ports producing unit cost advantages.
2. Port Adelaide and Port Lincoln have higher total port call costs than the other four SA proclaimed ports due to the effect of a channel levy (Port Adelaide) and higher towage costs (Port Lincoln).

Figure 1 Bulk Grain – Handymax vessel total port call cost (2017)



Total Port Call Costs for vessels and cargoes, 2017

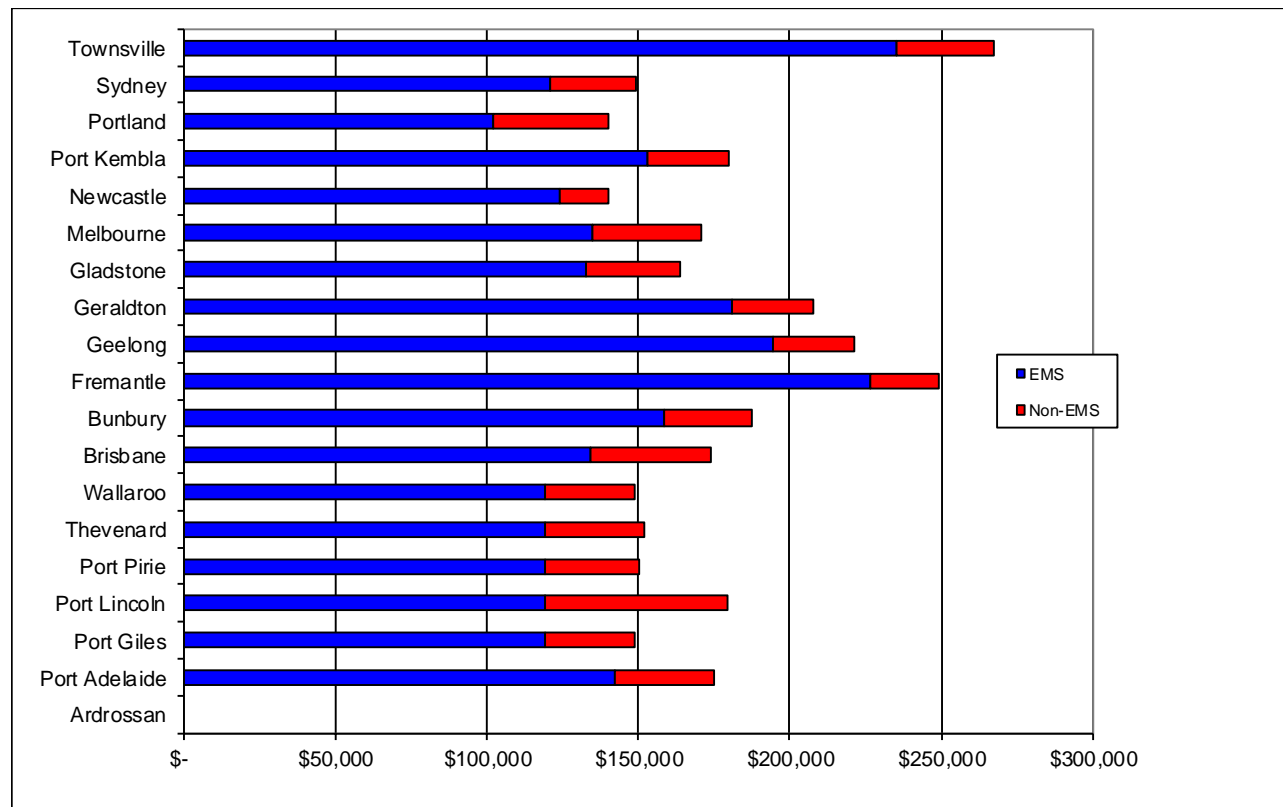
4.2 Total port call costs for Bulk Grain – Old Panamax vessel

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for an Old Panamax bulk carrier loading grain at the comparator ports is shown in Figure 2 below.

The modelling of total port call costs for an Old Panamax grain vessel shows that:

- Four of the six SA proclaimed ports offer total port call costs lower than the key grain export ports in WA, NSW (Port Kembla) and Victoria with the exception of Portland. The reason is possibly due to the higher volumes of grain at SA ports producing unit cost advantages.
- Port Adelaide and Port Lincoln have higher total port call costs than the other four SA proclaimed ports due to the effect of a channel levy (Port Adelaide) and higher towage costs (Port Lincoln).

Figure 2 Bulk Grain – Old Panamax vessel total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Total Port Call Costs for vessels and cargoes, 2017

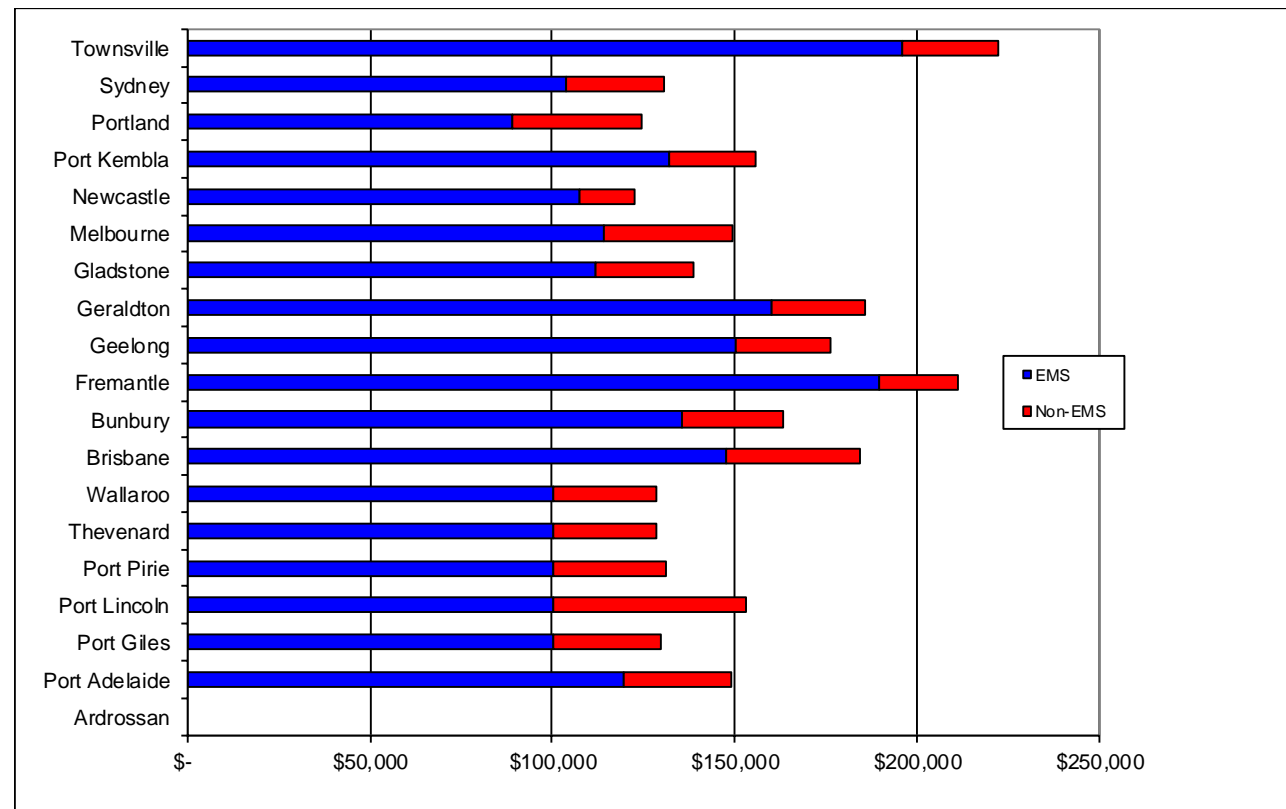
4.3 Total port call costs for Dry Bulk – general - Handymax vessel

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a Handymax dry bulk carrier exchanging general bulk at the comparator ports is shown in Figure 3 below.

The modelling of total port call costs for a Handymax dry bulk carrier exchanging general bulk shows that:

1. Four of the six SA proclaimed ports offer total port call costs lower than other inter-state ports with the exception of Newcastle (NSW) and Portland (VIC) possibly due to a higher volume base in this cargo/ship sector.
2. Port Adelaide and Port Lincoln have higher total port call costs than the other four SA proclaimed ports due to the effect of a channel levy (Port Adelaide) and higher towage costs (Port Lincoln).

Figure 3 Dry Bulk – general - Handymax vessel total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Total Port Call Costs for vessels and cargoes, 2017

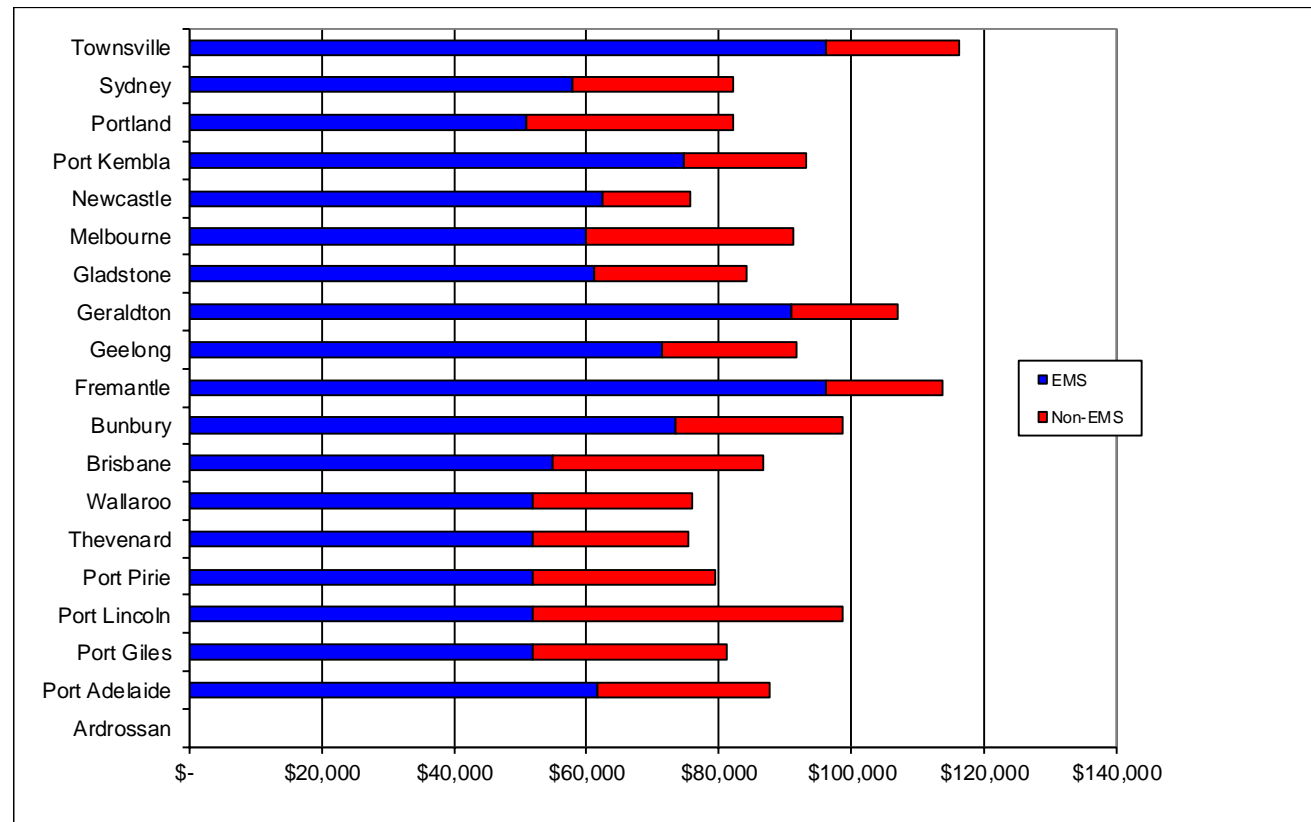
4.4 Total port call costs for Dry Bulk – concession – Handy size vessel

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a Handy size dry bulk carrier exchanging concession bulk (i.e. at reduced port tariffs) at the comparator ports is shown in Figure 4 below.

The modelling of total port call costs for a Handy size dry bulk carrier exchanging concession bulk shows that:

1. Four of the six SA proclaimed ports offer total port call costs lower than other inter-state ports and at the same level as Newcastle (NSW). The relatively important share of some of these concession-type cargoes at SA ports possibly explains this comparative situation.
2. Port Adelaide and Port Lincoln have higher total port call costs than the other four SA proclaimed ports due to the effect of a channel levy (Port Adelaide) and higher towage costs (Port Lincoln).

Figure 4 Dry Bulk – concession – Handy size vessel total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Total Port Call Costs for vessels and cargoes, 2017

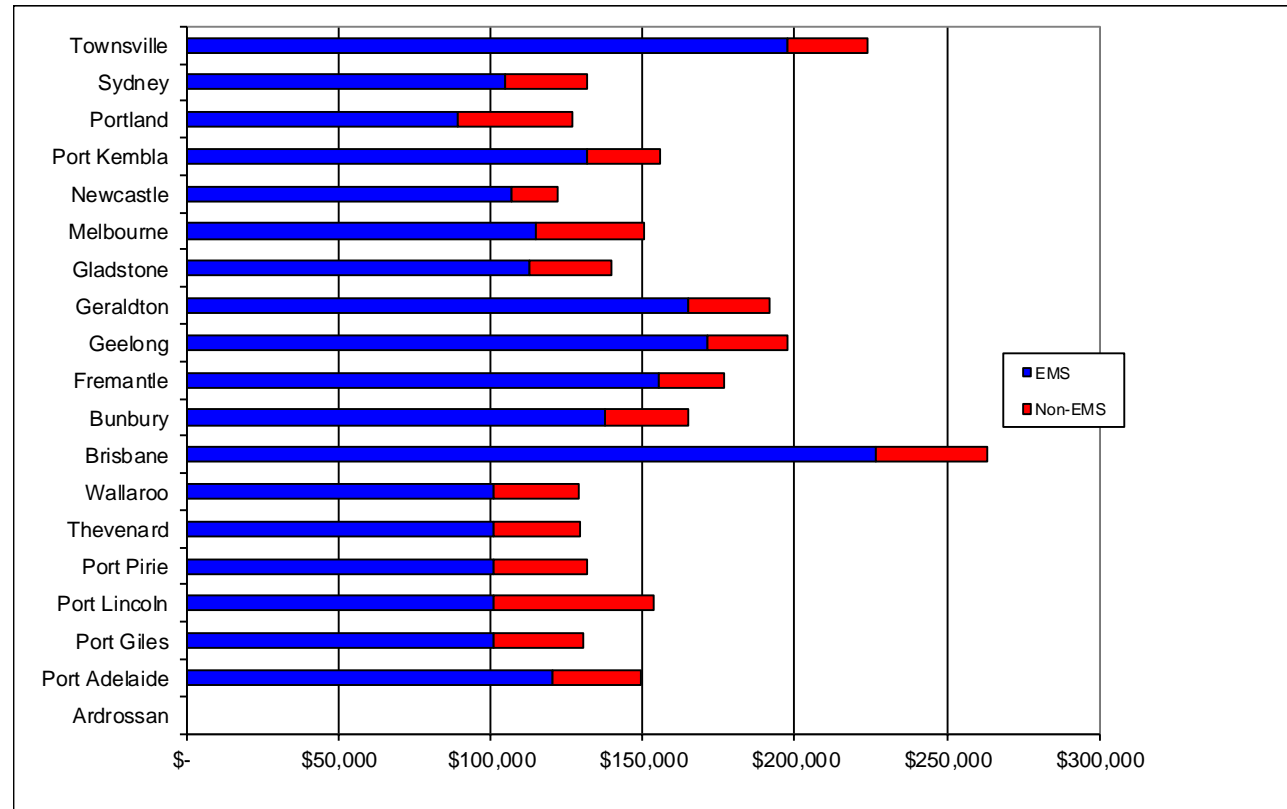
4.5 Total port call costs for Liquid Bulk – Tanker vessel

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a Tanker exchanging liquid bulk at the comparator ports is shown in Figure 5 below.

The modelling of total port call costs for a Tanker exchanging liquid bulk shows that:

1. Four of the six SA proclaimed ports offer total port call costs lower than other inter-state ports with the exception of Newcastle (NSW) and Portland (VIC).
2. Port Adelaide and Port Lincoln have higher total port call costs than the other four SA proclaimed ports due to the effect of a channel levy (Port Adelaide) and higher towage costs (Port Lincoln).
3. The QLD ports of Brisbane and Townsville are notable standouts of relatively high total port call costs. It is unclear as to the reasons, since fuel is a strategic supply chain for both ports.

Figure 5 Liquid Bulk – Tanker vessel total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Total Port Call Costs for vessels and cargoes, 2017

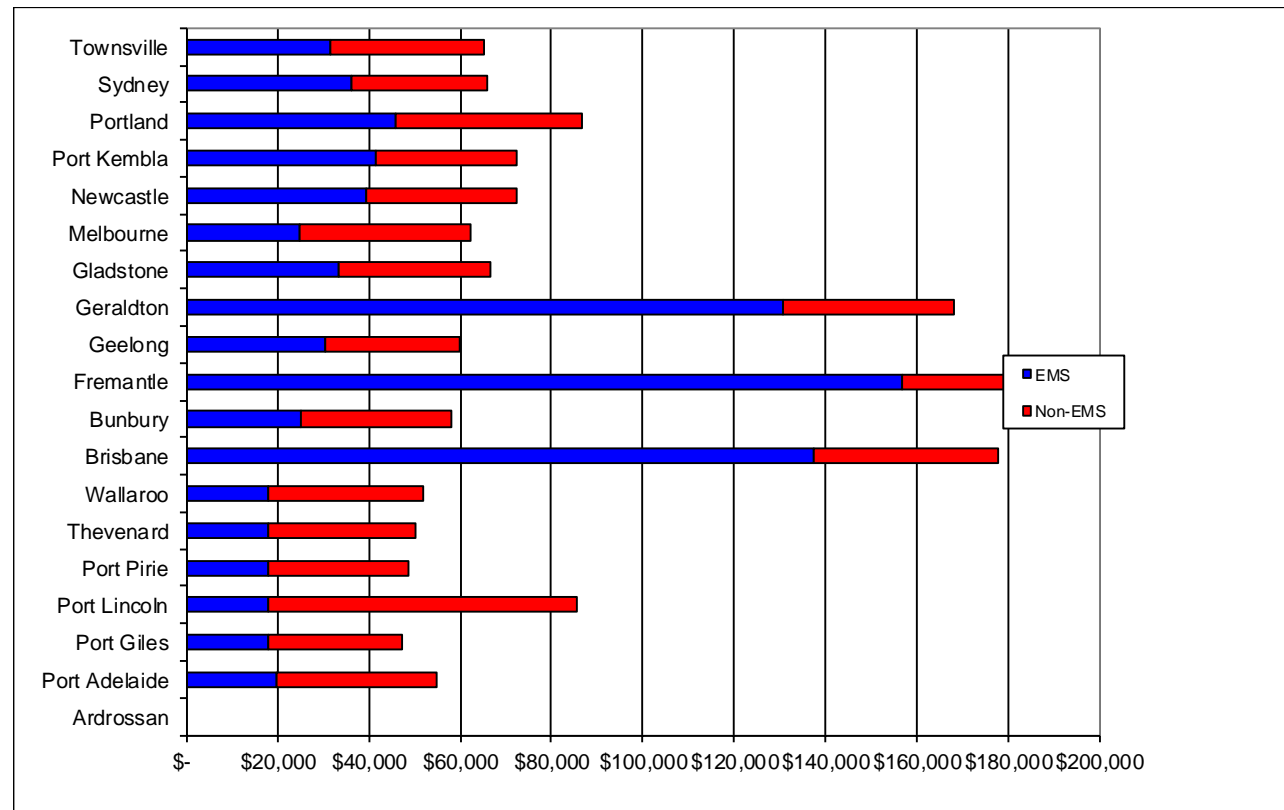
4.6 Total port call costs for Motor Vehicles – Pure Car Carrier (PCC)

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a Pure Car Carrier exchanging new motor vehicles at the comparator ports is shown in Figure 6 below.

The modelling of total port call costs for a PCC exchanging new motor vehicles shows that:

1. Out of the relevant ports for motor vehicles (i.e. Port Kembla for NSW, Melbourne, Fremantle, Brisbane and Port Adelaide), Port Adelaide has the lowest total port call cost, followed by Melbourne and Port Kembla. The reason is possibly due to both Melbourne and Port Kembla recently investing in new facilities.
2. The relevant ports of Fremantle and Brisbane are notable standouts of relatively high total port call costs. The reasons for this are unclear noting that both ports are gateway (only choice) ports for their respective catchments.

Figure 6 Motor Vehicles – PCC total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Total Port Call Costs for vessels and cargoes, 2017

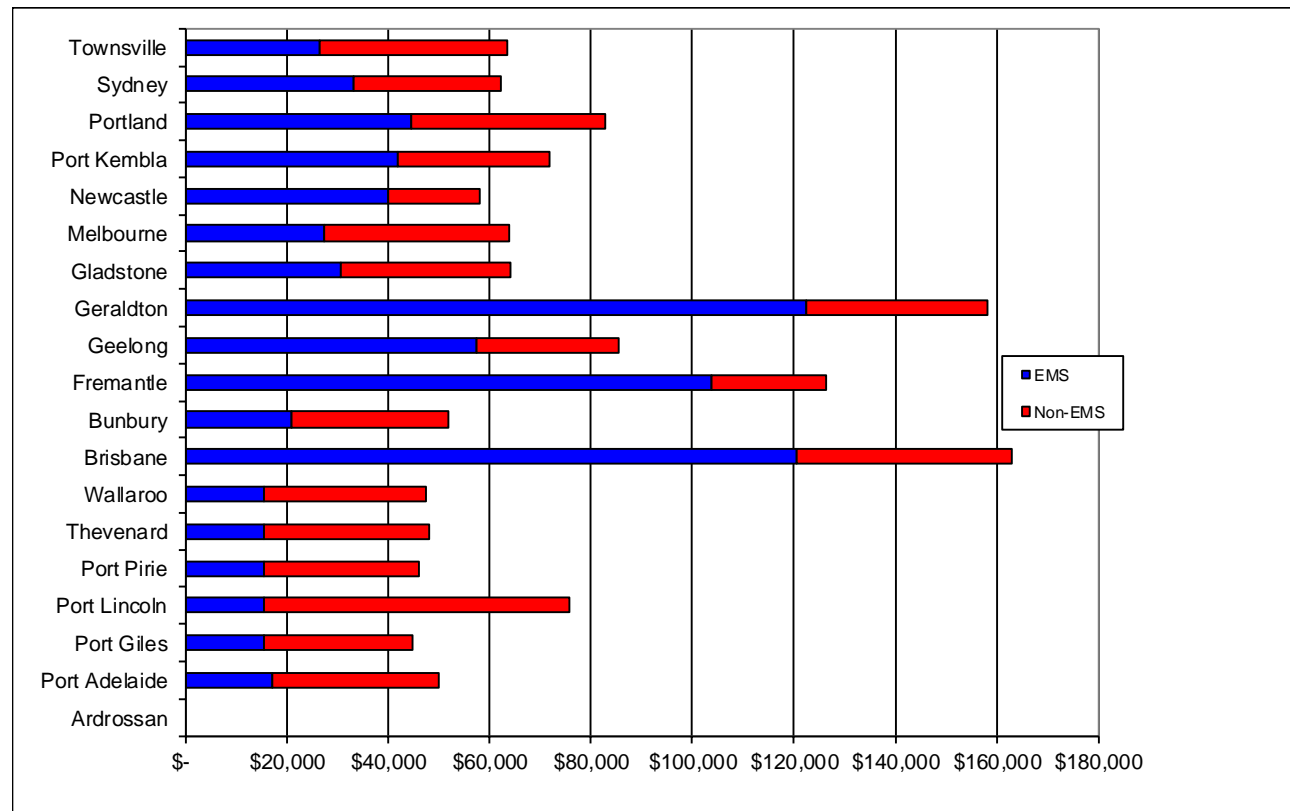
4.7 Total port call costs for Containership

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a containership (4,250 TEU size) exchanging international containers at the comparator ports is shown in Figure 7 below.

The modelling of total port call costs for a containership (4,250 TEU size) exchanging international containers shows that:

1. Out of the relevant ports for containers (i.e. Sydney, Melbourne, Fremantle, Brisbane and Port Adelaide), Port Adelaide has the lowest total port call cost, followed by Sydney and Melbourne. Port Adelaide is a significantly smaller operation than Sydney & Melbourne suggesting a lower capital base. Adelaide is also faced with some 'land-bridge' competition from Melbourne.
2. The relevant ports of Fremantle and Brisbane are notable standouts of relatively high total port call costs. The reasons for this are unclear noting that both ports are gateway (only choice) ports for their respective catchments.

Figure 7 Containership (4,250 TEU size) total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Total Port Call Costs for vessels and cargoes, 2017

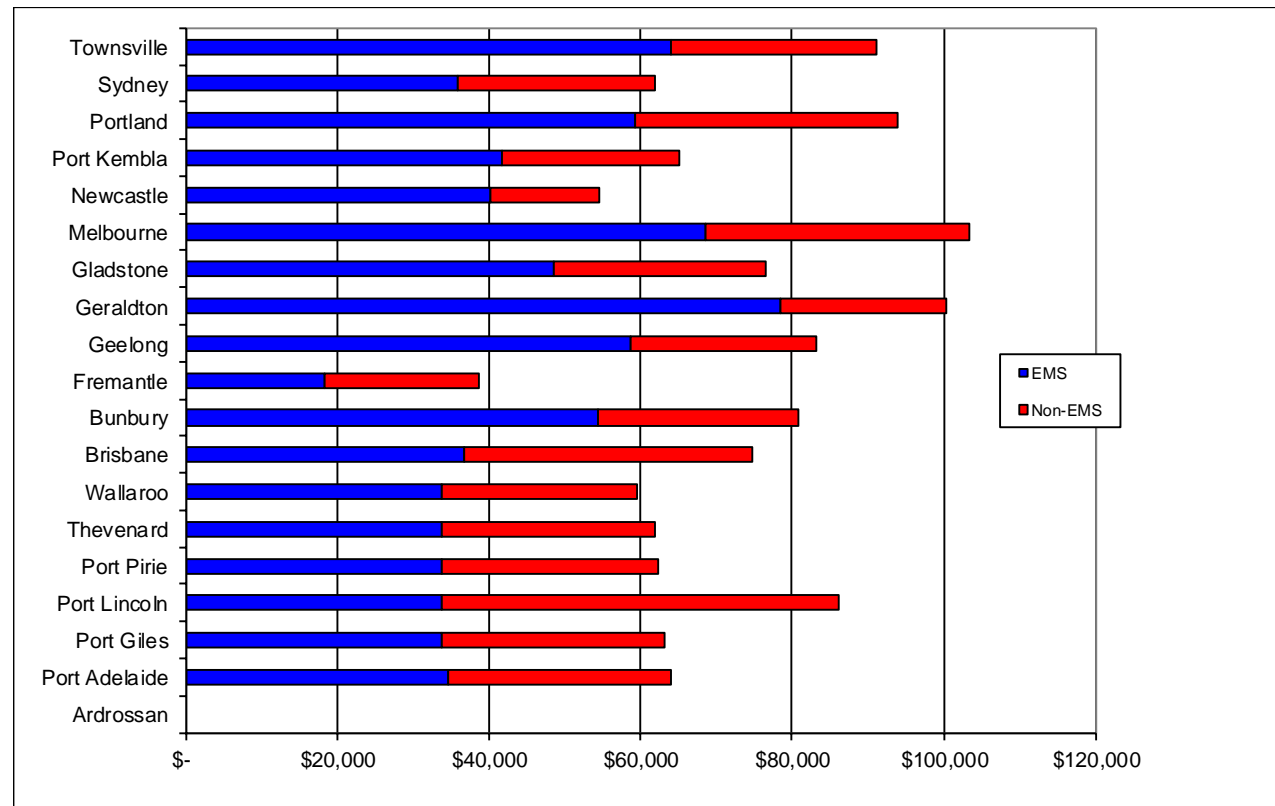
4.8 Total port call costs for Livestock carrier

Based on published charges and the modelling assumptions, the current (2017) total port call cost (ship and cargo) for a livestock carrier loading sheep at the comparator ports is shown in Figure 8 below.

The modelling of total port call costs for a livestock carrier loading sheep shows that:

1. Out of the relevant ports for livestock (i.e. Townsville, Portland, Geraldton, Geelong, Fremantle and Port Adelaide), Port Adelaide has the second lowest total port call cost, after Fremantle (the lowest). The reasons for the comparative positions of Adelaide and Fremantle are possibly due to the relative importance of the trades to both the ports and their regional economies (large catchment areas).
2. The relevant nearby port of Portland has total port call cost around 50% higher than the SA proclaimed ports. The reason for this is unclear, but the trade is a small part of the port's total business and may be therefore sensitive to the share of fixed costs allocated to the trade.

Figure 8 Livestock carrier total port call cost (2017)



Source: GHD modelling using published charges and vessel/cargo/port time assumptions.

Conclusions of the Study

5.1 Key findings of the analysis

The key findings of the 2017 Port Price Benchmarking Study are:

- Over the last five years, the published EMS port charges of the six SA proclaimed ports have increased the least compared with the other comparator inter-state ports. Although uncertain, the main reasons for this may possibly be due to a combination of the relative importance of the freight tasks (trades) to the six SA proclaimed ports, the lack of significant new large-scale investments in port infrastructure compared with other ports, and no exposure to privatisation processes (the six SA proclaimed ports were already privatised as Flinders Ports).
- Over the last five years, Pilotage charges have generally increased around Australia in excess of 20% with the largest increases at the NSW ports of Port Kembla and Sydney, and at the WA port of Fremantle. The Pilotage charge increase at SA ports (26%) is around the mid-point of the comparator ports. The driver behind pilotage charge increases is likely to be linked to wage rates increases (the levels possibly a recognition by port and state managers of the strategic (exclusive) skill-set of pilots and, where applicable, any replacement cost increase of assets).
- In terms of total port call costs in 2017, the SA proclaimed ports are generally in the lower range of total port call costs compared with the relevant inter-state comparator ports which may suggest a combination of one or more factors at play - competitive pricing, relatively low cost bases, single management structures across a port range, and efficiencies given their trade volumes and cargo mixes.
- The relative position of total port call costs of SA proclaimed ports has improved over the last five years (since 2012) due to the lower rate of increase in port charges compared with the other inter-state comparator ports, likely due to the aggregated effects of the reasons described above.

The above findings are based on published (public domain) port charges and as such need to be treated as indicative as variations may occur between published and some commercial (confidential) price agreements with ship- and cargo- owners.



Glossary – terms and abbreviations

Short	Description
ESCOSA	Essential Services Commission of South Australia
DWT	Dead weight tonnes
PCC	Pure Car Carrier
MSA	Maritime Services (Access Act)
LOA	Length Overall of a vessel (ship)
SA	South Australia
TEU	Twenty Foot Equivalent Unit
EMS	Essential Maritime Services
CPI	Consumer Price Index
QLD	Queensland
tph	Tonnes per hour
WA	Western Australia
BITRE	Bureau of Infrastructure, Transport and Regional Economics

Glossary – terms and abbreviations

Term	Description
Handymax	Smaller size of bulk carrier ship than Panamax.
Panamax	Vessel on length and beam which is limited by the dimensions of the old and new Panama Canal locks.
Dry Bulk	A non-liquid commodity which is shipped in large, unpackaged amounts.
Liquid Bulk	A liquid commodity which is shipped in large, unpackaged amounts.
Revenue Tons (RT)	Describes if cargo is rated as weight or measure, whichever produces the highest revenues will be considered the revenue ton
Mass Tonnes	Physical weight measure of the cargo or commodity
Lightship Weight	Measures the actual weight of the ship excluding fuel, passengers, cargo and water

Key modelling assumptions

#	Assumption																								
1	Only limited information on the number of tugs used for each vessel type in each port could be obtained. On the basis of industry inquiries and an inspection of port operation manuals where these contained relevant information, a default assumption of two tugs in, two tugs out was made for all model ships.																								
2	There is little compiled data available on typical times at berth. The exception to this is for container vessels, where information published by BITRE was used. All other ship times at berth are based on cargo handling rate and non-working time assumptions.																								
3	The most significant single limitation of the analysis is that it is based entirely on published/standard schedules of charges, and does not take into account privately negotiated discounts from these rates. However, as this information is, almost by definition, commercially confidential, it is not possible to obtain reliable information on discounts offered across the wide range of ports required for a satisfactory benchmarking process. Under these circumstances it is better to rely entirely on formal tariffs than to attempt to incorporate information on discounting that is fragmentary and uncertain.																								
4	Trade statistics for most ports required the conversion from either TEU or Mass tonnes to Revenue tons using the following assumed conversion factors: <table border="1" data-bbox="481 949 1787 1222"> <thead> <tr> <th>Commodity type</th> <th>Unit</th> <th>Mass tonnes</th> <th>Revenue tons</th> </tr> </thead> <tbody> <tr> <td>Full containers</td> <td>TEU</td> <td>12</td> <td>20</td> </tr> <tr> <td>Empty containers</td> <td>TEU</td> <td>2</td> <td>4</td> </tr> <tr> <td>Liquid bulk products</td> <td>Kilolitre</td> <td>0.80</td> <td>1.0</td> </tr> <tr> <td>Motor vehicles</td> <td>Unit</td> <td>1.2</td> <td>12.5</td> </tr> <tr> <td>Livestock (sheep)</td> <td>Head</td> <td>0.06</td> <td>0.06</td> </tr> </tbody> </table>	Commodity type	Unit	Mass tonnes	Revenue tons	Full containers	TEU	12	20	Empty containers	TEU	2	4	Liquid bulk products	Kilolitre	0.80	1.0	Motor vehicles	Unit	1.2	12.5	Livestock (sheep)	Head	0.06	0.06
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Key modelling assumptions

#	Assumption																																																																																																												
5	Towage is a non-EMS activity and not all rates for the ports in 2016 are published publically. Consequently, after analysing published data where available, it was assumed that the Towage annual increase percentage over the five years 2012-2016 for Port Giles, Port Pirie, Port Lincoln, Port Thevenard, Port Wallaroo, Port Fremantle, Port of Geelong, Port of Geraldton, Port of Melbourne, Port of Newcastle, Port Kembla, Port of Sydney, Port of Townsville was 3.17% leading to a 20% increase in towage rates comparing 2012 with 2016.																																																																																																												
6	Mooring is similar to Towage and mooring is often offered and performed by towage companies. The annual increase in rates for towage (see item 5 above) was also applied to mooring charges. Mooring charges for the Port of Brisbane are publicly available.																																																																																																												
7	It is assumed for the Port of Bunbury that there has been a 16.7% increase on 2012 levels in usage charges for Berth 8 as no charge is currently publicly listed.																																																																																																												
8	Ship and cargo specifications assumed in the analysis as follows:																																																																																																												
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Port charges data sources (from ESCOSA and Port authority websites)

Port Name	Source
SA Ports	
Port Adelaide	Flinders Ports Website
Port Giles	Flinders Ports Website
Port Pirie	Flinders Ports Website
Port Lincoln	Flinders Ports Website
Thevenard	Flinders Ports Website
Wallaroo	Flinders Ports Website
Non SA ports	
Brisbane	http://www.portbris.com.au/ShippingOperations/PortCharges
Bunbury	http://www.byport.com.au/
Fremantle	http://www.fremantleports.com.au/Operations/Pages/Rates-and-Charges.aspx
Geelong	http://www.geelongport.com.au/downloads/Final%20GeelongPort%20Tariff_Effective%201st%20July%202011.pdf
Geraldton	http://gpa.wa.gov.au/Port_Fees_Charges.aspx
Gladstone	http://www.gpcl.com.au/OperationsDevelopment/Shipping.aspx
Melbourne	http://www.portofmelbourne.com/shipping/tariffsandcharges.aspx
Newcastle	http://www.newportcorp.com.au/site/index.cfm?display=111639
Port Kembla	http://www.portkembla.com.au/page/port-business/price-schedule/
Sydney	http://www.sydneyports.com.au/_data/assets/pdf_file/0016/16036/Schedule_of_Port_Charges_Including_Pilotage_From_1_July_2011.pdf
Portland	http://www.portofportland.com.au/2011-12-port-charges.html
Townsville	http://www.townsville-port.com.au/account_enquiries

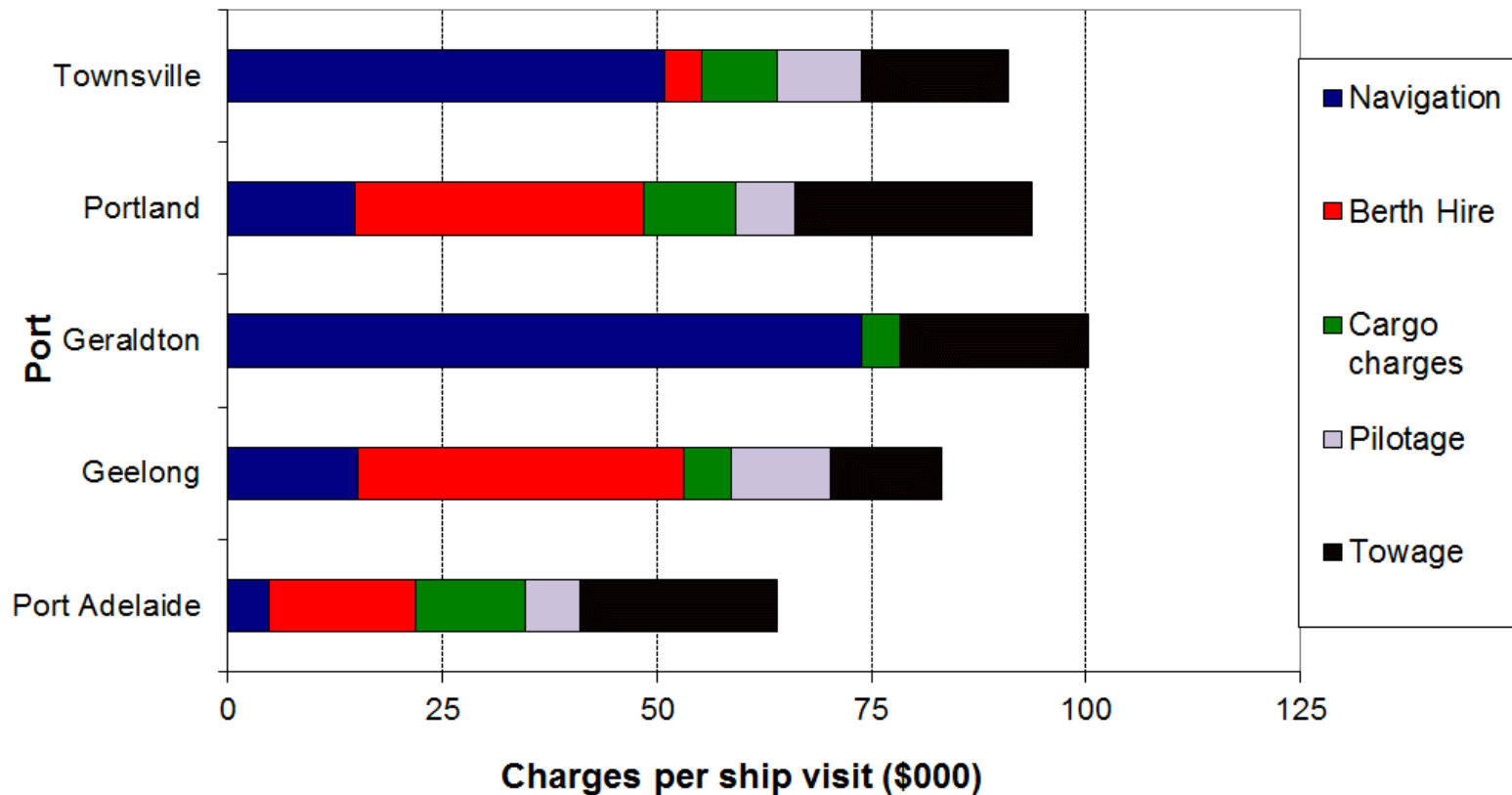


Other port charges sources (primarily from private towage, pilotage and mooring service operators)

Port Name	Source
SA ports	
Port Adelaide	Svitzer Australasia
Port Giles	Svitzer Australasia
Port Pirie	Port Lincoln Tugs Pty Ltd
Port Lincoln	Port Lincoln Tugs Pty Ltd
Thevenard	Port Lincoln Tugs Pty Ltd
Wallaroo	Port Lincoln Tugs Pty Ltd
Non SA ports	
- Brisbane	Transport Operations (Marine Safety) Regulation, pg 265 (Maritime Safety Queensland), Svitzer Australasia
- Bunbury	http://www.byport.com.au/
- Fremantle	Svitzer Australasia (2012 Tariffs used with assumed 5 year cost escalation of total 20% 2012-2015)
- Geelong	Svitzer Australasia (2012 Tariffs used with assumed 5 year cost escalation of total 20% 2012-2015)
- Geraldton	http://gpa.wa.gov.au/Port_Fees_Charges.aspx
- Gladstone	Smit Lamnalco: Marine and Offshore Services
- Melbourne	Svitzer Australasia (2012 Tariffs used with assumed 5 year cost escalation of total 20% 2012-2015)
- Newcastle	Svitzer Australasia (2012 Tariffs used with assumed 5 year cost escalation of total 20% 2012-2015)
- Port Kembla	Svitzer Australasia (2012 Tariffs used with assumed 5 year cost escalation of total 20% 2012-2015)
- Sydney	Svitzer Australasia (2012 Tariffs used with assumed 5 year cost escalation of total 20% 2012-2015)
- Portland	http://www.portofportland.com.au/2011-12-port-charges.html
- Townsville	Smit Lamnalco: Marine and Offshore Services

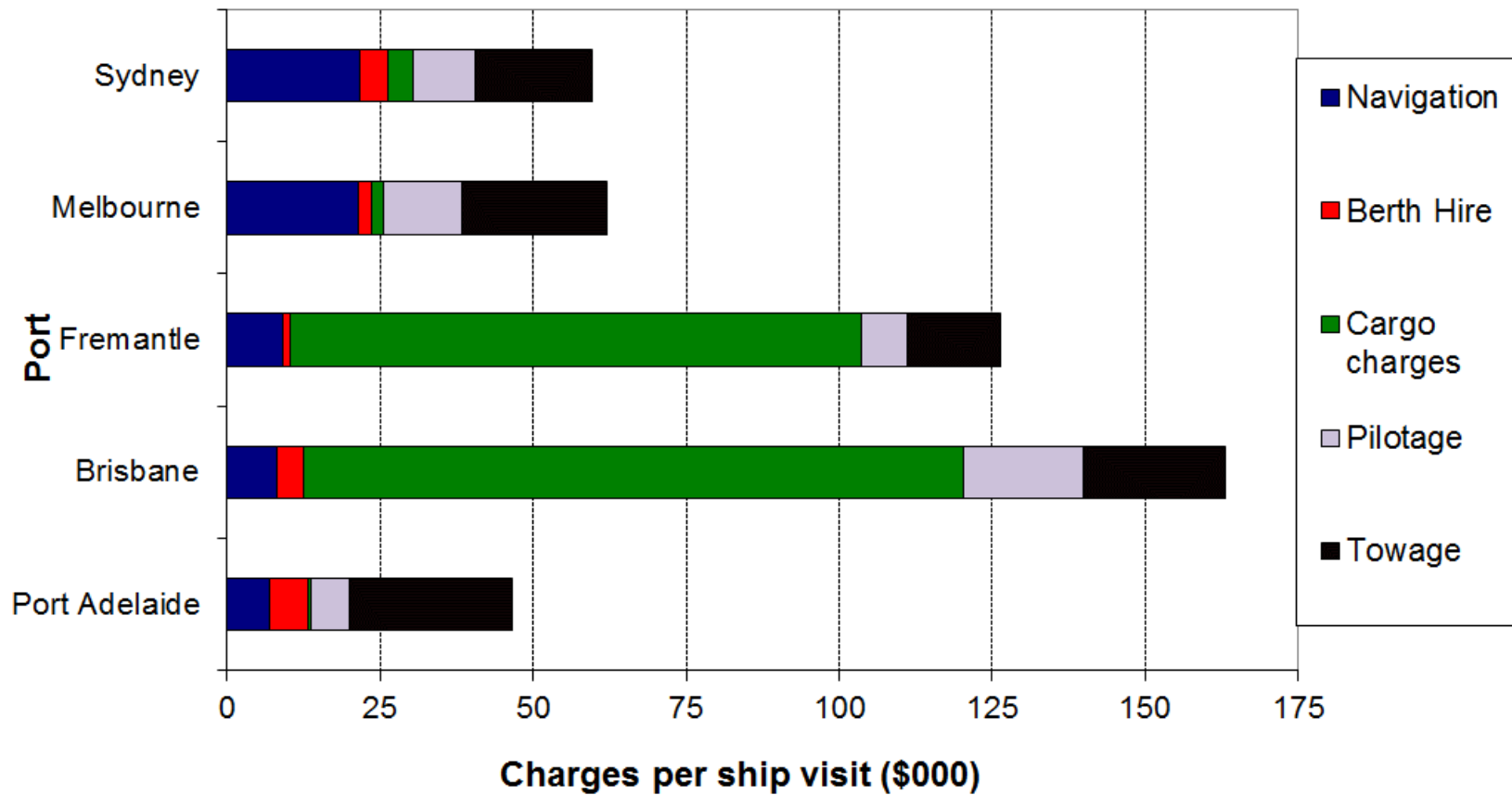
Port Name	Source
SA ports	
- Port Adelaide	http://www.flindersports.com.au/portstatistics2.html
- Port Giles	http://www.flindersports.com.au/portstatistics2.html
- Port Pirie	http://www.flindersports.com.au/portstatistics2.html
- Port Lincoln	http://www.flindersports.com.au/portstatistics2.html
- Thevenard	http://www.flindersports.com.au/portstatistics2.html
Non SA ports	
- Brisbane	https://www.portbris.com.au/trade-logistics/trade-statistics
- Bunbury	http://www.parliament.wa.gov.au/publications/tabledpapers.nsf/displaypaper/3914687a1effacb6f9a803f84825803600256552/\$file/4687.pdf
- Fremantle	http://www.fremantleports.com.au/News/Publications/AnnualReport/Documents/2016%20Annual%20Report%20-%20Full%20Report.pdf
- Geelong	http://www.regionalchannels.vic.gov.au/images/documents/2015/Geelong%20Port%20Economics_Final_151118.pdf
- Geraldton	https://www.midwestports.com.au/Assets/Documents/Document%20Centre/AnnualReports/2015-2016_Annual_Report.pdf
- Gladstone	http://www.tmr.qld.gov.au/Business-and-industry/Transport-sectors/Ports/Trade-statistics-for-Queensland-ports.aspx
- Melbourne	http://www.vicports.vic.gov.au/publications/Documents/annual-report-2016-pomc.pdf
- Newcastle	https://www.parliament.nsw.gov.au/la/papers/DBAssets/tabledpaper/webAttachments/69937/Attachment%20H%20-%20Port%20Authority%20of%20NSW%202015-16%20Annual%20Report.pdf
- Port Kembla	http://www.kemblaport.com.au/page/port-operations/trade---cargo/
- Sydney	http://www.nswportsbotany.com.au/assets/Trade-Reports---2016/Port-Botany-June-2016-Trade-Bulletin.pdf
- Portland	http://www.portsaustralia.com.au/aus-ports-industry/trade-statistics/
- Townsville	http://www.tmr.qld.gov.au/Business-and-industry/Transport-sectors/Ports/Trade-statistics-for-Queensland-ports.aspx

Breakdown of EMS and non-EMS Port Costs, Livestock 2017



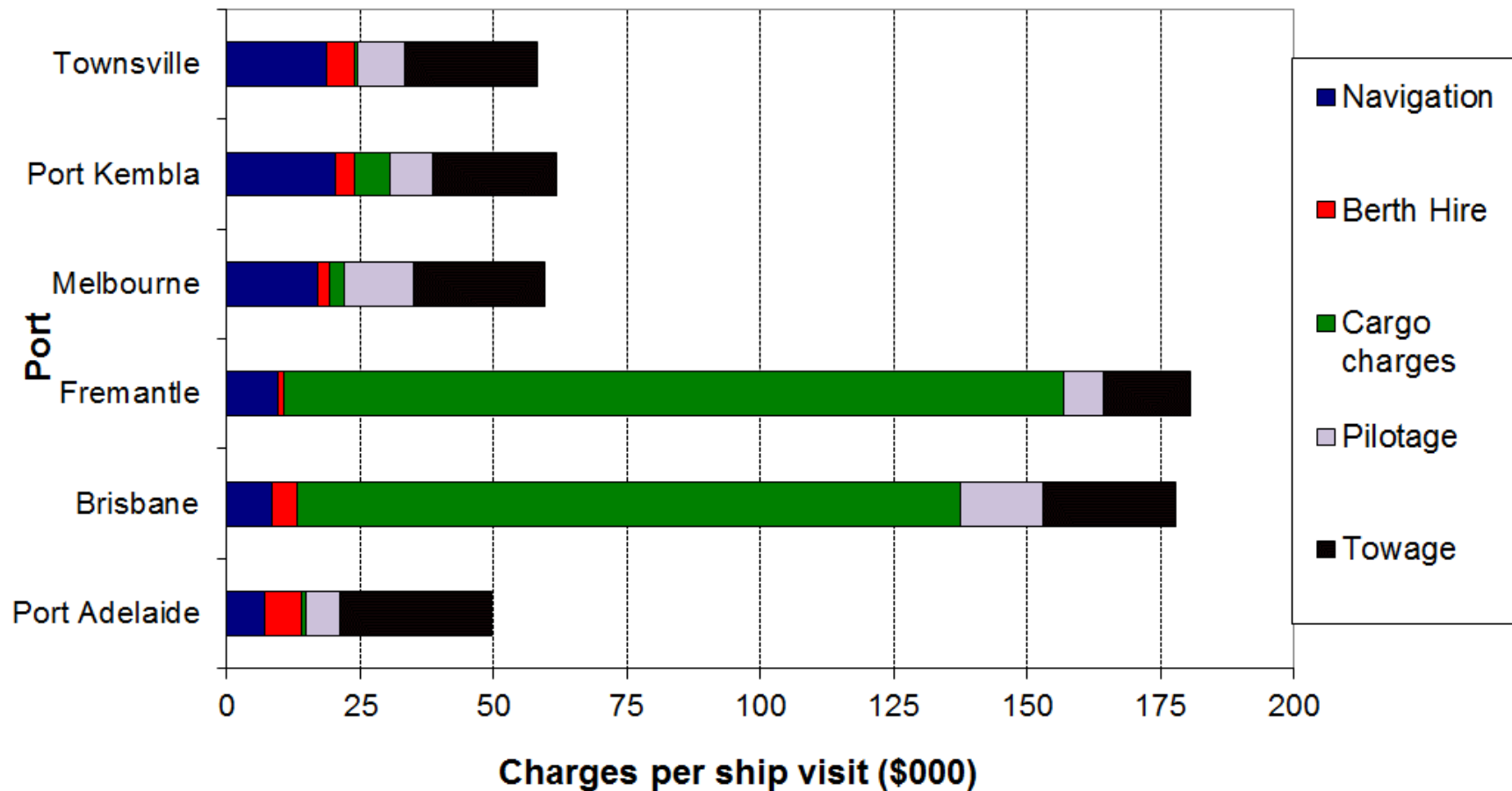
Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Container 2017



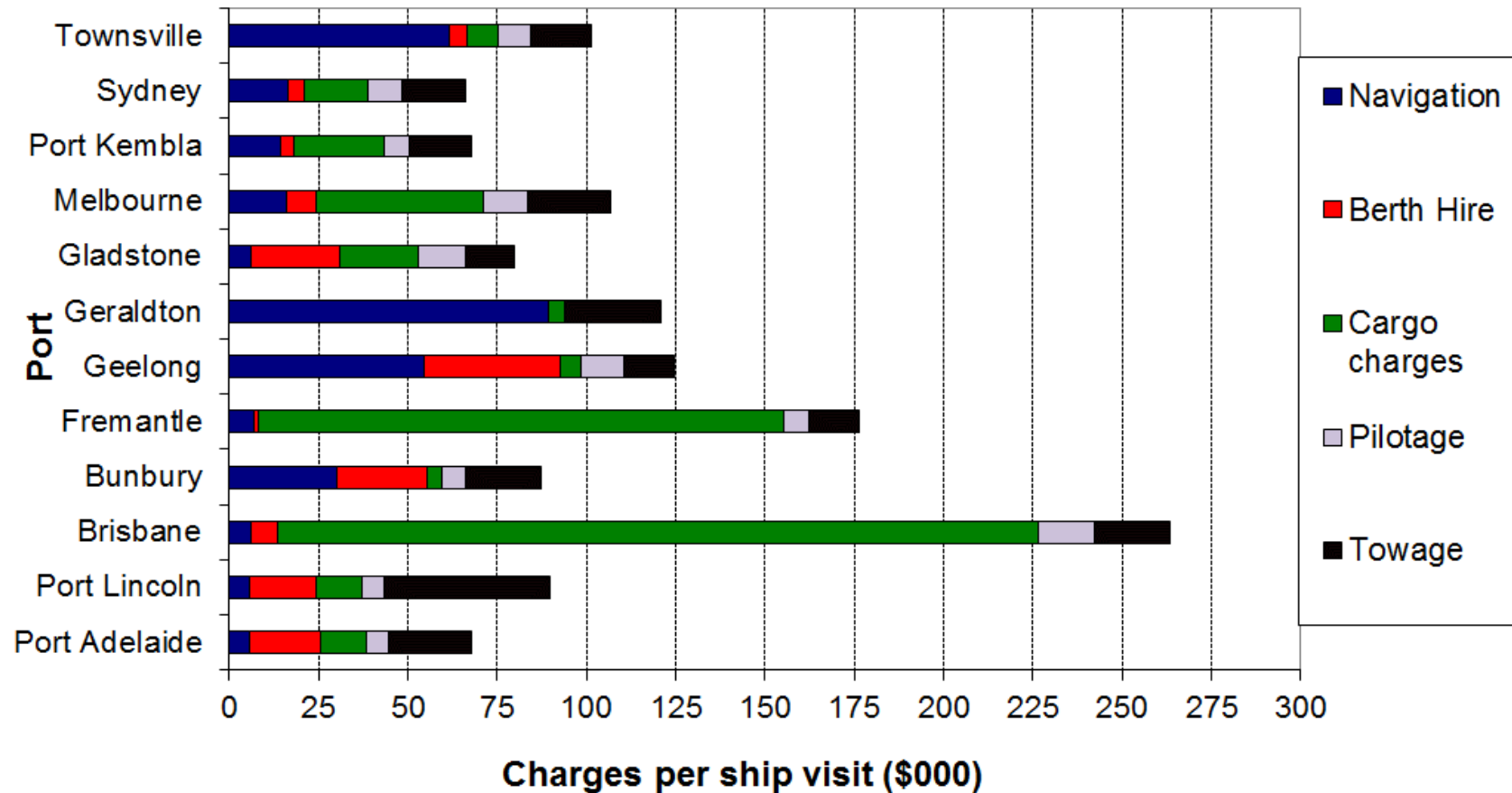
Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Motor Vehicle 2017



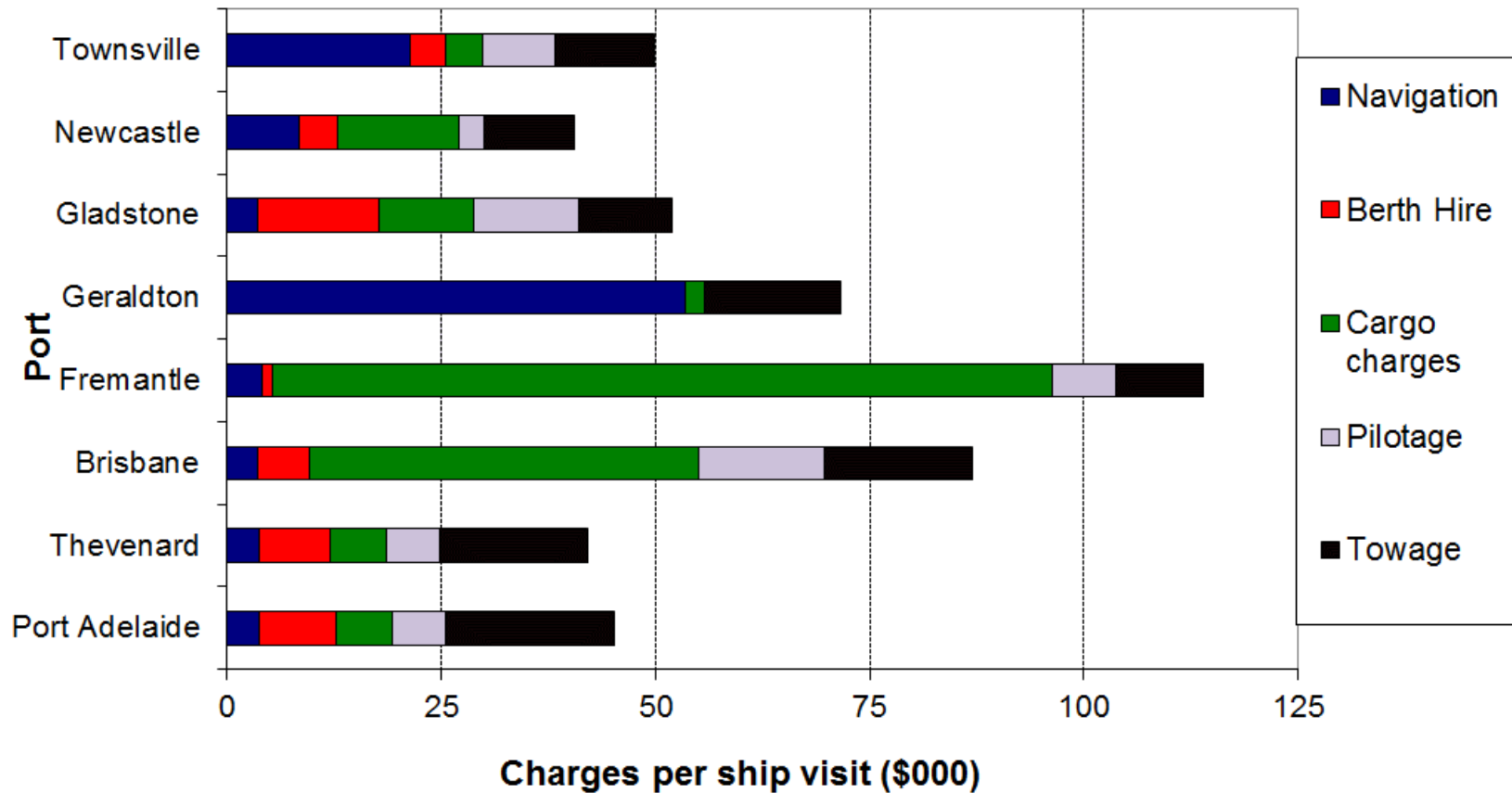
Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Liquid Bulk 2017



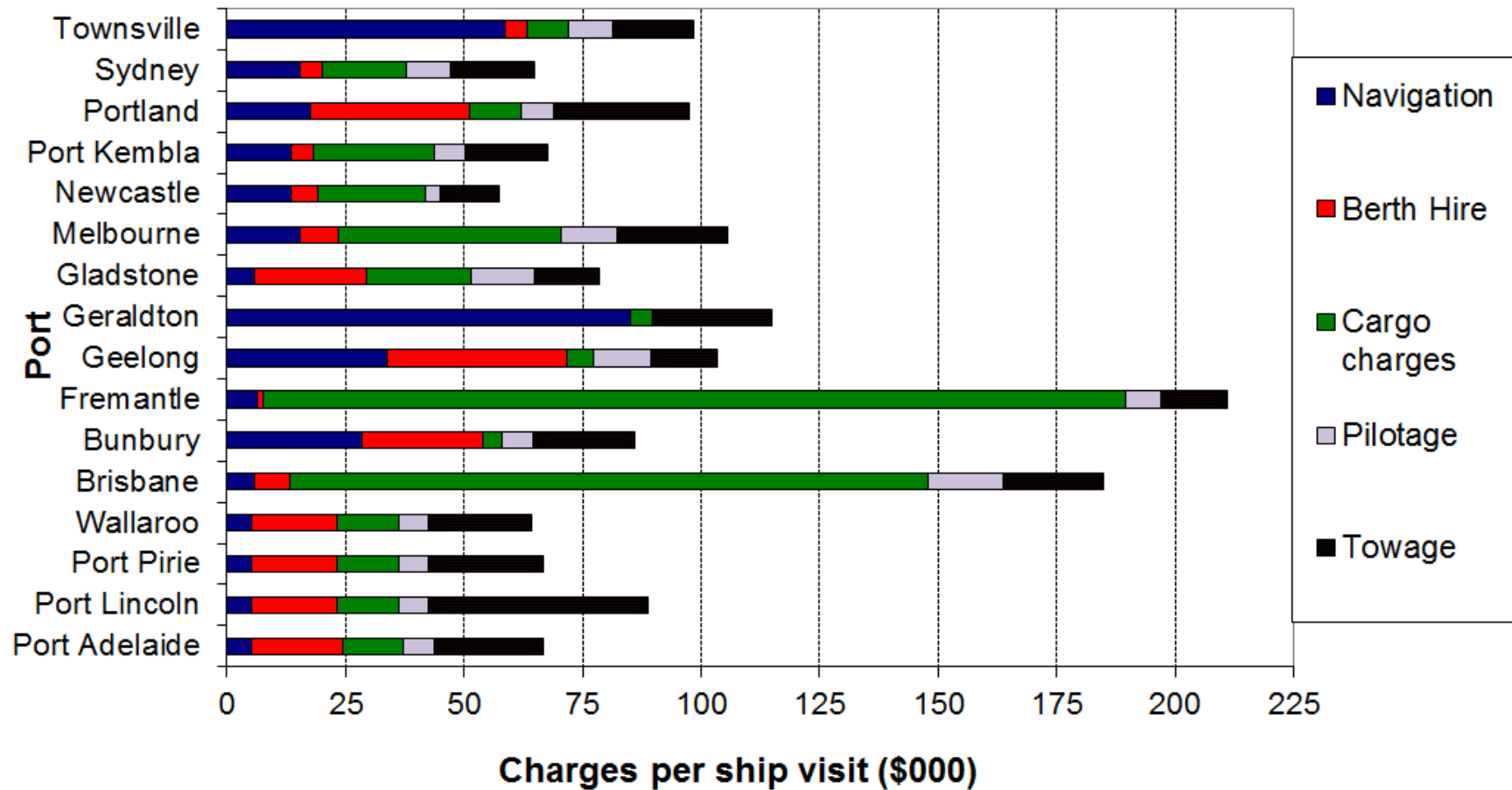
Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Dry Bulk (Concession) 2017



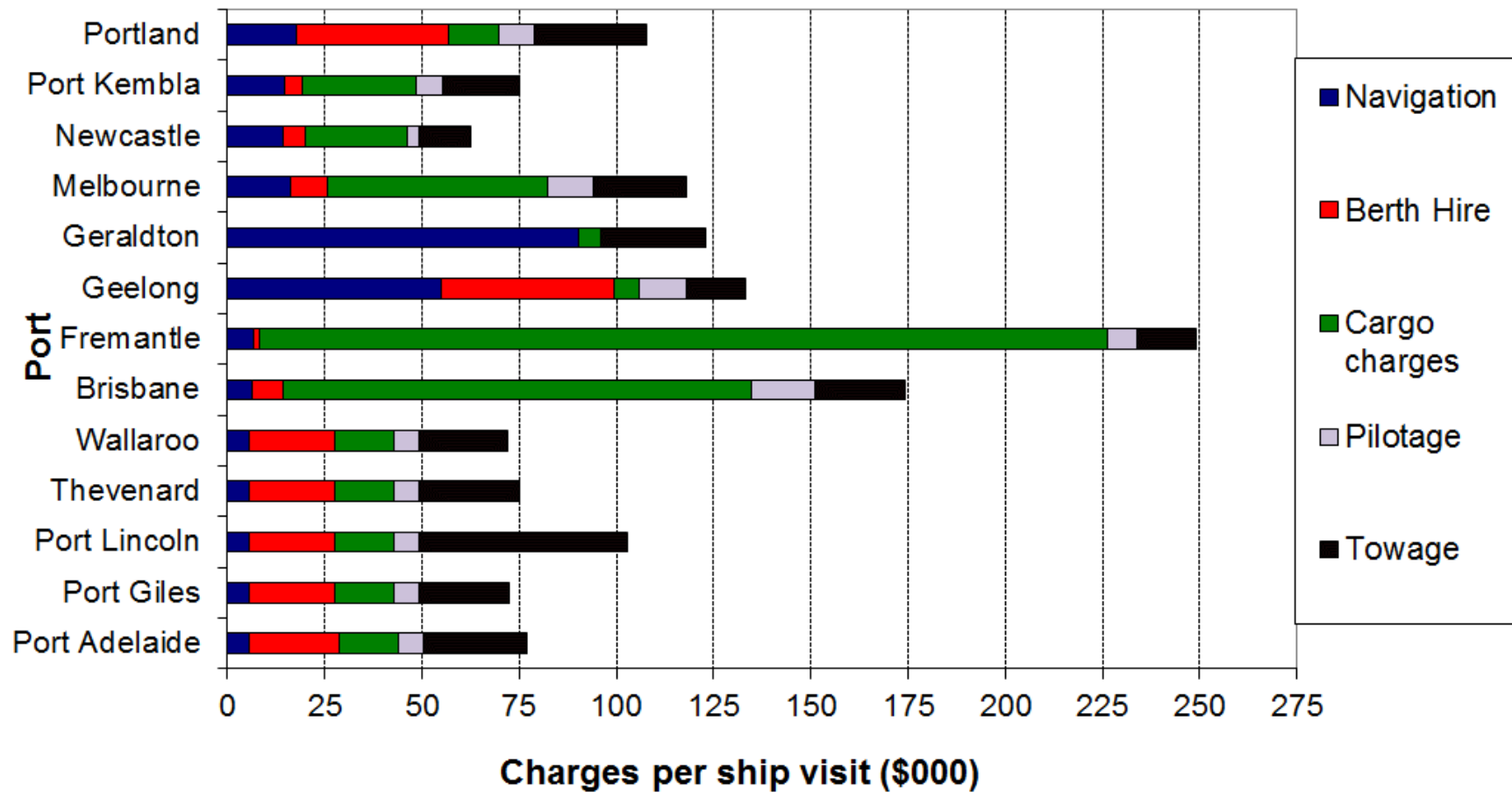
Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Dry Bulk (General) 2017



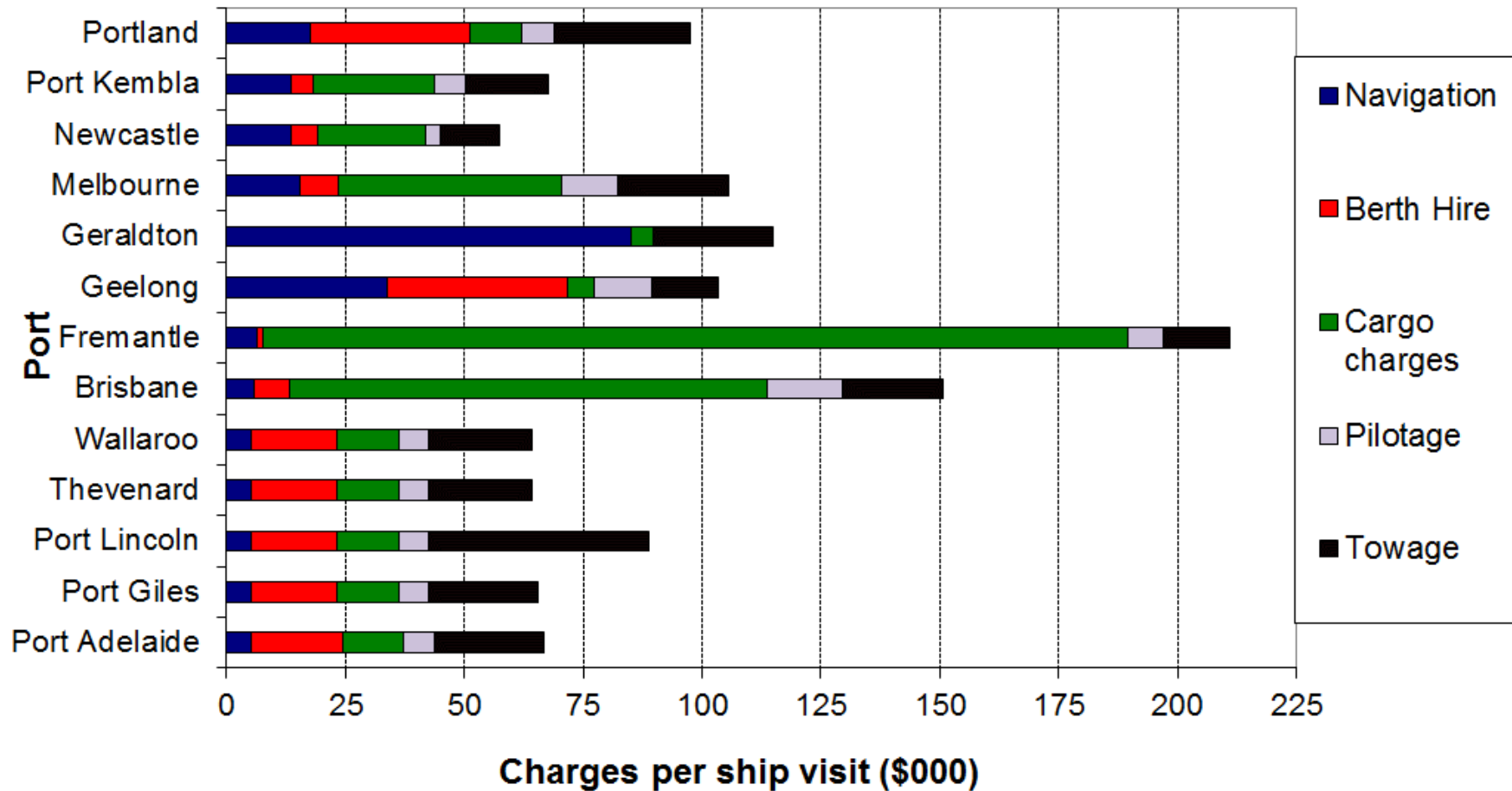
Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Grain - Panamax 2017



Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Breakdown of EMS and non-EMS Port Costs, Grain - Handymax 2017



Source: GHD analysis of published Breakdown of EMS and non-EMS Port Costs.

Summary of EMS Port Call Cost per Revenue Ton for vessels and cargoes (2016 charges)

\$ EMS Port Call Cost per Revenue Ton for each model ship visit (2016-17 charges)								
Vessel/Cargo:	Grain - Handymax	Grain - Panamax	Dry Bulk - general	Dry Bulk - concession	Liquid Bulk	Motor Vehicle	Container	Livestock
Port:	EMS Cost	EMS Cost	EMS Cost	EMS Cost	EMS Cost	EMS Cost	EMS Cost	EMS Cost
Port Adelaide	\$0.93	\$0.92	\$0.93	\$0.96	\$0.96	\$0.47	\$0.41	\$14.45
Port Giles	\$0.90	\$0.89	-	-	-	-	-	-
Port Lincoln	\$0.90	\$0.89	\$0.90	-	\$0.93	-	-	-
Port Pirie	-	-	\$0.90	-	-	-	-	-
Thevenard	\$0.90	\$0.89	-	\$0.93	-	-	-	-
Wallaroo	\$0.90	\$0.89	\$0.90	-	-	-	-	-
Brisbane	\$2.84	\$2.81	\$3.70	\$2.75	\$5.67	\$4.40	\$3.58	-
Bunbury	-	-	\$1.45	-	\$1.49	-	-	-
Fremantle	\$4.74	\$4.72	\$4.74	-	\$3.88	\$5.02	\$3.08	\$7.60
Geelong	\$1.93	\$2.21	\$1.93	-	\$2.46	-	-	\$24.46
Geraldton	\$2.24	\$2.00	\$2.24	\$2.78	\$2.35	-	-	\$32.64
Gladstone	\$1.29	\$1.25	\$1.29	\$1.44	\$1.32	\$0.94	\$0.83	\$20.19
Melbourne	\$1.76	\$1.71	\$1.76	-	\$1.78	\$0.71	\$0.76	-
Newcastle	\$1.05	\$0.97	\$1.05	\$1.35	\$1.04	\$1.00	\$1.05	\$16.74
Port Kembla	\$1.09	\$1.01	\$1.09	-	\$1.08	\$0.98	-	-
Portland	\$1.55	\$1.45	\$1.55	-	-	-	-	\$24.69
Sydney	-	-	\$0.95	-	\$0.97	-	\$0.91	-
Townsville	-	-	\$1.80	\$1.49	\$1.88	\$0.78	-	\$26.66

Note: '-' means trade not relevant at port.

Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes



Summary of Total Port Call Cost per Revenue Ton for vessels and cargoes (2016-17 charges)

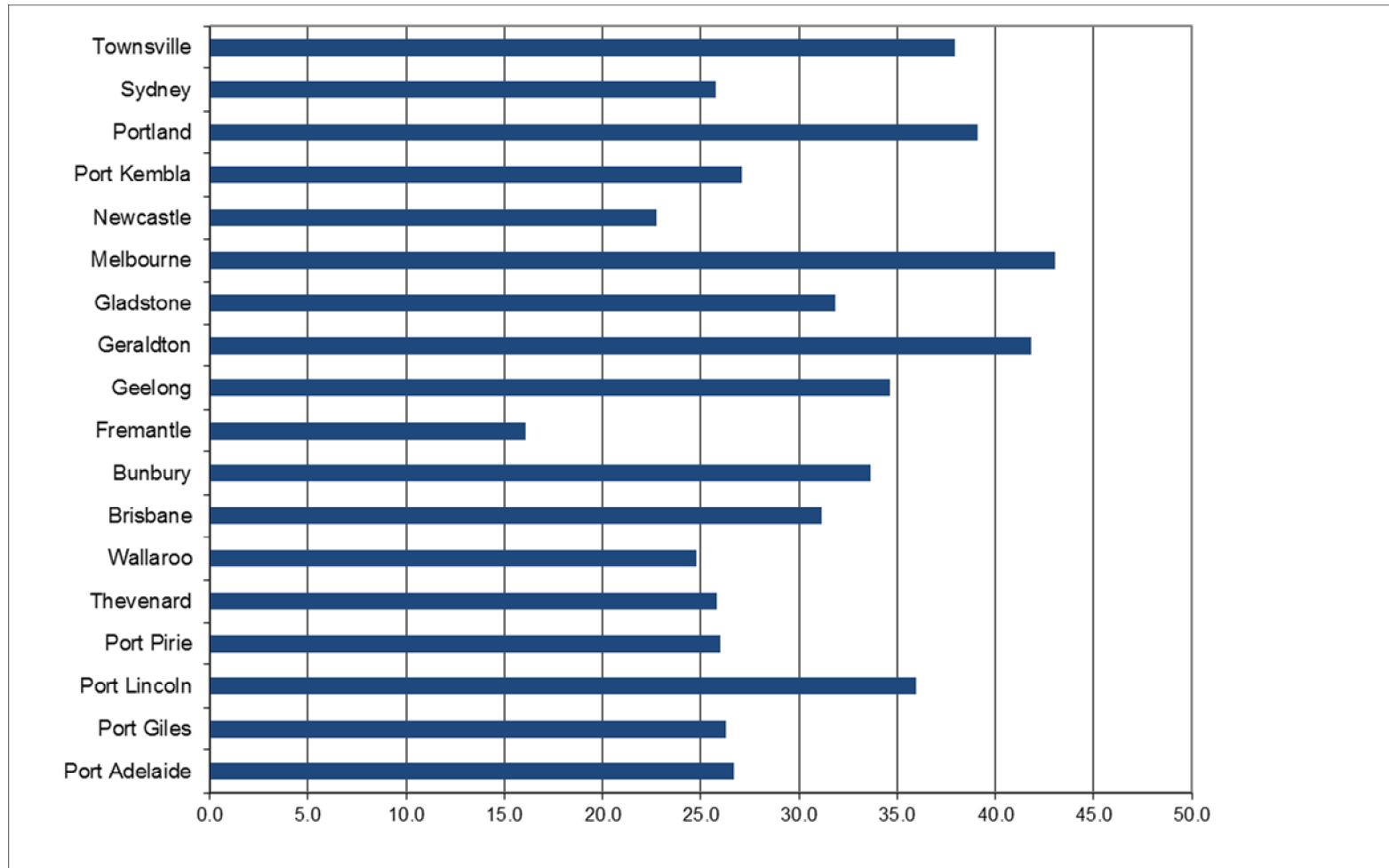
\$ Total Port Call Cost per Revenue Ton for each model ship visit (2016-17 charges)								
Vessel/Cargo:	Grain - Handymax	Grain - Panamax	Dry Bulk - general	Dry Bulk - concession	Liquid Bulk	Motor Vehicle	Container	Livestock
Port:	Total Cost	Total Cost	Total Cost	Total Cost	Total Cost	Total Cost	Total Cost	Total Cost
Port Adelaide	\$1.66	\$1.60	\$1.66	\$2.26	\$1.69	\$1.59	\$1.38	\$26.69
Port Giles	\$1.64	\$1.50	-	-	-	-	-	-
Port Lincoln	\$2.22	\$2.14	\$2.22	-	\$2.24	-	-	-
Port Pirie	-	-	\$1.67	-	-	-	-	-
Thevenard	\$1.61	\$1.57	-	\$2.10	-	-	-	-
Wallaroo	\$1.60	\$1.50	\$1.60	-	-	-	-	-
Brisbane	\$3.77	\$3.63	\$4.62	\$4.35	\$6.59	\$5.69	\$4.85	-
Bunbury	-	-	\$2.15	-	\$2.19	-	-	-
Fremantle	\$5.28	\$5.19	\$5.28	-	\$4.41	\$5.78	\$3.76	\$16.09
Geelong	\$2.58	\$2.78	\$2.58	-	\$3.11	-	-	\$34.64
Geraldton	\$2.87	\$2.56	\$2.87	\$3.58	\$3.02	-	-	\$41.79
Gladstone	\$1.97	\$1.89	\$1.97	\$2.60	\$1.99	\$2.01	\$1.82	\$31.82
Melbourne	\$2.64	\$2.46	\$2.64	-	\$2.67	\$1.91	\$1.85	-
Newcastle	\$1.43	\$1.30	\$1.43	\$2.02	\$1.42	\$2.05	\$1.59	\$22.73
Port Kembla	\$1.69	\$1.56	\$1.69	-	\$1.69	\$1.97	-	-
Portland	\$2.43	\$2.25	\$2.43	-	-	-	-	\$39.08
Sydney	-	-	\$1.62	-	\$1.65	-	\$1.77	-
Townsville	-	-	\$2.46	\$2.49	\$2.53	\$1.86	-	\$37.91

Note: ‘-’ means trade not relevant at port.

Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

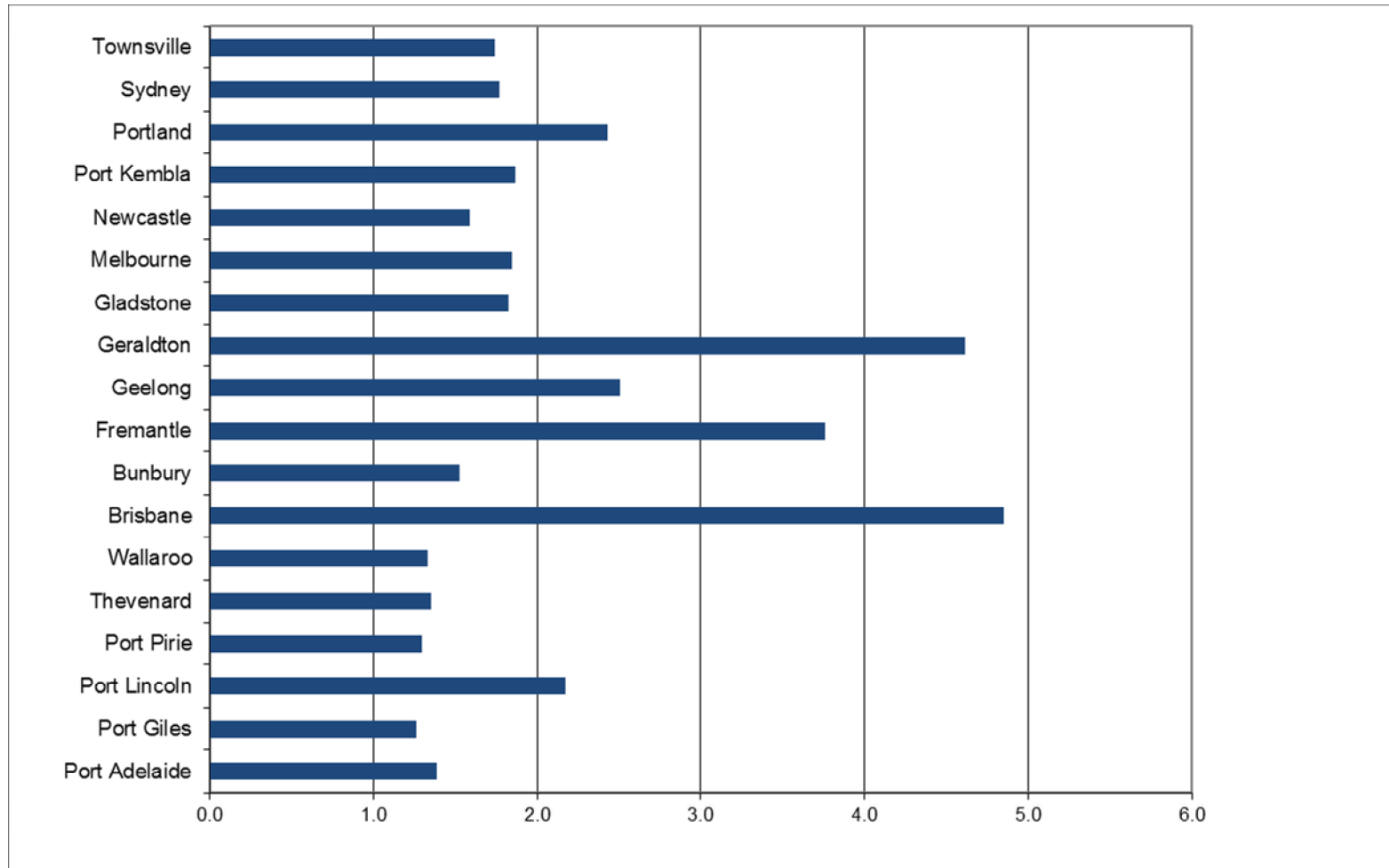


Total Port Costs per Revenue Ton for vessels and cargoes, Livestock 2017



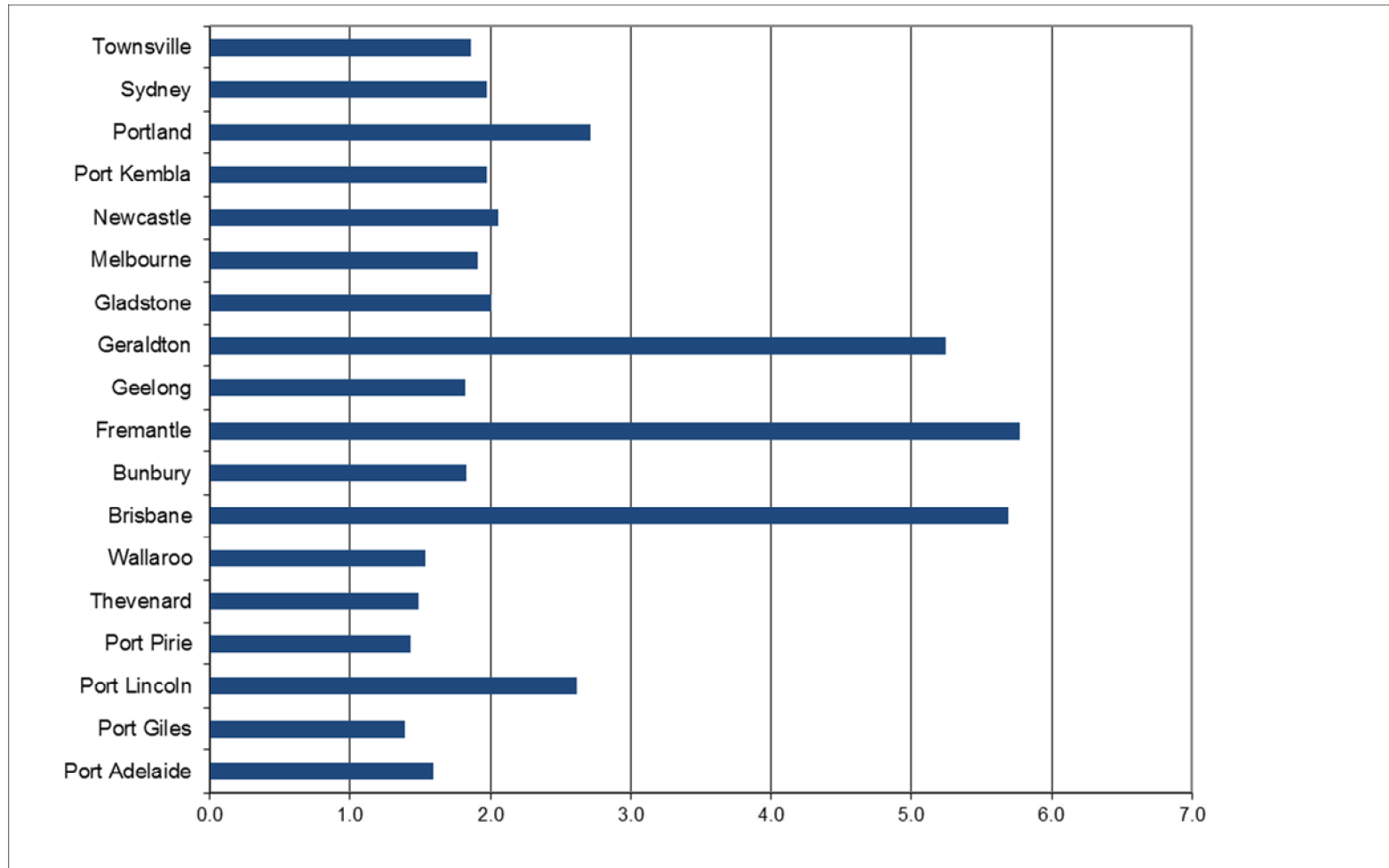
Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Containers 2017



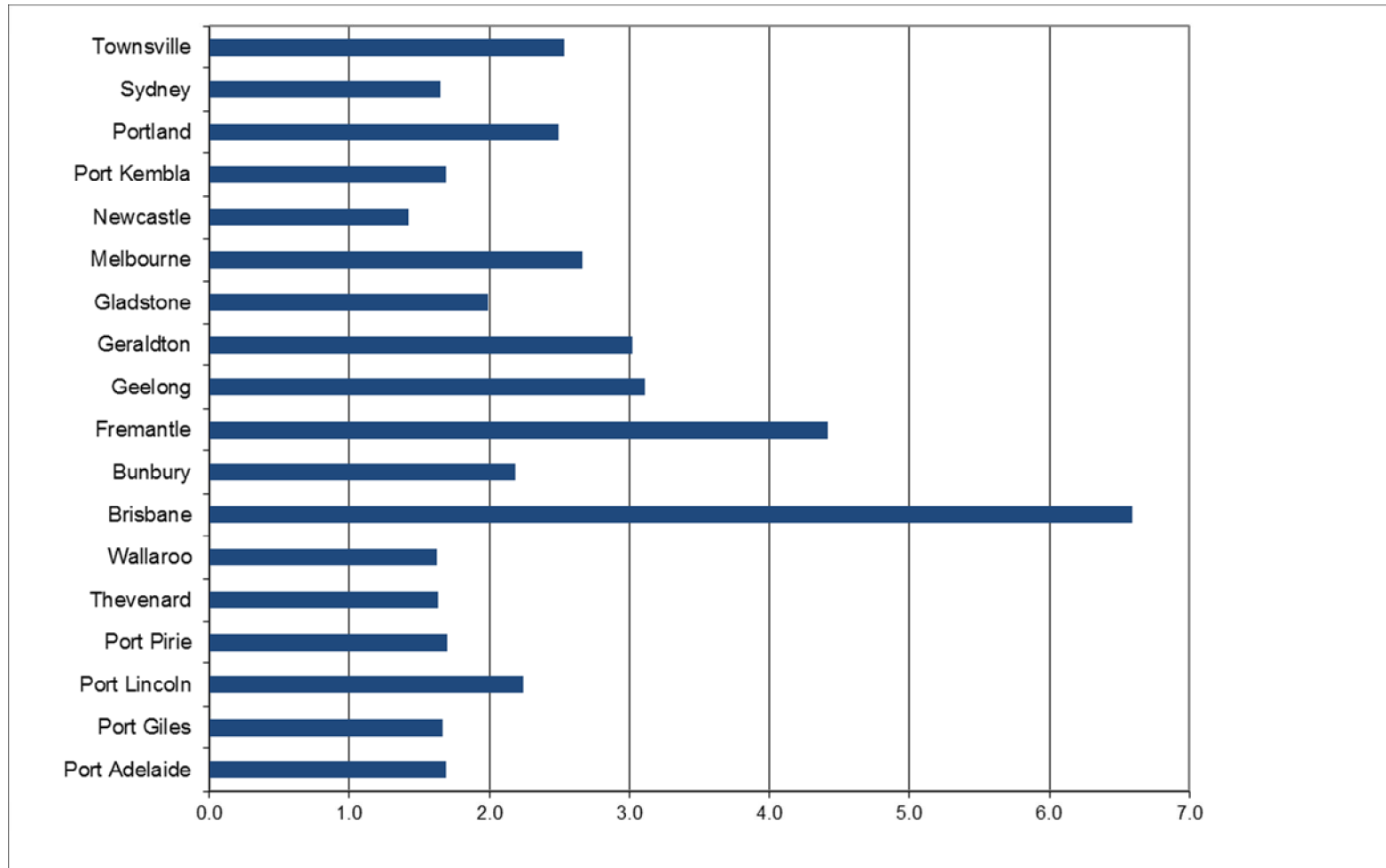
Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Motor Vehicles 2017



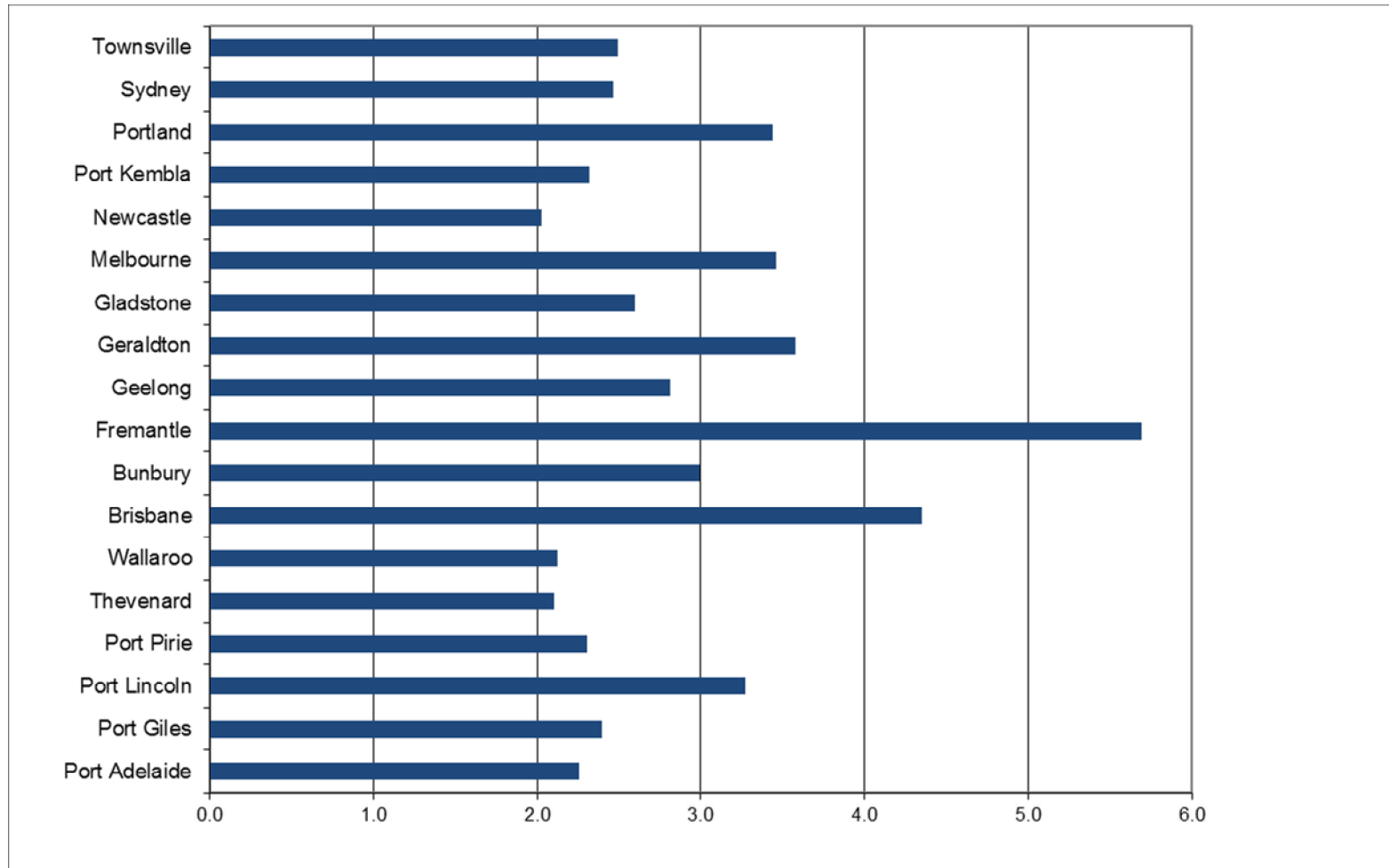
Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Liquid Bulk 2017



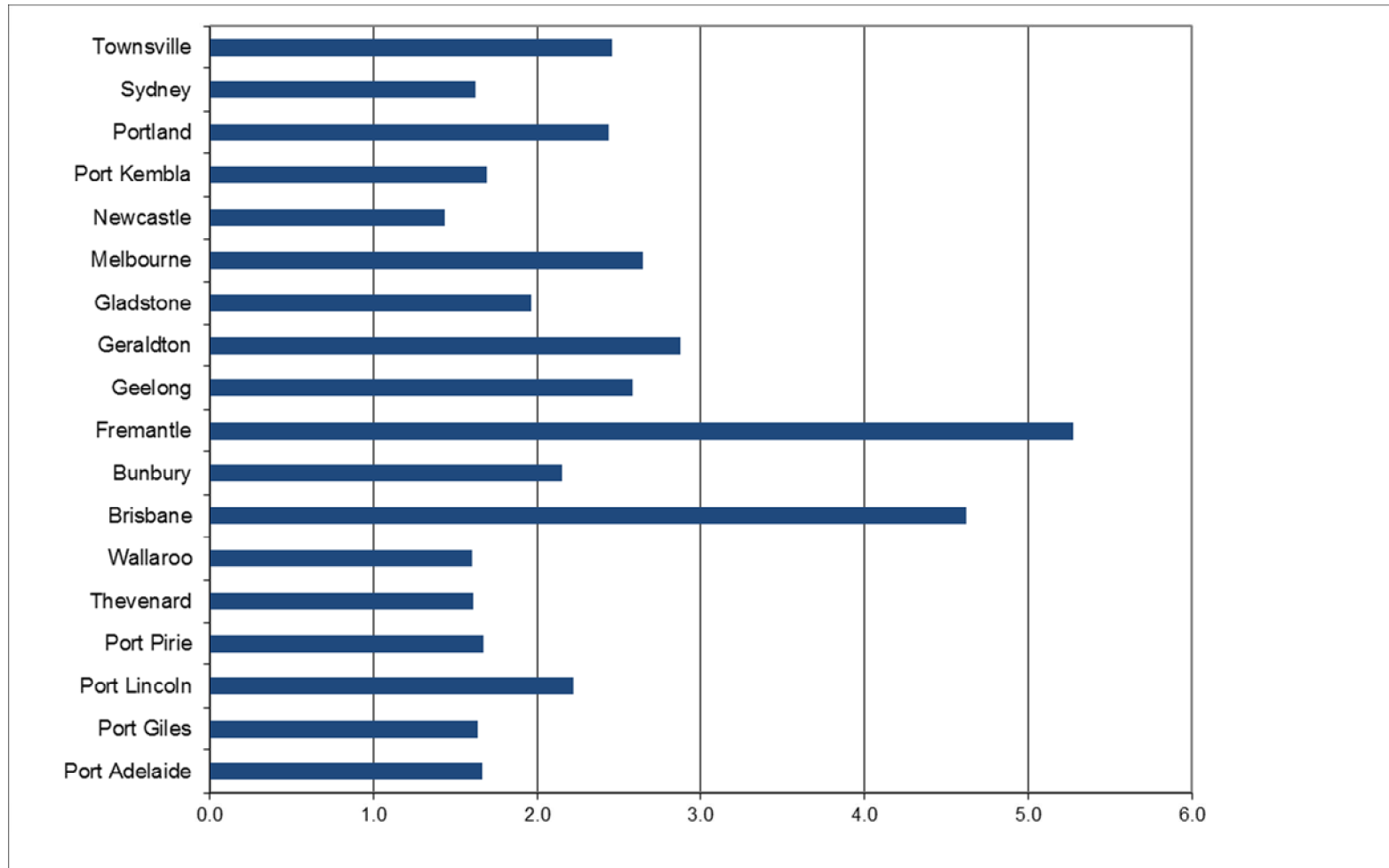
Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Dry Bulk (Concession) 2017



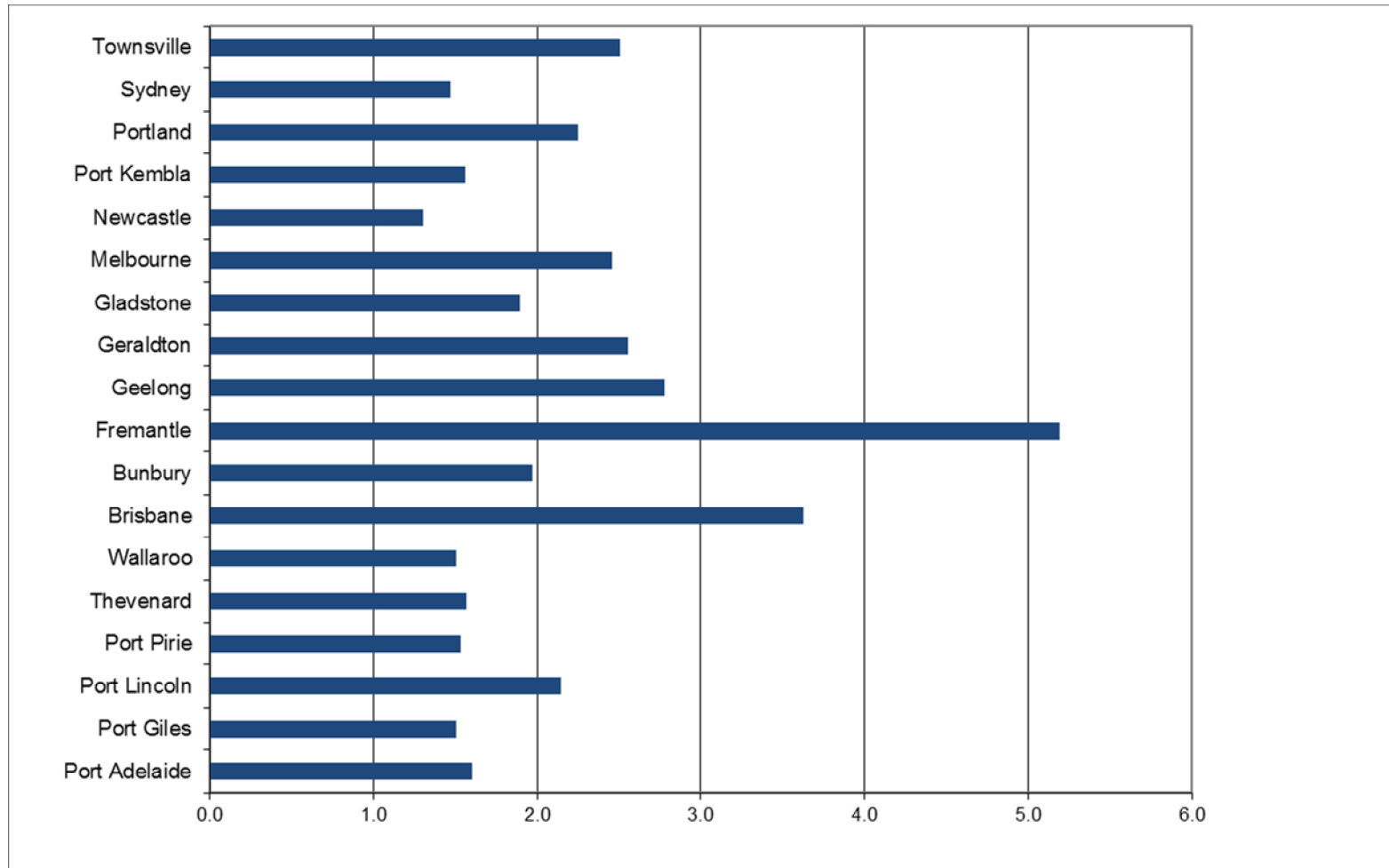
Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Dry Bulk (General) 2017



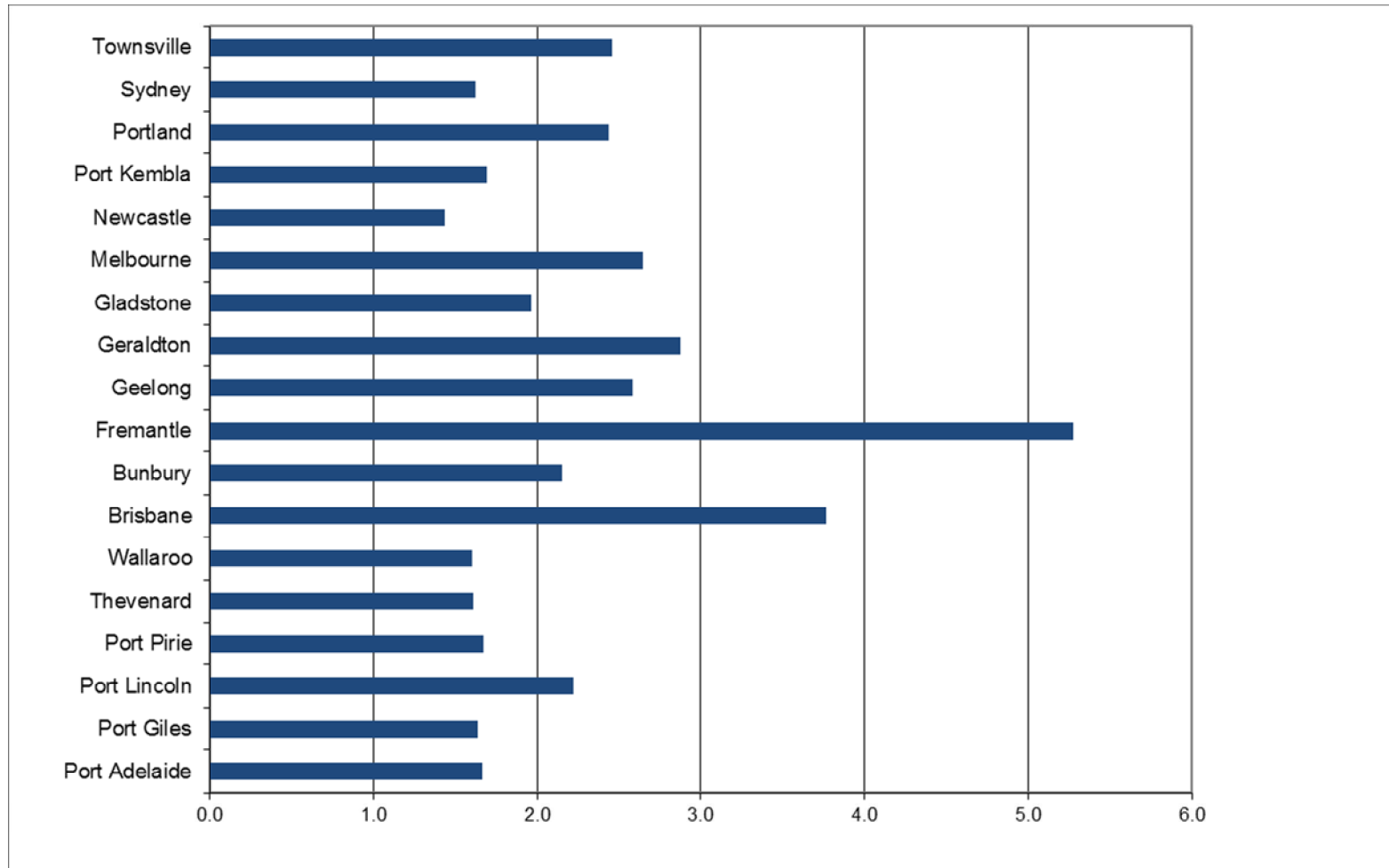
Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Grain - Panamax 2017









Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Total Port Costs per Revenue Ton for vessels and cargoes, Grain - Handymax 2017



Source: GHD analysis of published Breakdown of Costs per Revenue Ton for vessels and cargoes

Rev No.	Author	Reviewer		Approved for Issue		Date
		Name	Signature	Name	Signature	
A (Draft)	G. Reynolds	W. Van Lint		W. Van Lint		12/02/2017
B (Final)	G. Reynolds	W. Van Lint		W. Van Lint		08/03/2017
C (Final)	G. Reynolds	W. Van Lint		W. Van Lint		23/03/2017

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