

Utilities Commission of the NT



Photo Source: Port of Darwin website

Darwin Port Price Benchmarking Study, 2017

Final Report (Rev F), 21st Feb. 2018



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The Darwin Port Price Benchmarking Study, 2017

1.1 Background

GHD Advisory has been engaged by the Utilities Commission of the Northern Territory (UC), the economic regulator of the Port of Darwin, to undertake a benchmarking study of port prices (or ship visit costs or charges) at the Port of Darwin against comparable interstate port prices. The findings and insights from this study are intended to inform the UC's 2018 Ports Access and Pricing Review in accordance with work tasks under Part 11 of the *Ports Management Act* (the Act) and Part 3 of the Ports Management Regulations (the Regulations).

UC has been responsible for the economic regulation of the Port of Darwin since November 2015. The economic regulation covers the pricing and access for Prescribed standard port services at the Port of Darwin as managed and published by the declared port operator - Darwin Port Operations Pty Limited (DPO). This benchmarking study is the first Darwin Port price benchmarking study undertaken for the UC.

The results in this study are indicative only and will vary given different assumptions used. Hence, reader caution is needed.

1.2 Scope and Approach

The scope of the study and the approach used was limited to:

- Comparing the main Prescribed standard port services charges (prices) of Darwin Port with the equivalent prices of seven inter-state comparator ports around the coast of Broome (WA), Port Hedland (WA), Fremantle (WA), Adelaide (SA), Cairns (QLD), Townsville (QLD) and Gladstone (QLD).
- Use of a common set of relevant commodity sectors (vessel cargoes) as comparators: Containers (general cargo), Dry bulk (cement imports), Liquid bulk – oils (fuel imports), Liquid bulk – gases (LNG exports), Motor vehicles (car imports), Livestock (cattle exports), Offshore Supply (general cargo), and Cruiseship (passengers).
- Use of a common set of 'model' ships applicable to the carriage of the comparator cargoes: Containership (1,808 TEU), two Handysize bulk carriers, Handysize products tanker, two LNG tankers (137,000 & 155,300 m³), Pure Car Carrier (4,900 CEU), Livestock Carrier (5,225 dwt), Offshore Supply Vessel (4,000 dwt), and a Cruiseship (2,272 PAX).
- 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 the main Prescribed port services of Port Dues (vessel GT based charges for port access via channels, port security levies, Fremantle Ports' Tonnage Rates, & MSQ Conservancy Dues), Pilotage (vessel safe navigation to/from port & pilot boarding station), Berthing (vessel time-at-berth based charges) and Wharfage (cargo handling/throughput based charges). Excluded costs – AMSA vessel levies (no differentiation by port), compulsory Torres Strait/GBR reef pilotage, vessel towage & line-handling at port and cargo stevedoring (these services are mainly contracted).
- Three-year price changes comparing published 2014 price data (1st July) with 2017 current prices (November).



Overview of Current Ports

2.1 The Comparator Ports

Out of the eight ports in the study, Darwin and Adelaide are both privately operated. Plans by previous state governments to privatise Fremantle Ports and the other main ports in Queensland are currently on-hold or have been abandoned.

Since July 2014, with the exception of Fremantle Ports, individual port authorities in WA have been merged into regional port authorities. Cairns Port is operated by a regional port authority (Ports North) and both Townsville and Gladstone additionally manage a smaller neighbouring port.

In general, the trade-mix at the ports covered in the study has not significantly changed since 2014. Some traditional minor dry bulk trades have stagnated or declined, while some large resources projects have since become operational leading to new trades (i.e. LNG exports). This implies that the volume-base for the ports' charging schemes is broadly the same as in 2014 with some exceptions including at Darwin Port (i.e. the recent significant decline in minerals exports).

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

Trade Sector	Darwin (NT)	Broome (WA)	Port Hedland (WA)	Fremantle (WA)	Adelaide (SA)	Cairns (QLD)	Townsville (QLD)	Gladstone (QLD)
Containers	Yes	Minor	Yes	Yes	Yes	Minor	Yes	Yes
Motor Vehicles	Yes	-	-	Yes	Yes	Minor	Yes	Minor
Dry Bulks	Yes	-	Yes	Yes	Yes	-	Yes	Yes
Liquid Bulks - oils & chemicals	Yes	Minor	Yes	Yes	Yes	Minor	Yes	Yes
Liquid Bulks - gases (LNG/LPG)	Yes	-	#	Yes	-	-	-	Yes
Livestock	Yes	Yes	Yes	Yes	Yes	-	Yes	-
Offshore Supply	Yes	Yes	Yes	-	-	-	-	-
Cruise-ship Tourism	Yes	Yes	Minor	Yes	Yes	Yes	Yes	-
Other Commercial (incl. non-cargo)	Defence	Pearl/fish	Yes	Defence	Fishing	Def./Fish	Defence	Fishing

Legend:

Level of Sector minor or not applicable

Level of Sector significant regionally

Level of Sector significant nationally

Activity strategic nationally

(#) Significant at Dampier which is also managed by the Pilbara Ports Authority as from 2014.

Source: GHD analysis of port published trade statistics & Annual Reports.

Overview of Current Ports

2.2 Trade developments at the Comparator Ports

An overview of trade developments helps to provide an understanding of how this may, in part, influence (drive) changes in port pricing over recent years – see Table 2. Both Darwin and Broome have significant vessel visits, but much lower cargo trade volumes compared with the other ports. This is caused by a relatively high proportion of small Offshore Supply Vessels with limited cargo capacity visiting Darwin and Broome. Also, currently up to 3.5 million tonnes/year of LNG exports# from Darwin are not handled by the DPO – only the Port's channels and pilots are used for this trade, whereas LNG (19.4 million tonnes in FY 2016-17) is handled by the Gladstone Ports Corporation.

Table 2 Summary of trade throughputs and vessel visits at the comparator ports, 2014-2017

Key Trade Performance Indicator	Darwin (NT)	Broome (WA)	Port Hedland (WA)	Fremantle (WA)	Adelaide (SA)	Cairns (QLD)	Townsville (QLD)	Gladstone (QLD)
Total Cargo Trade (Million tonnes)								
FY 2013-14	4.6	0.5	372.3	33.51	11.76	1.04	10.26	97.67
FY 2014-15	3.4	0.5	446.9	35.84	10.64	1.31	10.49	99.29
FY 2015-16	2.3	0.5	460.4	34.82	10.26	1.15	9.23	115.98
FY 2016-17	1.7	0.3	500.9	35.25	9.45	1.36	6.91	120.41
Commercial Vessel Visits (Number)								
FY 2013-14	3,178	1,050	N/A	1,874	1,194	856	635	1,643
FY 2014-15	1,715	1,000	N/A	1,804	1,168	872	643	1,541
FY 2015-16	1,320	1,014	2,746	1,837	1,216	836	618	1,753
FY 2016-17	1,150	837	2,937	1,813	1,222	857	576	1,788

Source: GHD analysis of port published trade statistics & Annual Reports.

N/A=Publically Not Available.

Note: Significant reduction in total vessel visits in FY 2014-15 due to cessation of or reduction in vessels used for the INPEX project.

Note: Total Cargo Trade is in mass tonnes.

Note: Port Hedland total trade for FY 2016-17 comprises 494.4 million tonnes iron ore exports & 6.51 million tonnes of other cargoes.

Note: Fremantle received additional 62 Defence vessel visits in FY 2015-16, and 92 visits in FY 2016-17.

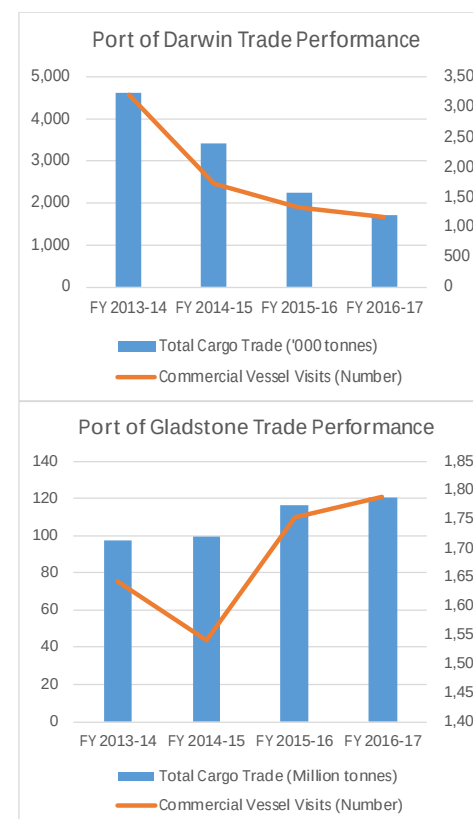
Note: Adelaide Total Cargo Trade excludes Containers and is for Calendar Year (Jan.-Dec.).

Note: Gladstone received 298 LNG vessel visits in FY 2016-17 with 19.4 million tonnes of LNG exports.

Note: Port of Darwin received additional 102 Defence vessel visits in FY 2013-14, and 85 visits in FY 2014-15.

Source: ConocoPhillips website – EIS documents.

Figure 1
Darwin versus Gladstone trade performance, 2014-2017



Overview of Current Ports

2.3 Financial developments at the Comparator Ports

An overview of financial developments may also help to provide further background on the potential influences and impacts of changes in port pricing over recent years – see Table 3.

Table 3 Summary of key financial performance at the comparator ports, 2014-2017

Financial Performance Indicator	Darwin (NT)	Broome (WA)	Port Hedland (WA)*	Fremantle (WA)	Adelaide (SA)	Cairns (QLD)**	Townsville (QLD)***	Gladstone (QLD)****
<i>Current Governance per Nov. 2017</i>	<i>Private (1)</i>	<i>StateCo (2)</i>	<i>StateCo (3)</i>	<i>StateCo (4)</i>	<i>Private (5)</i>	<i>StateCo (6)</i>	<i>StateCo (7)</i>	<i>StateCo (8)</i>
Operating Revenue (\$ million)								
FY 2013-14	\$57.78	\$20.81	\$326.58	\$204.48	N/A	\$52.38	\$76.02	\$691.20
FY 2014-15	N/A	\$22.15	\$497.95	\$229.75	N/A	\$53.59	\$75.95	\$453.00
FY 2015-16	N/A	\$24.55	\$406.91	\$223.34	N/A	\$56.62	\$75.07	\$478.90
FY 2016-17	N/A	\$17.97	\$422.63	\$214.06	N/A	\$53.82	\$69.26	\$470.90
Return on EBIT Assets (%)								
FY 2013-14	11.80%	6.60%	24.10%	12.60%	N/A	3.96%	5.38%	9.40%
FY 2014-15	N/A	5.20%	26.30%	15.10%	N/A	5.28%	4.86%	6.40%
FY 2015-16	N/A	7.80%	18.10%	14.70%	N/A	5.78%	4.65%	6.60%
FY 2016-17	N/A	-1.70%	9.70%	13.90%	N/A	3.56%	4.27%	5.80%
Capital Investments (\$ million)								
FY 2013-14	\$13.33	\$3.47	\$9.57	\$4.52	N/A	\$3.67	\$15.36	\$102.40
FY 2014-15	N/A	\$3.80	\$5.70	\$5.44	N/A	\$4.72	\$12.72	\$74.80
FY 2015-16	\$25#	\$11.32	\$14.36	\$0.46	N/A	\$1.24	\$19.95	\$67.90
FY 2016-17		\$5.22	\$53.30	\$2.86	N/A	\$4.57	\$30.42	\$58.50

StateCo = state-owned enterprise/corporation.

Source: GHD analysis of published Annual Reports available on the web.

For the Explanatory Notes to Table 3, please refer to Appendix C.

Port Charge Changes - recent

3.1 Inflationary (CPI) developments at the Comparator Ports

A comparison of the published ABS CPIs over the last five years for the relevant major cities shows that:

1. In 2014, due to the local impact of relatively significant construction projects, Darwin had the highest CPI level, but now has the lowest as these projects are completed.
2. Since 2015, Darwin has almost had zero CPI inflation, while the other comparator cities have annual CPI inflation rates of around 1-2%.

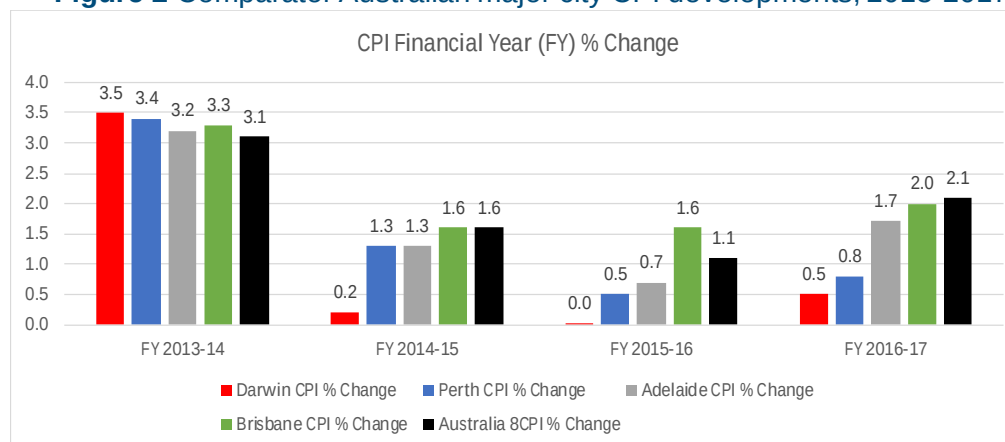
Table 4 Comparator Australian major city CPI developments, 2013-2017

End Period	Darwin (NT)		Perth (WA)		Adelaide (SA)		Brisbane (QLD)		Australia (8 cities)	
	CPI	% Change*	CPI	% Change*	CPI	% Change*	CPI	% Change*	CPI	% Change*
FY 2012-13	104.6	-	103.0	-	102.3	-	102.5	-	102.8	-
FY 2013-14	108.1	3.5	106.4	3.4	105.5	3.2	105.8	3.3	105.9	3.1
FY 2014-15	108.3	0.2	107.7	1.3	106.8	1.3	107.4	1.6	107.5	1.6
FY 2015-16	108.3	0.0	108.2	0.5	107.5	0.7	109.0	1.6	108.6	1.1
FY 2016-17	108.8	0.5	109.0	0.8	109.2	1.7	111.0	2.0	110.7	2.1

Source: ABS Quarterly Series All Groups CPI for Australian major cities.

(*) Change from previous period. FY = Financial Year.

Figure 2 Comparator Australian major city CPI developments, 2013-2017



Port Charge Changes – over last 3 years

3.2 Comparison of Port Charges – 2017 versus 2014 levels

A comparison of the published port charges of the comparator ports over the last three years (Nov. 2017 with 1st July 2014) shows that:

1. The period involved two port owners – the NT government until November 2015 and the private DPO from November 2015 until current. Hence, the analysed changes in port charges at Darwin Port cover two different port operators.
2. Darwin Port (with the two operators) has increased charges beyond CPI but not greater than 2% nominal with the exception of Fuel and Livestock wharfage. It may be the case that additional investment in fuel-related port infrastructure and operations has required the need for a greater cost recovery. A new large ship levy has been introduced for those vessels larger than 20,000 GT accessing the Bladin Channel. According to the DPO, this levy has been introduced to provide a recovery mechanism for investment in pilotage, harbour control and management facilities to support the safe management of large vessels within the Bladin Channel.
3. The increases in Ports Dues at Port Hedland (17%) and across all charges at Fremantle (7.2%) is significantly above local (Perth) CPI increases and the increases made at Darwin Port. The WA port charge increases may have been caused by a combination of possible new investments in port infrastructure and increasing operating costs. Adelaide has increased charges significantly more than Darwin Port – Adelaide's financials are not in the public domain.

Table 5 Three-year Comparison in Port Charges (2017 vs. 2014)

Comparator Port: 3-Year Nominal Charge Increase	Ports Dues	Pilotage	Berthing	Wharfage
Darwin (NT): Increase from 1st Feb. 2015 levels	0.8% New Bladin Channel Levy	1.9%	1.9%	1.9% 4.5% Fuel, 2.2% Livestock
Broome (WA)	-	-	-	-
Port Hedland (WA)	17.0%	0.0%	0.0%	0.0%
Fremantle (WA)	7.2%	7.2%	7.2%	7.2%
Adelaide (SA)	4.7%	9.8%	5.1%	10.6% Containers
Cairns (QLD)	6.1% Conservancy Dues on 2012 levels	-	-	-
Townsville (QLD)		10.6% on 2012 levels	-	-
Gladstone (QLD): Increase from 1st July 2015 levels		21.6% on 2012 levels	3.6%	3.6%

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

Port Charge Changes – over last 3 years

3.3 Individual Port Access Charges

A comparison of the published port charges of the comparator ports shows that for Individual Port Access Charges:

1. Darwin Port currently has the second lowest annual charge of \$50 with Broome the lowest (\$36.36) and Fremantle the highest (\$131.82). Cairns is the second highest at \$126. The charges were not readily available (visible) for the ports of Adelaide, Townsville and Gladstone.
2. These individual access charges (covering port induction and an issued MSIC) appear relatively low when compared with vessel port call costs. Over the last three years, levels of the individual access charges have remained generally constant (i.e. minimal price increases) due in part to some access charge options covering fixed periods of two to four years.

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



Port Call Costs Analysis for vessels and cargoes, 2017

This section presents the analysis of Port Call Costs for Equivalent Prescribed Services – Port Dues, Pilotage, Berthing and Wharfage, and the sum total - for the comparator ports, model vessels and related cargo sectors.

4.1 Containership Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for a Containership exchanging containers at the comparator ports is shown in Table 6 and Figure 3 below.

The modelling of port call costs for a Containership shows that:

1. The ports with minor volumes of container throughput (the remoter ports of which Darwin is one) appear to be more expensive, possibly as a result of diseconomies of scale.
2. Darwin Port is the third ranking of most expensive port call costs for a containership and appears to be around 27% more expensive in total cost than the lowest cost port of Adelaide.
3. Port Hedland appears to be the most expensive port for a containership particularly due to the port's relatively high vessel pilotage cost.

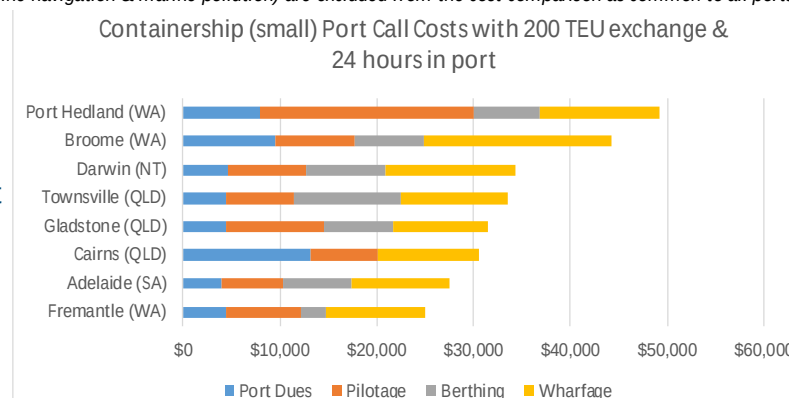
Table 6 Containership port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Cargo Tonne
Fremantle (WA)	\$4,544	\$7,624	\$2,630	\$10,272	\$25,069	73.0	\$10.45
Adelaide (SA)	\$3,984	\$6,340	\$7,027	\$10,116	\$27,466	80.0	\$11.44
Cairns (QLD)	\$13,113	\$7,003	\$0	\$10,452	\$30,568	89.1	\$12.74
Gladstone (QLD)	\$4,389	\$10,220	\$7,050	\$9,797	\$31,457	91.6	\$13.11
Townsville (QLD)	\$4,389	\$7,054	\$11,096	\$10,986	\$33,525	97.7	\$13.97
Darwin (NT)	\$4,578	\$8,106	\$8,253	\$13,388	\$34,324	100.0	\$14.30
Broome (WA)	\$9,566	\$8,204	\$7,031	\$19,479	\$44,279	129.0	\$18.45
Port Hedland (WA)	\$7,980	\$22,015	\$6,782	\$12,344	\$49,121	143.1	\$20.47

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Figure 3 Containership port call costs at comparator ports (2017)



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

Note: Fremantle's Tonnage Rate (a vessel GT based charge) is included in column "Port Dues" and not classified as "Berthing".



Port Call Costs Analysis for vessels and cargoes, 2017

4.2 Dry Bulk Carrier Port Call Costs for Equivalent Prescribed Services – import cargo

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for a Dry Bulk Carrier (Handysize - cement) unloading cargo at the comparator ports is shown in Table 7 and Figure 4 below.

The modelling of port call costs for a Dry Bulk Carrier (cement import) shows that:

1. The ports with the larger volumes of dry bulk throughput appear to be less expensive, possibly as a result of economies of scale.
2. Darwin Port is the second ranking of most expensive port call costs for a dry bulk carrier with import cargo and appears to be around 34% more expensive in total cost than the lowest cost port of Gladstone. However, ports such as Gladstone and Port Hedland have significantly higher throughputs of bulk cargoes than Darwin which as a result may possibly offer advantages of economies of scale.
3. Darwin Port's position for dry bulk (cement) import is particularly due to the port's relatively high wharfage cost for dry bulk imports.

Note: Fremantle's Tonnage Rate (a vessel GT based charge) is included in the column "Port Dues" and not classified as "Berthing".

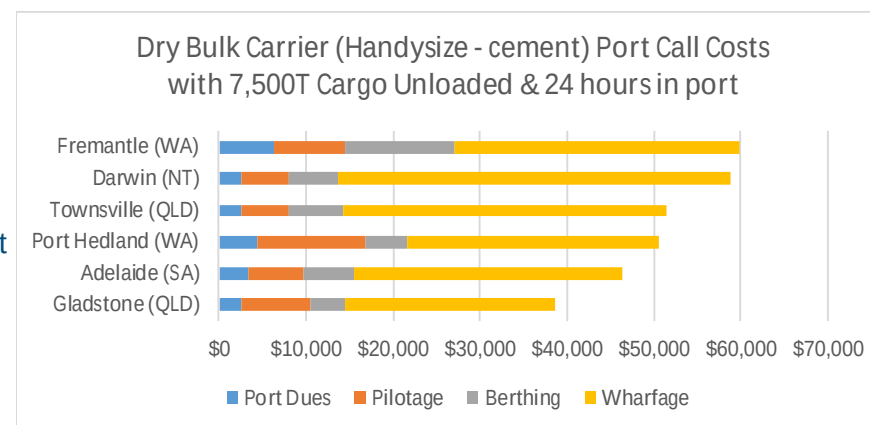
Table 7 Dry Bulk Carrier (cement import) port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Cargo Tonne
Gladstone (QLD)	\$2,530	\$7,927	\$4,063	\$24,063	\$38,584	65.6	\$5.14
Adelaide (SA)	\$3,432	\$6,340	\$5,709	\$30,975	\$46,455	79.0	\$6.19
Port Hedland (WA)	\$4,501	\$12,404	\$4,768	\$28,875	\$50,547	86.0	\$6.74
Townsville (QLD)	\$2,530	\$5,473	\$6,396	\$36,975	\$51,373	87.4	\$6.85
Darwin (NT)	\$2,638	\$5,388	\$5,613	\$45,150	\$58,789	100.0	\$7.84
Fremantle (WA)	\$6,311	\$8,317	\$12,554	\$32,679	\$59,861	101.8	\$7.98

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Figure 4 Dry Bulk Carrier (cement import) port call costs at comparator ports (2017)



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

Port Call Costs Analysis for vessels and cargoes, 2017

4.3 Dry Bulk Carrier Port Call Costs for Equivalent Prescribed Services – export cargo

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for a Dry Bulk Carrier (Handysize – standard) loading cargo at the comparator ports is shown in Table 8 and Figure 5 below.

The modelling of port call costs for a Dry Bulk Carrier (mineral concentrates export) shows that:

1. The wharfage cost at Darwin is not visible (confidential / negotiated) despite wharfage for other cargoes being published as a standard charge and common-user access to the East Arm wharves.
2. If the wharfage charge is assumed to be around \$4 per cargo tonne#, then Darwin's total cost appears to be roughly equivalent to Adelaide and Townsville.
3. The ports with the larger volumes of dry bulk throughput, such as Port Hedland & Gladstone, appear to be less expensive, possibly as a result of economies of scale.
4. The Adelaide-Darwin railway provides two port gateways for freight. However, differences in market rail freight rates southbound versus northbound can influence the competitive position of the Port of Darwin versus Adelaide such that breakeven transport costs may not be equi-distant between Adelaide & Darwin.

Table 8 Dry Bulk Carrier (concentrates export) port call costs at comparator ports (2017)

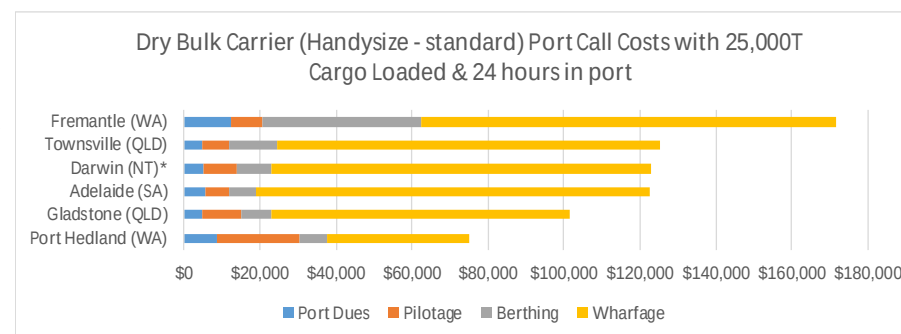
Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Cargo Tonne
Port Hedland (WA)	\$8,647	\$22,015	\$6,782	\$37,500	\$74,944	60.9	\$3.00
Gladstone (QLD)	\$4,934	\$10,244	\$7,925	\$78,663	\$101,765	82.7	\$4.07
Adelaide (SA)	\$5,493	\$6,340	\$7,412	\$103,250	\$122,495	99.5	\$4.90
Darwin (NT)*	\$5,145	\$8,902	\$9,026	\$100,000	\$123,073	100.0	\$4.92
Townsville (QLD)	\$4,934	\$7,070	\$12,472	\$100,750	\$125,226	101.7	\$5.01
Fremantle (WA)	\$12,309	\$8,317	\$41,848	\$108,930	\$171,403	139.3	\$6.86

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

(*) Darwin Cost for Dry Bulk export incl. estimated Wharfage Cost as this is a confidential (negotiated) rate and not visible.

Figure 5 Dry Bulk Carrier (concentrates export) port call costs at comparator ports (2017)



(*) Darwin Cost for Dry Bulk export incl. an estimated Wharfage Cost since a confidential (negotiated) rate and not visible.



(#) Source: NT Government – "EAW Expansion Project DEIS, 2010", Chapter 20 Economics, p368.

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



Port Call Costs Analysis for vessels and cargoes, 2017

4.4 Products Tanker Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for a Products Tanker unloading cargo at the comparator ports is shown in Table 9 and Figure 6 below.

The modelling of port call costs for a Products Tanker shows that:

1. With the exception of Fremantle# (cheapest) and Broome (the most expensive), the ports appear to have relatively similar total costs.
2. Darwin Port is the second ranking of most expensive port call costs for a products tanker but closely followed by Port Hedland and Townsville.
3. Darwin Port's position is particularly due to the port's relatively high wharfage cost for fuel imports.
4. The standout (high cost) pilotage is for Port Hedland and the standout (high cost) wharfage charge is for Broome – more than double Darwin's level.

(#) Fremantle's Tonnage Rate (a vessel GT based charge) is included in the column "Port Dues" and not classified as "Berthing".

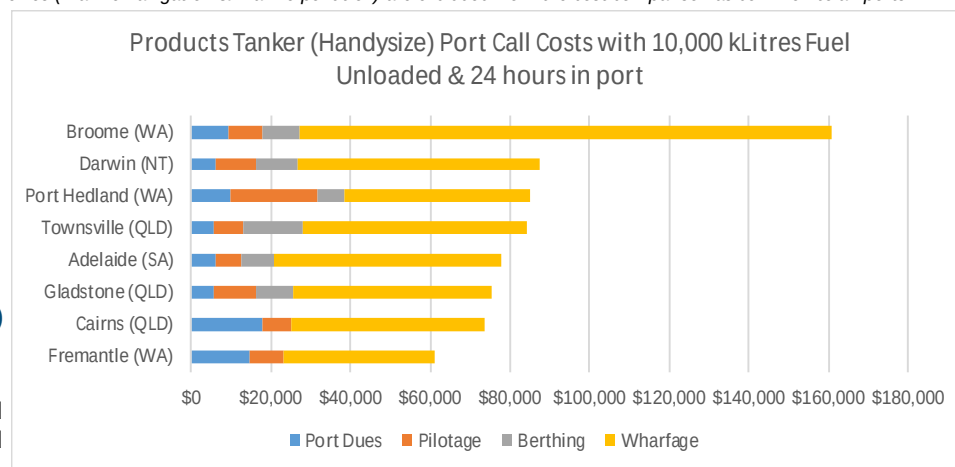
Table 9 Products Tanker port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Cargo KiloLitre
Fremantle (WA)	\$14,722	\$8,317	\$0	\$38,334	\$61,372	70.1	\$6.14
Cairns (QLD)	\$17,996	\$7,014	\$0	\$48,900	\$73,910	84.4	\$7.39
Gladstone (QLD)	\$5,901	\$10,236	\$9,478	\$49,672	\$75,287	86.0	\$7.53
Adelaide (SA)	\$6,323	\$6,340	\$8,098	\$57,200	\$77,960	89.0	\$7.80
Townsville (QLD)	\$5,901	\$7,065	\$14,918	\$56,560	\$84,444	96.4	\$8.44
Port Hedland (WA)	\$9,833	\$22,015	\$6,782	\$46,500	\$85,130	97.2	\$8.51
Darwin (NT)	\$6,154	\$10,316	\$10,399	\$60,700	\$87,568	100.0	\$8.76
Broome (WA)	\$9,566	\$8,204	\$9,452	\$133,545	\$160,767	183.6	\$16.08

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Figure 6
Products Tanker port call costs at comparator ports (2017)



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

Port Call Costs Analysis for vessels and cargoes, 2017

4.5 Pure Car Carrier Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for a Pure Car Carrier unloading motor vehicles at the comparator ports is shown in Table 10 and Figure 7 below.

The modelling of port call costs for a Pure Car Carrier shows that:

1. Total port call costs appear to almost double from the lowest level (Fremantle#) to the highest level (Darwin) possibly due to the larger volumes handled at Fremantle (economies of scale).
2. Darwin Port appears to have the most expensive port call costs for a car carrier with the next port (Townsville) 14% cheaper.
3. Darwin Port's position is particularly due to the port's relatively high pilotage cost for the vessel and wharfage cost for vehicles.
4. The standout (lowest cost) wharfage is for Townsville – Darwin has wharfage cost three times as expensive.

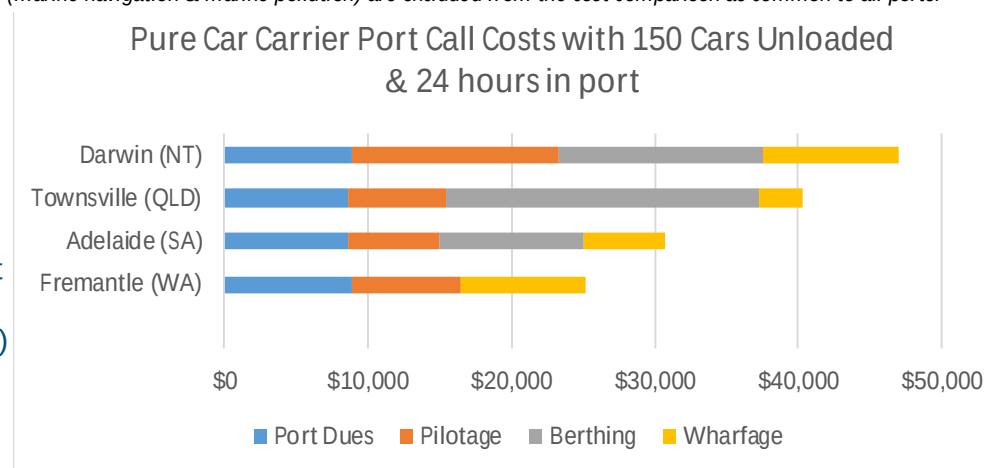
Table 10 Pure Car Carrier port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Vehicle
Fremantle (WA)	\$8,913	\$7,624	\$0	\$8,625	\$25,162	53.6	\$167.75
Adelaide (SA)	\$8,646	\$6,340	\$10,017	\$5,730	\$30,733	65.5	\$204.89
Townsville (QLD)	\$8,610	\$6,890	\$21,766	\$3,062	\$40,329	85.9	\$268.86
Darwin (NT)	\$8,979	\$14,276	\$14,244	\$9,450	\$46,949	100.0	\$313.00

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Figure 7
Pure Car Carrier port call costs at comparator ports (2017)



(#) Fremantle's Tonnage Rate (a vessel GT based charge) is included in the column "Port Dues" and not classified as "Berthing".

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

Port Call Costs Analysis for vessels and cargoes, 2017

4.6 Livestock Carrier Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for a Livestock Carrier loading cattle at the comparator ports is shown in Table 11 and Figure 8 below.

The modelling of port call costs for a Livestock Carrier shows that:

1. Total port call costs appear to vary with the highest (Broome) almost double the lowest (Fremantle#).
2. Darwin Port appears to be competitive with the second lowest total cost but cheapest of the northern Australia ports. This likely reflects Darwin's strong national position in this export trade.
3. Broome's position as the most expensive is counter-intuitive to its strong position in this trade.
4. The standout (lowest cost) wharfage is for Port Hedland – Broome has double the cost. This may reflect a competitive dynamic at Port Hedland with Fremantle for the Pilbara's livestock export business.

(#) Fremantle's Tonnage Rate (a vessel GT based charge) is included in the column "Port Dues" and not classified as "Berthing".

Table 11 Livestock Carrier port call costs at comparator ports (2017)

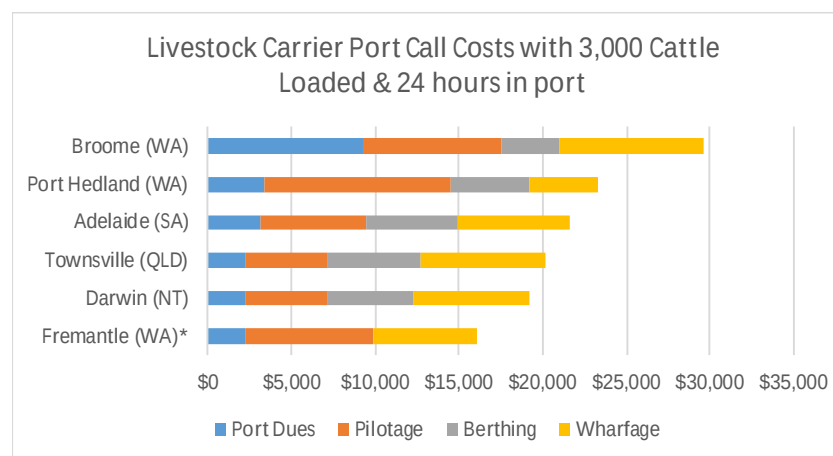
Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Head
Fremantle (WA) *	\$2,266	\$7,624	\$0	\$6,172	\$16,061	83.5	\$5.35
Darwin (NT)	\$2,282	\$4,888	\$5,129	\$6,930	\$19,229	100.0	\$6.41
Townsville (QLD)	\$2,188	\$4,968	\$5,532	\$7,470	\$20,159	104.8	\$6.72
Adelaide (SA)	\$3,139	\$6,340	\$5,467	\$6,720	\$21,666	112.7	\$7.22
Port Hedland (WA)	\$3,342	\$11,148	\$4,768	\$4,050	\$23,308	121.2	\$7.77
Broome (WA)	\$9,284	\$8,204	\$3,505	\$8,564	\$29,557	153.7	\$9.85

(*) Fremantle Wharfage based on cattle equivalent of rate for sheep with assumed conversion factor.

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Figure 8 Livestock Carrier port call costs at comparator ports (2017)



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

Port Call Costs Analysis for vessels and cargoes, 2017

4.7 LNG Tanker (medium & large) Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for LNG tankers loading liquefied gas at the comparator ports is shown in Tables 12 and 13 below.

The modelling of port call costs for LNG tankers shows that:

1. There is little transparency in total costs due to private wharves and negotiated (non-standard) charges at some ports. The number of ports involved in this trade is small – Dampier, recently Gladstone, and increasingly Darwin (with INPEX due to come on-stream in 2018).
2. Darwin Port appears to have lower port dues cost than Dampier, but Gladstone's is not fully transparent.
3. Darwin's recent new Bladin Channel levy for large vessels >20,000 GT will add an extra 10-16% to the Port Dues Cost if transited by a vessel.
4. Darwin's pilotage cost for LNG tankers is higher when compared to Gladstone. MSQ requires 2 pilots onboard at Gladstone for local safety reasons.
5. However, 'visible' port call costs appear to be relatively low when compared with the value of a large LNG shipment possibly valued around \$ 25-30 million based on a product value of \$428 per tonne of LNG#.

Table 12 LNG tanker (medium size) port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index
Darwin (NT) - not using Bladin Channel	\$24,426	\$35,930	Private wharves	Private wharves	\$60,356	100.0
Darwin (NT) - using Bladin Channel*	\$27,772	\$35,930	Private wharves	Private wharves	\$63,702	-
Dampier (WA)**	\$38,747	\$10,560	Private wharves	Private wharves	\$49,306	81.7
Gladstone (QLD)***	\$23,422	\$31,968	Private wharves	Private wharves	\$55,390	91.8

(*) Bladin Channel Large Vessel Levy applies when transited by tanker above 20,000 GT. Currently, vessels have yet to use the Bladin Channel.

(**) Dampier Pilotage for LNG tankers is private. As an estimation, Pilotage tariffs (re. Argonaut) for Dampier Cargo Wharf have been used.

(***) Port Dues assume MSQ Conservancy Dues only. For pilotage, MSQ have safety requirement of 2 pilots on-board vessel per movement.

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Table 13 LNG tanker (large size) port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index
Darwin (NT) - not using Bladin Channel	\$30,222	\$44,055	Private wharves	Private wharves	\$74,277	100.0
Darwin (NT) - using Bladin Channel*	\$34,362	\$44,055	Private wharves	Private wharves	\$78,417	-
Dampier (WA)**	\$47,941	\$10,560	Private wharves	Private wharves	\$58,501	78.8
Gladstone (QLD)***	\$28,980	\$31,785	Private wharves	Private wharves	\$60,765	81.8

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



(#) Source: ABS export trade statistics for FY2016-17.

Prepared for the Utilities Commission of the NT (UC) – Final Report (Rev. F), 21/02/2018



Port Call Costs Analysis for vessels and cargoes, 2017

4.8 Offshore Supply Vessel Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for an Offshore Supply Vessel exchanging cargoes at the comparator ports is shown in Table 14 below.

The modelling of port call costs for an Offshore Supply Vessel shows that:

1. There is little transparency in total costs due to private wharves (i.e. the Marine Supply Base at Darwin), pilotage exemptions, and negotiated (non-standard) charges at some ports. The number of relevant ports involved in this trade is small – Darwin, Broome, and Port Hedland.
2. Darwin Port appears to have the lowest port dues cost.
3. Wharfage cost at Port Hedland appears significantly lower than at Broome.

Darwin's Marine Supply Base is outside the regulatory regime. The costs for berthing and wharfage at Darwin's Marine Supply Base are set by the operator of the Marine Supply Base ASCO.

Table 14 Offshore Supply Vessel port call costs at comparator ports (2017)

Comparator Port:	Port Dues	Pilotage (assumed exempt)	Berthing	Wharfage	Total Port Call Cost	Total Port Call Cost Index	Visible Cost per Cargo Tonne
Darwin (NT)	\$833	\$0	Marine Supply Base (ASCO)	Marine Supply Base (ASCO)	-	-	\$1.67
Broome (WA)	\$3,389	\$0	\$1,280	\$9,200	-	-	\$27.74
Port Hedland (WA)	\$1,639	\$0		\$3,850	-	-	\$10.98

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Note: Assumed \$0 pilotage cost as vessels are typically navigated by Masters with pilotage exemption due to small size of the vessel & regularity of calling at the port.

Port Call Costs Analysis for vessels, 2017

4.9 Cruiseship Port Call Costs for Equivalent Prescribed Services

Based on published charges and the modelling assumptions, the current (2017) port call cost (vessel only) for a Cruiseship visiting at the comparator ports is shown in Table 15 and Figure 9 below.

The modelling of port call costs for a Cruiseship shows that:

1. Total port call costs appear to vary with the highest (Darwin) double the lowest (Fremantle#).
2. There are currently no wharfage costs (passenger charges per head) at the comparator ports unlike other capital-city ports such as Sydney.
3. Darwin's high total cost position is mainly caused by the relatively high cost of pilotage which is linked to the high gross tonnage of Cruiseships.

Table 15 Cruiseship port call costs at comparator ports (2017)

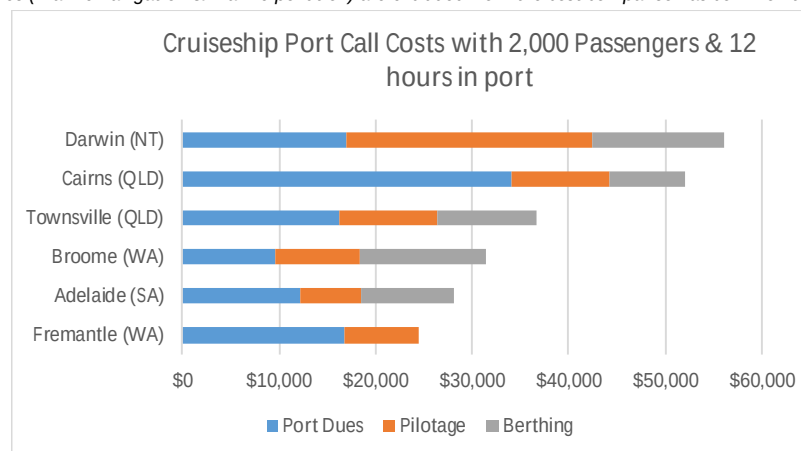
Comparator Port:	Port Dues	Pilotage	Berthing	Wharfage*	Total Port Call Cost	Total Port Call Cost Index	Total Port Call Cost per Passenger
Fremantle (WA)	\$16,836	\$7,624	\$0	\$0	\$24,459	43.7	\$12.23
Adelaide (SA)	\$12,199	\$6,340	\$9,678	\$0	\$28,216	50.4	\$14.11
Broome (WA)	\$9,566	\$8,874	\$13,024	\$0	\$31,464	56.2	\$15.73
Townsville (QLD)	\$16,263	\$10,122	\$10,250	\$0	\$36,635	65.4	\$18.32
Cairns (QLD)	\$34,083	\$10,046	\$7,839	\$0	\$51,968	92.8	\$25.98
Darwin (NT)	\$16,960	\$25,464	\$13,565	\$0	\$55,988	100.0	\$27.99

(*) Based on a Passenger Fee per head where charged by a Port.

Note: QLD ports include MSQ Conservancy Dues per vessel visit & excl. compulsory GBR/Torres Strait Reef pilotage (AMSA).

Note: AMSA levies (marine navigation & marine pollution) are excluded from the cost comparison as common to all ports.

Figure 9
Cruiseship port call costs at comparator ports (2017)



(#) Fremantle's Tonnage Rate (a vessel GT based charge) is included in the column "Port Dues" and not classified as "Berthing".

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

Port Call Costs Analysis for vessels, 2017

4.10 Comparison of Pilotage Costs per vessel visit

Based on published charges and the modelling assumptions, the current (2017) Pilotage Costs for the model vessels visiting at the comparator ports is shown in Table 16 and Figure 10 below.

Comparison of Vessel Pilotage Costs shows that:

1. Pilotage Costs appear to vary quite significantly between different ports and vessel types due to localised factors such as length & difficulty of channels, and the cost of pilots and boat crews.
2. Pilotage at the Queensland ports is managed by a government agency (MSQ). Other ports either operate own pilots or sub-contract.
3. Darwin has relatively high pilotage costs for large cubic type vessels with a high gross tonnage (i.e. car carriers and cruiseships).

Table 16 Comparison of Pilotage Costs per vessel visit (2017)

Comparator Vessel & Port:	Containership (Small size)	Dry Bulk Carrier (Handysize - cement)	Dry Bulk Carrier (Handysize - standard)	Products Tanker (Handysize)	Pure Car Carrier (Medium size)	Livestock Carrier (Large size)	LNG Tanker (Medium size)	LNG Tanker (Large size)	Cruiseship (Medium size)
Darwin (NT)	\$8,106	\$5,388	\$8,902	\$10,316	\$14,276	\$4,888	\$35,930	\$44,055	\$25,464
Broome (WA)	\$8,204	-	-	\$8,204	-	\$8,204	-	-	\$8,874
Port Hedland (WA)*	\$22,015	\$12,404	\$22,015	\$22,015	-	\$11,148	\$10,560	\$10,560	-
Fremantle (WA)	\$7,624	\$8,317	\$8,317	\$8,317	\$7,624	\$7,624	-	-	\$7,624
Adelaide (SA)	\$6,340	\$6,340	\$6,340	\$6,340	\$6,340	\$6,340	-	-	\$6,340
Cairns (QLD)	\$7,003	-	-	\$7,014	-	-	-	-	\$10,046
Townsville (QLD)	\$7,054	\$5,473	\$7,070	\$7,065	\$6,890	\$4,968	-	-	\$10,122
Gladstone (QLD)	\$10,220	\$7,927	\$10,244	\$10,236	-	-	\$31,968	\$31,785	-

(*) Dampier Pilotage for LNG tankers is private. As an estimation, Pilotage tariffs (re. Argonaut) for common-user Dampier Cargo Wharf have been used.

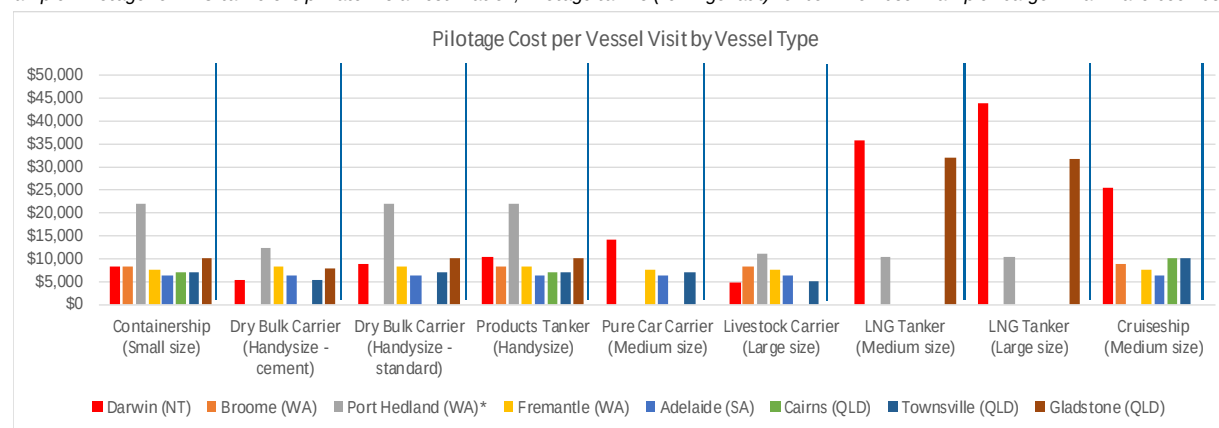


Figure 10 Comparison of Pilotage Costs (2017)



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

Port Call Costs Analysis for vessels and cargoes, 2017

4.11 Summary of Total Port Call Costs by Cargo Sector

Based on published charges and the modelling assumptions, the current (2017) port call cost (ship and cargo) for the various cargo sectors at the comparator ports in terms of total unit cost of a port call is shown in Table 17 and Figure 11.

The modelling of total port call unit costs shows that overall:

1. Darwin is only the most expensive for motor vehicle imports and cruiseship visits.
2. Total port call unit costs tend to be higher for cargoes which are unloaded/loaded as part ship-loads (i.e. the vessel makes several calls along the Australian coast). Examples are Containers, Fuel and Motor Vehicles. Darwin also tends to have smaller volumes.
3. Assuming an estimated \$4 per tonne for wharfage, Darwin dry bulk export total port call unit cost may be reasonably competitive.
4. The relationship of total port call unit cost to Cargo Value is analysed in section 4.12 below.

Figure 11 Summary of total port call costs at comparator ports (2017)

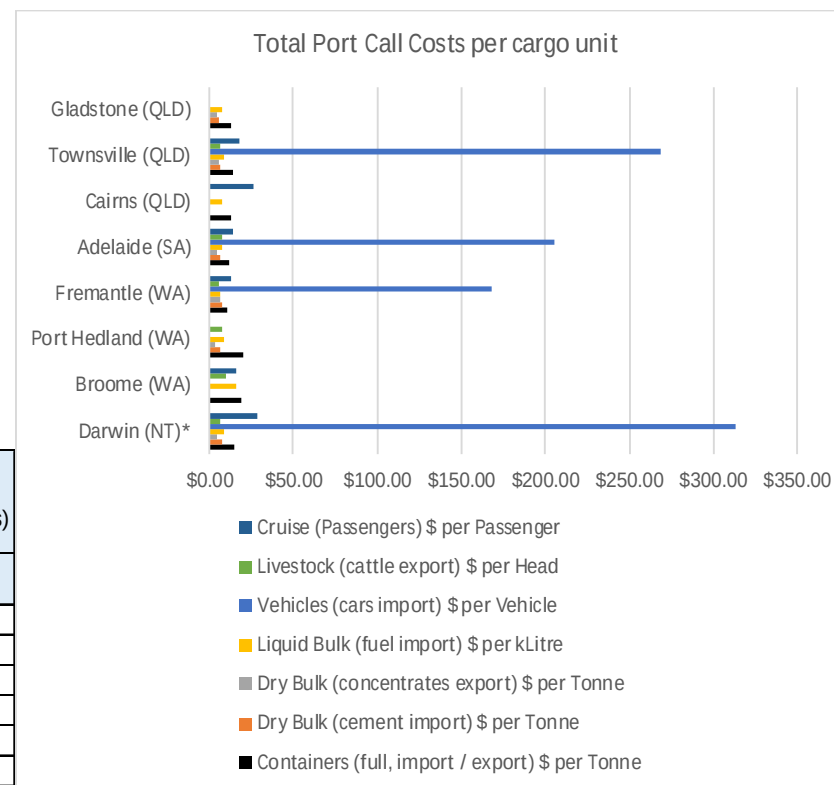


Table 17 Summary of total port call costs at comparator ports (2017)

Comparator Port:	Containers (full, import / export)	Dry Bulk (cement import)	Dry Bulk (concentrates export)	Liquid Bulk (fuel import)	Vehicles (cars import)	Livestock (cattle export)	Cruise (Passengers)
	\$ per Tonne	\$ per Tonne	\$ per Tonne	\$ per kLitre	\$ per Vehicle	\$ per Head	\$ per Passenger
Darwin (NT)*	\$14.30	\$7.84	\$4.92	\$8.76	\$313.00	\$6.41	\$27.99
Broome (WA)	\$18.45	-	-	\$16.08	-	\$9.85	\$15.73
Port Hedland (WA)	\$20.47	\$6.74	\$3.00	\$8.51	-	\$7.77	-
Fremantle (WA)	\$10.45	\$7.98	\$6.86	\$6.14	\$167.75	\$5.35	\$12.23
Adelaide (SA)	\$11.44	\$6.19	\$4.90	\$7.80	\$204.89	\$7.22	\$14.11
Cairns (QLD)	\$12.74	-	-	\$7.39	-	-	\$25.98
Townsville (QLD)	\$13.97	\$6.85	\$5.01	\$8.44	\$268.86	\$6.72	\$18.32
Gladstone (QLD)	\$13.11	\$5.14	\$4.07	\$7.53	-	-	-

Note: Insufficient standard (public domain) data for comparison of Offshore Supply & LNG sectors.

(*) Darwin Cost for Dry Bulk export includes an estimated Wharfage Cost as this is a confidential (negotiated) rate and not visible.

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

Port Call Costs Analysis for vessels and cargoes, 2017

4.12 Total Port Call Costs compared with Cargo Values

Based on published charges and the modelling assumptions, a comparison of current (2017) unit cargo port call costs versus unit Cargo Values is shown in Table 18 below.

Table 18 Total Port Call Costs as % of Cargo Values, per Nov. 2017

The comparison shows that:

1. Total Port Call Costs seldom exceed 5% of Cargo Value with Cement and Fuel incurring the highest percentages due to combination of relatively low cargo unit values and part ship-loads.
2. Darwin's key export cargo trades of livestock (cattle), LNG and bulk mineral ores/concentrates appear to have total port call costs representing less than 1% of their shipment values, noting that some of the costs for dry bulk exports and LNG are not visible (transparent) and are excluded from the analysis.
3. The results of the analysis are only an indicative snapshot as shipment (commodity) values can fluctuate widely on global markets, while the port call costs remain comparatively static and known. For instance, the Cargo Value of Livestock is currently at record highs.

Comparator Port:	Containers (full, import / export)	Dry Bulk (cement import)	Dry Bulk (concentrates export)	Liquid Bulk (fuel import)	Vehicles (cars import)	Livestock (cattle export)	Cruise (Passengers)
Cargo Unit	Tonne	Tonne	Tonne	KiloLitre	Vehicle	Head	Passenger
Assumed Cargo Unit Value	\$2,000	\$150	\$1,793	\$513	\$20,500	\$1,266	\$1,500
Darwin (NT)*	0.7%	5.2%	0.3%	1.7%	1.5%	0.5%	1.9%
Broome (WA)	0.9%	-	-	3.1%	-	0.8%	1.0%
Port Hedland (WA)	1.0%	4.5%	0.2%	1.7%	-	0.6%	-
Fremantle (WA)	0.5%	5.3%	0.4%	1.2%	0.8%	0.4%	0.8%
Adelaide (SA)	0.6%	4.1%	0.3%	1.5%	1.0%	0.6%	0.9%
Cairns (QLD)	0.6%	-	-	1.4%	-	-	1.7%
Townsville (QLD)	0.7%	4.6%	0.3%	1.6%	1.3%	0.5%	1.2%
Gladstone (QLD)	0.7%	3.4%	0.2%	1.5%	-	-	-

Comparator Port:	LNG** (export, medium)	LNG** (export, large)
Cargo Unit	Tonne	Tonne
Assumed Cargo Unit Value	\$428	
Darwin (NT)***	0.2%	0.2%
Dampier (WA)	0.2%	0.2%
Gladstone (QLD)	0.2%	0.2%

Sources: GHD modelling using published charges and vessel/cargo/port time assumptions. Cargo Unit Values are based on ABS and peak industry body Australian trade statistics (value and quantities) for FY 2016-17 with import value per Customs Value terms and export value per FOB terms. The Containerised Cargo Unit Value is a typical Australian capital-city ports industry number for a container with furniture/domestic appliances. Concentrates are the average of copper and zinc ores/concentrates. The Cruise Value is based on the price of a typical 8-10 night peak season cruise-holiday ticket per person as advertised on a number of Australian cruise operator websites.

Notes:

(*) Darwin Cost for Dry Bulk export includes an estimated Wharfage Cost as this is a confidential (negotiated) rate and not visible.

(**) The Cost for the ports is only for visible charges (rest confidential).

(***) Darwin LNG calculation based on current situation with vessels not using the Bladin Channel.

Conclusions of the Study

5.1 Key findings of the analysis

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

- Over the last three years (covering two different port operators), the published port charges for prescribed services at Darwin Port have experienced only relatively minor increases when compared to the other inter-state ports studied and taking account of local CPI changes. Although uncertain, the main reasons for this may possibly be due to a combination of declining total trade at Darwin Port (caused by bulk mineral exports), the lack of significant new large-scale investments in port infrastructure compared with other ports, and unchanging financial return requirements post privatisation of the port.
- Currently, wharfage charges for dry bulk exports (i.e. mineral ores/concentrates) are not published by Darwin Port as a prescribed service (i.e. there are no published standard charges for this export cargo segment, while other ports do provide standard tariffs albeit subject to negotiation).
- Darwin Port appears to have relatively high levels of Pilotage cost for large (high gross tonnage) vessels calling at the port. This is particularly true for pure car carriers, cruiseships and LNG tankers. The driver behind these high pilotage costs may be linked to a possibly more complex/lengthy pilotage task, and a possible need for more and higher-trained/experienced pilots for the increasing number of large (and more hazardous) vessels calling at the Port.
- In terms of 'visible' total port call costs in 2017, Darwin Port appears generally not to be the most expensive of the comparator ports for the various cargo sectors with the exception of motor vehicle imports and cruiseship visits. For cruiseship visits, Darwin Port is closely followed by Cairns. Darwin Port is strongly cost competitive for livestock vessels which confirms its key national position in this export trade. Overall, Darwin Port call costs currently appear to only represent a minor percentage of cargo shipment values.
- The relative position of total port call costs of Darwin Port appears to have improved over the last three years (since 2014) due to the lower rate of increase in port charges compared with the other inter-state comparator ports.

The above findings are based on published (public domain) port charges, study assumptions used, 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. The findings are also about showing where port costs are visible or not.



Glossary – terms and abbreviations

Term	Description
AMSA	Australian Maritime Safety Agency.
ASCO	ASCO is the current operator of Darwin's Marine Supply Base located at the East Arm port precinct.
CEU	Car Equivalent Unit – standard measure of vehicle carrier ship size capacity.
CPI	Consumer Price Index – a measure of inflation.
Def.	Defence.
DPO	Darwin Port Operations Pty Limited – the current (private) Darwin Port operator.
Dwt	Deadweight – measure of a ship's weight carrying capacity and size (maximum cargo weight plus other consumables such as fuel, and other on-board supplies).
FY	Financial Year – 1 st July to 30 th June.
GBR	Great Barrier Reef.
GT	Gross Tonnage – measure of a ship's overall internal volume.
Handymax	Smaller size of dry bulk carrier and tanker ship typically in the size range 20-50,000 deadweight and up to 200 metres in length.
LNG	Liquified Natural Gas – methane.
LPG	Liquified Petroleum Gas - butane, propane, etc.
MSIC	Maritime Security Identification Card – for individuals accessing secure port areas.
MSQ	Maritime Safety Queensland – a Queensland government agency.
M3	Cubic metres.
NT	Northern Territory.
PAX	Passenger (cruiseship).
QLD	Queensland.
SA	South Australia.
TEU	Twenty-foot Equivalent Unit – standard measure of shipping container size and numbers.
UC	Utilities Commission of the Northern Territory.
WA	Western Australia.
\$	Australian Dollars.
%	Per centage.

Key modelling assumptions

Comparator Vessels and Cargoes: Key Assumptions for Vessel Port Call Cost Analysis

Comparator Vessel Sector References	Assumed Vessel Main Particulars			Comparator Vessel Cargo Assumptions				Vessel Operating Assumptions (where relevant)				
	Size Class*	Length Overall (metres)	Gross Tonnage	Cargo Sector	Exchange	Units	Quantity per Port Call	Time in Port (hours)	# Tugs In	# Tugs Out	Pilotage (In & Out)	Calls at Port in 6 months
Vessel 1 - Containership (Small, geared)	1,808 TEU	179.63	20,902	Containers (general cargo)	Import & Export	TEU	200	24	2	2	Yes	3
Vessel 2a - Dry Bulk Carrier (Handysize - cement)	20,200 DWT	145.00	12,047	Dry bulk (cement)	Import	Tonnes	7,500	24	3	2	Yes	1
Vessel 2b - Dry Bulk Carrier (Handysize - standard)	33,700 DWT	180.00	23,494	Dry bulk (mineral concentrates)	Export	Tonnes	25,000	24	3	2	Yes	1
Vessel 3 - Products Tanker (Handysize)	46,000 DWT	179.88	28,100	Fuel (petroleum)	Import	Kilolitres	10,000	24	3	2	Yes	1
Vessel 4 - Pure Car Carrier (Medium)	4,900 CEU	176.00	41,000	Motor Vehicles	Import	Vehicle	150	24	2	2	Yes	1
Vessel 5 - Livestock Carrier (Large)	5,225 DWT	134.80	10,421	Livestock (cattle)	Export	Head	3,000	24	2	2	Yes	1
Vessel 6a - LNG Tanker (Medium)	137,000 Cu.M	290.00	111,533	LNG (gas)	Export	Tonnes	62,000	48	4	3	Yes	1
Vessel 6b - LNG Tanker (Large)	155,300 Cu.M	288.00	138,000	LNG (gas)	Export	Tonnes	70,000	48	4	3	Yes	1
Vessel 7 - Offshore Supply (Medium)	4,000 DWT	81.70	3,804	Offshore Supply	Import & Export	Tonnes	500	168	0	0	No	13
Vessel 8 - Cruiseship (Medium)	2,272 PAX	261.31	77,441	Cruise Tourism	-	PAX	2,000	12	2	2	Yes	3

(*) TEU = Twenty-foot Equivalent Unit (measure of container size by length & ship container capacity); DWT = Deadweight (measure of ship carrying capacity). Cu.M = Cubic Metres carrying Capacity.

CEU = Car Equivalent Unit (measure of vehicle size & ship vehicle capacity); PAX = Passenger (head).

Assumed Containership TEU Exchange being Empties 80

LNG = Liquefied Natural Gas (methane).

Source: GHD analysis of port published trade statistics & Annual Reports.

Key modelling assumptions

Reference vessels used for modelling

Data for Vessel 1 - Containership (Small, geared):

Source: Clarksons SIN for m/v "Kota Nasrat" / IMO 9494620 / Operated by PIL-Mariana/PAE / Calling Darwin & Townsville.

Data for Vessel 2a - Dry Bulk Carrier (Handysize - cement carrier):

Source: Clarksons SIN for m/v "Glory River" / IMO 9373606 / Operated by K.G. Jebsen / Calling Townsville.

Data for Vessel 2b - Dry Bulk Carrier (Handysize - standard):

Source: Clarksons SIN for m/v "DL Jasmine" / IMO 9629665 / Operated by Daelim Corporation / Calling Townsville.

Data for Vessel 3 - Products Tanker (Handysize):

Source: Clarksons SIN for m/v "Challenge Paragon" / IMO 9403310 / Operated by NYK / Calling Townsville.

Data for Vessel 4 - Pure Car Carrier (Medium):

Source: Clarksons SIN for m/v "Istra Ace" / IMO 9318503 / Operated by Ray-Stamco / Calling Townsville.

Data for Vessel 5 - Livestock Carrier (Large):

Source: Clarksons SIN for m/v "Greyman Express" / IMO 9733777 / Operated by Vroon / Calling Townsville & Darwin.

Data for Vessel 6a - LNG Tanker (Medium):

Source: Clarksons SIN for m/v "Pacific Notus" / IMO 9247962 / Operated by TEPCO / Calling Darwin (Wickham Point).

Data for Vessel 6b - LNG Tanker (Large):

Source: Clarksons SIN for m/v "Oceanic Breeze" / IMO 9698111 / Operated by K-Line / To Call Darwin (Bladin Point).

Data for Vessel 7 - Offshore Supply (Medium):

Source: Clarksons SIN for m/v "MMA Brewster" / IMO 9737216 / Operated by MMA / Calling Darwin.

Data for Vessel 8 - Cruiseship (Medium):

Source: Clarksons SIN for m/v "Sun Princess" / IMO 9000259 / Operated by Princess / Calling Darwin & Broome.

Key modelling assumptions

Cargo Unit to Revenue Tonnes: Assumed Conversion Factors

Cargo Sector	Revenue Tonnes basis	Cargo Units	Conversion Factor
Containers - 20ft Full	Tonnes	TEU	20
Containers - 20ft Empty	Internal cubic	TEU	30
Dry bulk	Tonnes	Tonnes	1
Liquid Bulk (fuel)	Kilolitres	Kilolitres	1
Liquid Bulk (fuel)	Kilolitres	Tonnes	0.8
Motor Vehicles (cars)	Cubic metre	Vehicle	12
Motor Vehicles (cars)	Tonnes	Vehicle	1.5
Livestock (cattle)	Head	Head	1
Cattle-to-sheep ratio	-	Head	7
LNG	Tonnes	Tonnes	1
Offshore Supplies	Revenue Tonnes	Tonnes	2
Cruise Passengers	Head	Head	1

Port charges data sources

Websites of:

Comparator Ports

ABS

Argonaut Marine Group (Dampier)

Various Industry Peak Bodies (Minerals/mining, Car Importers, Cement, London Metal Exchange)

Cruiseship operators (Australian websites)

Clarksons Shipping Intelligence Network (SIN)

MSQ

NT Government and NT Utilities Commission

Report Reference - Notes to Table 3 on Page 4

N/A= Publically Not Available.

(#) DPO quoted a \$25 million capital spend at Port of Darwin of which \$11 million for refrigeration in 2016 (source: DCN, 12th May 2017).

(1) Privatised per 16th Nov. 2015 by the NT Government. Landbridge Group, through their subsidiary Darwin Port Operations Pty Ltd (DPO), is the current operator of Darwin Port.

(2) Broome Port Authority became Kimberley Ports Authority per 1st July 2014, which will include at a future date the management of the ports of Derby, Wyndham, Yampi Sound, and proposed James Price Point.

(3) Port Hedland Authority became Pilbara Ports Authority per 1st July 2014, which now includes the ports of Port Hedland, Dampier and Ashburton, and future ports of Anketell, Balla Balla and Cape Preston East.

(4) Fremantle Ports Authority manages both the Fremantle Inner Harbour and Kwinana Outer Harbour.

(5) Since the privatisation of ports by the SA Government in 2001, Flinders Ports has operated Port Adelaide together with Port Lincoln, Port Pirie, Thevenard, Port Giles, Wallaroo and Klein Point.

(6) Ports North (FNQ Ports Corp.) manages the commercially trading ports of Cairns, Cape Flattery, Karumba, Mourilyan, Skardon River, Quintell Beach and Thursday Island.

(7) Port of Townsville Ltd manages the ports of Townsville and Lucinda.

(8) Gladstone Ports Corp. manages the ports of Gladstone, Rockhampton and Bundaberg.

(*) Since FY 2014-15, Financials incl. the ports of Dampier & Ashburton.

(**) Financials incl. all the commercially trading ports of Ports North.

(***) Financials incl. the Port of Lucinda.

(****) Financials incl. the ports of Rockhampton and Bundaberg.

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