FINAL REPORT

Transportation Study on the Dry Bulk Market Segment and the Panama Canal

Volume 1: Main Report

SUBMITTED TO
Autoridad del Canal de Panamá

SUBMITTED BY
Nathan Associates Inc.,
Arlington Virginia

IN ASSOCIATION WITH
Richardson Lawrie Associates,
London

UNDER CONTRACT NO.
SAA-81851

September 9, 2003

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Executive Summary

World trade of dry bulk commodities totals more than 2 billion tons annually. While the Panama Canal captures only 3 percent of this total world trade, dry bulk commodities nonetheless represents a substantial market for the Canal of nearly 70 million tons per year.[1]

OBJECTIVE AND SCOPE

The Transportation Study on the Dry Bulk Market Segment and the Panama Canal is part of a larger set of studies to examine the feasibility of expanding the capacity of the existing Canal to permit the transit of larger vessels. The dry bulk market segment study will:

- Assess the Canal's potential market for dry bulk trade,
- Determine the economic advantages of using the Canal versus existing and expected alternative transport options,
- Devise a market strategy that attracts the dry bulk business to the extent that the Canal's earnings are maximized under existing and expanded lock conditions, and
- Forecast traffic, transit, and revenue flows through 2025, and associated risks, for the status quo and expanded Canal.

WORLD TRADE

Macroeconomic Scenarios

The study has been conducted using three global macroeconomic and trade scenarios to the year 2025 prepared by DRI-WEFA for the Autoridad de Canal de Panamá.[2] The macroeconomic scenarios provide forecasts of GDP, population, per capita income, government and private consumption, investment, and trade of goods and services. The three macroeconomic scenarios—most probable case scenario, best case and worst case—incorporate varying assumptions on world economic performance, geopolitical conditions, international trade policies, and environmental issues.

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[1] This study does not cover the 38 million tons of grains that were shipped through the Panama Canal in 2001. A separate study for the grain market segment has been undertaken. See Nathan Associates Inc., Transportation Study on the Grain Market Segment and the Panama Canal, Final Report Volume 2: Panama Canal's Potential Market, conducted for the Autoridad de Canal de Panamá, September 9, 2003.

[2] DRI-WEFA, Global Macroeconomic and Trade Scenarios to 2025, Volume I: Most Probable Case, prepared for the Panama Canal Authority (Contract No. SAA75897BGP), March 2002.

Dry Bulk Production and Consumption

The analysis of dry bulk commodities is based on the judgment of CRU experts, who are specialists in the economic analysis of specific commodities. The experts have put together the available historical series of data into a standard format and then used their expert judgment to make forecasts.

The first stage in making the forecasts is the generation of demand forecasts. The base case forecasts are based on macroeconomic forecasts generated by for the ACP by WEFA-DRI. The forecasts are driven, however, by expert judgment rather than an econometric model. After demand has been calculated, supply is then forecast based on the experts' view of the future availability of supply from different potential sources.

The demand for raw materials used in downstream products is forecast as a derived demand, utilizing technical and market relationships between upstream and downstream products. Thus, for example, the demand for zinc concentrates is directly related to the supply of refined zinc. Similar relationships are as follows:

- The supply of steel determines the demand for steel scrap, pig iron and DRI/HBI. The supply of pig iron and DRI/HBI, taken together, determines the demand for iron ore. The supply of pig iron alone determines the demand for metallurgical coke. The supply of pig iron and the supply of metallurgical coke together determine the demand for metallurgical coal.
- The supply of primary aluminum determines the demand for calcined petroleum coke and alumina. The supply of alumina in turn determines the demand for bauxite.
- The supply of refined copper helps to determine the demand for copper concentrates.

Supply is variously defined as production or shipments, depending on the judgment of the experts as to which is most suitable. Demand is defined either as apparent or real consumption. Apparent consumption consists of supply plus imports minus exports. Real consumption consists of apparent consumption adjusted for changes in consumers' and traders' stocks.

FORECAST OF POTENTIAL CANAL TRADE

For purposes of the study, the term "potential Canal trade" refers to our estimate of the maximum market share that the Canal could capture of world trade assuming a value of zero for Panama Canal tolls. Table E-1 summarizes potential laden transits in terms of cargo tons, DWT, numbers of transits and PCUMS for both the Existing and Expanded Canals and for all cases. For the Most Probable Cases, ODB cargo transits for the Existing Canal are estimated to increase by 18 percent from 66 million tons in 2000 to almost 77 million tons in 2025 and for the Expanded Canal by 32 percent to over 87 million tons. For the Existing Canal similar percentage increases are projected for transits in terms of DWT and PCUMS. However because of the expected continuing trend towards the utilization of larger vessels, the total number of transits is forecast to increase by just under 8 percent for the Existing Canal, from 2,090 vessels in 2000 to 2,251 vessels in 2025.

For the Expanded Canal the projected growth in transits in terms of DWT and PCUMS remains around 26 percent. This is slightly lower than the rate of growth in cargoes because of the improved utilization that will result from an enlarged Canal. The number of transits would grow by only 6 percent overall as the result of both greater utilization levels and the trend towards larger vessel sizes.

Table E-1. Potential Laden Transits in Cargo Tons, DWT, Number of Transits and PCUMS, Existing and Expanded Canal, No Tolls, All Cases

	Existing Canal						Expanded Canal			
Case	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
Cargo (000 long tons)										
Most Probable	65,987.7	68,236.8	72,015.5	73,320.3	75,401.8	76,700.6	78,885.4	80,877.2	86,648.9	87,456.5
Best	66,993.1	73,282.2	83,473.5	91,651.0	102,065.4	113,040.5	91,227.3	100,635.5	115,927.3	127,104.6
Worst	67,072.1	65,611.5	65,607.6	64,155.0	62,387.9	60,268.8	71,763.2	70,711.9	71,888.2	68,948.3
Vessel Size (000 DWT)										
Most Probable	84,570.0	87,440.4	92,460.6	94,115.5	96,984.4	98,634.2	97,318.1	99,602.7	105,725.4	106,790.1
Best	85,780.1	94,016.6	107,491.5	118,123.5	131,927.9	146,260.6	112,578.4	124,052.8	141,749.9	155,558.4
Worst	85,875.1	83,933.4	84,039.7	82,107.2	80,002.3	77,209.5	88,451.2	86,998.4	87,655.8	84,114.4
Transits										
Most Probable	2,089.9	2,127.0	2,173.2	2,200.2	2,218.6	2,251.2	2,157.7	2,180.4	2,206.5	2,221.0
Best	2,130.6	2,265.9	2,444.3	2,648.0	2,872.5	3,136.7	2,418.1	2,609.8	2,832.1	3,056.2
Worst	2,132.9	2,057.3	2,010.9	1,963.7	1,878.1	1,818.5	1,997.8	1,949.0	1,873.5	1,801.9
PCUMS (000)										
Most Probable	43,607.9	45,056.0	47,529.6	48,353.7	49,744.3	50,623.5	49,634.4	50,724.2	53,556.6	54,139.2
Best	44,262.0	48,384.0	55,065.9	60,434.6	67,336.2	74,583.3	57,248.8	62,958.9	71,560.1	78,489.0
Worst	44,312.7	43,288.3	43,288.3	42,300.4	41,167.4	39,782.7	45,200.7	44,417.6	44,515.7	42,774.9

Source: Richardson Lawrie Associates

Highlights of the findings for the Existing Canal include:

- A continuing steady shift in market share terms from the smaller size ranges which is most pronounced southbound but also apparent northbound;
- A quite strong increase in both absolute and market share terms in the use of vessels in excess of 70,000 DWT northbound. This reflects in part the already more established presence of these vessels in the northbound business in particular in the coal movements from the West Coast of Vancouver to Europe

For the Expanded Canal, despite the likelihood that larger vessels will transit the Canal in this case, total DWT actually declines southbound and increases only marginally northbound compared to the Existing Canal as utilization levels increase in size ranges up to 80,000 DWT and inefficiencies are removed from the global shipping system. Specifically:

- As Existing Canal bypass trades flow through the Expanded Canal, so northbound DWT in size ranges in excess of 120,000 DWT are introduced. As these are light laden vessels the DWT is significantly in excess of the additional trade shifted through the Canal.
- Cargoes carried in the 70,000–80,000 DWT range northbound increase through 2015 but then, even in an environment of slow overall growth, decline as the use of vessels in the 80,000–100,000 DWT ranges increases.

- Similarly, the use of 60,000–70,000 DWT vessels declines with the introduction of vessels in excess of 80,000 DWT.

Nearly 80 percent of the increase in Canal potential trade for dry bulk commodities during this period is forecasted to occur on Pacific to Atlantic routes that will grow from an estimated 49.1 million tons in 2000 to 95.6 million tons by 2025. Growth of potential Canal trade for dry bulk commodities on Atlantic to Pacific routes will be marginal, increasing from 30.6 million tons in 2000 to 34.0 million tons by 2025.

Capture of Canal Bypass Routes

Canal bypass trades are those undertaken by vessels larger than those that can use the Canal at its current dimensions and which, on the basis of mileage considerations, could use an expanded or restricted Canal. At present, the only bypass trades involve all-water routes.

Iron ore and thermal and metallurgical coal are the two commodities that were identified as Canal bypass trades. In 2001, an estimated 22.2 million tons of iron ore was shipped on Canal bypass routes, 85 percent of which was for the South America East to Far East route. Bypass trade shipments from Brazil-North to the Far East totaled 15.8 million tons in 2001. Note that shipments from southern Brazil to the Far East are not considered as Canal bypass routes as the route through the Panama Canal is not shorter than alternative routes.

More than 75 percent of the 8.4 million tons of thermal and metallurgical coal identified as Canal bypass trade was from North America West to Europe. Another important route for thermal and metallurgical coal is North America West to South America East (1.4 million tons).

Data were obtained on iron ore and coal sailings from a number of export terminals, which are currently the sources of bypass trades, and analyses undertaken to determine vessel size distributions and utilization levels on these routes. As the result of the analyses the conclusions are that only trade on the following routes shown in Table E-2 would switch.

Table E-2. By Pass Trades Switched to the Canal Under Expanded Canal Conditions, Most Probable Case, No Tolls, Selected Years 2010-2025 (000 Tons)

Origin	Destination	Commodity	2010	2015	2020	2025
East Coast Canada	Korea	Iron Ore	-	-	448	448
East Coast Canada	Japan	Iron Ore	-	-	774	774
Venezuela	Taiwan	Iron Ore	201	225	247	247
Venezuela	China & Hong Kong	Iron Ore	-	-	809	809
Venezuela	Korea	Iron Ore	-	-	771	771
Venezuela	Japan	Iron Ore	-	-	1,047	1,047
West Coast Canada	Europe	Thermal and Metallurgical Coal	2,510	2,449	2,371	2,295
Oceania	North America East	Thermal and Metallurgical Coal	805	1,638	1,661	1,481
Oceania	North America Gulf	Thermal and Metallurgical Coal	2,485	2,344	2,202	1,964
Oceania	Central America East	Thermal and Metallurgical Coal	707	743	764	771
West Coast Canada	North Africa	Thermal and Metallurgical Coal	159	155	150	145
Total			6,867	7,554	11,244	10,753

Source: Richardson Lawrie Associates

Comparison of ACP Reported Dry Bulk Traffic with Study Estimates

The forecasts of potential Panama Canal dry bulk trade presented in this Volume are not directly comparable to ACP reported dry bulk traffic for several reasons. First, as already mentioned the definition of potential Panama Canal dry bulk trade is based on the assumption of no Panama Canal tolls. Second, the forecast of potential transits is for dry bulk vessels only and does not include dry bulk commodities that may transit the canal on non-dry bulk vessels[3]. Third, there has historically been a modest amount of Canal traffic on routes where the Panama Canal is not the shortest maritime routing and hence would not be included in the forecast that is based on transport economics. Again, this traffic has been identified and may be included in the overall final forecast of Panama Canal traffic.

It is important to recognize that this study was designed not to prepare independent forecasts of potential Panama Canal trade of dry bulk commodities. Accordingly, the study did not use ACP-reported Canal traffic as the basis of the forecast. Rather the study developed the potential trade forecast from other sources of production, consumption and trade of each commodity.

Table E-3 presents a comparison of ACP reported dry bulk traffic with forecasts prepared in this study. The upper portion of the table shows that in 2000 total ACP reported dry bulk commodity traffic was 67.1 million tons. To be comparable to the study's forecast, two items are subtracted: (i) the amount of dry bulk commodities carried on non-dry bulk vessels (11.0 million tons in 2000) and (ii) the amount of dry bulk traffic on routes where the Panama Canal is not the shortest routing (0.9 million tons). The remaining ACP-reported dry bulk traffic on dry bulk vessels totaled 55.2 million tons in 2000.

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[3] However, we have prepared and provided the ACP with a forecast of such cargo carried aboard non-dry bulk vessels to be incorporated in other market segment studies.

Table E-3. Comparison of ACP Reported Dry Bulk Traffic with Study Forecasts, 2000 and 2001 (thousands of long tons)

Item	2000	2001
ODB Trade flows from ACP data		
ACP reported dry bulk commodities traffic a/	67,103	65,070
Less: Dry bulk commodities on non-dry bulk vessels b/	10,994	11,298
Less: Traffic on routes excluded by mileage c/	889	766
Subtotal dry bulk traffic from RLA	55,220	53,006
ODB Trade flows prepared by Study		
Trade forecast of dry bulk commodities on routes where Canal routing is shortest	107,782	106,674
Less: Bypass traffic not captured by Canal d/	30,053	30,558
Potential Canal dry bulk trade with zero tolls e/	77,729	76,116
Less: Dry bulk trade in non-dry bulk carriers f/	11,742	11,097
Potential Canal dry bulk trade in dry bulk vessels	65,987	65,019
Less: Traffic diverted with actual ACP tolls g/	7,716	7,966
Forecast of ODB dry bulk traffic on dry bulk vessel g/	58,271	57,053

a/ From Volume 2, Appendix W Table W-1.
b/ From Volume 2, Appendix W, Table W1.
c/ From Volume 2, Appendix W, Table W-2.
d/ From Table 2-5.
e/ From Dry Bulk Transit model, Table XB1ODBTRADEFORECAST.XLS
f/ From Dry Bulk Transit model, Table XB3ODB.xls
g/ From Volume 5: Marketing Strategy Table 4-2 and 4-3.

Source: As noted.

The lower portion of Table E-3 shows the estimates of dry bulk trade prepared by the study. From the global trade forecasts prepared by the study, we identified the amount of dry bulk commodity trade on trade routes where the Panama Canal is the shortest routing (107.8 million tons in 2000). From this, the amount of trade on bypass routes that cannot be captured by the Existing or Expanded Canal is subtracted (30.1 million tons)[4]. The result is the forecast of potential Panama Canal dry bulk trade with zero tolls of 77.7 million tons as reported in this volume.

However, again this estimate includes dry bulk trade carried on non-dry bulk vessel (11.7 million tons in 2000). Also to be compared with ACP-reported traffic, the amount of potential dry bulk trade that is not captured due to Panama Canal tolls needs to be subtracted (7.7 million tons in 2000). The result is an estimate of 58.3 million tons of dry bulk commodities on dry bulk vessels that would use the Panama Canal. This is 3.1 million tons or 5.5 percent above the figure derived from ACP records. The results are quite close given the entirely independent and separate method used to prepare the forecast.

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[4] The bypass trade routes are identified in Table 2-5 herein, and the maritime economics is discussed in detail in *Volume 3: Vessel Transit and Fleet Analysis*, Chapter 3.

WORLD FLEET DEVELOPMENT BY SIZE

The potential growth in the world fleet and the potential impact of an Expanded Canal on its development are important background to the projection of changes in the allocation of cargo to different size ranges of vessel in the Canal transit forecasts. Forecasts of the world fleet by size range for the Existing and Expanded Canals have been developed based on future expectations of world trade growth in dry bulk commodities, changing preferences for ordering particular vessel sizes, the age distribution of the existing fleet and projected scrapping by size range.

The main difference between the Existing and Expanded Canal conditions is that under the latter conditions, the 70,000–80,000 DWT size range would be expected to peak at around 79 million DWT in 2018 before declining to just under 65 million DWT in 2025. This compares with a steady rise to nearly 109 million DWT under Existing Canal conditions. In contrast, with an Expanded Canal, the 80,000–90,000 DWT size range would increase to 54 million DWT instead of about 5 million DWT in the former case. There would also be an approximately 4 million DWT increase in the size of the 90,000–100,000 DWT size range by the end of the forecast period.

ANALYSIS OF FUTURE SHIP COSTS AND FREIGHT COSTS

For the purpose of this study we define freight costs as the freight paid by the shipper to the ship owner or operator. While these represent the cost to the shipper these are not the same as operating costs (capital, fixed and variable) borne by the owner (see below). Capital costs comprise capital repayments plus interest charges. Fixed operating costs include manning, repairs and maintenance, insurance, stores and supplies and overheads. Variable costs cover bunkers, port charges and Canal dues, where applicable.

Estimates of freight costs—expressed in terms of US$ per cargo ton—have been developed through voyage estimates by route and deadweight (DWT) size range for:

- All vessels transiting the Canal,
- Bypass routes
- Routes that represent alternatives to the existing Canal, and
- Routes where cargo moves in vessels that could transit the existing Canal but are precluded from so doing by current toll policies.

Decisions to utilize the Canal are based on marginal economics not long run costs so voyage calculations have been used to determine seaborne freight costs. These calculations use charter market rates rather than fully built up operating costs. Future estimates of charter rates have been linked to expected developments in total operating costs within the *Voyage Estimating Model.*
The data and estimates used in these calculations include voyage mileages, vessel speeds, port times, Canal transit times, DWT utilization factors, fixed operating costs, bunker prices, port charges and capital costs (vessel prices). The voyage calculations are based on representative ports within each region. The impact of structural change on future operating costs has also been assessed.

ECONOMIC VALUE OF THE PANAMA CANAL

For purposes of this study, the economic value of the Canal refers to the transportation cost differential for specific commodity route pairs through the Panama Canal as compared to the least cost alternative routing. The determination of the economic value of the Canal has three elements:

- The determination of total seaborne transportation costs by route for projected Canal transits for the Existing Canal and their comparison with total transportation costs on alternative routes, including the incremental interest costs associated with having cargoes at sea for longer durations than would be the case for shorter routes through the Canal;
- The determination of total seaborne transportation costs by route for projected Canal transits for the Expanded Canal and their comparison total transportation costs on alternative routes, including the incremental interest costs associated with having cargoes at sea for longer durations than would be the case for shorter routes through the Canal;
- Calculation of the greater economic value that would be achieved through expansion of the locks versus the Existing Canal.

Table E-4 summarizes the total economic values calculated for both the Existing and Expanded Canal, through to 2025. Under Existing Canal conditions, the economic value of the Canal is estimated to remain within the range of the equivalent of $4.90 per ton to 6.01 per ton in $2002 terms. Translated into total economic value, this results in a value of $396 million in 2001, $353 million in 2010 and $388 million in 2025. The higher economic value in 2000 is a result of the peak in maritime freight rates that occurred that year that increased the cost differential for Canal alternative routes.

For the Expanded Canal, the economic value is projected to range from $5.12 per ton to $5.35 per ton. Total economic value would rise from $405 million in 2010 to $466 million in 2025. The margins between the Expanded Canal and the Existing Canal are estimated to range from $0.18 per ton to $0.45 per ton during the period. The margin of the economic value of the Expanded Canal is $52 million in 2010 increasing to $78 million by 2025.

Table E-4. Summary of Economic Value of Existing and Expanded Panama Canal, Most Probable Case, Selected Years 2000-2025

	Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Year	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
2000	2,089.9	65,987.7	6.01	396,618.3	-	-	-	-	-	-
2005	2,127.0	68,236.6	4.97	339,358.9	-	-	-	-	-	-
2010	2,173.2	72,015.0	4.90	352,943.4	2,173.2	75,685.1	5.35	405,288.9	0.45	52,345.5
2015	2,200.2	73,319.6	4.98	364,943.2	2,180.4	81,437.8	5.30	431,822.1	0.33	66,877.5
2020	2,218.6	75,401.0	4.94	372,465.4	2,206.5	86,961.6	5.12	445,260.8	0.18	72,791.2
2025	2,251.1	76,699.5	5.05	387,656.6	2,221.0	87,771.2	5.31	466,100.6	0.26	78,441.0

ALTERNATIVE PANAMA CANAL MARKETING STRATEGIES

The terms of reference for the study state that the marketing strategy shall pursue the following objectives:

- Maximize Canal's earnings
- Maximize the canal market share for the dry bulk segment, and
- Be non-discriminatory within the dry bulk segment

Based on our review of the Panama Canal Neutrality Treaty and of toll policies at comparable facilities, we believe there is ample scope to differentiate Panama Canal tolls by size of vessel and commodity. Accordingly, we identified alternative toll pricing options for analysis that had tolls varying by size of vessel, and by commodity[5]. Toll options were also analyzed with tolls assessed by PCUMS and by ton of cargo carried. Toll pricing options included ACP tolls in effect prior to October 2002, from October 2002 through June 2003 and ACP tolls to take effect in July 1, 2003. The ACP tolls as of July 1, 2003 were used as the basis for examining a series of toll increases at 25 percent intervals from 25 percent increase through a 150 percent increase.

The detailed review of the Canal toll pricing options revealed the following findings.

- Approximately 15 percent of the potential transits (with no tolls) would be diverted to alternative routes once any non-insignificant Canal tolls were imposed. These involved routes Oceania to North America East and North America Gulf, from Canada West to Brazil South and from North America Gulf to the Far East for vessels greater than 70,000 DWT.
- A sizable number of transits and cargo would be diverted at certain pricing points for particular commodity-route pairs.
- After certain levels of toll increases, Canal revenues decline as the loss of toll revenue due to diverted transits is not offset by toll increases for the remaining Panama Canal transits.

Table E-5 present an examples of summarized results of the 13 Canal toll pricing options for the Existing Canal and Expanded Canal, Most Probable Case for 2011.. The table shows the potential Canal transits and cargo (with no tolls) and the forecast of Canal transits and cargo for each Canal toll pricing option. The tables also present the forecast of Canal toll revenues.

In 2011, estimated Canal toll revenues for dry bulk vessels in the dry bulk market segment under current toll rates total $109.3 million (Table E-5). The Canal captured 87 percent of potential transits in this market segment and 87 percent of potential dry bulk cargo. However, the Canal toll revenues of $109.3 million only accounted for 34 percent of the estimated economic value of the Canal of $323 million.

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[5] As this market segment only deals with dry bulk carriers, Panama Canal toll pricing options by type of vessel were not analyzed.

If Canal toll levels in 2011 were increased by 50 percent, toll revenues in 2011 from this market segment would be $148.5 million, an increase of 26 percent. Even with tolls at this level, the Canal would still only capture 42 percent of the total economic value of the Canal[6].

The demand for Canal services is inelastic relative to tolls. That is, a given percentage increase in tolls would result in a smaller percentage decrease in Canal transits and would generate higher Canal toll revenues. A review of Table E-5 provides an indication of the price inelasticity of demand. A 50 percent increase in tolls reduces the forecast of Canal bulk transits from 1,865 vessels to 1,623 vessels, or only 13 percent. A 100 percent increase in tolls reduces the forecast of Canal bulk transits to 1,271vessels or 32 percent.

For some years and pricing options, the Existing Canal scenario is shown to generate more toll revenues than the Existing Canal for the dry bulk market segment. While these results initially seem counter-intuitive, there are three factors that together fully explain these findings.

First, the total potential Panama Canal dry bulk cargo under the Expanded Canal scenario of 79.3 million tons in 2011 (Table E-5) is only slightly higher than the Existing Canal scenario of 71.8 million tons. Thus, the introduction of the Expanded Canal does not significantly impact the volume of dry bulk trade that could potentially use the Canal in 2011. By 2020, the Expanded Canal has potential traffic of 87.0 million tons compared to the Existing canal potential traffic of 75.4 million tons.[7]

Second, with the Expanded Canal, there is a trend toward using larger vessels and hence the number of dry bulk vessels needed is reduced. The Expanded Canal scenario is shown to have 2,147 potential transits in 2011 while the Existing Canal is forecast at 2,163 potential transits even though the Expanded canal has more cargo traffic. As Canal tolls provide discounted rates for larger vessels, Canal toll revenues for the same annual volume of grain cargo will be less for the Expanded Canal versus the Existing Canal.

Third, the Expanded Canal is shown to have almost the same economic value as the Existing Canal. In 2011, the Expanded Canal has a total economic value of $360.4 million as compared to $352.8 million for the Existing Canal. The economic value of the Canal defined for study purposes is the transportation cost savings of the use of the Canal as compared to the least-cost alternative routing. Decisions on whether to use the Canal or an alternative route are made taking into account the shipping characteristics and corresponding costs of each routing. For the Existing Canal scenario,

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[6] For the Canal to capture 100 percent of the economic value of the Canal, it would have to have a toll pricing policy that charged each vessel transiting the full benefit of using the Canal over alternative routings. Such a policy is not administratively practical, nor consistent with the Panama Canal Neutrality Treaty.

[7] This is due to the capture of bypass trade by the Expanded Canal which in 2020 is assumed to be deepened to 50 feet.

Table E-5. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2011

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163
Potential Panama Canal Cargo (ton 000s)	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775
Forecast Panama Canal Transits (no.)	1,894	1,873	1,865	1,803	1,623	1,480	1,271	1,112	1,051	977	1,578	1,578	1,543
Percent of Potential Transits	87.6%	86.6%	86.2%	83.3%	75.0%	68.4%	58.8%	51.4%	48.6%	45.2%	72.9%	72.9%	71.3%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,433	61,818	61,602	58,681	51,624	45,481	38,249	32,458	30,687	27,414	50,016	50,016	48,670
Percent of Potential Cargo	87.0%	86.1%	85.8%	81.8%	71.9%	63.4%	53.3%	45.2%	42.8%	38.2%	69.7%	69.7%	67.8%
Economic Value of Canal for Potential Transits ($000s)	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,491	5,608	6,030	12,132	30,535	48,916	74,540	97,693	105,973	120,436	35,633	35,633	39,984
Forecast Panama Canal Toll Revenues ($000S)	105,115	112,667	117,659	140,436	148,593	153,828	148,460	142,299	143,251	134,436	163,852	164,558	160,771
Average Toll Revenue per Forecasted Transit ($000)	55	60	63	78	92	104	117	128	136	138	104	104	104
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.90	3.28	3.29	3.30
Expanded Canal													
Potential Panama Canal Transits (no.)	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147
Potential Panama Canal Cargo (ton 000s)	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297
Forecast Panama Canal Transits (no.)	1,884	1,859	1,839	1,783	1,618	1,471	1,244	1,093	1,019	955	1,547	1,547	1,524
Percent of Potential Transits	87.7%	86.6%	85.7%	83.0%	75.4%	68.5%	58.0%	50.9%	47.5%	44.5%	72.1%	72.1%	71.0%
Forecast Panama Canal Cargo (ton 000s)	69,577	68,774	67,795	64,728	57,698	48,814	39,094	32,959	30,495	27,391	52,603	52,588	51,790
Percent of Potential Cargo	87.7%	86.7%	85.5%	81.6%	72.8%	61.6%	49.3%	41.6%	38.5%	34.5%	66.3%	66.3%	65.3%
Economic Value of Canal for Potential Transits ($000s)	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,706	6,108	7,665	13,426	29,280	45,235	77,347	100,526	111,329	123,671	34,937	34,976	37,589
Forecast Panama Canal Toll Revenues ($000s)	110,124	117,731	121,713	145,929	156,034	157,125	145,406	138,705	136,808	129,956	164,101	164,749	162,711
Average Toll Revenue per Forecasted Transit ($000)	58	63	66	82	96	107	117	127	134	136	106	106	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.80	2.25	2.70	3.22	3.72	4.21	4.49	4.74	3.12	3.13	3.14

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

the decision is based on the shipping characteristics and costs associated with that scenario. These were described fully in *Volume 3: Vessel Transit and Fleet Analysis.* With the Expanded Canal scenario, again decisions to use the Canal are determined by the shipping characteristics and costs for the Canal and alternative routings associated with that scenario.

The reason that the economic value of the Canal is not higher for the Expanded Canal scenario is that the cost differentials between the Expanded Canal and its least-cost alternative routings are lower than those estimated for the Existing Canal. With the Expanded Canal, there will be a trend toward use of larger vessels and some originating and receiving ports will develop facilities to accommodate the larger vessels. However, the use of larger vessel will reduce the transport cost of both Canal and least-cost alternative routings. As the mileages for the least-cost alternative routings are greater than for Canal routes, the cost saving of using larger vessels is greater in absolute terms. Thus the Expanded Canal has a smaller transportation cost differential or economic value between the Canal and the least-cost alternative routing[8].

IDENTIFICATION OF PREFERRED PANAMA CANAL TOLL PRICING

The preferred Panama Canal toll pricing option was selected for the Existing and Expanded Canal scenarios separately by applying the following criteria:

- Maximization of Canal's earnings
- Maximization of the Canal market share for the grain bulk segment, and
- Non-discriminatory within the grain bulk segment
- Administrative simplicity (easy to measure and apply without cumbersome verification)
- Ease of understanding and transparency to shipping community
- Stability from one year to next with gradual variations

All of the tolls pricing options analyzed were considered to be non-discriminatory within the dry bulk segment. Precedents set at comparable facilities allow for differentiation of tolls by size of vessel and by commodity as long as they are applied to all such vessels on a consistent basis. First priority was given to maximization of toll revenues, closely followed by maximization of Canal market share. A preferred Canal toll pricing option was identified for each year and each Canal scenario (Table E-6).

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[8] Please note that the treatment of economic used herein for the toll pricing analysis differs from that presented in *Volume: Economic Value of Panama Canal.* In Volume 4, the terms of reference called for a direct comparison of the economic value of the Existing Canal and Expanded Canal. Thus for that analysis, transportation costs of routes through the Existing and Expanded Canals were both compared to the transportation costs of the alternative routes under the Existing Canal scenario.

Table E-6. Preferred and Alternative Canal Toll Pricing Options, 2000-2025

	Existing Canal		Expanded Canal	
Year	Preferred Toll Pricing Option	Alternative Toll Pricing Option	Preferred Toll Pricing Option	Alternative Toll Pricing Option
2000-2009	Commodity Option1 (75% increase with 10% discounts for phosphates, cement, met coke and copper concentrates)	PCUMS Option 1 (25% increase)	n.a.	n.a.
2010	Commodity Option1 (75% increase with 10% discounts for phosphates, cement, met coke and copper concentrates)	PCUMS Option 1 (25% increase)	Commodity Option1 (75% increase with 10% discounts for phosphates, cement, met coke and copper concentrates)	PCUMS Option 1 (25% increase)
2011–2024	Commodity Option 2 (75% increase with 10% discounts for phosphates, cement, and 5% discount for met coke and copper concentrates)	PCUMS Option 1 (25% increase)	Commodity Option 2 (75% increase with 10% discounts for phosphates, cement, and 5% discount for met coke and copper concentrates)	PCUMS Option 1 (25% increase)
2025	Commodity Option 3 (75% increase with 10% discounts for phosphates and cement)	PCUMS Option 1 (25% increase)	Commodity Option 3 (75% increase with 10% discounts for phosphates and cement)	PCUMS Option 1 (25% increase)

Source:Volume 5, Table 4-2 through Table 4-27.

Existing Canal

For the Existing Canal, the preferred option for 2000 through 2010 is Commodity Option 1 which corresponds to Panama Canal tolls increased by 75 percent from July 1, 2003 levels with 10 percent discounts for vessels carrying phosphates, cement, metallurgical coke and copper concentrates. These discounts allow the Canal to increase toll revenue by 8 percent as compared to a uniform 75 percent increase. This pricing option allows the Canal to retain approximately 72 percent of total potential transits as compared to 87 percent under current tolls. Panama Canal toll revenues, however, increase by 36 to 40 percent under Commodity Option 1 as compared to current tolls.

From 2011 through 2024, the preferred Canal toll pricing option is Commodity Option 2 which corresponds to Panama Canal tolls increased by 75 percent with 10 percent discounts for vessels carrying phosphates, cement, and a 5 percent discount for vessels carrying metallurgical coke and copper concentrates. Again toll revenues from the preferred pricing option are about 40 percent higher than those forecast under current toll levels.

For 2025, the preferred Canal toll pricing option is Commodity Option 3 corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement (discounts for metallurgical coke and copper concentrates are eliminated). None of the other Canal pricing options analyzed yield more revenue than the preferred Canal toll pricing options. In general, Canal toll revenue declines once tolls exceed levels 75 percent above the July 1, 2003 rates.

An interesting alternative to the preferred Canal pricing option is to look at Panama Canal tolls with only an increase of 25 percent increase over July 1, 2003 rates. This generates approximately 13 percent to 15 percent less toll revenue but also results in significantly less diversions of potential cargo.

Expanded Canal

The preferred Canal toll pricing options for the Expanded Canal are the same as those for the Existing Canal. From 2011 through 2024, the preferred Canal toll pricing option is Commodity Option 2 which corresponds to Panama Canal tolls increased by 75 percent with 10 percent discounts for vessels carrying phosphates, cement, and a 5 percent discount for vessels carrying metallurgical coke and copper concentrates. Again toll revenues from the preferred pricing option are about 40 percent higher than those forecast under current toll levels.

For 2025, the preferred Canal toll pricing option is Commodity Option 3 corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement (discounts for metallurgical coke and copper concentrates are eliminated).

Using the combined objectives of maximizing Canal earnings and Canal market share, a preferred Canal toll pricing option was identified for each year and each Canal scenario. The preferred option through 2010 is Commodity Option 1 which corresponds to Panama Canal tolls increased by 75 percent from July 1, 2003 levels combined with 10 percent discounts for transits carrying phosphate, cement, metallurgical coke and copper concentrates. This pricing option allows the Canal to retain approximately 73 percent of total potential transits (with no tolls) and in fact has additional diversions of around 15 percent of the forecasted transits under July 1, 2003 tolls. Panama Canal revenues, however, increase by 36 percent under the preferred Canal toll pricing option.

From 2011 through 2024, the preferred Canal toll pricing option is Commodity Option 2 which corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement and a 5 percent discount for metallurgical coke and copper concentrates. For 2025, the preferred Canal toll pricing option is Commodity Option 3 corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement (discounts for metallurgical coke and copper concentrates are eliminated).

None of the other Canal pricing options analyzed yield more revenue than the preferred Canal toll pricing options. In general, Canal toll revenue declines once tolls exceed 75 percent of the July 1, 2003 rates.

Tables E-7 and E-8 present Panama Canal transits, cargo and revenues under the preferred toll pricing option of a 75 percent increase combined with commodity discounts specified above for the Existing Canal and Expanded Canal scenarios. For the Existing Canal, forecasted Canal transits increase slightly from 1,529 vessels in 2004 to 1,562 vessels in 2010 and to 1,592 vessels by 2025. Forecasted canal revenues increase from $149 million in 2004 to $161 million in 2010 and $174 million by 2025. Average revenue per transit ranges from $100,000 in 2004 to $109,000 as average vessel sizes increase.

The forecast for the Expanded Canal shows slightly lower transits and revenues than the Existing Canal scenario due to a larger average vessel size despite the slight increase in cargo volumes.

Table E-7. Panama Canal Transits, Cargo, and Revenue under Preferred Toll Option, Existing Canal, Most Probable Case, 2000–2025

	Forecast with Preferred Tolls			Forecast with Current Tolls		
Year	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)
2000	1,643	49,631	163,266	1,850	57,914	110,975
2001	1,534	46,075	151,591	1,796	56,442	108,008
2002	1,475	44,713	147,069	1,771	56,179	107,338
2003	1,487	44,988	147,735	1,774	56,425	107,752
2004	1,498	45,385	148,922	1,795	57,238	109,287
2005	1,547	47,081	154,540	1,859	59,491	113,674
2006	1,522	46,637	152,957	1,834	59,037	112,761
2007	1,526	47,009	154,216	1,839	59,507	113,662
2008	1,532	47,487	155,833	1,846	60,111	114,818
2009	1,540	48,171	158,115	1,854	60,861	116,261
2010	1,562	49,074	161,221	1,877	61,927	118,312
2011	1,578	50,016	164,558	1,865	61,602	117,659
2012	1,584	50,269	165,409	1,862	61,546	117,539
2013	1,600	51,011	167,832	1,861	61,596	117,623
2014	1,603	51,194	168,496	1,864	61,749	117,905
2015	1,629	52,054	171,605	1,884	62,387	119,180
2016	1,581	51,050	168,303	1,841	61,572	117,640
2017	1,575	51,034	168,290	1,839	61,773	118,033
2018	1,573	51,161	168,774	1,853	62,397	119,280
2019	1,574	51,348	169,475	1,862	62,904	120,286
2020	1,579	51,721	170,796	1,877	63,636	121,725
2021	1,580	51,721	170,803	1,881	63,771	121,969
2022	1,578	51,773	170,976	1,883	63,947	122,298
2023	1,586	52,135	172,251	1,892	64,292	122,985
2024	1,590	52,318	172,871	1,899	64,620	123,612
2025	1,592	52,513	174,167	1,905	64,959	124,258

Source: Volume 5, Table 4-2 through Table 4-27.

Table E-8. Panama Canal Transits, Cargo, and Revenue under Preferred Toll Option, Expanded Canal, Most Probable Case, 2010–2025

	Forecast with Preferred Tolls			Forecast with Current Canal Tolls		
Year	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)
2010	1,570	51,805	162,466	1,858	63,933	116,621
2011	1,547	52,588	164,749	1,839	67,795	121,713
2012	1,551	52,756	165,380	1,835	67,804	121,696
2013	1,563	53,341	167,193	1,833	67,938	121,907
2014	1,563	53,401	167,520	1,835	68,198	122,344
2015	1,589	54,377	170,907	1,853	68,972	123,780
2016	1,539	53,281	167,366	1,805	67,766	121,657
2017	1,529	53,169	167,084	1,798	67,628	121,523
2018	1,524	53,197	167,281	1,806	67,953	122,297
2019	1,521	53,266	167,651	1,812	68,359	123,148
2020	1,510	51,610	163,707	1,822	68,800	124,137
2021	1,507	51,512	163,524	1,822	68,813	124,232
2022	1,502	51,439	163,471	1,820	68,867	124,437
2023	1,507	51,671	164,508	1,826	69,089	125,002
2024	1,506	51,716	164,872	1,829	69,296	125,508
2025	1,504	51,753	165,826	1,843	70,276	127,221

Source: Volume 5, Table 4-12 through Table 4-27.

1. Introduction

World trade of dry bulk commodities totals more than 2 billion tons annually. While the Panama Canal captures only 3 percent of this total world trade, dry bulk commodities nonetheless represents a substantial market for the Canal of nearly 70 million tons per year.[1]

OBJECTIVE AND SCOPE

The Transportation Study on the Dry Bulk Market Segment and the Panama Canal is part of a larger set of studies to examine the feasibility of expanding the capacity of the existing Canal to permit the transit of larger vessels. The dry bulk market segment study will:

- Assess the Canal's potential market for dry bulk trade,
- Determine the economic advantages of using the Canal versus existing and expected alternative transport options,
- Devise a market strategy that attracts the dry bulk business to the extent that the Canal's earnings are maximized under existing and expanded lock conditions, and
- Forecast traffic, transit, and revenue flows through 2025, and associated risks, for the status quo and expanded Canal.

The study has conducted in-depth analysis of trends in production, consumption and trade for the commodity categories and commodities shown in Table 1-1. The 27 commodities differ from one another in various ways. Some commodities have largely regionalized trade patterns, while others are truly global. Some, such as alumina, are perfectly homogeneous, while others, such as steel, consist of diverse and easily distinguishable product forms. Markets for regionalized commodities are analyzed on a more disaggregated basis than markets for more global commodities. Markets for diversified commodity groups often require product-by-product analysis, while markets for homogeneous commodities do not. Some bulk commodities are intermediate goods in the manufacture of other bulk commodities, and their demand is largely derived from the demand for downstream products. Others are used largely in single well-defined industrial sectors. And still others have diverse industrial or agricultural uses.

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[1] This study does not cover the 38 million tons of grains that were shipped through the Panama Canal in 2001. A separate study for the grain market segment has been undertaken. See Nathan Associates Inc., Transportation Study on the Grain Market Segment and the Panama Canal, Final Report Volume 2: Panama Canal's Potential Market, conducted for the Autoridad de Canal de Panamá, September 9, 2003.

Table 1-1. Dry Bulk Study Commodity Categories and Commodities

Steel Products and Steelmaking Raw Materials	Ores and Metals	Minerals and Fertilizers	Other Dry Bulks
Iron metal	Alumina/Bauxite	Niitrates	Cement
Iron ore	Copper concentrates	Phosphates	Lumber
Metallurgical coke	Primary aluminum	Salt	Paper
Semi-finished and finished steel	Refined copper	Soda ash	Petroleum coke
Steel scrap	Refined zinc	Sulfur	Pulp
	Thermal and metallurgical coal	Urea	Sugar
	Zinc concentrates	Misc. fertilizers	
	Misc. metals		
	Misc. ores		

The study has analyzed world production consumption and trade for study regions delineated for their significance for potential Panama Canal trade (Table1-2). In addition for important Panama canal commodities, analyses of production consumption and trade where conducted for individual countries and areas. Examples include the division of South America East into Brazil and Venezuela for iron ore trade and the further subdivision of Brazil into Brazil-North and Brazil South.

Table 1-2. Study Regions and Sub-Regions

North America	Latin America	Asia
East Coast	Caribbean	Far East
West Coast	East Coast Central America	Middle East
Gulf Coast	West Coast Central America	South Asia
Europe	East Coast South America	South East Asia
Africa	West Coast South America	Oceania

REPORT ORGANIZATION

The Draft Final Report of the Transportation Study on the Dry Bulk Market Segment and the Panama Canal consists of the following six volumes:

- Volume 1: Main Report
- Volume 2: Panama Canal's Potential Market
- Volume 3: Vessel Transit and Fleet Analysis
- Volume 4: Economic Value of the Panama Canal
- Volume 5: Marketing Strategy
- Volume 6: Forecast of Panama Canal Cargo, Transits and Toll Revenue

The organization of this Volume 1: Main Report generally follows the structure of the study's analyses presented in detail in Volume 2 through Volume 6.

Following this introductory section, Section 2 presents the approach methodology and results of the forecast of world demand, supply and trade for each of the dry bulk commodities. Section 3 present a review of historical Panama dry bulk trade and the forecast of potential Panama Canal trade through 2025.

Section 4 provides the analysis and forecast of the global vessel fleet for the Existing and Expanded Canal cases and a description of the ocean voyage estimation model and other inputs used to develop forecast of ocean freight rates for Panama Canal routes and alternative routes.

The forecast of potential canal transits and the determination of the economic value of the Panama Canal are presented in Section 5. The development and recommendation of a preferred Panama Canal toll strategy and the resulting forecast of canal transits and revenues are described in Section 6.

2. World Trade

This section presents the assessment of the Canal's potential market for dry bulk trade. It is important to note that for purposes of this study the term "Canal's potential market" represents our estimate of the maximum market share that the Canal could capture of world trade assuming a value of zero for Panama Canal tolls. Draft Final Report Volume 5 on Canal market strategy and pricing identifies and analyzes the impact of alternative Canal toll structures and rates on forecast traffic volume.

STUDY APPROACH

Macroeconomic Scenarios

The study has been conducted using three global macroeconomic and trade scenarios to the year 2025 prepared by DRI-WEFA for the Autoridad de Canal de Panamá.[2] The macroeconomic scenarios provide forecasts of GDP, population, per capita income, government and private consumption, investment, and trade of goods and services. The three macroeconomic scenarios—most probable case scenario, best case and worst case—incorporate varying assumptions on world economic performance, geopolitical conditions, international trade policies, and environmental issues.

Dry Bulk Production and Consumption

The forecasts of dry bulk production, consumption and trade for the Most Probable Case were prepared by CRU International Ltd. CRU International regularly tracks production, consumption and international trade for dry bulk commodities included in this study and publishes various market monitors and outlook reports for commercial clients. CRU's market intelligence and knowledge have been developed by their specialists over a period of years drawing upon a variety of sources including interviews and site visits to major producers and consumers concerning expected changes in production and consumption patterns, continuous monitoring of trade and industry publications, and in-house knowledge and expertise.

The analysis of dry bulk commodities is based on the judgment of CRU experts, who are specialists in the economic analysis of specific commodities. The experts have put together the available historical series of data into a standard format and then used their expert judgment to make forecasts (Figure 2-1).

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[2] DRI-WEFA, Global Macroeconomic and Trade Scenarios to 2025, Volume I: Most Probable Case, prepared for the Panama Canal Authority (Contract No. SAA75897BGP), March 2002.

The forecasts prepared by CRU are supported by the extensive discussion of underlying analysis of trends in production, consumption and trade for each individual commodity or commodity group presented later in this section.

The first stage in making the forecasts is the generation of demand forecasts. The base case forecasts are based on macroeconomic forecasts generated for the ACP by WEFA-DRI. The forecasts are driven, however, by expert judgment rather than an econometric model. Although no econometric models were developed for this study, some simple econometric techniques were used by analysts to provide guidance regarding trends. However, for all commodities, the analyst's judgment and not an equation was the final determinant of the forecast. After demand has been calculated, supply is then forecast based on the experts' view of the future availability of supply from different potential sources.

The demand for raw materials used in downstream products is forecast as a derived demand, utilizing technical and market relationships between upstream and downstream products. Thus, for example, the demand for zinc concentrates is directly related to the supply of refined zinc. Similar relationships are as follows:

- The supply of steel determines the demand for steel scrap, pig iron and DRI/HBI. The supply of pig iron and DRI/HBI, taken together, determines the demand for iron ore. The supply of pig iron alone determines the demand for metallurgical coke. The supply of pig iron and the supply of metallurgical coke together determine the demand for metallurgical coal.
- The supply of primary aluminum determines the demand for calcined petroleum coke and alumina. The supply of alumina in turn determines the demand for bauxite.
- The supply of refined copper helps to determine the demand for copper concentrates.

Figure 2-1. Dry Bulk Production, Consumption, and Trade Databases

Commodities	CRU has developed its own global/regional production and consumption databases for all major metals and fertilizers, including intermediate products and some non-metallic raw material inputs, extending back over many years. These represent an entirely internally consistent series that builds up to a global overview of fundamentals unique to each commodity. We maintain comprehensive country/region trade data, which is unsurpassed in detail, coverage, and compilation procedures. These data are available historically for all of the major routes of interest to ACP and in a significantly greater level of product detail than is available in the ACP database. Our database includes, to varying degrees of detail, products mentioned in the Terms of Reference, or subcategories of these products as follows:— iron ore and primary iron scrap substitutes, metallurgical coal, petroleum coke, metallurgical coke, manufactures of iron and steel including scrap, bauxite, alumina, primary aluminum, copper concentrates, refined copper, zinc concentrates, refined zinc, salt, sulfur, phosphate rock, phosphates in various forms, nitrates, and urea.
Sources	This data are complied and derived from a variety of sources, which include company reports, unpublished correspondence with companies, national trade associations, regional and supraregional trade associations, government publications (such as US Geological Survey, Eurostat, Japan's MITI, Brazil's SDI). Customs data for individual countries are the main source of information concerning trade flows. Supplementary information for some commodities, for example, metallic concentrates, comes from specific knowledge of long-term contracts linked to specific sources of supply and consuming countries. Where data are otherwise incomplete, a significant amount of

	additional and original market research is undertaken with firms in the industry to supplement the official data.
Coverage	Unlike many databases in the public domain, we obtain trade data at the appropriate level of detail for each commodity. Depending on the analysis needed, the data may be collected at a 4-digit, 6-digit, 8-digit or even a 10-digit level in the national trade classification. Sometimes, individual customs series are too narrow for our purposes at one level but are too broad at the next, more aggregated level. In such cases, we may make up our own series by aggregating different series as appropriate.
Compilation Procedures	Data are entered into detailed trade matrices developed by CRU. These trade matrices, which include by country coastline where necessary, ensure that trade flows on a route by route basis can be readily identified. Discrepancies frequently exist, even in the most reputable sources of trade data, between imports and exports. A clear set of procedures has been developed in order to reconcile conflicting data. For example, exports from Country A do not necessarily match imports for the same product as determined by importing Country B. Product definitions can vary. We undertake a large market research exercise with producers and consumers to fill in the gaps, ensure data are up to date, and to correct data errors. As a further check, trade data are reconciled with demand and supply data.

Source: CRU International Ltd and Nathan Associates, Inc.

Supply is variously defined as production or shipments, depending on the judgment of the experts as to which is most suitable. Demand is defined either as apparent or real consumption. Apparent consumption consists of supply plus imports minus exports. Real consumption consists of apparent consumption adjusted for changes in consumers' and traders' stocks.

Comparison of ACP Reported Dry Bulk Traffic with Study Estimates

The forecasts of potential Panama Canal dry bulk trade presented in this Volume are not directly comparable to ACP reported dry bulk traffic for several reasons. First, as already mentioned the definition of potential Panama Canal dry bulk trade is based on the assumption of no Panama Canal tolls. Second, the forecast of potential transits is for dry bulk vessels only and does not include dry bulk commodities that may transit the canal on non-dry bulk vessels[3]. Third, there has historically been a modest amount of Canal traffic on routes where the Panama Canal is not the shortest maritime routing and hence would not be included in the forecast that is based on transport economics. Again, this traffic has been identified and may be included in the overall final forecast of Panama Canal traffic.

It is important to recognize that this study was designed not to prepare independent forecasts of potential Panama Canal trade of dry bulk commodities. Accordingly, the study did not use ACP-reported Canal traffic as the basis of the forecast. Rather the study developed the potential trade forecast from other sources of production, consumption and trade of each commodity.

Table 2-1 presents a comparison of ACP reported dry bulk traffic with forecasts prepared in this study. The upper portion of the table shows that in 2000 total ACP reported dry bulk commodity traffic was 67.1 million tons. To be comparable to the study's forecast, two items are subtracted: (i)

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[3] However, we have prepared and provided the ACP with a forecast of such cargo carried aboard non-dry bulk vessels to be incorporated in other market segment studies.

the amount of dry bulk commodities carried on non-dry bulk vessels (11.0 million tons in 2000) and (ii) the amount of dry bulk traffic on routes where the Panama Canal is not the shortest routing (0.9 million tons). The remaining ACP-reported dry bulk traffic on dry bulk vessels totaled 55.2 million tons in 2000.

Table 2-1. Comparison of ACP Reported Dry Bulk Traffic with Study Forecasts, 2000 and 2001 (thousands of long tons)

Item	2000	2001
ODB Trade flows from ACP data		
ACP reported dry bulk commodities traffic a/	67,103	65,070
Less: Dry bulk commodities on non-dry bulk vessels b/	10,994	11,298
Less: Traffic on routes excluded by mileage c/	889	766
Subtotal dry bulk traffic from RLA	55,220	53,006
ODB Trade flows prepared by Study		
Trade forecast of dry bulk commodities on routes where Canal routing is shortest	107,782	106,674
Less: Bypass traffic not captured by Canal d/	30,053	30,558
Potential Canal dry bulk trade with zero tolls e/	77,729	76,116
Less: Dry bulk trade in non-dry bulk carriers f/	11,742	11,097
Potential Canal dry bulk trade in dry bulk vessels	65,987	65,019
Less: Traffic diverted with actual ACP tolls g/	7,716	7,966
Forecast of ODB dry bulk traffic on dry bulk vessel g/	58,271	57,053

a/ From Volume 2, Appendix W Table W-1.
b/ From Volume 2,Appendix W, Table W1.
c/ From Volume 2, Appendix W, Table W-2.
d/ From Volume 2, Table 2-5.
e/ From Dry Bulk Transit model, Table XB1ODBTRADEFORECAST.XLS
f/ From Dry Bulk Transit model, Table XB3ODB.xls
g/ From Volume 5: Marketing Strategy Table 4-2 and 4-3.

Source: As noted.

The lower portion of Table2-1 shows the estimates of dry bulk trade prepared by the study. From the global trade forecasts prepared by the study, we identified the amount of dry bulk commodity trade on trade routes where the Panama Canal is the shortest routing (107.8 million tons in 2000). From this, the amount of trade on bypass routes that cannot be captured by the Existing or Expanded Canal is subtracted (30.1 million tons)[4]. The result is the forecast of potential Panama Canal dry bulk trade with zero tolls of 77.7 million tons as reported in this volume.

However, again this estimate includes dry bulk trade carried on non-dry bulk vessel (11.7 million tons in 2000). Also to be compared with ACP-reported traffic, the amount of potential dry bulk trade that is not captured due to Panama Canal tolls needs to be subtracted (7.7 million tons in 2000). The

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[4] The bypass trade routes are identified in Table 2-5 herein, and the maritime economics is discussed in detail in *Volume 3: Vessel Transit and Fleet Analysis*, Chapter 3.

result is an estimate of 58.3 million tons of dry bulk commodities on dry bulk vessels that would use the Panama Canal. This is 3.1 million tons or 5.5 percent above the figure derived from ACP records. The results are quite close given the entirely independent and separate method used to prepare the forecast.

Implications of Continued Implementation of Free Trade Agreements

Trade reform initiatives have an impact on trade worldwide. A number of studies have shown, for example, that implementing the GATT/WTO Uruguay Round would increase the size of the world economy after a ten-year transition period. These studies also demonstrate that efficient exporters benefit as trade reforms increase their access to foreign markets and allow them to exploit economies of scale in production. Access to formerly restrictive markets will thus induce changes in trade flows. China's accession to the WTO exemplifies how trade flows might be affected. WTO accession is likely to increase U.S. exports and imports with China 10 and 7 percent, respectively, and evidence of this is already present in the U.S.-China agreement to normalize trade relations. China will introduce private trading to the grain markets, making it less expensive for U.S. grain producers to export grain to China. But China will likely import more U.S. fertilizers because chemical import tariffs will be reduced by more than 50 percent on average (under WTO stipulations). This will enable China to increase its own grain harvest capability, water shortages notwithstanding, thus possibly reducing demand for U.S. grains in the mid- to long-term.

The advent of new accession agreements, the possibility of the execution of a Free Trade Area of the Americas agreement by 2005, and restrictions on genetically modified grains portend new trading opportunities and changes in traditional trading relationships.

Table 2-2 lists eleven free trade agreements in effect and seven free trade agreements under negotiation that are most relevant for Panama Canal trade[5]. Of the free trade agreements under negotiation, the following three regional associations of free trade have the greatest potential implications for Panama Canal due to the size of the member nation economies, the potential volume of trade, and their location relative to the Canal:

- Free Trade Agreement of the Americas
- Andean Community – European Union
- Mercosur – Andean Community

The current status of negotiations, factors affecting the likelihood and timing of the successful conclusion of negotiations, and the potential effects on Panama Canal trade of each of these proposed free trade agreement is discussed below.

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[5] A comprehensive list of existing and proposed free trade agreements worldwide is presented in Appendix V.

Table 2-2. Current and Proposed Bilateral and Multilateral Free Trade Agreements Relevant to the Panama Canal, June 2003

Name	Member Countries	Type of Agreement	Date Entered into Force or Targeted
Agreements in Effect as of June 2003			
Andean Community - Brazil	Brazil, Colombia, Ecuador, Peru, Venezuela	Association Free Trade Agreement	16-Aug-99
Canada - Israel	Canada, Israel	Bilateral Free Trade Agreement	01-Jan-97
Central America - Chile	Chile, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua	Regional/Plurilateral Free Trade Agreement	18-Oct-99
Chile - Colombia	Chile, Colombia	Bilateral Free Trade Agreement	01-Jan-94
Chile - Venezuela	Chile, Venezuela	Bilateral Free Trade Agreement	01-Jun-93
Costa Rica - Panama	Costa Rica, Panama	Bilateral Free Trade Agreement	08-Jun-73
El Salvador - Panama	El Salvador, Panama	Bilateral Free Trade Agreement	02-Jun-70
Honduras- Panama	Honduras, Panama	Bilateral Free Trade Agreement	08-Nov-73
Israel - United States	Israel, United States	Bilateral Free Trade Agreement	19-Aug-85
Jordan - United States	Jordan, United States	Bilateral Free Trade Agreement	17-Dec-01
Panama - Dominican Republic	Panama, Dominican Republic	Bilateral Free Trade Agreement	17-Jul-85
Proposed Agreements			
Free Trade Agreement of the Americas	34 nations in Western Hemisphere	Association Free Trade Agreement	2005
Andean Community - European Union	Bolivia , Colombia, Ecuador, Peru, Venezuela and the 18 EU member countries	Association Free Trade Agreement	2004
Argentina - Mexico	Argentina, Mexico	Bilateral Free Trade Agreement	2004
Mexico - Uruguay	Mexico, Uruguay	Bilateral Free Trade Agreement	2004
MERCOSUR - Andean Community	Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela	Association Free Trade Agreement	2003
Canada - Central America	Canada, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua	Association Free Trade Agreement	2004
Central America - United States	Canada, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, United States	Association Free Trade Agreement	2004

Source: Center of International Business, Tuck School of Business at Dartmouth, CIB Trade Agreements Database and Archive; Sistema de Información al Comercio Exterior of the Organization of America States; and Nathan Associates Inc.

Free Trade Agreement of the Americas

The effort to unite the economies of the Western Hemisphere into a single free trade agreement began at the Summit of the Americas, which was held in December, 1994 in Miami. The Heads of State and Government of the 34 democracies in the region agreed to construct a Free Trade Area of the Americas, or FTAA, in which barriers to trade and investment will be progressively eliminated, and to complete negotiations for the agreement by 2005.

A number of agreed principles guide the negotiations. These include, among others:

- decisions will be taken by consensus;
- negotiations will be conducted in a transparent manner;
- the FTAA will be consistent with WTO rules and disciplines, and should improve upon these rules and disciplines wherever possible and appropriate;
- the FTAA will be a single undertaking (“nothing is agreed until all is agreed”);
- the FTAA can coexist with bilateral and sub-regional agreements and countries may negotiate and accept the obligations of the FTAA individually or as members of a sub-regional integration group; and

- special attention will be given to the needs of the smaller economies.

It appears most likely that the conclusion of a comprehensive FTAA will not be achieved by the beginning of 2005. Issues concerning agricultural subsidies, the use of anti-dumping measures and intellectual property protection are of such global significance to the United States that hemispheric agreement will not be negotiated without the context of a broader WTO agreement. However, the attractiveness of other elements of the FTAA, especially access to US markets by Latin American nations will likely result in the signing of a more limited agreement (similar to NAFTA) by the end of 2005 or early 2006.

The potential impact of FTAA on Panama Canal trade of course depends on the provision of the final agreement. If FTAA ends up to be modeled similar to NAFTA, one might expect increases in hemispheric trade flows of 1 to 2 percent higher annually than without FTAA over the first 10 years.

Andean Community – European Union

In 2003, the Andean Community and the European Union commenced negotiations of a Political Dialogue and Co-operation Agreement that should lead to the negotiation of an Association Agreement that would encompass a Free Trade Accord. The Political Dialogue and Co-operation Agreement will guarantee dialogue and cooperation at all levels, from technical assistance in improving our trade, to the efforts to control terrorism and the worldwide drug problem, sustainable development, migration, conflict resolution, human rights, disaster prevention and the war on poverty, among other things. Negotiations are targeted to be completed in 2003 and the Agreement signed at the European Union-Latin American-Caribbean Summit in Mexico in 2004.

The negotiation of a Free Trade Accord the EU and the Andean Community amounted to a figure of about 16 million Euros, corresponding to an increase of nearly 100 percent over ten years. Trade with the Andean Community represents 0.8 percent of the EU's total trade, while the EU represents 14.1 percent to the Andean Community. Base products or primary production make up 77 percent of Andean exports, while 85 percent of the EU's exports are manufactured products.

Mercosur – Andean Community

An extensive schedule of negotiations is currently underway to enable the Free Trade Agreement between the two blocs to be signed in December 2003. The general tariff phase-out periods would be 10 years for the Andean countries, Paraguay and Uruguay and 6 years for Argentina and Brazil.

A smaller number of initial tariff reduction levels would make it possible to safeguard the asymmetries of the existing tariff preferences. Accordingly, levels of 10 percent, 15 percent and 35 percent are proposed for the Andean countries, Paraguay and Uruguay, and 30 percent and 45 percent for Argentina and Brazil. Other proposed provisions include:

- The maximum tariff phase-out period for sensitive products would be 13 years, with a few exceptions of 15 years.
- The implications of the existing preferences for particular sensitive products would be evaluated in the light of the tariff phase-out timetables that CAN and MERCOSUR agree upon.

- The products on which tariffs will be phased out within maximum periods of 10 or of 6 years, according to the general tariff phase-out schedule, should amount, in terms of those traded between the two blocs, to at least 70 percent in the case of the Andean Community and 85 percent for MERCOSUR, and in terms of the number of tariff universe subheadings involved, to 80 percent and 90 percent, respectively.

In the case of country-to-country trade, this could apply to at least 60 percent of the imports.

- The fixed tariff would be used for the tariff phase-out of products to which price stabilization systems are applied.
- An agricultural safeguard clause would be negotiated for the products decided by the two Parties.
- Bolivia and Peru may conduct negotiations to bring their respective Agreements with MERCOSUR, as applicable, into line with the CAN – MERCOSUR Agreement.

In the sections below, we discuss the implications of continued implementation of free trade agreements for selected dry bulk commodities.

Effect on Steel and Steelmaking Raw Materials

Our study team assessed the implications for the trade forecasts of a continuation of the trend for establishing multi-lateral and bilateral free trade agreements. We believe there would be an acceleration of the trend to build more integrated steel plants in Brazil and to close plants in the United States and Europe. Less certainly, Russian mills would take advantage as well. The main disadvantage facing Russian mills over the long term is their coal supply. The mills currently receive domestic coal for which the rail transport is heavily subsidized. If the subsidies were to disappear as part of a free trade agreement, a large part of the Russian mills' competitive advantage would disappear. The mills are not located conveniently, moreover, to a deep sea port where coal could be imported. Like the Brazilians, the Russians do have good cheap sources of iron ore[6].

For the most part, the shift would not affect finished and semi-finished steel trade through the Canal. Trade would be increased mainly on the routes Brazil-North America Gulf, Brazil-Europe and possibly Europe (Russia)-North America Gulf.

A similar pattern might take place in Asia, where production in Australia might replace production in Japan and Taiwan. This, too, would likely have minimal direct effect on Canal traffic. There would be secondary effects in raw material markets with the following expected impacts:

- ***Iron ore.*** A shift in steel production to the iron ore producing regions would reduce imports from all sources into Europe, North America, Japan, and Taiwan. To the

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[6] If the subsidies were removed and Russian steel mills became uncompetitive, they would eventually be shut down rather than be converted to electric-arc furnaces. This is due to the lack of available scrap iron and the lack of a large domestic market for finished products that provides an advantage for local mills in terms of timely deliveries and lower transport costs.

extent that these are potential Canal routes (with a widening of the Canal), this could reduce potential Canal traffic.

- ***Coal.*** More Australian and Canadian metallurgical coal would go to Brazil rather than to Europe. Less metallurgical coal will be produced in the United States for domestic industry. Production will increase in Australia in compensating volumes for export to Brazil. Some of the new export-oriented steel mills might be located in northern Brazil in order to use Carajas ore. There might therefore be a need for coal to be shipped to northern Brazil as well as southern. There is an interrelationship between coal trade and coke trade. The Brazilians might decide not to build coke plants sufficient to meet all their requirements. In this case, some of the additional coal requirements would be converted into coke requirements. Although we have not mentioned the Far East here, the results would be similar. Australia would take the place of Brazil in the analysis.
- ***Metallurgical coke.*** There would be a drop in East Coast and Gulf Coast North American and European imports of coke from all sources, most notably China. Indeed, this drop might be proportionately sharper than the drop in steel production because there would be plenty of surplus domestic coke capacity available to meet the needs of the surviving North American and European steel mills. Whether there would be an increase in coke imports elsewhere would depend largely on the degree of self-sufficiency in coke of any new Brazilian mills that are built.
- ***Iron metal.*** There would probably be little change.
- ***Scrap.*** There would be few first-order effects of a switch in integrated blast furnace production from North America and Europe to Brazil. Free trade in steel, however, would also affect trade in steel made by the electric arc furnace process, which consumes scrap. The location of electric arc furnace production depends less than the location of blast furnace/ basic oxygen furnace production on the location of major raw materials. The effects of free trade in steel on the geographic location of such production are practically impossible to predict. Any effects, however, would translate into a change in the regional demand for scrap. Canal traffic could be affected but we do not know exactly how.

Effect on Sugar

The progress of the WTO negotiations on sugar is very slow, and it is likely to be at least 10 years before trade is liberalized to a significant extent. In the meantime, it is likely to be addressed in other regional or bilateral negotiations, such as the case with NAFTA. In terms of raw sugar, the fact of the matter is that sugar cane accounts for the large majority of traded raw sugar, and it is grown in only a very limited number of places, dependent on climate. Brazil, Australia, Thailand, Central America, and the Caribbean countries are currently the major exporters to the world market, and that will remain the case, simply because they are geographically endowed to produce this commodity. Sugar beets can be grown in temperate northern climates, like North America and NW Europe, but it doesn't seem likely that that this industry will be able to supply increasing requirements of the population. In fact, the activity has to be heavily subsidized in order for it to take place in these regions. NAFTA will enable Mexican sugar producers to have greater access to the U.S. market, and this will change the flow of trade a little bit, and has been incorporated into the forecast. North America, however, will remain a net importer of raw sugar, and NW Europe is likely to go that way as well as subsidies are dismantled under the WTO structure.

For the long-run, trade patterns for raw sugar are expected to minimize freight costs for the trading regions, ignoring the existence of artificial barriers. Two examples: we expect the North American market to import sugar primarily from the Americas and the Caribbean; Oceania is likely to export sugar mainly to the Asian markets.

The historical analysis and forecast of global demand, supply and trade for each of the study's commodities through 2025 is presented.

SEMI-FINISHED AND FINISHED STEEL PRODUCTS

Demand

Our analysis with regard to steel includes all semi-finished and finished products made of carbon steel, alloy steel, and stainless steel. Semi-finished products include blooms, slabs, and billets. The main product groups within finished steel products are

- Sheet products (hot-rolled sheet and coils, cold-rolled sheet and coils and coated sheet and coils). These products are mainly used for production of cars, household appliances, sandwich panels, tubes and beverage cans.
- Long products (rebar, sections, merchant bars and wire rod). These products are used mainly in the construction industry.
- Plate, which is used in a variety of industries, including line pipe, off-shore, shipbuilding, heavy vehicles, industrial machinery, and construction.

We estimate that sheet, long and plate products account for over 90 percent of global finished steel consumption. Other finished products include tubes and rails.

Over the last decade, the global demand for steel has grown in fits and starts, if at all. A major downward factor influencing steel demand has been the collapse of much of the steel market in the CIS and Eastern Europe. A decade-long recession in Japan has also been a major factor reducing demand since 1990. On the other hand, demand has grown sharply in some developing countries, especially in China, and to a lesser extent in Central America, western South America, South Korea, South Asia, and the Middle East.

The countries that have grown most strongly in the recent past are expected to continue to grow over the forecast period. In Eastern Europe and the CIS, moreover, the fall in the demand for steel is likely to have run its course, and future developments are expected to be positive. As a result, the steel industry appears likely to break out of its decade-long rut. Demand should increase.

Global steel demand fell from 745 million tons in 1990 to 643 million tons in 1993. It has since rebounded to 758 million tons in 2001.We expect that growth will continue, especially in Asia. By 2025, we expect demand to reach 1.32 billion tons, of which China alone should consume 373 million tons.

Supply

We have defined supply as production of total semi-finished and finished steel products. Our figures are based on crude steel output. Crude steel is cast into slabs, billets and blooms and afterwards processed into the various finished products. In every transformation process some part of the material is lost and subsequently recycled. Due to these so-called yield losses the sum of all finished steel products is lower than crude steel output and we have made a correction for this factor. Based on CRU experience we estimate that the average yield loss from crude steel output to (semi)finished product is 10 percent and we have reduced crude steel output by 10 percent to find supply of semi(finished) steel.

International Trade

Imports and exports forecasts are based on historical trends. We have analyzed import/demand and export/supply ratios for each region and projected these trends into the future. Finally, supply was calculated as the residual. However, we have made some adjustments from historical trends where we felt this necessary. In our vision of the future of the steel industry, we have assumed that South America East (Brazil and Venezuela), Oceania (Australia) and to a lesser extent Africa (South Africa) and Russia will strongly increase their steel exports, in particular of semi-finished products. These are countries with relatively cheap raw materials, energy, and labor at locations remote from heavily populated areas. In contrast, North America and Western Europe are likely to come under increasing pressure to reduce polluting, capital intensive and relatively simple upstream processes and buy in semi-finished products, while focusing on high value downstream production processes. This is likely to lead to an increase in trade of semi-finished steel products on one hand and high value finished steel products on the other hand.

A further important assumption that we have made is that exports from high cost countries, in particular Japan, which is one the world's largest steel exporting countries, will decline in the future as a result of increased competition from China and countries in South East Asia.

Implications for Panama Canal Routes

There should remain a lively steel trade on many potential Panama Canal routes. North America, in particular, will remain a big importer of steel, and the West Coast will continue to import some of its requirements from Europe and East Coast South America while the East and Gulf Coasts will continue to do the same using material from East and South East Asia. The diversity of steel products and the special needs of customers, moreover, will guarantee that there will remain some demand for steel on most minor potential Panama Canal trade routes.

IRON ORE

Demand

Demand for iron ore is determined by the level of output from blast furnaces and DRI modules. In 2001, production of blast furnace hot metal was 573 million tons while DRI production totaled 39 million tons. The amount of iron ore consumed in blast furnaces depends on the iron (Fe) content of the iron ore as the function of both processes is to produce metal with as high an iron content as possible. As a rule of thumb, around 1.55 tons of iron ore products are required to produce one ton of hot metal or DRI.

The consumption of iron ore has grown steadily ever since the industrial revolution and this has continued over the past decade when the growth in consumption has averaged just less than 1 percent per year despite a collapse in hot metal production in the CIS. Today, growth is almost totally confined to the developing countries as blast furnace output in the developed world is static or declining slowly. The main growth areas are China, other Asia (excluding Japan) and Brazil. DRI output on the other hand is growing more rapidly but from a much smaller base. Here output growth is largely confined to gas-rich areas with ready access to iron ore i.e. Venezuela, Middle East, Australia.

Future growth in iron ore demand will depend on the expansion in steel production and the technology used to produce that steel. On average, we anticipate that global steel production will grow by 2.4 percent per year over the period to 2025. Much of this growth will favor the electric arc furnace (EAF). This is because EAFs require a much lower capital investment than the blast furnace/BOF route and have a lower environmental impact. We anticipate average annual growth in EAF steel production of 3.8 percent to 2025.

In contrast, there are virtually no plans to build new greenfield blast furnace/BOF steel mills and growth in hot metal capacity will be almost totally confined to incremental additions at existing plants in Asia (especially China), South America and possibly the CIS. As a result, production of hot metal will lag the overall growth in steel production but we still anticipate that global output will grow by around 1.8 percent per year over the next 20–25 years.

The production of DRI should grow more rapidly than this because of DRI's role as a scrap-substitute in EAF steel production. DRI output is projected to more than double by 2025 expanding at an average annual rate of 3.5 percent.

The growth in hot metal and DRI production will feed directly through to higher iron ore demand. This should expand by 1.7 percent per year, taking global consumption to more than 1.5 billion tons by 2025.

Supply

Iron is one of the most common natural elements and, consequently, iron ore mining operations can be found in many countries. However, over time, supply has shifted to those countries with the richest and most abundant sources of iron ore and the role of international trade has expanded. This process is virtually complete in Western Europe, where iron ore production is mainly confined to Sweden, and is ongoing in the United States and China. Correspondingly, iron ore production has expanded hugely in a small number of low cost resource-rich countries, namely Brazil and Australia.

This process will continue over the coming decades as the iron ore industry has become increasingly consolidated while marginal operations around the globe are under continuous threat of closure. Furthermore, both Brazil and Australia are likely to see growing domestic demand for iron ore. By 2025, we expect the combined production of iron ore in these two countries to account for 41 percent of global production compared with 30 percent in 2001.

International Trade

The trends outlined in the previous section will have a major bearing on international trade which is expected to account for 52 percent of iron ore consumption in 2025 compared with 41 percent in 2001. The main increase in trade flows will be from Brazil and Oceania to the Far East. We are also likely to see a significant growth in Indian exports to other Asian countries.

Implications for Panama Canal Routes

Iron ore trade is expected to continue growing and this should have positive implications for the Canal. At present all of the iron ore produced in Northern Brazil is exported. Furthermore, this production is forecast to grow significantly and virtually all of this will be for export (some may go to feed new steel plants). Additionally, demand for iron ore will be increasingly concentrated in Asia so there should be significant growth in shipments from Northern Brazil to Asia. Finally, the projected increase in Venezuela's iron ore exports will be predominantly bound for Asia.

Asia is the natural market for iron ore from South America West. Indeed, the iron ore industry in Peru is controlled by Chinese interests. Exports from South America West on potential Canal routes have been minimal in recent years and we expect the overwhelming majority of this region's exports to continue to go to Asia.

Iron ore exports out of West Coast Mexico have been significant recently, but this is not a long-term phenomenon. They have risen because of a collapse in domestic DRI production, which itself was caused by a spike in gas prices. This has now been at least partially resolved and Mexican DRI output is rising again. Trends in DRI output may have temporarily freed up iron ore for export but we would not expect this to continue. Mexican iron ore is significantly inferior in quality to South American ores and, in any case, Mexican demand for ore usually exceeds domestic supply.

METALLURGICAL COKE

Demand

Metallurgical coke is manufactured from coking coal in coking plants and is used as the main energy source in producing blast furnace hot metal. The average amount of coke required to produce one ton of hot metal varies significantly from country to country and ranged from 320kg/ton of hot metal in the Netherlands in 2000 to 635kg/thm in India. In 2000, the global average coke rate was 440kg/thm.

The use of pulverized coal injection (PCI) has grown strongly in the past two decades and has led to significant reductions in the amount of coke required to produce a ton of hot metal. This gradual decline in the average blast furnace coke rate has meant that global coke demand has expanded much more slowly than overall hot metal production. This trend is expected to continue over the long term. There is still plenty of potential to increase fuel injection at blast furnaces. For example, the global average PCI rate in 2001 was 99kg per ton of hot metal compared with industry best practice of just over 200kg per ton of hot metal. Furthermore, average blast furnace size will continue to rise as smaller furnaces are withdrawn from service and less coke is consumed outside the steel industry (especially in China). Consequently, we anticipate that global coke demand up to 2025 will expand at just 0.1 percent per year compared with average hot metal production growth of 1.8 percent per year.

Supply

Generally speaking, coke is produced where it is consumed and most blast furnace steel plants have integrated cokemaking operations. Consequently, global trade in coke is relatively small and, in 2001, less than 7 percent of global coke consumption was imported. This explains why international trade in coking coal is far greater than trade in metallurgical coke.

International Trade

China dominates the supply of internationally traded coke thanks to its domestic coking coal supply and low coke production costs. In 2000, China accounted for 54 percent of global exports and 80 percent of sea-borne trade. The bulk of Chinese exports go to Western European and Asian steel mills but there is also significant trade to Brazil and the eastern seaboard of North America.

With little change expected in global coke demand, international trade is unlikely to change hugely on current levels. China seems likely to continue to dominate the export market for the foreseeable future. Consequently, the pattern of international trade is not expected to alter radically over the next 20–25 years.

Implications for Panama Canal Routes

We foresee little change in global coke trade over the forecast period. China will continue to dominate exports of coke but the pattern of imports should change somewhat. Asia will import more while Western Europe and North America will import less. The implications for the Canal are slightly negative as less coke will be exported from China to the U.S. East and Gulf Coasts.

IRON AND STEEL SCRAP

Demand

Scrap is consumed in all forms of steelmaking. It is the main raw material used in electric arc furnace (EAF) steelmaking where, on average, some 850kg of scrap are consumed for every ton of steel produced. Furthermore, scrap typically constitutes 20 percent of the metallic charge in basic oxygen steelmaking. Consequently, demand for scrap is heavily linked to trends in steel production and most particularly the trend in EAF steelmaking.

Between 1995 and 2001, global scrap demand rose by 46 million tons or 15 percent. Inevitably, consumption is greatest in the main steel producing regions with the highest consumption in Europe followed by Asia and then North America.

The outlook for scrap demand is very positive. Over the period to 2025, steel production is forecast to grow by 2.4 percent per year. However, scrap demand should grow even more rapidly because EAF steel production is expected to expand by 3.8 percent per year on average. As a result, scrap demand is forecast to rise at an average annual rate of 2.9 percent. As a result, global demand for scrap should more than double over the next 25 years. Growth should be strongest in China, South America and North America.

Supply

There are three main sources of scrap supply. Future scrap supply in any given region will depend on its level of manufacturing activity and its previous steel consumption. We would therefore anticipate that developed countries would continue to have a large pool of obsolete scrap available for recycling while prompt scrap supply may decline as manufacturing activity continues to relocate to cheaper locations. On the other hand, developing countries will have a limited pool of obsolete scrap to recycle and prompt scrap generation is unlikely in most cases to be sufficient to meet demand. Finally, newly industrializing countries will have very low scrap supply and will need to import if their steel production is to expand.

International Trade

Trade flows in scrap move predominantly from the developed world to the developing world. In effect this means that Europe (East and West), Japan and North America export large quantities while Asia is a large importer. Australia is also a large exporter of scrap.

Trade in scrap is likely to expand significantly in the future. Steel production growth should be strongest in those regions which are short of scrap and this should facilitate a substantial expansion in trade. In geographic terms, trade flows will continue to move from the developed world towards Asia with China in particular likely to experience a substantial growth in import demand.

Implications for Panama Canal Routes

Although global trade is forecast to expand, there are unlikely to be huge benefits for the Canal. Asia will be the main focus of growth in scrap demand but scrap supply in Asia will also expand hugely in the future due to the huge growth in Asian steel consumption over the past 40 years. This in turn ensures a rapidly expanding pool of obsolete scrap available for recycling. This is the main reason why global trade is expected to grow much more slowly than global demand. Furthermore, scrap trade involving South American countries will remain low due to the availability of low cost high quality iron ore. There will be some increase in scrap flows from North America to Asia. Although these will come predominantly from the U.S. West Coast, where scrap generation is much higher than local scrap demand, there will continue to be some exports of surplus scrap via potential Canal routes from the U.S. East Coast as well.

IRON METAL—DRI/HBI AND PIG IRON

Demand

Both DRI and pig iron are substitute materials for scrap in EAF steelmaking. They are used instead of scrap where insufficient scrap is locally available or where the quality of the steel to be produced is such that raw materials based on virgin iron ore are required. As both DRI and pig iron are denser materials than scrap they are more expensive to melt in an EAF than scrap.

The future demand outlook for both commodities is promising. As we have seen, scrap demand is expected to grow significantly. However, supply constraints in many developing countries combined with technical advances associated with EAF steelmaking should mean strong demand growth for scrap substitutes as well. This will favor DRI more than pig iron as the supply of DRI is easier to expand than that of pig iron. We anticipate that global demand for DRI will expand at an average annual rate of 3.5 percent over the period to 2025 while pig iron demand should grow by 1.6 percent per year.

Supply

For DRI, supply is largely determined by access to low or reasonable cost natural gas. Consequently, production is relatively high in the Middle East and Venezuela. Production had been growing in Mexico and North America until the late 1990s but the gas price surge in this region has reversed this process since 1999.

In recent years the growth in DRI capacity has waned due to low merchant prices and higher gas costs. However, an emerging shortage of scrap should see renewed interest in DRI facilities and we expect significant growth in supply over the longer term. By 2025, global DRI production should have more than doubled compared with 2000 levels.

Brazil and India are the only countries where pig iron is widely produced from blast furnaces for merchant sale. Some other countries have excess blast furnace capacity and produce some pig iron for domestic sale and export. These include Russia, Ukraine, China, and Japan.

Because much pig iron availability is based on excess blast furnace capacity, future growth in supply is likely to be modest. In fact, in some countries, supply will fall as growing demand for steel products means more pig iron will be converted directly into steel rather than being made available for merchant sale. This is already happening in China and is likely to become increasingly common in Russia and Ukraine. However, we still anticipate some growth in supply. In Brazil, low production costs means more merchant pig iron capacity is planned. Also new pig iron producing technologies that avoid the need for blast furnaces will soon enter the commercial arena and Australia is likely to emerge as a significant exporter of pig iron in the future.

International Trade

For DRI, Venezuela is by far the largest exporting nation due to its domestic reserves of both iron ore and natural gas. It accounted for almost 60 percent of sea-borne shipments in 2000. The other main exporting nations are Trinidad, Australia and, to a lesser extent, Russia. On cost competitiveness grounds these countries will continue to monopolize merchant supply well into the future.

For pig iron, Brazil is by far the largest exporter and this should continue over the next two decades. As mentioned above, Australia is likely to emerge as a major source of merchant pig iron and, between them, these two countries should account for 75 percent of global sea-borne trade in 2025.

Implications for Panama Canal Routes

Trade in DRI is forecast to double by 2025 but this means the absolute volumes will remain small. Demand is concentrated in Asia and North America (East and Gulf) while supply tends to come from Venezuela, Trinidad and Australia. By and large, the United States tends to be supplied from

Venezuela and Asia from Australia. This should continue in the future with little knock-on benefits for the Canal.

Pig iron supply is dominated by Brazil and, to a lesser extent, Russia. North America tends to get its pig iron from Brazil but all the demand goes through the Gulf and East Coasts. There will, however, be some growth in Brazilian exports to Asia where demand is likely to grow. However, Australia is set to become a major pig iron exporter in the future and this will limit Brazilian exports to Asia. However, the Canal should benefit as the Brazilian pig iron industry continues to move northwards where charcoal supply is more plentiful.

THERMAL COAL

Demand

Thermal coal is defined for the purposes of this report as bituminous coal that is not used directly or indirectly in metallurgical processes. It therefore excludes coal used in cokemaking or directly in blast furnaces. Most thermal coal is burnt in the process of generating electricity. There are also a number of industrial uses of thermal coal, most notably cement. The thermal coal market is much larger than the metallurgical coal market. Global demand was 2.88 million tons in 2001. Demand was 2.84 billion tons in 1992 and peaked in 1997 at 3.01 billion tons.

Growth rates in thermal coal demand depend on a number of factors including the growth in the demand for electric power and the availability of alternative means of electric power generation—nuclear, oil, gas and hydroelectric. In Europe, for example, deregulation of electricity in many countries, combined with a switch to gas-fired power, has led to a decline in coal-fired electricity generation. Political issues may determine whether nuclear power plants go ahead at the expense of fossil fuel-fired plants. The use of coal itself raises environmental issues, including emissions of sulphur and other harmful pollutants, and global warming related to the generation of carbon dioxide.

We expect the demand for steam coal to increase in most major regions. Even China, where demand has fallen in recent years, is widely expected to add at least 100 GW of coal-fired generating capacity by 2020. There is also expected to be a major increase in the use in China of coal in non-metallurgical industrial uses. The major exception to the growth outlook is Europe, where the trends that are already in motion are expected to continue to work against the use of coal. Overall, we expect thermal coal demand to increase to 4.48 billion tons by 2025.

About 1.33 billion tons of the increased demand, relative to the 2001 level, is expected to be required in South, South East and Far East Asia. A further 365 million tons of the increased demand would appear in North America. The impact of other regions on world demand is expected to be relatively minor in terms of changes in absolute levels of demand.

Supply

The supply of thermal coal is more varied than the supply of metallurgical coal, because several countries produce large volumes of coal, little of which can be used for metallurgical purposes. These countries include South Africa, Indonesia, Colombia and Venezuela.

North America is still the largest producer of thermal coal. Production is estimated to have been 914 million tons in 2001. Most of this production took place in the United States, although there was some production in Western Canada.

China, Europe (including the CIS), and South Asia, mainly India, are the next most important producers of thermal coal. China produced 649 million tons in 2001, Europe 415 million tons and South Asia 284 million tons. Australasia produced 136 million tons, most of it in Australia.

Trends in production have tended to follow trends in consumption. In countries where consumption has risen, production has risen. To some extent, the causation may be the other way around, since countries that have ample reserves of local coal are the most likely to use coal as the fuel when expanding power generation capacity.

Future production of thermal coal within the big consuming regions is likely to be supplied mainly by the domestic producers, where they are available. However, supply is expected to continue to increase as well in the export-oriented regions. By 2025, we expect production to reach 95 million tons in Eastern South America and the 113 million tons in South East Asia. African production should reach 368 million tons and Australasian production 177 million tons.

International Trade

The big coal-importing regions are the developed countries of East Asia and Europe. Total world trade in thermal coal was 407 million tons in 2001 and should increase to 562 million tons in 2025. Of the 2001 total, Japan, South Korea and Taiwan together imported 154 million tons. Their combined imports are expected more than to double by 2025, to 318 million tons. European imports, which were 147 million tons in 2001, are expected to peak in 2015 at 164 million tons and thereafter to fall to 144 million tons by 2025. Imports into the Middle East are expected more than to double over the forecast period, but from a base of only 11 million tons in 2001.

We expect Chinese exports of thermal coal nearly to double by 2025, to 137 million tons from 72 million tons in 2001. By 2025, in fact, China, the world's largest producer, is also expected to have become the world's largest exporter. Exports from Australasia should increase from 87 million tons to 125 million tons over the same period.

Exports should increase more rapidly in Eastern South America, from 49 million tons in 2001 to 80 million tons in 2025. Exports from Africa and South East Asia should reach similar magnitudes by 2005, but starting from higher bases. African exports should increase from 65 million tons to 84 million over the forecast period, and South East Asian exports from 52 million tons to 82 million tons.

Thermal coal exports from North America and Europe have already fallen to relatively inconsequential levels and should fall further in the years to come. Much of the existing trade is intraregional.

Implications for Panama Canal Routes

Regional trading patterns are fairly distinct in thermal coal. South American coal is exported predominantly to Europe, and some coal in addition goes to North America. South African coal is exported mainly to Europe but small volumes go to Far East Asia. In the future, it may be expected that additional volumes of South African coal will be exported to eastern South America. Indonesian coal goes mainly to the Far East but also goes in significant volumes to Europe. Australian coal is exported principally to Far East Asia. None of these flows is especially relevant to the Canal.

North America West is an important source of metallurgical coal for Western Europe, but not of thermal coal. The metallurgical coal is imported for its specific coking properties. For thermal coal, where caloric value is more important, the properties of western North American coals are not sufficiently distinctive to make them economical to be shipped to Europe in competition with South African and South American coals.

There may continue to be some flows of coal on potential Canal routes from South America East, mainly to South America West and Central America West, but these should remain fairly inconsequential in terms of the broader picture of world coal trade.

METALLURGICAL COAL

Demand

Metallurgical coal is a term used to encompass all coal used, directly or indirectly, in metallurgical processes. The two main direct uses of metallurgical coal are in the manufacture of metallurgical coke and of iron in the form of blast furnace hot metal. Sized metallurgical coal can be used to produce coke, which in turn is used to produce hot metal. In addition, metallurgical coal can be pulverized or granulated and injected directly into a blast furnace.

The global demand for metallurgical coal was 585 million tons in 2001. Demand has expanded to this level from 498 million tons in 1992. Virtually the entire increase in demand has taken place in China, where demand expanded during the 1992-2001 period from 122 million tons to 241 million tons. The rapid rate of growth in China has come about in part because of the expansion of that country's iron and steel industry, which is now the largest in the world in terms of crude steel volume, and in part because of the emergence of China as a major exporter of coke.

The forecasts of demand have all been derived from the forecasts of blast furnace hot metal and coke production required for other parts of this report. In addition, we have made specific assumptions about future coal injection rates and yields from coal to coke. Coal injection rates, in particular, are forecast to continue to increase but not to exceed 180 kg/thm in any region at any time.

We expect the demand for metallurgical coal to increase to 708 million tons by 2025. The largest share of the growth is expected to take place again in China, where we expect demand to total 324 million tons in 2025. Significant increases are also expected in South Asia, notably including India, South Korea, Taiwan and South America. Demand is expected to fall in North America and Japan.

In Europe and the CIS, where the historical fall in demand has been linked largely to the collapse of the economies of Eastern Europe, Russia and the Ukraine, we expect a recovery in demand to continue in the medium term. Demand in this region is expected to peak in 2016 but thereafter to fall.

Supply

Some countries produce large volumes of metallurgical coal mainly for the domestic market. These include China, India, the United States, Russia and the Ukraine. Some European countries, in particular Germany and Poland, also produce much of their own metallurgical coal, although the use of European coal has been declining. Countries that lack the economic coal resources to feed their own coke ovens and blast furnaces have been turning increasingly to exports.

In terms of export supply, Australia is the undisputed champion. In 2001, Australia exported 106 million tons of metallurgical coal out of a world export market of 185 million tons. In 1992, by contrast, Australia exported a mere 67 million tons out of a world export market of 184 million tons.

Australia has everything—hard coking coals with high fluidity, hard coking coals with low volatile matter content and a full range of injection coals ranging from high-volatile semi-soft coals to ultra-low-volatile coals. The Australian coking coal producers, especially those located in the state of Queensland, have proven themselves to be competitive against all other rivals. Mine capacity and output have tended to grow as needed to supply the market.

The other main exporters of high-rank coking coal have tended to be the United States (East Coast and Gulf Coast), Canada (West Coast) and Poland. Coal exports have declined sharply in the United States and Poland as the mines there have been unable to compete with the Australians. Polish coal exports are now limited mainly to Europe, while the United States is left exporting to a diminishing group consisting mainly of European and Brazilian steelmakers. The United States produces coking coals of exceptionally high quality, but high production costs and consequent high prices have forced cokemakers outside North America to look for cheaper alternative coals. Canadian exports have been relatively more stable, but even these are expected to fall over time as existing mines become depleted. There have been no major mine development projects in the Canadian coking coal industry since the 1980s.

China has become more active in recent years in the metallurgical coal market. In 2001, in particular, it increased its exports to 11.5 million tons, from 6.5 million tons in 2000. China has a huge base of coking coal reserves but has tended to use most of its production to supply the domestic market. It also has improved the infrastructure that it needs to export both metallurgical and thermal coal. Given the size of domestic demand relative to total metallurgical coal output, it is hard to see Chinese exports amounting to more than a residual, but it could be a large residual in terms of world trade in metallurgical coal.

Russia exports some metallurgical coal, especially from Nakhodka port in the Far East but also within Eastern Europe.

South Africa, Colombia, Venezuela, and Indonesia all export coal for use in blast furnace injection. Indonesia is currently the most important of these. The coals are essentially thermal coals that are classified as metallurgical because of their final use.

Overall, China will remain the largest producer of metallurgical coal. We expect Chinese supply to increase from 253 million tons in 2001 to 344 million tons in 2025. The other big increase in supply is expected to take place in Australasia, where production is forecast to reach 169 million tons in 2025, compared with 112 million tons in 2001. All but a derisory volume of these tonnages should come from Australia.

North American production should decline sharply. First, consumption is likely to fall in the region. Second, U.S. exports are likely mainly to disappear apart from exports to Canada. Third, Canadian production is likely also to fall as old mines deplete and are not replaced.

In Europe, the main source of supply is expected to be the countries of the former USSR, which will produce mainly for internal consumption. We expect European consumption to peak in 2015 and to decline subsequently.

International Trade

Australia is likely to be the big winner in terms of share of world trade. We expect that the decline in domestic coalfields in consuming countries and the decline in U.S., Canadian and Polish exports, in particular, will be matched by a switch to the use of Australian metallurgical coal in all qualities. Australian coking coals are already shipped to most main import destinations, and are expected to be shipped in still greater volumes in the future.

We also expect Chinese metallurgical coals to increase their share of extraregional exports. However, we expect the market for these Chinese coals to expand mainly in Asia.

Implications for Panama Canal Routes

Shipments on potential Canal routes from the big North American suppliers—the East and Gulf Coasts of the United States and the West Coast of Canada—should continue to fall. Long before the end of the forecast period, there will be virtually no demand for U.S. metallurgical coals in Asian markets. Canadian coals will still be demanded in significant tonnages in Europe, South America East and even Africa, but these tonnages will be smaller than at present.

Australian metallurgical coals, meanwhile, will be demanded in ever increasing tonnages by consumers in Europe and even in North America.

PRIMARY ALUMINUM

Demand

Aluminum is used in a wide range of sectors including transport, construction, packaging and consumer durables. As a result, aluminum consumption is greatly dependent on economic growth. A key economic determinant of aluminum consumption is industrial production. However, changes in industrial production do not correspond to proportionate changes in primary aluminum consumption, as other factors have to be considered including competing materials and the rate of recycling.

Aluminum is a metal, which can be reprocessed and used again, without the loss of quality, saving energy and raw materials. As a result, recycling of aluminum has proven to be very advantageous, both economically and ecologically and recycling has become an industry of its own.

Between 2000 and 2025, we forecast that the total demand for primary aluminum will grow by some 23.15 million tons to reach 48 million tons at the end of the period. Out of this increment, China will account for some 9.5 million tons, South Asia 1.5 million tons and South Korea approximately 1.38 million tons.

Over the last few years there has been significant growth in aluminum consumption in China and the Asian economies, which has seen significant rises in industrial production. Indeed, consumption in China has grown at annual rate of 12.7 percent in the period 1996-2000. Moreover, with aluminum consumption per capita relatively low in these countries, we expect most future growth will arise in China and the Asian economies. However, growth is expected to slow towards the end of the period under review as these economies reach maturity and recycling rates increase.

In the mature economies, such as North America, where consumption per capita is high there is little potential for significant growth. In addition, recycling rates of between 85–90 percent are being achieved in these economies. Recycling rates for production scrap are around 100 percent.

Over the 2000–2025 period, primary aluminum consumption in North America is projected to rise by 3.3 million tons, while in Europe (including the CIS) consumption will rise by 3.8 million tons.

Supply

Aluminum is the third most abundant element in the Earth's crust and constitutes 7.3 percent by mass. About 2 tons of alumina is required to produce 1 ton of aluminum. Aluminum is an energy-intensive industry with power typically accounting for around 30–40 percent of operating costs. Thus new aluminum capacity is attracted to regions where the cost of power is competitive.

World supply of aluminum totaled around 24.4 million tons in 2000. This represents a rise of 3.5 million tons on the 1996 level of 20.9 million tons. The main contributors to this rise in production were China, which added 1 million tons, and Europe (including the CIS), which contributed approximately 1.2 million tons.

Aluminum supply will have to grow by around 23.7 million tons between 2000 and 2025 in order to meet the projected levels of demand. A large part of the new capacity required to generate this supply will be located in countries where the cost of power is competitive, notably China, Middle East, Oceania, and Africa.

China will continue to expand domestic primary production in order to keep its import requirement down to manageable levels. Chinese aluminum production is forecast to rise to 10.9 million tons in 2025 from 2.8 million tons in 2000.

Aluminum production in the Middle East will rise by 2.6 million tons by 2025, with some of this capacity already in the pipeline. Capacity in Europe (including the CIS) will grow by 3.34 million tons over the 2000–2025 period.

In North America aluminum supply is projected to rise to 8.9 million tons in 2025 compared to 5.2 million tons in 2001. A large part of this increase will take place in North America East.

International Trade

Approximately 27 percent of aluminum demand in 2025 will be met by imports, which will expand by some 4.9 million tons. We are assuming that export-orientated capacity will be installed at sites with favorable power costs in line with the growth of import demand. The principal exporting regions, in order of importance, will be Oceania, Africa, and the Middle East. Exports from Venezuela and Brazil will rise modestly out to 2025.

Trade tables are based on exporters' data (national statistics) or, if unavailable, traced from imports and other related information.

Implications for Panama Canal Routes

There is a potential for some of the exports from South America East to meet growing demand in the Asian economies with a possibility that some of this could use the Canal. Nonetheless, most of the growing requirements of Asian economies should continue to be satisfied with imports from Oceania, as this is the natural market for them.

BAUXITE

Demand

Bauxite is refined into aluminum oxide trihydrate (alumina) and then electrolytically reduced into metallic aluminum. Two tons of bauxite is typically required to produce one ton of alumina and two tons of alumina are required to produce one ton of aluminum metal.

Nearly all of the bauxite produced worldwide makes its way into the alumina industry and thus the level of alumina production on the whole shapes bauxite demand. In 2000, World bauxite demand stood at 104.5 million tons. The main consuming region by far was Oceania, which consumed an estimated 31.3 million tons in 2000.

Between 2000 and 2025, we forecast that the total demand for bauxite will grow by approximately 110.2 million tons to reach over 214 million tons at the end of the period. Out of this increment, Oceania will account for some 33 million tons, Europe (including the CIS) nearly 10 million tons and China 27.5 million tons.

Supply

Bauxite is plentiful and occurs mainly in tropical and subtropical areas: Africa, the West Indies, South America, and Australia.

In 2000, world bauxite production totaled 105 million tons. The main producing regions were Oceania at 35.2 million tons, South America East at 19.4 million tons and Africa at 14.3 million tons.

Bauxite supply will have to grow by around 112 million tons between 2000 and 2025 in order to meet the projected levels of demand. A large part of this supply will come from increasing production in Africa (15.2 million tons), South America East (15.7 million tons). In Oceania and China bauxite production will grow to meet the projected level of demand largely from the alumina industry.

International Trade

Approximately 26 percent of bauxite demand in 2025 will be met by imports, which will expand by around 29.5 million tons. We are assuming that production at export-oriented bauxite mines will grow to in line with the growth of import demand. The principal exporting regions, in order of importance, will be Africa, South America East, Oceania, and the Caribbean basin. We expect the current trade pattern to continue over the period examined.

Implications for Panama Canal Routes

There is little potential for increased traffic through the Canal. The main potential flow would be trade from Oceania to North America East and Gulf Coasts, which even by 2025 we expect to amount to less than 1 million tons per year.

ALUMINA

Demand

The aluminum industry relies on the Bayer process to produce alumina from bauxite. It remains the most economic means of obtaining alumina, which in turn is vital for the production of aluminum metal—some two tons of alumina are required to produce one ton of aluminum.

Around 90 percent of the alumina produced worldwide makes its way into the aluminum industry and, apart from special uses of alumina in chemicals, alumina demand is on the whole driven by the level of aluminum production. In 2000, world alumina demand stood at 52.2 million tons. The main consuming regions were Europe (including the CIS), China and North America.

Between 2000 and 2025, we forecast that the total demand for alumina will grow by approximately 51 million tons, to reach over 103 million tons at the end of the period. Out of this increment, China will account for some 17 million tons, Europe (including the CIS) 7.1 million tons and the Middle East by around 5.6 million tons.

Supply

In 2000, world alumina production totaled 51.4 million tons. The main producing regions were Oceania at 15.6 million tons, Europe (including the CIS) at 12.9 million tons and South America East at 7 million tons.

One of the main factors determining the location of new refining capacity is abundance and quality of bauxite. The ore from which alumina is produced. Other factors include proximity to consuming markets, cost of labor, and energy costs.

Alumina supply will have to grow by around 50.8 million tons between 2000 and 2025 in order to meet the projected levels of demand. A large part of the new capacity required to generate this supply will be located in countries where there is good source of bauxite, notably Oceania, South America East and South Asia. We project alumina supply in Oceania rising from 15.6 million tons in 2000 to 32.0 million tons, and thus Oceania will remain the largest producing region.

In China, we expect domestic alumina production to grow 17.9 million tons from 4.1 million tons in 2000. Despite this growth in production China will not be self-sufficient in alumina.

International Trade

Approximately 36 percent of alumina demand in 2025 will be met by imports, which will expand by some 18.2 million tons. We are assuming that export-oriented capacity will be installed at sites with favorable cost parameters in line with the growth of import demand. The principal exporting regions, in order of importance, will be Oceania, South America East and the Caribbean basin.

Implications for Panama Canal Routes

At present, a large tonnage of material is shipped from Australia to East Coast North America via the Cape of Good Hope. Trade between these two regions is forecast to rise and thus there is a potential for the Canal to capture some of this traffic.

COPPER

Demand

Refined copper

Copper's historical growth has also been punctured by the loss of specific markets through substitution, most notably in the 1960s, which saw the development of aluminum power cables. The 1970s saw the invention of the aluminum radiator in the automotive industry and more recently the development of fiber optic cables is diminishing copper's share of the telecom sector. Thus, whilst world GDP grew by more than 85 percent in the 25 years to 2000, world copper consumption was up by less than 60 percent.

Copper demand trends since 1990 have been stronger, with annual world consumption growing by 40 percent (4.3 million tons) in the last decade. Asia dominated this growth, with 31 percent of all net rises occurring in China, with Taiwan, South Korea and the Indian Sub-Continent each contributing around a further 10 percent. Though less dramatically, South and Central America also increased their market shares in the 1990s, so that these now stand at a combined 6.6 percent. These greater-than-average rises were partly offset by slower growth in the more mature economies of Western Europe and North America and by an absolute fall of 725,000 tons in the CIS.

We believe that copper semis production growth will be strongest in Asia, and the CIS. Both because their stronger-growing economies will yield the fastest increases in final-product demand and because they will remain (at least initially) a relatively low-cost location for semis manufacture. Eventually, totals will begin to level off in South Korea and some SE Asian countries as these economies come more and more to resemble those of Western Europe and the United States. However, industrialization in China still has some way to run, whilst Southern Asia has the potential to become a significant copper consumer too. Overall, we expect Asia to account for nearly 47 percent of all 2000–25 copper consumption growth, with annual offtake increasing by roughly 8.5 million tons.

Growth in Western Europe and the United States is expected to be considerably slower, but there is scope for a significant revival in the fortunes of Eastern Europe and the CIS. Growth in Europe as a whole could thus average over 3 percent a year. In Central America, Mexico should meanwhile continue to benefit from the relocation of what used to be U.S. manufacturing, while South America should eventually get some lift from this too.

Copper Concentrates

Our figures for concentrate demand have been calculated directly from those for metal supply, and allow for a 30 percent average copper content in concentrate. The smelter demand numbers account for copper concentrate only and do not account for blister production from scrap. To obtain a value for blister copper production the copper content of the concentrate should be adjusted by 3.2 percent to account for smelter loss.

Supply

Refined Copper

Unlike with demand, South America West has accounted for most of the recent growth in copper metal supply, with almost half of the 3.6 million tons 1990–2000 increase occurring there. Other contributions to supply growth were far more modest. After South America West the next largest increases in copper output came from China, where production rose by 785,000 tons, and Japan which saw output rise by 451,000 tons.

Through much of the 1990s, growth in Western World smelting and refining capacity, particularly in Western Europe and the United States, was also only modest, as increases associated with the expansion of more efficient plants were offset by the closure of operations at the other end of the cost curve. More recently, however, smelter capacity has increased more rapidly. This has led to an excess of capacity over metal demand, and encouraged temporary cutbacks at a number of plants.

Despite this, producers have fully-funded plans to increase metallurgical capacity in Chile, and construction is also under way which will lead to big increases in China, India, and elsewhere. For at least the next five years (and probably as far out as 2010), copper supply will governed by the utilization of already-known plants rather than the location of as-yet unknown new facilities.

New smelting and refining capacity will be required not long after the end of the decade, however, and we expect most of this capacity to be installed in South America West. We have also assumed that the remaining capacity requirement will be installed in regions with the highest rates of growth in refined copper demand. Our precise output figures for 2000–25 assume a balanced market.

In order to meet demand, world copper supply will have to grow by 15.4 million tons between 2000 and 2025. A staggering 9.1 million tons (or 59 percent) of this should be produced in South America West. We expect just over 25 percent (3.9 million tons) of this increase again to occur in China and a further 25 percent to occur elsewhere in Asia. European supply is expected to grow by 1.3 million tons, while North American supply is expected to grow by not much over half a million tons.

Copper Concentrates

Most known new copper-producing mines are already in place. Not all have yet worked up to their full capacity output, so some increases can still be expected from these. And there will be scope for various recently idled operations also to be brought back on stream.

Beyond the end of this decade, there will be a need for as-yet unknown new producers. Indeed, because existing mines have a finite life; this will be even greater than that for new smelters and refineries. Not only will new mines have to feed the copper industry's growth; they will also have to replace existing units which close through exhaustion. New mines will be located in the most prospective areas for copper. Although some traditional producing areas are now becoming denuded of economically exploitable ore, copper still has very good exploration prospects in Chile, where we expect the strongest in copper concentrate production over the forecast period, and in Peru, Brazil, China, Indonesia, Australia and elsewhere.

In the ten years to 2000, world copper concentrate output grew by 5.3 million tons (18 percent). Output in Chile increased by 5.9 million tons, Indonesia's output increased by 3 million tons and Chinese output rose by a million tons. However, these gains were partially offset by a 3.2 million tons fall in North American production and a 2.6 million tons drop in African concentrate output.

In order to meet demand, mine output will have to grow by over 46 million tons gross weight between 2000 and 2025, an increase of 130 percent. Western South America is expected to be the major performer, contributing a massive 32 million ton (nearly 70 percent) of this increase, with Chile taking the starring role and Peru making up most of the rest.

International Trade

Refined Copper

Even though access to local markets is one of the prime factors driving investment in copper smelting and refining capacity, regional metal supply and demand are by no means in line. Most importantly, South America West has long been a surplus producer whilst Europe and Asia have long been in deficit. Our forecasts imply that, even if the bulk of new metallurgical capacity is built there, Asia's underlying deficit will grow from around 1.4 million tons/y now to nearly 4 million tons/y by 2025. North America's market deficit is forecast to rise a little too. Meanwhile, as Chile's output is expected to grow well ahead of local demand, South America West's surplus should increase significantly.

Overall, we calculate that 4.7 million tons of copper metal (32 percent of all supply) were traded between the regions relevant to our current analysis in 2000. By 2025, we expect this figure to have grown to 12.3 million tons, nearly 41 percent of all supply. Asia's rising market deficit will be met by extra exports from South America West (Chile), and Africa (mainly Zambia and the Democratic Republic of Congo).

The last major European smelter/refinery expansion is due to be completed in 2005, but after that we are not expecting any major new capacity. Mainly because European environmental regulations are very unfavorable to the smelting industry, costs are very high and there is little local mine supply. As demand is expected to grow strongly, we believe that the European market will face a rising market deficit during the forecast period, and that like most other regions Europe will make up the balance by importing from South America West. Europe, along with North America East (see below) is also home to LME copper warehouses, and therefore stock movements affect both trade and apparent demand.

Trade between North America East and South America West is expected to double during the forecast period. North America East has no supply of its own, yet it has many consumers, is home to the world's largest stock of LME copper, and holds a large proportion of Comex stock. When the market is in surplus, stock will tend to build up in warehouses, and when the market is in deficit, those stocks are then removed, giving seemingly erratic trade and demand growth patterns. North America East's demand for copper is expected to grow strongly during the forecast period, but, as the region has no refineries, demand has to be met by imports. And as the 1 percent import tariff on Chilean cathode is due to expire in the next couple of years (Peru is already exempt), South America

West and specifically Chile is likely to be the major suppler to North America East during the forecast period.

For the trade data we have assumed that cathode-importing countries such as Japan, South America East others will continue to import a fixed amount of cathode, and that growth in these countries will be funded by domestic supply. Existing copper fabricators generally insist on a specific brand of cathode, and many look for long term contracts with suppliers. The latter is true of copper concentrates and smelters.

Implications for Panama Canal Routes

Almost all of the potential Panama Canal traffic in refined copper will consist of material from South America West. The largest such flows will move into Europe, increasing from approximately 1.3 million tons in 2000 to 3.7 million tons in 2025. Smaller flows will move into the East Coasts of North and South America.

Copper Concentrates

General

In 2000, we can identify 12.6 million tons of copper concentrate that was traded between the regions used in this analysis. This equated to 36 percent of all supply. Overall, South America West was the largest exporting region, its shipments accounting for 47 percent of those worldwide. Indonesia contributed 19 percent of all exports and Australasia contributed 15 percent. Asia was the largest importing region, taking 56 percent of all gross concentrate trade, with Japan's individual share being 38 percent, South Korea's being 9 percent and China taking 8 percent. The next largest importer was Europe, which accounted for 21 percent of world trade.

Trade is expected to more than double by 2025, but will still involve 36 percent of all supply. However patterns will change. Most importantly, China is expected to become the main destination for copper concentrates, with its share rising to 28 percent. Japan's share of the market is expected to fall to 18 percent, with South Korea taking only 6 percent of all trade. The growing needs of these countries are expected to be met by concentrate from South America West. And from 2020 Africa could once again begin to figure in the global copper market.

As with refined copper, we have assumed that certain countries will maintain steady imports and exports. This is because smelters are configured to a specific feed and can be sensitive to changes in the properties of the concentrate they use, and actively seek long term tonnage contracts with suitable mines.

The major potential flow of copper concentrates through the Canal will continue to be South America West to Europe. Trade on this route should increase from approximately 1.6 million tons in 2000 to 2.3 million tons in 2025.

On another significant route, South America West to South America East, trade is expected to fall as new copper resources are developed in Brazil. We expect trade to fall on this route from 461,000 tons in 2000 to 176,000 tons in 2025.

ZINC

Demand

Metal Demand

Zinc's major use is as a coating for steel to guard against corrosion. It is also used in pure forms (rolled in battery and architectural applications, as a die-casting metal in toys, motor housings and locks, and as dust in paints), is used as oxide in rubber manufacture, and is alloyed with copper in brass. However, steel coating accounts for more than half of all demand.

Generally, zinc-containing products have been increasing their penetration of end-use markets through time, but this positive trend has been more than offset by economizations in per-unit zinc use. Zinc's historical growth has also been punctured by the occasional loss of specific markets through substitution. Thus, whilst world GDP grew by more than 85 percent in the 25 years to 2000, world zinc consumption was up by less than 60 percent.

We expect world zinc consumption to roughly double between 2000 and 2025. The balance between increased market penetration of zinc-containing products and economizations in per-unit zinc use is thus expected to remain slightly negative, with only 80 percent of general economic gains on average translating into extra zinc demand.

Both because its stronger-growing economies will yield the fastest increases in final-product demand and because it will remain (at least initially) a relatively low-cost location for semis manufacture, we expect Asia to continue to lead zinc consumption up. Eventually, totals will begin to level off in South Korea and some SE Asian countries as these economies come more and more to resemble those of Western Europe and the United States. However, industrialization in China still has some way to run, whilst Southern Asia has the potential to become a significant zinc consumer too. Overall, we expect Asia to account for more than 70 percent of all 2000–25 zinc consumption growth, with annual offtake increasing by roughly 6.5 million tons.

Growth in Western Europe and the United States is expected to be considerably slower, but there is scope for a revival in the fortunes of Eastern Europe and the CIS. Growth in Europe as a whole could thus average 1.4 percent p.a., though this will still be less than half the figure we project worldwide. In Central America, Mexico should meanwhile continue to benefit from the relocation of what used to be U.S. manufacturing, while South America should eventually get some lift from this too.

Concentrate Demand

Our figures for concentrate demand have been calculated directly from those for metal supply, and allow for a 54 percent average zinc content in concentrate and for a 6 percent loss of metal on smelting. They have also been adjusted to exclude metal produced from scrap, which is of only modest importance to zinc (8 percent of the world total), but growing.

Supply

Metal supply

Forty countries mine zinc ores, of which the most important are China (20 percent of the world total), Australia (16 percent), Canada (11 percent), Peru (10 percent), and the United States (9 percent). Mines vary in size from a few hundred tons of zinc output each year to a contained metal production of up to half a million tons.

Although 34 individual countries now host zinc smelters, the world has considerably fewer smelters than mines. Therefore each smelter typically sources its feed from a number of different mines, some of which will inevitably be geographically remote. Furthermore, the corporate ownership of mines is quite distinct from that of smelters, with many large miners owning no smelters and visa versa. International trade in zinc concentrates is therefore not only large but also competitive and variable year-on-year.

As with demand, Asia has accounted for most of the recent growth in zinc metal supply, with almost three-quarters of the 2.3 million tons 1990–2000 increase occurring there. A number of new smelters have been constructed in the last decade in China and, with others also expanding, more than 60 percent of all supply growth has occurred in this country alone. Expansions have also been commissioned in South Korea, whilst Korea Zinc (South Korea's sole producer) has additionally built a new smelter in Australia.

North America has been the second most important region in terms of recent zinc production growth, though its contribution to the 1990–2000 total has been only 9 percent. Growth has been even more modest in Greater Europe, with CIS output only now recovering to late-1980s levels after slipping to some severe mid-1990s lows.

Through much of the 1990s, growth in Western smelter *capacity* was also only modest, as increases associated with the expansion of more efficient plants were offset by the closure of operations at the other end of the cost curve. As already stated, the position was rather different in China, and almost all net smelter capacity growth in fact occurred there. In the last few years, however, Western smelter capacity has also increased overall. This has led to an excess of capacity over metal demand, and encouraged temporary cutbacks at a number of plants.

Despite this, producers have fully-funded plans to continue to increase smelter capacity in China, and construction is also underway which will lead to net rises in the FSU and elsewhere. For at least the next five years (and possibly as far out as 2010), zinc supply will therefore be determined by the utilization of already-known plants rather than the location of as-yet unknown new facilities. Producers have not yet cut by enough to prevent zinc metal stocks rising. A part of future demand will therefore also be met from today's excess stocks.

New smelter capacity *will* be required from the early 2010s and, with one or two exceptions associated with projects we know already to be under consideration, we assume that this will continue to be installed mainly in regions with the highest demand growth. Our precise output figures for 2010–25 assume a balanced market, with stocks rising just by the amount needed to keep them at a constant proportion of zinc demand.

In order to meet demand, world supply will have to grow by 9.05 million tons between 2000 and 2010. We expect just over 40 percent (3.7 million tons) of this increase again to occur in China and a further 20 percent to occur elsewhere in Asia. Supply is also forecast to increase by 1.5 million tons in Greater Europe, by 1.05 million tons in Central and South America, by 430,000 tons in Africa, by 285,000 tons in North America and by 265,000 tons in Australia.

Concentrate Supply

As with metals, the world's ability to produce zinc in concentrate has moved above market needs in recent years, and this has again led to the temporary closure of a number of high-cost operations. Indeed, actual supply was above demand in 2000 and, although the market has since switched to deficit, not all excess stocks have yet been removed.

Unlike with metals, however, most known new zinc-producing mines are already in place. Not all have yet worked up to their full capacity output, so some increases can still be expected from these. But there will eventually be scope for many recently idled operations also to be brought back on stream.

In the ten years to 2000, world mine output grew by 3.35 million tons (46 percent). 1.95 million tons (58 percent) of this increase occurred in China, 865,000 tons (26 percent) in Australia and 661,000 tons (20 percent) in Western South America. North America was more modestly up, with gains in the West offset by falls in the Gulf and the East. Mexican output increased too, but Africa and the rest of Asia were essentially flat, while falls were recorded in Europe.

In order to meet supply, mine output will have to grow by more than 14 million tons (85 percent) between 2000 and 2025. China should again contribute to this rise, but might perhaps add only 2.6 million tons (18.5 percent of the total). At 16 percent (2.25–2.30 million tons), Australia's contribution will also be less than of late. Western South America is expected to be the major out-performer, with a 2000–25 production increase of 4.9 million tons (35 percent of the total). Despite further falls in the East and the Gulf, North American production might rise a little too, as could that in Mexico and (as the FSU recovers) even that in Europe.

International Trade

Metal trade

Even though access to local markets is one of the prime factors driving investment in zinc smelter capacity, regional metal supply and demand are not exactly in line. Most importantly, Greater Europe has long been a surplus producer while North America and Asia have long been in deficit. Our forecasts imply that, even if the bulk of new smelter capacity is built there, Asia's underlying deficit will grow from around 0.75 million tons/y now to nearly 1.7 million tons/y by 2025. North America's market deficit is forecast to rise a little too. Meanwhile, as CIS output recovers ahead of local demand, Greater Europe's surplus should increase.

Overall, we calculate that 2.1 million tons of zinc metal (24 percent of all supply) was traded between the regions relevant to our current analysis in 2000. By 2025, we expect this figure to have grown to 3.8 million tons, although this will then be only 21 percent of all supply. Asia's rising market deficit will be met by extra exports from Oceania (Australia), Africa (mainly South Africa), Europe and Western South America (Peru and possibly Bolivia). This will limit European shipments to North America, with Eastern South America (principally Brazil) and again Africa doing most to fill the gap.

The potential for trade in zinc metal on routes relevant to the Panama Canal should remain small. There should be some minor movements of metal within the Western Hemisphere, from North America West to North America East, from Central and South America East to Central and South America West.

Concentrate Trade

In 2000, we can identify 6.8 million tons of zinc concentrate that was traded between the regions used in this analysis. This equated to 41 percent of all supply. Overall, North America was the largest exporting region, its shipments accounting for 28 percent of those worldwide (15 percent from the West; 13 percent from the East). Oceania (Australia) contributed 27 percent of all gross exports and Western South America contributed 26 percent. Europe was the largest importing region, taking 52 percent of all gross concentrate trade. 38 percent went into Asia, with Japan's individual share being 15 percent and South Korea's being 14 percent.

Trade is expected to double by 2025, so that it then involves 45 percent of all supply. Patterns will also change. Most importantly, as existing mines in Eastern Canada reach exhaustion, this region's exportable surplus will be replaced by an import need. Thus, current shipments from there to Europe will dry up, and Eastern Canada will begin to absorb surplus material from (most likely) Mexico, Africa, and Western South America. As domestic mine production growth fails to keep pace with that of smelter capacity, China could also become a major importer of concentrate. Less severely, South Korea, Southeast Asia, and Southern Asia will also see their requirements rise. These growing import needs are forecast to be met by new mines in Australia, Northwest America and, again, Western South America. Some of Africa's new mine capacity could service new Asian smelters too.

Implications for Panama Canal Routes

The main implication for the Panama Canal routes is that smelters, in Europe in particular, will be require new sources of zinc concentrates, and that significant volumes of these will be supplied by mines in Western South America. There will also be a significant, though smaller trade from Western South America to the East Coasts of North and South America. Other smaller trade routes would include material from the West Coasts of North and Central America to the East Coasts of the same regions and to Europe.

NITRATES

Demand

The nitrates that are covered in this section are the sodium nitrate and potassium nitrate that are produced from mineral raw materials in Chile, and the potassium nitrate that is manufactured synthetically elsewhere. We have omitted synthetic sodium nitrate because its volume is relatively small, and it has no direct or indirect significance for Panama Canal traffic.

The main driver of demand for nitrates has been fertilizer consumption, but it has changed from use in the conventional mainstream fertilizer sector to use as a specialized soluble fertilizer. During the past decade, the total demand for nitrates, as defined above, rose by 221,000 tons to reach 1.56 million tons, an increase of 16.5 percent, equivalent to compound growth of 1.5 percent annually. However, as has already been explained, there have been two opposing demand trends for nitrates:

- Historic decline in the demand for Chile sodium nitrate, which fell by 44 percent between 1990 and 2000, and
- Strong expansion of demand for potassium nitrate, which grew at 6 percent per year during the 1990s.

Most of the residual demand for Chile sodium nitrate was in North America and Latin America, and it is in these regions that the downturn took place in the 1990s.

The Americas and Europe together accounted for over three quarters of total nitrates use in 2000. However, because of the role of sodium nitrate, the regional pattern of total nitrates demand growth in the 1990s was confusing. There was, in fact, little or no net growth in the Americas, and only a small increase in the European total (+25,000 tons). The countries of Asia/Oceania appeared to have been responsible for the overall growth in nitrates demand in this period. What these statistics fail to show is the very strong growth that has taken place in the demand for potassium nitrate in Europe (+121,000 tons), stimulated by the growth of fertigation, particularly in the Mediterranean countries. Potassium nitrate demand has also grown in Latin America (+49,000 tons) and, to a lesser extent, in Latin America (+32,000 tons).

In the forecast period, potassium nitrate will be the more important product influencing the overall trend of nitrates demand. There will continue to be a decline in sodium nitrate use, but its impact on the overall trend will be less significant than in the past decade.

The demand for specialty fertilizers, including potassium nitrate, for use in fertigation, is projected to expand during the forecast period, as agricultural systems are up-graded to yield higher-quality products in response to the demand of consumers that have more disposable income to spend on food. This development embraces not only national producers of truck crops, fruit and flowers supplying local needs, but also the growing number of export-orientated producers located in southern countries.

In Europe and North America, the demand for nitrates is already well developed, and is projected to grow at only 1-2 percent annually in the forecast period. Demand is already quite high in Latin America, and a correspondingly low growth rate is projected. In all three regions, there is still some use of sodium nitrate fertilizer that will continue to decline.

The biggest growth in nitrates consumption, in both absolute and relative terms, will be in the Asian region, where there is enormous potential for introducing sophisticated irrigation systems. However, the low cost of labor in most of this region means that the economic advantage of using premium-prices soluble fertilizers has not always been obvious, and so the response to this new technology has been cautious. Although the consumption forecasts for South Asia and Southeast Asia indicate relatively high growth rates of 6-7 percent annually, they start from very low levels. China, by contrast, already consumes a substantial tonnage of nitrates, and the forecast reflects this. There is a similar situation in Latin America.

Supply

For a period of 20 years up to the mid-1980s, the only world-scale producers of potassium nitrate were the factories in Israel and the United States, with the former dominating the global import market. This situation changed when the Chilean nitrates producer decided to begin transforming some of its sodium nitrate into potassium nitrate, and to secure a significant share of the world market for this product.

Production in Chile, based on natural nitrate and a captive source of potash, has a substantially more favorable cost base than the operations that have to manufacture nitric acid and to purchase potash from other producers. This difference was highlighted in the 1990s when over-supply forced down prices throughout the market and squeezed profitability, with the following consequences:

- Investment was attracted to Chile, where the established producer expanded, i.e. converted more sodium nitrate capacity to potassium nitrate, two new producers commissioned capacity and another project was announced;
- Capacity closures in Israel (probably temporary) and in the United States (probably permanent).

Even with these closures, the rush to invest in potassium nitrate capacity has resulted in substantial over-capacity for nitrates as a whole, and for potassium nitrate in particular.

As we have already indicated in this Report, there is sufficient capacity in place to cover the projected demand for nitrates well into the forecast period. In these circumstances, we can make a number of assumptions about future developments.

- The producer in Israel, which is in danger of becoming uncompetitive, will eventually be acquired by the Israel Chemicals Group and thus will have access to a captive source of potash. It will then be in a similar position to the potassium nitrate plant that is being built in Jordan, which means that both of the West Asian producers should be viable suppliers in the medium-long term.
- New potassium nitrate capacity will be built in Russia and China, specifically to meet the growing demand within these regions. The Russians will have access to captive potash. The Chinese appear to have the possibility of developing reserves of natural nitrate in Xinjiang A.R.
- Any shortfall in supply capability will be covered by expansion on the part of existing producers, especially those in Chile.

On the basis of these assumptions, we have prepared a forecast of supply in which the two principal sources—Chile and the Middle East—will meet most of the projected growth in demand, roughly in proportion to their available production capacities. These two will also dominate the world trade in nitrates.

International Trade

Extraregional trade in nitrates will double between 2000 and 2025. Import demand will grow in all of the major regions. The corresponding growth of exports will take place in West Coast Latin America

(Chile) and in the Middle East (Israel, Jordan). As there are only two groups of suppliers, it is likely that each of them will ship to the full range of global markets.

Implications for Panama Canal Routes

In the case of Chile, over one half of its exports will be to Atlantic Rim countries that could be supplied through the Panama Canal. The exporters in the Middle East can supply most world markets without making use of the Panama Canal.

PHOSPHATES

Demand

The phosphate fertilizers that are covered in this section are di-ammonium phosphate (DAP), mono-ammonium phosphate (MAP) and triple superphosphate (TSP). These three products are almost wholly produced for fertilizer use[7] and together they account for around 60 percent of the world's total consumption of P_2O_5 the phosphate nutrient.

The share of total phosphate fertilizer use that is represented by the three concentrated phosphate products will gradually increase. Most of the new demand for phosphate fertilizer will be in the developing regions where these products already account for most of the usage. Moreover, in China where there is still a substantial use of low-grade phosphate fertilizers, they are gradually being replaced by the concentrated products.

In the year 2000, the total world demand for concentrated phosphates was 40.7 million tons[8]. The more developed regions, including those in transition, accounted for 36 percent of this total (*c.f.* 56 percent in 1990), and the developing regions for 64 percent, including Asia 44 percent and Latin America 15 percent. The developments that have taken place in the past ten years are not a satisfactory guide to future trends in the demand for phosphates. In the period between 1990 and 2000, the total world demand for concentrated phosphates fell by 0.5 million tons which was equivalent to a 1.2 percent decline; during the same period, the demand for all fertilizer P_2O_5 fell by 4 percent.

This relative stagnation in the demand for concentrated phosphates was the result of two opposing trends:

- Demand continued to grow in the main developing regions, viz. by 4.2 million tons in Asia and +3.2 million tons in Latin America; in China alone, the increase was 3.0 million tons;

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[7] There is a small requirement for fertilizer-grade ammonium phosphates for use in fire extinguishers and related applications.

[8] British Sulphur Consultants maintains a database of statistics on fertilizers, and on related minerals and chemicals. Production data are obtained from producers or, if unavailable, estimated from sales. Trade tables are based on exporters' data (national statistics) or, if unavailable, traced from imports and other related information. Some additional data for the present report were obtained from the U.S. Department of Commerce and from Statistics Canada.

- Demand fell back by 0.6 million tons in North America and by 7.7 million tons in Europe, largely as a result of the collapse of fertilizer use in the former Communist countries of Central Europe and, especially, the Soviet Union, and the absence yet of any significant recovery.

The fall of demand in the European ex-Communist countries effectively cancelled out the impact of the continuing strong growth in Asia and Latin America. As demand also fell, although less seriously, in other regions, the net effect over the ten-year period was a drop in the world total. However, this was a unique situation that will not be repeated in the forecast period.

In the first quarter of the 21st century, we forecast that the demand for concentrated phosphates will increase by 31 million tons to reach 72 million tons in 2025, representing a compound annual growth rate of 2.3 percent over the entire period. The average growth rate will fall from 2½-3 percent per year in the first decade to 1½-2 percent per year in the later part of the period.

Most of the growth will take place in the developing regions: Asia, Africa and Latin America will account for 84 percent of the projected increment. In Asia, the biggest elements of growth will be in China (+7.9 million tons) and in South Asia (+7.5 million tons), followed by the Middle East (+2.3 million tons) and Southeast Asia (+1.6 million tons). In Latin America, the largest components of the growth will be in EC South America (+3.5 million tons) and Central America (+1.6 million tons).

Some 10 percent of the overall growth will take place in Greater Europe (+3.1 million tons), mainly in the Former USSR and Central Europe where some recovery will take place in fertilizer use, although it will not revert to the levels of the Communist era.

In North America, the demand for phosphates will grow by 9 percent (+0.8 million tons) over the 25-year period.

Supply

During the past decade, the total annual supply of concentrated phosphates has ranged between 35 and 42 million tons. The downturn in the Former USSR contributed to the 7.4 million tons fall between 1990 and 1993; this was followed by growth in other regions, mainly China and South Asia, that took the total back up to 41-42 million tons per year in the closing years of the decade.

In 2000, when the supply total was just less than 41 million tons, the relative importance of the major regions as suppliers of concentrated phosphates was as follows:

- North America, 42 percent
- Greater Europe, 15 percent
- Africa, 11 percent
- South Asia, 12 percent
- China, 8 percent
- Middle East, 4 percent
- EC South America, 3 percent
- WC Central America, 2 percent

Most of the North American industry is in the U.S. Gulf region and based on Florida phosphate rock, although the start of a long-term deterioration in availability has caused two factories to start importing rock from Africa. Some phosphate operations are on the Eastern seaboard and in Western states that are integrated into phosphate rock mines. In Greater Europe, most of the remaining capacities for concentrated phosphates are located in the Former USSR, particularly where they have access to raw material from the Kola apatite mines.

The African industry consists of integrated producers, with most of the capacity being in Morocco, Tunisia, and South Africa.

South Asia, the fourth biggest producing region for concentrated phosphates, more than doubled its output in the course of the 1990s. It does not have any phosphate rock mining capacity, and operates entirely on the basis of imported raw materials and intermediates. A production subsidy scheme in India makes it possible for such producers to survive in competition with imported phosphate fertilizers.

- In China, an industry to produce concentrated phosphate fertilizers from indigenous phosphate rock began to materialize in the 1990s, when output grew from 370,000 tons at the start of the decade to 3.4 million tons in 2000.
- The phosphate industry in the Middle East, mostly located in Jordan and Israel, is still quite small in relation to the region's importance as a phosphate rock supplier.
- In Latin America, there are some integrated producers of phosphates in Brazil and on the West Coast of Mexico.
- Oceania's first integrated producer of phosphates began operation in 2000.

In this forecast, we estimate that the annual supply of concentrated phosphates will have to expand by 31.5 million tons in order to meet the growth of demand over the 25-year period. Most of the new supply will take the form of integrated plants that process captive phosphate rock. However, in contrast to the situation in former years when the Florida phosphate industry was able to expand and dominate supply, only limited expansion is now feasible in this region. The U.S. industry will now decline in relative importance—it now accounts for over 40 percent of world supply—as expansion takes place in other regions with phosphate reserves, but no other country or region will come to dominate supply in the same way. The main developments that we are including in the forecast are summarized below.

- The Middle East will be the single largest contributor to new supply as a result of substantial expansion in the existing producer countries and the implementation of the major project to develop phosphate reserves in Saudi Arabia.
- Africa, which has very large phosphate reserves, will also be the focus of several projects to expand the supply of concentrated phosphates, not only in the established producing countries like Morocco and Tunisia, but also in Egypt, which has barely begun to build up a modern phosphate industry. We also expect that new phosphate producers will emerge in West Africa where there appear to be reserves that could support viable projects.
- China has substantial phosphate reserves of relatively low quality that we believe will be developed to support new capacity for concentrated phosphates, which in some cases will replace existing capacity for lower-grade phosphate fertilizers.
- In Latin America, there will be some further development of integrated phosphate capacities in Brazil, and a major investment to start exploiting the Sechura phosphate rock deposit in

Peru. It is possible that any Sechura project will start out as a simple producer of phosphate rock supplying the U.S. Gulf industry, and that capacity for phosphate fertilizers will follow as a second phase.

- In Greater Europe, a relatively modest expansion of the Russian phosphate industry, based on the ample reserves of Kola apatite raw material, will take production levels back up to the levels that were being achieved at the start of the 1990s.

These developments, coupled with some further expansion of the import-based phosphate industry in South Asia will be sufficient to cover the requirements generated by the demand forecast.

International Trade

General

Most of the new capacity for concentrated phosphate fertilizers will be built in regions with phosphate rock reserves that will be able to supply the raw material. Africa and the Middle East will account for three quarters of this new supply of phosphates. There will also be some expansion in North America, but this will be small in relation to the existing capacity in this region. An integrated phosphate industry is being established in Australia, and one will be developed in West Coast South America.

Consuming regions that do not have suitable mineral resources to support integrated phosphate plants will depend on imports to cover their expanding requirements for fertilizers. During the 25-year forecast period, imports will supply 51 percent of the projected 32 million tons expansion of phosphate demand. Inter-regional trade will account for 85 percent of the 16 million tons growth of international trade. The principal sources of the new inter-regional export tonnage will be producers in Africa (+5.0 million tons) and the Middle East (+5.7 million tons). The main regions generating inter-regional import demand will be Asia (+10.2 million tons) and Latin America (+2.9 million tons). The emergence of new phosphate producers in Oceania (Australia) and West Coast Latin America (Peru), coupled with the continuing expansion of the integrated phosphate industry in China will damp down the growth of import demand in these regions.

Implications for Panama Canal Routes

In 2000, around one third of all inter-regional phosphate fertilizer trade passed through the Panama Canal, mostly made up of material originating at North America Gulf/East Coast export points and destined for Pacific Rim markets. This trade will expand through the forecast period by some 2.5 million tons, constrained by the growth of supply capability in the Southeast United States where phosphate raw material reserves are limited.

SULPHUR

Demand

Sulphur is a key industrial raw material that is primarily used to manufacture sulphuric acid, which is itself consumed in a wide range of industries that include fertilizers, fibers and plastics, detergents, oil refining, metal treatment, ore processing and many others.

Out of the 62 million tons of sulphur-in-all-forms (SAF) that were consumed in 2000, some 90 percent was used to make sulphuric acid (or recovered as acid from metal smelters) and the remaining 10 percent, known collectively as non-acid sulphur, was used for other applications

The apparent demand for brimstone totaled 42.8 million tons in 2000, and the three largest consuming regions were, in order of importance, North America (29 percent of total), Asia/Oceania (28 percent) and Greater Europe (21 percent). On account of the importance of its phosphate industry, Africa is a significant brimstone user, accounting for 13 percent of the world total. Latin America was responsible for the remaining 8 percent.

The trend of world brimstone demand in the 1990s was distorted by the political and economic changes that occurred in Central Europe and the Former USSR which lead to a massive downturn in demand between 1990 and 1995, followed by only a partial recovery in the second half of the decade. The net growth of world brimstone demand between 1990 and 2000 was 3.4 million tons, equivalent to an average annual growth of only 0.8 percent. However, demand in Greater Europe (West Europe, Central Europe and the Former USSR) fell by 4.4 million tons during this period, whereas demand in the rest of the world increased by 7.8 million tons, equivalent to compound growth of 2.7 percent annually.

The demand for sulphur will be driven by developments in the various industries that consume sulphur and sulphuric acid. Phosphate fertilizers are forecast to grow at an average annual rate of 2.3 percent over the forecast period. Most of the new demand will be in the regions that have reserves of phosphate raw materials and the associated industries that process them with sulphuric acid.

Other industrial end-uses for sulphuric acid can overall be expected to follow the trends of economic growth. Relatively high rates of expansion in sectors such as metallurgy and oil refining will be balanced by weaker growth in other sectors where the final product is in decline, such as rayon, or where there are alternative process, e.g. for titanium dioxide or steel pickling.

Non-acid uses of sulphur have a similar profile, with total demand reflecting the general state of economic advancement.

In the 25-year forecast prepared for this report, the total world demand for brimstone will expand from 43 million tons in 2000 to 78 million tons in 2005, an increase of 35 million tons that is equivalent to a compound annual growth rate of 2.4 percent. This growth rate averages 2.7 percent annually in the first five-year period (2000–2005) and declines steadily to reach 2.0 percent in the final five years that end in 2025.

With compound annual growth rates if 1.0–1.5 percent, North America and Greater Europe will account for a declining share of world sulphur demand. These more developed regions currently use just over one half of the brimstone total, and the corresponding proportion in 2025 will be 38 percent. Higher growth will be evident in Asia, Africa and Latin America, associated with the faster rates of economic development that are projected for these regions. By the end of the forecast period, brimstone consumption will amount to 30 million tons in Asia, 12 million tons in Africa—linked to a greatly expanded phosphate industry—and 6 million tons in Latin America.

Supply

In 2000, brimstone[9] accounted for two thirds of sulphur-in-all-forms (SAF) supply, pyrites for 9 percent of the total and other sulphur-containing materials—mainly smelter acid—for 24 percent. Most of the brimstone and almost all of the other forms are classified as involuntary production, which thus represented 87 percent of total supply in 2000.

The geographical distribution of brimstone supply is a consequence of the location of the big sour gas fields that are currently being exploited, and of the oil refineries that are processing sour crude. The main regions in which sulphur is recovered from sour natural gas are North America (Canada is currently the world's biggest producer), the Former USSR (Russia and Kazakhstan) and the Middle East. Oil refineries processing sour crude are spread more widely, but most of them are in the developed regions, i.e. North America, West Europe and the Far East of Asia—Japan is the second-largest producer of oil-recovered sulphur, after the United States. Taking account of the small amount of other recovered sulphur and the remaining output of mined sulphur, the total world production in 2000 of 43 million tons S was distributed among the major regions as follows:

- North America, 42 percent
- Greater Europe, 30 percent
- Middle East, 13 percent
- Rest of Asia/Oceania, 10 percent
- Latin America, 4 percent
- Africa, less than 1 percent

The increase of 3.3 million tons in brimstone supply between 1990 and 2000 was the net result of two opposing trends, i.e., the decline of mined sulphur and the growth of recovered sulphur.

- The mine closures in the Former USSR, Poland and Mexico were mainly responsible for the fall in sulphur supply from Greater Europe (-1.2 million tons) and Latin America (-0.9 million tons) during this period.
- The run-down of Frasch mining in the United States was more than off-set by the growth of recovered sulphur in both Canada and the United States, so that there was a net growth of production (+1.8 million tons) in North America.
- In the Middle East, mined sulphur output in Iraq has been constrained by the UN sanctions, but recovered sulphur has grown strongly in the rest of the region, and was responsible for the net growth of supply (+1.1 million tons).
- The biggest regional increase in sulphur output during the 1990–2000 period took place in South Asia and South East Asia (+2.4 million tons) as a result of the growth of oil refining

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[9] Brimstone is an old-fashioned name that is used in the sulphur industry specifically to refer to elemental sulphur, whereas "sulphur" is often used to include other forms such as the sulphur in pyrites and smelter acid.

and of the greater amount of sour crude being processed in Japan and Korea, as well as in Taiwan, Singapore, Thailand and India.

To meet the growth that is projected for sulphur demand, after taking account of the increased availability of sulphur in other forms, notably smelter acid, we estimate that brimstone supply will have to increase by 35 million tons in the period between 2000 and 2025. This should present no problem in view of the very big increases that are being anticipated in the involuntary supply of brimstone from the oil and gas industries. In fact there is likely to be a considerable surplus in the short-to-medium term10 that producers will have to keep off the market by pouring to block (*i.e.* accumulating stockpiles of brimstone) and also by developing the technology of acid-gas reinjection at some of the gas fields under exploitation. The latter is not an option for oil refineries that will find themselves handling more sulphur, both on account of the greater volume of sour and heavy crude that they process, but also because of the trend towards more stringent specifications limiting the amount of sulphur in refined products.

The main sources of new sulphur supply will be the oil and gas industries in the Former USSR and the Middle East, that will together account for more than one half of the projected 35 million tons increase. Output in the Americas will also expand significantly, although Canada will no longer be the driving force as it has been in the past couple of decades. By the end of the 25-year period, the major components of brimstone supply will be as follows:

- North America will remain the single biggest source of supply with a forecast production total of 22.5 million tons (+25 percent on 2000), and it will account for 29 percent of the world total in 2025.
- Greater Europe will continue to be the second biggest regional supplier. After its production has expanded by 64 percent, it will produce 21 million tons, equivalent to 27 percent of the world total in 2025.
- The projected growth in the Middle East of 10.6 million tons (+30 percent) will be larger than that in any of the other major regions, and it will produce 16 million tons in 2025.
- The Mexican and Venezuelan oil and gas industries, which are currently relatively small sulphur suppliers, will substantially increase their processing of sour and heavy crude and this will contribute to a four-fold increase in Latin America's brimstone output, taking the regional total to 7 million tons in 2025.
- Asia's production of sulphur will double over the 25 years, as a result of the expansion of oil refining in the region, and the introduction of measures to protect the environment from sulphur emissions. The total regional increase will be 4.5 million tons. Significantly, China's production will only grow 1.2 million tons, and the country will have to import on a large scale to cover its needs.

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[10] We have not forecast gross supply, but have only considered the amount that will be needed to satisfy demand.

International Trade

In 2000, international brimstone trade corresponded to a little less than one half of total world demand, and the largest part of this trade (currently 78 percent) was inter-regional. The biggest exporters—Canada, the Arab Gulf countries, and Russia—make most of their export sales to other regions.

These countries, plus some of the other ex-Soviet states in Central Asia, are expected to remain the principal exporters of brimstone in the foreseeable future. The total volume of trade is forecast to be 40 million tons in 2005 (*c.f.* 20 million tons in 2000), and the component represented by inter-regional trade will be 31 million tons (*c.f.* 16 million tons in 2000). Most of the new import demand will be generated by consumers in China, Africa, and Australia.

Implications for Panama Canal Routes

Movement through the Panama Canal consists of sulphur from West Coast North America directed to East Coast South America and to Africa. Demand in East Coast South America will increasingly be met by new supply in the region, whereas Africa's import needs will expand strongly. Deliveries from West Coast North America through the Panama Canal to these two markets will remain in the 2.0–2.5 million ton range through most of the forecast period. The main exporter in West Coast North America has indicated that any increase in availability is likely to be directed towards the Pacific Rim market.

SALT

Demand

Though most of us think about salt as a flavoring for food, this end-use represents only about 19 percent of world salt demand. It is the chemicals industry which is the most important outlet for salt and it uses about 50 percent of the salt produced. Salt is most important as a feedstock in the manufacture of chlorine, caustic soda and synthetic soda ash (where it is mixed with lime), but there are other chemical uses as well.

Road de-icing in North America and northern Europe accounts for about 10 percent of world salt demand. This is mostly in the form of rock salt (or halite) and demand can fluctuate substantially in any given year depending on weather conditions. Although some chemical preparations to induce ice melt have come on the market to address the environmental concerns surrounding the use of salt, these are used mainly by consumers in small quantities as they are much more expensive than rock salt. We expect rock salt to hold its position as the bulk de-icer as it is the most cost-effective product for governments and road authorities to purchase and store. However, bulk salt users will continue to seek ways to employ road salt more efficiently, for example by applying it in combination with magnesium chloride brine.

World consumption of salt in 1990 amounted to 182.2 million tons. By 2000, the level had increased to 212.9 million tons, representing an average annual growth rate of 1.6 percent per year. By comparison, world GDP over the same period increased at a rate of 2.7 percent per year. Going forward, we expect world salt consumption to increase at a rate of 1.4 percent per year, a slightly slower rate than in the latest 10–year period as world growth returns to a more normal, trend level.

This relatively low rate of demand growth arises from the environmental and health issues associated with salt itself, as well as with the chloride products that are manufactured from it.

North America, Europe, China and South Asia represented 80 percent of world salt demand in 2000. We expect that condition to continue into the future, and by 2025, these four regions will represent just over 79 percent of demand.

North America is the largest consumer of salt and we expect this to remain the case through the forecast period. Chemical uses are really restricted to the chlorine industry, and by default the PVC industry, as soda ash production is from natural trona deposits, rather than the synthetic composition of salt and lime. North America also has a stable demand for salt in road de-icing. We expect salt to continue to fill that end-use as it is much cheaper for local municipalities and the federal governments to buy rock salt for this than to substitute another chemical based product.

Salt demand in Europe was 60.8 million tons in 2000. By 2025, we expect that to decrease at an annual rate of 0.8 percent per year to a level of 49.2 million tons. Unlike North America, Western Europe's chemical industry has not fully rationalized and will continue to come under cost pressure. The chemical industry in the CIS and Eastern Europe is not likely to expand significantly; in fact, it should contract in response to these economies conforming to Western European environmental standards.

The demand for salt is expected to expand at a rate of 3 percent per year in China as the soda ash and chlor-alkali industries also expand. In particular, China has a large and growing synthetic soda ash industry and will probably be the only region to see significant increases in synthetic soda ash production. Therefore, we expect China to increase consumption from a level of 30.8 million tons in 2000 to 64.47 million tons by 2025, at which time it will replace Europe as the second largest regional salt consumer.

India is also a large salt consumer, again due to the chemical industry which is expected to grow strongly in the future. In 2000, the South Asia region required 16.9 million tons of salt and we expect that to more than double to 35.3 million tons by 2025.

Supply

Salt is produced in over 100 countries has virtually unlimited resources. Rock salt (halite) deposits are widespread and frequently very large. Oceans and other saline waters contain enormous quantities of salt which can be produced by solar evaporation and which are constantly being replenished. Salt extraction, whether by dry or solution mining or by evaporation is cheap relative to transport costs. Taking a look at the largest salt-producing regions, that in 2000 represented nearly 78 percent of production:

- In 2000, Europe was the world's largest salt producer with 59.8 million tons of production. Through the forecast period, European salt production will decline at a rate of 0.6 percent per year to a level of 5124 million tons as demand within the region falls.
- The United States is the single largest salt producer and this makes North America the world's second largest salt supplier. In 2000, North America produced 57.55 million tons of

salt and we expect this to increase at an average rate of 1.4 percent per year to 82.0 million tons by 2025.

- China follows North America and Europe with 31.2 million tons of production in 2000. Through the forecast period we expect growth of about 3 percent per year and by 2025 production will double to 65.7 million tons.
- South Asia in 2000 produced 17.2 million tons of salt and this is likely to increase to a level of 36.0 million tons by 2025, representing an average annual increase of 3 percent per year.

International Trade

Asia and the Far East, with the exception of China, are the only regions of the world without salt reserves that can adequately address demand. Most trade, therefore, occurs to meet demand in Asia. Australia (Oceania) supplied 7.9 million tons of salt to Asia in 2000, while Mexico, Peru and Chile supplied another 5.8 million tons.

Implications for Panama Canal Routes

The trade flow that is most important for the Panama Canal is the transport of salt from West Coast Central and South America to East Coast North America, which totaled 3.4 million tons in 2000. We do not expect this amount to grow significantly during the forecast period. Moreover, although new mines have recently been opened in the northern United States to meet the demand for salt for de-icing, the production is likely mainly to reduce imports from Canada and should not significantly affect imports by way of potential Canal routes.

SODA ASH

Demand

According the USGS, the world's largest deposit of trona is in the Green River Basin in Wyoming, USA which has identified reserves of over 22 billion tons. California also has an estimated 815 million tons of soda ash reserves. There are at least 62 identified natural sodium carbonate deposits in the world, some of which have been quantified. Of note are those in Botswana and Kenya, which currently produce soda ash, as well as in Mexico, Turkey and Uganda, where no natural soda ash production currently takes place.

The glass industry is the largest consumer of soda ash, accounting for about 55 percent of the soda ash consumed in 2000. The market for glass is discussed in two segments, that for container glass and that for flat glass.

With container glass, there is stiff intermaterial competition for market share between glass, plastics and metals, the most serious of which is from plastics. In terms of food, glass is an ideal packaging material because it presents the food product in a visual way, and has been very successful in those food applications where a sense of purity and high quality is an issue. However, plastics have been encroaching on these markets, most recently in that of baby food. With regard to the beverage segment, glass continues to hold off competition from plastics in the beer and certain soft drinks markets, but the plastics industry continues to improve on the properties and perceptions of plastic packaging, and glass is likely to very gradually lose market share to PET over time.

The flat glass industry includes end-uses in automobiles, construction, and electronics, and at time, there is no real competition from other materials.

The chemicals industry accounts for another 20 percent of soda ash demand. In many chemicals applications, caustic soda is substitutable for soda ash. Caustic soda, however, is a co-product in the production of chlorine, which has some very unfavorable environmental consequences. Therefore, the preference for soda ash is fairly well entrenched. The existence of long-term contractual commitments and the reluctance of production personnel to make a change in raw materials also contribute to the lack of more active substitution between the two chemicals. However, if the price of soda ash were to remain at a level about 1.4 times the price of caustic soda for a rather extended period of time, then substitution of caustic soda for soda ash would be likely to occur.

The other major end-uses for soda ash are in detergents, the pulp and paper industry, water treatment, metallurgy, the production of alumina, the production of titanium dioxide, animal feeds, and drilling muds.

Worldwide demand for soda ash is expected to at a rate of 2 percent per year between 2000 and 2025, compared with an increase in GDP of 2.9 percent per year over the same period. That will take soda ash demand from a current level of nearly 36 million tons in 2000 to 58.8 million tons by 2025.

The largest consumer of soda ash is Europe, including the CIS and Eastern Europe. The demand for glass, particularly in construction in the latter two regions, is expected to keep soda ash demand growing at 1.8 percent per year during the forecast period. That will increase Europe's demand from a level of 12.7 million tons in 2000 to nearly 197.7 million tons by 2025.

China will exhibit very strong growth in soda ash demand throughout the forecast period due to expansion in both the glass and chemicals sectors. China's demand will go from a level of 7.5 million tons in 2000 to 16.4 million tons by 2025, an average annual rate of growth of 3.2 percent.

The economies of South and South East Asia will see strong growth in demand during the forecast period. The Middle East will exhibit the strongest annual growth, at 5.5 percent per year, but that is from a very low base.

Though North America was the third largest regional consumer of soda ash in 2000 at 6.9 million tons, we expect demand to fall slowly, declining at a rate of 0.7 percent per year to 5.8 million tons by 2025.

Demand for soda ash in Latin America will grow at an average rate of 2.5 percent. In the East Coast of South America, where Brazil is the dominant economy, we project that total soda ash demand will grow from just under 1.0 million tons in 2000 to 1.8 million tons in 2025; total demand on the West Coast of South America is smaller, at 340,000 tons in 2000, and is projected to grow to 640,000 tons by the end of the forecast period.

Supply

World soda ash production in 2000 was 34.94 million tons. We expect that by 2025, production will increase in line with demand to total 58.91 million tons.

As the world's largest natural soda as producer, with abundant reserves, the United States will continue to dominate the soda ash industry. In the United States, the six soda ash producers (five domestic, and Solvay of Europe) have banded together and sell their exports through an outfit called ANSAC. Increasingly, foreign companies have been investing in the U.S. natural soda industry, and this will continue as it is much more cost effective to extract the natural soda ash than to produce it synthetically. With 10.2 million tons of production in 2000, the U.S. represented just under 1/3 of the world's soda as industry. By 2025, North American production of all types of soda ash is expected to reach 18.6 million tons by 2025, an increase of 2.3 percent per year.

In terms of other producers, Solvay, a European chemical company, holds a patent on the primary process for producing synthetic soda ash. This will help Europe to remain a dominant supplier of synthetic soda ash through the forecast period. Europe produced 11.4 million tons of soda ash in 2000 and this will rise to a level of 18.3 million tons by 2025, representing a growth rate of 1.9 percent per year.

With a very low-cost position, China will be a player in the production of synthetic soda ash for some time to come. In 2000, China produced 8.3 million tons of soda ahs, but by 2025 we expect this to expand to 16.6 million tons.

India is also an up-and-coming producer of soda ash and, as a policy, the country currently refuses to purchase soda ash from ANSAC since it is sold through a cartel. Whether this is a tactic to protect a domestic industry is unclear, but in 2000 South Asia manufactured 2.06 million tons of soda has and this will increase at a rate of 2.5 percent per year throughout the forecast period to reach a level of 3.8 million tons by 2025.

Synthetic soda ash production facilities around the world have been closing. In fact, the United States also has excess capacity in soda ash production. In particular, through the forecast period, we expect the 550,000 tons of production which occurred in Mexico, Taiwan and Brazil in 2000 to cease before 2010. Korea will gradually phase out its 310,000 tons of production capacity by 20205, and Japan will also reduce it production capabilities as well.

International Trade

Since there are very few large producers of soda ash in the world, the trade matrices for soda ash have been produced from export statistics, rather than from import statistics, which is normally the case.

In fact, in 2000, the United States accounted for nearly all of the extra-regional trade in soda ash, as Europe, which produced 11.4 million tons of soda ash in 2000, only exported about 300,000 tons beyond the region. China, which produced 8.3 million tons in 2000, exported 997,000 tons, 88 percent of which stayed in Asia.

Since U.S. soda ash production rakes place in the west of the country, the main export ports are those on the Pacific coast, but the industry has the option of using Gulf/Atlantic Coast ports when it can obtain better shipping terms and/or when its customers cannot handle larger vessels.

Out of the 4 million tons soda ash that was exported from the United States in 2000, some 22 percent were moved overland by rail to customers in Canada and Mexico. Most of the exports by sea were loaded at Pacific ports, and these accounted for 69 percent of the overall total in 2000. Most of the remaining 9 percent of export volumes, equivalent to 380,000 tons in 2000, was railed to ports on the U.S. Gulf. The main markets supplied in this way were on the East Coast of South America, *i.e.*

Argentina, Brazil and Venezuela, and in Africa. However, the South American markets are also supplied from the U.S. Pacific ports, depending on the relative economics.

Implications for Panama Canal Routes

Total movement of U.S. soda ash through the Panama Canal, to destinations in Europe and the Middle East, as well as South America, totaled 630,000 tons in 2000, corresponding to 15 percent of the export total. As the world becomes more dependent on U.S. soda ash, we forecast a steady growth in exports, and also of the proportion of this material that passes through the Canal. By 2025, we project that the movement of U.S. soda ash through the Canal will reach 4 million tons, equivalent to 30 percent of the export total.

UREA

Demand

Urea is an industrial chemical that is produced from ammonia on a large scale in all of the world's major regions. Total production is currently in excess of 100 million tons per year, and it continues to grow in response to the expansion of fertilizer demand, which is the principal end-use for urea.

The advantages of urea as a fertilizer are that it has a higher nutrient content than the other products. Its main shortcomings are that it is less effective in colder climates where nitrates give better results, and some of its content of nitrogen may be lost to volatilization (as ammonia) when it is applied as a top dressing, but in most circumstances it is a very effective fertilizer.

Worldwide, urea supplies over one half of the total amount of nitrogen that is consumed as a fertilizer nutrient, and it is the single most important nitrogen fertilizer product. In Asia and Latin America, urea accounts for well over one half of total nitrogen use, and so the demand for urea is directly affected by the factors that drive overall fertilizer demand. In Europe and the Former USSR, ammonium nitrates have traditionally been the principal sources of fertilizer nitrogen, and they continue to have this role as urea has only partly displaced them. In North America, urea is less important than UAN solutions, in which one half of the N content derives from urea, and anhydrous ammonia used as a fertilizer.

While fertilizers are the dominant use of urea and effectively drive the demand for this product, some 8 percent of urea consumption has other uses, such as the manufacture of plastics and resins and as a source of non-protein nitrogen for compound feeds, as well as number of minor applications.

In the decade up to 2000, world demand for urea in all end-uses expanded from 76.9 million tons to 111.1 million tons, an increase of 34.2 million tons or 44 percent over ten years, which corresponded to annual average growth of 3.7 percent. Most of this growth took place in Asia, with three of the Asia sub-regions accounting for two thirds of the increase in the world total:

- Demand in China grew by 10.8 million tons to reach 30.0 million tons in 2000, when it was the world's single most important user of urea, accounting for 27 percent of the overall total.
- Demand in South Asia, primarily India, Pakistan, and Bangladesh, grew by 9.5 million tons to 26.7 million tons, equivalent to 24 percent of the world total.

- Demand in South East Asia grew from 5.8 million tons to 9.5 million tons, an increase of 3.7 million tons.

Between 2000 and 2025, we forecast that the total demand for urea will grow by some 69 million tons to reach 180 million tons at the end of the period. Out of this increment, fertilizer use will account for some 63-64 million tons and other uses for some 5–6 million tons. The compound annual growth rate for total world demand will fall from 2-2½ percent in the early part of the period to 1½-2 percent in the later years.

Overall, we forecast that the importance of urea will steadily increase because of the relative importance of the growth of fertilizer use in Asia where urea is already the dominant product. The position of urea in Asia will also be boosted as it displaces the very large quantities of low-grade ammonium bicarbonate fertilizer that have traditionally been used in China.

In the 25-year forecast, the biggest increases in total urea demand will take place in Asia, primarily in China (+22 million tons), South Asia (+18 million tons) and Southeast Asia (+7 million tons). Total urea demand in Latin America is forecast to row by 6.3 million tons, of which 4.8 million tons will be in the Atlantic Rim countries and 1.5 million tons in the Pacific countries. Total urea demand in Greater Europe will grow by almost 5 million tons over the 25-year period, as a result of the recovery of fertilizer use in Central Europe and the Former USSR, and despite the contraction of demand in West Europe.

Supply

Urea is manufactured on an industrial scale from ammonia and carbon dioxide. As the latter is a co-product of ammonia synthesis, urea production is normally integrated with ammonia production.

Most of the 33 million tons increase in urea supply between 1990 and 2000 originated from producers in the Asian region, especially China (+19.6 million tons), and South Asia (+9.7 million tons). Neither of these regions has the resources for low-cost production, but government policies in China and India have favored the expansion of local supply. In Southeast Asia, the availability of gas reserves—in Indonesia and Malaysia—coupled with the expansion of regional demand has supported the 2 million tons growth in urea production. Elsewhere in the Far East of Asia, there has been an aggregate 1.5 million tons downturn in supply as uncompetitive producers have cut back production or closed down capacity—a process that will continue in the current decade. In the Middle East, urea supply expanded by 2.7 million tons, mostly to supply material for the export trade that grew by 2.1 million tons in the same period.

Latin American suppliers, all of which are located on the Atlantic/Gulf coasts, reduced their output by 1.4 million tons between 1990 and 2000. This was due to the temporary closure of urea capacity in Mexico, due to a dispute over gas prices that is now being resolves to allow the plants to re-start. The recent substantial additions to capacity in South America—in Venezuela and Argentina—did not start to impact upon supply until after 2000.

Urea supply in Greater Europe fell by 1.3 million tons in the 1990s, as a result of the closure of uneconomic capacity in West and Central Europe, and the failure of the plants in the FSU countries to revert to the high levels that they were achieving under Communism.

Urea production in North America grew by 2.3 million tons between 1990 and 2000. A large part of this growth arose from the exploitation of natural gas reserves in western Canada to produced fertilizers for the U.S. market.

Urea supply will have to grow by 70 million tons between 2000 and 2025 in order to cover the forecast levels of demand. A large part of the new capacity required to generate this supply will be located in gas-rich regions, notably the Middle East, EC Latin America and (northeast) Africa. The developments in these regions will result in a substantial increase in the relative importance of urea export trade, so that it will be equivalent to 38 percent of total supply at the end of the period, compared with 24 percent at present.

Middle East urea production will grow by 23 million tons between 2000 and 2025, most of which will be attributed to export supply. Some of the new capacity is already being financed by consumers in South Asia, particularly in India where gas resources are insufficient to support further expansion of the indigenous urea industry. The expansion of urea supply in the Middle East will account for almost one third of the total growth of urea supply in this 25-year period.

Latin America is the other region where there will be a very substantial expansion of urea supply, with a projected increase of 18 million tons, which is equivalent to one quarter of the overall growth in this period. Most of the gas reserves that will be exploited to support this expansion are located in and around the Caribbean Sea, *i.e.* in Trinidad and Venezuela. However, there are potentially viable gas resources on the west side of South America, mainly in Peru and Chile, and we are forecasting that they will be exploited to support new urea capacity in this region during the course of the next decade. This development will have a significant impact on the volume of urea movements through the Panama Canal.

Export-orientated urea industries will also be expanded in Africa (+9 million tons) and Southeast Asia (+8 million tons), but the latter will cease to grow strongly after 2010.

China, the world's biggest consumer of urea, will continue to expand domestic production in order to keep its import requirements down to manageable levels. It will be able to do this by exploiting the natural gas reserves that are being uncovered in the remoter parts of western China.

European urea supply will grow by 3 million tons to meet the higher levels of demand in Central Europe and the Former USSR. This expansion of supply will take place in parts of the Former USSR where there is a good availability of natural gas. However, while these remotely-located gas reserves may support urea supply for the local market, they will not in our view support the expansion of the Russian and Ukrainian urea export industries.

North American urea supply will fall back, by some 4 million tons, as the pressure from low-cost imports undermines the position of the less favorably situated producers in this region.

International Trade

International urea export industry has been built up on the basis of processing relatively low-cost natural gas at sites that can serve foreign markets by sea or by land. Most of today's big exporters have these favorable characteristics, and our forecasts indicate that such exporters will have an expanding role in meeting urea demand.

More that 60 percent of the new demand for urea in the forecast period will be met by imports, which will expand by some 43 million tons. This total includes intra-regional trade; the increase in terms of interregional trade, as shown in the trade matrix tables, is 38 million tons.

We are assuming that export-orientated capacity will be installed at sites with favorable parameters in line with the growth of import demand. The principal exporting regions, in order of importance, will be the Middle East, Europe, EC South America, Africa, Southeast Asia, Caribbean, WC North America, WC South America and Oceania.

Implications for Panama Canal Routes

Urea movements through the Panama Canal are comprised of material originating from Europe/CIS and to a lesser extent from EC South America and possibly from the Middle East directed towards Pacific Rim markets. The emergence of new urea capacity in WC South America will limit the growth of imports into this region.

The substantial volume of exports shown in the trade tables from WC North America to Gulf Coast North America moves overland, and does not generate Panama Canal movements.

We expect no significant exports on potential Canal routes from Pacific regions.

- The urea export capacity in West Coast North America is located in Alaska and in the Canadian province of Alberta. The Alaskan plant delivers its entire output to Pacific Rim customers, and under normal circumstances does not need to sell to distant markets such as Europe. It will not be expanded in the forecast period, and may well be closed. The Alberta plants deliver most of their output directly by rail to North American customers; this business is made up of domestic shipments (i.e. within Canada), intra-regional trade (i.e. within North America West) and export trade with other parts of North America—only the last of these is recorded in the trade matrix. The Alberta plants are badly located to supply deep-sea destinations and in any case do not need to do so.
- The development of urea capacity in one of the Pacific countries of South America would displace imported urea within the region, and ship any surplus to Pacific Coast markets in Central and North America, where it has a freight advantage over the established urea exporters which supply these markets. This would be more favorable for the new producer than trying to penetrate the U.S. Gulf market where it would have to displace competitive supplies from low-cost producers in the Caribbean and elsewhere. For this reason, we do not predict a regular movement from West Coast South America to the U.S. Gulf, but there may be occasional opportunistic sales.

SUGAR

Demand

Sugar cane is the origin of approximately 72 percent of world refined sugar production, with the balance produced from sugar beets. Sugar cane is grown primarily in the tropical and sub-tropical zones of the southern hemisphere, but is also grown in the northern hemisphere in below 30° latitude. Sugar beets are cultivated in temperate, northern climates in the North America and Europe.

Between 1976 and 2001, world consumption of sugar increased at an average rate of 1.7 percent per annum, from a level of 82.1 million tons in 1976 to 134.3 million tons in 2001. This growth rate is about half of that of world GDP.

In per capita terms, the demand for sugar has been stable on a worldwide basis, averaging 21 kg/person. During the last 10 years, however, per capita sugar consumption has increased on a worldwide basis to a level of 22.3 kg/person. In general, wealthier countries like the United States, Japan and Western Europe have experienced declining per capita sugar consumption, while the opposite is the case in developing countries/regions.

For the forecast period, we expect global sugar demand on a per capita basis to remain fairly stable, and have estimated it at a worldwide average of 22.5kg/person to 2025. We thus forecast a global demand of 178.6 million tons by 2025, an average annual increase of 1.5 percent per annum from 2001. This growth rate corresponds to about half the rate of world GDP growth which we expect.

Europe, comprising Western Europe, Eastern Europe and the CIS, should remain the largest consumer of sugar in volume terms as demand increases in the countries of Eastern Europe and the CIS. Europe is, and should remain, followed in volume terms by South Asia, South America and Africa. North America is the next largest consuming region, but should be overtaken by Southeast Asia and China beginning in 2010.

Supply

In 2001, world sugar production amounted to 133.2 million tons. In 2000, with a bit more than 25 percent of production, Europe was the world's largest sugar producer with 36.4 million tons, most of which was for the region's own consumption

Next, with nearly 20 percent of world production was South America. Of the region's 23.1 million tons, Brazil accounted for 17.1 million tons and is the world's second largest producer. Southern Asia's production is mostly that of India, the single largest producer of sugar at 20.5 million tons in 2000. Again, this region's production is largely for its own consumption.

In Southeast Asia, Thailand is the major producer, and the world's third largest, accounting for 5.2 million tons of production. Indonesia and the Philippines each add about 1.8 million tons to the region's total. Next is Africa, where South Africa accounts for 2.9 million tons of production. Other major African producers are Zimbabwe and Mauritius. Once again, however, most of the region's production is for consumption, and it tends to stay in the southern part of Africa, with import requirements in the North being met by Europe and South America.

After India, Brazil and Thailand, Australia is the world's fourth largest sugar producer and in 2000 produced about 4.2 million tons of sugar, 3.6 million of which was for exports. Cuba is the next largest producer, having produced 3.5 million tons of sugar and exported 2.99 million tons, mostly to the countries of the CIS and Eastern Europe, but with a bit to China as well.

As is now the case, we expect the major cane producers to continue to hold their positions as the largest producers. On a regional basis, Europe and North America will continue to produce beet sugar, but it is unlikely that these regions will be able to expand cultivation at the same rate as the cane sugar producers. Thus, the structure of supply will remain largely unchanged, with the largest increases coming in South America, Asia, and Africa.

The primary source of total country production, import and export data is the U.S. Department of Agriculture (USDA). Via the internet, it provided a comprehensive database which has history extending back to 1960 (although there are no data for 1963). This was cross-referenced in some years with United Nations data and found to be comparable. The USDA was chosen as the primary because it was more up-to-date.

International Trade

World trade in sugar is constrained by the protection of domestic sugar beet industries in the United States, EU, Russia and Japan. All of these countries impose a quota on sugar imports. This is a subject of great negotiation at the WTO.

For the most part, trade in sugar occurs in the pattern that one would expect, given geography.

- Southeast Asia and Oceania supply Japan, Korea and Taiwan, as well as North America West. Into the future, this will expand to include China as well.
- Africa and Europe trade with one another in an almost equal amount. But North Africa does import a fair amount from South America East.
- Europe's imports are met by Cuba and South America East, with some trade with Africa
- In North America, by 2010, the United States will have fully liberalized trade in sugar with Mexico, and more of its import requirement will be increasingly met by that country. It is not clear how this will affect the U.S. sugar industry in the Gulf. These producers are considered fairly high cost, but consumers have been willing to protect the domestic industry, and it costs the U.S. government very little to do so.

The progress of the WTO negotiations on sugar is very slow, and it is likely to be at least 10 years before trade is liberalized to a significant extent. In the meantime, it is likely to be addressed in other regional or bilateral negotiations, such as the case with NAFTA. In terms of raw sugar, the fact of the matter is that sugar cane accounts for the large majority of traded raw sugar, and it is grown in only a very limited number of places, dependent on climate. Brazil, Australia, Thailand, Central America, and the Caribbean countries are currently the major exporters to the world market, and that will remain the case, simply because they are geographically endowed to produce this commodity. Sugar beets can be grown in temperate northern climates, like North America and NW Europe, but it doesn't seem likely that that this industry will be able to supply increasing requirements of the population. In fact, the activity has to be heavily subsidized in order for it to take place in these regions. NAFTA will enable Mexican sugar producers to have greater access to the U.S. market, and this will change the flow of trade a little bit, and has been incorporated into the forecast. North America, however, will remain a net importer of raw sugar, and NW Europe is likely to go that way as well as subsidies are dismantled under the WTO structure.

For the long-run, trade patterns for raw sugar are expected to minimize freight costs for the trading regions, ignoring the existence of artificial barriers. Two examples: we expect the North American market to import sugar primarily from the Americas and the Caribbean; Oceania is likely to export sugar mainly to the Asian markets.

Implications for Panama Canal Routes

The major trade routes potentially affecting Panama Canal trade are as follows:

- In Central America West, Guatemala is a large exporter. Nicaragua sends sugar to the United States, as does El Salvador, but these are two very small producers. Currently, the region sends 495,000 tons to the East Coast of North America. By 2025, we think this is likely to increase to a level of 678,000 tons. We also expect Central America West to send increased volumes to Europe to fill that region's import requirements.
- In South America West, Colombia currently exports about 260,000 tons to Europe. By 2025, we expect this may reach 600,000 tons. Most of Colombia's sugar plantations are on the West Coast and it is assumed that the sugar comes from this area. Although South America West has recently been shipping sugar to South America East, we would not expect significant future trade along this route given the export surpluses expected to be available in South America East itself.
- Oceania to North America East is not a natural market in terms of transport, even though significant volumes have recently been shipped to the East Coast of Canada. Although there have historically been shipments on this route, we do not expect these to continue.

CEMENT

Demand

Cement is used all over the world. As a relatively cheap building material, it is used heavily in the less developed countries of the world. China and Hong Kong alone are estimated to have consumed 608 million tons, or 36 percent of the world total, in 2001. European consumption, including the CIS, was just under half that level. All other regions that are important in terms of population also consumed large volumes of cement.

The demand for cement has grown at an average annual rate of 3.5 percent between 1990 and 2001. China has been a major driver in the growth of the demand for cement.

We expect that the growth in world demand for cement will slow slightly from recent historical rates. Consumption is forecast to reach 3.45bn tons by 2025, implying an average annual growth rate of 3.0 percent from 2001.

Most of the growth in demand should take place in Asia. Chinese demand alone (including Hong Kong) is expected to increase to 1.59bn tons by 2005, implying a 46 percent share of world consumption. Other important regions in which growth is expected to be faster than the world average are South East Asia, South Asia and the Middle East. The combined share of world demand is expected to increase from 16 percent in 2001 to 22 percent in 2025.

Growth is expected to be far slower in the developed world. Growth of only 2.0 percent per year is expected in the North American market, and growth in demand should be less than 1 percent per year in Japan. We even forecast a small decline in consumption in Europe.

Supply

Cement is produced mainly in the countries where it is consumed. Portland cement clinker, the key intermediate raw material, is manufactured by a controlled burning of calcareous rocks, usually limestone, in a kiln. Limestone is commonly found in most parts of the world, making it possible for production to be well dispersed geographically. The U.S. Geological Survey estimates that cement was produced in 2000 in 160 countries worldwide.

The regional shares of global production generally conform to the regional shares of global demand. Thus, for example, the Chinese share of global production was 36 percent in 2001. There are some important variations, however. South East Asia produced 6 percent of global cement in 2001 but consumed only 5 percent. In relative terms, this may not seem like much, but in terms of absolute volumes of trade it is significant.

North America produced only 6 percent of world cement output but consumed 8 percent. Africa produced 4 percent but consumed 5 percent of world output.

One factor that may be slowing the rate of growth in cement consumption in the developed world is the environment. It is increasingly difficult in the developed countries to get permission to open limestone quarries. Like other mining and quarrying activities, limestone quarrying defaces the earth and is therefore a target for environmental campaigners. The production of cement also burns large volumes of fuel and contributes to the generation of carbon dioxide. In the North America, where supply has lagged behind demand, supply has nevertheless increased since 1990 in absolute terms.

We forecast a continuation of the trend for cement increasingly to be produced in export-oriented plants. However, the bulkiness of cement implies that most material is likely to be consumed locally or else shipped relatively short distances for export.

International Trade

There is significant international and interregional trade in clinkers as well as in finished cement. The trade data used to derive demand for finished cement from the production statistics must necessarily exclude clinkers. However, clinkers must be included in order for the trade tables to show gross movements of cement. The import and export tables therefore do not exactly balance the supply and demand tables. The difference consists of trade in clinkers.

The main net exporting regions of the world are Europe and East Asia, including South East Asia, China, South Korea and Taiwan. The main net importing regions are North America and Africa. North American imports come into the East, Gulf and West coasts. Both Europe and East Asia export to North America and Africa. Asian material even constitutes some of the cement that flows into the East and Gulf coasts of the United States.

Thailand is the largest single exporter of cement worldwide. China is a major exporter, even if its domestic consumption volume dwarfs its export volume.

Trade patterns are expected to remain similar throughout the forecast period. We expect North American and African net import requirements to increase and to continue to be met by European and East Asian supply.

Implications for Panama Canal Routes

The main trade flows potentially affecting the Panama Canal would be those from East and South East Asia to the East and Gulf coasts of North America. We estimate that these routes carried nearly 11 million tons of finished cement and clinkers in 2000, not all of it necessarily going through the Canal. These flows are forecast to reach 17 million tons by 2025.

There is also some potential for expanded exports from Asia into the Caribbean Basin. These totaled less than 400,000 tons in 2000 but could reach 1.9 million tons by 2025.

PETROLEUM COKE

Demand

Petroleum coke consists of two distinct markets: green coke, which is consumed as a fuel by electric utilities and cement plants, and calcined coke, which is consumed in various other industrial processes.

In today's deregulated electricity market, it is very attractive for utilities to consider low variable cost fuel alternatives. Power plants with scrubbers are able to handle coal blends containing from 10 to 20 percent of green petroleum coke. Our forecast demand for green petroleum coke is based on the expected regional development of the electric power and cement industries.

North America and Europe (including the CIS) represent around 70 percent of the global green petroleum coke demand. In North America, we expect an average annual increase in demand of 1.2 percent over the forecast period, while demand in Europe (including the CIS) is expected to increase at an average annual rate of 1.3 percent. There are regions like Central America West where we expect a significant growth rate but these carry a much lower weight in the global market.

In our assumption, countries such as Germany and Spain that currently consume large quantities of coal as fuel in power plants are expected to increase demand at a faster rate than other regions. Among the European countries, Italy is the one with the highest proportion of power generators utilizing petroleum coke. More precisely, while in most countries of the region power generators fuelled with coke represent from 0 percent to 5 percent of the total; in Italy the figure is 39 percent. Additionally, because green petroleum coke is valuable in cement production, we forecast a significant increase in demand in Asia and Latin America. Nevertheless, given that the European countries participate with 15 percent[11] of the world total cement production, the smaller increase in the region will still be significant in terms of volumes.

The majority of calcined coke is used for the manufacture of carbon anodes for the aluminum industry. Indeed, CRU estimates that the aluminum industry consumes in the region of 74 percent total calcined petroleum coke. Other producers that utilize calcined coke in their production processes are the steel industry and TiO_2 pigment producers. The steel industry uses calcined petroleum coke in needle form for the production of graphite electrodes for the electric arc furnace (EAF) method of steel making, as well as a carbon riser material.

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[11] CEMBUREAU.

Given that the aluminum industry is the major consumer of calcined petroleum coke, our forecast demand is based in the expected regional development of this key industry. The global demand is expected to increase at the average annual rate of 2.8 percent over the forecast period.

North America, Europe (including the CIS) and China represent around 70 percent of the global calcined coke demand. In North America and Europe (including the CIS), we expect an average annual increase in demand of 1.4 percent over the forecast period, while in China the expected growth is about 5.5 percent. The increase in demand in China is mainly driven by our forecast aluminum production for that region.

Supply

Petroleum coke is a byproduct of the upgrading of the heaviest petroleum fractions to more valuable lighter products. Its production process was developed and refined over many years and has become an important aspect of refining operations. Refineries located in the United States dominate Western world production of green coke.

The economics of producing transportation fuels govern coker operations. Thus regardless of the demand for green, refineries continue producing petroleum coke, the adjusting factor being its price. Although its price fluctuates over a wide range, it is almost always less than that of coal.

Most of the worldwide growth in demand for petroleum coke is tied to transportation fuels. Petroleum coke, as a natural by-product of petroleum processing, carries no real production cost, its revenues are not significant enough to most refiners to affect coke production.

Although the main application for petroleum coke is as a fuel, more than 20 percent is calcined and consumed by other more specialized industries. Calcined coke is produced by a calcining (or roasting) process, which burns off the moisture and volatile material inherent in the green coke, and than modifies the structure of the coke.

We have based our forecast of the supply of green petroleum coke on known projects and different drivers such as environmental legislation that could determine the regions with more chances of an increase in e production.

In the industrialized nations, power projects will have to be environmentally benign to win support of the governments and public.

North America and Europe (including the CIS) represent around 77 percent of the global green petroleum coke supply. In North America, we expect an average annual increase in supply of 1.3 percent over the forecast period, while in Europe (including the CIS) it is expected to increase at an average annual rate of 1 percent.

Although Latin America is expected to experience a greater annual average increase, the global growth will be determined by North America and Europe (included CIS) because of their higher weight in global supply.

Our supply forecast for calcined petroleum coke is based on the announced calcining projects and the estimated long-term regional growth.

North America and Europe (including the CIS) represent around 70 percent of the global calcined petroleum coke supply. In North America, we expect an average annual increase in supply of 2.1 percent over the forecast period, while in Europe (including the CIS) supply is expected to increase at an average annual rate of less than 1 percent. Indeed, refineries in the United States have made significant investments in order to increase the volume of high value liquid fuels during the latest years. As a result, refineries not only have become more flexible in terms of feedstock but also have started to produce higher volumes of coke. CRU believes that the trend will continue in the future but at a slower pace.

The regions that will experience the biggest increase during the forecast period are the Middle East, Africa, China and South Asia.

International trade

More than 35 percent of the green petroleum coke produced in the world is traded internationally. We expect that production and trade growth will remain stable over the forecast period. Nevertheless, trade flows are expected to change somewhat between regions. More precisely, we expect that production in North America will grow faster than demand. The region will therefore increase its exports to the world over the forecast period. On the other hand, Europe (including the CIS) will increase its consumption, delivering less material to the export market.

Almost 30 percent of the calcined petroleum coke produced in the world is traded internationally. We expect that production and trade growth will remain stable over the forecast period. Nevertheless, trade flows are expected to change somewhat between regions. More precisely, we expect that production in Australia will grow at a slower rate demand, and thus Australasia will increase its imports over the forecast period. On the other hand, Europe (including the CIS) will increase its consumption, delivering less material to the export market.

CRU believes that some of the currently idled aluminum production in the Pacific North West will remain shut in the foreseeable future. As a result, the calcined coke historically consumed by the smelters of that region will be shipped overseas.

Implications for Panama Canal Routes

We expect some increase in the flow of trade in green petroleum coke between North America West and Western Europe. CRU identifies the Yorktown, Philips Alliance and El Segundo refineries as potential exporters through the Canal.

Some of the calcined petroleum coke historically consumed in the Pacific North West of the United States will be probably sent to Europe, most likely through the Canal. So far, since the closure of the aluminum production in that region, CRU understands that BP Arco has implemented a strong marketing policy in Europe by using the service of the trading company AIMCOR. For the forecast period, we expect these shipments to continue and perhaps to increase somewhat. We also understand that this trade is mainly directed through the Canal.

There is currently a small flow of green petroleum coke from the U.S. Gulf Coast to Japan. Such trade could continue in small volumes indefinitely given the cost and logistical positions of the local producers.

The majority of Canal trade of petroleum coke is between North America West and Europe.

LUMBER, PAPER AND PULP

Forecasts of world trade for lumber, paper and pulp to 2025 were obtained from a recent study completed by DRI-WEFA for the Autoridad de Canal de Panamá[12]. That study prepared annual trade forecasts using the same three global macroeconomic and trade scenarios as this study. The trade forecasts prepared by DRI-WEFA for nearly 70 countries and regions were aggregated into our 15 region and sub-regions.

Global trade of lumber, paper and pulp are forecast to increase at an average annual rate of 3.5 percent from 2001 through 2025 with total shipments more than doubling from 107 million tons in 2001 to 245 million tons in 2025. European imports of lumber, paper and pulp in 2001 accounted for 42 percent of global trade. By 2025, Europe share of lumber, paper and pulp imports is forecast to decline to 32 percent. During this same period, the share of imports East Asia is forecasted to increase from 22 percent to 28 percent and in the United States from 18 percent to 22 percent.

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[12] DRI-WEFA, Global Macroeconomic and Trade Scenarios to 2025, Volume I: Most Probable Case, prepared for the Panama Canal Authority (Contract No. SAA75897BGP), March 2002.

3. Potential Panama Canal Trade

This section presents the assessment of the Canal's potential market for dry bulk trade. The section commences with a review of historical Panama Canal trade by route and commodity followed by a forecast of potential Panama Canal Trade through 2025. It is important to note that for purposes of this study the term "Canal's potential market" represents our estimate of the maximum market share that the Canal could capture of world trade assuming a value of zero for Panama Canal tolls. Section 6 on Canal toll pricing strategy identifies and analyzes the impact of alternative Canal toll structures and rates on forecast traffic volume.

HISTORICAL PANAMA CANAL TRADE

Direction of Transit and Route

During 1995–2001 trade through the Panama Canal of the dry bulk commodities averaged 72.5 million tons, with a high of 78.1 million tons recorded in 1998 and a low of 67.1 million tons in 2001 (Table 3-1 and Figure 3-1). Since the peak in 1998, total dry bulk trade through the Panama Canal has declined each year through 2001.

The decline in dry bulk Canal trade has been due to the more than 30 percent decline in dry bulk trade on Atlantic to Pacific routes from 35.3 million tons in 1997 to 23.9 million tons in 2001. Reasons for the decline is the drop in shipments of phosphates, coal and steel products from the U.S. Gulf to the Far East and the decline in semi-finished and finished steel products and scrap from North America East to the Far East.

Panama Canal trade on Pacific to Atlantic routes increased from 36.3 million tons in 1995 to 43.2 million tons in 2001 primarily due to the increase in shipments of salt and refined copper and copper concentrates from South America West to North America East and shipments of steel products and cement from the Far East to the U.S. Gulf.

Commodity Category and Commodity

Panama Canal trade is rather evenly distributed among the four dry bulk commodity categories established for the study. In 2001, the other dry bulk category and minerals and fertilizers category had total Canal trade of 17.9 million tons and 17.8 million tons, respectively (Table 3-2). Canal trade for other ores and metals in 2001 totaled 15.0 million tons and steel products and steelmaking raw materials, 14.3 million tons.

As can been from Figure 3-2, despite some annual fluctuations, Panama Canal trade for these commodity categories have stayed within the range of 14 to 20 million tons during the 1995–2001 period.

Semi-finished and finished steel products is the dry bulk commodity with the largest volume of Panama Canal trade, averaging 10.2 million tons annually during 1995–2001. In 2001, 8.8 million tons of semi-finished and finished steel products were shipped through the Canal accounting for 13.5 percent of total dry bulk trade. Thermal and metallurgical coal, miscellaneous fertilizers, salt and phosphates and lumber are also important Canal dry bulk commodities with annual trade volumes often exceeding 5 million tons.

Table 3-1. All Dry Bulk: Panama Canal Trade by Direction and Route, 1995 through 2001 (thousands of long tons)

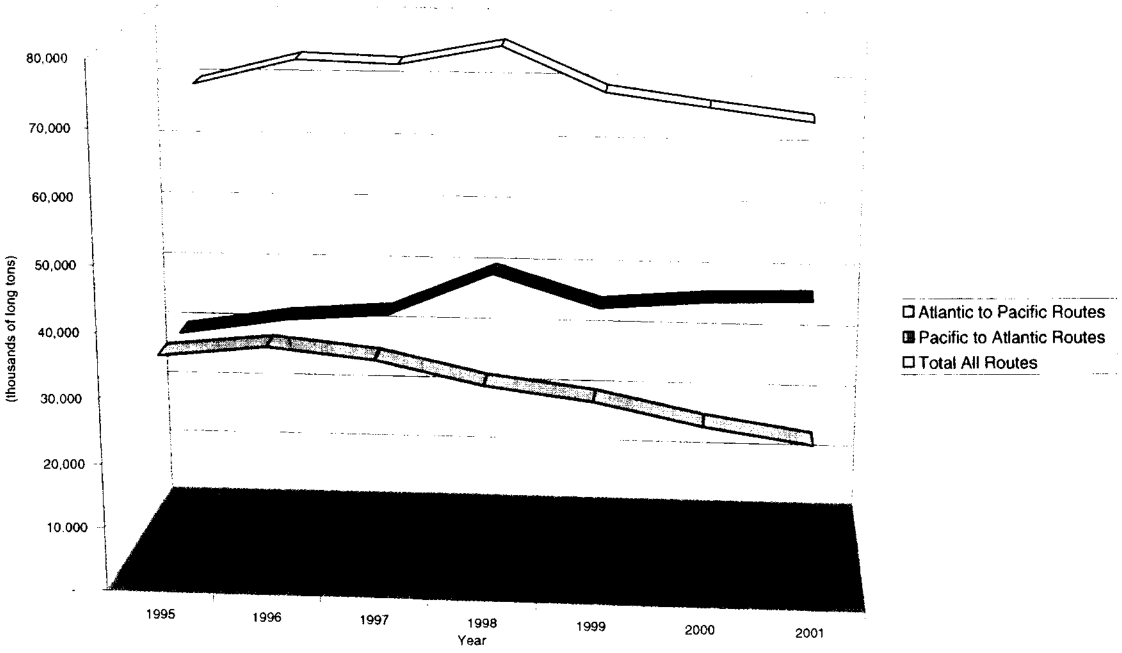
		Actual							Annual Average Growth Rate (%)
Origin Region	Destination Region	1995	1996	1997	1998	1999	2000	2001	1995-2001
Atlantic to Pacific Routes									
North America Gulf	Far East	13,556	12,887	10,921	9,755	10,299	7,801	5,317	(14.4)
North America East	Far East	4,537	5,783	5,365	3,429	3,446	2,917	3,602	(3.8)
Europe	South America West	1,256	952	1,153	1,917	1,191	1,800	1,951	7.6
Europe	Central America West	695	502	1,075	1,655	1,329	1,835	1,777	16.9
South America East	South America West	1,464	2,512	2,151	1,721	1,672	1,805	1,474	0.1
Europe	North America West	976	1,019	1,915	1,496	1,234	1,250	1,243	4.1
South America East	Far East	1,543	1,407	1,340	1,004	951	861	1,086	(5.7)
South America East	North America West	1,206	1,361	1,718	1,579	1,165	1,014	868	(5.3)
North America Gulf	Oceania	1,228	1,384	827	1,210	1,111	1,015	784	(7.2)
Africa	Oceania	157	214	376	287	192	458	746	29.6
South America East	Central America West	601	351	308	231	431	529	623	0.6
Caribbean Basin	Far East	942	644	588	496	383	478	585	(7.6)
North America Gulf	South America West	709	1,292	793	1,102	1,047	494	543	(4.4)
North America Gulf	Central America West	552	489	480	527	348	309	422	(4.4)
North America East	Central America West	277	551	465	367	406	445	390	5.8
North America East	South America West	481	514	693	449	408	360	385	(3.6)
Africa	Central America West	820	804	898	960	1,073	466	360	(12.8)
Central America East	Far East	145	308	102	123	253	194	302	13.1
Europe	Oceania	229	152	136	162	153	156	221	(0.6)
North America Gulf	South East Asia	513	723	629	256	337	350	166	(17.1)
Central America East	South America West	163	130	289	506	259	160	166	0.3
Africa	North America West	1,086	1,118	1,065	1,122	841	208	159	(27.4)
North America East	North America West	60	17	154	60	255	280	137	14.7
North America East	Oceania	318	447	374	51	18	69	91	(18.8)
Europe	Far East	700	277	287	129	35	30	74	(31.2)
Caribbean Basin	South America West	277	227	94	132	41	179	66	(21.2)
Africa	South America West	-	36	32	42	59	60	59	n.a.
Central America East	North America West	-	-	22	25	1	-	57	n.a.
Caribbean Basin	North America West	74	95	179	153	178	104	51	(6.1)
Caribbean Basin	Central America West	366	237	355	85	174	427	48	(28.8)
Central America East	Central America West	17	88	209	473	226	21	48	19.0
Other Atlantic to Pacific Routes		466	470	289	240	196	276	112	(21.2)
Total Atlantic to Pacific Routes		35,414	36,989	35,279	31,744	29,712	26,352	23,912	(6.3)
Pacific to Atlantic Routes									
North America West	Europe	10,705	10,810	10,680	9,664	9,356	9,136	10,147	(0.9)
Far East	North America Gulf	4,818	4,765	5,494	10,657	8,038	8,652	6,665	5.6
South America West	North America East	1,777	2,995	2,924	2,751	2,971	3,170	5,239	19.7
South America West	Europe	2,923	3,392	3,740	3,529	3,541	3,360	3,277	1.9
Far East	North America East	2,941	2,107	2,144	3,929	3,610	4,313	2,863	(0.4)
South America West	North America Gulf	547	974	1,233	988	1,046	921	1,457	17.7
Central America West	North America East	1,409	1,692	1,445	1,687	1,676	1,666	1,407	(0.0)
Central America West	Europe	281	424	274	761	685	813	1,061	24.8
Central America West	North America Gulf	1,073	1,271	1,457	1,118	798	1,084	822	(4.3)
North America West	Africa	1,634	1,545	2,186	1,698	791	793	805	(11.1)
South America West	Caribbean Basin	44	63	71	118	256	644	789	61.8
North America West	South America East	697	812	680	659	391	463	635	(1.5)
South East Asia	North America Gulf	201	266	196	305	484	492	520	17.2
North America West	North America East	659	519	637	512	578	418	517	(3.9)
South America West	Central America East	74	99	109	309	285	374	493	37.3
South America West	South America East	571	417	335	368	340	195	449	(3.9)
Far East	Caribbean Basin	81	70	64	174	248	296	415	31.2

Table 3-1 (continued)

		Actual							Annual Average Growth Rate (%)
Origin Region	Destination Region	1995	1996	1997	1998	1999	2000	2001	1995-2001
Oceania	North America East	1,045	969	833	1,064	720	502	393	(15.0)
North America West	Middle East	297	276	355	639	487	318	389	4.6
South East Asia	North America East	454	447	340	392	579	505	355	(4.0)
Oceania	North America Gulf	502	522	548	620	521	434	344	(6.1)
Central America West	Caribbean Basin	63	183	90	101	248	148	318	30.9
Far East	Central America East	54	114	102	403	306	483	318	34.4
North America West	North America Gulf	68	34	23	40	52	23	303	28.4
Far East	South America East	297	312	282	269	266	215	300	0.2
Oceania	Europe	272	274	191	140	282	220	218	(3.6)
North America West	Caribbean Basin	161	224	143	220	279	197	216	5.0
South America West	Africa	102	156	122	111	120	136	107	0.9
Central America West	South America East	240	226	285	297	118	131	75	(17.5)
Central America West	Central America East	25	84	185	222	-	15	75	20.4
Oceania	Central America East	67	123	97	66	80	90	53	(3.9)
North America West	Central America East	2	15	39	84	117	10	39	58.8
Oceania	Caribbean Basin	-	-	-	21	62	58	35	n.a.
Other Pacific to Atlantic Routes		243	533	534	489	191	477	55	(21.9)
Total Pacific to Atlantic Routes		34,327	36,715	37,837	44,406	39,521	40,750	41,158	3.1
Total All Routes		69,741	73,703	73,117	76,149	69,233	67,103	65,070	(1.1)

Source: Autoridad de Canal de Panama

Figure 3-1. All Dry Bulk: Panama Canal Trade by Direction of Transit, 1995–2001



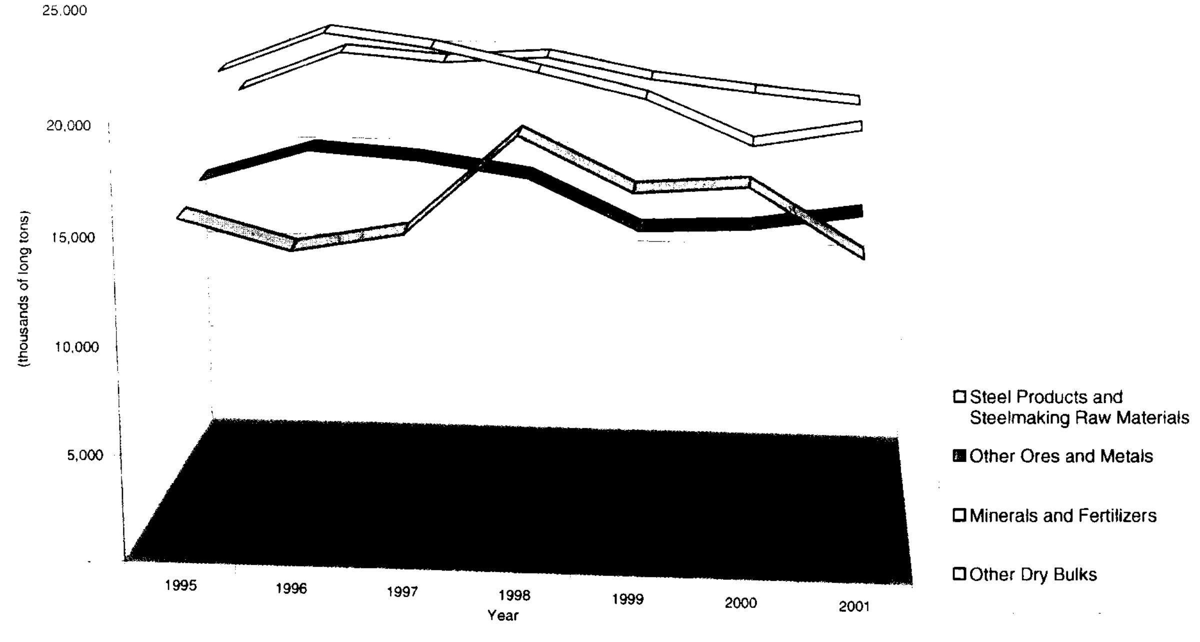
SOURCE: Autoridad de Canal de Panamá

Table 3-2. All Dry Bulk: Historical Canal Trade by Commodity, 1995 through 2001 (thousands of long tons)

	Actual							Annual Average Growth Rate (%)
Commodity	1995	1996	1997	1998	1999	2000	2001	1995-2001
Steel Products and Steelmaking Raw Materials								
Semifinished and Finished Steel	9,198	8,334	8,217	13,487	11,707	12,006	8,772	(0.8)
Metallurgical coke	3,431	3,141	3,542	3,350	3,507	3,885	2,137	(7.6)
Iron Ore	776	551	933	683	564	537	1,525	11.9
Iron and Steel Scrap	1,744	1,837	1,853	991	864	672	1,480	(2.7)
Iron Metal	374	293	467	1,014	448	343	405	1.3
Total Steel Products and Steelmaking Raw Materials	15,524	14,157	15,012	19,525	17,090	17,443	14,320	(1.3)
Other Ores and Metals								
Thermal and Metallurgical Coal	7,793	8,297	7,805	6,196	5,692	5,576	5,842	(4.7)
Misc. Ores	4,208	4,353	4,556	4,477	2,674	3,091	2,786	(6.6)
Refined Copper	607	654	940	1,404	1,855	1,927	2,012	22.1
Copper concentrates	899	1,401	986	796	956	916	1,536	9.3
Zinc concentrates	971	1,162	1,324	1,082	832	877	800	(3.2)
Bauxite and Alumina	564	775	820	1,104	583	687	712	4.0
Zinc Metal	107	175	102	438	412	304	537	30.8
Misc. Metals	152	306	160	167	343	476	501	22.0
Primary Aluminum	726	421	472	760	736	410	266	(15.4)
Total Other Ores and Metals	16,027	17,543	17,165	16,425	14,083	14,265	14,992	(1.1)
Minerals and Fertilizers								
Misc. Fertilizers	4,533	5,146	5,416	5,199	7,569	8,353	7,602	9.0
Salt	2,613	3,974	3,625	2,972	2,960	3,380	5,040	11.6
Phosphates	9,519	9,673	8,253	7,536	5,417	2,560	2,469	(20.1)
Sulphur	2,036	1,999	2,740	2,591	1,388	1,205	1,217	(8.2)
Urea	630	353	560	1,006	757	625	630	(0.0)
Soda Ash	442	578	530	413	597	385	563	4.1
Nitrates	271	229	188	516	401	463	286	0.9
Total Minerals and Fertilizers	20,044	21,954	21,311	20,233	19,089	16,972	17,807	(2.0)
Other Dry Bulks								
Lumber	6,512	7,157	7,142	6,234	6,177	5,783	4,629	(5.5)
Petroleum coke	2,492	3,040	2,227	3,444	3,200	2,732	3,646	6.5
Pulp	4,090	3,881	4,130	3,336	3,367	3,463	3,322	(3.4)
Sugar	3,115	3,472	3,301	3,202	2,870	2,828	2,868	(1.4)
Cement	562	792	1,300	1,985	2,095	2,444	2,131	24.9
Paper	1,375	1,709	1,530	1,766	1,262	1,174	1,356	(0.2)
Total Other Dry Bulks	18,146	20,050	19,629	19,967	18,970	18,424	17,952	(0.2)
Total All Commodities	69,741	73,703	73,117	76,149	69,233	67,103	65,070	(1.1)

Source: Autoridad de Canal de Panama

Figure 3-2. Dry Bulk: Panama Canal Trade by Commodity Category, 1995 through 2001



SOURCE: Autoridad de Canal de Panamá

FORECAST OF POTENTIAL CANAL TRADE

Forecasts of potential Canal trade for dry bulk commodities were prepared based on the approach and methodology discussed in Section 1. For purposes of the study, the term "potential Canal trade" refers to our estimate of the maximum market share that the Canal could capture of world trade assuming a value of zero for Panama Canal tolls. *Volume 5: Marketing Strategy* identifies and analyzes the impact of alternative Canal toll structures and rates on forecast of Canal traffic.

In the following sections we present forecasts to 2025 of potential canal trade for dry bulk commodities first by direction of Canal transit and then by commodity category and commodity. This is followed by a discussion of potential Canal capture of current Canal bypass routes and a review of the share of forecast world trade that is potential canal trade for each commodity.

Direction of Panama Canal Transit and Route

Potential canal trade for dry bulk commodities is forecasted to increase from 77.4 million tons in 2000 to 85.1 million tons by 2010 and to reach 93.5 million tons in 2025 (Table 3-3 and Figure 3-3).

Table 3-3. All Dry Bulk: Potential Canal Trade by Direction of Canal Transit and Route Estimated 2000 and 2001 and Projected 2005 through 2025 (thousands of long tons)

		Estimated		Projected					Annual Average Growth Rate (%)				
Origin Region	Destination Region	2000	2001	2005	2010	2015	2020	2025	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Atlantic to Pacific Routes													
North America Gulf	Far East	7.289	7.462	8,253	9,083	9,597	10,193	10,722	2.5	1.9	1.1	1.2	1.0
North America East	Far East	5,999	6,136	6,746	6,346	5,826	6,202	6,548	2.4	(1.2)	(1.7)	1.3	1.1
South America East	North America West	3,068	2,793	2,152	2,588	2,995	2,945	2,443	(6.8)	3.8	3.0	(0.3)	(3.7)
Europe	North America West	2,092	2,046	1,895	1,740	1,870	588	587	(2.0)	(1.7)	1.4	(20.7)	(0.0)
South America East	South America West	1,722	1,714	1,740	1,924	2,008	1,788	1,602	0.2	2.0	0.9	(2.3)	(2.2)
Central America East	Far East	301	373	1,403	524	469	511	555	36.1	(17.9)	(2.2)	1.7	1.7
Europe	South America West	1,159	1,169	1,217	948	1,138	294	265	1.0	(4.9)	3.7	(23.7)	(2.1)
North America Gulf	Oceania	1,290	1,271	1,203	1,285	1,305	1,319	1,333	(1.4)	1.3	0.3	0.2	0.2
Europe	Central America West	1,073	1,041	935	851	936	439	56	(2.7)	(1.9)	1.9	(14.1)	(33.8)
South America East	Far East	846	838	813	1,009	952	1,445	1,530	(0.8)	4.4	(1.1)	8.7	1.1
North America East	Central America West	831	728	785	756	784	909	1,040	(1.1)	(0.8)	0.7	3.0	2.7
South America East	Central America West	552	550	684	948	1,382	1,903	1,974	4.4	6.8	7.8	6.6	0.7
Caribbean Basin	Far East	491	512	607	682	649	662	677	4.3	2.4	(1.0)	0.4	0.4
North America Gulf	Central America West	868	565	593	590	588	588	392	(7.4)	(0.1)	(0.1)	-	(7.8)
North America Gulf	South America West	450	460	506	572	490	408	424	2.4	2.5	(3.1)	(3.6)	0.8
Africa	Oceania	477	470	445	428	481	534	534	(1.4)	(0.8)	2.4	2.1	-
North America East	South America West	340	346	376	433	489	540	581	2.1	2.9	2.4	2.0	1.5
North America East	North America West	304	308	324	356	394	438	479	1.3	1.9	2.0	2.1	1.8
Caribbean Basin	Central America West	277	280	300	351	396	472	539	1.6	3.2	2.5	3.6	2.7
Central America East	South America West	272	269	260	230	123	45	25	(0.9)	(2.4)	(11.7)	(18.1)	(11.2)
North America Gulf	South East Asia	226	229	246	281	306	320	324	1.7	2.7	1.7	0.9	0.2
Africa	North America West	152	148	154	175	297	324	290	0.2	2.6	11.2	1.7	(2.2)
Caribbean Basin	South America West	95	102	139	26	27	28	29	7.9	(28.4)	0.9	0.8	0.6
Africa	Central America West	96	97	103	118	130	139	144	1.5	2.7	1.9	1.3	0.8
Other Atlantic to Pacific Routes		367	296	200	352	648	559	930	(11.4)	12.0	13.0	(2.9)	10.7
Total Atlantic to Pacific Routes		30,636	30,205	32,077	32,595	34,280	33,594	34,022	0.9	0.3	1.0	(0.4)	0.3
Pacific to Atlantic Routes													
North America West	Europe	9,698	9,763	10,146	11,341	12,049	12,512	12,406	0.9	2.3	1.2	0.8	(0.2)
Far East	North America East	6,953	6,683	6,435	6,344	5,180	5,146	5,002	(1.5)	(0.3)	(4.0)	(0.1)	(0.6)
Far East	North America Gulf	5,673	5,642	5,736	5,769	4,900	4,964	4,794	0.2	0.1	(3.2)	0.3	(0.7)
South America West	Europe	4,518	4,042	4,713	6,263	7,418	8,245	8,444	0.9	5.9	3.4	2.1	0.5
South America West	North America East	3,419	3,223	2,927	3,515	3,801	3,918	3,964	(3.1)	3.7	1.6	0.6	0.2
Central America West	North America East	1,878	1,828	2,581	2,549	2,097	1,940	2,237	6.6	(0.3)	(3.8)	(1.5)	2.9
Oceania	North America East	2,105	2,136	2,347	3,115	3,444	3,625	3,773	2.2	5.8	2.0	1.0	0.8
North America West	South America East	1,805	1,837	2,040	2,173	2,075	3,114	3,377	2.5	1.3	(0.9)	8.5	1.6
North America West	Africa	1,387	1,356	1,612	1,853	2,033	2,269	2,253	3.0	2.8	1.9	2.2	(0.1)
South America West	Caribbean Basin	1,020	985	917	1,036	1,166	1,283	1,297	(2.1)	2.5	2.4	1.9	0.2
Far East	Central America East	807	799	788	868	879	914	948	(0.5)	2.0	0.3	0.8	0.7
South America West	North America Gulf	580	486	746	981	1,094	1,165	1,275	5.2	5.6	2.2	1.3	1.8
Oceania	North America Gulf	718	716	732	1,018	1,102	1,093	1,070	0.4	6.8	1.6	(0.2)	(0.4)
North America West	Middle East	587	611	729	944	1,119	1,313	1,514	4.4	5.3	3.5	3.2	2.9
Central America West	Europe	1,198	1,041	608	514	576	621	666	(12.7)	(3.3)	2.3	1.5	1.4
South East Asia	South America East	516	531	593	61	-	72	9	2.8	(36.5)	n.a.	n.a.	(34.0)
Central America West	North America Gulf	666	635	563	499	526	554	570	(3.3)	(2.4)	1.1	1.0	0.6
South America West	Central America East	313	329	457	487	582	806	998	7.9	1.3	3.6	6.7	4.4
North America West	North America East	399	405	440	443	474	507	534	2.0	0.1	1.3	1.4	1.0
South East Asia	North America East	292	312	405	536	696	885	1,089	6.7	5.8	5.4	4.9	4.2
Central America West	Africa	210	239	400	255	300	350	400	13.8	(8.6)	3.3	3.1	2.7
South East Asia	North America Gulf	481	447	378	509	692	892	1,007	(4.7)	6.2	6.3	5.2	2.5
Central America West	South America East	68	74	349	334	299	249	250	38.7	(0.9)	(2.2)	(3.6)	0.0

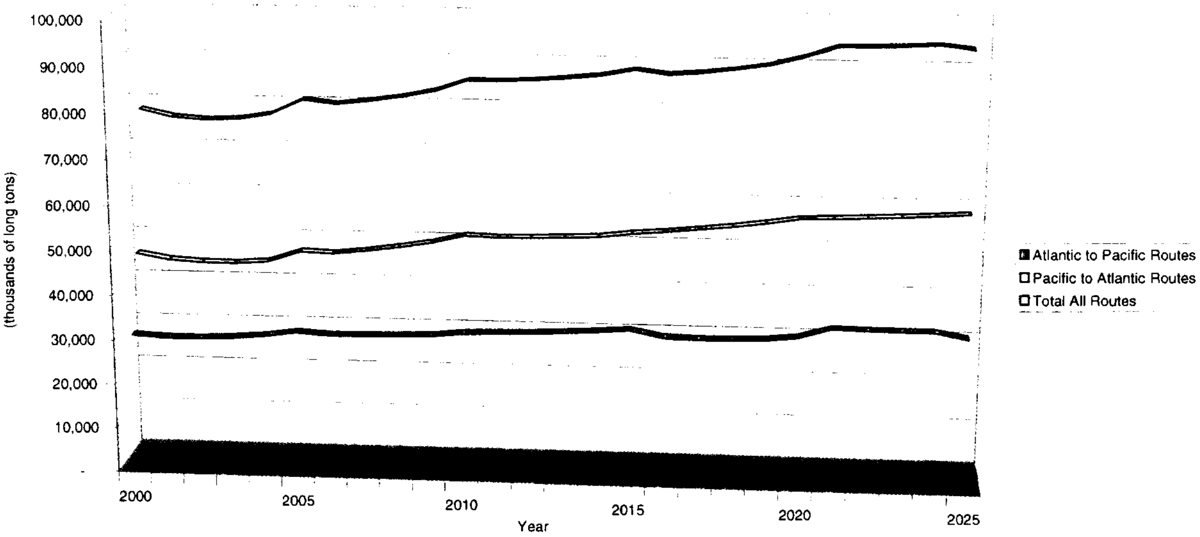
Table 3-3 (Continued)

		Estimated		Projected					Annual Average Growth Rate (%)				
Origin Region	Destination Region	2000	2001	2005	2010	2015	2020	2025	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
South America West	South America East	316	313	300		-		-	(1 0)	n a.	n.a.	n.a.	n a
North America West	Caribbean Basin	221	216	300	151	155	154	146	6 3	(12.9)	0.6	(0.2)	(1 0)
Central America West	Central America East	221	233	290	200	255	305	370	5.6	(7.2)	5.0	3.6	3 9
Far East	South America East	236	241	259	282	256	279	303	1.9	1.7	(1.9)	1 7	1 7
Far East	Caribbean Basin	273	257	207	227	245	266	287					
North America West	Central America East	178	179	190	204	182	182	192	1.3	1.5	(2.2)	(0.1)	1 1
South America West	Africa	86	85	143	138	140	139	178	10.7	(0.7)	0.3	(0.1)	5.0
Central America West	Caribbean Basin	99	101	112	49	58	68	77	2.7	(15.2)	3.2	3.3	2.7
Oceania	Central America East	92	86	101	111	120	124	127	1.9	1.9	1.7	0.6	0 5
South America West	Middle East	-	-	-	-	104	127	136	n.a.	n.a.	n.a.	4.1	1.4
Other Pacific to Atlantic Routes		81	81	86	96	107	118	129	1.4	2.2	2.1	2.0	
Total Pacific to Atlantic Routes		47,093	45,911	48,258	52,538	53,805	57,886	59,523	0.5	1.7	0.5	1.5	0.6
Total All Routes		77,729	76,116	80,335	85,133	88,085	91,480	93,545	0.7	1.2	0.7	0.8	0.4

a. Potential canal trade assuming no canal tolls.

Source: Estimated 2000 and 2001 and projected 2005 through 2025 prepared by Nathan Associates Inc.

Figure 3-3. All Dry Bulk: Potential Canal Trade[a] by Direction of Transit, Estimated 2000 and 2001 and Projected 2002 through 2025



a. Potential canal trade assuming no tolls.

SOURCE: Estimated 2000 and 2001 and projected 2005 through 2025 prepared by Nathan Associates Inc.

This represents an annual average growth of 0.9 percent from 2000 to 2010 and of 0.6 percent from 2010 to 2025.

Nearly 80 percent of the increase in Canal potential trade for dry bulk commodities during this period is forecasted to occur on Pacific to Atlantic routes that will grow from an estimated 46.7 million tons in 2000 to 59.5 million tons by 2025. Growth of potential Canal trade for dry bulk commodities on Atlantic to Pacific routes will be marginal, increasing from 30.6 million tons in 2000 to 34.0 million tons by 2025.

In general, the growth of trade is forecasted to occur on current Canal principal routes. Noteworthy is the growth forecasted on the route from South America West to Europe that is projected to increase from 4.5 million tons in 2000 to 8.4 million tons in 2025. Key commodities on this route are refined copper, copper concentrates and zinc concentrates.

Commodity Categories and Commodities

The other dry bulk commodity category, driven by the increase in potential Canal trade of lumber, petroleum coke and paper trade will become the largest commodity category by 2004. Potential Canal trade for this commodity category is forecasted to increase by 40 percent during the 2000–2025 period from 20.9 million tons in 2000 to 29.2 million tons in 2025.

Potential Canal trade for the commodity categories "Other Ores and Metals and "Minerals and Fertilizers" will each grow from around 16 million tons in 2000 to 22.8 million tons and 21.1 million tons by 2025.

Despite a gradual but steady decline forecasted throughout the 2000–2025, semi-finished and finished steel will remain as the dry bulk commodity with the largest volume of Panama Canal trade, with 14.7 million tons in 2010 and 13.5 in 2025. As noted above, potential Canal trade for lumber will exhibit the largest growth during the forecast period, doubling from 5.7 million tons in 2000 to 11.4 million tons by 2025. The growth in potential Canal trade for lumber is forecast predominantly on the routes to the Far East from the U.S. Gulf and North America East and from South East Asia to the U.S. Gulf and North America East.

Potential Canal trade of thermal and metallurgical coal is forecast to decline gradually but steadily from 6.8 million tons in 2000 to 5.5 million tons in 2010 and 4.5 million tons in 2025. This reflects the expected continuing decline in shipments of metallurgical coal from North American suppliers.

Potential Capture of Canal Bypass Routes

Canal bypass trades are those undertaken by vessels larger than those that can use the Canal at its current dimensions and which, on the basis of mileage considerations, could use an expanded or restricted Canal. At present, the only bypass trades involve all-water routes.

For certain commodities there can be no bypass trade. For most concentrates and refined products of base metals, for example, the volumes shipped, relative to the sizes of producers and consumers, are too small ever to justify using vessels larger than those currently transiting the Canal with these products. All dry bulk trades that would logically transit the Panama Canal from a straightforward mileage perspective already do so. This is a reflection of the historical importance of the U.S. and/or South American market in trades of certain dry commodities—for example, copper, zinc and their concentrates—and the associated constraints on vessel size imposed by the Canal itself and U.S. or Latin American ports.

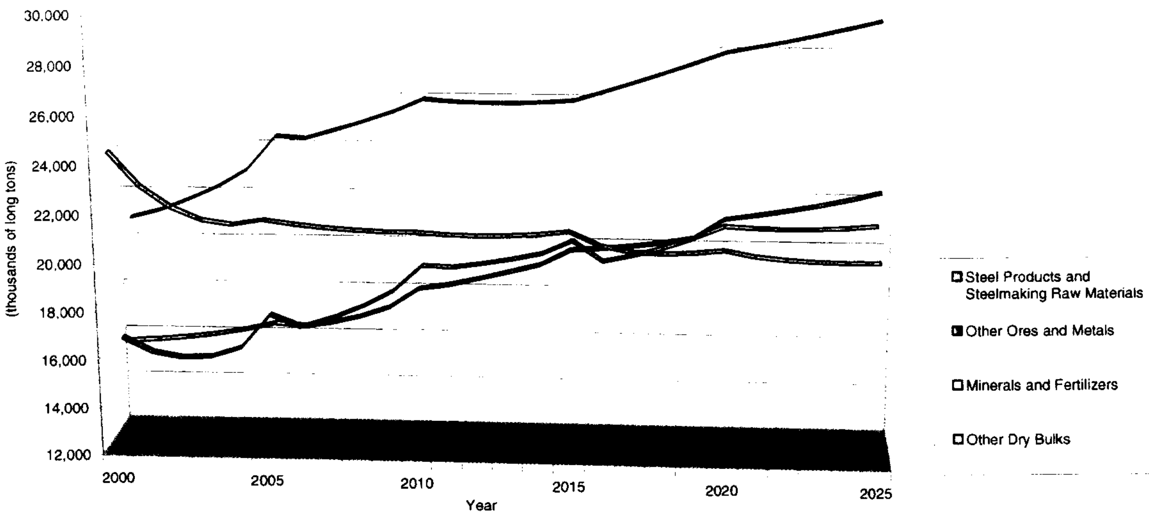
Table 3-4. All Dry Bulk: Potential Canal Trade by Commodity Category and Commodity Estimated 2000 and 2001 and Projected 2005 through 2025 (thousands of long tons)

	Estimated		Projected					Annual Average Growth Rate (%)				
Commodity	2000	2001	2005	2010	2015	2020	2025	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Steel Products and Steelmaking Raw Materials												
Semifinished and Finished Steel	18.698	17,184	15.125	14,714	14,610	13,889	13,547	(4.2)	(0 5)	(0 1)	(1.0)	(0.5)
Metallurgical Coke	3,866	3 946	4,281	4.130	3,985	3,834	3,644	2 1	(0.7)	(0.7)	(0 8)	(1 0)
Iron and Steel Scrap	622	694	1,109	1.102	1,351	1,467	1,572	12.3	(0.1)	4 2	1 7	1 4
Iron Ore	1,129	1.104	1,071	1,177	1,284	1,393	1,393	(1 0)	1 9	1.8	1.6	-
Iron Metal	149	151	162	176	187	177	169	1.7	1.7	1 2	(1.1)	(0.9)
Total Steel Products and Steelmaking Raw Materials	24,464	23,080	21,748	21,299	21,417	20,760	20,325	(2.3)	(0 4)	0.1	(0.6)	(0.4)
Other Ores and Metals												
Thermal and Metallurgical Coal	6,841	6,748	6,509	5,481	5,320	4,831	4,490	(1.0)	(3.4)	(0.6)	(1 9)	(1.5)
Copper Concentrates	1,788	1,406	2,645	2,880	3,031	3,089	3,081	8.1	1.7	1.0	0.4	(0.1)
Bauxite and Alumina	1,818	1,894	2,233	2,852	3,197	3,424	3,617	4.2	5.0	2.3	1.4	1.1
Refined Copper	1,826	1,833	1,878	2,889	3,607	4,231	4,907	0.6	9.0	4.5	3.2	3.0
Misc. Ores	1,555	1,527	1,755	1,780	1,888	2,006	2,132	2.5	0.3	1.2	1 2	1 2
Zinc concentrates	1,751	1,626	1,491	1,975	2,387	2,605	2,890	(3.2)	5.8	3.9	1.8	2.1
Misc. Metals	382	375	404	330	394	477	542	1.1	(4 0)	3.6	3.9	2.6
Primary Aluminum	393	390	380	380	380	867	957	(0.7)	-	-	17.9	2.0
Zinc Metal	94	40	201	94	153	177	215	16.4	(14.1)	10.2	3.0	4.0
Total Other Ores and Metals	16,448	15,839	17,496	18,661	20,357	21,707	22,831	1.2	1.3	1 8	1.3	1.0
Minerals and Fertilizers												
Phosphates	6,533	6,644	7,148	7,689	7,715	7,435	7,640	1.8	1.5	0.1	(0.7)	0.5
Salt	3,392	3,291	3,005	3,490	3,175	2,955	3,025	(2.4)	3.0	(1.9)	(1.4)	0.5
Misc. Fertilizers	1,783	1,822	2,052	2,429	2,694	2,907	2,738	2.9	3.4	2.1	1.5	(1.2)
Urea	1,688	1,670	1,702	1,500	2,000	1,350	1,050	0.2	(2.5)	5.9	(7.6)	(4.9)
Sulphur	1,524	1,498	1,405	1,585	1,800	2,050	2,050	(1 6)	2.4	2.6	2.6	-
Soda Ash	667	727	1,046	2,153	2,525	3,845	4,058	9.4	15.5	3.2	8.8	1 1
Nitrates	359	358	413	435	499	549	614	2.8	1.0	2.8	1.9	2.3
Total Minerals and Fertilizers	15,946	16,011	16,771	19,281	20,408	21,091	21,175	1.0	2.8	1.1	0 7	0 1
Other Dry Bulks												
Lumber	5,717	5,844	6,394	7,552	8,819	10,149	11,422	2.3	3.4	3.1	2.9	2.4
Cement	3,971	4,143	5,976	6,168	4,285	4,119	3,963	8.5	0.6	(7.0)	(0.8)	(0.8)
Petroleum coke	3,924	4,051	4,610	4,912	5,196	5,472	5,758	3.3	1.3	1.1	1.0	1.0
Pulp	3,399	3,392	3,370	3,347	3,330	3,298	3,191	(0.2)	(0.1)	(0.1)	(0.2)	(0.7)
Sugar	2,775	2,647	2,747	2,483	2,628	3,017	2,815	(0.2)	(2.0)	1.1	2.8	(1.4)
Paper	1,085	1,111	1,224	1,427	1,645	1,867	2,065	2.5	3.1	2.9	2.6	2.0
Total Other Dry Bulks	20,871	21,186	24,320	25,890	25,902	27,922	29,213	3.1	1.3	0.0	1.5	0.9
Total All Commodities	77,729	76,116	80,335	85,132	88,085	91,480	93,545	0.7	1.2	0.7	0.8	0.4

a. Potential canal trade assuming no canal tolls.

Source: Estimated 2000 and 2001 and projected 2005 through 2025 prepared by Nathan Associates Inc.

Figure 3-4. All Dry Bulk: Potential Canal Trade[a] by Commodity Category, Estimated 2000 and 2001 and Projected 2002-2025



a. Potential canal trade assuming no tolls.

SOURCE: Estimated 2000 and 2001 and projected 2005 through 2025 prepared by Nathan Associates Inc.

Potential bypass trades—to which cargoes could be switched from the Canal under existing conditions and from which trade could be captured for the expanded Canal—have been identified by first noting all trades for which a Canal transit represents the shortest route. This covers existing trades, those that could be regained having been diverted from the Canal under existing conditions, those that could be induced by expansion of the Canal (possible shipments of iron ore in Cape-size vessels), and possibly new trades.

Table 3-5 presents the bypass routes and commodities that were considered for the potential Canal trade forecast. Likely shifts between Canal and bypass routes for the potential trade forecast was determined based on an analysis of current and forecasted vessel sizes used in the specific trades and the corresponding vessel economics. The methodology and results of these determinations are described in detail in *Volume 3: Vessel Transit and Fleet Analysis.*

Iron ore and thermal and metallurgical coal are the two commodities that were identified as Canal bypass trades. In 2001, an estimated 22.2 million tons of iron ore was shipped on Canal bypass routes, 85 percent of which was for the South America East to Far East route. Bypass trade shipments from Brazil-North to the Far East totaled 15.8 million tons in 2001. Note that shipments from southern Brazil to the Far East are not considered as Canal bypass routes as the route through the Panama Canal is not shorter than alternative routes.

More than 75 percent of the 8.4 million tons of thermal and metallurgical coal identified as Canal bypass trade was from North America West to Europe. Another important route for thermal and metallurgical coal is North America West to South America East (1.4 million tons).

Table 3-5. Bypass Trade: Routes Considered for Panama Canal Potential Trade Estimated 2000 and 2001 and Projected 2005 through 2025 (thousands of long tons)

			Estimated		Projected					Annual Average Growth Rate				
Origin Region and Country	Destination Region and Country	Commodity	2000	2001	2005	2010	2015	2020	2025	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
South America East	Far East													
Brazil North	China & Hong Kong	Iron Ore	4,343	4,971	8,536	10,743	13,008	15,545	15,783	14.5	4.7	3.9	3.6	0.3
Brazil North	Japan	Iron Ore	8,022	7,842	7,162	7,079	7,090	7,240	7,351	(2.2)	(0.2)	0.0	0.4	0.3
Brazil North	S Korea	Iron Ore	3,479	3,571	3,963	4,375	4,831	5,333	5,415	2.6	2.0	2.0	2.0	0.3
Venezuela	China & Hong Kong	Iron Ore	629	714	1,188	1,541	1,895	2,248	2,248	13.6	5.3	4.2	3.5	0.0
Venezuela	Japan	Iron Ore	1,162	1,127	997	1,016	1,033	1,047	1,047	(3.0)	0.4	0.3	0.3	0.0
Venezuela	S Korea	Iron Ore	504	513	551	628	704	771	771	1.8	2.7	2.3	1.8	0.0
Venezuela	Taiwan	Iron Ore	161	164	177	201	225	247	247	1.9	2.6	2.3	1.9	0.0
Colombia	Japan	Thermal and Metallurgical Coal	79	77	69	69	69	69	69	(2.7)	0.0	0.0	0.0	0.0
		All Products	18,379	18,980	22,643	25,652	28,855	32,500	32,931	4.3	2.5	2.4	2.4	0.3
North America West	Europe													
West Coast Canada	Europe	Thermal and Metallurgical Coal	6,000	5,903	5,529	4,864	4,752	4,607	4,468	(1.6)	(2.5)	(0.5)	(0.6)	(0.6)
West Coast USA	Europe	Thermal and Metallurgical Coal	573	550	465	436	419	399	379	(4.1)	(1.3)	(0.8)	(1.0)	(1.0)
		All Products	6,573	6,452	5,994	5,300	5,171	5,006	4,847	(1.8)	(2.4)	(0.5)	(0.6)	(0.6)
Oceania	North America East	Thermal and Metallurgical Coal	-	-	2,242	2,203	4,481	1,661	1,481	n.a.	(0.4)	15.3	(18.0)	(2.3)
North America East	Far East													
East Coast Canada	China & Hong Kong	Iron Ore	683	772	1,264	1,640	2,016	2,392	2,392	13.1	5.3	4.2	3.5	0.0
East Coast Canada	Japan	Iron Ore	808	793	737	751	763	774	774	(1.8)	0.4	0.3	0.3	0.0
East Coast Canada	S Korea	Iron Ore	448	432	372	403	430	448	448	(3.6)	1.6	1.3	0.8	0.0
		All Products	1,939	1,997	2,373	2,794	3,209	3,614	3,614	4.1	3.3	2.8	2.4	0.0
North America West	South America East	Thermal and Metallurgical Coal	1,431	1,405	1,305	1,154	1,186	1,090	1,055	(1.8)	(2.4)	0.5	(1.7)	(0.7)
Oceania	Central America East	Thermal and Metallurgical Coal	-	-	689	707	743	764	771	n.a.	0.5	1.0	0.6	0.2
North America East	Oceania													
East Coast USA	Oceania	Iron Ore	736	709	612	662	706	736	736	(3.6)	1.6	1.3	0.8	0.0
South America West	Caribbean Basin													
Chile	Caribbean Basin	Iron Ore	347	370	479	545	611	670	670	6.7	2.6	2.3	1.9	0.0
North America West	Africa	Thermal and Metallurgical Coal	442	434	403	356	348	337	326	(1.8)	(2.4)	(0.5)	(0.6)	(0.7)
South America West	North America East													
Chile	East Coast USA	Iron Ore	133	134	138	131	126	129	129	0.7	(1.0)	(0.8)	0.5	0.0
Peru	East Coast USA	Iron Ore	73	76	92	88	84	87	87	4.7	(0.9)	(0.9)	0.7	0.0
		All Products	206	210	230	219	210	216	216	2.2	(1.0)	(0.8)	0.6	0.0
Total			30,053	30,558	36,970	39,592	45,520	46,594	46,647	4.2	1.4	2.8	0.5	0.0

a. Potential canal trade assuming no canal tolls.

Source: Prepared by Nathan Associates and CRU International Ltd based on data sources described in text.

Overall the Canal bypass trades are projected to increase from 30.0 million tons in 2001 to 39.5 million tons in 2010 and to reach 46.6 million tons by 2020.

As described fully in *Volume 3, Vessel Transit and Fleet Analysis,* data were obtained on iron ore and coal sailings from a number of export terminals, which are currently the sources of bypass trades, and analyses undertaken to determine vessel size distributions and utilization levels on these routes. As the result of the analyses the conclusions are that only trade shown in Table 3-6 on the following routes would switch to the Expanded Canal.

Table 3-6 By Pass Trades Switched to the Canal Under Expanded Canal Conditions, Most Probable Case, No Tolls, Selected Years 2010-2025 (000 Tons)

Origin	Destination	Commodity	2010	2015	2020	2025
East Coast Canada	Korea	Iron Ore	-	-	448	448
East Coast Canada	Japan	Iron Ore	-	-	774	774
Venezuela	Taiwan	Iron Ore	201	225	247	247
Venezuela	China & Hong Kong	Iron Ore	-	-	809	809
Venezuela	Korea	Iron Ore	-	-	771	771
Venezuela	Japan	Iron Ore	-	-	1,047	1,047
West Coast Canada	Europe	Thermal and Metallurgical Coal	2,510	2,449	2,371	2,295
Oceania	North America East	Thermal and Metallurgical Coal	805	1,638	1,661	1,481
Oceania	North America Gulf	Thermal and Metallurgical Coal	2,485	2,344	2,202	1,964
Oceania	Central America East	Thermal and Metallurgical Coal	707	743	764	771
West Coast Canada	North Africa	Thermal and Metallurgical Coal	159	155	150	145
Total			6,867	7,554	11,244	10,753

Source: Richardson Lawrie Associates

Potential Canal Trade Share of World Trade

For most dry bulk commodities, trade through the Panama Canal represents a small fraction of global world trade. Table 3-7 presents global world trade for each commodity category and commodity for 2000 and 2001 and projected to 2025. The overall volume of world trade for these dry bulk commodities is staggering, with 2.1 billion tons of trade recorded in 2001. Five commodities, thermal and metallurgical coal, iron ore, semi-finished and finished steel, cement and pulp account for 78 percent of world dry bulk trade.

Table 3-8 presents the percentage share that our estimated potential canal trade represents of world trade for each commodity category and commodity. Overall, the share of potential canal trade for all dry bulk commodities is around 3 percent; if thermal and metallurgical coal and iron ore are excluded, the share is still only around 6 percent.

Nonetheless, potential Canal traffic does constitute a significant portion of world trade for some commodities, such as refined copper and nitrates (35 percent each), zinc concentrates (24 percent),and metallurgical coke and petroleum coke (15 percent each). During the forecast period, potential Canal trade will continue to constitute an important portion of world trade. In addition, potential Canal trade will become increasingly important for commodities such as soda ash (25 percent by 2025) and copper concentrates (18 percent in 2005).

BEST AND WORST CASE RESULTS

In Section 1, we described the three global macroeconomic and trade scenarios prepared by DRI-WEFA. The three macroeconomic scenarios—most probable case scenario, best case and worst case—incorporate varying assumptions on world economic performance, geopolitical conditions, international trade policies, and environmental issues. We have used the GDP forecasts by country and region from DRI-WEFA for the Best Case and Worst Case scenarios[13] along with estimates of the demand elasticity relative to GDP for each commodity to prepare the Best Case and Worst Case forecasts of potential Canal trade.[14] A benefit of this approach is that it provides a consistent basis across all of the dry bulk commodities for the preparation of the Best and Worst case forecasts. The estimates of elasticity of demand relative to GDP were prepared by the CRU International commodity specialists taking into account a generalized historical relationship observed between demand and GDP.

The forecast of each commodities consumption, production and trade for the Best and Worst case scenarios were prepared based on CRU's forecast for the Most Probable Case adjusted for changes in consumption for each dry bulk commodity using the elasticity of demand relative to GDP. For the Best and Worst case scenarios, changes in consumption thus calculated were then used to determine changes in import demand from the Most Probable case. The new import demand was then allocated among export sources in accordance with CRU's forecast of trade flows for the Most Probable case.

Figure 3-5 presents a summary of potential Canal trade results by direction of transit for each of the three global macroeconomic and trade scenarios.

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[13] The WEFA-DRI forecasts of GDP by country for the Best Case and Worst Case were aggregated into the set of regions and countries used in this study.

[14] The following elasticity of demand relative to GDP were used: aluminum, alumina, bauxite and calcined petroleum coke, 0.97; copper, 0.40; zinc, 0.80; steel, iron ore, metallurgical coke, scrap iron, pig iron, DRI-HBI, and metallurgical coal, 0.93; non-calcined petroleum coke, 1.00; thermal coal, 1.05; cement, 0.80; sulfur and soda ash, 0.60 salt, 0.56; urea, 0.20, phosphates, 0.08.

Table 3-7. All Dry Bulk: World Trade by Commodity Category and Commodity Actual 2000 and 2001 and Projected 2005 through 2025 (thousands of metric tons)

	Actual		Projected				
Commodity	2000	2001	2005	2010	2015	2020	2025
Steel Products and Steelmaking Raw Materials							
Semifinished and Finished Steel	326,745	294,122	316,868	353,835	393,511	421,845	451,908
Iron Ore	485,994	482,158	529,302	602,558	675,481	740,493	805,265
Metallurgical Coke	28,663	25,749	28,630	28,407	28,222	28,029	27,856
Iron and Steel Scrap	64,870	65,639	71,849	81,364	90,109	96,231	101,176
Iron Metal	17,758	19,229	21,103	23,500	26,062	29,486	33,332
Total Steel Products and Steelmaking Raw Materials	924,030	886,898	967,752	1,089,664	1,213,386	1,316,085	1,419,536
Other Ores and Metals							
Thermal and Metallurgical Coal	557,760	599,056	631,677	686,326	720,631	756,494	794,904
Primary Aluminum	7,900	9,488	7,345	9,003	10,445	11,765	12,802
Bauxite and Alumina	44,494	45,470	54,392	70,532	79,097	85,552	88,616
Refined Copper	4,728	5,140	5,802	7,577	9,108	10,496	12,312
Copper Concentrates	12,106	12,593	14,886	19,049	21,457	24,602	28,543
Zinc Metal	2,120	2,295	2,250	2,425	2,670	3,170	3,781
Zinc Concentrates	6,811	6,775	6,935	7,690	9,175	11,210	13,655
Total Other Ores and Metals	635,919	680,818	723,286	802,601	852,582	903,289	954,613
Minerals and Fertilizers							
Nitrates	1,063	1,033	1,260	1,443	1,658	1,862	2,075
Phosphates	21,153	20,491	23,687	26,901	30,325	33,692	37,067
Sulphur	20,261	21,591	24,425	27,559	31,923	36,240	40,337
Salt	38,005	38,118	40,290	43,665	47,257	50,643	54,218
Soda Ash	8,364	7,093	8,397	10,972	12,720	14,320	16,003
Urea	27,302	25,234	32,565	42,903	53,673	61,306	69,060
Total Minerals and Fertilizers	116,149	113,560	130,624	153,443	177,557	198,062	218,760
Other Dry Bulks							
Sugar	36,319	36,666	45,079	49,016	53,152	57,579	62,103
Cement	129,291	131,381	140,214	152,395	165,958	181,040	197,796
Petroleum coke	24,146	26,804	28,807	31,117	33,111	34,968	36,883
Lumber	56,207	55,671	65,248	79,624	96,727	116,496	137,928
Paper	46,272	46,519	51,758	59,697	68,132	76,656	84,046
Pulp	112,444	112,996	118,428	123,189	128,932	134,604	137,691
Total Other Dry Bulks	404,679	410,036	449,534	495,038	546,011	601,343	656,447
Total All Commodities	2,080,777	2,091,313	2,271,197	2,540,747	2,789,536	3,018,779	3,249,356

Source: Prepared by Nathan Associates and CRU International Ltd based on data sources described in text.

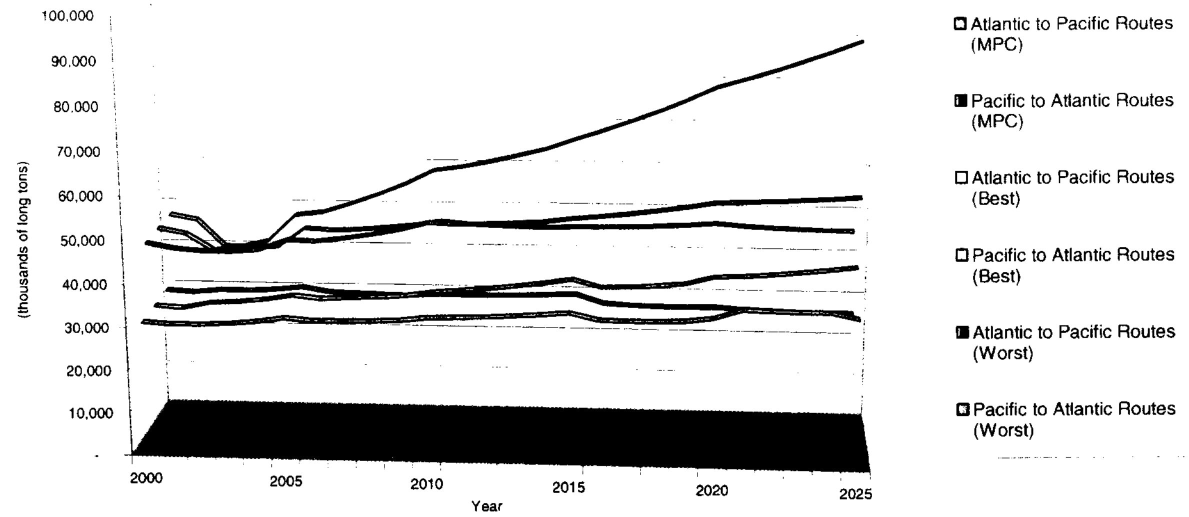
Table 3-8. All Dry Bulk: Potential Canal Trade Share of Total World Trade by Commodity Category and Commodity, Estimated 2000 and 2001 and Projected 2005 through 2025 (percent)

	Estimated		Projected				
Commodity	2000	2001	2005	2010	2015	2020	2025
Steel Products and Steelmaking Raw Materials							
Metallurgical coke	13.5	15.3	15.0	14.5	14.1	13.7	13.1
Semifinished and Finished Steel	5.7	5.8	4.8	4.2	3.7	3.3	3.0
Iron and Steel Scrap	1.0	1.1	1.5	1.4	1.5	1.5	1.6
Iron Metal	0.8	0.8	0.8	0.7	0.7	0.6	0.5
Iron Ore	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Total Steel Products and Steelmaking Raw Materials	2.6	2.6	2.2	1.9	1.7	1.5	1.4
Other Ores and Metals							
Refined Copper	38.6	35.7	32.4	38.1	39.6	40.3	39.9
Zinc Concentrates	25.7	24.0	21.5	25.7	26.0	23.2	21.2
Copper concentrates	14.8	11.2	17.8	15.1	14.1	12.6	10.8
Zinc Metal	4.4	1.8	8.9	3.9	5.7	5.6	5.7
Primary Aluminum	5.0	4.1	5.2	4.2	3.6	7.4	7.5
Bauxite and Alumina	4.1	4.2	4.1	4.0	4.0	4.0	4.1
Thermal and Metallurgical Coal	1.2	1.1	0.8	0.6	0.6	0.5	0.4
Total Other Ores and Metals	2.3	2.0	1.9	1.9	2.0	2.0	2.0
Minerals and Fertilizers							
Nitrates	33.8	34.7	32.8	30.1	30.1	29.5	29.6
Phosphates	30.9	32.4	30.2	28.6	25.4	22.1	20.6
Soda Ash	8.0	10.3	12.5	19.6	19.9	26.9	25.4
Salt	8.9	8.6	7.5	8.0	6.7	5.8	5.6
Sulphur	7.5	6.9	5.8	5.8	5.6	5.7	5.1
Urea	6.2	6.6	5.2	3.5	3.7	2.2	1.5
Total Minerals and Fertilizers	12.2	12.5	11.3	11.0	10.0	9.2	8.4
Other Dry Bulks							
Petroleum coke	16.3	15.1	16.0	15.8	15.7	15.6	15.6
Sugar	7.6	7.2	6.1	5.1	4.9	5.2	4.5
Cement	3.1	3.2	4.3	4.0	2.6	2.3	2.0
Lumber	10.2	10.5	9.8	9.5	9.1	8.7	8.3
Paper	2.3	2.4	2.4	2.4	2.4	2.4	2.5
Pulp	3.0	3.0	2.8	2.7	2.6	2.5	2.3
Total Other Dry Bulks	5.2	5.2	5.4	5.2	4.7	4.6	4.5
Total All Commodities	3.6	3.5	3.3	3.1	2.9	2.8	2.6
Total All Commodities Excluding Thermal and Metallurgical Coal and Iron Ore	6.4	6.4	6.2	5.9	5.5	5.2	5.0

a. Potential canal trade assuming no canal tolls.

Source: Estimated 2000 and 2001 and projected world trade and projected Canal trade for 2005 through 2025 prepared by Nathan Associates Inc.

Figure 3-5. All Dry Bulk, Most Probable, Best and Worst Cases: Potential Canal Trade[a] by Direction of Transit, Estimated 2000 and 2001 and Projected 2002-2025



a. Potential canal trade assuming no tolls.

Source: Estimated 2000 and 2001 and projected 2005 through 2025 prepared by Nathan Associates Inc.

4. Vessel Transit and Fleet Analysis

This section presents the world fleet and freight costs analyses and forecasts for the Existing Canal and an Expanded Canal. This part of the report covers all the forecast variables required to prepare forecasts of potential transits for all cases for the required parameters and to run the *Transit Model*, described in Section 5 of this report.

The objectives of this part of the study center around three inter-related elements. These are:

- World Fleet Analyses and Forecasts
- Seaborne Freight Costs
- Seaborne Cost Differentials

The achievement of these objectives has been facilitated by the development of analytical tools for use in the forecast of freight costs. The world fleet analysis and forecast determines future developments in the size mix of the global dry bulk carrier fleet and creates the framework for analyses of future Panama Canal transit size ranges.

Seaborne freight costs and cost differentials are based on voyage calculations for all routes and size ranges and are the single most important element in the determination of vessel routing decisions and the tolls policy.

This section is organized around the development of the global framework as represented by the development of the world fleet demand and supply forecasts; the capture of the maximum potential trade and traffic assuming no Panama Canal tolls through iterations between trade, traffic, and seaborne freight costs and the development and forecast of these seaborne freight costs.

The section immediately below discusses the approach and methodology for the vessel fleet and voyage cost estimation. The next two subsections present analyses of existing actual and potential Canal trade and traffic. The first of these subsections particularly addresses ACP trade and traffic data as developed for use both by RLA and other study team members while the second addresses bypass traffic. The next two sections consider issues of global and Canal vessel size changes. Two sets of linked analytical tools have been developed, the *Transit Model* and the *Voyage Estimating Model* which have been used to forecast freight costs and transits. The *Voyage Estimating Model* is described in the final part of this section along with the analyses and results. Forecasts of transits are described in Section 4 of this report.

APPROACH AND METHODOLOGY

World Fleet Analysis and Forecast

The approach is expert driven, embracing both statistical analysis and industry insight. It provides forecasts of the world fleet for Existing and Expanded Canal conditions by size and size range. There are four key elements to determination of the projections:

- The first is analyses of trends in the size and size distribution of the current world dry bulk fleet.
- The second is the use of projections of future global trade for key dry bulk commodity groups—both grains and other dry bulks—to determine the future demand supply for dry bulk carriers.
- Thirdly, in addition to historical trends and current newbuilding preferences, the future size break down takes into account potential expansion of the Canal, port developments, the replacement of older vessel by new vessels, changes in cargo quantities on individual routes, consolidation and other changes in trade practices affecting cargo sizes.
- Finally an assessment has been made of the potential impact of an Expanded Canal on the world fleet.

By consolidating grains and other dry bulk trade forecasts, we ensure that one internally consistent framework is created for forecasts of transits of vessels carrying grains and other dry bulk cargoes.

Estimation of Total Seaborne Transport Cost on Canal Routes and Alternatives

In this section we provide estimates of seaborne freight costs by route, ship type and DWT size range for the Existing and Expanded Canals for a range of different circumstances. Firstly this includes both vessels transiting the Canal and vessels on routes that represent alternatives to the Canal. Additionally we have determined whether there are existing routes where cargo moves in vessels that could transit the Existing Canal but are precluded from doing so by current toll policies. Where such routes exist, freight costs have been provided. Finally, freight costs have also been provided where there are new routes and trades that could be attracted by the Expanded Canal. These are based on detailed assessments of dry bulk carrier size ranges and utilization on bypass trades plus freight cost assessments for Canal transits—including light loaded vessels.

Decisions to utilize the Canal are based on marginal economics not long run costs so voyage calculations have been used to determine seaborne freight costs. These calculations use charter market rates rather than fully built up operating costs. Future estimates of charter rates have been linked to expected developments in total operating costs within the *Voyage Estimating Model.*
The data and estimates used in these calculations include voyage mileages, vessel speeds, port times, Canal transit times, DWT utilization factors, fixed operating costs, bunker prices, port charges and capital costs (vessel prices). The voyage calculations are based on representative ports within each region. The impact of structural change on future operating costs has also been assessed.

Determination of Cost Differentials between Existing/Expanded Canals and Alternatives

For both the Existing Canal and the Expanded Canal and for each route pair and size range, freight cost differentials have been calculated for routes through the Canal versus least cost alternative routes for each year 2000–2025. These freight cost differentials are an important element in the development of the toll pricing strategy.

HISTORICAL ANALYSIS OF ACP TRANSITS

In this section, we present the sources and analyses conducted of historical Panama Canal traffic and the methodology and factors used to forecast future vessel characteristics of Canal traffic. Laden transits are reviewed by vessel DWT size range, including direction of transit, route, cargo size distribution, average DWT and DWT utilization. This is followed by an analysis of ballast transits.

Description of the Databases Used

The three databases described below contain the ACP data which were required for the study. To ensure that the study team had the latest data available, including any revisions to earlier versions, ACP were asked to provide the following three databases:

- **Carga.mdb**—contains data from 1973 and was used for the period not covered by the other databases (i.e. for 1973/4 to 1984/5). It consists of one table which contains data on vessel cargoes (vessel ID, transit date, cargo type, origin, destination, tonnage). Vessel characteristics were obtained from the other two databases.
- **SDB85-97.mdb**—contains data from 1985/6 to 1996/7 and was used for the period not covered by SDB94-02.mdb, that is, from 1985/6 to 1993/4. There are three main tables which contain data on vessel details, transits and cargoes. These are linked by vessel number and date. The transit table includes times, operational data, transit parameters and accounting data. The cargoes table, which also has extension tables for multiple cargoes, describes the cargoes and their origin, destination and tonnage.
- **SDB94-02.mdb**—comprehensive management information system in which separate functions have their own tables which link appropriately with other functions. Thus separate tables exist for each accounting function, for operations, for transits and for cargoes. For each transit it is possible to extract all the necessary data on cargoes, accounting details (including revisions), ship details, transit parameters and the various operational requirements and timings during the transit.

Vessel Definitions

Within this study transits were analyzed and forecast for those vessels carrying other dry bulk. In principle this includes dry bulk carriers, combined carriers operating in dry bulk trades and vehicle/dry bulk carriers. The latter is a vessel definition that is no longer in use by ACP although some records still contain this description. These ships were aggregated together for transit purposes as all of these vessels are acting as dry bulk carriers. Further, combined carriers increasingly operate in the dry or wet markets but not both. There is no analytical advantage to developing transits separately and a number of disadvantages centering on unnecessary data delineation that hampers meaningful scrutiny and has no use when determining economic value of the Canal, marketing strategies or toll policy. We additionally incorporated transits for Ship Type 27 into dry bulk carrier transits in our analyses. Scrutiny of the actual vessels assigned to this code suggests that most of them are chip carriers which are a sub set of dry bulk carrier types.

It was agreed with ACP, trade volumes relating to products that are included in this study but which are not carried in dry bulk carriers have been excluded from the projections of future transits in this study. Nevertheless historical data on other dry bulk trade through the Canal on non bulk ship types by route have been identified and retained for future reference if needed.

Conversely, dry bulk carriers occasionally carry products which are not the subject of scrutiny in this study. In the most recent years—that is from FY1994/1995 onwards—these represent quantities varying between 2.8 percent and 3.8 percent annually of all commodities carried in bulk. Individually, these commodities are very small and they include autos and trucks; chemicals; container cargoes; food and agricultural products; fishmeal; clay, fire and china; and a range of manufactures and semi-manufactures. These are not included here in the future assessment of Canal transits in dry bulk carriers

Data Preparation

Creation of New Databases

In order to achieve perfect concordance between commodities and ship movements, it was decided to use the cargo data records and not the transit data for all information on commodities, origins and destinations including transit origins and destinations. This is because the transit data records are not designed to cater for multiple commodities or multiple routes for a transit. Indeed, the transit records in the ACP database are maintained using region codes that do not correspond to ACP's regional and country requirements in this study. Further, we know from detailed scrutiny of the data that approximately 25 percent of all bulk carrier transits involve the carriage of more than one cargo and a minimum of 11 percent of transits involve loading and/or discharging at two or more geographical areas. (By areas in this instance we mean geographical region. At a country level this percentage is obviously higher.) In our view this means that the link between commodities, routes and transits in the current database format is neither robust enough nor accurate enough for study purposes.

Therefore, tables were created which would allow for a complete analysis of all trade in bulk cargoes and all transits of bulk carriers. The first step was to transform the cargo data in SDB 85–97 into the same format as that for SDB 94–02, namely into one record for each cargo. The cargo data (transit identification, commodity sequence number, commodity code, origin country, destination country and cargo tons) for each database was then expanded to include in each record:

- Fiscal year, obtained from the transit arrival date
- Ship type, obtained by linking to the Operational Table
- DWT obtained by linking to the ship characteristics

- DWT range (as specified by ACP)
- Total cargo for the transit, by summing all cargoes on a transit
- Transit fraction (cargo tons for the commodity sequence divided by total cargo for the transit).
- DWT equivalent (DWT multiplied by Transit fraction)
- Each record was also checked to identify missing data so that it could be rectified if appropriate.

Trade and Transit Analyses

The following analyses were undertaken using the reconstructed ACP database:

- Tables of commodity trade by ship type and year;
- Analysis of other dry bulk trades by (sub) region to (sub) region, (sub) region to country and country/country combinations for individual products and groups of products as requested by ACP;
- Analysis of multiple cargoes on other dry bulk transits;
- Analyses for other dry bulk ship transits from 1985 through 2002 (part) adding study commodity groups and routes. Tables for transits, DWT and cargo by route and DWT size range;
- Annual trade of each ACP commodity in bulk ships by ship type. Each ACP commodity was aligned to its corresponding study commodity;
- Analysis of ballast transits by route, DWT range and bulk ship type;
- Transits by dry bulk carriers in ballast providing numbers of transits by size range, route and direction.

Detailed analyses were also undertaken of the distribution of cargoes by route and DWT size range, average DWT by route and DWT size range and DWT utilization by route and DWT size range. An extraction of vessel characteristics data from the ACP database was used to aid the creation of conversion tables from DWT to PCUMS, Gross Tonnage, LOA, Beam and Draft ranges.

Matching ACP Trade Data to Trade Data and Forecasts

Concordances were established between the study regions and ACP route structures, between commodity definitions in the ACP database and those specified in the study and between ACP trade and transit volumes and those of the Nathan team.

Concordance between Study Regions and ACP Route Structures

The following details the concordance between the study regions—as described in the document Regiones para Estudios (1)—and the original routes used in the trade data. The original routes reflect "normal" ACP route structures.

The overall study regions conform to the ACP regions as set out in the database SDB94–02 except for the following:

- North America East is divided into North America Atlantic and North America Gulf
- North America Atlantic is combined with Canada East except for certain commodities
- North America West is combined with Canada West except for certain commodities
- Hawaii is included in North America West
- Cristobal RP is included in Central America East
- Balboa is included in Central America West
- Certain South America East countries are separated for some commodities
- Certain South America West countries are separated for some commodities
- Africa is separated (North and South) for some commodities
- Antarctica is included in Oceania
- Far East and South East Asia countries are separated out for some commodities

Concordance between ACP Trade/Transit Data and the Consultants' Data

Work was undertaken to establish concordances between the Nathan team's trade data results and the ACP data. Reasons as to why data do not always match center on:

- when the Canal is not the shortest route but some cargo still goes through the Canal;
- bypass trades;
- technical issues of data from different sources, for example, ACP other dry bulks trade data and data from external sources;

ACP specified a large number of individual sub routes with separate cargo specifications. After the cargo forecasts were developed for these specified sub routes and commodities, a further review of these specified trades was undertaken to see assess the merits of undertaking separate forecasts of transits, vessel economics and economic values for all commodity/sub route combinations recognizing that some of these trades could be extremely small.

Generally, it was agreed that transit and vessel economic forecasts would be undertaken on a route by route basis with the route defined on a region to region, or country to country with the products on a route grouped. This reflects commercial reality where it is quite common for a number of different cargoes to be carried on board the same vessel. Nevertheless a number of commodities on particular routes (region/region; region/country or country/country) still merit special focus and have been kept separate.

Historical Trade

As background to the commodity trade forecasts, historical other dry bulk trade by commodity, region to region route and ship type were extracted from the restructured database for the period 1985/6 to 2000/1.

A detailed specification of trade by individual routes was undertaken. This specification, in combination with the revised ACP database tables was used to produce an analysis of each region to region and country to country route by commodity as agreed.

All trade from the ACP database is available in principle on a country by country basis. Each country is given a code in the ACP system which places it within a specific geographic region—or regions—if the country has more than on coastline, which is important for Canal trade. Therefore the trade data could generally be provided at a level of aggregation best suited to the TOR for forecast trade although in practice of course not all countries are specified in the ACP database and there are various "non specified" catch all categories within each area.

Analysis of Laden Transits by Ship Type, Route and DWT Size Range

Details of other dry bulk trade by commodity, route and ship type were extracted from the restructured ACP database to determine the usage of different ship types in the transport of other dry bulks. The results were used to derive allocations to ship type for the forecast future trade. In general there were no clear trends in the apportionment of trade by vessel type at a route and commodity level and five year averages were used to calculate the split of future trade by size unless it was clear from the data that trends had been changing in more recent years. In these cases, either three year averages were used or the most recent year.

These allocations were applied at the commodity and route level. A summary covering all routes and all commodities for recent years is shown below as an example.

	Other Dry Bulk Cargoes - % by Ship Type						
All routes	1994/95	19959/6	1996/97	1997/98	1998/99	1999/00	2000/01
Container/Break-Bulk	5.0%	4.8%	5.5%	5.5%	6.2%	7.7%	7.7%
Chip Carrier	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	4.3%
Dry Bulk Carrier	82.8%	84.4%	85.3%	84.3%	84.6%	80.8%	76.8%
Dry/Liquid Bulk Carrier	0.6%	0.6%	0.4%	0.0%	0.5%	0.5%	0.7%
Full Container	0.4%	0.5%	0.4%	0.7%	0.8%	0.7%	0.3%
General Cargo	7.6%	6.5%	6.3%	6.7%	5.5%	6.4%	7.3%
Liquid Gas	0.2%	0.1%	0.2%	0.4%	0.2%	0.3%	0.3%
Other	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%
Refrigerated Cargo	0.3%	0.3%	0.2%	0.3%	0.4%	0.2%	0.2%
Roll-on/Roll-off	0.3%	0.3%	0.2%	0.1%	0.3%	0.5%	0.3%
Tanker	0.5%	0.6%	0.4%	0.8%	0.6%	0.5%	1.1%
Vehicle/Dry Bulk	2.2%	1.9%	1.1%	1.2%	0.9%	0.8%	0.9%
Vehicle Carrier	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Richardson Lawrie Associates.

As this table shows, in the latter part of the 1990s the overall proportion of commodities covered in this study that were shipped through the Canal in dry bulk carriers was around 85 percent. More recently this figure appears to have fallen and for FY2000/01, the figure was 76.8 percent.

The allocation of commodity forecasts to ship type is the first step in the determination of future transits of these commodities in dry bulk carriers.

Cargo Distribution by Route and DWT Size Range

As a starting point for projecting future cargo size distributions on Canal routes, a series of regressions have been developed. It is stressed that these trends—based as they are on historical ACP data—are not necessarily applicable for bypass or new trades which may be attracted to an Expanded Canal. Treatment of cargo allocation by size range for the Expanded Canal is discussed in a later section.

The purpose of the regressions is to assist in the estimation of the rates of annual change in DWT range percentages in the future and so provide a sound statistical framework for the transit forecasts. Time and total cargo encapsulate all the relevant variables that could be used in an unbiased regression. Time represents the general trend of vessel usage over the historical period whilst total cargo represents the manner in which different sized vessels might be used when trade volumes increase or decline.

The regressions undertaken on a route basis provided less statistically acceptable results than those undertaken on a northbound and southbound basis. Well over one hundred different analyses were carried out using different dependent variables, different routes/route aggregations, and different size ranges/aggregated size ranges. Due to the sparseness of data in some size ranges, the aggregated northbound/southbound approach was an obvious candidate from the beginning, but the consultants decided to investigate the route approach in case more significant trends were apparent for the more common size ranges... When this proved not to be the case, the northbound/southbound option was adopted. Details of the analyses undertaken but discarded have been excluded from this report as they are no longer germane to the description of how forecasts were developed.

There are a number of inter-linked reasons as to why the regressions at a route level provided less statistically acceptable results. In the first instance, shipowners order and operate dry bulk carriers in order to employ their vessels in:

- The coal and/or iron ore trades which are generally but not always in Cape size and above;
- Grains trades (but often including the minor bulks as well) which, with the exception of soybeans from the U.S. Gulf to Europe and Brazil to Europe are carried in up to Panamax sizes;
- Minor bulk trades including iron ore and coal on minor routes and which are carried in vessels up to Panamax.

In other words, shipowners do not generally operate vessels in order to employ them only in grains or only in any of the individual minor bulks. Neither are vessels designed with only a very limited number of route possibilities in mind until one reaches the very largest size ranges.

Secondly, ACP will be well aware that trade volumes for any given product as well as trade within a route can vary considerably year on year.

Thirdly, the number of DWT size ranges into which transit forecasts are being divided in these studies is large and much larger than is normally considered to be representative of the market. This can be readily demonstrated by the table below which shows the proportion by both number of vessels and DWT occupied by each study size range in the global fleet.

Therefore the proportions occupied by individual size ranges in the total fleet are small and it is not surprising that there is considerable variation by route. Put simply, the greater the level of disaggregation of data, the less likely the possibility of obtaining acceptable results from statistical analyses. Generically, the dry bulk carrier market is viewed in terms of Handysize, Handymax, Panamax and Cape Size vessels with ships below Handysize being somewhat of a residual. Some market players view the 'above Panamax' sector as divided into Post Panamax, Small or Mini Capes, Capesize and Very Large Bulk Carriers. However, in terms of DWT size ranges all of these terms can mean slightly different sizes to different people. For this reason throughout the study we refer to totally unambiguous DWT size ranges.

The general comments made above apply to Other Dry Bulks. In the description of the approach adopted for forecasting it will be seen that regressions have been applied at the north/south levels for the reasons described above.

Table 4-1. Historical Allocation of Cargo to DWT Size Range 1986–2001 (percent)

DWT Range and Direction	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
South																
Less or equal to 10,000	1.4	1.6	1.4	1.0	0.9	0.7	1.1	1.2	1.1	1.0	0.8	0.7	0.6	0.5	0.4	0.5
Greater than 10,000–Less than 15,000	1.0	1.0	0.8	0.6	0.8	1.4	1.2	1.3	1.3	1.3	0.9	1.2	0.9	0.8	0.9	0.8
Greater or equal to 15,000–Less than 20,000	2.6	4.0	2.7	3.6	3.1	2.3	2.6	3.3	3.6	2.6	2.5	3.0	2.5	1.5	1.4	1.6
Greater or equal to 20,000–Less than 25,000	5.9	7.4	5.7	7.3	4.9	4.5	4.6	4.1	4.2	4.6	3.1	3.5	4.3	4.3	5.0	5.4
Greater or equal to 25,000–Less than 30,000	15.0	19.5	20.0	20.2	19.4	16.7	11.6	12.5	12.3	11.6	11.6	11.4	13.6	11.4	13.4	15.6
Greater or equal to 30,000–Less than 40,000	22.8	21.1	23.7	27.4	28.2	24.6	21.1	20.4	18.0	17.8	18.0	15.7	14.0	8.8	11.7	15.7
Greater or equal to 40,000–Less than 50,000	15.5	13.2	14.7	14.6	16.1	21.5	23.6	26.6	25.3	27.0	34.1	35.0	35.8	35.3	37.9	36.1
Greater or equal to 50,000–Less than 60,000	3.8	3.4	2.8	1.1	2.3	4.3	4.1	4.1	5.0	3.7	3.3	5.2	3.6	5.6	4.1	4.4
Greater or equal to 60,000–Less than 70,000	25.5	22.4	20.9	19.0	19.4	20.0	22.7	18.8	21.2	23.9	18.6	19.9	16.0	22.6	19.0	13.8
Greater or equal to 70,000–Less than 80,000	6.6	5.8	7.2	4.7	4.5	4.0	6.8	6.5	7.3	5.7	6.3	4.0	8.7	9.1	6.2	6.1
Greater or equal to 80,000–Less than 90,000	-	0.5	0.3	0.4	0.5	-	0.7	1.1	0.6	0.8	0.8	0.4	-	-	-	-
Greater or equal to 90,000–Less than 100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total South	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
North																
Less or equal to 10,000	1.5	1.0	0.9	0.8	0.7	0.6	0.8	0.8	0.6	0.7	0.6	0.4	0.2	0.1	0.2	0.2
Greater than 10,000–Less than 15,000	0.8	0.6	0.6	0.5	0.6	0.7	0.9	0.8	0.8	0.7	0.6	0.7	0.4	0.7	0.5	0.4
Greater or equal to 15,000–Less than 20,000	3.1	2.9	2.6	2.5	2.6	2.5	2.9	3.0	2.8	1.5	2.1	2.5	1.7	1.5	1.3	1.1
Greater or equal to 20,000–Less than 25,000	7.4	6.6	6.4	6.5	6.2	6.0	4.9	4.5	5.0	5.9	4.4	3.6	4.5	3.6	3.9	3.3
Greater or equal to 25,000–Less than 30,000	16.9	19.9	15.7	16.0	16.5	15.8	15.2	17.6	16.1	13.0	13.0	12.7	15.4	14.6	13.5	13.8
Greater or equal to 30,000–Less than 40,000	30.0	30.2	28.7	29.3	28.9	29.1	28.3	24.4	23.4	20.8	19.4	18.7	17.8	15.4	15.1	16.4
Greater or equal to 40,000–Less than 50,000	18.4	19.3	19.9	15.5	15.4	16.5	17.8	20.8	19.7	21.7	22.9	22.4	22.3	29.1	27.8	26.9
Greater or equal to 50,000–Less than 60,000	2.3	2.5	3.5	2.8	3.7	2.3	3.9	3.4	3.6	3.3	4.5	3.6	2.4	3.4	3.1	3.3
Greater or equal to 60,000–Less than 70,000	18.0	17.0	20.1	24.5	23.2	23.9	23.1	21.8	24.4	28.8	28.7	28.6	25.1	21.1	20.6	19.5
Greater or equal to 70,000–Less than 80,000	1.6	-	1.6	1.6	2.1	2.3	1.9	2.9	3.6	3.3	3.6	6.4	9.9	10.2	13.4	14.8
Greater or equal to 80,000–Less than 90,000	-	-	-	-	-	-	0.2	-	-	0.2	0.2	0.6	-	0.2	0.7	0.2
Greater or equal to 90,000–Less than 100,000	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-	-	-
Total North	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Richardson Lawrie Associates

Expanded Canal

There are two elements to this. The first element is those trades which move in vessels which are larger than can transit the Existing Canal, in other words the by pass trades. The size range pattern in which these products move currently can be identified). The changes in the future pattern (if any) have been addressed as part of the global fleet forecast.

The second element is the identification of changes in vessel size (if any) for existing trades and transits which will be routed through the Expanded Canal. For some of these transits there will be no change in vessel size – as compared with the forecasts for the Existing Canal - as the sizes used are not constrained or in any way defined by the dimensions of the Existing Canal. For vessels around the existing Panamax size the issue is the extent to which cargo will be re-allocated to larger vessel sizes which can transit the Expanded Canal.

The mix of DWT size ranges for bulk carrier other dry bulk transits is estimated by applying annual rates of change to the actual percentages which occurred in the fiscal year 2000–2001. These rates of change have been estimated from statistical analyses applied to historical data representing the percentages pertaining to transits from 1985/6 to 2000/1.

With regard to the methodology adopted, we considered whether cargo, transits or percent should be used as the dependent variable. Whichever approach is adopted the resulting final forecast will be in percent terms which must sum to 100 – since the total cargo is already determined - and so a larger percent for one size range will necessarily mean a smaller percent for another size range. Additional analyses were undertaken using cargo as the dependent variable. The percent forecasts using this method were very similar to the method adopted, both in real and relative terms.

The purpose of the forecasting was to identify the trends in those size ranges with the highest incidence of use. These analyses produced statistically significant results, particularly after the aggregation of adjacent size ranges which have undergone periods of substantial switching. For some other size ranges, that the statistical significance was low as one would expect from the both cargo and/or percentage historical data. However these size ranges were responsible for the carriage of only a very small proportion of total cargo, both historically and in the forecasts.

Under Existing Canal conditions, the vessel size ranges in the world fleet contain vessels that are unable to transit the Canal. Therefore it is not appropriate in this instance to calculate representative vessel DWTs based on the world fleet. Instead, this is more properly undertaken with reference to the actual vessels utilizing the Canal. For the Expanded Canal most vessels in the world fleet would be able to transit the Canal in terms of their LOA and beam although, as discussed below, vessels of more than 110,000-120,000DWT would need to transit the Canal partly loaded. Therefore in this case it is appropriate to base vessel characteristics on those of the world fleet.

For the Expanded Canal, it is assumed that average DWT within size ranges for vessels above 60,000 DWT will reflect those in the world fleet.

Average DWT by Size Range and Route

For similar reasons to those described above, analyses and regressions of historical data on average DWT sizes within DWT size range on Canal routes were undertaken at a North/South level. The broad conclusions were that for most DWT size ranges, the average DWT of transits through the Panama Canal remained fairly flat over the 17 year period analyzed. Moreover, when upward or downward trends appear in the Panama Canal transits, these tend to be mirrored in the world fleet. The final conclusions were that for the Existing Canal, the same average DWT should be used for North and South transits in both the Other Dry Bulk and Grains studies and that these should remain unchanged in the future.

The adopted approach was to use a combination of Panama Canal transit data and world fleet data to obtain a single constant average DWT for each size range. For the 0–10,000 DWT range, the average Canal Transit figure for 2000 was used. For the ranges 10,000–15,000 DWT to 50,000–60,000 DWT the world fleet data and Panama Transit data are very similar and the world fleet data were used. For the larger DWT size ranges up to 100,000 DWT, significant differences exist between the world fleet and Panama Transit data and so the Panama data for 2000 was again used... This resulted in the use of average DWT as shown in the following table.

Size Range	Adopted Average Dwt
0 to 10k	4135
10 to 15k	12540
15 to 20k	17862
20 to 25k	23009
25 to 30k	27441
30 to 40k	35495
40 to 50k	44408
50 to 60k	53444
60 to 70k	66644
70 to 80k	72040
80 to 90k	82224
90 to 100k	91388

Source: Richardson Lawrie Associates

For the Expanded Canal from 2010, the average DWT from the world fleet were used for vessel size ranges above 60,000 DWT.

DWT Utilization by DWT Size Range and Route

As with the treatment of cargo allocations by size range and average DWT the analysis of DWT utilization—the ratio of cargo to DWT—for other dry bulks was carried out on a 17 year time series of data extracted from the ACP database at the North/South level. For most DWT size ranges and trades, the average utilization of transits through the Panama Canal remained fairly flat over the 17 year period analyzed, to the extent that there is no statistical evidence for varying utilizations over time.

The development of constant utilization factors for each trade (North/South; Grain/Other Dry Bulk) for each DWT size range was adopted as the best approach. There is strong evidence that northbound trades have different utilization levels to southbound trades and that grain and other dry bulk also differ. In order to establish a consistent set of utilization figures—for example, for use in freight cost calculations by size—utilization levels by size range, North and South were determined by dividing the average cargo sizes from 1985/1986 onwards for the different DWT size ranges by the average DWT established in the previous sections. Their results—which have been used in the forecasts of freight coast and transits for the Existing Canal—are shown in the following table.

	Mean Utilization			
	Grain		Other Dry Bulk	
	South	North	South	North
0 to 10k	77.9%	76.3%	80.8%	81.4%
10 to 15k	80.3%	78.1%	77.6%	79.9%
15 to 20k	86.0%	75.5%	82.5%	80.2%
20 to 25k	84.6%	75.3%	81.2%	76.5%
25 to 30k	85.5%	81.1%	84.3%	75.9%
30 to 40k	86.4%	77.7%	82.5%	77.0%
40 to 50k	87.5%	73.6%	83.1%	77.5%
50 to 60k	89.8%	75.3%	85.6%	82.3%
60 to 70k	81.1%	77.0%	80.7%	74.8%
70 to 80k	77.3%	74.5%	76.4%	72.5%
80 to 90k	70.1%	75.2%	71.8%	73.0%
90 to 100k	64.4%			41.2%

Source: Richardson Lawrie Associates.

For the Expanded Canal from 2010 through 2019, utilization levels for vessels between 60,000 DWT and 100,000 DWT are assumed to increase to 82 percent for Northbound transits and to between 85 percent and 86 percent Southbound. From 2020 to 2025, these respective utilization levels are also applied for southbound vessels up to 150,000 DWT and for northbound ships up to 200,000 DWT. For vessels between 150,000 DWT and 200,000 DWT southbound the utilization levels would be limited by the draft of the Canal to around 82/83percent.

Given that the maximum vessel size that would be able to transit an Expanded Canal fully laden would be in the region of 110,000 to 120,000 DWT, separate vessel utilization factors have been calculated for vessels above 120,000 DWT on bypass routes which under Expanded Canal conditions could switch to the Canal (see below).

The maximum vessel utilization, without Canal or other constraints is 98percent assuming a ship can load to its full DWT. In practice this may vary dependent on the cubic capacity of the vessel and the density of the cargo. The first phase of the proposed expansion would increase the draft to 46' (14.02m) at which point vessels up to 100,000 DWT could transit the Canal fully laden. With the Canal draft at 50' (15.24m) from 2020 some vessels between 100,000 DWT and 120,000 DWT could transit the Canal fully laden but for both size ranges the average maximum drafts on full loads would still be in excess of the Canal draft.

As a footnote, there are a few ships in excess of 120,000 DWT that could transit a 50' draft Canal fully laden. Currently in the 120,000 to 149,999 DWT size range there are 161 vessels. All of these vessels would be able to use the fully Expanded Canal in terms of beam and LOA – that is, they would be able to transits the Canal light loaded - but just eight would be able to transit on full draft. These eight ships range from 122,760 up to 141,475 DWT.

With the maximum vessel drafts for the phase 1 expansion, utilization levels for other dry bulks fall from around 98percent for ships between 40,000 DWT and 90,000 DWT to around 78percent for ships between 120,000 DWT and 150,000 DWT and to about 74percent for vessels between 170,000 DWT and 200,000 DWT. Following completion of the second phase of the expansion to 50' from

2020, utilization levels would increase to 87percent for ships between 120,000 DWT and 150,000 DWT and to about 83percent for vessels between 170,000 DWT and 200,000 DWT.

These utilization levels assume that vessels can load to DWT, that is there are no constraints due to cubic capacity. Coal cargoes, for example, are restricted by vessels' cubic carrying capacities such that the maximum DWT utilization for a modern ship would be around 88/89percent.

As noted above, actual utilization levels observed through the Canal are below the maximum possible for all size ranges up to 100,000 DWT. It is assumed that this would continue to be the case under Expanded Canal conditions. For this reason, from 2010 through 2019, utilization levels for vessels between 60,000 DWT and 100,000 DWT are assumed to increase to 82 percent for Northbound transits and to between 85 percent and 86 percent Southbound, that is, the maximum utilization levels observed currently. For larger vessels utilization levels would be defined by the 46' (14.02m) draft limit. From 2020 to 2025 southbound, utilization levels for vessels up to 150,000 DWT would increase to between 85percent and 86percent. Above this size, cargo sizes would again be determined by the maximum permissible draft of 50' (15.24m). For northbound ships up to 200,000 DWT utilization levels would be increased to 82/83 percent.

In other words we do foresee partially loaded ships using the canal after expansion. For example, for coal trade from West Coast Canada to Europe we envisage vessels of between 120,000 DWT and 200,000 DWT being utilized, which would only be able to transit the Canal on a part laden basis. Obviously the full extent to which trade would be switched from by pass routes depends also on comparative freight costs

Conversion Factors for PCUMS, Gross Tonnage, LOA, Beam and Draft from DWT

In order to determine transits and cargo through the Canal by vessel characteristic a series of distribution factors were developed which map the percentage of DWT transiting the Canal to each subject characteristic range. These distribution factors were developed for each DWT range and vessel characteristic range as defined in the Terms of Reference.

The series of conversion factors developed for the Existing Canal and the Expanded Canal are provided in *Volume 3: Vessel Transit and Fleet Analysis*, Tables 2–7 to 2–12.

Approach

The development of the conversion factors for all characteristics except PCUMS was based in the first instance on the world fleet which was analyzed by vessel characteristics as follows:

- Length Overall (LOA)
- Beam
- Design Draft
- Gross Registered Tons

These analyses were undertaken within each vessel DWT size range and in a number of pre-defined ranges for the vessel characteristics as defined in the Terms of Reference. For the world fleet therefore, total DWT within each size range was subdivided by vessel characteristic such that within each DWT size range, the distribution pattern conforming to each characteristic could be calculated. An example of the analysis is provided below:

Dry Bulk Carriers 50,000 - 59,999 dwt: Characteristics Analysis

Beam Range (m)	% total dwt	LOA (m) Range (m)	% total dwt	Draft Range (m)	% total dwt	GRT Range	% total dwt
27.75-28.96	4.73	<200	23.64	10.00	0.73	< 9,999	0.00
28.97-30.49	3.80	200-230.90	75.53	10.00-10.50		10,000 - <19,999	0.00
30.50-32.31	88.97	230.90-289.56	0.83	10.50-11.00	3.08	19,999 - <29,999	14.90
32.32-33.53	0.00			11.00-11.50	3.26	29,999 - < 39,999	75.47
33.54-36.58	1.70			11.50-12.04	8.33	9,999 - < 49,999	8.60
36.59-39.63	0.79			12.04-12.50	49.93	49,999 - < 59,999	1.03
				12.50-13.00	28.14		
				13.00-13.50	4.87		
				13.50-14.00	1.66		
Total	100.00	Total	100.00	Total	100.00		100.00

These data, rather than data from the ACP transit data were chosen as the basis of inputs to the forecasts of transits and cargo by vessel characteristic range. This was to ensure conformity and internal consistency between for example, data to be used for the Existing and Expanded Canals and data to be used for grains and other dry bulk transits and cargo. Furthermore, using global fleet data screened out any serendipitous distribution patterns that could be present in any one year's transit data.

Modifications

There were however instances where it was necessary to modify the global data to ensure its relevance and accuracy for both the Existing and Expanded Canal analyses.

In the first instances this centered on vessels which cannot transit the Existing Canal due to either beam or LOA restrictions. These vessels were concentrated in the following DWT ranges:

- 60,000–70,000 DWT
- 70,000–80,000 DWT
- 80,000–90,000 DWT
- 90,000–100,000 DWT

A number of vessels were therefore removed from the analyses and the distribution patterns for vessels in these size ranges adjusted accordingly. For the first two vessel size ranges, while the removals improved the accuracy of the data, the statistical impact was small. For vessels in the 80,000–90,000 DWT range, the extent of the removals as a proportion of the total fleet (60 percent) highlighted the fact that such vessels are not necessarily built in order to transit the Existing Canal.

Dry bulk carriers in the 90,000–100,000 DWT range are the largest recorded transiting the Canal but this is an infrequent occurrence as demonstrated by the fact that all but one vessel in this size range has either a beam or LOA constraint.

For the Expanded Canal, the distribution pattern for each DWT size range reverted to the global data except where vessels which had been removed were Lakers, that is, vessels carrying grains within the Great Lakes.

PCUMS

For vessels which transit the Existing Canal, conversion factors from DWT to PCUMS were derived from analyses of the FY 1994/1995 to FY 2000/2001 ACP database. All vessels which had transited the Canal in this period were sorted by DWT range and PCUMS. The data series developed counted individual vessels once only.

To develop relationships between vessel DWT and PCUMS for larger vessels transiting the Expanded Canal only, a series of regressions was undertaken between DWT and PCUMS data in the ACP database. These relationships reflected a high degree of statistical correlation with R squared at 0.97.

Analysis of Ballast Transits

Individual vessels undertaking ballast transits in recent years were identified together with the dates of these transit(s) and route. Itineraries of a sample of these vessels were obtained as input to the determination of establishing the drivers of ballast transits.

Historical Trends

Ballast transits for the fiscal years 1994/1995 to 2000/2001 were identified from the ACP database. The majority of transits in ballast were northbound, comprising more than 80 percent of the total in each of the years. Of these northbound transits, 70 percent or more related to just four routes with a common destination of the U.S. East Coast (including U.S. Gulf). The origins for these routes were:

- U.S. West Coast
- Central America West
- South America West
- Asia

The last route, Asia to U.S. East Coast, had the largest number of transits in ballast, about 35 percent of total northbound.

The number of ballasts in transit by dry bulk carriers declined steeply and steadily over the seven year period analyzed, the total in 2000/2001 being just 30 percent of the total in 1994–1995. This decline affected all routes that had three ballast transits per year.

Number of Ballast Transits by Dry Bulk Carriers

DWT Range	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001
0 to 10k	45	35	40	37	21	18	22
10 to 15k	20	20	19	16	22	6	6
15 to 20k	29	22	30	20	13	9	5
20 to 25k	77	49	40	22	18	15	13
25 to 30k	99	117	91	84	78	46	34
30 to 40k	71	86	61	37	23	33	30
40 to 50k	134	151	144	133	103	98	73
50 to 60k	23	15	12	7	11	7	6
60 to 70k	151	171	68	25	31	18	12
70 to 80k	17	53	16	9	7	5	3
80 to 90k	2	8	4	0	1	0	0
Total	668	727	525	390	328	255	204

The decline in the number of transits in ballast also affected all size ranges as well as all routes. In particular, the 60,000–70,000 DWT size range had only 8 percent of the 1994–1995 ballast transits in 2000/2001. This was partly to be expected as the use of this size range, particularly on the U.S. Gulf to Far East grain trade, had decreased significantly in the mid to late 1990s, being replaced by newer bulk carriers in the 40,000–50,000 DWT and 70,000–80,000 DWT size ranges.

As a means of developing forecasts of future ballast transits, statistical techniques were ruled out and a discrete method developed linking ballast transits with specific laden transits passing through the canal in the opposite direction. The fiscal years 1999/2000 and 2000/2001 were used as the basis for the analysis. The steps involved:

- Identifying all transits in ballast by dry bulk carriers from the ACP database, noting the region to region route, DWT and ship number;
- Identifying all laden transits for the above ships, using the ship number, and, for each laden transit, noting the transit sequence number;
- Extracting details of the laden transits of these ships, using the transit sequence number, noting the commodities, origins and destinations.

The ballast transits for each vessel were examined against their laden transits in order to identify those for which a direct link between laden and ballast transits could be established. In other cases, ballast transits could only be considered as positioning voyages relating to a much larger number of laden transits. In these cases, judgment had to be used to establish the trade link which was most likely to be associated with the ballast transit. Such trade links were not always associated with a single commodity, or the same end points as the ballast transits.

The number of ballast transits per ship was then grossed up to take account of a relatively small number of transits for which insufficient details were available and an annual figure derived. For other dry bulk ballast transits this led to 86 separately defined ballast transits.

Comments on Methodology

To evaluate all the reasons behind the rapid decline in ballast transits over the seven year period would require a major study. However, the consultants identified two major causes, namely:

- Ballast transits from Central America West, South America West and Asia northbound through the canal were and still are the major components of ballast transits. During the seven year period, the net balance of laden canal trade by dry bulk carriers from these regions has increased steadily, i.e. the canal trade from these regions minus the trade to these regions has increased. This means that vessels previously returning northbound in ballast through the canal, now have cargo to carry.
- During the mid to late 1990s, the old 60-70k range vessels taking grain from North America to the Far East were rapidly phased out and replaced by much newer vessels in the 40-50k range and then the 70-80k range. The older, inflexible 60-70k range vessels often returned in ballast, whereas the newer vessels did not. With the rising intra-regional coal trade in the Asia-Pacific area, after carrying grain to Asia, Panamax vessels carry coal and iron ore from Australia to Europe or they remain in Pacific markets. The more coal cargoes there are from Australia to Europe the less ballasting.

As a measure of the depth and extent of the work undertaken here an analysis of the trade routes of various bulk carriers and the types of commodities they haul as a means of providing insight into the origins of ballast transits was undertaken. The analysis included scrutiny of individual vessel itineraries. At one extreme, many ballast transits could be directly linked to laden transits on a one to one basis. At the other extreme, a few ballast transits could not be linked to any laden transit by the vessel concerned. In the middle were a number of vessels transiting in ballast once for every two, three or higher number of laden transits. Considerable effort was expended identifying the most likely link to a laden transit. Of the 459 ballast transits by dry bulk carriers studied in the two year period (2000 and 2001), we are confident that the correct links have been identified. Moreover, for the Expanded Canal, the individual itineraries were scrutinized for larger (for example, Capesize) vessels that might transit the Canal in ballast either as part of an itinerary involving laden transit of the Canal or as the result of the Canal offering an optimum route for re-positioning a ballast vessel which previously had carried a cargo on a non canal route. We considered a study into trade routes followed by various bulk carriers and types of commodities hauled on various legs of the trade route but concluded that it would not have provided any additional insight into factors that give rise to ballast shipments. The resources required to undertake this analysis would be enormous. There is no certainty that the results would be conclusive and the level of effort suggested is not commensurate with the importance of ballast transits as compared with laden transits.

DETERMINATION OF CANAL AND BY PASS TRADES

The dry bulk trade forecasts by route and commodity prepared by the trade specialists were reviewed by the maritime shipping specialists to determine those trades that represent potential traffic for the Existing Canal and the Expanded Canal. Mileages have been assigned to routes on the basis of the representative ports shown in Tables 4-2 and 4-3. Specific analyses have been grouped as follows:

- Trades excluded on a mileage basis

- Trades where there are significant differences between ACP data and trade forecasts
- Bypass trades.

Trades Excluded on a Mileage Basis

All of the data were inspected and mileages determined using as input the representative ports provided. This set included trade routes where the Canal is not the shortest maritime route. Where ACP data showed Canal transits for these routes in 2001 we undertook further reviews of those routes to determine why the Canal was used. In some cases, it may have been that different ports than the chosen representative regional ports were used and that the Canal may indeed have been the shorter route. This can be particularly the case where origin/destination pairs represent wide geographical regions within which it is possible to determine both Canal and non Canal routes depending upon the ports selected. In other cases, it may have been that the traffic was transported on vessels along with other commodities that involved a Canal transit.

Existing Canal Routes With Significant Differences Between Actual And Forecast Data

There were a number of commodities/routes where the forecast data for 2002 were different by orders of magnitude to the actual data for 1999/2000 and 2000/2001 shown by ACP. All of these trades are minor bulks which are not carried in post Panamax vessels. In orders of magnitude terms, the commodities with the most significant apparent differences were:

- Ammonium phosphate (for phosphates)
- Sulphur
- Cement
- Petroleum coke
- Semi-finished and finished products of steel.

These were reviewed and adjustments made as necessary. Appendix A shows the final forecasts of potential Canal trade at zero tolls for the Existing Canal, Most Probable Case, after taking into account the above factors. Total dry bulk trade is projected to increase from 76.1 million tons in 2001 to 93.5 million tons in 2025. Generally average annual growth rates are shown to decline over the forecast period, from 1.4 percent between 2001 and 2005 to less than 0.5 percent between 2020 and 2025. Overall growth in northbound trades is estimated to be slightly higher than that on southbound routes with the total share of northbound cargoes rising from 60 percent (45.9 million tons) in 2001 to 64 percent (59.5 million tons) in 2025.

Table 4-2. Importing Areas—Representative Ports by Region, Country and Commodity

	Thermal and			Other	
Importing Region and Country	Metallurgical Coal	Iron Ore	Minor Bulk	Commodity	Port
Africa	Alexandria, Egypt	n.a.	Safi, Morocco	n.a.	n.a.
Caribbean Basin	San Juan, Puerto Rico	Point Lisas, Trinidad	San Juan, Puerto Rico	n.a.	n.a.
Central America East	Tampico, Mexico	n.a.	Tampico, Mexico	n.a.	n.a.
Central America West	Lazaro Cardenas, Mexico	n.a.	Lazaro Cardenas, Mexico	n.a.	n.a.
Europe	Rotterdam	n.a.	Rotterdam	n.a.	n.a.
Far East	Osaka	n.a.	Guangzhou, China	n.a.	n.a.
Japan	Mizushima	Mizushima	n.a.	Primary aluminum	Shimzu
China	Qinhuangdao	Shanghai	n.a.	Primary aluminum	Guangzhou
Korea	Kwangyang	Kwangyang	n.a.	n.a.	n.a.
Taiwan	Kaohsiung	Kaohsiung	n.a.	n.a.	n.a.
Middle East	Eregli, Turkey	n.a.	Istanbul	n.a.	n.a.
North America East	Tampa	Baltimore	Philadelphia	n.a.	
US East Coast	Tampa	Baltimore	n.a.	Manufactures of Iron and Steel Cement	New York Miami
Canada East Coast	n.a.	n.a.	n.a.	Copper concentrates	Quebec City
North America Gulf	Mobile, AL	Mobile, AL	South Louisiana	n.a.	n.a.
North America West	Los Angeles	n.a.	Los Angeles	n.a.	n.a.
US West Coast	n.a.	n.a.	n.a.	Manufactures of Iron and Steel Cement	Los Angeles Los Angeles
Canada West Coast	n.a.	n.a.	n.a.	Manufactures of Iron and Steel	Vancouver
Oceania	n.a.	Whyalla	Brisbane	n.a.	n.a.
South America East	Sepetiba, Brazil	n.a.	Sepetiba, Brazil	n.a.	n.a.
Brazil North	n.a.	n.a.	n.a.	n.a.	n.a.
Brazil South	Sepetiba	n.a.	n.a.	n.a.	n.a.
Venezuela	n.a.	n.a.	n.a.	n.a.	n.a.
Argentina	n.a.	n.a.	n.a.	n.a.	n.a.
Colombia	n.a.	n.a.	n.a.	n.a.	n.a.
South America West	Puerto Huasco, Chile	n.a.	Matarani, Peru	n.a.	n.a.
Chile	Puerto Huasco, Chile	n.a.	n.a.	n.a.	n.a.
Ecuador	n.a.	n.a.	n.a.	n.a.	n.a.
Peru	n.a.	n.a.	n.a.	n.a.	n.a.
Colombia	n.a.	n.a.	n.a.	n.a.	n.a.
South Asia	Port Qasim, Pakistan	n.a.	Chittagong, Bangladesh	n.a.	n.a.
Southeast Asia	n.a.	Cigading, Indonesia	Jakarta, Indonesia	n.a.	n.a.

Source: CRU International Ltd.

Table 4-3. Exporting Area-Representative Ports by Region, Country, and Commodity

				Specific commodity/country focus	
Exporting Region and Country	Thermal and Metallurgical Coal	Iron Ore	Minor Bulks	Commodity	Port
Africa	n.a.	n.a.	Durban, South Africa	n.a.	n.a.
Caribbean Basin	n.a.	n.a.	Kingston, Jamaica	n.a.	n.a.
Central America East	n.a.	n.a.	Puerto Limon, Costa Rica	n.a.	n.a.
Central America West	n.a.	n.a.	Puerto Quetzal, Gautemala	n.a.	n.a.
Europe	n.a.	n.a.	Rotterdam	n.a.	n.a.
Far East	n.a.	n.a.	Guangzhou, China	n.a.	n.a.
Japan	n.a.	n.a.	n.a.	Manufactures of Iron and Steel	Kobe
China	n.a.	n.a.	n.a.	Manufactures of Iron and Steel	Shanghai
Korea	n.a.	n.a.	n.a.	Manufactures of Iron and Steel	Kwangyang
Taiwan	n.a.	n.a.	n.a.	Manufactures of Iron and Steel	Kaohsiung
Middle East	n.a.	n.a.	Dammam, Saudi Arabia	n.a.	n.a.
North America East	n.a.	Seven Islands, Canada	New York	n.a.	n.a.
US East Coast	Norfolk	Duluth	n.a.	n.a.	n.a.
Canada East Coast	n.a.	Seven Islands, Canada	n.a.	n.a.	n.a.
North America Gulf	Mobile	n.a.	Tampa	n.a.	n.a.
North America West	n.a.	n.a.	Vancouver, Canada	n.a.	n.a.
US West Coast	Los Angeles	n.a.	n.a.	n.a.	n.a.
Canada West Coast	Westshore(Vancouver)	n.a.	n.a.	n.a.	n.a.
Oceania	Newcastle	Port Hedland	Bunbury	n.a.	n.a.
South America East	n.a.	n.a.	Santos	n.a.	n.a.
Brazil North	n.a.	Ponta da Madeira	n.a.	Copper Concentrates	Sao Luis
				Primary Aluminum	Sao Luis
Brazil South	n.a.	Tubarao	n.a.	Primary Aluminum	Santa Cruz
				Petroleum Coke	Cubatao
				Manufactures of Iron and Steel	Santos
Venezuela	Puerto La Cruz	Puerto Ordaz	n.a.	Primary Aluminum	Puerto Ordaz
				Manufactures of Iron and Steel	Puerto Ordaz
Argentina	n.a.	n.a.	n.a.	Primary Aluminum	Puerto Madryn
				Petroleum Coke	La Plata
Colombia	Puerto Bolivar	n.a.	n.a.	Manufactures of Iron and Steel	Santa Marta
Soutn America West	n.a.	n.a.	Callao	n.a.	n.a.
Chile	n.a.	n.a.	n.a.	Copper Concentrates	Antafogasta
Ecuador	n.a.	n.a.	n.a.	n.a.	n.a.
Peru	n.a.	San Nicolas	n.a.	Copper Concentrates	Matarani
Colombia	n.a.	n.a.	n.a.	n.a.	n.a.
South Asia	n.a.	n.a.	Visakhapatham, India	n.a.	n.a.
Southeast Asia	n.a.	n.a.	Jakarta	n.a.	n.a.
Indonesia	PT Kaltim Prima Port (NE Kalimantan)	n.a.	n.a.	Cement	Gresik
Malaysia	n.a.	n.a.	n.a.	Cement	Jurong Port, Singapore
Philippines	n.a.	n.a.	n.a.	Cement	Manila
Thailand	n.a.	n.a.	n.a.	Cement	Bangkok

Source: CRU International Ltd.

Determination of Bypass Trades

Bypass routes are defined in one of two ways:

- Routes involving both overland and sea transportation which offer a potentially competitive alternative to the Canal;
- Those all water alternative routes for which the mileages are greater than those via the Canal but which account for all or a portion of the trade between the points of origin and destination because it is possible to utilize larger vessels than can transit the Canal, thereby achieving economies of scale.

For other dry bulks there are no examples of the first case. All of the minor bulk trades move on vessels no larger than Panamax. Potential bypass trades—which are confined to certain iron ore and coal trades—were first identified by determining the mileages between representative ports. The list of potential bypass trades for further analysis is shown below:

Iron ore:

- East Coast Canada to Oceania;
- East Coast Canada to each of Korea, Japan and China and Hong Kong;
- Venezuela to each of Taiwan, China and Hong Kong, Korea, Japan;
- North Brazil to Korea, Japan and China and Hong Kong
- Peru to East Coast USA
- Chile to East Coast USA
- Chile to the Caribbean Basin

Coal

- East Coast USA to each of Taiwan, Korea and Japan;
- North America Gulf to the Far East;
- Colombia to Japan;
- North America West to South America East;
- West Coast Canada to Europe*

Bypass trades are assigned to the Expanded Canal on the basis of:

- The current and future allocation of cargo to ship sizes. Current data are based on our market research with terminal operators and port agents. The future allocation is based on rates of change in the global fleet and port developments (see below).
- Comparisons of freight costs for Panama Canal routes and least cost alternative routes, which may result not only in trade switching to the Canal but also a change in vessel size distribution patterns.

Analysis of By Pass Trades

Data were obtained on iron ore and coal sailings from a number of export terminals, which are currently the sources of bypass trades, and analyses undertaken to determine vessel size distributions and utilization levels on these routes. While every effort was made to obtain data from all export terminals, this was not possible in all cases. In these instances, assumptions of vessel size distributions and utilization levels were based on similar detailed work undertaken in the 2001 study "The Development of Long Term Traffic Demand Forecasts for the Panama Canal, 2001-2050", prepared for ACP by Richardson Lawrie Associates. The results of these analyses are shown in Table 4-4.

Table 4-4. Cargo Size Distribution by Route and DWT Size Range on Potential Bypass Trades (percent)

Origin	Destination	Commodity	120 to 150k	150 to 170k	170 to 200k	200 to 230k	230 to 250k	250 to 300k	300k +
East Coast Canada	Oceania	Iron Ore	-	100.0	-	-	-	-	-
East Coast Canada	Korea	Iron Ore	-	100.0	-	-	-	-	-
East Coast Canada	Japan	Iron Ore	-	100.0	-	-	-	-	-
East Coast Canada	China & Hong Kong	Iron Ore	-	100.0	-	-	-	-	-
Venezuela	Taiwan	Iron Ore	36.0	64.0	-	-	-	-	-
Venezuela	China & Hong Kong	Iron Ore	36.0	64.0	-	-	-	-	-
Venezuela	Korea	Iron Ore	36.0	64.0	-	-	-	-	-
Venezuela	Japan	Iron Ore	36.0	64.0	-	-	-	-	-
Brazil North	Korea	Iron Ore	5.2	22.1	49.6	14.4	8.7	-	-
Brazil North	Japan	Iron Ore	2.5	19.0	56.8	-	-	-	21.7
Brazil North	China & Hong Kong	Iron Ore	19.9	22.2	38.9	19.0	-	-	-
North America West	South America East	Thermal and Metallurgical Coal	29.0	46.4	24.5	-	-	-	-
West Coast Canada	Europe	Thermal and Metallurgical Coal	29.9	30.3	39.8	-	-	-	-
Oceania	North America East	Thermal and Metallurgical Coal	29.0	46.4	24.5	-	-	-	-
Oceania	North America Gulf	Thermal and Metallurgical Coal	29.0	46.4	24.5	-	-	-	-
Oceania	Central America (incl. Mex	Thermal and Metallurgical Coal	29.0	46.4	24.5	-	-	-	-
West Coast Canada	North Africa	Thermal and Metallurgical Coal	100.0	-	-	-	-	-	-

Source: Richardson Lawrie Associates

Comparisons of Freight Costs on Canal and By Pass Routes

A full description of the preparation of freight costs is provided in Section 6. However, because this is central to the allocation of cargoes between the Canal and by pass routes for the Expanded Canal, the results are summarised here for the potential by pass routes studied. As an example of the relevant freight costs, Table 3-13 shows estimated figures for 2010 and 2020 – corresponding to the start points for the two proposed phases on the Canal expansion - for vessel size ranges between 90,000 and 200,000 DWT for the Canal and from 120,000 DWT up to 300,000+ DWT for the by pass trades in accordance with the size ranges within which cargoes are moved. For each trade, the table highlights the lower cost for each size range (Canal versus by pass) and the lowest overall cost. As the result of the analyses the conclusions are that only trade on the following routes would switch:

- East Coast Canada to S Korea (iron ore) from 2020
- East Coast Canada to Japan (iron ore) from 2020
- Venezuela to Taiwan (iron ore) from 2020
- Venezuela to China (iron ore) from 2020

- Venezuela to S Korea (iron ore) from 2020
- Venezuela to Japan (iron ore) from 2020
- West Coast Canada to Europe (coal) from 2010
- West Coast Canada to North Africa (coal) from 2010
- Oceania to North America East Coast (coal) from 2010
- Oceania to North America Gulf Coast (coal) from 2010
- Oceania to Central America East Coast (coal) from 2010

In the case of coal from Oceania to North America East Coast, only trade in the 120,000 to 150,000 DWT size range would switch from the by pass route to the Canal in 2010. From 2020, the further deepening of the Canal – which would provide for better utilization of vessels on these routes and therefore improve the competitive position of the Canal – would result in all of the cargo on this by pass route switching to the Canal.

Comparing 2010 freight costs, size for size between Canal and by pass routes for the three size ranges between 120,000 DWT and 200,000 DWT - in the instances where the Canal has an advantage and trade switches – the differentials in favor of the Canal route range from $0.06/ton to $1.26/ton. In 2020 as more trades are attracted to the Canal, the differentials range from $0.21/ton to $2.04/ton. These comparisons exclude consideration of Canal tolls, which currently are equivalent to around $2/ton including transit expenses. This is discussed further in Volume 5 of this study. Finally, the export of Colombian coal into the Far East was also considered as a potential by pass trade. However the annual forecast of just 69,000 tons is an insufficient quantity to be considered further as a potential by pass trade in post-Panamax vessels. North America and Europe are the natural markets for Colombian coal, while East Asia would naturally rely on the vast coalfields of China, Australia and Indonesia.

Table 4-5. Iron Ore Exports from Ponta Da Madeira to Far East, Vessel Size Distribution and Freight Costs, 2020

	Ponta da Madeira-Kwangyang			Ponta da Madeira-Mizushima			Ponta da Madeira-Shanghai		
Vessel Size Range (DWT)	Cargo Distribution (%)	Panama Freight Cost (2002$ /ton)	Alternative Freight Cost (2002$ /ton)	Cargo Distribution (%)	Panama Freight Cost (2002$ /ton)	Alternative Freight Cost (2002$ /ton)	Cargo Distribution (%)	Panama Freight Cost (2002$ /ton)	Alternative Freight Cost (2002$ /ton)
Greater or equal to 120,000–Less than 150,000	5.2	8.25	7.02	2.5	9.43	8.11	19.9	8.88	7.27
Greater or equal to 150,000–Less than 170,000	22.1	8.24	6.65	19.0	9.49	7.82	22.2	8.79	6.84
Greater or equal to 170,000–Less than 200,000	49.6	8.07	6.55	56.8	9.33	7.81	38.9	8.62	6.68
Greater or equal to 200,000–Less than 230,000	14.4	-	5.88	-	-	-	19.0	-	6.05
Greater or equal to 230,000–Less than 250,000	8.7	-	5.46	-	-	-	-	-	-
Greater or equal to 300,000	-	-	-	21.7	-	5.77	-	-	-
Total	100.0			100.0			100.0		

Source: Richardson Lawrie Associates

Table 4-6. Coal Exports from Vancouver to Europe, Vessel Size Distribution and Freight Costs, 2020

	Vancouver-Rotterdam		
Vessel Size Range (DWT)	Cargo Distribution (%)	Panama Freight Cost (2002$ /ton)	Alternative Freight Cost (2002$ /ton)
Greater or equal to 40,000–Less than 50,000	1.7	13.27	19.10
Greater or equal to 50,000–Less than 60,000	0.6	11.05	15.75
Greater or equal to 60,000–Less than 70,000	3.4	9.32	13.19
Greater or equal to 70,000–Less than 80,000	33.2	9.22	13.00
Greater or equal to 80,000–Less than 90,000	11.9	8.49	11.97
Greater or equal to 90,000–Less than 100,000	1.9	8.56	12.07
Greater or equal to 120,000–Less than 150,000	14.2	7.37	8.60
Greater or equal to 150,000–Less than 170,000	14.3	7.38	8.57
Greater or equal to 170,000–Less than 200,000	18.9	7.23	8.56
Total	100.0		

Source: Richardson Lawrie Associates

As an example of the relevant freight costs for all bypass trades considered, Table 4-7 shows estimated figures for 2010 for vessel size ranges between 90,000 and 200,000 DWT for the Expanded Canal and from 120,000 DWT up to 300,000+ DWT for the bypass trades in accordance with the size ranges within which cargoes are moved. For each trade, the table highlights the lower cost for each size range (Canal versus bypass) and the lowest overall cost. As the result of the analyses the conclusions are that only trade on the following routes would switch:

- East Coast USA to Japan (coal)
- East Coast USA to South Korea (coal)
- East Coast USA to Taiwan (coal)
- North America Gulf to Far East (coal)
- Venezuela to Taiwan (iron ore)
- West Coast Canada to Europe (coal)
- West Coast Canada to North Africa (coal)

In the case of coal from the East Coast USA to Japan, only cargo in the 120,000–150,000 DWT size range would switch back to the Canal. However on this route, and between the East Coast USA and other Far East destinations, trade is projected to decline substantially over the forecast period and the quantities of cargo envisaged switching to the Canal reach a point where the use of Cape Size vessels would not be justified due to insufficient cargo. The same comment is true of the coal trade from North America Gulf to the Far East.

Switching of Cargoes from By Pass to Canal Trades

The total quantities of cargo that would be switched in the Most Probable Case are shown in Table 4-8 for selected years from 2010 to 2025. In total, they amount to an additional 6.9 million tons in 2010, and almost 10.8 million tons in 2025

Comparison of Freight Costs for By Pass Trades by Route highlights the least cost route. From this comparison of rates, it seems clear that the routes from North Brazil to Asia via the Panama Canal are more expensive than the alternatives. This is even without consideration on Canal tolls. On this basis therefore it would not be expected that iron ore trade between Brazil and the Far East would switch to an Expanded Canal.

The freight costs shown in Table 4-7 assume zero tolls. The reasons for discarding trade from Brazil are a combination of freight costs and vessel size distribution, which for the Far East are concentrated in vessels above 120,000 DWT. For Canal transits vessel utilization levels get progressively lower the larger the ship due to the draft restriction of the Canal. In contrast, vessels on the alternative routes are able to take full loads. The relatively small savings in mileages from taking the Canal route are more than offset by the use of large dry bulk carriers (up to 300,000+ DWT) and better DWT utilization on the by pass route.

Table 4-7 Comparisons of Freight Costs for By Pass Trades by Route and Dwt Size Range, 2010 (2002$ / Ton)

				Panama				Least Cost Alternative						
Origin Region	Origin Port	Destination Region	Destination Port	90 to 100k	120 to 150k	150 to 170k	170 to 200k	120 to 150k	150 to 170k	170 to 200k	200 to 230k	230 to 250k	250 to 300k	300k+
2010														
East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	8.88	**7.80**	7.67	**7.50**		[illegible]					
East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	8.62	7.60	7.58	7.41	**7.45**	**7.02**	**6.91**	6.15	5.67	[illegible]	
East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	9.86	8.79	8.83	8.68	**8.54**	**8.19**	[illegible]				
East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	9.23	8.22	8.11	7.95	**7.73**	**7.23**	**7.05**	[illegible]			
Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	8.46	**7.41**	7.36	**7.19**	7.63	[illegible]	7.53				
Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	8.83	7.89	7.80	7.64	**7.47**	**7.00**	**6.83**	[illegible]			
Venezuela	Puerto Ordaz	Korea	Kwangyang	8.21	7.27	7.25	7.09	**7.21**	**6.80**	**6.69**	[illegible]			
Venezuela	Puerto Ordaz	Japan	Mizushima	9.44	8.45	8.50	8.35	**8.30**	**7.97**	[illegible]				
North Brazil	Ponta da Madeira	Korea	Kwangyang	8.94	7.96	7.94	7.78	**6.76**	**6.40**	**6.31**	5.66	[illegible]		
North Brazil	Ponta da Madeira	Japan	Mizushima	10.18	9.14	9.19	9.04	**7.85**	**7.57**	**7.56**				[illegible]
North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	9.56	8.58	8.49	8.32	**7.02**	**6.60**	**6.45**	[illegible]			
West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	7.99	**6.82**	6.82	6.69		[illegible]	**6.23**				
West Coast Canada	Vancouver	Europe	Rotterdam	8.29	**7.14**	**7.15**	[illegible]	8.31	8.28	8.27				
West Coast Canada	Vancouver	North Africa	Alexandria	9.59	**8.07**	**8.02**	[illegible]	9.17						
Oceania	Newcastle	North America East	Baltimore	10.01	**8.68**	8.71	8.54	9.04	**8.58**	[illegible]				
Oceania	Newcastle	North America Gulf	Mobile	9.64	**8.40**	**8.53**	[illegible]	9.19	8.79	8.58				
Oceania	Newcastle	Central America East	Tampico	9.14	**7.73**	**7.69**	[illegible]	8.69	8.17	7.96				
2020														
East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	9.20	**7.39**	7.15	**6.98**		[illegible]					
East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	8.94	**7.21**	**7.07**	**6.90**	7.73	7.28	7.17	6.39	5.90	[illegible]	
East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	10.17	**8.29**	**8.19**	[illegible]	8.83	8.46	8.45				
East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	9.55	**7.78**	7.55	7.39	8.00	**7.49**	**7.31**	[illegible]			
Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	8.80	**7.04**	**6.89**	[illegible]	7.94	7.48	7.83				
Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	9.15	**7.48**	7.27	7.10	7.75	**7.26**	**7.08**	[illegible]			
Venezuela	Puerto Ordaz	Korea	Kwangyang	8.52	**6.90**	**6.77**	**6.61**	7.49	7.07	6.95	[illegible]			
Venezuela	Puerto Ordaz	Japan	Mizushima	9.75	**7.98**	**7.89**	[illegible]	8.59	8.25	8.23				
North Brazil	Ponta da Madeira	Korea	Kwangyang	9.28	7.55	7.41	7.25	**7.02**	**6.65**	**6.55**	5.88	[illegible]		
North Brazil	Ponta da Madeira	Japan	Mizushima	10.51	8.63	8.54	8.38	**8.11**	**7.82**	**7.81**				[illegible]
North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	9.91	8.13	7.91	7.74	**7.27**	**6.84**	**6.68**	[illegible]			
West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	8.25	**6.69**	6.37	**6.22**		[illegible]	6.43				
West Coast Canada	Vancouver	Europe	Rotterdam	8.56	**7.01**	**6.67**	[illegible]	8.60	8.57	8.56				
West Coast Canada	Vancouver	North Africa	Alexandria	9.92	**7.94**	**7.50**	[illegible]	9.44						
Oceania	Newcastle	North America East	Baltimore	10.38	**8.56**	**8.16**	[illegible]	9.39	8.90	8.69				
Oceania	Newcastle	North America Gulf	Mobile	9.98	**8.27**	**7.98**	[illegible]	9.54	9.13	8.91				
Oceania	Newcastle	Central America East	Tampico	9.50	**7.65**	**7.23**	[illegible]	9.06	8.52	8.30				

Bold = Lowest for size range

Shaded = Lowest overall

Source: Richardson Lawrie Associates

Table 4-8. Bypass Trades Switched to the Canal under Expanded Canal Conditions, Most Probably Case, No Tolls, Selected Years 2001–2025 (000 tons)

Origin	Destination	Commodity	2010	2015	2020	2025
East Coast Canada	Korea	Iron Ore	-	-	448	448
East Coast Canada	Japan	Iron Ore	-	-	774	774
Venezuela	Taiwan	Iron Ore	201	225	247	247
Venezuela	China & Hong Ko	Iron Ore	-	-	809	809
Venezuela	Korea	Iron Ore	-	-	771	771
Venezuela	Japan	Iron Ore	-	-	1,047	1,047
West Coast Canada	Europe	Thermal and Metallurgical Coal	2,510	2,449	2,371	2,295
Oceania	North America Ea	Thermal and Metallurgical Coal	805	1,638	1,661	1,481
Oceania	North America Gu	Thermal and Metallurgical Coal	2,485	2,344	2,202	1,964
Oceania	Central America E	Thermal and Metallurgical Coal	707	743	764	771
West Coast Canada	North Africa	Thermal and Metallurgical Coal	159	155	150	145
Total			6,867	7,554	11,244	10,753

Source: Richardson Lawrie Associates

WORLD FLEET DEVELOPMENT BY SIZE

The potential growth in the world fleet and the potential impact of an Expanded Canal on its development are important background to the projection of changes in the allocation of cargo to different size ranges of vessel in the Canal transit forecasts. This section examines historical trends in the growth of the world fleet by size range and, for vessels below 80,000 DWT, makes comparisons with the trends observed in transits through the Canal. Forecasts of the world fleet by size range for the Existing and Expanded Canals have been developed based on future expectations of world trade growth in dry bulk commodities, changing preferences for ordering particular vessel sizes, the age distribution of the existing fleet and projected scrapping by size range.

Analysis of Trends in the World Dry Bulk Carrier Fleet by Size Range

The potential growth in the world fleet and the potential impact of an Expanded Canal on its development are important background to the projection of changes in the allocation of cargo to different size ranges of vessel in the Canal transit forecasts. This section examines historical trends in the growth of the world fleet by size range and, for vessels below 80,000 DWT, makes comparisons with the trends observed in transits through the Canal. Forecasts of the world fleet by size range for the Existing and Expanded Canals have been developed based on future expectations of world trade growth in dry bulk commodities, changing preferences for ordering particular vessel sizes, the age distribution of the existing fleet and projected scrapping by size range.

The world dry bulk carrier fleet increased from 290 million DWT at the beginning of 2002 to 298 million DWT by the start of 2003. Analysis of the current world fleet shows the spread of vessels over a wide number of size ranges. However, it also shows the concentration of tonnage around the Handy Size/Handymax (30,000–50,000 DWT), Panamax (60,000–80,000 DWT) and the Capesize

(120,000–200,000 DWT) size ranges. It also highlights the dearth of tonnage that exists in the size ranges between 80,000 and 120,000 DWT. This may be significant since this is precisely the size ranges which—on a fully laden basis—could be accommodated by an Expanded Canal.

For owners operating in that segment of the market which is above 60,000 DWT but excluding the Cape Size sector, the existing Panama Canal dimensions represent a significant constraint if the vessel is to be traded truly internationally. If, as in some cases, vessels are intended to operate only in the Pacific markets, there is the opportunity to employ post Panamax vessels – generally above 80,000 DWT but possibly lower - and this is a slowly emerging trend. Above 100,000 DWT up to 120,000 DWT these vessels are generally too big for the grains and minor bulk trades and although they find employment in some coal and iron ore trades, they are generally uncompetitive with the Cape Size vessels more commonly used in the major iron ore and coal trades.

With the expansion of the Canal it has been assumed that on some of the larger grains and minor dry bulk trades through the Canal would utilize a proportion of vessels in the 80,000-100,000 DWT size ranges but it is not expected that there would be increased employment opportunities for vessels between 100,000 DWT and 120,000 DWT. As documented in various sections of the Transportation Study on the Grains Market Segment and the Panama Canal, Volume 3, we expect grains cargoes to be limited to vessels below 100,000 DWT. For other dry bulks the economics of utilizing vessels in the 100,000-120,000 DWT size range through an Expanded Canal versus either large vessels part laden through the Canal or larger sizes on by pass routes do not justify the employment of the smaller size of vessel through the Canal.

The proportions of the world fleet—in DWT terms—in DWT ranges below 40,000 DWT are declining slowly and steadily, as is the case for Panama Canal transits. Also evident is a decline in the 60,000–70,000 DWT range and an increase in the 70,000–80,000 DWT range although these are not as steep as exhibited by transits through the Canal since the impact of the Japanese "15 year rule" on vessels carrying grains in relative terms is less significant in the context of the world fleet.

The increase in the employment of 70,000 to 80,000 DWT dry bulk carriers through the Canal is a function of the age structure of the world Panamax fleet and the Japanese preference for modern vessels. They prefer vessels to be less than 10 years of age and will not accept vessels over 15 years. There is a concentration of 60,000 to 70,000 DWT Panamaxes built around the mid 1980s which have been phased out from this trade under the 15 year old rule. In contrast, China will take vessels up to 20 years.

Recently, the steady increase in the 40,000–50,000 DWT range in the world fleet has stopped and its share has remained constant, while the slow decline in the 50,000–60,000 DWT range has also stopped and a small increase appeared. This is unlike transits through the Panama Canal for which the increase in the 40,000–50,000 DWT range and decrease in the 50,000–60,000 DWT range have continued.

World Dry Bulk Carrier New Building Order Book

The new building order book as at January 2003 comprised 33.8 million DWT, equivalent to about 11 percent of the existing fleet. This is a relatively moderate figure in comparison with the size of the current fleet. For tankers, for example, the comparable figure is around 20 percent. Orders are scheduled at 11.2 million DWT in 2003, 14.1 million DWT in 2004, 8.0 million DWT in 2005 and

0.5 million DWT in 2006. Yard space for additional orders for delivery over the next two years is limited although, undoubtedly, further orders will eventually be placed for deliveries in 2005 and 2006

Orders are concentrated in three size ranges in particular; 50,000–60,000 DWT (19 percent of the order book), 70,000–80,000 DWT (almost 24 percent) and 170,000–200,000 DWT (25 percent). Some orders are beginning to be placed in the size range from 80,000 to 90,000 DWT and there are two ships in the 90,000–100,000 DWT size range but there are no orders for vessels between 100,000 DWT and 150,000 DWT.

Currently, the largest Panamax dry bulk carriers are 76,000 DWT. New dry bulk carrier designs are being offered for vessels in the 80,000–90,000 DWT size range. Japanese yard, Tsuneishi reported signing its first contract in March 2003 for its new super Panamax vessel of 82,300 DWT. With an LOA of 229 meters—slightly longer than a conventional Panamax vessel—it has a beam of 32.26 meters and therefore would be capable of transiting the Existing Canal part laden. These ships appear to have been designed primarily for non Canal trades but have the flexibility to transit the Canal.

Dry Bulk Carrier Scrapping Model

Future scrapping has been calculated by looking at historical data which shows the progressive removal of vessels for a given year and size. This establishes a probability curve which describes the phase out of the fleet. This has been undertaken for the individual size ranges specified in the study TOR and shows the potential phase out of the existing dry bulk carrier fleet by size range in each study year. It should be recognized that the resulting figures indicate the potential long term trend in scrapping and that market developments in the short term will determine actual deletions from the fleet. In high markets, scrapping would be expected to fall below the long term trend while at times of low rates the reverse would be true.

The approach taken is the same as taken in all medium and long term forecasts of vessel removals in the international bulk shipping sectors and was originally developed by RLA in the early 1980s. The approach is based on historical data analysis which combines:

- historical fleet data by size range and age
- vessel scrapping by size range, year scrapped and age of vessel when scrapped.

From these data it is possible to develop functions which express the average likelihood of vessels of certain ages being scrapped (or conversely remaining in the fleet) for any given year or sequence of years. In other words this approach recognizes that older vessels are phased out over a range of ages and do not simply ‘drop dead’ at, say, age 25 years. Obviously the amount of scrapping will vary from year to year according to both the age structure of the fleet and market conditions. The model is designed to capture typical scrapping profiles, which are representative of a complete market cycle, covering both peaks and troughs, and therefore estimated scrapping levels relate specifically to the age profile of the fleet by size range in each year.

In summary vessels below 40,000 DWT are assumed to be largely phased out once they reach ages of between 24 and 34 years. For larger ships, the age range is assumed to be between 23 and 29 years. In view of increasing concerns over aging vessels in the shipping industry generally it is possible that a combination of tougher legislation and charterers' requirements could cause vessels to be scrapped in future at earlier ages than has been observed in the past. However, providing any new rules are introduced gradually there should be sufficient elapsed time for the industry to adjust without substantial disruptions to the overall tonnage balance.

The projections show annual scrapping rising from 5.8 million DWT in 2002 to just over 12 million DWT in 2010 before easing back to just over 7 million DWT in 2016/2017. After that, scrapping is estimated to commence a rising trend again with annual deletions at the end of the period reaching almost 14 million DWT. Between now and 2010, scrapping is expected to increase most significantly in the 30,000–50,000 DWT, 60,000–70,000 DWT and 120,000–200,000 DWT size ranges. The rise again in scrapping beyond 2017 is estimated to be concentrated in the 40,000–50,000 DWT, 70,000–80,000 DWT and 150,000–200,000 DWT size ranges.

Forecast of World Dry Bulk Carrier Fleet by Size Range

Existing Canal Conditions

As a first step, world dry bulk carrier supply by size range has been projected from the position at the beginning of 2002 through to 2005 on the basis of actual deliveries and deletions in 2002 plus scheduled deliveries from the new order book in 2003 and 2004 and less expected scrapping from the fleet.

Longer term, future dry bulk carrier supply by size range has been determined with reference to estimated demand in the main world bulk trades, based on data from CRU and NDSU. Forecasts of future demand and supply by broad size ranges—less than 50,000 DWT; 50,000–100,000 DWT and 100,000+DWT—were developed with reference to forecast trades of specific commodity groups, namely, minor bulks, grains, coal and iron ore.

In calculating vessel demand from a series of trade matrices we have used a widely accepted methodology which calculates demand by estimating the amount of tonnage required to move a certain amount of commodity in a given trade for a given year. The results are aggregated for all trades to determine overall demand. Tonnage required is calculated by determining the vessels' annual carrying capacities on a route based on its speed, port and Canal times and DWT utilization. In other words a series of tables has been constructed for each of the four commodity groups which determines the amount of DWT that would be required to move each forecast cargo on the route indicated. The formula which is applied for each route is as follows:

- Trade*(mileage*2/speed(knots)*24+port time+canal time)/(vessel annual days in service*cargo size)

The resulting DWTs were summed across all routes for each of the commodity groups to determine total demand by commodity group and hence determine overall demand.

For the Existing Canal, these size ranges were broken down further into the vessel size ranges specified in the TOR using the results of regression analyses on trends in the proportions of the world fleet within the three broad size ranges over the period from 1996 to 2005. The results of these regressions were used to project future trends in the vessel size distribution of the world fleet from 2005 through 2025 (Table 4-9).

Table 4-9. Dry Bulk Supply, 1996–2025, Existing Canal (million DWT)

	Vessel Size Range (000 DWT)																	
Year	10-15	15-20	20-25	25-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	110	120	150	200	250	250+	Total
1995	3.0	8.5	12.6	23.7	35.1	25.5	9.5	34.2	12.8	2.9	0.8	1.2	4.1	23.5	22.3	6.6	2.5	229.0
1996	3.0	8.6	13.1	24.4	35.2	28.9	9.4	35.4	15.5	3.2	1.1	1.2	3.7	24.5	26.5	6.6	2.5	242.9
1997	3.1	8.5	13.3	24.7	34.8	32.4	8.3	35.3	17.9	3.1	1.1	1.1	3.1	24.4	32.5	7.0	2.5	253.2
1998	3.0	8.2	13.4	24.7	34.6	35.0	8.1	35.5	22.0	2.9	1.3	0.8	3.0	24.4	37.8	7.2	3.2	265.2
1999	3.0	7.7	13.0	24.3	32.9	37.5	7.4	34.1	25.5	2.6	1.3	0.8	2.3	23.7	39.3	7.0	3.2	265.7
2000	3.0	7.4	12.8	23.6	32.6	38.5	6.5	33.3	29.5	2.3	1.1	0.8	1.5	22.9	43.1	7.3	3.2	269.4
2001	3.0	7.1	12.7	23.2	32.4	39.5	6.5	33.1	33.5	2.8	1.4	0.7	1.2	22.8	48.2	7.3	2.9	278.2
2002	3.0	7.0	12.3	22.9	31.4	40.8	9.2	31.7	41.0	2.7	1.5	0.9	0.9	22.3	52.1	7.5	2.9	290.0
2003	3.0	6.8	11.9	22.5	31.3	41.6	12.3	30.6	44.7	3.0	1.6	0.7	0.7	21.6	55.5	7.7	2.9	298.3
2004	3.0	6.6	11.4	21.9	31.1	42.2	14.5	29.5	45.8	3.2	1.5	0.7	0.6	21.3	59.3	8.1	2.9	303.8
2005	3.0	6.3	10.8	21.3	30.6	42.5	16.4	28.2	49.7	3.4	1.7	0.7	0.6	21.2	63.4	9.2	2.9	311.8
2006	3.0	6.4	11.4	21.8	30.5	43.6	16.9	27.6	54.5	3.3	1.7	0.7	0.1	19.4	67.8	9.1	2.9	320.6
2007	3.0	6.5	11.8	22.4	30.8	44.1	18.5	26.6	58.4	3.4	1.8	0.6	-	19.0	70.2	9.2	2.8	329.3
2008	3.0	6.7	12.3	23.0	31.1	44.7	20.2	25.6	62.3	3.6	1.9	0.6	-	18.6	72.5	9.4	2.8	338.3
2009	3.0	6.9	12.8	23.6	31.5	45.2	22.1	24.5	66.4	3.7	1.9	0.6	-	18.1	74.9	9.6	2.8	347.6
2010	3.0	7.1	13.3	24.3	31.9	45.6	23.9	23.4	70.5	3.8	2.0	0.6	-	17.7	77.4	9.8	2.8	357.1
2011	3.0	7.3	13.9	25.0	32.3	46.1	24.8	22.8	72.7	3.9	2.0	0.6	-	17.5	78.8	9.9	2.8	363.3
2012	3.0	7.6	14.5	25.8	32.8	46.5	25.6	22.3	74.9	3.9	2.1	0.5	-	17.2	80.3	10.0	2.8	369.7
2013	3.1	7.8	15.1	26.5	33.2	46.8	26.5	21.7	77.2	4.0	2.1	0.5	-	17.0	81.7	10.1	2.8	376.2
2014	3.1	8.1	15.7	27.3	33.7	47.2	27.4	21.1	79.4	4.0	2.1	0.5	-	16.7	83.2	10.2	2.8	382.8
2015	3.1	8.4	16.4	28.2	34.3	47.5	28.3	20.5	81.7	4.1	2.2	0.5	-	16.4	84.8	10.3	2.8	389.5
2016	3.1	8.8	17.2	29.3	35.0	47.8	29.3	19.9	84.1	4.2	2.2	0.5	-	16.2	86.4	10.4	2.8	397.1
2017	3.1	9.2	18.1	30.4	35.7	48.1	30.4	19.3	86.4	4.2	2.3	0.5	-	15.9	88.0	10.5	2.7	404.9
2018	3.1	9.6	19.0	31.6	36.5	48.4	31.4	18.7	88.8	4.3	2.3	0.5	-	15.5	89.7	10.7	2.7	412.8
2019	3.1	10.0	20.0	32.8	37.3	48.7	32.5	18.0	91.2	4.4	2.3	0.4	-	15.2	91.4	10.8	2.7	421.0
2020	3.2	10.5	21.0	34.1	38.1	48.9	33.6	17.3	93.7	4.5	2.4	0.4	-	14.9	93.1	11.0	2.7	429.3
2021	3.2	10.5	21.1	34.3	38.2	49.2	35.0	16.5	96.6	4.6	2.4	0.4	-	14.8	93.8	11.0	2.7	434.4
2022	3.2	10.6	21.3	34.5	38.3	49.4	36.4	15.7	99.5	4.7	2.5	0.4	-	14.7	94.6	11.0	2.7	439.6
2023	3.2	10.6	21.5	34.7	38.4	49.7	37.9	14.9	102.5	4.8	2.5	0.4	-	14.6	95.3	11.1	2.7	444.8
2024	3.2	10.7	21.7	35.0	38.6	49.9	39.4	14.0	105.5	4.9	2.6	0.4	-	14.5	96.0	11.1	2.7	450.2
2025	3.2	10.8	21.9	35.3	38.7	50.2	40.9	13.1	108.6	5.0	2.6	0.4	-	14.4	96.7	11.2	2.7	455.6

Expanded Canal Conditions

The approach to estimating size trends in the world fleet under Expanded Canal conditions was the same as for the Existing Canal with adjustments made to take into account the following:

- the impact of trade switching from bypass routes to Canal routes;
- the potential for utilizing larger vessel sizes on existing trades through the Canal.

The first of these adjustments was made by calculating the effect on dry bulk carrier demand by size range as the result of switching trade to the shorter Canal routes and, in some cases, switching vessel sizes.

The second part of the analysis started with the assumption that the impact on the size distribution of the world fleet of an Enlarged Canal - on the dimensions currently planned - will be focused almost entirely on the size mix of vessels between 60,000 DWT and 100,000 DWT. While an Enlarged Canal could attract trade in some vessels above 120,000 DWT part laden – subject to tolls – such volumes would be relatively small by comparison with global trade moved in vessels of this size. Therefore, the size distribution of the world fleet in these size ranges would scarcely be impacted by an Enlarged Canal

The maximum size of vessel that could transit the Canal fully laden would be around 110,000 DWT. This comment is based on the average dimensions for vessels in the 100,000-110,000 DWT of LOA 249.9m, beam 40.6m and draft 15.3m. For the 110,000-120,000 DWT size range the average dimensions are LOA 258.1m, beam 40.1 and draft 16.1m. Calculations have been based on the average dimensions of vessels within each size range although it is recognized that 8 vessels of over 120,000 DWT could transit the Expanded Canal with a draft of 15.24m fully laden. However these vessels are not representative of ships in the 120,000-140,000 DWT size range. A more detailed description of the impact of the Expanded Canal on the sizes of vessel that could transit the Canal and cargo utilization levels is included in Section 2, page 40.

By way of further clarification, the important consideration for the Expanded Canal is vessel draft. In the Expanded Case – unlike for the Existing Canal - beam would not be a restriction. For the Existing Canal there is a restriction of just over 32m. We have also considered whether one should take average or 'optimum' dimensions as representative of a size range. We think our approach – based on average dimensions - is correct since there is no surety that vessels over 100,000 DWT would be optimized for Panama Canal trading.

There have always been trends towards increasing vessel sizes. Handy Sizes have given way to Handymaxes and now "Super Handies" over 50,000 DWT are favored by some owners. Likewise the sizes of Panamax dry bulk carriers have also been increasing. However, the constraints represented by the Canal and the importance of the U.S. Gulf–Far East grain trades to this sector have represented a constraint to the growth in vessel sizes above 80,000 DWT. At the same time the growth in demand for post Panamax tonnage of around this size in the Pacific coal trades has meant that the removal of the existing Panama Canal constraints would create a demand for a flexible vessel for this Pacific business, capable of being employed also in the grains trades.

Up until 2009, it is assumed that the world fleet under the Expanded Canal would be the same as that for the Existing Canal. From 2009, vessels scrapped between 60,000 and 100,000 DWT would be replaced by a larger size mix of new ships. Starting with supply by size range in 2009, and using the results of the scrapping model, the amount of new tonnage required in each year from 2009 through 2025 to replace older tonnage and to meet rising demand has been calculated for the 60,000–100,000 DWT size range in total.

The way in which this new tonnage has been apportioned between the individual size ranges is as follows:

- For the 60,000–70,000 DWT range size range it is assumed that the relative lack of interest in newbuildings will continue and that further annual additions to this size range will remain at around the 1.4 percent of the total deliveries between 60,000 DWT and 100,000 DWT, that is, a similar proportion to that in the current order book.
- Looking at the current new building order book, ships in the 90,000 to 100,000 DWT range account for just 2 percent of the contracts for vessels between 60,000 DWT and 100,000 DWT. Over the period from 1988 to 2004, deliveries in the 80,000 DWT to 100,000 DWT range in total are estimated to account for an average of only 7.2 percent of the vessels in the 60,000–100,000 DWT segment of the fleet and the pattern has been somewhat sporadic. It has therefore been assumed that future new deliveries in the 90,000–100,000 DWT size range from 2009 will be equivalent to 7.2 percent of the deliveries in the 60,000 DWT to 100,000 DWT size range.
- Between 70,000 DWT and 90,000 DWT it is envisaged that there would be a marked shift in the distribution of vessels above and below 80,000 DWT, in favor of the larger size range. This trend has been patterned on observations from the changes in vessel size distribution that have taken place between the 60,000–70,000 DWT and 70,000–80,000 DWT size ranges from 1988 to date. In 1988/9 the 60,000–70,000 DWT size range accounted for about 86 percent of the newbuilding deliveries in the 60,000–100,000 DWT size range. Although there are a few vessels scheduled for delivery this year, this proportion had fallen to zero by 1999. Conversely the share represented by the 70,000–80,000 DWT size range increased from 13/14 percent in 1988/9 and is now around 80 to 90 percent, having briefly reached almost 100 percent in 2001. It seems reasonable to assume that removal of the Existing Canal constraints would result in a similar switch taking place between vessels of 70,000–80,000 DWT and 80,000–90,000 DWT in the period from 2010.

Results

Existing Canal

Table 4-9 shows the fleet at the beginning of 2002 was equivalent to 290 million DWT. During the year, new deliveries totaled 14.0 million DWT—more than offsetting scrapping which amounted to 5.8 million DWT. Based on the newbuilding order book at January 2003, deliveries in 2003 and 2004 are projected at 11.3 million DWT and 14.1 million DWT respectively. With scrapping assumed at 5.7 million DWT in 2003 and 6.0 million DWT in 2004, the total world fleet is estimated to have increased to 298 million DWT by the beginning of 2003 and is projected to reach 312 million DWT by January 2005. It is recognized that the scale of scrapping to date in 2003—about 1.3 million DWT has been reported so far as at mid May—has been less than would be implied based on our assumptions. This is due to the sharp spike currently being experienced in the charter market.

In the period from 2005 through 2025, the results show the world fleet growing steadily to reach 458 million DWT by 2025. Overall, this represents an average annual growth rate from 2003 to 2025 of about 2 percent.

Vessel sizes in which growth is expected to be concentrated are between 40,000 and 60,000 DWT, between 70,000 and 90,000 DWT and above 150,000 DWT. The size ranges between 40,000DWT and 60,000 DWT would increase as a proportion of the world fleet from just over 17 percent in 2002 to 20 percent in 2025. Ships between 70,000 DWT and 90,000 DWT which accounted for 15 percent of the world fleet in 2002 would make up 25 percent by 2025. The share represented by vessels above 150,000 DWT would rise from almost 22 percent to over 24 percent. Vessels between 90,000 DWT and 120,000 DWT would continue to represent a small proportion of the fleet.

Projections of the world dry bulk carrier fleet for both the Existing and Expanded Canals indicate a phase out of vessels in the size range between 110,000 DWT and 119,999 DWT and a decline in interest in vessels of around 120,000 DWT generally. Currently there are just 7 ships in the 110,000 to 119,999 DWT size range. Of these, 5 were built in the 1970s. The remaining two were built in 1986 and 1990 respectively and therefore if a 25 year life is assumed both of these ships would still exist in 2010 but they would be removed from the fleet by 2020. This study assumes all ships in this size range would be removed by 2010. Although vessels may be scrapped before they reach the age of 25 years it is possible we have phased out this size range slightly earlier than might be the case. However we are talking about very few vessels here.

Between 120,000 and 130,000 DWT there are 29 vessels, of which 1 was built in 1986 and 12 built between 1990 and 1996. Therefore applying the simple 25 year rule, all of these vessels would be in the fleet in 2010 but just 4 would survive until 2020. In Tables 4-25(a) and 4-26(a) of the ODB Study, Volume III, we show a continuing, although declining, supply of dry bulk carriers in the 120,000 to 150,000 DWT size range. This is consistent with the view of a declining interest in vessels of around 120,000 DWT.

Within the time frame envisaged, this view was confirmed in discussions with three prominent ship owners, one of whom currently owns a number of the very few ships around 120,000 DWT. Even though this company currently operates five of the 1990s built vessels of around 123,000 DWT and, for example, has employed these in the grains trades from the US Gulf into Europe, they do not see these as the vessel size for the future and this view is not changed when considering the potential expansion of the Canal.

This view is supported by the current dry bulk carrier order book which contains no dry bulk carriers between 100,000 and 140,000 DWT There are just 2 combined carriers of 121,000 DWT but these can be considered exceptional due to their dry bulk and oil carrying capability. Vessels of around 120,000 DWT are considered just too big for minor bulks and general grains trading (see Transportation Study on the Grain Market Segment and the Panama Canal). While they might find employment in limited trades they would be extremely inflexible. This would mean almost inevitably that these vessels would be confined to trading on a round voyage basis, which would incur a substantial proportion of ballast trading. In the true coal and iron ore Cape Size trades which increasingly employ vessels of 150,000 DWT and upwards, vessels of around 120,000 DWT would not be competitive.

Expanded Canal

Table 4-10 shows the development of the world fleet for the Expanded Canal. Changes from 2010 take into account the impact on the global fleet between 60,000 DWT and 100,000 DWT as the result of a move to larger vessel sizes up to 100,000 DWT. They also reflect those changes which would result from the switching of other dry bulk trades which are currently being shipped in vessels of between 120,000 DWT and 200,000 DWT from bypass routes to Canal routes.

The main difference between the Existing and Expanded Canal conditions is that under the latter conditions, the 70,000–80,000 DWT size range would be expected to peak at around 79 million DWT in 2018 before declining to just under 65 million DWT in 2025. This compares with a steady rise to nearly 109 million DWT under Existing Canal conditions. In contrast, with an Expanded Canal, the 80,000–90,000 DWT size range would increase to 54 million DWT instead of about 5 million DWT in the former case. There would also be an approximately 4 million DWT increase in the size of the 90,000–100,000 DWT size range by the end of the forecast period.

Comments on Results

Based on these projections of world dry bulk carrier supply to 2005, our estimates of total dry bulk carrier demand and supply from 1996 through 2005 shows the market surplus at almost 17 percent of supply in 1996 and reaching a peak of 17.6 percent in 1998 after a brief decline. The surplus reached a low point in 2000 of around 10 percent. This is a view that has been confirmed also in discussion with a major ship owner. Between 2000 and 2002 the surplus is seen to have risen again. These trends coincide with developments in dry bulk carrier charter rates, which—as might be expected—bear an inverse relationship to the size of the market surplus (see Figure 4–1).

One other point of clarification should be made which is important to the understanding of the long range (23 year) outlook that has been presented here. Table 4–23, indicates a rising market surplus in 2003 but market rates are at a peak currently. Firstly, it is perfectly possible that this peak, as has been the case in the past, will be relatively short lived. More importantly, the trade figures used to calculate vessel demand is based on the expected global developments between 2000 and 2025, which are intended to capture long term underlying trends rather than short term fluctuations about these trends.

There is also the question of the extent to which long term forecasts of freight costs are sensitive to these projections of vessel demand and supply. In the short term, freight costs are very sensitive to changes in vessel demand and supply - both at global and localized levels.

However over the longer term, vessel supply adjusts to changes in demand levels. Rising demand and a firm market is likely to result in a combination of additional new vessels being built and a slowdown in scrapping. A weak market - brought on by declining demand and/or a substantial over supply on tonnage brought about by a period of 'over-ordering' - will induce an increase in scrapping and a slowdown in the ordering of new vessels. In other words vessel supply is adjusted to offset major imbalances developing in the markets. On this basis - barring sudden and overwhelming changes in the market there is little reason to assume that average market surpluses - and hence freight rates - over the long term would be substantially sensitive to changes in vessel demand.

Table 4-10. Dry Bulk Carrier Supply, 1996–2025, Expanded Canal (million DWT)

	Vessel SizeRange (000 DWT)																
Year	10-15	15-20	20-25	25-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-150	150-200	200-250	250+	Total
1995	3.0	8.5	12.6	23.7	35.1	25.5	9.5	34.2	12.8	2.9	0.8	1.2	4.1	23.5	22.3	6.6	2.5	229.0
1996	3.0	8.6	13.1	24.4	35.2	28.9	9.4	35.4	15.5	3.2	1.1	1.2	3.7	24.5	26.5	6.6	2.5	242.9
1997	3.1	8.5	13.3	24.7	34.8	32.4	8.3	35.3	17.9	3.1	1.1	1.1	3.1	24.4	32.5	7.0	2.5	253.2
1998	3.0	8.2	13.4	24.7	34.6	35.0	8.1	35.5	22.0	2.9	1.3	0.8	3.0	24.4	37.8	7.2	3.2	265.2
1999	3.0	7.7	13.0	24.3	32.9	37.5	7.4	34.1	25.5	2.6	1.3	0.8	2.3	23.7	39.3	7.0	3.2	265.7
2000	3.0	7.4	12.8	23.6	32.6	38.5	6.5	33.3	29.5	2.3	1.1	0.8	1.5	22.9	43.1	7.3	3.2	269.4
2001	3.0	7.1	12.7	23.2	32.4	39.5	6.5	33.1	33.5	2.8	1.4	0.7	1.2	22.8	48.2	7.3	2.9	278.2
2002	3.0	7.0	12.3	22.9	31.4	40.8	9.2	31.7	41.0	2.7	1.5	0.9	0.9	22.3	52.1	7.5	2.9	290.0
2003	3.0	6.8	11.9	22.5	31.3	41.6	12.3	30.6	44.7	3.0	1.6	0.7	0.7	21.6	55.5	7.7	2.9	298.3
2004	3.0	6.6	11.4	21.9	31.1	42.2	14.5	29.5	45.8	3.2	1.5	0.7	0.6	21.3	59.3	8.1	2.9	303.8
2005	3.0	6.3	10.8	21.3	30.6	42.5	16.4	28.2	49.7	3.4	1.7	0.7	0.6	21.2	63.4	9.2	2.9	311.8
2006	3.0	6.4	11.4	21.8	30.5	43.6	16.9	27.6	54.5	3.3	1.7	0.7	0.1	19.4	67.8	9.1	2.9	320.6
2007	3.0	6.5	11.8	22.4	30.8	44.1	18.5	26.6	58.4	3.4	1.8	0.6	-	19.0	70.2	9.2	2.8	329.3
2008	3.0	6.7	12.3	23.0	31.1	44.7	20.2	25.6	62.3	3.6	1.9	0.6	-	18.6	72.5	9.4	2.8	338.3
2009	3.0	6.9	12.8	23.6	31.5	45.2	22.1	24.5	66.4	3.7	1.9	0.6	-	18.1	74.9	9.6	2.8	347.6
2010	3.0	7.1	13.3	24.3	31.9	45.6	23.9	22.5	70.6	4.5	2.1	0.6	-	17.6	77.1	9.6	2.8	356.6
2011	3.0	7.3	13.9	25.0	32.3	46.1	24.8	20.4	73.1	5.6	2.3	0.6	-	17.3	78.6	9.7	2.8	362.9
2012	3.0	7.6	14.5	25.8	32.8	46.5	25.6	18.6	74.9	7.1	2.6	0.5	-	17.1	80.1	9.8	2.8	369.3
2013	3.1	7.8	15.1	26.5	33.2	46.8	26.5	17.0	76.2	8.9	2.9	0.5	-	16.9	81.6	9.9	2.8	375.7
2014	3.1	8.1	15.7	27.3	33.7	47.2	27.4	15.5	77.2	11.0	3.1	0.5	-	16.6	83.1	10.0	2.8	382.3
2015	3.1	8.4	16.4	28.2	34.3	47.5	28.3	14.2	77.9	13.2	3.4	0.5	-	16.3	84.6	10.1	2.8	389.1
2016	3.1	8.8	17.2	29.3	35.0	47.8	29.3	12.9	78.3	15.6	3.6	0.5	-	16.1	86.2	10.2	2.8	396.7
2017	3.1	9.2	18.1	30.4	35.7	48.1	30.4	11.8	78.5	18.1	3.8	0.5	-	15.7	87.9	10.4	2.7	404.5
2018	3.1	9.6	19.0	31.6	36.5	48.4	31.4	10.8	78.5	20.8	4.0	0.5	-	15.5	89.5	10.5	2.7	412.4
2019	3.1	10.0	20.0	32.8	37.3	48.7	32.5	9.6	78.0	24.1	4.3	0.4	-	15.1	91.2	10.7	2.7	420.6
2020	3.2	10.5	21.0	34.1	38.1	48.9	33.6	8.5	77.1	27.8	4.5	0.4	-	14.8	93.0	10.8	2.7	428.9
2021	3.2	10.5	21.1	34.3	38.2	49.2	35.0	7.4	75.7	32.2	4.8	0.4	-	14.7	93.7	10.8	2.7	434.0
2022	3.2	10.6	21.3	34.5	38.3	49.4	36.4	6.5	73.7	37.1	5.1	0.4	-	14.6	94.4	10.9	2.7	439.2
2023	3.2	10.6	21.5	34.7	38.4	49.7	37.9	5.7	71.1	42.4	5.5	0.4	-	14.5	95.1	10.9	2.7	444.4
2024	3.2	10.7	21.7	35.0	38.6	49.9	39.4	5.0	68.0	48.1	5.9	0.4	-	14.4	95.9	11.0	2.7	449.8
2025	3.2	10.8	21.9	35.3	38.7	50.2	40.9	4.6	64.5	53.9	6.2	0.4	-	14.3	96.6	11.0	2.7	455.2

DEVELOPMENT OF TRADE BY VESSEL SIZE ON CANAL ROUTES

This section summarizes some of the main comments and observations obtained as the result of market research and through responses from Delphi Panel members. The final part of this section describes the approaches adopted to determine future vessel size distributions on Canal routes for the Existing and Expanded Canals and discusses the results.

Ports and Port Developments

A survey was undertaken by Nathan to determine the extent of other dry bulk port/terminal expansions currently under construction or at the planning stage. Few, if any, major projects have been reported. It would appear that there has not been a lot of investment in dry bulk ports generally and that port authorities are afraid to make the investments for the long term given the difficulty in making a financial return.

As a general comment, the factor that limits the size of Panamax vessels under current Canal conditions is the beam (32.31 meters) not LOA (294.13 meters). The constraints in ports generally tend to be LOA and draft. More ports are draft restricted than beam restricted. One company with whom we spoke pointed to the fact that there are a number of "over Panamaxes" with a 35 meter beam. These are shallow draft designs built specifically for Asian ports, typically power plant berths. These are really dedicated vessels for Pacific business only. Drafts in Japanese ports are generally 14-13.5 meter but it is better to have a 12 meter draft. If the Panama Canal was expanded and vessels increased to 85,000 DWT, an owner may prefer to keep to a 12 meter draft and optimize on beam and, possibly, LOA.

For discharging at Japanese power utilities, the cargo size is often around 60,000 tons because of limitations on port facilities. For metallurgical coal, cargo sizes are larger as ports are not constrained in the same way. There are some coal-fired power plants which have a 38 meter beam limit. There is a question as to whether they can take vessels on a 14 meter draft. These ports need as shallow a draft as possible for maximum cargo delivery. For this reason, one company with whom we spoke believes that a vessel of around 85,000 DWT can replace a number of vessels operating on this trade.

For iron ore imports into China (as for Japan, South Korea and Taiwan), Cape Sizes are used. Qinhuandao is a one such Cape Size port. The general restriction currently is 18.2 meter draft but Chinese ports are getting deeper. With regard to port developments, China is more flexible than Japan. China is expanding port facilities for iron ore and coal to meet needs. The money is there to build terminals to meet the needs of new plant under the current government and economic structure.

Vessel and Cargo Sizes

As a generality, cargo sizes have not increased noticeably. Coal in Panamax vessels is restricted by vessels' cubic capacity with a typical cargo in the 64,000-65,000 ton range. Iron ore in ore carriers can be carried to DWT with the cargo loaded in alternative holds - that is, 2, 4 and 6. A Cape Size of around 150,000 DWT would probably be able to carry around 110,000 tons of cargo through a Canal which was expanded to a 15.24m draft.

By contrast, a fully loaded cargo of coal in a modern Cape Size of around 170,000 DWT is 150,000 tons. One interesting point made is that the size of vessel is not of prime interest to the buyer. It is the delivered price of the coal that is of prime interest to the buyer. The additional inventory costs associated with buying in larger parcel sizes are likely to be low and therefore coal sales contracts do not have restrictive shipping terms. In other words, the coal can be shipped as one Cape Sized cargo or two Panamax cargoes depending on the precise state of the shipping market at any one time. If the dry bulk carrier market is such that it is less expensive to ship in Panamax rather than Cape Size vessels then the buyer will be happy to accept Panamax vessels.

No Cape Size vessels of less than 170,000 DWT are being ordered. This could possibly change if the maximum size of vessel that could go through the Canal is around 110,000–120,000 DWT. However this vessel size would not be a particularly good fit with other global trading patterns. It might prove inflexible and suited only to dedicated trades, thereby incurring a possible high level of ballast trading. One view expressed in interviews with operators is that there are no minor bulk cargoes which are likely to increase significantly in size.

To date, responses from Delphi panelists have brought mixed responses. Generally, ongoing shifts to larger vessel sizes were anticipated in the iron ore and coal trades, particularly in the case of the Expanded Canal. For other dry bulk cargoes, the views were less certain and for the Expanded Case doubts were expressed about these cargoes moving in vessels above 80,000 DWT.

For the Existing Canal there was general agreement over a continuing declining trend in the importance of vessels below 40,000 DWT and a rising trend between 60,000 DWT and 80,000 DWT. There were differing views concerning vessels between 40,000 and 60,000 DWT. For the Expanded Canal it was expected that the share of cargoes in the 80,000–120,000 DWT size ranges would increase at the expense of the 60,000–80,000 DWT range. Commodities that were highlighted as most likely to move in larger vessels over the forecast period, in addition to coal, were concentrates and nitrates, phosphates and fertilizers.

Allocation of Future Other Dry Bulk Cargoes to DWT Size Ranges

For the Existing Canal, the development of the algorithms used to determine forecasts of changes in the mix of vessel sizes were based on regressions of the percentage proportion of trade in each size range against the natural logarithm of time plus total cargo at the north and south levels respectively. These proportions were forecast to 2025 using the trade forecasts for the three different scenarios. The resulting annual rates of change in vessel size distributions were then applied to those on individual routes to derive future cargo size allocations by route and DWT size range.

Appendix B, Table B-1 shows the allocation of cargoes by route and DWT size range on Canal routes for the Existing Canal, most probable case for selected years through to 2025. As an example, for U.S. Gulf to Far East trades—collectively one of the major trades for other dry bulk cargoes through the Canal—this shows in particular a continuing shift from the 60,000–70,000 DWT size range to the 70,000–80,000 DWT size range and also increases in the size ranges between 40,000 DWT and 60,000 DWT. For two of the other main trades—from North America West Coast to Europe, the same shift from 60,000–70,000DWT up to 70,000–80,000 DWT is seen, although little change is anticipated in the 40,000–60,000 DWT size range.

For the Expanded Canal the above algorithms clearly required amendment. Unlike the grains trades there are not readily comparable non Canal trades on which to pattern potential size trends through an Expanded Canal. However, apart from the carriage of large volume coal and iron ore trades, it is unlikely that any other dry bulk commodities will move in vessels over 100,000 DWT in the forecast period. It is assumed that vessel size distribution patterns below 60,000 DWT would remain unchanged from the Existing Canal case. However, given the expected continued steady drive to develop ports as trade volumes grow, there is every reason think that the longer term trends in vessel sizes between 60,000 DWT and 100,000 DWT for Expanded Canal routes would converge towards those generally observed in the world fleet.

There is a view that the trend towards increasingly larger vessels is driven both by shipyards and the market. For example, coal is a low value product where the freight can account for 50 percent of the price. If the land to store the coal is cheap there is every incentive to utilize larger vessels to reduce the delivered price. Moreover in the other dry bulk trades there are not quite the same restrictions such as exist in the Japanese grains trades which have a major bearing on future developments in that segment.

The approach to allocating cargo to DWT size ranges for an Expanded Canal was based on three assumptions:

- For routes which currently, and in the past, rarely use ships above 60,000 DWT, there is little reason to believe that an Expanded canal would result in any change in the allocation of DWT size ranges;
- For routes which currently use ships above 60,000 DWT, there is a good reason to believe that larger ship sizes might be used with an Expanded Canal;
- For by-pass routes which currently do not use the Canal, only large DWT size ranges (that is, 80,000 DWT and greater) would use an Expanded Canal, subject to economics;

The regression equations for the Existing Canal use total south/north trade as a variable for the allocation process. The additional trade created from switching trade from by-pass routes has been handled separately (see above) and therefore does not affect the allocation process for Existing routes. The algorithms therefore required modification only for those routes where ships above 60,000 DWT were employed in 2001. For these routes:

- Up to 2009, the original allocation was used
- From 2010 onwards, the allocation to the DWT ranges up to 60,000 DWT remain the same but for the larger ranges (60,000–100,000 DWT) the allocation was summed and then re-allocated according to the forecast composition of the world fleet in these size ranges for the year. This has the effect of moving some of the allocation to larger DWT ranges not previously used.

The results are included in Appendix B, Table B-2 which shows the allocation by route and DWT size range on Canal routes for the Expanded Canal, most probable case for selected years to 2025. For the trades that comprise the major routes from North America Gulf to the Far East, for example, the importance of the 60,000–70,000 DWT size range is seen to decline close to zero by 2025. The share of the 70,000–80,000 DWT range is projected to peak at 29 percent in 2010 before declining gradually to 15 percent by the end of the forecast period. This is due to a projected increase in the utilization of vessels in the 80,000–100,000 DWT size ranges to nearly 14 percent by 2025.

For North America West to Europe trades, the proportion of cargoes moved in 60,000–70,000 DWT vessels is estimated to fall to just 2 percent in 2025. The share of the 70,000–80,000 DWT size range is projected to peak in 2015 at 53 percent before declining to about 38 percent in 2025. These vessels would be replaced by an increase in the share of cargoes moved in the 80,000–100,000 DWT size ranges from less than 5 percent in 2010 to 35 percent in 2025. The proportion of cargoes moved in vessels between 40,000 DWT and 60,000 DWT ships would change little over the forecast period.

ANALYSIS OF FUTURE SHIP COSTS AND FREIGHT COSTS

This section describes the approach, methodology and the calculations used to determine freight costs for Canal, least cost alternative and bypass routes. These are essential inputs to the identification, for subsequent tasks, of the cost points at which commodity–route pairs will divert from the Canal under alternative marketing and pricing policies. The accuracy and reliability of the freight cost analyses and forecasts are central to the credibility of the Canal forecast for grains and other dry bulk traffic and the Canal marketing and pricing analysis.

For the purpose of this study we define freight costs as the freight paid by the shipper to the ship owner or operator. While these represent the cost to the shipper these are not the same as operating costs (capital, fixed and variable) borne by the owner (see below). Capital costs comprise capital repayments plus interest charges. Fixed operating costs include manning, repairs and maintenance, insurance, stores and supplies and overheads. Variable costs cover bunkers, port charges and Canal dues, where applicable.

Estimates of freight costs—expressed in terms of US$ per cargo ton—have been developed through voyage estimates by route and deadweight (DWT) size range for:

- All vessels transiting the Canal,
- Bypass routes
- Routes that represent alternatives to the Existing Canal, and
- Routes where cargo moves in vessels that could transit the Existing Canal but are precluded from so doing by current toll policies.

Estimates of freight costs are used in later sections of this study as one of the inputs to the determination of future Canal traffic demand. With an Expanded Canal, some trades which move in larger vessels will be attracted to the Canal but it is necessary to determine the relative freight costs between these, bypass, trades and Canal routes. The basis selected for calculating freight costs reflects the way in which owners and operators view their economics when deciding whether or not to use the Canal.

In reviewing future seaborne freight costs, the following two elements must be considered:

- In the shipping sector it can be demonstrated that long-run costs—defined as the equivalent of fully built-up costs (capital plus fixed operating costs) for a vessel delivered in the year in question—do not equal long-run revenue. We therefore have not used this approach in forecasting transportation costs.
- Owners' decisions on whether to route ships via the Canal, when there are other options, are based generally on market freight rate levels. Utilizing the Canal saves vessel time and fuel costs but results in incurring tolls. The higher the market—and bunker prices—the greater the savings on vessel time and fuel costs from using the Canal. Also from a shipper's perspective, use of the Canal, or otherwise, affects vessel requirements that are covered, at the margin, in the spot market. Marginal economics, therefore, determine operators' routing policies. In other words, the approach is based on opportunity costs rather than actual costs when putting a value on the vessel's time.

It is also important to recognize that the relationship between vessel costs and earnings on the one hand and vessel size on the other is not linear. In the first instance the relationship reflects economies of scale as one moves up through the individual size ranges. These economies of scale are a feature of all of the main cost elements, that is, capital costs, fixed direct operating costs and variable operating costs. This statement applies to all cargo carrying vessels including obviously the dry bulk carrier fleet. This is broadly a log relationship.

Additionally, there can be other elements that impact on the cost/earnings to size relationship. These generally center on the fact that vessel designs are not the same across all size ranges. To put this simply, a 35,000 DWT bulk carrier is not the same as say, a 70,000 DWT dry bulk carrier only half the size. For dry bulk carriers, one of the essential differences is the provision or otherwise of cargo handling gear on board the vessel. Generally, smaller vessels are geared while larger vessels are not. This type of difference in vessel design again impacts on the cost/earnings to size relationship. From a statistical perspective it could be said to "distort" the relationship.

The incidence of high or low port charges and also geographical variations in port times can also distort freight cost comparisons between different routes, particularly on shorter hauls.

To calculate the numerous freight costs by route and vessel size required in this study, Richardson Lawrie Associates have developed a *Voyage Estimating Model* from its own in-house system. The following sections explain our approach to the determination of long term freight costs, the relationships between operating costs and market rates and the construction of voyage estimates. The Section concludes with a description of the *Voyage Estimating Model* and the results.

APPROACH TO THE DETERMINATION OF LONG TERM FREIGHT COSTS

Basis for the Calculation of Freight Costs

Freight rates are determined by a series of voyage calculations in which there are three essential components:

- The cost or value of the ship's time (normally expressed as the net daily return or time) charter equivalent rate;
- Bunker fuel costs;
- Port charges.

Panama Canal tolls would also be an element in determining the freight cost. However in this section of the study freight costs have been calculated without consideration of tolls so as to determine the maximum potential for Canal transits. In consideration of least cost alternative routes, which could entail transit of the Suez Canal, tolls for Suez transits have been included.

Of the three variables above, the last two are specific to each individual voyage. Bunker fuel costs are determined by bunker fuel prices, voyage length and the speed and fuel consumption characteristics of the vessel. Port charges are a function of vessel size and the ports considered. The value which is placed on the ship's time is broadly independent of the voyage performed with the possible exception of "back-haul" voyages where owners may be prepared to accept less than general market levels in order to make a contribution to costs on what otherwise might have been a ballast voyage.

The issue then is on what basis the time value—the time charter equivalent rate—of a vessel should be determined. In the dry bulk shipping market, ship operators' decisions on whether to transit the Canal are based on marginal economics in which the value placed on the vessel's time is determined by its potential earnings in the short term or single voyage (spot) charter market.

The answer is that is should be valued at its daily earnings potential in the market at that time. The higher the market, the greater will be the incentive for an owner to take the shorter route. This is the concept underlying the toll pricing strategy of the Suez Canal Authority. When charter market rates (freight rates) decline and therefore the value of the time saved by transiting the Canal falls, tolls are also adjusted downward to encourage operators to continue to use the Canal.

The key to our approach is therefore establishing the relationship between trends in short term charter rates and vessel operating cost levels—or more precisely the net daily return or time charter equivalent rate of vessels in relation to total fixed and capital operating costs. Owners' net daily returns are what are left as a contribution to fixed and capital costs after variable costs have been deducted from the total voyage revenue. Reviewing historical trends, a number of issues become apparent:

- Short term charter rates are extremely volatile, being determined principally by changes in demand and supply balances in the market;
- Trends in charter rates are cyclical in nature;
- Except at times of market peaks, short term charter rates are not sufficient to cover fully built up operating costs—that is capital costs fixed operating costs (manning, repairs and maintenance, insurance, stores, spares and overheads) plus variable costs (bunkers and port charges)—and for prolonged periods may fall significantly below these levels. For this reason fully built up costs are not appropriate for the determination of long term freight costs on relevant routes.
- While not a major determinant of short term charter rates, operating costs broadly define the limits within which rates fluctuate according to supply and demand developments. At one extreme operators will not fix their ships at levels below total variable costs which—leaving Canal dues aside—equate to bunker fuel costs and port charges. The maximum charter rate is broadly determined by fully built up costs since at this point operators have an incentive to order new tonnage and as a result the tight demand and supply balance which causes high charter rates is eased as additional tonnage is delivered.

For studies of near term developments it is reasonable to attempt to determine short term charter rates on the basis of global vessel demand and supply analyses and in so doing capture potential rate fluctuations. In a long term study of this nature it is not appropriate to try and predict future cyclical trends in the market but to determine a basis for projecting the future underlying trend in short term charter rates.

To attempt to determine net daily returns (market earnings) for individual voyages based on spot market rates is not a practical proposition given the wide array of routes and ship sizes to be analyzed and the fact that rates for particular voyages may be subject to localized supply and demand balances which are short lived and not representative of underlying market levels. The alternative therefore is to select a market indicator that reflects underlying trends in the short term charter market but which is not subject to the extreme volatility observed in individual voyage charter rates. For this purpose we have used estimates of one year time charter rates.

The dry bulk shipping market has the characteristics of a virtually perfect market with free competition. The impact of structural changes on either vessel demand or supply generally are offset within relatively short time frames by adjustments to the fleet, either through increased scrapping or the ordering of new tonnage. This means that it is totally reasonable to pattern future market trends on observations from past market behavior. In this case we have related trends in one year time charter rates to developments in operating costs—that is, the sum of fixed direct and capital costs. We have determined the underlying relationship between these two variables and also the range within which rates are likely to fluctuate.

The historical relationships of one year time charter rates to fixed operating and capital costs have been applied to forecasts of these future costs for all relevant ship sizes specified in the TOR. Factors taken into account in forecasting future fixed operating and capital costs include developments in vessel construction costs, manning, repairs and maintenance and insurance costs.

Determination of Future Trends in Ship Operating Costs and Prices

RLA maintains a certain amount of time series data on newbuilding prices and fixed direct operating costs by main items of expense for various sizes of dry bulk carrier. These data have been supplemented by other sources. For historical data, we have obtained further information from operating companies and also used resources such as the U.S. Army Corps of Engineers' database on deep sea vessel operating costs.

Past trends in these various cost elements in relation to general levels of cost inflation are one input in the projection of future costs. However future trends in costs will be determined also by technological and structural changes which may not necessarily bear a close relationship to past developments. For example, improvements in the design and structure of dry bulk carriers for safety and environmental reasons may exert upward pressure on prices. Fixed direct operating costs may be adversely impacted by the increasingly rigorous operating standards placed on the industry or may benefit further from new technology requiring, for example, fewer crew numbers to operate vessels. Meanwhile future manning costs will be determined also by the worldwide availability of qualified seaman and the sources of supply. These considerations dictate that the assessment of future costs should largely be based on an expert driven approach, using the consultants own knowledge plus input from the market.

A discussion paper was prepared and was sent to major ship owners and operators to obtain their views on the future direction of ship newbuilding prices and costs. It described the trends apparent in prices and costs back to 1988 and requested respondents to comment on the likelihood that these trends would continue into the future. In order to project future costs, trends and analyses were developed for all vessel sizes. However since the results for each item of cost were similar and in order to keep the market survey as simple as possible a 60,000 DWT vessel was selected as being representative. The discussion paper, together with responses is included in *Volume 3: Vessel Transit and Fleet Analysis*, Appendix C.

Historical trends in vessel prices and operating costs, by major item of expense where presented to respondents together with a lists of the factors that could affect future developments. Respondents were then invited to comment on the likelihood of various trends extending into the future and the reasons for their views. These inputs supplemented, and served as a test of, the numbers produced from our own research.

Forecasts of one year charter rates have been developed in the Vessel Earnings Estimating Module, which is part of the *Voyage Estimating Model.* Newbuilding prices are converted to annual capital costs. These are added to annual fixed operating costs and, using average historical relationships between total costs and one year time charter rates, projections of future one year time charter rates were made.

The resulting forecasts of one year time charter rates have then been combined with the forecasts of variable operating costs (bunkers and port charges) to determine future long term annual freight costs in terms of $ per cargo ton, in the first instance, excluding Canal tolls.

Methodology for Voyage Estimates

The use of voyage estimates to determine freight rates is an internationally accepted methodology used by owners and charterers. The *Voyage Estimating Model* has been designed to provide the maximum flexibility in the calculation of freight rates in that some options built into the system may in fact not be required.

The voyage estimate comprises four main elements:

- The vessel hire cost is determined by multiplying the total voyage time by the daily time charter rate or net daily return. The total voyage time is calculated by dividing the voyage mileage by the vessel speed and adding the appropriate allowances for port and Canal transit times.
- Bunker costs are calculated by multiplying the daily bunker fuel consumption rates for the vessel's main and auxiliary engines at sea and in port by the respective times spent at sea and in port and by representative bunker fuel prices for the trade in question.
- Port charges are the costs incurred by the vessel at the load and discharge ports and include, for example, the costs of pilots, tugs and harbor dues (see below).
- Canal dues are the costs incurred by the vessel in transiting, for example, the Panama or Suez Canals. Initially Panama Canal dues have been excluded from our calculations with only those for Suez transits on alternative routes included where applicable.

These four elements are summed to derive the total voyage cost. The freight cost is determined by dividing this total cost by the cargo carried.

The freight rates calculated for other dry bulks in this study exclude any ballast voyage. They relate to the laden passage—including load and discharge port times—only. The results therefore will be seen to differ from spot freight rates quoted in the market. The spot freight rates reported by, for example, brokers' reports include a provision for a ballast or positioning voyage. However for the purposes of this study, as discussed previously, the important consideration is the *difference* between freight costs via the Canal and those on least cost alternative routes. The ballast voyage will be common to both options. Moreover, the precise nature of the ballast voyage will vary dependent on trade and market conditions. To include the ballast voyage in this instance is to introduce a level of spurious accuracy. The exclusion of the ballast passage is, as we understand it, also consistent with the approach adopted in the study being undertaken for ACP on the Tanker Segment

Even with the inclusion of a ballast leg, there would probably be some difference between the freight costs calculated on the basis of one year time charter rates and spot market rates. As discussed above, spot rates are more volatile than period charter rates. In high markets, spot rates could be expected to rise above one year time charter rates. In a weak market the reverse is true. Over an extended period of time, rates should average out more closely and it is for this reason that one year time charter rates are chosen to represent market levels over the long term. Again, the approach used in the tanker study, as we understand it, would appear to be consistent with this.

Sensitivity of Freight Differentials Between Canal and Alternative Routes to Changes in the Market

In the initial phase of the study we undertook some freight calculations to demonstrate the extent to which estimated freight costs could fluctuate, the table below shows the results of the freight cost calculations for the shipment of coal on the route from the Canadian West Coast to the North Continent on a modern Panamax dry bulk carrier. This is illustrative on any comparison that might be made for dry bulk commodities transiting the Canal. Two routings are provided, via the Canal—excluding tolls—and via the next least cost alternative route via the Cape. From this it can be seen that annual average freight costs calculated on the basis of one year time charter rates over the period from 1998 to 2001 have varied between $7.20 per ton and $11.1 per ton on the Canal route and by $10.20 per ton to $16.30 per ton on the alternative route.

In other words, in each case the range of values is approximately +/-$2–3 per ton either side of the mid point. However, in this study it is the differentials between voyages that are important. In the example given, the differentials in each year range from $3.10 per ton to $5.20 per ton. Put another way, the range of uncertainty has narrowed to just $2 per ton or, in other words the average differential is $4 per ton +/-$1.00 per ton.

Looking at the key variables which impact on this differential, the one year time charter rate (or time value) of the vessel accounts for $2.20 per ton to $3.40 per ton and the effect of changes in bunker prices accounts for $0.80 per ton to $1.80 per ton. In conclusion, while this illustration underlines the volatility of the dry bulk carrier charter market it also demonstrates that the differential between freight costs for the Canal and alternative routes may not be quite so sensitive to the market value placed on the time value of the vessel and that bunker costs are almost as important a factor. In this example, the variation in differentials due to bunker price changes ($1.0/ton) is almost as big as that for the hire element ($1.2/ton).

Sensitivity of Freight Costs to Changes in Charter Rates and Fuel Prices

Indicative Shipping Economics
Coal: West Coast Canada to North Continent (1) (2)

		$/Cargo Tonne Equivalent				Differentials			
	Dwt	Hire	Bunkers	Port charges	Total	Hire	Bunkers	Port charges	Total
2001									
Via Canal	70000	5.1	2.4	1.9	9.5				
Via Cape	70000	7.9	3.9	1.9	13.7	2.7	1.5	0.0	4.3
2000									
Via Canal	70000	6.4	2.8	1.8	11.1				
Via Cape	70000	9.8	4.7	1.8	16.3	3.4	1.8	0.0	5.2
1999									
Via Canal	70000	4.6	1.8	1.7	8.2				
Via Cape	70000	7.1	2.9	1.7	11.8	2.4	1.2	0.0	3.6
1998									
Via Canal	70000	4.2	1.3	1.7	7.2				
Via Cape	70000	6.4	2.1	1.7	10.2	2.2	0.8	0.0	3.1
Average									
Via Canal	70000	5.1	2.1	1.8	9.0				
Via Cape	70000	7.8	3.4	1.8	13.0	2.7	1.3	0.0	4.0
Range						***1.2***	***1.0***		***2.1***

(1) Excl. positioning leg
(2) Excl Panama Canal tolls
Source: Richardson Lawrie Associates

VOYAGE ESTIMATING MODEL

Description of the Model Inputs

The *Voyage Estimating Model* has been developed in Microsoft Access in order to calculate freight rates as required in the determination of the economic value of the Canal and the comparison of freight costs on Canal, bypass and alternative routes.

Below is a list the individual components that comprise the determination of one year time charter rates and voyage estimates. RLA maintains its own databases on, for example, charter rates, bunker prices, port charges and port times. This information has been supplemented by further market research. As part of the model, input tables have been developed for each of these cost elements and data input for base year 2000—and in some cases 2001 and 2002—as follows:

All cost inputs to the model are in terms of nominal U.S. dollars and various escalation factors have been built into the model to project future costs in nominal dollars. The model outputs provide for freight costs expressed in both nominal dollars and real 2002 dollars. Freight costs are produced for individual routes for Canal, bypass and least cost alternative routes (which are selected automatically by the model from series of calculations run for Cape Horn, Cape of Good Hope and Suez Canal alternatives).

- ***Fixed Operating Costs***. Data on fixed direct costs covers manning, repairs and maintenance, insurance, stores and spares, management fee and overheads. These data are compiled directly from owners' and operators' actual cost data.
- One Year Time Charter Rates (Table 4-11).
- ***Dry Bulk Cargoes.*** Average dry bulk cargo sizes are determined in the *Transit Model* (see Section 4) through the application of utilization factors to average DWT by size range. The size distributions by route are also input from the *Transit Model* and vary, dependent upon the level of trade on individual routes.
- ***Bunker Prices.***
- ***Mileages.***
- ***Port Charges.*** Port charges by size range have been determined for a range of representative other dry bulk ports within the specified regions. Data have been assembled from information received directly from ship agents worldwide as published tariffs, even if available, generally do not include all the elements of the port charges. Significant variation in calculation and terminology of these elements was observed across different ports around the world.
- ***Port Times***. Details of typical port times by port and vessel size were obtained from port agents as part of the exercise above.
- ***Vessel Characteristics***. This includes PCUMS, Suez Canal Net Tonnage (SCNT), laden and ballast speeds, bunker consumption at sea (laden and ballast) and bunker consumption in port for modern vessels by DWT size range.
- ***Canal Transit Times***
- ***Canal Tolls.*** Two separate tables have been developed for the calculation of Panama and Suez Canal tolls. Information on the formulae for calculating Suez Canal tolls has been obtained from vessel owners transiting the Canal. In the *Voyage Estimating Model* provision has been made for either including or excluding Panama Canal tolls.
- ***Port Description Table. A*** table has been developed which links port name with a Sequence Code in the *Voyage Estimating Model*, the UN port code, the ACP country code, country abbreviation and country name, the ACP region code and name.

Table 4-11. Projections of One-year Time Charter Rates (Nominal $/day)

Vessel Size Range (000 DWT)	2000	2005	2010	2015	2020	2025
0 to 10k	4,413	4,932	5,618	6,320	7,035	7,761
10 to 15k	4,885	5,764	6,567	7,388	8,224	9,073
15 to 20k	6,902	6,304	7,177	8,071	8,982	9,908
20 to 25k	7,291	6,781	7,717	8,674	9,652	10,645
25 to 30k	7,639	7,258	8,256	9,278	10,321	11,382
30 to 40k	8,171	7,867	8,947	10,053	11,182	12,329
40 to 50k	8,910	8,222	9,343	10,492	11,665	12,858
50 to 60k	9,362	8,526	9,689	10,881	12,097	13,334
60 to 70k	10,606	8,915	10,132	11,378	12,650	13,942
70 to 80k	10,914	9,342	10,618	11,925	13,258	14,613
80 to 90k	11,875	10,204	11,594	13,018	14,471	15,948
90 to 100k	12,308	11,232	12,758	14,321	15,916	17,538
100 to 110k	13,211	12,050	13,685	15,360	17,070	18,809
110 to 120k	13,933	12,647	14,365	16,124	17,920	19,745
120 to 150k	16,088	13,343	15,155	17,011	18,906	20,831
150 to 170k	17,118	13,676	15,536	17,440	19,384	21,359
170 to 200k	18,144	14,380	16,338	18,343	20,389	22,467
200 to 230k	20,970	14,877	16,906	18,982	21,100	23,252
230 to 250k	22,964	15,357	17,453	19,598	21,786	24,009
250 to 300k	24,409	15,837	18,000	20,213	22,471	24,765
300+k	28,743	16,316	18,547	20,829	23,157	25,522

Source: Richardson Lawrie Associates

Results of Freight Costs Calculations

Freight costs by vessel size and trade have been calculated for all other dry bulk movements involving transit of the Panama Canal (excluding tolls) together with the costs for alternative routes and bypass routes via the Suez Canal, Cape of Good Hope and Cape Horn for all years from 2000 through 2025. The rates for bypass routes were summarized in Section 3 as part of the work required to determine the trades that would be shifted to an expanded Canal. The main differences in the rates between the Existing and Expanded Canals are, of course, the use of larger vessels and improved utilization in the latter case.

The results of the freight cost calculations are shown in Appendix C, Tables C-1 through C-6. The main conclusions—expressed in terms of $2002—when Panama Canal tolls are excluded are presented below for the Existing Canal and Expanded Canal scenarios.

Existing Canal

Taking one of the major routes as an illustration—N America Gulf to Far East—freight costs for the Existing Canal for the smallest size range are estimated to increase overall by about 1.7 percent in real terms between 2000 and 2025, from around $82–86 per ton to $83–87 per ton. For vessels in the

70,000–80,000 DWT range there would be an overall decrease in real terms of 12-13 percent, from $13.8–14.6 per ton to $12–13 per ton. This decline is due to the relatively high Panamax freight market that prevailed in 2000. For the 70,000–80,000 DWT size range, the differentials versus least cost alternative routes would decrease from $5.3 per ton to $4.5 per ton for Japan and from $2.9 per ton to $2.4 per ton for China.

Expanded Canal

The Expanded Canal permits two things to happen. Firstly it creates the opportunity to employ larger vessels. By virtue of the economies of scale this acts to reduce the freight cost, provided that DWT utilization levels (cargo to DWT ratios) are maintained. For vessels above 60,000 DWT, which already transit the Canal laden, there is the opportunity to increase utilization levels due to the deeper draft on the Canal. This would also reduce freight costs. Therefore because it is assumed that an Expanded Canal would result in the employment of larger vessels and improved utilization of existing vessels transiting the Canal, freight costs would fall.

Freight costs for larger vessels expected to be deployed on Canal routes under the Expanded Canal scenario need to be compared with the freight costs for these same vessels using the non-Canal alternative routing. Hence, the estimates of freight costs for the non-Canal least cost alternative routes also fall under the Expanded Canal scenario due to the economies of scale element mentioned above. The exception to this is in the case of by pass routes where both vessel sizes and utilization levels are already higher than those for Canal routes. In these cases, the shipping economics for by pass routes are unchanged between the Existing and Expanded Canal cases.

Therefore for the Expanded Canal, while freight costs for vessels below 60,000 DWT are estimated to remain the same, those for size ranges from 60,000–100,000 DWT are reduced compared with those for the Existing Canal as utilization levels are increased from 2010. For the N America Gulf to Far East routes, freight costs in 2025 for the 70,000–80,000 DWT size range are estimated at around $10.5-11.0 per ton. This compares with $12.3–12.7 per ton for the Existing Canal. Similarly for coal trades in this size range from the West Coast of Canada to Europe, freight costs in 2025 would be $9.40 per ton compared with $10.88 per ton in the Existing Canal case. Under the Expanded Canal, freight costs for vessels between 120,000 DWT and 170,000 DWT—transiting the Canal light laden—would be about $8.6 per ton for the N America Gulf to Far East route and $7. 0 per ton on the West Coast Canada to Europe route.

For the 70,000–80,000 DWT size range in 2025, the freight cost through the Canal would be lower than the least cost alternative route by $2–4 per ton on the N America Gulf to Far East routes and by almost $4.00 per ton on the West Coast Canada to Europe route. On the former routes, the savings on Cape Sizes via the Canal would be $1.3-1.7 per ton and on the latter route the savings for similar sizes would be just $1.7-1.9 per ton.

Model Validation and the Sensitivity of Freight Costs and Differentials to Market Changes

The choice of routes against which to validate the model is limited by the number of routes for which market data are readily available and which are also relevant to the Panama Canal. For the purpose of demonstrating the validity of the model and the sensitivity of dry bulk freight costs and differentials to market changes we have selected the Brazil to Japan route in Cape Size vessels and the West Coast Canada to Europe route for Panamax vessels. We commence with an analysis of historical freight costs for iron ore from Brazil to Japan and then follow with a review of the Panamax coal trade from Vancouver to North Europe.

As discussed earlier in this section, the freight costs calculated here are designed to capture the expected long term underlying trend. It is recognized that over the course of the study period, the market will fluctuate above and below this trend, reflecting the impact of short term developments. The following table compares average annual spot freight rates for a Cape Size dry bulk carrier moving 165,000 tons of iron ore from Tubarao in Brazil to Japan as reported by Clarksons with freight costs based on one year time charter rates as calculated by the Voyage Estimating Model. A ballast positioning voyage has been included in the calculation using the model to ensure the comparison is made on the same basis.

	Clarksons Spot Rate Tubarao – Japan Via Cape	RLA Freight Cost Ponta da Madeira-Japan Via Cape	Difference $/ton
1996	9.37	8.80	-0.57
1997	10.46	9.70	-0.76
1998	7.00	7.16	0.16
1999	6.94	7.61	0.67
2000	11.85	11.58	-0.27
2002	8.52	8.95	0.43
Ave	**8.94**	**9.12**	**0.19**

The net result is that on average the freight costs calculated in the model using one year time charter rates over the period from 1996 to 2002 are just $0.19/ton higher than those reported by Clarksons. It would be expected in any event that the freight cost from Ponta da Madeira would be greater than that for Tubarao because of the slightly longer mileage via the Cape of Good Hope to Japan.

To provide an indication of the sensitivity of the Canal's competitive position versus alternative routes we have assessed the impact of different freight market conditions with reference to the period from 1996 to 2002. The extent of these variations might not have an impact on the volume of trade, but depending on the level of Canal tolls, transits could be diverted or tolls adjusted to take advantage of short term changes in the economic value of the Canal.

Firstly we have compared the above freight costs via the Cape of Good Hope – based on the spot and the one year time charter (T/C) markets – with the *hypothetical* freight costs assuming the vessel transited the Panama Canal part laden on a draft which would enable it to get through a fully Expanded Canal. The purpose of this exercise is to demonstrate the potential variation in differentials under Expanded Canal conditions. Spot freight rates via the Canal have been calculated using the Voyage Estimating Model and Clarksons reported average annual time charter equivalent (TCE) rates for the Cape Size vessel from Brazil to Japan. The calculations include consideration of a ballast positioning voyage and Canal tolls plus related transit expenses. The following table summarizes the results:

Clarksons TCE Rate ($/day)		Spot Market Freight Cost based on TCE	Clarksons Spot Freight		Time Charter Market basis RLA One Year T/C Rates Freight Cost		
		Via Panama ($/ton)	Via Cape ($/ton)	Diff ($/ton)	Via Panama ($/ton)	Via Cape $/ton)	Diff ($/ton)
1996	15,776	13.49	9.37	4.12	12.45	8.80	3.64
1997	18,894	14.84	10.46	4.38	13.64	9.70	3.94
1998	12,369	11.41	7.00	4.41	10.57	7.16	3.41
1999	11,312	11.42	6.94	4.48	11.25	7.61	3.65
2000	21,436	17.55	11.85	5.70	16.10	11.58	4.51
2001	14,573	13.91	8.52	5.39	12.94	8.95	3.99
2002	13,000	13.49	8.42	5.07	14.35	10.06	4.29
Ave	**15,337**	**13.73**	**8.94**	**4.79**	**13.04**	**9.12**	**3.92**
Minimum Differential				**4.12**			**3.41**
Maximum Differential				**5.70**			**4.51**

Over the period from 1996 to 2002, and based on prevailing spot rates, the theoretical differential between the Canal and the Cape routes is shown to average $4.79/ton in favor of the Cape route. By comparison, based on one year time rates, the differential is shown to average $3.92, a difference of $0.87/ton. It would be expected that differentials based on spot rates – being more volatile - would show wider variation than those based on one year time charter rates. In the former case the difference between the maximum and minimum annual averages is $1.58/ton. In the latter case the difference between the maximum and minimum values is $1.10/ton.

Similar time series data back to 1996 for spot Panamax freight rates for coal from the West Coast of Canada to North Europe are not readily available. Clarksons report average spot freight rates for this trade via the Canal for 2002 and 2003 to date as $11.64/ton and $18.11/ton respectively. This, they estimate, gives time charter equivalent rates of $5,103/day and $11,576/day. If these time charter equivalent rates are then used in the Voyage Estimating Model to calculate freight costs they produce results of $12.68/ton and $18.29/ton respectively, which include allowances for a ballast positioning voyage and Canal tolls. While our assumptions on vessel operating parameters are thought to be similar we are unable to comment precisely on other assumptions made by Clarksons. However, the Voyage Estimating Model can be seen again to be producing results which are similar orders of magnitude.

Earlier in this section, Panamax coal trade from the West Coast of Canada to Europe was used to illustrate the sensitivity of freight costs and differentials to changes in the market. The table below provides a similar comparison using the Voyage Estimating Model but this time including a positioning voyage and Canal tolls and extending the time series from 1995 to 2002, a period that encompasses both market peaks and troughs. The freight costs in the following table are based on actual average one year time charter rates:

Panamax Coal Freight Costs ($/ton)

	Via Panama	Via Cape	Differential
1995	18.70	22.44	3.74
1996	15.30	17.99	2.69
1997	15.78	18.41	2.63
1998	12.08	13.35	1.27
1999	13.57	15.21	1.64
2000	18.13	21.57	3.44
2001	15.10	17.45	2.35
2002	15.89	17.71	2.28
Ave	**15.50**	**18.00**	**2.51**

On average the differential was $2.51/ton with the minimum value $1.27/ton and the maximum value $3.74/ton. In other words the average differential was $2.51+/-$1.24/ton.

5. Potential Panama Canal Transits and Economic Value of the Canal

This section commences with a description of the *Transit Model* that was used to determine number and size of vessels that would be required to carry the cargo forecasted on Panama Canal routes. This is followed by the presentation and discussion of the forecast of potential Panama Canal transits and the determination of the economic value of the Panama Canal under the Existing and Expanded Canal scenarios.

TRANSIT MODEL

The transit model has been developed as an analytical tool to calculate future transits of laden and ballast dry bulk carriers for the Existing and Expanded Canals and for all scenarios, in terms of cargo tons, numbers of transits, DWT and PCUMS by route and DWT size range. The outputs include also projections of these parameters by other vessel size range characteristics such as PCUMS, GRT, beam, LOA and draft. In this section, the *Transit Model* is used to produce forecasts of potential transits, that assume zero tolls and before the pricing strategy is considered. Separate transit models have been designed for grains and other dry bulks (ODB). This reflects:

- Variations in route definitions required for each study;
- Differences evident in vessel sizes and utilization;
- The necessity to maintain separate outputs for the development of freight costs and economic value.

In addition, the *Transit Model* has been developed to generate final laden and ballast transit forecasts with tolls based on the preferred pricing strategy. These include projections of revenues as specified in the TOR. This is discussed further in *Volume 6: Forecast of Canal Cargo, Transits and Toll Revenue*.

These analytical tools have been developed and coded in Microsoft Access with input data and output data in Microsoft Excel. The system has been set up so as to enable the Client to update the model easily. The input and output tables are designed to allow maximum flexibility for the user and are set up to run each of the following cases.

- Existing Canal—Most Probable Case
- Existing Canal—Best Case
- Existing Canal—Worst Case
- Expanded Canal—Most Probable Case
- Expanded Canal—Best Case
- Expanded Canal—Worst Case

The second part of this section discusses the results from the *Transit Model.* Results on potential Canal transits contained in this report are based on the determination of the Canal's potential market prepared and presented in Volume 2: Panama Canal's Potential *Market.* The Canal's potential market represents our estimate of the maximum market share that the Canal could capture of world trade assuming a value of zero for Panama Canal tolls.

Transit Model Design and Assumptions

The model design is described below. For clarity each input and output is provided with a sequential numbering system. The description follows the logical flow of model inputs and outputs together with descriptions of supporting analyses and assumptions. A number of the input tables differ to take account of different trade forecasts, new routes where applicable, larger vessel sizes and improved DWT utilizations for some ship sizes transiting the Expanded Canal. Summarized below is a listing of inputs/outputs for laden and ballast transits. The various input tables are all derived from the work described in Section 4 of this report.

Inputs

- ODB potential trade forecasts by route and commodity for each year from 2000 through 2025. For the Expanded Canal this includes potential bypass trades that would be shifted to the Canal at zero tolls.
- Percentage split by ship type for each individual commodity within each route and every year 2000 through 2025 inclusive. These assumptions are derived from an Access routine developed to calculate the proportion of each product carried in each subject ACP ship type by route from the historical data. Within the same routine 3 year and 5 year averages were also calculated. Based on these data, assumptions were made concerning the future split of ship types to be assumed. Generally the five year average was assumed unless it was clear that the shorter term data were more representative.
- Percentage split of cargo allocation to ship sizes for each route and each year within route. The Percentage for each route totals 100. This table is based on an analysis of historical data by routes and represents the start point from which future percentage splits are determined by the Cargo Allocation Module in the *Transit Model.*
- Average DWT for dry bulk carriers for each size range and year within route. It was not strictly necessary to create input Excel tables which specified these data by route. However the model is "over specified" to allow for any use or requirement for sensitivities that ACP may have in the future.
- Percentage utilization level—that is, cargo to DWT ratios—for dry bulk carriers for each size range and year within route. As with above input, it is not strictly necessary to format tables and input on a route basis. However, this has been undertaken in order to allow for any future uses that ACP may have.

- A conversion factor from DWT to PCUMS for each DWT size range and year within route. These are a series of factors which, when multiplied with the average DWT in each size range, give average PCUMS per size range. The data were derived from a series of analyses of data taken from the ACP database utilizing PCUMS and summer DWT data for individual vessels within each subject size range. Data for larger vessel sizes was determined by regression analysis.
- Conversion factors for DWT range to GRT/LOA/Beam/PCUMS/Draft ranges. Within each subject DWT size range a series of factors which convert DWT to each of these other measurements are input to the model. These are not simple average factors for each size range. Instead, for each size range RLA have calculated the proportion of DWT which falls within all relevant measurement ranges. Data within each DWT range is therefore split into an array of measurement ranges.
- A table of trades and factors by size range linking ballast transits to laden transits.

Outputs

With the exception of outputs concerned with cargoes, all of the following apply to both laden and ballast transits:

- ODB cargoes allocated to dry bulk carriers in thousands of tons for each route and for each commodity within route and for each year 2000 through 2025.
- ODB cargoes allocated to all other ship types in thousands of tons for each route and for each commodity within route and for each year 2000 through 2025. Also included at this stage of the model is a "check output". This lists any commodities by route in the original input data which do not appear in either of the outputs which allocate trade to ship type. This is designed to be particularly useful if trade assumptions are changed and is an additional check to ensure, for example, that syntax remains consistent and that ship type assumptions are input for all commodity/route combinations.
- ODB trades forecasts in thousands of tons for trade in dry bulk carriers only. These are within each route, for commodities in aggregate for that route—highlighting commodities/routes for specific focus—and for each year, that is, 2000 through 2025 inclusive. This is derived from the output streams above.
- ODB trades forecasts in thousands of tons for trade in all other ship types within each route, for commodities in aggregate for that route and for each year from 2000 through 2025 inclusive. This is derived from the output streams above.
- Percentage split of cargo allocation to ship size for each route and each year to 2025 within route. This is the output from the cargo allocation module with percentages changed from 2002 to reflect trends in size distributions, the volumes of trade and changes in the world fleet mix.
- Total cargo in thousands of tons by route, DWT size range and year.

- Total DWT in thousands by DWT size range, route and year. There is a further check output at this stage which lists routes and size ranges which are missing from output XB10. This is designed to ensure that percentage utilization factors are available for all necessary routes, vessel sizes and years.
- Number of transits by DWT size range, route and year with the option also to produce output by commodity.
- Total PCUMS in thousands by DWT size range, route and year.
- Average cargo size by DWT size range, route and year together with overall weighted average cargo size to enable the trends resulting from the cargo allocation model to be monitored.
- Summaries of total cargo, DWT, Number of transits and PCUMS by route and year.
- Total cargo in thousands of long tons by DWT/GRT/LOA/Beam/PCUMS/Draft range by year and direction.
- Total number of transits by DWT/GRT/LOA/Beam/PCUMS/Draft range by year and direction.
- Total PCUMS in thousands of long tons by DWT/GRT/LOA/Beam/PCUMS/Draft range by year and direction

POTENTIAL CANAL TRANSITS

Table 5-1 summarizes potential laden transits in terms of cargo tons, DWT, numbers of transits and PCUMS for both the Existing and Expanded Canals and for all cases. For the Most Probable Cases, ODB cargo transits for the Existing Canal are estimated to increase by 18 percent from 66 million tons in 2000 to almost 77 million tons in 2025 and for the Expanded Canal by 32 percent to over 87 million tons. For the Existing Canal similar percentage increases are projected for transits in terms of DWT and PCUMS. However because of the expected continuing trend towards the utilization of larger vessels, the total number of transits is forecast to increase by just under 8 percent for the Existing Canal, from 2090 in 2000 to 2251 in 2025.

For the Expanded Canal the projected growth in transits in terms of DWT and PCUMS remains around 26 percent. This is slightly lower than the rate of growth in cargoes because of the improved utilization that will result from an enlarged Canal. The number of transits would grow by only 6 percent overall as the result of both greater utilization levels and the trend towards larger vessel sizes.

For both the Existing and Expanded Canals, the figures for the Most Probable Case lie closer to the Worst Case than the Best Case, the difference between the Most Probable and Worst Cases being just under one third of the difference between Best and Worst Cases. Figures 5-1 to 5-4 illustrate the values shown in Table 5-1.

Table 5-1. Potential Laden Transits in Cargo Tons, DWT, Number of Transits and PCUMS, Existing and Expanded Canal, No Tolls, All Cases

	Existing Canal						Expanded Canal			
Case	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
	Cargo (000 long tons)									
Most Probable	65,987.7	68,236.8	72,015.5	73,320.3	75,401.8	76,700.6	78,885.4	80,877.2	86,648.9	87,456.5
Best	66,993.1	73,282.2	83,473.5	91,651.0	102,065.4	113,040.5	91,227.3	100,635.5	115,927.3	127,104.6
Worst	67,072.1	65,611.5	65,607.6	64,155.0	62,387.9	60,268.8	71,763.2	70,711.9	71,888.2	68,948.3
	Vessel Size (000 dwt)									
Most Probable	84,570.0	87,440.4	92,460.6	94,115.5	96,984.4	98,634.2	97,318.1	99,602.7	105,725.4	106,790.1
Best	85,780.1	94,016.6	107,491.5	118,123.5	131,927.9	146,260.6	112,578.4	124,052.8	141,749.9	155,558.4
Worst	85,875.1	83,933.4	84,039.7	82,107.2	80,002.3	77,209.5	88,451.2	86,998.4	87,655.8	84,114.4
	Transits									
Most Probable	2,089.9	2,127.0	2,173.2	2,200.2	2,218.6	2,251.2	2,157.7	2,180.4	2,206.5	2,221.0
Best	2,130.6	2,265.9	2,444.3	2,648.0	2,872.5	3,136.7	2,418.1	2,609.8	2,832.1	3,056.2
Worst	2,132.9	2,057.3	2,010.9	1,963.7	1,878.1	1,818.5	1,997.8	1,949.0	1,873.5	1,801.9
	PCUMS (000)									
Most Probable	43,607.9	45,056.0	47,529.6	48,353.7	49,744.3	50,623.5	49,634.4	50,724.2	53,556.6	54,139.2
Best	44,262.0	48,384.0	55,065.9	60,434.6	67,336.2	74,583.3	57,248.8	62,958.9	71,560.1	78,489.0
Worst	44,312.7	43,288.3	43,288.3	42,300.4	41,167.4	39,782.7	45,200.7	44,417.6	44,515.7	42,774.9

Source: Richardson Lawrie Associates

The summaries of total laden transits encompass a number of different trends. The combination of variations in trade forecasts and shifts in the cargo allocation to size ranges on individual routes result in individual size ranges being substituted by others and variations around the mean growth rates both between vessel sizes and individual time periods. As the overall growth rates are lower than for grains there are less pronounced changes in the DWT size ranges utilized. The most salient features for the Existing Canal are:

- A continuing steady shift in market share terms from the smaller size ranges which is most pronounced southbound but also apparent northbound;
- A quite strong increase in both absolute and market share terms in the use of vessels in excess of 70,000 DWT northbound. This reflects in part the already more established presence of these vessels in the northbound business in particular in the coal movements from the West Coast of Vancouver to Europe

Figure 5-1. Potential Laden Transits in Cargo Tons, Existing and Expanded Canal, No Tolls, All Cases

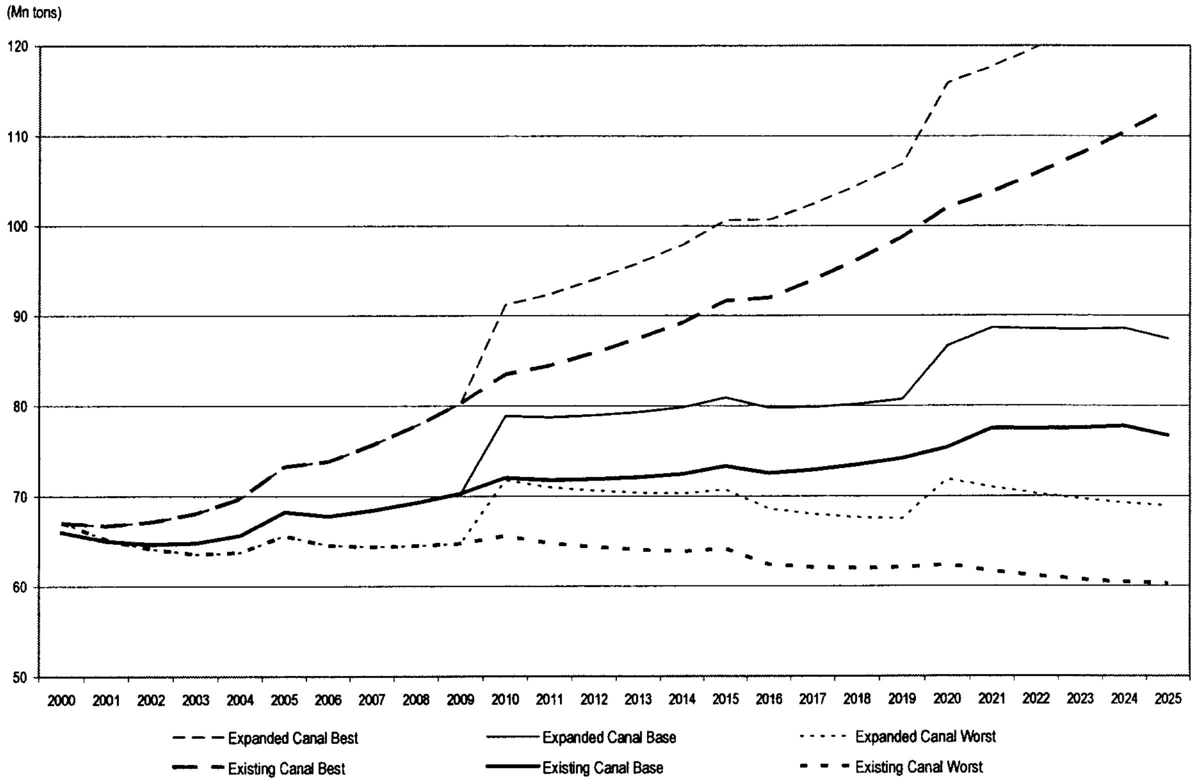


Figure 5-2. Potential Number of Laden Transits, Existing and Expanded Canal, No Tolls, All Cases

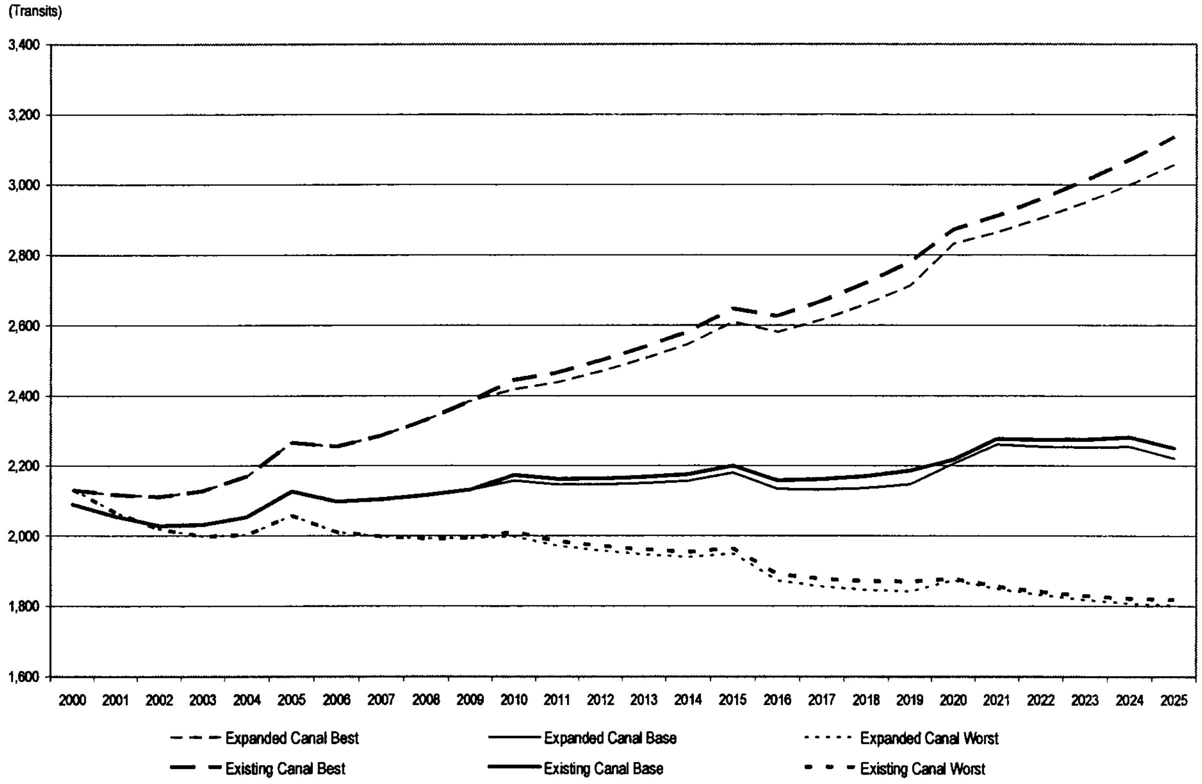


Figure 5-3. Potential Laden Transits in DWT, Existing and Expanded Canal, No Tolls, All Cases

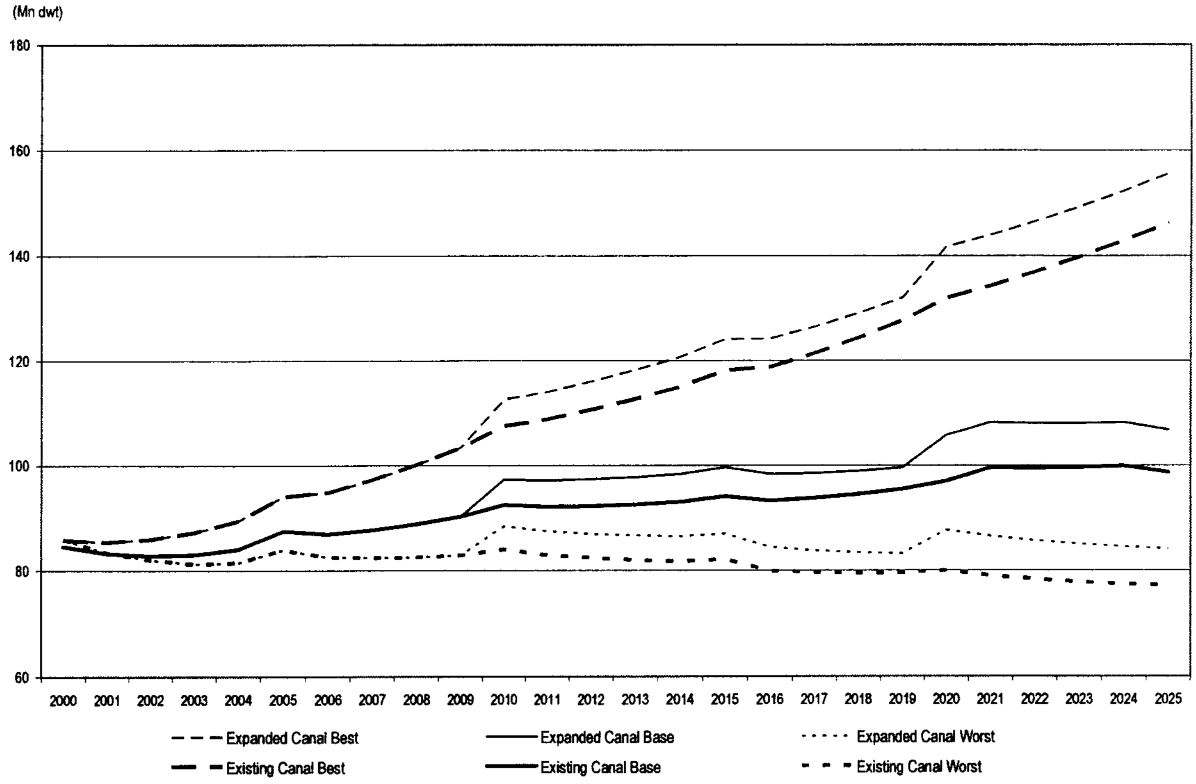
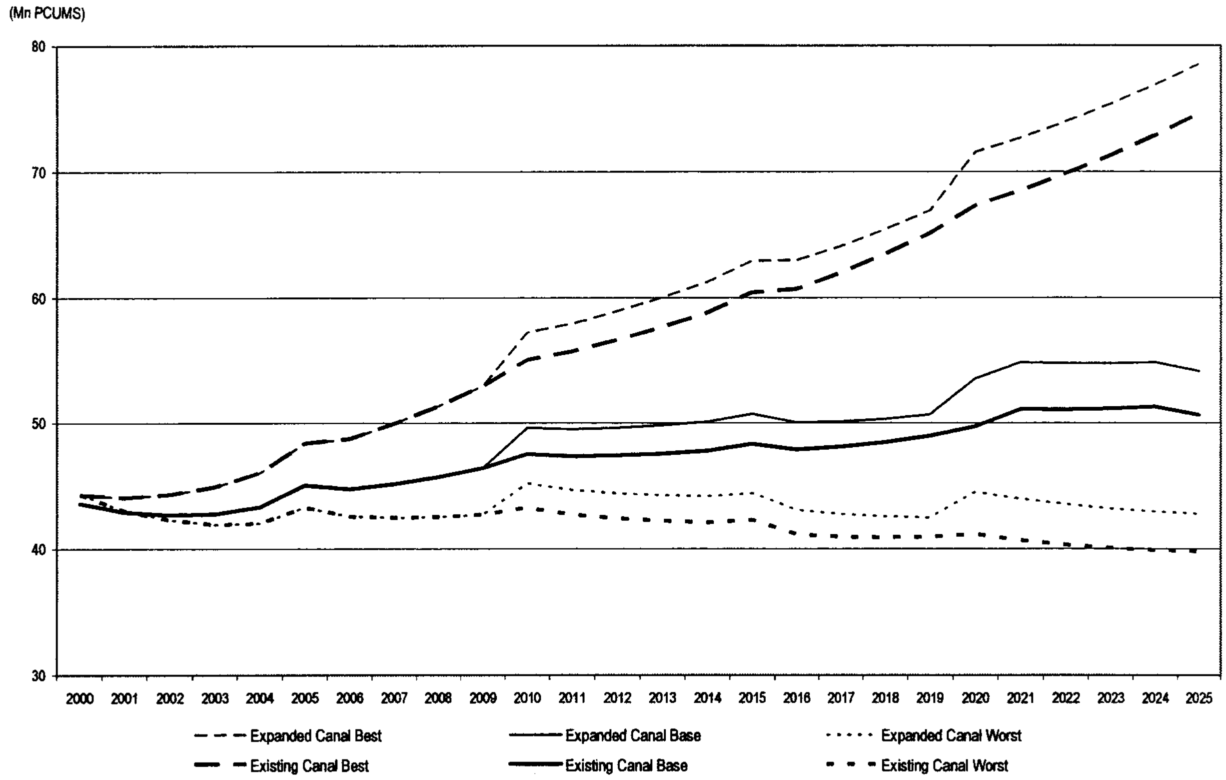


Figure 5-4. Potential Laden Transits in PCUMS, Existing and Expanded Canal, No Tolls, All Cases



For the Expanded Canal, despite the likelihood that larger vessels will transit the Canal in this case, total DWT actually declines southbound and increases only marginally northbound compared to the Existing Canal as utilization levels increase in size ranges up to 80,000 DWT and inefficiencies are removed from the global shipping system. Specifically:

- As Existing Canal bypass trades flow through the Expanded Canal, so northbound DWT in size ranges in excess of 120,000 DWT are introduced. As these are light laden vessels the DWT is significantly in excess of the additional trade shifted through the Canal.
- Cargoes carried in the 70,000–80,000 DWT range northbound increase through 2015 but then, even in an environment of slow overall growth, decline as the use of vessels in the 80,000–100,000 DWT ranges increases.
- Similarly, the use of 60,000–70,000 DWT vessels declines with the introduction of vessels in excess of 80,000 DWT.

These trends are respectively accelerated and dampened in the Best and Worst cases. Tables 5-2 to 5-5 summarize potential laden transits in cargo tons, DWT, numbers of transits and PCUMS by DWT size range for the Existing and Expanded Canal. Figure 5-5 shows the potential weighted average DWT which results from these forecasts, for all cases. In the Most Probable Case the average DWT is shown to increase from just over 40,000 DWT currently to between 44,000 DWT and 45,000 DWT in 2025.

Table 5-6 presents summary forecasts of ballast transits in terms of numbers of transits, DWT, and PCUMS. They cover the Existing Canal; Most Probable, Best and Worst Cases for the Existing and Expanded Canal.

For the Existing Canal, in the Most Probable Case, the number of transits is estimated to increase from 158 transits in 2001 to 224 transits by 2025. In the Best Case they would reach 281 transits in 2025 and in the Worst Case this figure would fall to 194 transits. Changes in the growth of future transits would be reflected largely in northbound transits which account for most of the total in all cases.

It is not expected that there would be any real differences between the Existing and Expanded Cases. We have scrutinized a sample of vessel itineraries for larger ships on bypass routes irrespective of whether they would transit an Expanded Canal on a laden basis—and concluded that the patterns of movements are such that it would be unlikely that these larger vessels would transit the Canal in ballast in any appreciable numbers.

Table 5-2. Potential Laden Transits by Direction and DWT Range, Existing and Expanded Canal, No Tolls, Most Probable Case, Selected Years, 2001–2025 (000 tons)

	Existing Canal						Expanded Canal			
Vessel Size Range (dwt)	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
South										
Less or equal to 10,000	287	303	320	340	354	372	320	340	355	373
Greater than 10,000–Less than 15,000	211	232	233	226	177	152	233	226	177	152
Greater or equal to 15,000–Less than 20,000	423	449	420	444	330	294	420	444	329	293
Greater or equal to 20,000–Less than 25,000	848	783	816	805	564	772	812	801	559	766
Greater or equal to 25,000–Less than 30,000	2,633	2,673	2,257	2,220	1,719	1,561	2,248	2,208	1,705	1,545
Greater or equal to 30,000–Less than 40,000	2,620	2,694	2,498	2,522	2,134	1,954	2,495	2,519	2,130	1,949
Greater or equal to 40,000–Less than 50,000	9,871	10,903	11,672	12,210	12,483	13,195	11,623	12,143	12,397	13,091
Greater or equal to 50,000–Less than 60,000	1,035	1,083	1,202	1,291	1,355	1,380	1,194	1,280	1,341	1,364
Greater or equal to 60,000–Less than 70,000	4,341	4,485	4,520	4,611	4,640	4,717	1,584	965	530	251
Greater or equal to 70,000–Less than 80,000	2,429	2,240	2,656	3,014	3,112	2,931	5,186	5,586	5,191	3,935
Greater or equal to 80,000–Less than 90,000							330	935	1,854	3,236
Greater or equal to 90,000–Less than 100,000							147	239	300	374
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							72	81	1,553	1,553
Greater or equal to 150,000–Less than 170,000							129	144	2,544	2,544
Greater or equal to 170,000–Less than 200,000							-	-	-	-
Total Southbound	24,649	25,844	26,593	27,684	26,868	27,328	27,024	27,927	27,165	27,603
North										
Less or equal to 10,000	51	-	-	-	-	-	-	-	-	-
Greater than 10,000–Less than 15,000	111	103	67	73	18	-	67	73	18	-
Greater or equal to 15,000–Less than 20,000	679	495	-	-	-	-	-	-	-	-
Greater or equal to 20,000–Less than 25,000	1,154	1,141	1,258	1,366	1,673	1,663	1,264	1,373	1,681	1,672
Greater or equal to 25,000–Less than 30,000	5,812	6,018	6,134	6,149	6,800	6,612	6,192	6,217	6,882	6,700
Greater or equal to 30,000–Less than 40,000	7,101	6,307	4,253	3,085	-	-	4,283	3,109	-	-
Greater or equal to 40,000–Less than 50,000	9,646	10,733	13,876	14,671	18,279	19,007	14,085	14,950	18,654	19,440
Greater or equal to 50,000–Less than 60,000	1,190	1,169	1,275	1,342	1,357	1,345	1,305	1,382	1,404	1,397
Greater or equal to 60,000–Less than 70,000	7,780	7,931	8,650	8,522	8,960	8,964	3,985	2,315	1,340	648
Greater or equal to 70,000–Less than 80,000	7,730	8,452	9,852	10,365	11,378	11,708	13,044	13,403	13,117	10,180
Greater or equal to 80,000–Less than 90,000	36	44	57	64	71	73	831	2,245	4,684	8,371
Greater or equal to 90,000–Less than 100,000							369	573	758	968
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							2,881	3,654	2,551	2,373
Greater or equal to 150,000–Less than 170,000							2,156	2,091	2,741	2,538
Greater or equal to 170,000–Less than 200,000							1,629	1,584	1,856	1,745
Total Northbound	40,370	42,393	45,423	45,636	48,534	49,372	48,094	48,243	51,058	51,816
Grand Total	65,019	68,237	72,015	73,320	75,402	76,701	75,118	76,170	78,223	79,419

Source: Richardson Lawrie Associates

Table 5-3. Potential Laden Transits by Direction and DWT Range, Existing and Expanded Canal, Most Tolls, Most Probable Case, Selected Years, 2001–2025 (000 DWT)

	Existing Canal						Expanded Canal			
Vessel Size Range (dwt)	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
South										
Less or equal to 10,000	355	375	396	421	438	461	396	421	439	462
Greater than 10,000–Less than 15,000	272	298	300	291	228	196	300	291	228	195
Greater or equal to 15,000–Less than 20,000	513	544	509	539	400	357	509	538	399	355
Greater or equal to 20,000–Less than 25,000	1,044	964	1,004	991	695	950	1,001	986	689	944
Greater or equal to 25,000–Less than 30,000	3,124	3,171	2,677	2,633	2,039	1,851	2,666	2,619	2,022	1,833
Greater or equal to 30,000–Less than 40,000	3,176	3,265	3,027	3,057	2,587	2,369	3,024	3,053	2,581	2,363
Greater or equal to 40,000–Less than 50,000	11,878	13,120	14,045	14,693	15,022	15,878	13,987	14,612	14,919	15,754
Greater or equal to 50,000–Less than 60,000	1,209	1,265	1,404	1,508	1,583	1,612	1,395	1,495	1,566	1,593
Greater or equal to 60,000–Less than 70,000	5,380	5,558	5,600	5,714	5,749	5,845	1,851	1,127	619	293
Greater or equal to 70,000–Less than 80,000	3,179	2,932	3,476	3,946	4,074	3,837	6,058	6,525	6,065	4,597
Greater or equal to 80,000–Less than 90,000							386	1,093	2,166	3,780
Greater or equal to 90,000–Less than 100,000							172	279	351	437
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							85	95	1,602	1,602
Greater or equal to 150,000–Less than 170,000							151	169	2,635	2,635
Greater or equal to 170,000–Less than 200,000							-	-	-	-
Total Southbound	30,059	31,492	32,441	33,794	32,814	33,356	32,285	33,370	32,458	33,017
North										
Less or equal to 10,000	62	-	-	-	-	-	-	-	-	-
Greater than 10,000–Less than 15,000	139	129	84	91	22	-	84	92	22	-
Greater or equal to 15,000–Less than 20,000	846	617	-	-	-	-	-	-	-	-
Greater or equal to 20,000–Less than 25,000	1,509	1,492	1,645	1,786	2,186	2,173	1,652	1,795	2,198	2,185
Greater or equal to 25,000–Less than 30,000	7,658	7,929	8,082	8,102	8,959	8,711	8,158	8,192	9,067	8,827
Greater or equal to 30,000–Less than 40,000	9,222	8,191	5,524	4,006	-	-	5,563	4,037	-	-
Greater or equal to 40,000–Less than 50,000	12,447	13,849	17,905	18,930	23,585	24,525	18,174	19,290	24,069	25,084
Greater or equal to 50,000–Less than 60,000	1,446	1,420	1,550	1,631	1,648	1,635	1,585	1,679	1,706	1,698
Greater or equal to 60,000–Less than 70,000	10,401	10,603	11,564	11,393	11,978	11,984	4,843	2,812	1,628	788
Greater or equal to 70,000–Less than 80,000	10,662	11,659	13,588	14,296	15,694	16,149	15,850	16,285	15,938	12,369
Greater or equal to 80,000–Less than 90,000	50	60	79	88	98	100	1,010	2,727	5,692	10,171
Greater or equal to 90,000–Less than 100,000							449	696	921	1,176
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							3,352	4,207	2,923	2,723
Greater or equal to 150,000–Less than 170,000							2,571	2,495	3,120	2,893
Greater or equal to 170,000–Less than 200,000							2,046	1,990	2,160	2,034
Total Northbound	53,237	55,948	60,019	60,322	64,171	65,278	60,871	61,009	64,516	65,455
Grand Total	83,296	87,440	92,461	94,116	96,984	98,634	93,156	94,379	96,974	98,472

Source: Richardson Lawrie Associates

Table 5-4. Potential Laden Transits by Direction and DWT Range, Existing and Expanded Canal, No Tolls, Most Probable Case, Selected Years, 2001–2025 (Transits)

	Existing Canal						Expanded Canal			
Vessel Size Range (dwt)	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
South										
Less or equal to 10,000	85.9	90.6	95.8	101.8	106.0	111.4	95.9	101.9	106.1	111.6
Greater than 10,000–Less than 15,000	21.7	23.8	24.0	23.2	18.2	15.6	24.0	23.2	18.2	15.6
Greater or equal to 15,000–Less than 20,000	28.7	30.5	28.5	30.2	22.4	20.0	28.5	30.1	22.3	19.9
Greater or equal to 20,000–Less than 25,000	45.4	41.9	43.6	43.1	30.2	41.3	43.5	42.9	29.9	41.0
Greater or equal to 25,000–Less than 30,000	113.8	115.5	97.6	96.0	74.3	67.5	97.2	95.4	73.7	66.8
Greater or equal to 30,000–Less than 40,000	89.5	92.0	85.3	86.1	72.9	66.7	85.2	86.0	72.7	66.6
Greater or equal to 40,000–Less than 50,000	267.5	295.4	316.3	330.9	338.3	357.6	315.0	329.0	335.9	354.8
Greater or equal to 50,000–Less than 60,000	22.6	23.7	26.3	28.2	29.6	30.2	26.1	28.0	29.3	29.8
Greater or equal to 60,000–Less than 70,000	80.7	83.4	84.0	85.7	86.3	87.7	26.9	16.4	9.0	4.3
Greater or equal to 70,000–Less than 80,000	44.1	40.7	48.3	54.8	56.5	53.3	82.5	88.8	82.6	62.6
Greater or equal to 80,000–Less than 90,000							4.5	12.6	25.0	43.7
Greater or equal to 90,000–Less than 100,000							1.9	3.0	3.8	4.7
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							0.6	0.7	11.1	11.1
Greater or equal to 150,000–Less than 170,000							0.9	1.1	16.5	16.5
Greater or equal to 170,000–Less than 200,000							-	-	-	-
Total Southbound	798.8	837.5	849.7	880.0	834.6	851.2	839.0	865.6	826.6	850.7
North										
Less or equal to 10,000	15.1	-	-	-	-	-	-	-	-	-
Greater than 10,000–Less than 15,000	11.1	10.3	6.7	7.2	1.8	-	6.7	7.3	1.8	-
Greater or equal to 15,000–Less than 20,000	47.4	34.6	-	-	-	-	-	-	-	-
Greater or equal to 20,000–Less than 25,000	65.6	64.8	71.5	77.6	95.0	94.5	71.8	78.0	95.5	95.0
Greater or equal to 25,000–Less than 30,000	279.1	288.9	294.5	295.2	326.5	317.5	297.3	298.5	330.4	321.7
Greater or equal to 30,000–Less than 40,000	259.8	230.8	155.6	112.9	-	-	156.7	113.7	-	-
Greater or equal to 40,000–Less than 50,000	280.3	311.9	403.2	426.3	531.1	552.3	409.2	434.4	542.0	564.8
Greater or equal to 50,000–Less than 60,000	27.1	26.6	29.0	30.5	30.8	30.6	29.7	31.4	31.9	31.8
Greater or equal to 60,000–Less than 70,000	156.1	159.1	173.5	170.9	179.7	179.8	70.3	40.8	23.6	11.4
Greater or equal to 70,000–Less than 80,000	148.0	161.8	188.6	198.4	217.9	224.2	215.8	221.7	217.0	168.4
Greater or equal to 80,000–Less than 90,000	0.6	0.7	1.0	1.1	1.2	1.2	11.7	31.5	65.8	117.6
Greater or equal to 90,000–Less than 100,000							4.9	7.5	10.0	12.7
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							23.2	29.1	20.3	18.9
Greater or equal to 150,000–Less than 170,000							16.1	15.6	19.5	18.1
Greater or equal to 170,000–Less than 200,000							11.8	11.5	12.5	11.7
Total Northbound	1,256.0	1,289.5	1,323.6	1,320.2	1,384.0	1,400.0	1,290.8	1,277.9	1,326.3	1,328.2
Grand Total	2,054.8	2,127.0	2,173.2	2,200.2	2,218.6	2,251.2	2,129.8	2,143.5	2,153.0	2,178.9

Source: Richardson Lawrie Associates

Table 5-5. Potential Laden Transits by Direction and DWT Range, Existing and Expanded Canal, No Tolls, Most Probable Case Selected Years, 2001–2025 (000 PCUMS)

	Existing Canal						Expanded Canal			
Vessel Size Range (dwt)	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
South										
Less or equal to 10,000	226	239	253	269	280	294	253	269	280	294
Greater than 10,000–Less than 15,000	158	173	175	169	133	114	175	169	132	114
Greater or equal to 15,000–Less than 20,000	279	296	277	293	217	194	277	293	217	193
Greater or equal to 20,000–Less than 25,000	623	576	600	592	415	567	597	589	411	563
Greater or equal to 25,000–Less than 30,000	1,645	1,670	1,410	1,387	1,074	975	1,404	1,380	1,065	965
Greater or equal to 30,000–Less than 40,000	1,704	1,752	1,624	1,640	1,388	1,271	1,622	1,638	1,385	1,268
Greater or equal to 40,000–Less than 50,000	6,345	7,009	7,503	7,849	8,025	8,482	7,472	7,806	7,970	8,416
Greater or equal to 50,000–Less than 60,000	662	692	768	825	866	882	763	818	857	872
Greater or equal to 60,000–Less than 70,000	2,557	2,642	2,662	2,716	2,733	2,779	880	536	294	139
Greater or equal to 70,000–Less than 80,000	1,502	1,385	1,642	1,864	1,924	1,812	2,861	3,082	2,864	2,171
Greater or equal to 80,000–Less than 90,000							181	511	1,013	1,768
Greater or equal to 90,000–Less than 100,000							80	129	163	203
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							39	43	726	726
Greater or equal to 150,000–Less than 170,000							68	76	1,190	1,190
Greater or equal to 170,000–Less than 200,000							-	-	-	-
Total Southbound	15,669	16,434	16,914	17,604	17,054	17,370	16,830	17,401	16,921	17,295
North										
Less or equal to 10,000	40	-	-	-	-	-	-	-	-	-
Greater than 10,000–Less than 15,000	81	75	49	53	13	-	49	53	13	-
Greater or equal to 15,000–Less than 20,000	460	336	-	-	-	-	-	-	-	-
Greater or equal to 20,000–Less than 25,000	901	890	982	1,066	1,305	1,297	986	1,072	1,312	1,304
Greater or equal to 25,000–Less than 30,000	4,034	4,176	4,257	4,267	4,719	4,588	4,297	4,315	4,776	4,650
Greater or equal to 30,000–Less than 40,000	4,948	4,395	2,963	2,149	-	-	2,984	2,166	-	-
Greater or equal to 40,000–Less than 50,000	6,649	7,398	9,565	10,113	12,599	13,101	9,709	10,305	12,858	13,400
Greater or equal to 50,000–Less than 60,000	791	777	848	892	902	894	867	919	933	929
Greater or equal to 60,000–Less than 70,000	4,944	5,040	5,497	5,416	5,694	5,697	2,302	1,337	774	374
Greater or equal to 70,000–Less than 80,000	5,036	5,506	6,418	6,752	7,412	7,628	7,486	7,692	7,528	5,842
Greater or equal to 80,000–Less than 90,000	23	28	37	41	46	47	472	1,275	2,662	4,756
Greater or equal to 90,000–Less than 100,000							208	323	427	546
Greater or equal to 100,000–Less than 110,000							-	-	-	-
Greater or equal to 110,000–Less than 120,000							-	-	-	-
Greater or equal to 120,000–Less than 150,000							1,519	1,907	1,325	1,234
Greater or equal to 150,000–Less than 170,000							1,161	1,127	1,409	1,306
Greater or equal to 170,000–Less than 200,000							921	896	973	916
Total Northbound	27,270	28,622	30,615	30,750	32,690	33,253	30,916	30,948	32,695	33,146
Grand Total	42,940	45,056	47,530	48,354	49,744	50,623	47,746	48,348	49,616	50,441

Source: Richardson Lawrie Associates

Figure 5-5. Potential Average DWT, Existing and Expanded Canal, No Tolls, All Cases

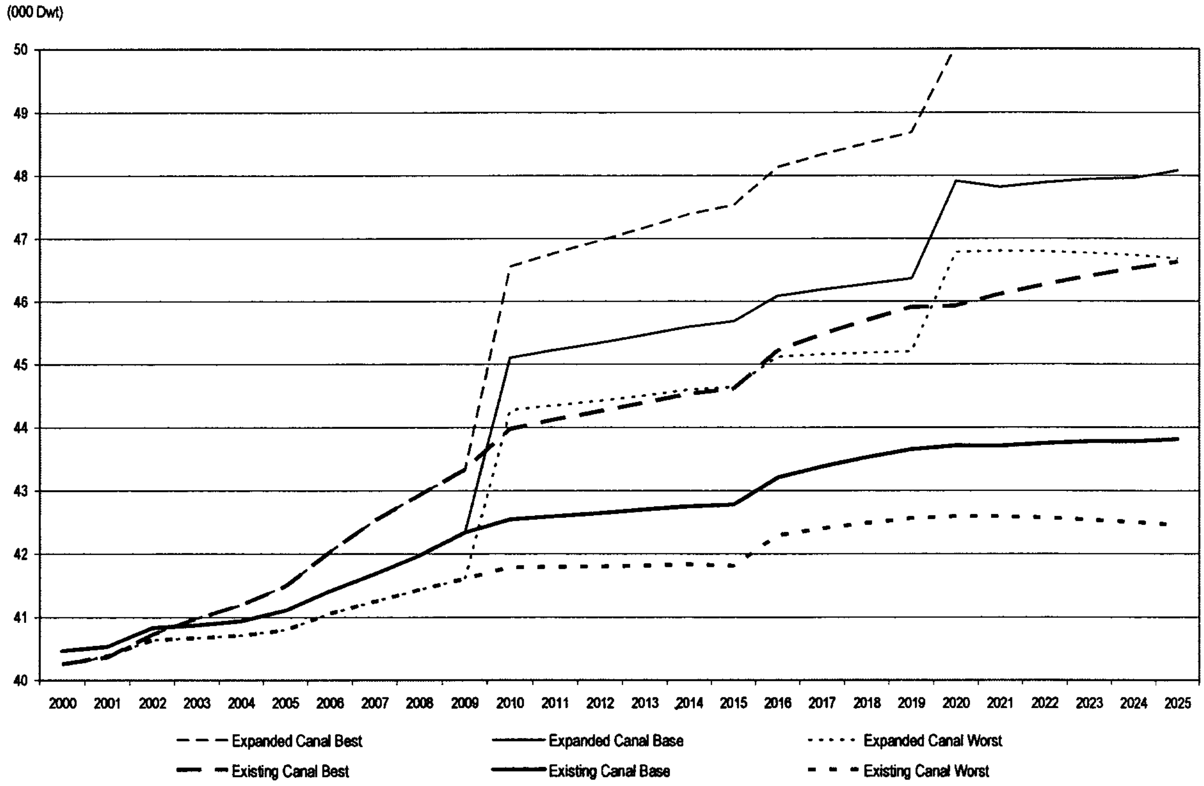


Table 5-6. Potential Ballast Transits in DWT, Number of Transits and PCUMS, Existing and Expanded Canal, No Tolls, All Cases

	Existing Canal						Expanded Canal			
Case	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
Vessel Size (000 dwt)										
Most Probable	6,014.5	6,741.2	7,551.7	8,389.9	8,975.8	9,473.0	7,294.6	8,065.6	8,585.6	8,997.7
Best	6,014.5	6,992.5	8,182.9	9,503.0	10,651.0	11,764.1	7,867.7	9,089.8	10,131.1	11,097.3
Worst	6,014.5	6,618.7	7,196.2	7,762.8	8,070.9	8,270.9	6,957.1	7,473.2	7,738.6	7,883.0
Transits										
Most Probable	157.8	165.8	182.5	201.5	213.6	223.7	176.4	193.9	204.6	212.8
Best	157.8	172.3	197.9	228.8	254.9	280.5	191.1	219.8	243.6	265.9
Worst	157.8	163.2	174.0	186.3	191.5	194.3	168.2	179.4	183.8	185.4
PCUMS (000)										
Most Probable	3,195.0	3,554.6	3,981.1	4,426.9	4,742.7	5,013.8	3,846.6	4,257.3	4,538.3	4,764.4
Best	3,195.0	3,687.7	4,314.8	5,016.2	5,631.1	6,231.0	4,149.7	4,799.9	5,358.5	5,880.9
Worst	3,195.0	3,490.4	3,793.6	4,095.5	4,263.3	4,375.8	3,668.4	3,944.0	4,089.1	4,172.2

Source: Richardson Lawrie Associates

ECONOMIC VALUE OF THE PANAMA CANAL

This section presents the determination of the economic value of the Existing and Expanded Canal. For purposes of this study, the economic value of the Canal refers to the transportation cost differential for specific commodity route pairs through the Panama Canal as compared to the least cost alternative routing·

The economic value determination builds on determination of the Canal's potential market and vessel transit and fleet analysis that were presented Sections 3 and 4.

The achievement of this component of the study has been facilitated by the development of integrated analytical tools for use in the determination of economic value, the development of a marketing strategy and the estimation of transit revenue flows which result from that and alternative strategies. In outline, for the Dry Bulk Segment, the determination of the economic value of the Canal has three elements:

- The determination of total seaborne transportation costs by route for projected Canal transits for the Existing Canal and their comparison with total transportation costs on alternative routes, including the incremental interest costs associated with having cargoes at sea for longer durations than would be the case for shorter routes through the Canal;
- The determination of total seaborne transportation costs by route for projected Canal transits for the Expanded Canal and their comparison total transportation costs on alternative routes, including the incremental interest costs associated with having cargoes at sea for longer durations than would be the case for shorter routes through the Canal;

- Calculation of the greater economic value that would be achieved through expansion of the locks versus the Existing Canal.

For the Expanded Canal, consideration has been given to the dimensions and characteristics of dry bulk carriers, as well as the added value from an Expanded Canal service in terms of greater cargo utilization rates and cost savings due to larger drafts and shorter routes compared with other alternatives. This part of the study also determines the relative margin between the economic value of the Existing Canal and the Expanded Canal, from 2010 through 2025.

In developing the approach and methodology for this component of the study, we have drawn on our team's in-depth understanding of global trends in shipping and maritime trade, detailed knowledge of specific product and transportation markets, and ability to organize and conduct meticulous, rigorous transport cost analyses for specific commodity–route pairs.

Approach

The determination of the economic value of the Canal involves comparing the total cost of transporting dry bulk commodities over routes transiting the Panama Canal and over alternative routes. For each potential Canal route involving dry bulk commodities, we first identified all current and projected viable alternative routes and then identified the least cost alternative route. Depending on the commodity and particular Canal route under consideration, the least-cost alternative may be one of the following:

- An all-water route such as those around Cape Horn, the Cape of Good Hope or through the Suez Canal,
- A different source of origin of the commodity that does not involve a Canal transit. An effective substitute for the product under consideration.

The definition of the least-cost alternatives takes into account the following factors:

- Mileage, if necessary, at a port level where more than one port might be considered representative of a particular origin or destination.
- Size and characteristics of vessels forecast to be operating on specific commodity–route pairs for all-water alternative routes

Current and projected draft of ports that serve the Canal and alternative routes. These include the ports of origin and destination, as well as intermediate ports.

- Current and projected capacity constraints in the transportation system, including bottlenecks and congestion at ports, limits of the land transport system, and the capacity of the Panama Canal under Existing and Expanded Canal scenarios.
- Commodity market forecasts that look at production and consumption trends and developments that will help identify current and future geographic and product competition.
- Timing. Route structures may change during the projection period, as improvements in the transportation system and other developments are implemented. Typically, if one expects trade on a specific route to grow over the forecast period, then, all other things being equal, cargo sizes will increase and there is also the possibility that the incidence of "parceling" of

cargoes will increase to the utilization of larger vessels as has been seen in the coal and iron ore trades.

- Typical cargo sizes that may be determined not by transportation considerations but by industrial requirements and trade volumes.
- Inventory costs for the additional time required for shipping over the longer distances associated with least cost alternative routes.

For each commodity–route pair, we compared the total freight cost of the commodity via routes through the existing Canal and the least-cost alternative route. The cost differential was then determined on an annual basis from 2000 through 2025. Hence, the timing of developments that affect the cost or capacity of the system was integrated directly in the transport cost analysis.

The calculation of economic value is based on zero Canal tolls. The economic value of the Canal for any one individual route is determined by the number of transits on that route, by commodity and size range, multiplied by the freight savings in $/ton versus the alternative routes. The freight savings are largely the differences between the freight costs for the Canal and alternative routes as described in Section 4.

The one other element considered in the calculation of economic value is the price of the commodity. This is taken into account in the calculation of the incremental interest costs associated with having cargoes at sea for longer durations in the case of the alternative routes.

Starting from the assumption of zero tolls, for those trades for which the Canal represents the least cost transportation option, the economic value of the Canal is the total cost of moving commodities on alternative routes less the costs associated with trading on Canal routes. In the case of other dry bulk commodities where the only costs to take into account in the comparison are associated with seaborne transportation there are just two elements to consider. These are the vessel freight costs and the additional "inventory" costs that are incurred as the result of shipping commodities on longer routes. If a cargo shipped on an alternative route is on the water for a longer duration than would be the case when transiting the Canal, then the shipper's money—equal to the total value of the cargo—is tied up for a longer period. There is therefore the cost of interest on the value of the cargo to be taken into account.

Results

Table 5-7 summarizes the total economic values calculated for both the Existing and Expanded Canal, through to 2025. Under Existing Canal conditions, the economic value of the Canal is estimated to remain within the range of the equivalent of $4.90 per ton to 6.01 per ton in $2002 terms. Translated into total economic value, this results in a value of $396 million in 2001, 353 million in 2010 and $388 million in 2025. The higher economic value in 2000 is a result of the peak in maritime freight rates that occurred that year, that increased the cost differential for Canal alternative routes.

For the Expanded Canal, the economic value is projected to range from $5.12 per ton to $5.35 per ton. Total economic value would rise from $405 million in 2010 to $466 million in 2025. The margins between the Expanded Canal and the Existing Canal are estimated to range from $0.18 per ton to $0.45 per ton during the period. The margin of the economic value of the Expanded Canal is $52 million in 2010 increasing to $78 million by 2025.Table 5-8 presents the detailed results of the economic value calculations of the Existing Canal at the route, commodity level for 2000 and 2005. Table 5-9 presents the results for the Existing Canal and the Expanded Canal cases and the margin in economic value of the Expanded Canal versus the Existing Canal for 2010. Table 5-10 presents the same items for 2025.

Table 5-7. Summary of Economic Value of Existing and Expanded Panama Canal, Most Probable Case, Selected Years 2001-2025

	Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Year	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
2000	2,089.9	65,987.7	6.01	396,618.3	-	-	-	-	-	-
2005	2,127.0	68,236.6	4.97	339,358.9	-	-	-	-	-	-
2010	2,173.2	72,015.0	4.90	352,943.4	2,173.2	75,685.1	5.35	405,288.9	0.45	52,345.5
2015	2,200.2	73,319.6	4.98	364,943.2	2,180.4	81,437.8	5.30	431,822.1	0.33	66,877.5
2020	2,218.6	75,401.0	4.94	372,465.4	2,206.5	86,961.6	5.12	445,260.8	0.18	72,791.2
2025	2,251.1	76,699.5	5.05	387,656.6	2,221.0	87,771.2	5.31	466,100.6	0.26	78,441.0

Table 5-8. Economic Value of Existing Panama Canal, Most Probable Case by Route and Commodity, 2000 and 2005

			2000				2005			
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
North America East	North America West	Other	7.2	298.1	10.40	3,100.0	7.8	317.1	8.77	2,780.4
North America East	Central America West	Other	20.8	580.9	12.69	7,370.6	23.9	687.7	10.74	7,388.8
North America East	South America West	Other	5.0	118.6	9.42	1,117.2	5.6	130.7	8.32	1,087.6
North America East	Oceania	Other	0.0	1.0	4.57	4.6	0.0	1.0	3.92	3.9
North America East	Far East	Other	109.4	4,158.3	3.16	13,150.6	122.3	4,657.2	2.68	12,460.2
North America East	Far East	Phosphate	25.0	949.6	2.87	2,724.3	29.9	1,137.6	2.38	2,709.6
North America Gulf	North America West	Other	1.0	37.2	12.83	477.3	1.1	40.5	10.90	441.1
North America Gulf	Central America West	Other	15.0	219.2	20.19	4,426.1	22.0	323.3	17.69	5,718.9
North America Gulf	Central America West	Phosphate	5.5	81.1	19.12	1,551.1	8.5	124.7	16.62	2,072.2
North America Gulf	South America West	Other	0.4	7.3	13.07	95.4	0.5	8.1	11.41	92.9
North America Gulf	South America West	Phosphate	12.1	204.1	12.31	2,512.0	13.5	230.0	10.64	2,447.4
North America Gulf	Oceania	Other	3.1	102.9	5.55	571.3	3.7	123.6	4.71	582.4
North America Gulf	Oceania	Phosphate	33.4	1,104.6	5.08	5,616.2	30.0	998.1	4.24	4,235.1
North America Gulf	Far East	Other	84.9	3,462.3	4.25	14,728.2	95.2	3,890.0	3.58	13,909.5
North America Gulf	Far East	Phosphate	84.5	3,445.9	3.85	13,263.4	94.6	3,863.0	3.17	12,249.4
North America Gulf	South East Asia	Other	6.8	188.7	2.11	399.0	7.4	205.2	1.80	369.4
Central America East	North America West	Other	2.0	39.0	35.10	1,369.0	0.9	17.0	31.21	532.0
Central America East	South America West	Other	4.2	65.1	16.13	1,051.0	4.1	62.7	14.99	940.6
Central America East	South America West	Phosphate	9.9	153.9	15.29	2,352.4	9.6	145.6	14.15	2,059.8
Central America East	Far East	Other	6.7	166.9	7.02	1,172.1	23.1	575.1	6.26	3,598.6
Colombia East	Japan	Thermal and Metallurgical Coal	2.3	79.0	4.86	384.0	2.0	68.8	3.89	267.7
Brazil	WC USA	Semi-finished & finished products of steel	29.1	1,207.0	0.80	962.0	19.6	827.8	0.68	559.7
Venezuela	WC USA	Semi-finished & finished products of steel	8.4	350.5	9.91	3,473.6	2.7	114.7	8.19	938.8
Venezuela	Japan	Primary aluminium	1.4	48.7	10.69	520.7	1.4	48.2	9.60	463.1
Venezuela	Japan	Thermal and Metallurgical Coal	0.6	20.0	-	-	0.5	16.0	-	-
Other EC S America	WC USA	Semi-finished & finished products of steel	0.0	1.8	-	-	3.9	164.6	-	-
South America East	North America West	Other	4.3	179.0	6.03	1,080.5	4.2	178.6	4.93	879.6
South America East	North America West	Petroleum coke	1.9	81.0	0.60	48.6	2.2	95.0	0.48	45.5
South America East	Canada West	Semi-finished & finished products of steel	24.0	997.1	-	-	13.7	580.9	-	-
South America East	Central America West	Other	4.7	188.6	10.64	2,005.8	3.8	152.3	8.66	1,318.4
South America East	Central America West	Thermal and Metallurgical Coal	5.0	198.0	9.68	1,916.9	10.8	432.0	6.66	2,875.9
South America East	South America West	Other	8.8	161.7	10.48	1,694.2	9.4	177.9	8.84	1,572.6
South America East	South America West	Thermal and Metallurgical Coal	52.0	958.6	8.66	8,298.2	41.1	774.0	6.19	4,787.8
South America East	Oceania	Other	0.6	14.0	-	-	0.2	4.0	-	-
South America East	Far East	Other	9.4	329.3	2.08	686.1	9.3	325.3	1.74	565.4
North Brazil	Japan	Primary aluminium	2.8	96.9	4.82	467.0	2.6	92.8	4.35	403.5

Table 5-8. Economic Value of Existing Panama Canal, Most Probable Case by Route and Commodity, 2000 and 2005

			2000				2005			
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
South Brazil	Far East	Primary aluminium	0.7	24.3	-	-	0.7	23.0	-	-
Caribbean	North America West	Other	0.8	20.6	14.81	305.4	1.4	38.4	12.62	485.1
Caribbean	North America West	Semi-finished & finished products of steel	3.3	87.5	15.54	1,359.9	0.5	13.7	13.36	183.1
Caribbean	Central America West	Other	56.0	221.6	50.65	11,223.4	61.4	241.6	47.73	11,532.3
Caribbean	South America West	Other	1.2	16.3	14.95	243.5	1.5	20.0	13.56	270.7
Caribbean	Far East	Bauxite and Alumina	2.1	63.0	4.59	289.3	2.6	77.0	3.86	297.4
Caribbean	Far East	Other	12.6	377.4	5.11	1,927.0	15.5	466.9	4.38	2,043.2
Europe	North America West	Other	4.1	117.6	8.75	1,028.6	4.3	126.0	7.37	929.3
Europe	WC USA	Semi-finished & finished products of steel	23.5	680.9	9.22	6,275.4	20.5	600.1	7.84	4,707.3
Europe	Canada West	Semi-finished & finished products of steel	14.9	431.4	9.22	3,975.4	12.5	364.9	7.84	2,862.2
Europe	Central America West	Other	30.9	779.9	9.66	7,532.5	26.4	671.3	8.21	5,510.5
Europe	South America West	Other	37.0	867.0	5.52	4,783.5	38.5	908.5	4.69	4,257.4
Africa	North America West	Other	4.6	152.2	0.68	103.1	4.6	154.0	0.60	92.4
Africa	Central America West	Other	2.4	92.4	6.38	589.9	2.6	99.8	5.47	545.5
Africa	Oceania	Other	12.6	457.5	-	-	11.8	426.7	-	-
Middle East	Central America West	Other	0.4	4.0	3.30	13.0	1.6	15.1	3.17	47.9
Middle East	South America West	Other	0.1	2.0	0.21	0.4	-	-		-
Middle East	South America West	Phosphate	0.3	6.3	0.17	1.1	0.3	5.0	0.15	0.7
North America West	North America East	Other	13.8	356.9	14.16	5,051.7	15.2	396.4	11.92	4,724.2
North America West	North America Gulf	Other	0.1	2.1	12.52	25.9	0.1	2.2	10.27	22.3
North America West	Central America East	Other	3.6	78.3	18.03	1,411.2	3.2	71.2	14.84	1,056.7
North America West	South America East	Other	19.7	505.2	1.47	742.1	30.0	770.2	1.25	963.7
North America West	Caribbean	Other	5.3	153.1	12.72	1,946.8	8.2	241.4	10.73	2,589.4
North America West	Europe	Other	114.0	4,846.7	7.37	35,735.3	128.3	5,543.3	6.02	33,381.2
North America West	Africa	Other	26.6	1,087.0	6.41	6,970.7	23.4	967.0	5.29	5,119.6
North America West	Middle East	Other	11.6	582.9	2.80	1,632.0	14.4	725.0	2.43	1,762.6
Canada West	South America East	Thermal and Metallurgical Coal	21.9	1,140.8	0.80	909.2	20.0	1,040.4	0.62	644.1
Canada West	Europe	Thermal and Metallurgical Coal	69.5	3,460.4	5.64	19,500.5	63.1	3,155.6	4.35	13,736.7
Canada West	South Africa	Thermal and Metallurgical Coal	3.9	206.1	0.31	63.7	3.6	187.9	0.24	45.6
Canada West	North Africa	Thermal and Metallurgical Coal	0.7	34.8	3.36	116.8	0.6	31.7	3.01	95.4
Central America West	North America East	Other	46.7	1,295.6	14.61	18,933.7	70.8	2,267.7	11.84	26,842.5
Central America West	North America East	Semi-finished & finished products of steel	17.3	479.0	15.33	7,341.6	6.3	201.2	12.55	2,524.3
Central America West	North America Gulf	Other	2.3	61.5	16.84	1,035.2	1.1	29.2	14.46	422.1
Central America West	North America Gulf	Semi-finished & finished products of steel	21.2	558.0	17.63	9,836.5	17.9	488.3	15.25	7,446.7
Central America West	Central America East	Other	10.7	221.0	19.38	4,282.5	14.2	290.0	17.45	5,060.5
Central America West	South America East	Other	4.0	67.5	2.56	172.7	14.7	348.0	1.90	661.6

Table 5-8. Economic Value of Existing Panama Canal, Most Probable Case by Route and Commodity, 2000 and 2005

			2000				2005			
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
Central America West	Caribbean	Other	0.6	18.1	13.18	238.9	0.5	19.8	9.58	190.1
Central America West	Europe	Other	45.2	1,113.7	11.39	12,686.6	22.8	571.0	9.78	5,587.2
Central America West	Africa	Other	5.7	154.5	9.12	1,409.5	10.8	294.3	8.03	2,362.5
Chile	North Atlantic United States	Iron Ore	4.8	133.0	7.15	951.2	4.6	138.0	5.59	771.0
Chile	Caribbean	Iron Ore	7.5	347.0	4.12	1,428.6	10.4	479.0	3.24	1,551.5
Chile	Europe	Copper concentrates	2.7	64.2	4.84	310.4	55.2	1,360.0	4.07	5,541.7
Peru	North Atlantic United States	Iron Ore	2.6	73.0	8.78	640.7	3.1	92.0	6.86	630.8
Peru	Caribbean	Iron Ore	11.7	538.0	5.29	2,843.6	6.9	320.0	4.16	1,330.6
Peru	Europe	Copper concentrates	47.1	1,112.3	6.00	6,676.5	7.0	172.2	5.05	870.2
South America West	North America East	Copper concentrates	2.6	73.5	9.85	724.1	5.5	159.4	8.29	1,321.6
South America West	North America East	Other	98.7	2,772.9	10.66	29,560.1	74.6	2,170.9	8.89	19,289.2
South America West	North America Gulf	Copper concentrates	1.8	46.4	12.06	559.8	2.6	69.1	10.21	704.9
South America West	North America Gulf	Iron Ore	1.3	34.7	10.40	361.4	1.4	38.4	8.46	325.0
South America West	North America Gulf	Other	5.9	153.3	12.86	1,971.6	11.4	302.4	10.79	3,261.2
South America West	Central America East	Other	3.3	66.1	15.62	1,031.7	5.1	104.0	13.23	1,375.8
South America West	South America East	Other	14.5	262.4	12.77	3,351.4	12.2	249.1	10.38	2,584.8
South America West	Caribbean	Other	2.5	88.4	8.79	777.0	1.7	71.3	6.89	491.6
South America West	Europe	Other	72.5	1,710.1	7.53	12,872.8	63.9	1,576.0	6.28	9,895.3
South America West	Africa	Other	2.8	46.8	7.18	336.3	6.3	108.3	5.87	635.3
Oceania	North America East	Other	68.8	2,059.5	0.02	44.9	75.6	2,322.1	0.03	73.3
Oceania	North America Gulf	Other	21.9	603.5	1.87	1,125.7	22.3	629.1	1.58	995.1
Oceania	Central America East	Other	3.1	91.7	2.01	183.9	3.3	100.9	1.69	170.9
Oceania	Caribbean	Other	0.9	16.7	-	-	0.8	14.6	-	-
Oceania	Middle East	Other	1.5	31.0	-	-	1.9	39.0	-	-
Far East	North America East	Cement	63.4	1,938.0	3.40	6,591.0	77.1	2,452.2	2.69	6,602.6
Far East	North America East	Metallurgical Coke	73.5	2,246.0	3.59	8,072.2	77.9	2,479.0	2.89	7,153.2
Far East	North America East	Other	11.7	356.8	4.02	1,432.5	12.6	401.3	3.31	1,327.0
Far East	North America Gulf	Cement	48.0	1,718.0	4.36	7,492.3	59.4	2,173.8	3.47	7,537.5
Far East	North America Gulf	Metallurgical Coke	38.2	1,368.0	4.63	6,328.3	42.3	1,550.0	3.73	5,785.0
Far East	North America Gulf	Other	10.1	363.3	5.20	1,890.6	12.2	446.7	4.31	1,925.5
Far East	North America Gulf	Semi-finished & finished products of steel	57.5	2,060.7	5.50	11,344.1	39.0	1,428.7	4.61	6,588.2
Far East	Canada East	Semi-finished & finished products of steel	13.2	452.6	3.99	1,805.8	4.8	175.2	3.27	573.4
Far East	Central America East	Other	26.8	757.1	6.20	4,694.6	25.6	740.5	5.18	3,836.4
Far East	South America East	Other	7.7	186.7	3.81	710.5	8.2	204.8	3.16	646.6
Far East	Caribbean	Other	9.0	210.3	4.43	931.8	6.7	154.9	3.78	585.1
China	North Atlantic United States	Semi-finished & finished products of steel	9.7	348.7	3.88	1,351.6	2.0	73.2	3.22	235.8

Table 5-8. Economic Value of Existing Panama Canal, Most Probable Case by Route and Commodity, 2000 and 2005

			2000				2005			
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
Taiwan	North Atlantic United States	Semi-finished & finished products of steel	11.1	303.5	4.44	1,346.9	5.5	151.8	3.85	584.2
Japan	North Atlantic United States	Semi-finished & finished products of steel	13.5	465.2	8.22	3,822.8	8.1	296.3	6.72	1,990.5
South East Asia	North America East	Other	9.3	264.9	2.93	775.4	12.7	367.2	2.46	902.6
South East Asia	North America Gulf	Other	5.2	159.4	4.40	701.3	7.1	220.9	3.68	813.2
South East Asia	North America Gulf	Semi-finished & finished products of steel	8.2	254.0	2.45	621.7	3.5	110.2	2.08	228.9
South East Asia	South America East	Thermal and Metallurgical Coal	28.6	516.0	-	-	31.3	593.0	-	-
South Korea	North Atlantic United States	Semi-finished & finished products of steel	22.4	572.7	4.66	2,669.4	8.4	215.9	3.99	861.9
Total			2,089.9	65,987.7	6.01	396,618.3	2,127.0	68,236.6	4.97	339,358.9

Source: Nathan Associates Inc.

Table 5-9. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2010

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
North America East	North America West	Other	8.6	348.2	8.94	3,111.1	8.6	358.2	9.15	3,278.8	0.22	167.7
North America East	Central America West	Other	22.3	659.9	10.73	7,081.1	22.3	659.9	10.73	7,081.1	-	-
North America East	South America West	Other	6.4	150.5	8.44	1,270.3	6.4	150.5	8.44	1,270.3	-	-
North America East	Oceania	Other	0.0	1.0	3.96	4.0	0.0	1.0	3.96	4.0	-	-
North America East	Far East	Other	113.1	4,309.2	2.71	11,687.6	113.1	4,410.4	2.98	13,130.9	0.27	1,443.3
North America East	Far East	Phosphate	31.9	1,213.8	2.42	2,935.6	31.9	1,242.3	2.68	3,333.8	0.27	398.2
North America Gulf	North America West	Other	1.3	46.1	11.06	510.1	1.3	46.1	11.06	510.1	-	-
North America Gulf	Central America West	Other	21.5	321.3	17.78	5,713.6	21.5	321.3	17.78	5,713.6	-	-
North America Gulf	Central America West	Phosphate	8.3	124.7	16.72	2,084.0	8.3	124.7	16.72	2,084.0	-	-
North America Gulf	South America West	Other	0.5	9.4	11.39	106.8	0.5	9.4	11.39	106.8	-	-
North America Gulf	South America West	Phosphate	14.8	258.8	10.63	2,749.8	14.8	258.8	10.63	2,749.8	-	-
North America Gulf	Oceania	Other	4.5	150.2	4.75	713.8	4.5	150.2	4.75	713.8	-	-
North America Gulf	Oceania	Phosphate	31.1	1,045.7	4.28	4,480.3	31.1	1,045.7	4.28	4,480.3	-	-
North America Gulf	Far East	Other	107.8	4,398.1	3.63	15,952.6	107.8	4,591.0	4.10	18,840.9	0.48	2,888.3
North America Gulf	Far East	Phosphate	102.5	4,181.6	3.22	13,474.9	102.5	4,365.0	3.70	16,147.0	0.48	2,672.1
North America Gulf	South East Asia	Other	8.3	234.1	1.81	424.1	8.3	234.1	1.81	424.1	-	-
Central America East	North America West	Other	0.9	17.8	31.78	565.5	0.9	17.8	31.78	565.5	-	-
Central America East	South America West	Other	3.7	56.2	15.37	863.2	3.7	56.2	15.37	863.2	-	-
Central America East	South America West	Phosphate	8.4	126.4	14.52	1,835.5	8.4	126.4	14.52	1,835.5	-	-
Central America East	Far East	Other	7.1	177.7	6.35	1,127.8	7.1	177.7	6.35	1,127.8	-	-
Colombia East	Japan	Thermal and Metallurgical Coal	1.9	68.6	3.94	270.3	2.0	69.0	3.95	272.5	0.01	2.2
Brazil	WC USA	Semi-finished & finished products of steel	23.5	1,010.0	0.68	686.5	23.5	1,108.2	1.65	1,831.1	0.97	1,144.6
Brazil	Far East	Copper concentrates	4.9	173.0	-	-	4.9	173.0	-	-	-	-
Venezuela	WC USA	Semi-finished & finished products of steel	3.3	139.7	8.24	1,150.5	3.3	153.2	8.91	1,365.0	0.67	214.4
Venezuela	Japan	Primary aluminium	1.4	48.2	9.66	466.1	1.4	48.2	9.66	466.1	-	-
Venezuela	Japan	Thermal and Metallurgical Coal	0.5	16.0	-	-	0.5	16.0	4.46	71.3	4.46	71.3
Other EC S America	WC USA	Semi-finished & finished products of steel	4.6	197.9	-	-	4.6	217.2	0.09	19.0	0.09	19.0
South America East	North America West	Other	4.7	200.4	4.96	994.1	4.7	219.9	5.73	1,259.8	0.77	265.7
South America East	North America West	Petroleum coke	2.3	100.0	0.48	48.3	2.3	109.7	1.46	159.7	0.97	111.4
South America East	Canada West	Semi-finished & finished products of steel	16.5	707.6	-	-	16.5	776.3	0.09	68.0	0.09	68.0
South America East	Central America West	Other	4.0	161.0	8.78	1,414.3	4.0	172.1	9.04	1,556.2	0.26	141.9
South America East	Central America West	Thermal and Metallurgical Coal	12.1	485.0	6.79	3,292.6	12.1	518.4	7.40	3,834.3	0.61	541.7
South America East	South America West	Other	10.0	195.2	8.81	1,719.8	10.0	197.5	8.84	1,745.3	0.03	25.5
South America East	South America West	Thermal and Metallurgical Coal	38.8	754.2	6.15	4,638.6	38.8	763.1	6.44	4,915.8	0.29	277.2
South America East	Oceania	Other	0.1	3.0	-	-	0.1	3.0	-	-	-	-

Table 5-9. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2010

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
South America East	Far East	Other	9.9	348.0	1.76	612.3	9.9	350.2	1.83	640.8	0.07	28.4
North Brazil	Japan	Primary aluminium	2.6	92.8	4.37	405.9	2.6	92.8	4.37	405.9	-	-
South Brazil	Far East	Primary aluminium	0.7	23.0	-	-	0.7	23.0	-	-	-	-
Caribbean	North America West	Other	1.5	39.6	12.82	507.5	1.5	39.6	12.82	507.5	-	-
Caribbean	North America West	Semi-finished & finished products of steel	0.6	15.0	13.55	203.7	0.6	15.0	13.55	203.7	-	-
Caribbean	Central America West	Other	70.6	280.2	48.11	13,480.4	70.6	280.2	48.11	13,480.4	-	-
Caribbean	South America West	Other	0.8	10.6	13.75	146.4	0.8	10.6	13.75	146.4	-	-
Caribbean	Far East	Bauxite and Alumina	3.3	98.0	3.92	384.0	3.3	98.0	3.92	384.0	-	-
Caribbean	Far East	Other	17.0	512.2	4.43	2,270.4	17.0	512.2	4.43	2,270.4	-	-
Europe	North America West	Other	4.8	143.2	7.42	1,062.3	4.8	143.2	7.42	1,062.3	-	-
Europe	WC USA	Semi-finished & finished products of steel	18.0	532.4	7.89	4,200.4	18.0	532.4	7.89	4,200.4	-	-
Europe	Canada West	Semi-finished & finished products of steel	10.9	323.8	7.89	2,555.2	10.9	323.8	7.89	2,555.2	-	-
Europe	Central America West	Other	23.0	590.9	8.29	4,900.7	23.0	590.9	8.29	4,900.7	-	-
Europe	South America West	Other	28.9	685.4	4.74	3,251.7	28.9	685.4	4.74	3,251.7	-	-
Africa	North America West	Other	5.2	175.1	0.60	105.7	5.2	175.1	0.60	105.7	-	-
Africa	Central America West	Other	2.9	114.1	5.55	632.5	2.9	122.3	6.04	739.0	0.50	106.4
Africa	Oceania	Other	11.3	410.3	-	-	11.3	410.3	-	-	-	-
Middle East	Central America West	Other	0.8	7.4	3.22	23.9	0.8	7.4	3.22	23.9	-	-
Middle East	South America West	Phosphate	5.4	100.0	0.15	14.8	5.4	100.0	0.15	14.8	-	-
North America West	North America East	Other	15.0	395.5	12.01	4,749.9	15.0	395.5	12.01	4,749.9	-	-
North America West	North America Gulf	Other	0.1	2.4	10.33	24.7	0.1	2.6	10.93	28.4	0.60	3.7
North America West	Central America East	Other	3.5	79.5	14.77	1,173.7	3.5	79.5	14.77	1,173.7	-	-
North America West	South America East	Other	38.3	991.9	1.26	1,253.8	38.3	991.9	1.26	1,253.8	-	-
North America West	Caribbean	Other	4.8	146.7	10.62	1,557.3	4.8	146.7	10.62	1,557.3	-	-
North America West	Europe	Other	151.8	6,686.9	6.05	40,429.3	151.8	7,390.6	6.98	51,595.9	0.94	11,166.5
North America West	Africa	Other	30.3	1,263.4	5.34	6,741.5	30.3	1,352.2	5.97	8,077.4	0.64	1,335.9
North America West	Middle East	Other	18.7	941.0	2.45	2,307.5	18.7	1,073.2	3.94	4,232.4	1.49	1,924.9
Canada West	South America East	Thermal and Metallurgical Coal	17.6	920.0	0.63	579.3	17.6	1,145.5	1.96	2,248.6	1.33	1,669.2
Canada West	Europe	Thermal and Metallurgical Coal	55.5	2,790.3	4.42	12,332.5	55.5	3,186.6	5.69	18,140.1	1.27	5,807.7
Canada West	South Africa	Thermal and Metallurgical Coal	3.2	166.0	0.25	41.0	3.2	225.3	1.97	444.9	1.73	403.9
Canada West	North Africa	Thermal and Metallurgical Coal	0.6	28.0	3.01	84.5	0.6	32.6	4.42	144.0	1.40	59.5
Central America West	North America East	Other	67.7	2,243.6	11.78	26,420.3	67.7	2,318.2	11.93	27,662.8	0.16	1,242.5
Central America West	North America East	Semi-finished & finished products of steel	5.8	193.5	12.49	2,416.3	5.8	200.0	12.64	2,528.0	0.16	111.7
Central America West	North America Gulf	Other	1.1	30.2	14.40	435.0	1.1	30.2	14.40	435.0	-	-
Central America West	North America Gulf	Semi-finished & finished products of steel	15.1	426.9	15.19	6,484.9	15.1	426.9	15.19	6,484.9	-	-

Table 5-9. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2010

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
Central America West	Central America East	Other	10.1	200.0	18.15	3,630.0	10.1	200.0	18.15	3,630.0	-	-
Central America West	South America East	Other	11.9	333.2	1.76	586.2	11.9	333.2	1.76	586.2	-	-
Central America West	Caribbean	Other	0.1	4.5	9.70	44.1	0.1	4.9	10.30	50.7	0.60	6.6
Central America West	Europe	Other	18.7	479.6	9.80	4,697.5	18.7	479.6	9.80	4,697.5	-	-
Central America West	Africa	Other	6.9	187.6	8.16	1,530.8	6.9	187.6	8.16	1,530.8	-	-
Chile	North Atlantic United States	Iron Ore	3.9	131.0	5.20	681.0	3.9	141.9	5.85	830.4	0.65	149.4
Chile	Caribbean	Iron Ore	11.8	545.0	3.30	1,796.0	11.8	604.2	4.07	2,457.9	0.77	662.0
Chile	Europe	Copper concentrates	43.7	1,113.8	4.06	4,521.2	43.7	1,113.8	4.06	4,521.2	-	-
Peru	North Atlantic United States	Iron Ore	2.6	88.0	6.38	561.4	2.6	95.3	6.80	648.3	0.42	86.9
Peru	Caribbean	Iron Ore	7.9	365.0	4.23	1,544.1	7.9	404.7	4.73	1,915.1	0.50	371.0
Peru	Europe	Copper concentrates	16.4	418.3	5.04	2,106.3	16.4	418.3	5.04	2,106.3	-	-
South America West	North America East	Copper concentrates	5.2	159.4	8.15	1,298.5	5.2	164.7	8.36	1,376.2	0.21	77.6
South America West	North America East	Other	86.4	2,663.6	8.72	23,230.4	86.4	2,752.6	8.91	24,523.5	0.19	1,293.1
South America West	North America Gulf	Copper concentrates	3.7	101.8	10.08	1,025.9	3.7	104.5	10.23	1,068.6	0.15	42.8
South America West	North America Gulf	Iron Ore	1.6	43.9	8.33	365.7	1.6	45.0	8.43	379.9	0.10	14.2
South America West	North America Gulf	Other	13.2	366.7	10.65	3,903.7	13.2	376.4	10.78	4,056.6	0.13	152.9
South America West	Central America East	Other	5.2	106.1	13.40	1,421.1	5.2	106.1	13.40	1,421.1	-	-
South America West	Caribbean	Other	1.9	79.2	6.95	550.6	1.9	86.4	7.65	661.2	0.70	110.6
South America West	Europe	Other	94.0	2,396.1	6.25	14,984.4	94.0	2,396.1	6.25	14,984.4	-	-
South America West	Africa	Other	4.3	103.1	4.88	502.8	4.3	103.1	4.88	502.8	-	-
Oceania	North America East	Other	96.6	3,085.4	0.03	98.9	96.6	3,193.0	0.50	1,591.5	0.47	1,492.6
Oceania	North America Gulf	Other	30.8	898.5	1.57	1,413.9	30.8	898.5	1.57	1,413.9	-	-
Oceania	Central America East	Other	3.5	110.6	1.69	187.2	3.5	110.6	1.69	187.2	-	-
Oceania	Caribbean	Other	0.8	16.2	-	-	0.8	16.2	-	-	-	-
Oceania	Middle East	Other	2.1	44.0	-	-	2.1	44.0	-	-	-	-
Far East	North America East	Cement	72.6	2,452.2	2.63	6,447.3	72.6	2,620.7	3.45	9,049.1	0.82	2,601.8
Far East	North America East	Metallurgical Coke	70.5	2,382.0	2.82	6,722.2	70.5	2,545.7	3.65	9,280.9	0.82	2,558.8
Far East	North America East	Other	12.7	428.0	3.24	1,387.8	12.7	457.4	4.07	1,859.9	0.82	472.0
Far East	North America Gulf	Cement	57.5	2,173.8	3.46	7,512.2	57.5	2,318.9	4.27	9,900.8	0.81	2,388.6
Far East	North America Gulf	Metallurgical Coke	39.6	1,496.0	3.72	5,566.0	39.6	1,595.9	4.53	7,236.3	0.81	1,670.2
Far East	North America Gulf	Other	9.2	346.8	4.30	1,490.6	9.2	369.9	5.11	1,891.1	0.81	400.5
Far East	North America Gulf	Semi-finished & finished products of steel	43.4	1,640.3	4.60	7,544.4	43.4	1,749.8	5.41	9,471.9	0.81	1,927.4
Far East	Canada East	Semi-finished & finished products of steel	4.7	183.4	3.20	587.2	4.7	202.9	4.46	905.1	1.26	317.9
Far East	Central America East	Other	27.2	813.7	5.15	4,186.7	27.2	845.2	5.57	4,703.8	0.42	517.1
Far East	South America East	Other	8.6	223.1	3.13	698.6	8.6	223.1	3.13	698.6	-	-

Table 5-9. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2010

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
Far East	Caribbean	Other	7.2	168.5	3.84	647.1	7.2	168.5	3.84	647.1	-	-
China	North Atlantic United States	Semi-finished & finished products of steel	2.1	84.0	3.19	267.8	2.1	92.0	4.33	398.4	1.14	130.6
Taiwan	North Atlantic United States	Semi-finished & finished products of steel	6.4	175.2	3.90	683.3	6.4	175.2	3.90	683.3	-	-
Japan	North Atlantic United States	Semi-finished & finished products of steel	6.9	268.3	6.57	1,763.2	6.9	296.9	7.92	2,350.9	1.35	587.7
South East Asia	North America East	Other	16.5	485.8	2.46	1,196.8	16.5	485.8	2.46	1,196.8	-	-
South East Asia	North America Gulf	Other	9.2	292.3	3.70	1,080.3	9.2	292.3	3.70	1,080.3	-	-
South East Asia	North America Gulf	Semi-finished & finished products of steel	4.8	153.6	2.09	320.2	4.8	153.6	2.09	320.2	-	-
South East Asia	South America East	Thermal and Metallurgical Coal	2.8	61.0	-	-	2.8	61.0	-	-	-	-
South Korea	North Atlantic United States	Semi-finished & finished products of steel	9.5	248.4	4.02	997.8	9.5	248.4	4.02	997.8	-	-
Total			2,173.2	72,015.0	4.90	352,943.4	2,173.2	75,685.1	5.35	405,288.9	0.45	52,345.5

Source: Nathan Associates Inc.

Table 5-10. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2025

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
North America East	North America West	Other	11.7	466.2	9.52	4,439.4	11.2	466.1	10.11	4,712.0	0.59	272.59
North America East	Central America West	Other	28.8	906.0	11.00	9,962.6	28.8	906.0	11.00	9,963.2	-	-
North America East	South America West	Other	8.5	197.1	8.93	1,760.7	8.5	197.1	8.93	1,760.9	-	-
North America East	Oceania	Other	0.0	1.0	4.15	4.1	0.0	1.0	4.15	4.1	-	-
North America East	Far East	Other	120.8	4,609.9	2.86	13,186.8	117.2	4,609.5	3.37	15,521.9	0.51	2,335.08
North America East	Far East	Phosphate	31.6	1,205.1	2.57	3,093.4	30.6	1,205.0	3.07	3,704.1	0.51	610.66
North America Gulf	North America West	Other	1.4	53.2	11.66	620.5	1.4	53.2	11.66	620.5	-	-
North America Gulf	Central America West	Other	13.6	212.3	18.34	3,892.6	13.6	212.3	18.34	3,894.3	0.01	1.68
North America Gulf	Central America West	Phosphate	5.3	83.1	17.27	1,435.2	5.3	83.1	17.28	1,435.9	0.01	0.66
North America Gulf	South America West	Other	0.7	13.2	11.62	153.4	0.7	13.2	11.62	153.4	-	-
North America Gulf	South America West	Phosphate	7.8	143.8	10.86	1,560.7	7.8	143.8	10.86	1,561.4	-	-
North America Gulf	Oceania	Other	5.6	190.2	4.96	944.1	5.6	190.2	4.96	944.1	-	-
North America Gulf	Oceania	Phosphate	30.6	1,045.7	4.50	4,701.9	30.6	1,045.7	4.50	4,701.9	-	-
North America Gulf	Far East	Other	146.1	5,958.4	3.82	22,780.3	137.1	5,957.5	4.82	28,693.1	0.99	5,912.79
North America Gulf	Far East	Phosphate	102.5	4,181.6	3.42	14,295.2	96.2	4,181.0	4.41	18,446.7	0.99	4,151.55
North America Gulf	South East Asia	Other	9.3	270.0	1.88	507.7	9.3	270.0	1.88	507.8	-	-
Canada East	Japan	Iron Ore	-	-		-	5.0	774.0	0.90	697.8	0.90	697.84
Canada East	South Korea	Iron Ore	-	-		-	2.9	448.0	0.85	382.4	0.85	382.41
Central America East	North America West	Other	1.2	22.9	34.15	783.1	1.2	22.9	34.16	783.3	0.01	0.26
Central America East	South America West	Other	0.7	9.4	16.78	158.5	0.7	9.4	16.80	158.6	0.01	0.11
Central America East	Far East	Other	7.4	185.1	6.74	1,246.8	7.4	185.1	6.74	1,246.7	-	-
Argentina	China	Primary aluminium	2.3	58.3	-	-	2.3	58.3	-	-	-	-
Colombia East	Japan	Thermal and Metallurgical Coal	1.9	67.9	4.18	283.9	1.9	69.0	4.21	290.5	0.03	6.68
Brazil	WC USA	Semi-finished & finished products of steel	20.3	894.4	0.70	629.4	18.0	894.1	2.42	2,167.5	1.72	1,538.08
Brazil	Far East	Copper concentrates	1.3	46.0	-	-	1.3	46.0	-	-	-	-
Venezuela	WC USA	Semi-finished & finished products of steel	2.8	123.9	8.58	1,063.6	2.5	123.9	10.04	1,243.6	1.46	180.01
Venezuela	China	Primary aluminium	2.8	69.4	8.38	581.2	2.8	69.4	8.38	581.2	-	-
Venezuela (by pass)	Taiwan	Iron Ore	-	-		-	1.9	247.0	0.12	29.5	0.12	29.49
Venezuela	Japan	Primary aluminium	1.9	68.9	9.96	686.1	1.9	68.9	9.96	686.1	-	-
Venezuela	Japan	Thermal and Metallurgical Coal	0.4	16.0	-	-	0.4	16.0	4.76	76.1	4.76	76.08
Other EC S America	WC USA	Semi-finished & finished products of steel	3.8	166.5	-	-	3.4	166.4	0.77	127.7	0.77	127.67
South America East	North America West	Other	6.1	270.4	5.18	1,401.1	5.4	270.4	6.71	1,815.3	1.53	414.19
South America East	North America West	Petroleum coke	2.6	116.0	0.51	58.8	2.3	116.0	2.23	258.3	1.72	199.53
South America East	Canada West	Semi-finished & finished products of steel	14.1	621.6	-	-	12.5	621.4	0.77	476.6	0.77	476.62
South America East	Central America West	Other	15.4	622.4	9.28	5,774.5	13.5	622.2	10.24	6,371.0	0.96	596.48

Table 5-10. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2025

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
South America East	Central America West	Thermal and Metallurgical Coal	10.7	431.0	7.32	3,155.9	9.4	430.9	8.65	3,728.1	1.33	572.21
South America East	South America West	Other	14.7	308.3	8.95	2,758.6	14.5	308.3	9.11	2,807.3	0.16	48.66
South America East	South America West	Thermal and Metallurgical Coal	11.3	238.2	6.26	1,491.0	11.2	238.2	6.69	1,594.3	0.43	103.35
South America East	Oceania	Other	0.4	10.0	-	-	0.4	10.0	-	-	-	-
South America East	Far East	Other	11.8	417.9	1.86	775.4	11.7	417.9	2.00	835.5	0.14	60.10
North Brazil	China	Primary aluminium	3.7	93.3	-	-	3.7	93.3	-	-	-	-
North Brazil	Japan	Primary aluminium	2.6	92.8	4.50	417.7	2.6	92.8	4.50	417.7	-	-
South Brazil	Far East	Primary aluminium	1.3	46.4	-	-	1.3	46.4	-	-	-	-
Venezuela (by pass)	China	Iron Ore	-	-		-	5.7	809.3	0.73	590.0	0.73	589.98
Venezuela (by pass)	Japan	Iron Ore	-	-		-	7.0	1,047.0	1.07	1,117.9	1.07	1,117.87
Venezuela (by pass)	South Korea	Iron Ore	-	-		-	5.1	771.0	1.00	769.2	1.00	769.19
Caribbean	North America West	Other	1.2	32.5	13.59	441.9	1.2	32.5	13.59	441.8	-	-
Caribbean	North America West	Semi-finished & finished products of steel	0.6	16.4	14.32	234.3	0.6	16.4	14.32	234.3	-	-
Caribbean	Central America West	Other	102.0	416.2	49.45	20,583.0	102.1	416.2	49.51	20,610.0	0.06	26.94
Caribbean	South America West	Other	0.8	11.4	14.57	165.4	0.8	11.4	14.58	165.5	0.01	0.13
Caribbean	Far East	Bauxite and Alumina	4.1	125.0	4.16	519.7	4.1	125.0	4.16	519.7	-	-
Caribbean	Far East	Other	15.4	466.9	4.67	2,181.3	15.4	466.9	4.67	2,181.4	-	-
Europe	North America West	Other	6.8	207.9	7.72	1,604.8	6.8	207.9	7.72	1,604.9	-	-
Europe	WC USA	Semi-finished & finished products of steel	0.7	20.2	8.19	165.4	0.7	20.2	8.19	165.4	-	-
Europe	Canada West	Semi-finished & finished products of steel	0.4	12.4	8.19	101.4	0.4	12.4	8.19	101.4	-	-
Europe	Central America West	Other	1.1	28.6	8.68	248.5	1.1	28.6	8.68	248.5	-	-
Europe	South America West	Other	6.3	150.4	4.99	750.2	6.3	150.4	4.99	750.1	-	-
Africa	North America West	Other	8.4	290.1	0.63	182.1	8.4	290.1	0.63	182.0	-	-
Africa	Central America West	Other	3.6	139.7	5.84	816.4	3.1	139.7	7.31	1,021.0	1.47	204.56
Africa	Oceania	Other	14.1	512.8	-	-	14.1	512.8	-	-	-	-
Middle East	Central America West	Other	0.8	7.8	3.40	26.5	0.8	7.8	3.40	26.5	-	-
Middle East	South America West	Other	0.3	5.0	0.20	1.0	0.3	5.0	0.20	1.0	-	-
Middle East	South America West	Phosphate	18.7	350.0	0.16	54.5	18.7	350.0	0.16	54.5	-	-
North America West	North America East	Other	17.3	471.2	12.43	5,857.1	17.3	471.2	12.43	5,857.3	-	-
North America West	North America Gulf	Other	0.1	3.3	10.77	35.0	0.1	3.3	11.82	38.5	1.05	3.43
North America West	Central America East	Other	1.8	44.2	14.98	661.8	1.8	44.2	14.98	661.8	-	-
North America West	South America East	Other	75.3	2,018.2	1.31	2,639.3	75.3	2,018.2	1.31	2,639.4	-	-
North America West	Caribbean	Other	4.1	141.8	10.47	1,484.6	4.1	141.8	10.47	1,484.6	-	-
North America West	Europe	Other	172.3	7,767.6	6.31	48,999.2	150.4	7,776.0	7.73	60,081.5	1.42	11,082.27
North America West	Africa	Other	39.8	1,684.1	5.59	9,422.5	36.8	1,685.3	6.55	11,039.0	0.96	1,616.54

Table 5-10. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2025

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
North America West	Middle East	Other	30.0	1,511.0	2.54	3,834.7	23.2	1,513.3	4.80	7,262.6	2.26	3,427.82
Canada West	South America East	Thermal and Metallurgical Coal	16.1	841.1	0.67	565.7	12.9	925.5	2.46	2,280.4	1.79	1,714.73
Canada West	Europe	Thermal and Metallurgical Coal	50.5	2,551.8	4.72	12,032.4	40.7	2,555.4	6.55	16,743.5	1.84	4,711.09
Canada West	South Africa	Thermal and Metallurgical Coal	2.9	152.0	0.26	40.0	2.4	169.4	2.57	435.3	2.31	395.33
Canada West	North Africa	Thermal and Metallurgical Coal	0.5	25.7	3.04	78.2	1.6	183.0	1.84	337.1	(1.20)	258.88
Canada West	Europe	Thermal and Metallurgical Coal	-	-		-	17.5	2,473.7	2.17	5,370.0	2.17	5,370.00
Central America West	North America East	Other	54.2	1,872.9	12.24	22,924.4	53.0	1,873.5	12.65	23,706.6	0.41	782.27
Central America West	North America East	Semi-finished & finished products of steel	7.0	240.5	12.95	3,114.0	6.8	240.5	13.36	3,214.4	0.41	100.41
Central America West	North America Gulf	Other	1.1	33.7	14.64	493.2	1.1	33.7	14.64	493.2	-	-
Central America West	North America Gulf	Semi-finished & finished products of steel	16.0	489.2	15.43	7,546.9	16.0	489.2	15.43	7,547.1	-	-
Central America West	Central America East	Other	19.6	370.0	20.57	7,609.5	19.6	370.0	20.57	7,612.4	0.01	2.86
Central America West	South America East	Other	8.3	248.7	1.79	444.5	8.3	248.7	1.79	444.5	-	-
Central America West	Caribbean	Other	0.2	6.7	10.25	68.8	0.1	6.7	11.24	75.5	0.98	6.66
Central America West	Europe	Other	23.2	619.1	10.21	6,323.6	23.2	619.1	10.22	6,323.7	0.00	0.14
Central America West	Africa	Other	8.6	294.3	7.52	2,213.0	8.6	294.3	7.52	2,213.0	-	-
Chile	North Atlantic United States	Iron Ore	3.3	129.0	4.99	643.6	2.9	129.1	6.37	822.2	1.38	178.64
Chile	Caribbean	Iron Ore	14.4	670.0	3.53	2,368.4	12.4	670.7	4.64	3,111.2	1.10	742.80
Chile	Europe	Copper concentrates	60.6	1,589.5	4.23	6,716.2	60.6	1,589.5	4.23	6,716.4	0.00	0.26
Peru	North Atlantic United States	Iron Ore	2.2	87.0	6.12	532.6	1.9	87.1	7.15	622.4	1.02	89.74
Peru	Caribbean	Iron Ore	9.6	448.0	4.54	2,033.0	8.3	448.5	5.30	2,376.6	0.76	343.60
Peru	Europe	Copper concentrates	5.1	133.7	5.24	700.6	5.1	133.7	5.24	700.6	-	-
South America West	North America East	Copper concentrates	4.7	159.4	8.23	1,311.2	4.6	159.4	8.68	1,383.3	0.45	72.06
South America West	North America East	Other	83.7	2,808.0	8.81	24,746.0	81.3	2,809.1	9.25	25,985.0	0.44	1,239.05
South America West	North America Gulf	Copper concentrates	2.3	69.1	10.16	702.1	2.2	69.1	10.59	731.6	0.42	29.52
South America West	North America Gulf	Iron Ore	1.8	53.9	8.42	454.3	1.7	53.9	8.77	473.4	0.35	19.08
South America West	North America Gulf	Other	16.3	495.8	10.74	5,325.0	16.0	496.0	11.15	5,532.2	0.41	207.22
South America West	Central America East	Other	10.6	213.2	14.46	3,083.6	10.6	213.2	14.47	3,083.7	0.00	0.10
South America West	Caribbean	Other	2.4	102.6	7.28	746.6	2.1	102.6	8.41	863.3	1.13	116.66
South America West	Europe	Other	116.7	3,063.4	6.53	19,992.0	116.7	3,063.4	6.53	19,992.9	-	-
South America West	Africa	Other	5.8	142.9	5.07	725.3	5.8	142.9	5.07	725.4	-	-
South America West	Middle East	Other	7.5	136.0	5.04	685.5	7.5	136.0	5.04	685.6	-	-
Oceania	North America East	Other	108.9	3,741.7	0.03	115.6	104.6	3,743.4	0.82	3,052.0	0.78	2,936.43
Oceania	North America Gulf	Other	30.4	937.9	1.62	1,523.0	30.4	937.9	1.62	1,523.0	-	-
Oceania	Central America East	Other	3.9	127.1	1.78	225.8	3.9	127.1	1.78	225.8	-	-
Oceania	Caribbean	Other	1.1	21.6	-	-	1.1	21.6	-	-	-	-

Table 5-10. Economic Value of Existing and Expanded Panama Canal, Most Probable Case by Route and Commodity, 2025

			Existing Canal				Expanded Canal				Margin Expanded vs. Existing Canal	
Origin	Destination	Commodity	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Potential Panama Canal Transits	Potential Panama Canal cargo (tons 000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)	Economic Value of Canal ($/ton)	Economic Value of Canal ($000s)
Oceania	Middle East	Other	2.8	59.0	-	-	2.8	59.0	-	-	-	-
Oceania (by pass)	North America East	Thermal and Metallurgical Coal	-	-		-	10.5	1,481.0	1.38	2,050.1	1.38	2,050.11
Oceania (by pass)	North America Gulf	Thermal and Metallurgical Coal	-	-		-	14.0	1,964.0	2.24	4,397.6	2.24	4,397.59
Oceania (by pass)	Central America East	Thermal and Metallurgical Coal	-	-		-	5.5	771.0	2.33	1,798.7	2.33	1,798.74
Far East	North America East	Cement	42.7	1,558.2	2.68	4,173.2	39.8	1,559.5	4.05	6,308.5	1.37	2,135.38
Far East	North America East	Metallurgical Coke	57.6	2,103.0	2.87	6,037.6	53.7	2,104.7	4.24	8,919.4	1.37	2,881.80
Far East	North America East	Other	15.0	548.3	3.29	1,804.8	14.0	548.8	4.66	2,556.1	1.37	751.28
Far East	North America Gulf	Cement	35.4	1,397.8	3.61	5,048.4	33.0	1,398.8	4.85	6,790.4	1.24	1,741.97
Far East	North America Gulf	Metallurgical Coke	32.7	1,289.0	3.88	4,996.7	30.5	1,289.9	5.12	6,602.9	1.24	1,606.23
Far East	North America Gulf	Other	9.2	363.3	4.45	1,618.1	8.6	363.5	5.70	2,070.7	1.24	452.59
Far East	North America Gulf	Semi-finished & finished products of steel	41.4	1,631.0	4.75	7,755.0	38.6	1,632.1	6.00	9,786.7	1.24	2,031.70
Far East	Canada East	Semi-finished & finished products of steel	3.2	132.8	3.26	433.1	2.8	132.9	5.19	689.4	1.92	256.29
Far East	Central America East	Other	27.5	886.8	5.23	4,636.1	26.5	887.2	6.03	5,345.6	0.80	709.41
Far East	South America East	Other	8.7	239.8	3.21	769.7	8.7	239.8	3.21	769.8	-	-
Far East	Caribbean	Other	8.9	210.0	4.07	854.3	8.9	210.0	4.07	854.3	-	-
China	North Atlantic United States	Semi-finished & finished products of steel	5.0	212.3	3.25	689.5	4.5	212.5	5.02	1,067.2	1.77	377.65
Taiwan	North Atlantic United States	Semi-finished & finished products of steel	3.7	128.3	3.62	465.0	3.7	128.3	3.62	465.0	-	-
Japan	North Atlantic United States	Semi-finished & finished products of steel	3.2	136.4	6.70	913.4	2.9	136.6	8.88	1,212.7	2.18	299.23
South East Asia	North America East	Other	32.3	987.7	2.55	2,515.8	32.3	987.7	2.55	2,515.8	-	-
South East Asia	North America Gulf	Other	18.2	594.2	3.85	2,286.0	18.2	594.2	3.85	2,286.0	-	-
South East Asia	North America Gulf	Semi-finished & finished products of steel	8.9	289.6	2.16	626.4	8.9	289.6	2.16	626.5	-	-
South East Asia	South America East	Thermal and Metallurgical Coal	0.4	9.0	-	-	0.4	9.0	-	-	-	-
South Korea	North Atlantic United States	Semi-finished & finished products of steel	3.0	79.5	4.20	333.7	3.0	79.5	4.20	333.7	-	-
Total			2,251.1	76,699.5	5.05	387,656.6	2,221.0	87,771.2	5.31	466,100.6	0.26	78,441.00

Source: Nathan Associates Inc.

6. Canal Toll Pricing Strategy and Forecast of Canal Transits and Toll Revenue

This section presents the analysis and recommendations for a marketing strategy for the existing and expanded Canal. The recommended marketing strategy identifies an optimum pricing strategy for the dry bulk market segment including the structure and rates for Canal tolls and its implementation.

APPROACH

Our approach consists of the following steps:

- Review toll policy theory and concepts.
- Evaluate the theoretical dimensions and performance of the current Canal toll policy, structure, and rates.
- Conduct a comparative analysis of toll policies and rate schedules at facilities similar to the Panama Canal.
- Specify and analyze alternative Canal toll structures and rates and develop optimal structure and rates.
- Prepare a strategic implementation plan for introducing the revised toll policy.

TOLL POLICY THEORY AND CONCEPTS

A toll policy represents a set of principles underlying the objectives to be achieved by a given toll rate structure. Basic objectives include

- Revenues expected to be generated by the toll rates and traffic volumes;
- Equity or fairness, which can be measured by whether the toll rates reflect the
  - Cost of providing service through the waterway,
  - Value of service to the user, and
  - User's ability to pay, which can be measured by cubic cargo capacity, quantity of cargo, and value of cargo;
- Promotion of traffic growth;
- Efficiency or capacity utilization of the waterway; and
- Administrative simplicity.

Determining the optimal toll structure depends on the priority of these objectives. Some objectives conflict, so it is important to define limits or acceptable ranges for some of them. For instance, maximizing revenue could conflict with equity or fairness, if carried to an extreme. Other objectives could also conflict, such as the promotion of traffic growth and generation of revenues.

PANAMA CANAL TOLL POLICY

From it opening in 1914 through 1999, the Panama Canal was operated under the control of the United States and with toll policies and rates established by the United States. With the transfer of control of the Panama Canal to Panama in December 1999, toll policy and rates were established by the newly created Panama Canal Authority in accordance with Panamanian law and existing treaties. In the sections below, we discuss the key elements of the Panama Canal toll policy and rates for these two periods.

Prior to 2000

Policy

Until 2000, Panama Canal tolls were set at rates calculated to produce revenues to cover as nearly as practicable all costs of maintaining and operating the Canal and related facilities and appurtenances and to provide capital for plant replacement, expansion, and improvement. Tolls were assessed on the earning capacity of the ship, defined as the gross tonnage minus spaces used for operating the ship, such as the engine room, fuel tanks, and crew quarters. On July 1, 1997, the rules of measurement were modified to apply to on-deck container carrying capacity.

Tolls were required to be set at rates calculated to produce revenues to cover, as nearly as practicable, all costs of maintaining and operating the canal and related facilities and appurtenances and to provide capital for plant replacement, expansion, and improvements.

Rate Structure

Tolls were assessed on the earning capacity of the ship. Earning capacity is the cubic cargo-carrying capacity of the ship. It equals the total enclosed space (gross tonnage) of the ship minus the spaces used for operating the ship—the spaces required for the engine room, fuel tanks, and crew quarters. At the Panama Canal, a ship's earning capacity is referred to as the Panama Canal net tons.

On October 1, 1994, the Panama Canal Commission adopted the Panama Canal Universal Measurement System (PC/UMS) to determine the volume of vessel to be used to assess Panama Canal tolls. The system is compatible with the standard tonnage measurement promulgated in the 1969 International Convention on Tonnage Measurement of Ships.

The Panama Canal system of tolls applies rates per PC/UMS ton. There are differentiated rates only for laden and ballast vessel. The structure of the toll structure at the Panama Canal does not vary by merchant ship type or by ship size. It does, however, differentiate between laden and ballast merchant vessels.

Panama Canal tolls remain unchanged from its opening in 1914 to 1974. From 1974 to 2000, Panama Canal tolls were increased 8 times as shown in Table 6-1.

Table 6-1. Panama Canal Tolls for Laden and Ballast Transit 1974–2002 ($ per PCUMS)

Date	Landen	Ballast
Before July 8, 1974	0.9	0.72
July 8, 1974	1.08	0.86
November 18, 1976	1.29	1.03
October 1, 1979	1.67	1.33
March 12, 1983	1.83	1.46
October 1, 1989	2.01	1.6
October 1, 1992	2.21	1.76
January 1, 1997	2.39	1.9
January 1, 1998	2.57	2.04

Source: Autoridad de Canal de Panama.

Post 2000

Policy

In 2000, the ACP announced that new guidelines that would permit the Canal to earn a profit rather than simply cover costs would be established. Under the new guidelines, tolls will be based on the following principles:

- Canal operating and maintenance costs
- The protection of water resources
- Working capital and required reserves
- Payments to the national treasury stipulated by the constitution and the law governing the ACP
- Funds needed to expand, upgrade, and modernize the canal
- Interest on the Canal's value based upon the interest rate approved by the ACP
- Losses from previous years.

Rate Structure

In October 2002, Panama implemented a new rate structure for Canal tolls. The new structure is based on ship size and type with a separate provision for use of locomotives. Along with the new rate structure, two toll increases were adopted; the first to take effect on October 1, 2002 and the second to take effect on July 1, 2003. The new rate structure and toll levels are presented in Table 6-2. While the new rate structure allows for tolls to vary by type of vessel, actual toll levied remain uniform across vessel types.

Table 6-2. Panama Canal Tolls, 2002–2003 ($ per PCUMS)

	First 10,000 tons		Next 10,000 tons		Remaining tons	
Type of vessel	Laden	Ballast	Laden	Ballast	Laden	Ballast
Panama Canal Tolls - October 1, 2002						
General cargo	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Refrigerated cargo	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Dry bulk	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Tankers	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Container ships	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Vehicle carriers	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Passenger ships	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Others	$2.80	$2.22	$2.78	$2.21	$2.75	$2.18
Panama Canal Tolls Structure- July 1, 2003						
General cargo	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Refrigerated cargo	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Dry bulk	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Tankers	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Container ships	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Vehicle carriers	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Passenger ships	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26
Others	$2.96	$2.35	$2.90	$2.30	$2.85	$2.26

Achievement of Underlying Objectives

Prior studies of the Panama Canal tolls examined how well the Panama Canal toll structure in the pre-2000 period met stated toll policies. However, as current Panama Canal tolls are uniform by vessel type and vary only slightly by vessel size, findings regarding Canal tolls in the pre-2000 remain relevant today.

Based on cost of service, small vessels pay less than the marginal cost of providing Canal service and a disproportionately small share of fixed costs; large vessels pay more than the marginal cost of service and a disproportionately large share of fixed costs. The marginal cost of providing service is the cost that varies with the number of transits or the size of the vessel. In contrast, the fixed cost of providing service does not vary with traffic. It is a sunk cost incurred to make the Canal available to shippers.

Tolls are not necessarily proportional to the value of the service provided by the Canal. Value of service is directly related to the degree that shippers need to use the Canal. For shippers who have no economically attractive alternative to the Canal to move cargo from supply sources to demand destinations, the value of the Canal is high. The toll should be relatively high to reflect this value. However, when commodities can be purchased from numerous alternative sources of supply or when they can be transported by several different modes of transportation or in large vessels, shippers have more transportation alternatives available to them, some of which are likely to be an economically attractive alternative to the Canal. In these cases, the value of service provided by the Canal is relatively low and shippers should be charged in a lower toll to encourage their continued use of the

Canal. The existing Canal toll structure, however, does not vary by value of service. All shippers pay the same rate. As a result, larger vessels, which, because of economies of scale, have more routing alternatives than do smaller vessels, pay a toll not necessarily proportional to the value of service they receive from the Canal. And, for some commodities, tolls are not proportional to the value of Canal service

The structure reflects ability to pay on the basis of earning capacity. Only indirectly, through a toll differential on laden versus ballast movements, does the structure reflect ability to pay on the basis of the quantity of cargo carried. Only coincidentally—when dense cargoes are of low value—does the current structure reflect ability to pay on the basis of cargo value. Iron and steel, however, are dense, high-value Canal cargoes for which the toll structure does not reflect to pay on the basis of cargo value.

Efficiency was not promoted by the pre-200- Canal toll structure. It encouraged use by small ships and discourages use by large ships. As a result, it discouraged use by those who contribute most to recovery of fixed cost.

PANAMA CANAL TREATIES OF 1977 AND TOLL POLICY IMPLICATIONS

Beginning in 1903, the U.S.-Panama Treaty of 1903 and subsequent amendments have governed Canal operations since the construction of the waterway. Under the treaty, the United States had total control of the Canal operations and the Canal Zone.

The Panama Canal Treaty and the Treaty Concerning the Permanent Neutrality and Operation of the Panama Canal, signed September 7, 1977, changed the relationship between the United States and Panama. These treaties provide for the transfer of all rights to and operation of the Canal to Panama by December 31, 1999. In addition, the goals of the treaties were to ensure that the Canal would be efficiently operated and would remain secure, neutral, and open to all nations.

Article I of the Panama Canal Treaty of 1977 provided that "The Republic of Panama declares that the Canal, as an international transit waterway, shall be permanently neutral in accordance with the regime established in this Treaty. The same regime of neutrality shall apply to any other international waterway that may be built either partially or wholly in the territory of the Republic of Panama."

Article II, Paragraph 1(c), of the 1977 Treaty Concerning the Permanent Neutrality and Operation of the Panama Canal provides that for purposes of the security, efficiency, and proper maintenance of the Canal, "tolls and other charges for transit and ancillary services shall be just, reasonable, equitable and consistent with the principles of international law."

During ratification of the treaties, the U.S. Senate introduced an "Understanding" to the neutrality treaty, which reads as follows:

> (1) Paragraph 1 (c) of Article III of the Treaty shall be construed as requiring, before any adjustment in tolls for use of the Canal, that the effects of any such toll adjustment on the trade patterns of the two Parties shall be given full consideration, including consideration of the following factors in a manner consistent with the regime of neutrality:
>
> (A) the costs of the operating and maintaining the Panama Canal;
>
> (B) the competitive position of the use of the Canal in relation to other means of transportation;

(C) the interests of both Parties in maintaining their domestic fleets;
(D) the impact of such an adjustment on the various geographic areas of each of the two Parties; and
(E) the interests of both Parties in maximizing their international commerce.

On September 30, 1979, the Panama Canal Company was terminated and the Panama Canal Commission (PCC) was established according to the Panama Canal Treaty of 1977 by P.L. 96-70. Chapter 6 of the law is concerned with tolls for use of the Panama Canal.

Section 1602(b) of Chapter 6 stipulates that "tolls shall be prescribed at rates calculated to produce revenues to cover as nearly as practicable all costs of maintaining and operating the Panama Canal, together with the facilities and appurtenances related thereto, including unrecovered costs incurred on or after the effective date of this Act, interest, depreciation, payments to the Republic of Panama pursuant to paragraph 5 of Article III and paragraph 4(a) and (b) of Article XIII of the Panama Canal Treaty of 197715, and capital for plant replacement, expansion, and improvement. Tolls shall not be prescribed at rates calculated to produce revenue sufficient cover payments to the Republic of Panama pursuant to paragraph 4 (c) of Article XIII of the Panama Canal Treaty of 1977."

Undertaking the Canal Expansion Program requires an increase in toll rates in order to aid the financing of the expansion It is clear from a reading of the treaty that the Panama Canal must remain neutral and nondiscriminatory, but it is less clear how much the treaty actually inhibits the ability to raise tolls. The treaty does offer the opportunity to raise tolls and to cover costs, including those associated with financing capital improvement. This opportunity is reiterated in P.L. 96-70, which states that "tolls shall be prescribed at rates calculated to produce revenues to cover as nearly as practicable all costs of … capital for plant replacement, expansion, and improvement." However, treaty also states that "the effects of any such toll adjustment on the trade patterns of the two Parties shall be given full consideration…"

Despite the language on the regional impact of tolls, there appears to be sufficient justification to raise tolls because it will help finance one of the alternatives to the Canal, which will help maximize world trade. In addition, our analysis of the transportation costs shows that the effect of the toll increase on most trade routes will be relatively small compared with total transportation costs.

Toll policies, schedules, and rates at other facilities are relevant to the Panama Canal in several ways. First, these toll systems are part of the current accepted global practice concerning differentiated toll rates. Second, for some commodity–route pairs, these facilities may be an alternative to Panama Canal routes. In this task we will identify and evaluate toll systems used for other international waterways, such as the Suez Canal and the Saint Lawrence Seaway.

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[15] Articles III and XIII are concerned with payments to Panama. According to the Treaty, Panama shall receive "the sum of ten million United States dollars ($10,000,000) per annum for the foregoing services…and in the event Canal operating revenues in any year do not produce a surplus sufficient to cover this payment, the unpaid balance shall be paid from operating surpluses in future years…"

SUEZ CANAL

Policy

The Suez Canal Authority, a government entity of the United Arab Republic of Egypt, runs, manages, maintains, and improves the Suez Canal. The Authority sets tolls and turns revenue over to the Central government, excluding a portion set aside for improvements. The Suez Canal toll rate structure is based on vessel earning capacity. It differs from the Panama Canal toll structure by differentiating among ship types, cargo carried by the ship, and within ship-type and cargo combination size intervals of the ship's earning capacity. Recognizing the economies of scale, the toll rate per Suez Canal net ton declines with ship size. But tolls levied are also market related and for a given ship size will rise with vessel earning capacity, bunker fuels prices, and, as a result, the potential savings offered by Canal transits.

The primary policy objective is to maximize cargo tonnage moving through the Canal.

Structure and Rates

The Suez Canal toll rate structure is based on vessel earning capacity. It differs from the Panama Canal toll structure by differentiating among ship type, cargo carried by the ship, and with a ship-type and cargo combination, size intervals of the ship's earning capacity.

The toll rate per Suez Canal net ton declines as the ships earning capacity increases.[16] Suez Canal tolls are expressed in Standard Drawing Rights (SDR), the unit of currency of the International Monetary Fund. Because the SDR represents a basket of currencies, Suez Canal rates fluctuates when converted to U.S. dollars.

Table 6-3 presents current Suez Canal transit dues in SDRs and their U.S. dollar equivalent as of January 1, 2003.

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[16] The system of measurement of the Suez Canal net ton differs from that of the Panama Canal net ton. Although both have the objective of measuring the earning capacity of a vessel, the system of net ton measurement is unique to each canal. The Suez Canal system of measurement was specified by the International Commission held at Constantinople in 1873. The system of measurement for the Panama Canal Commission net ton is specified in Title 35, Parts 133 and 135 of the U.S. Code of Federal Regulations. Both systems of measurement are extremely detailed and complex and differ in their treatment of vessel space to be included in the net ton calculation.

Table 6-3. Suez Canal Transit Dues by Type and Size of Vessel, January 1, 2003

Type of Vessel	First 5,000		Next 5,000		Next 10,000		Next 20,000		Next 30,000		Rest	
	Laden	Ballast	Laden	Ballast	Laden	Ballast	Laden	Ballast	Laden	Ballast	Laden	Ballast
Dues in SDRs												
Crude oil tankers	6.49	5.52	3.62	3.08	3.25	2.77	1.40	1.19	1.40	1.19	1.21	1.03
Tanker of petroleum products	6.75	5.52	3.77	3.08	3.43	2.77	1.93	1.19	1.93	1.19	1.93	1.03
Dry bulk carriers	7.21	6.13	4.14	3.52	2.97	2.53	1.05	0.90	1.00	0.85	1.00	0.85
Other bulk liquid & LNG carriers	7.50	6.38	4.18	3.56	3.81	3.24	2.68	2.28	2.68	2.28	2.68	2.28
LPG carrier	6.75	5.75	3.77	3.21	3.43	2.92	2.42	2.06	2.42	2.06	2.42	2.06
Car/container vessels	7.21	6.13	4.10	3.49	3.37	2.87	2.42	2.06	2.42	2.06	1.83	1.56
Special floating units	7.21	-	4.14	-	3.77	-	2.63	-	2.63	-	2.63	-
Other vessels	7.21	6.13	4.14	3.52	3.77	3.21	2.63	2.24	2.63	2.24	2.63	2.24
Dues in US dollars a/												
Crude oil tankers	8.81	7.49	4.91	4.18	4.41	3.76	1.90	1.62	1.90	1.62	1.64	1.40
Tanker of petroleum products	9.16	7.49	5.12	4.18	4.66	3.76	2.62	1.62	2.62	1.62	2.62	1.40
Dry bulk carriers	9.79	8.32	5.62	4.78	4.03	3.43	1.43	1.22	1.36	1.15	1.36	1.15
Other bulk liquid & LNG carriers	10.18	8.66	5.68	4.83	5.17	4.40	3.64	3.10	3.64	3.10	3.64	3.10
LPG carrier	9.16	7.81	5.12	4.36	4.66	3.96	3.29	2.80	3.29	2.80	3.29	2.80
Car/container vessels	9.79	8.32	5.57	4.74	4.58	3.90	3.29	2.80	3.29	2.80	2.48	2.12
Special floating units	9.79	-	5.62	-	5.12	-	3.57	-	3.57	-	3.57	-
Other vessels	9.79	8.32	5.62	4.78	5.12	4.36	3.57	3.04	3.57	3.04	3.57	3.04

a. Suez Canal dues are paid in Special Drawing Rights (SDRs), an international reserve asset created by the International Monetary Fund whose value is calculated of a basket of five currencies. As of January 1, 2003 a SDR was equal to 1.35766 US dollars.

The Suez Canal also offers long-haul users the opportunity to request rebates on Suez Canal dues if the vessel operators can demonstrate that the vessel's alternative routing through the Cape of Good Hope or the Panama Canal is less expensive than the route through the Suez Canal. The application for rebates must be submitted well before the vessel reaches the deviation point and is valid for up to 60 days prior to Suez Canal arrival date. The rebate provided is released after all required documentation is submitted, usually within 3-4 months from the date of transit.

ST. LAWRENCE SEAWAY

POLICY

The toll policy and rate schedule for the St. Lawrence Seaway are determined jointly by the U.S. and Canadian governments.

The St. Lawrence Seaway Development Corporation, a wholly owned U.S. government corporation created in 1954 within the Department of Transportation, is responsible for the development, seasonal operation, and the maintenance of the seaway between Montreal and Lake Erie and within the territorial limits of the United States.

The St. Lawrence Seaway Authority, which is a parent Crown corporation, was established in 1954 to construct and operate a deep waterway between the Port of Montreal and Lake Erie, together with works and other property deemed necessary. Tolls are determined by the amount needed to cover operating and maintenance costs and maximize traffic. Specifically the provisions of the St Lawrence Seaway Act concerning tolls state that charges should be guided by the following principles[17]:

1. That the rates shall be fair and equitable and shall give due consideration to encouragement of increased utilization of the navigation facilities, and to the special character of bulk agricultural, mineral, and other raw materials.
2. That rates shall vary according to the character of cargo with the view that each classification of cargo shall so far as practicable derive relative benefits from the use of these facilities.
3. That the rates on vessels in ballast with passengers or cargo may be less than the rates for vessels with passengers or cargo.
4. That the rates prescribed shall be calculated to cover as nearly as practicable, all costs operating and maintaining the works under the administration of the Corporation, including depreciation, and payments in lieu of taxes.

RATE STRUCTURE

The St. Lawrence Seaway toll rate structure comprises a primary component based on cargo carried and a secondary component based on vessel earning capacity.

The primary component differentiates among cargo types but not among cargo tonnage intervals. The rate charged per metric ton remains constant regardless of the total tons carried on any transit.

The St. Lawrence Seaway's secondary toll component, which is based on ship earning capacity, does not differentiate among vessel types or sizes. It is charged on the basis of the ship's gross registered tons.

Table 6-4 presents the current St. Lawrence Seaway toll schedule. Tolls were raised by 2 percent on March 26, 2002 and raised by 1.2 percent February 7, 2003.

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[17] Saint Lawrence Seaway Act, Public Law 35 (as amended through September 30, 1994), and Sec.12. (b) (§988).

Table 6-4. St. Lawrence Seaway Tolls, 2003 (US$)

Charge Type	Between Montreal and Lake Ontario	Between Lake Ontario and Lake Erie
Vessel Charge per Gross Registered Ton	0.0894	0.1453
Cargo charge per metric ton		
Bulk Cargo	0.9275	0.6145
General Cargo	2.2348	0.9834
Steel Slab	2.0225	0.7040
Containerized Cargo	0.9275	0.6145
Grain	0.5698	0.6145
Coal	0.5475	0.6145
Lock charge		
Per Passenger per Lock	1.3185	1.3185
Per Cargo Vessel per Welland Canal Transit		
Laden per Lock	n.a.	490.79
In Ballast per Lock	n.a.	362.62

Source: 2003 St. Lawrence Seaway Schedule of Tolls (2003/02/07).

In this section we identify a set of alternative Panama Canal marketing strategies to be analyzed followed by a description of the *Panama Canal Dry Bulk Toll Pricing Model* used in the analysis. We then present the interpretation of the results and the recommended Panama Canal marketing implementation strategy.

ALTERNATIVE PANAMA CANAL MARKETING STRATEGIES

The terms of reference for the study state that the marketing strategy shall pursue the following objectives:

- Maximize Canal's earnings
- Maximize the canal market share for the dry bulk segment, and
- Be non-discriminatory within the dry bulk segment

Based on our review of the Panama Canal Neutrality Treaty and of toll policies at comparable facilities, we believe there is ample scope to differentiate Panama Canal tolls by size of vessel and commodity. Accordingly, we identified alternative toll pricing options for analysis that had tolls varying by size of vessel, and by commodity[18]. Toll options were also analyzed with tolls assessed by PCUMS and by ton of cargo carried. From the initial set of toll pricing options reviewed, it was determined that no pricing benefit was obtained from the assessment of tolls by ton of cargo carried that was not already captured by one of the PCUMS-based pricing options. Hence, all pricing options for further analysis were conducted on PCUMS-based options or commodity-based options (using discounts applied to PCUMS-based rates) as shown in Table 6-5.

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[18] As this market segment only deals with dry bulk carriers, Panama Canal toll pricing options by type of vessel were not analyzed.

Table 6-5. Dry Bulk Market Segment: Panama Canal Toll Pricing Options Analyzed

PCUMS-Based Canal Toll Pricing Options			
	Canal toll per portion of PCUMS (laden transits)		
Canal tolll policy	1st 10,000	2nd 10,000	Remainder
A. ACP prior Oct 2002	2.57	2.57	2.57
B. ACP Oct 2002-June 2003	2.80	2.78	2.75
C. ACP July 2003	2.96	2.90	2.85
D. PCUMS Option 1 (25% increase)	3.70	3.63	3.56
E. PCUMS Option 2 (50% increase)	4.44	4.35	4.28
F. PCUMS Option 3 (75% increase)	5.18	5.08	4.99
G. PCUMS Option 4 (100% increase)	5.92	5.80	5.70
H. PCUMS Option 4 (125% increase)	6.66	6.53	6.41
I. PCUMS Option 5 (140% increase)	7.10	6.96	6.84
J. PCUMS Option 5 (150% increase)	7.40	7.25	7.13

Commodity based Canal Toll Pricing Options			
	Percent of full toll applied by commodity to PCUMS Option 3 (75% increase)		
Commodity Group	1	2	3
Grain	1.00	1.00	1.00
Phosphate	0.90	0.90	0.90
Cement	0.90	0.90	0.90
Thermal and Metallurgical Coal	1.00	1.00	1.00
Metallurgical Coke	0.90	0.95	1.00
Petroleum coke	1.00	1.00	1.00
Iron ore	1.00	1.00	1.00
Semi-finished & finished products of stee	1.00	1.00	1.00
Bauxite and Alumina	1.00	1.00	1.00
Primary aluminium	1.00	1.00	1.00
Copper concentrates	0.90	0.95	1.00
Other	1.00	1.00	1.00

Toll pricing options included ACP tolls in effect prior to October 2002, from October 2002 through June 2003 and ACP tolls to take effect in July 1, 2003. The ACP tolls as of July 1, 2003 were used as the basis for examining a series of toll increases at 25 percent intervals from 25 percent increase through a 150 percent increase.

For pricing reasons discussed in more detail later in this section, a toll pricing option at 140 percent increase was also analyzed. Four additional pricing options were analyzed in which discounts of 5 or 10 percent off of the increased tolls were assigned to specific commodities.

REVIEW OF ALTERNATIVE PANAMA CANAL MARKETING STRATEGIES

The Panama *Canal Dry Bulk Toll Pricing Model* was used to assess each of the 13 Canal toll pricing options shown in Table 6-5. In general the review process for each toll pricing option involves:

- determination of the total number of transits, cargo and toll revenue associated with the pricing option resulted
- identification of the traffic by route commodity and vessel size range that was diverted from the canal under the toll pricing option
- close examination of the route, commodity and vessel size ranges where the cost disadvantage of the Panama Canal was less than 35 cents per cargo ton.

The detailed review of the Canal toll pricing options revealed the following findings.

- Approximately 15 percent of the potential transits (with no tolls) would be diverted to alternative routes once any non-insignificant Canal tolls were imposed. These involved routes Oceania to North America East and North America Gulf, from Canada West to Brazil South and from North America Gulf to the Far East for vessels greater than 70,000 DWT.
- A sizable number of transits and cargo would be diverted at certain pricing points for particular commodity-route pairs.

- After certain levels of toll increases, Canal revenues decline as the loss of toll revenue due to diverted transits is not offset by toll increases for the remaining Panama Canal transits.

Table 6-6 through 6-8 present examples of summarized results of the 13 Canal toll pricing options for the Existing Canal and Expanded Canal, Most Probable Case for the years 2004, 2011, and 2025. The tables show the potential Canal transits and cargo (with no tolls) and the forecast of Canal transits and cargo for each Canal toll pricing option. The tables also present the forecast of Canal toll revenues.

These tables clearly show the potential for the Panama Canal to increase toll revenues. In 2004, estimated Canal toll revenues for dry bulk vessels in the dry bulk market segment under current toll rates total $109.3 million (Table 6-6). The Canal captured 87 percent of potential transits in this market segment and 87 percent of potential dry bulk cargo. However, the Canal toll revenues of $109.3 million only accounted for 34 percent of the estimated economic value of the Canal of $323 million.

If Canal toll levels in 2004 were increased by 50 percent, toll revenues in 2004 from this market segment would be $138.4 million, an increase of 27 percent. Even with tolls at this level, the Canal would still only capture 43 percent of the total economic value of the Canal[19].

The demand for Canal services is inelastic relative to tolls. That is, a given percentage increase in tolls would result in a smaller percentage decrease in Canal transits and would generate higher Canal toll revenues. A review of Table 6-6 provides an indication of the price inelasticity of demand. A 50 percent increase in tolls reduces the forecast of Canal bulk transits from 1,795 vessels to 1,569 vessels, or only 12.6 percent. A 100 percent increase in tolls reduces the forecast of Canal bulk transits to 1,165 vessels or 35.1 percent.

Annual results from 2000 through 2025 of the canal toll pricing options for the Most Probable case are presented in Appendix D. The tables show the potential Canal transits and cargo (with no tolls) and the forecast of Canal transits and cargo for each Canal toll pricing option. The tables also present the forecast of Canal revenues.

Using the combined objectives of maximizing Canal earnings and Canal market share, a preferred Canal toll pricing option was identified for each year and each Canal scenario. The preferred option through 2010 is Commodity Option 1 which corresponds to Panama Canal tolls increased by 75 percent from July 1, 2003 levels combined with 10 percent discounts for transits carrying phosphate, cement, metallurgical coke and copper concentrates. This pricing option allows the Canal to retain approximately 73 percent of total potential transits (with no tolls) and in fact has additional diversions of around 15 percent of the forecasted transits under July 1, 2003 tolls. Panama Canal revenues, however, increase by 36 percent under the preferred Canal toll pricing option.

From 2011 through 2024, the preferred Canal toll pricing option is Commodity Option 2 which corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement and a 5 percent discount for metallurgical coke and copper concentrates. For 2025, the preferred Canal toll pricing option is Commodity Option 3

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[19] For the Canal to capture 100 percent of the economic value of the Canal, it would have to have a toll pricing policy that charged each vessel transiting the full benefit of using the Canal over alternative routings. Such a policy is not administratively practical, nor consistent with the Panama Canal Neutrality Treaty.

corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement (discounts for metallurgical coke and copper concentrates are eliminated).

None of the other Canal pricing options analyzed yield more revenue than the preferred Canal toll pricing options. In general, Canal toll revenue declines once tolls exceed 75 percent of the July 1, 2003 rates.

Panama Canal transits would decline by another 4 percent of potential transits if Canal tolls are increased by 75 percent over the July 1, 2003 levels without providing the proposed commodity discounts. Toll revenues would decline by a similar percentage.

Table 6-6. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case, 2004

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% Increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054
Potential Panama Canal Cargo (ton 000s)	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655
Forecast Panama Canal Transits (no.)	1,807	1,797	1,795	1,733	1,569	1,421	1,165	1,060	962	924	1,498	1,475	1,461
Percent of Potential Transits	88.0%	87.5%	87.4%	84.4%	76.4%	69.2%	56.7%	51.6%	46.8%	45.0%	72.9%	71.8%	71.1%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	57,540	57,318	57,238	54,460	48,091	41,926	33,328	29,709	25,515	24,465	45,385	44,727	44,018
Percent of Potential Cargo	87.6%	87.3%	87.2%	82.9%	73.2%	63.9%	50.8%	45.2%	38.9%	37.3%	69.1%	68.1%	67.0%
Economic Value of Canal for Potential Transits ($000s)	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,876	4,294	4,452	10,279	26,557	44,570	75,135	89,828	108,137	113,214	34,608	36,738	38,885
Forecast Panama Canal Toll Revenues ($000S)	96,769	104,391	109,287	130,215	138,389	141,841	129,433	130,123	120,160	119,987	148,922	147,401	145,711
Average Toll Revenue per Forecasted Transit ($000)	54	58	61	75	88	100	111	123	125	130	99	100	100
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.71	4.90	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

☐ Alternative Canal toll pricing option

Table 6-7. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case, 2011

Canal Scenario and Item	Panama Canal Toll Pricing Option ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163
Potential Panama Canal Cargo (ton 000s)	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775
Forecast Panama Canal Transits (no.)	1,894	1,873	1,865	1,803	1,623	1,480	1,271	1,112	1,051	977	1,578	1,578	1,543
Percent of Potential Transits	87.6%	86.6%	86.2%	83.3%	75.0%	68.4%	58.8%	51.4%	48.6%	45.2%	72.9%	72.9%	71.3%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,433	61,818	61,602	58,681	51,624	45,481	38,249	32,458	30,687	27,414	50,016	50,016	48,670
Percent of Potential Cargo	87.0%	86.1%	85.8%	81.8%	71.9%	63.4%	53.3%	45.2%	42.8%	38.2%	69.7%	69.7%	67.8%
Economic Value of Canal for Potential Transits ($000s)	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,491	5,608	6,030	12,132	30,535	48,916	74,540	97,693	105,973	120,436	35,633	35,633	39,984
Forecast Panama Canal Toll Revenues ($000S)	105,115	112,667	117,659	140,436	148,593	153,828	148,460	142,299	143,251	134,436	163,852	164,558	160,771
Average Toll Revenue per Forecasted Transit ($000)	55	60	63	78	92	104	117	128	136	138	104	104	104
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.90	3.28	3.29	3.30
Expanded Canal													
Potential Panama Canal Transits (no.)	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147
Potential Panama Canal Cargo (ton 000s)	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297
Forecast Panama Canal Transits (no.)	1,884	1,859	1,839	1,783	1,618	1,471	1,244	1,093	1,019	955	1,547	1,547	1,524
Percent of Potential Transits	87.7%	86.6%	85.7%	83.0%	75.4%	68.5%	58.0%	50.9%	47.5%	44.5%	72.1%	72.1%	71.0%
Forecast Panama Canal Cargo (ton 000s)	69,577	68,774	67,795	64,728	57,698	48,814	39,094	32,959	30,495	27,391	52,603	52,588	51,790
Percent of Potential Cargo	87.7%	86.7%	85.5%	81.6%	72.8%	61.6%	49.3%	41.6%	38.5%	34.5%	66.3%	66.3%	65.3%
Economic Value of Canal for Potential Transits ($000s)	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,706	6,108	7,665	13,426	29,280	45,235	77,347	100,526	111,329	123,671	34,937	34,976	37,589
Forecast Panama Canal Toll Revenues ($000s)	110,124	117,731	121,713	145,929	156,034	157,125	145,406	138,705	136,808	129,956	164,101	164,749	162,711
Average Toll Revenue per Forecasted Transit ($000)	58	63	66	82	96	107	117	127	134	136	106	106	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.80	2.25	2.70	3.22	3.72	4.21	4.49	4.74	3.12	3.13	3.14

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table 6-8. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case, 2025

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251
Potential Panama Canal Cargo (ton 000s)	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699
Forecast Panama Canal Transits (no.)	1,915	1,905	1,905	1,840	1,708	1,546	1,331	1,144	1,089	1,043	1,592	1,592	1,592
Percent of Potential Transits	85.1%	84.6%	84.6%	81.7%	75.9%	68.7%	59.1%	50.8%	48.4%	46.3%	70.7%	70.7%	70.7%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	65,346	64,985	64,959	62,539	56,798	50,107	41,230	35,137	33,044	31,863	52,513	52,513	52,513
Percent of Potential Cargo	85.2%	84.7%	84.7%	81.5%	74.1%	65.3%	53.8%	45.8%	43.1%	41.5%	68.5%	68.5%	68.5%
Economic Value of Canal for Potential Transits ($000s)	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,329	6,986	7,031	12,354	26,959	46,681	77,732	103,155	112,307	118,128	39,612	39,612	39,612
Forecast Panama Canal Toll Revenues ($000S)	110,193	118,635	124,258	149,521	163,554	169,285	160,576	154,012	154,890	155,374	172,887	173,527	174,167
Average Toll Revenue per Forecasted Transit ($000)	58	62	65	81	96	110	121	135	142	149	109	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.89	4.38	4.69	4.88	3.29	3.30	3.32
Expanded Canal													
Potential Panama Canal Transits (no.)	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221
Potential Panama Canal Cargo (ton 000s)	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771
Forecast Panama Canal Transits (no.)	1,868	1,845	1,843	1,764	1,650	1,494	1,300	1,090	1,037	984	1,508	1,505	1,504
Percent of Potential Transits	84.1%	83.1%	83.0%	79.4%	74.3%	67.3%	58.6%	49.1%	46.7%	44.3%	67.9%	67.7%	67.7%
Forecast Panama Canal Cargo (ton 000s)	71,959	70,350	70,276	66,420	59,524	51,222	42,449	34,770	32,405	30,760	52,039	51,784	51,753
Percent of Potential Cargo	82.0%	80.2%	80.1%	75.7%	67.8%	58.4%	48.4%	39.6%	36.9%	35.0%	59.3%	59.0%	59.0%
Economic Value of Canal for Potential Transits ($000s)	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,256	8,161	8,284	15,151	28,959	45,774	74,654	104,803	114,377	121,960	43,545	44,232	44,313
Forecast Panama Canal Toll Revenues ($000s)	114,711	121,613	127,221	150,696	163,706	166,326	158,929	146,901	146,796	145,138	165,378	165,315	165,826
Average Toll Revenue per Forecasted Transit ($000)	61	66	69	85	99	111	122	135	142	148	110	110	110
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.73	1.81	2.27	2.75	3.25	3.74	4.22	4.53	4.72	3.18	3.19	3.20

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

☐ Alternative Canal toll pricing option

An interesting alternative to the preferred Canal pricing option is to look at Panama Canal tolls with only an increase of 25 percent increase over July 1, 2003 rates. This generates 13 percent to 15 percent less toll revenue but also results in significantly less diversions of potential cargo.
For all years and pricing options, the Existing Canal scenario is shown to generate more toll revenues than the Existing Canal for the dry bulk market segment. While these results initially seem counter-intuitive, there are three factors that together fully explain these findings.

First, the total potential Panama Canal dry bulk cargo under the Expanded Canal scenario of 79.3 million tons in 2011 (Table 6-7) is only slightly higher than the Existing Canal scenario of 71.8 million tons. Thus, the introduction of the Expanded Canal does not significantly impact the volume of dry bulk trade that could potentially use the Canal in 2011. By 2020, the Expanded Canal has potential traffic of 87.0 million tons compared to the Existing canal potential traffic of 75.4 million tons.[20]

Second, with the Expanded Canal, there is a trend toward using larger vessels and hence the number of dry bulk vessels needed is reduced. The Expanded Canal scenario is shown to have 2,173 potential transits in 2010 the same as for the Existing Canal even with the increased cargo traffic. As Canal tolls provide discounted rates for larger vessels, Canal toll revenues for the same annual volume of grain cargo will be less for the Expanded Canal versus the Existing Canal.

Third, the Expanded Canal is shown to have almost the same economic value as the Existing Canal. In 2010, the Expanded Canal has a total economic value of $355.1 million as compared to $353.4 million for the Existing Canal. The economic value of the Canal defined for study purposes is the transportation cost savings of the use of the Canal as compared to the least-cost alternative routing. Decisions on whether to use the Canal or an alternative route are made taking into account the shipping characteristics and corresponding costs of each routing. For the Existing Canal scenario, the decision is based on the shipping characteristics and costs associated with that scenario. These were described fully in *Volume 3: Vessel Transit and Fleet Analysis*. With the Expanded Canal scenario, again decisions to use the Canal are determined by the shipping characteristics and costs for the Canal and alternative routings associated with that scenario.

The reason that the economic value of the Canal is not higher for the Expanded Canal scenario is that the cost differentials between the Expanded Canal and its least-cost alternative routings are lower than those estimated for the Existing Canal. With the Expanded Canal, there will be a trend toward use of larger vessels and some originating and receiving ports will develop facilities to accommodate the larger vessels. However, the use of larger vessel will reduce the transport cost of both Canal and least-cost alternative routings. As the mileages for the least-cost alternative routings are greater than for Canal routes, the cost saving of using larger vessels is greater in absolute terms. Thus the Expanded Canal has a smaller transportation cost differential or economic value between the Canal and the least-cost alternative routing[21].

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[20] This is due to the capture of bypass trade by the Expanded Canal which in 2020 is assumed to be deepened to 50 feet.

[21] Please note that the treatment of economic used herein for the toll pricing analysis differs from that presented in *Volume: Economic Value of Panama Canal.* In Volume 4, the terms of reference called for a direct comparison of the economic value of the Existing Canal and Expanded Canal. Thus for that analysis, transportation costs of routes through the Existing and Expanded Canals were both compared to the transportation costs of the alternative routes under the Existing Canal scenario.

This finding directly impacts the results of the Canal toll pricing options for the Expanded Canal as more traffic is shown to be diverted from the Canal to alternative routings compared to the same toll level for the Existing Canal.

IDENTIFICATION OF PREFERRED PANAMA CANAL TOLL PRICING

The preferred Panama Canal toll pricing option was selected for the Existing and Expanded Canal scenarios separately by applying the following criteria:

- Maximization of Canal's earnings
- Maximization of the Canal market share for the grain bulk segment, and
- Non-discriminatory within the grain bulk segment
- Administrative simplicity (easy to measure and apply without cumbersome verification)
- Ease of understanding and transparency to shipping community
- Stability from one year to next with gradual variations

All of the tolls pricing options analyzed were considered to be non-discriminatory within the dry bulk segment. Precedents set at comparable facilities allow for differentiation of tolls by size of vessel and by commodity as long as they are applied to all such vessels on a consistent basis. First priority was given to maximization of toll revenues, closely followed by maximization of Canal market share. A preferred Canal toll pricing option was identified for each year and each Canal scenario (Table 6-9).

Table 6-9. Preferred and Alternative Canal Toll Pricing Options, 2000-2025

	Existing Canal		Expanded Canal	
Year	Preferred Toll Pricing Option	Alternative Toll Pricing Option	Preferred Toll Pricing Option	Alternative Toll Pricing Option
2000-2009	Commodity Option1 (75% increase with 10% discounts for phosphates, cement, met coke and copper concentrates)	PCUMS Option 1 (25% increase)	n.a.	n.a.
2010	Commodity Option1 (75% increase with 10% discounts for phosphates, cement, met coke and copper concentrates)	PCUMS Option 1 (25% increase)	Commodity Option1 (75% increase with 10% discounts for phosphates, cement, met coke and copper concentrates)	PCUMS Option 1 (25% increase)
2011–2024	Commodity Option 2 (75% increase with 10% discounts for phosphates, cement, and 5% discount for met coke and copper concentrates)	PCUMS Option 1 (25% increase)	Commodity Option 2 (75% increase with 10% discounts for phosphates, cement, and 5% discount for met coke and copper concentrates)	PCUMS Option 1 (25% increase)
2025	Commodity Option 3 (75% increase with 10% discounts for phosphates and cement)	PCUMS Option 1 (25% increase)	Commodity Option 3 (75% increase with 10% discounts for phosphates and cement)	PCUMS Option 1 (25% increase)

Source: Volume 5, Table 4-2 through Table 4-27.

Existing Canal

For the Existing Canal, the preferred option for 2000 through 2010 is Commodity Option 1 which corresponds to Panama Canal tolls increased by 75 percent from July 1, 2003 levels with 10 percent discounts for vessels carrying phosphates, cement, metallurgical coke and copper concentrates. These discounts allow the Canal to increase toll revenue by 8 percent as compared to a uniform 75 percent increase. This pricing option allows the Canal to retain approximately 72 percent of total potential transits as compared to 87 percent under current tolls. Panama Canal toll revenues, however, increase by 36 to 40 percent under Commodity Option 1 as compared to current tolls.

From 2011 through 2024, the preferred Canal toll pricing option is Commodity Option 2 which corresponds to Panama Canal tolls increased by 75 percent with 10 percent discounts for vessels carrying phosphates, cement, and a 5 percent discount for vessels carrying metallurgical coke and copper concentrates. Again toll revenues from the preferred pricing option are about 40 percent higher than those forecast under current toll levels.

For 2025, the preferred Canal toll pricing option is Commodity Option 3 corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement (discounts for metallurgical coke and copper concentrates are eliminated). None of the other Canal pricing options analyzed yield more revenue than the preferred Canal toll pricing options. In general, Canal toll revenue declines once tolls exceed levels 75 percent above the July 1, 2003 rates.

An interesting alternative to the preferred Canal pricing option is to look at Panama Canal tolls with only an increase of 25 percent increase over July 1, 2003 rates. This generates approximately 13 percent to 15 percent less toll revenue but also results in significantly less diversions of potential cargo.

Expanded Canal

The preferred Canal toll pricing options for the Expanded Canal are the same as those for the Existing Canal. From 2011 through 2024, the preferred Canal toll pricing option is Commodity Option 2 which corresponds to Panama Canal tolls increased by 75 percent with 10 percent discounts for vessels carrying phosphates, cement, and a 5 percent discount for vessels carrying metallurgical coke and copper concentrates. Again toll revenues from the preferred pricing option are about 40 percent higher than those forecast under current toll levels.

For 2025, the preferred Canal toll pricing option is Commodity Option 3 corresponds to a 75 percent increase in Canal tolls from the July 1, 2003 levels combined with a 10 percent discount for phosphate and cement (discounts for metallurgical coke and copper concentrates are eliminated).

FORECAST OF PANAMA CANAL TOLL REVENUES[22]

Tables 6-10 and 6-11 present Panama Canal transits, cargo and revenues under the preferred toll pricing option of a 75 percent increase combined with commodity discounts specified above for the Existing Canal and Expanded Canal scenarios.

For the Existing Canal, forecasted Canal transits remain in the range from 1,475 transits to 1643 transits throughout the forecast period. Forecasted Canal revenues range from $163 million in 2000 to $161 million in 2010 and $174 million by 2025.

Table 6-10. Panama Canal Transits, Cargo, and Revenue under Preferred Toll Option, Existing Canal, Most Probable Case, 2000–2025

	Forecast with Preferred Tolls			Forecast with Current Tolls		
Year	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)
2000	1,643	49,631	163,266	1,850	57,914	110,975
2001	1,534	46,075	151,591	1,796	56,442	108,008
2002	1,475	44,713	147,069	1,771	56,179	107,338
2003	1,487	44,988	147,735	1,774	56,425	107,752
2004	1,498	45,385	148,922	1,795	57,238	109,287
2005	1,547	47,081	154,540	1,859	59,491	113,674
2006	1,522	46,637	152,957	1,834	59,037	112,761
2007	1,526	47,009	154,216	1,839	59,507	113,662
2008	1,532	47,487	155,833	1,846	60,111	114,818
2009	1,540	48,171	158,115	1,854	60,861	116,261
2010	1,562	49,074	161,221	1,877	61,927	118,312
2011	1,578	50,016	164,558	1,865	61,602	117,659
2012	1,584	50,269	165,409	1,862	61,546	117,539
2013	1,600	51,011	167,832	1,861	61,596	117,623
2014	1,603	51,194	168,496	1,864	61,749	117,905
2015	1,629	52,054	171,605	1,884	62,387	119,180
2016	1,581	51,050	168,303	1,841	61,572	117,640
2017	1,575	51,034	168,290	1,839	61,773	118,033
2018	1,573	51,161	168,774	1,853	62,397	119,280
2019	1,574	51,348	169,475	1,862	62,904	120,286
2020	1,579	51,721	170,796	1,877	63,636	121,725
2021	1,580	51,721	170,803	1,881	63,771	121,969
2022	1,578	51,773	170,976	1,883	63,947	122,298
2023	1,586	52,135	172,251	1,892	64,292	122,985
2024	1,590	52,318	172,871	1,899	64,620	123,612
2025	1,592	52,513	174,167	1,905	64,959	124,258

Source: Volume 5, Table 4-2 through Table 4-27.

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[22] All of the analysis and results presented in this section pertain to Canal tolls for laden vessels. The Canal toll strategy and forecast of ballast toll revenues are presented in *Volume 6: Forecast of Panama Canal Transits, Cargo and Toll Revenue.*

Table 6-11. Panama Canal Transits, Cargo, and Revenue under Preferred Toll Option, Expanded Canal, Most Probable Case, 2010–2025

Year	Forecast with Preferred Tolls			Forecast with Current Canal Tolls		
	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)	Transits (no.)	Cargo (ton 000s)	Toll Revenue ('$000)
2010	1,570	51,805	162,466	1,858	63,933	116,621
2011	1,547	52,588	164,749	1,839	67,795	121,713
2012	1,551	52,756	165,380	1,835	67,804	121,696
2013	1,563	53,341	167,193	1,833	67,938	121,907
2014	1,563	53,401	167,520	1,835	68,198	122,344
2015	1,589	54,377	170,907	1,853	68,972	123,780
2016	1,539	53,281	167,366	1,805	67,766	121,657
2017	1,529	53,169	167,084	1,798	67,628	121,523
2018	1,524	53,197	167,281	1,806	67,953	122,297
2019	1,521	53,266	167,651	1,812	68,359	123,148
2020	1,510	51,610	163,707	1,822	68,800	124,137
2021	1,507	51,512	163,524	1,822	68,813	124,232
2022	1,502	51,439	163,471	1,820	68,867	124,437
2023	1,507	51,671	164,508	1,826	69,089	125,002
2024	1,506	51,716	164,872	1,829	69,296	125,508
2025	1,504	51,753	165,826	1,843	70,276	127,221

Source: Volume 5, Table 4-12 through Table 4-27.

FORECAST OF PANAMA CANAL TRANSITS, TOLL REVENUE AND CARGO

Tables 6-12 through 6-15 present the forecast of Panama Canal, toll revenue, cargo, PCUMS and transits by vessel DWT size range for the Existing and Expanded Canal under the preferred Panama Canal toll option. For the Most Probable Case, transits with the Existing Canal scenario are forecast to remain within a range of 1,549 transits in 2005 to 1,629 transits by 2015 and to decline slightly to 1,592 transits in 2025 (Table 6-11). For the Best Case, transit will increase steadily from 1,663 transits in 2005 to 2,200 transit in 2025; while for the Worst Case, transits will decrease from 1,512 transits in 2005 to 1,301 transits in 2025. There are slightly fewer transits with the Expanded Canal scenario than the Existing Canal scenario in each period and global macroeconomic and trade case.

Panama Canal toll revenue is forecast to increase from $158.7 million in 2005 to $176.5 million for the Existing Canal, Most Probable Case (Table 6-12). Due to fewer transits associated with the use of larger vessels, toll revenue increases slightly less under the Expanded Canal scenario d to $166.3 million in 2025.

For the Most Probable Case, dry bulk cargo carried on dry bulk vessels is forecast to increase from 47.2 million tons in 2005 to 52.5 million tons in 2025 for the Existing Canal scenario (Table 6-13). For the Best Case, dry bulk cargo is forecast to increase from 51.0 million tons in 2005 to 76.6 million tons in 2025. For the Worst Case, dry bulk cargo is forecast to decline slightly from 46.0 million tons in 2005 to 42.0 million tons in 2025.

Total PCUMS of dry bulk vessel transits are shown in Table 6-14. These track closely the forecast of transits by Canal scenario and global macroeconomic and trade case. In 2005, total PCUMS of dry bulk transits is forecast at 31.1 million PCUMS, increasing to 34.6 million PCUMS by 2025.

PANAMA CANAL MARKETING IMPLEMENTATION STRATEGY

In this section we discuss issues and strategies for the introduction and implementation of the preferred toll option. It should be noted that the preferred Canal toll pricing option discussed above is "preferred" from the perspective of the study's terms of reference and the specified Canal toll pricing objectives. The timing and phasing of the revised toll levels must be carefully planned taking into consideration the perception of canal users, trends in Canal traffic and markets, and pricing developments of alternatives to use of the Canal. Another consideration is the matching of increased tolls with improved Canal service and the expansion of canal capacity.

Clearly, an increase in tolls to the preferred option of 75 percent above the July 1, 2003, rates would need to be implemented over an extended time-frame and in conjunction with service improvements. For example, tolls could be raised and the increased revenue set-aside in a capital improvement fund in conjunction with the announcement of a decision to proceed with the construction of the Expanded Canal. Toll increases associated with the expansion of the Canal could be justified to Canal users' as a way of sustaining the long-term viability of the Canal and the avoidance of costly delays to users due capacity constraints.

If the Existing Canal were to become close to reaching full capacity, toll increases could be implemented as a way of reducing demand, and reducing Canal waiting to acceptable levels.

The ACP has embraced service to its clients as a core element of its operating goals. The implementation of significant increases in Canal toll rates will require regular communication and interaction with its principal clients. Indeed, visits to major clients by ACP senior officials and marketing personnel can provide insights as to the appropriate timing and phasing of toll increases and to service improvements or new pricing elements that would be desirable. The cost of such marketing trips would likely require an additional $200,000 to the ACP marketing budget. A significant toll increase will also require a public relations campaign targeted to the shipping industry and general business community. This would involve the retention of an experienced public relations firm and the preparation and placement of a variety of advertising and informational materials. The cost of such a campaign could approach $1 million over a two-year campaign.

The Delphi Panelists embraced the potential for introducing new pricing elements—such as variable tolls for peak and non-peak periods of Canal use, fees for preferential and/or reserved transit times, discount for the use of larger vessels, and discounts for large scale users or contract rates that might be negotiated. However, due to the general price inelasticity of demand for Canal services, there does not appear to be much advantage to the canal for introducing such pricing elements such as discounts that would reduce its revenues. There may be greater interest though, in further development of the preferential transit slots with increased fees.

Table 6-12. Laden Toll Revenue by Year and DWT Range, Existing and Expanded All Scenarios,Selected Years, 2000-2025 ($000s)

Scenario and	Existing Canal						Expanded Canal			
DWT Range	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
Most Probable Case										
0 TO 10K	2,300	2,066	2,187	2,326	2,424	2,551	2,187	2,327	2,427	2,555
10 TO 15K	1,091	1,127	1,005	982	594	457	1,005	985	594	456
15 TO 20K	2,955	2,404	1,294	1,368	935	817	1,294	1,366	933	814
20 TO 25K	7,036	6,350	6,631	6,720	6,921	6,752	6,631	6,732	6,938	6,768
25 TO 30K	24,138	23,951	23,598	23,442	22,537	21,722	23,599	23,643	22,781	21,987
30 TO 40K	26,948	21,838	16,076	14,788	5,744	5,343	16,076	14,858	5,732	5,328
40 TO 50K	45,883	47,010	55,715	60,267	66,559	70,556	55,715	60,997	67,547	71,698
50 TO 60K	5,051	5,012	5,377	5,632	5,748	5,830	5,377	5,725	5,856	5,946
60 TO 70K	28,830	26,234	28,407	31,018	31,983	32,074	28,407	6,089	3,467	1,678
70 TO 80K	18,764	17,924	21,064	24,463	26,769	27,598	22,308	34,360	33,083	25,683
80 TO 90K	124	150	195	217	242	248	195	4,989	10,375	18,644
90 TO 100K	-	-	-	-	-	-	-	1,098	1,672	2,145
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	-	2,139	1,971	1,909
150 TO 170K	-	-	-	-	-	-	-	2,249	-	-
170 TO 200K	-	-	-	-	-	-	-	2,974	-	-
Total	163,121	154,066	161,549	171,222	170,458	173,947	162,795	170,532	163,376	165,610
Best Case										
0 TO 10K	2,300	2,146	2,404	2,766	3,200	3,789	2,403	2,766	3,201	3,791
10 TO 15K	1,091	1,161	839	875	701	685	838	873	699	683
15 TO 20K	2,955	2,310	1,455	1,697	1,245	1,254	1,452	1,691	1,238	1,245
20 TO 25K	7,036	7,087	7,642	7,439	6,464	5,826	7,653	7,449	6,473	5,831
25 TO 30K	24,138	26,053	25,686	23,825	18,673	14,864	25,829	23,976	18,809	14,964
30 TO 40K	26,948	21,866	7,433	9,339	8,254	8,769	7,432	9,327	8,236	8,742
40 TO 50K	45,883	52,005	74,064	86,563	100,084	118,843	74,789	87,544	101,423	120,596
50 TO 60K	5,051	5,048	5,142	5,151	4,780	4,461	5,169	5,174	4,779	4,426
60 TO 70K	28,830	28,922	34,114	40,321	44,790	49,419	11,753	8,161	5,029	2,693
70 TO 80K	18,764	20,152	26,501	33,589	39,824	45,604	39,831	46,055	47,987	41,211
80 TO 90K	124	196	294	374	469	551	1,975	6,856	15,458	30,843
90 TO 100K	-	-	-	-	-	-	915	1,544	2,490	3,549
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	2,606	2,724	2,665	2,725
150 TO 170K	-	-	-	-	-	-	2,741	2,865	-	-
170 TO 200K	-	-	-	-	-	-	3,624	3,788	-	-
Total	163,121	166,946	185,575	211,939	228,484	254,067	189,011	210,794	218,486	241,300
Worst Case										
0 TO 10K	2,300	1,967	1,937	1,931	1,792	1,680	1,936	1,930	1,791	1,680
10 TO 15K	1,091	1,104	991	963	742	687	994	967	746	693
15 TO 20K	2,955	2,763	2,140	2,335	1,527	1,727	2,144	2,297	1,491	1,671
20 TO 25K	7,036	6,278	6,221	5,959	5,337	4,907	6,231	5,968	5,344	4,912
25 TO 30K	24,138	23,093	21,337	20,249	18,154	17,092	21,460	20,378	18,292	17,226
30 TO 40K	26,948	22,077	18,347	19,016	15,417	14,666	18,445	19,142	15,535	14,794
40 TO 50K	45,883	44,757	47,933	48,396	47,715	46,678	48,338	48,883	48,303	47,269
50 TO 60K	5,051	5,061	5,383	5,622	5,710	5,757	5,451	5,716	5,828	5,890
60 TO 70K	28,830	25,602	26,010	26,845	26,206	24,766	8,639	5,191	2,789	1,272
70 TO 80K	18,764	17,129	18,694	20,373	20,956	20,327	28,766	29,293	26,612	19,465
80 TO 90K	124	160	186	191	199	189	1,381	4,226	8,272	13,950
90 TO 100K	-	-	-	-	-	-	644	928	1,333	1,605
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	1,844	1,724	1,527	1,424
150 TO 170K	-	-	-	-	-	-	1,940	1,813	-	-
170 TO 200K	-	-	-	-	-	-	2,564	2,397	-	-
Total	163,121	149,992	149,179	151,879	143,754	138,476	150,774	150,854	137,862	131,851

Source: Richardson Lawrie Associates

Table 6-13 Laden Cargo by Year and DWT Range, Existing and Expanded. All Scenarios,Selected Years, 2000-2025 (000 long tons)

Scenario and DWT Range	Existing Canal						Expanded Canal			
	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
Most Probable Case										
0 TO 10K	338	303	320	340	354	372	320	340	355	373
10 TO 15K	284	294	262	255	153	117	262	256	153	117
15 TO 20K	874	717	387	408	281	245	387	407	280	244
20 TO 25K	1,827	1,659	1,715	1,729	1,767	1,705	1,715	1,732	1,771	1,709
25 TO 30K	7,204	7,207	6,994	6,916	6,600	6,288	6,995	6,974	6,670	6,362
30 TO 40K	8,172	6,646	4,868	4,507	1,812	1,685	4,868	4,528	1,808	1,680
40 TO 50K	13,572	13,991	16,448	17,737	19,498	20,560	16,448	17,940	19,773	20,875
50 TO 60K	1,633	1,632	1,746	1,825	1,862	1,886	1,746	1,853	1,895	1,921
60 TO 70K	9,568	8,737	9,422	10,291	10,594	10,604	10,568	2,255	1,282	619
70 TO 80K	6,123	5,850	6,853	7,982	8,728	8,977	8,428	13,058	12,557	9,726
80 TO 90K	36	44	57	64	71	73	68	1,760	3,659	6,574
90 TO 100K	-	-	-	-	-	-	-	387	592	760
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	-	733	709	687
150 TO 170K	-	-	-	-	-	-	-	741	-	-
170 TO 200K	-	-	-	-	-	-	-	975	-	-
Total	49,631	47,081	49,074	52,054	51,721	52,513	51,805	53,939	51,504	51,647
Best Case										
0 TO 10K	338	314	352	404	467	553	352	404	468	553
10 TO 15K	284	302	219	227	180	176	219	226	180	175
15 TO 20K	874	688	434	505	373	375	433	503	371	372
20 TO 25K	1,827	1,848	1,971	1,909	1,649	1,468	1,974	1,911	1,651	1,469
25 TO 30K	7,204	7,835	7,605	7,035	5,492	4,340	7,647	7,078	5,530	4,367
30 TO 40K	8,172	6,662	2,336	2,935	2,597	2,756	2,336	2,931	2,591	2,747
40 TO 50K	13,572	15,427	21,679	25,223	29,031	34,225	21,886	25,500	29,408	34,715
50 TO 60K	1,633	1,644	1,675	1,679	1,565	1,468	1,683	1,685	1,564	1,456
60 TO 70K	9,568	9,600	11,258	13,310	14,754	16,237	4,332	3,013	1,854	990
70 TO 80K	6,123	6,566	8,600	10,935	12,954	14,799	15,142	17,449	18,154	15,551
80 TO 90K	36	58	86	110	138	162	693	2,415	5,445	10,858
90 TO 100K	-	-	-	-	-	-	323	544	881	1,255
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	893	933	959	980
150 TO 170K	-	-	-	-	-	-	903	944	-	-
170 TO 200K	-	-	-	-	-	-	1,188	1,242	-	-
Total	49,631	50,945	56,217	64,270	69,201	76,558	60,003	66,779	69,055	75,490
Worst Case										
0 TO 10K	338	288	284	282	262	245	283	282	262	245
10 TO 15K	284	288	259	250	192	178	259	251	194	180
15 TO 20K	874	824	633	688	449	502	634	676	439	486
20 TO 25K	1,827	1,645	1,617	1,544	1,376	1,252	1,620	1,546	1,377	1,253
25 TO 30K	7,204	6,965	6,350	6,008	5,346	4,987	6,385	6,045	5,384	5,024
30 TO 40K	8,172	6,717	5,526	5,741	4,637	4,368	5,555	5,778	4,672	4,406
40 TO 50K	13,572	13,337	14,211	14,336	14,114	13,779	14,323	14,469	14,275	13,938
50 TO 60K	1,633	1,646	1,745	1,817	1,844	1,854	1,765	1,846	1,879	1,894
60 TO 70K	9,568	8,524	8,635	8,913	8,689	8,202	3,198	1,923	1,032	470
70 TO 80K	6,123	5,591	6,087	6,649	6,835	6,615	10,964	11,138	10,107	7,378
80 TO 90K	36	47	55	56	59	56	485	1,490	2,917	4,920
90 TO 100K	-	-	-	-	-	-	227	327	472	569
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	632	591	549	512
150 TO 170K	-	-	-	-	-	-	639	598	-	-
170 TO 200K	-	-	-	-	-	-	841	786	-	-
Total	49,631	45,872	45,401	46,284	43,802	42,038	47,810	47,746	43,560	41,276

Source: Richardson Lawrie Associates

Table 6-14. Laden PCUMS by Year and DWT Range, Existing and Expanded. All Scenarios,Selected Years, 2000-2025 (000 PCUMS)

Scenario and	Existing Canal						Expanded Canal			
DWT Range	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
Most Probable Case										
0 TO 10K	266	239	253	269	280	294	253	269	280	294
10 TO 15K	210	218	195	189	114	88	195	190	114	88
15 TO 20K	585	479	255	269	185	162	255	269	185	161
20 TO 25K	1,389	1,261	1,307	1,323	1,359	1,313	1,307	1,325	1,362	1,317
25 TO 30K	4,835	4,828	4,711	4,660	4,479	4,271	4,712	4,700	4,528	4,323
30 TO 40K	5,589	4,532	3,302	3,038	1,178	1,096	3,302	3,052	1,176	1,092
40 TO 50K	9,090	9,354	11,019	11,882	13,105	13,815	11,019	12,024	13,297	14,035
50 TO 60K	1,068	1,065	1,139	1,189	1,212	1,227	1,139	1,208	1,235	1,250
60 TO 70K	5,936	5,403	5,827	6,371	6,561	6,562	6,020	1,289	733	354
70 TO 80K	3,960	3,781	4,430	5,160	5,644	5,803	4,810	7,415	7,133	5,523
80 TO 90K	23	28	37	41	46	47	39	992	2,062	3,702
90 TO 100K	-	-	-	-	-	-	-	218	331	425
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	-	424	391	378
150 TO 170K	-	-	-	-	-	-	-	449	-	-
170 TO 200K	-	-	-	-	-	-	-	592	-	-
Total	32,951	31,189	32,474	34,391	34,163	34,677	33,050	34,416	32,826	32,943
Best Case										
0 TO 10K	266	248	278	319	369	437	278	319	369	437
10 TO 15K	210	225	164	170	135	132	164	169	135	131
15 TO 20K	585	458	286	333	246	247	286	332	244	246
20 TO 25K	1,389	1,405	1,506	1,464	1,271	1,135	1,508	1,466	1,272	1,136
25 TO 30K	4,835	5,244	5,123	4,732	3,710	2,923	5,152	4,762	3,737	2,943
30 TO 40K	5,589	4,527	1,519	1,909	1,689	1,792	1,519	1,906	1,685	1,787
40 TO 50K	9,090	10,335	14,608	17,009	19,635	23,174	14,749	17,200	19,895	23,513
50 TO 60K	1,068	1,072	1,090	1,089	1,011	944	1,095	1,094	1,011	936
60 TO 70K	5,936	5,948	6,983	8,269	9,174	10,095	2,478	1,725	1,062	567
70 TO 80K	3,960	4,247	5,565	7,079	8,389	9,584	8,613	9,926	10,331	8,850
80 TO 90K	23	37	55	71	88	104	393	1,363	3,072	6,125
90 TO 100K	-	-	-	-	-	-	182	306	493	703
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	516	540	528	540
150 TO 170K	-	-	-	-	-	-	548	572	-	-
170 TO 200K	-	-	-	-	-	-	721	754	-	-
Total	32,951	33,746	37,178	42,445	45,716	50,567	38,201	42,434	43,835	47,914
Worst Case										
0 TO 10K	266	228	224	223	207	194	224	223	207	194
10 TO 15K	210	214	192	185	142	131	192	186	143	132
15 TO 20K	585	551	423	460	301	338	424	453	294	327
20 TO 25K	1,389	1,246	1,227	1,174	1,051	957	1,229	1,176	1,052	958
25 TO 30K	4,835	4,643	4,256	4,022	3,609	3,369	4,281	4,048	3,636	3,395
30 TO 40K	5,589	4,577	3,771	3,917	3,175	2,998	3,791	3,944	3,200	3,024
40 TO 50K	9,090	8,903	9,490	9,560	9,428	9,187	9,569	9,654	9,541	9,300
50 TO 60K	1,068	1,075	1,138	1,185	1,203	1,209	1,152	1,205	1,227	1,236
60 TO 70K	5,936	5,272	5,338	5,514	5,376	5,068	1,826	1,099	590	268
70 TO 80K	3,960	3,614	3,933	4,296	4,416	4,272	6,225	6,321	5,737	4,186
80 TO 90K	23	30	35	36	38	36	274	840	1,643	2,770
90 TO 100K	-	-	-	-	-	-	128	184	264	318
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	365	342	303	282
150 TO 170K	-	-	-	-	-	-	388	362	-	-
170 TO 200K	-	-	-	-	-	-	510	477	-	-
Total	32,951	30,351	30,028	30,573	28,945	27,757	30,579	30,512	27,837	26,390

Source: Richardson Lawrie Associates

Table 6-15. Laden Transits by Year and DWT Range, Existing and Expanded All Scenarios,Selected Years, 2000-2025 (Transits)

Scenario and	Existing Canal						Expanded Canal			
DWT Range	2000	2005	2010	2015	2020	2025	2010	2015	2020	2025
Most Probable Case										
0 TO 10K	101	91	96	102	106	111	96	102	106	112
10 TO 15K	29	30	27	26	16	12	27	26	16	12
15 TO 20K	60	49	26	28	19	17	26	28	19	17
20 TO 25K	101	92	95	96	99	96	95	96	99	96
25 TO 30K	334	334	326	322	310	295	326	325	313	299
30 TO 40K	293	238	173	160	62	58	173	160	62	57
40 TO 50K	383	394	464	501	552	582	464	507	560	592
50 TO 60K	37	36	39	41	41	42	39	41	42	43
60 TO 70K	187	171	184	201	207	207	184	39	22	11
70 TO 80K	116	111	130	152	166	171	139	214	206	159
80 TO 90K	1	1	1	1	1	1	1	25	51	92
90 TO 100K	-	-	-	-	-	-	-	5	8	10
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	-	6	6	6
150 TO 170K	-	-	-	-	-	-	-	6	-	-
170 TO 200K	-	-	-	-	-	-	-	8	-	-
Total	1,643	1,547	1,562	1,629	1,579	1,592	1,570	1,589	1,510	1,504
Best Case										
0 TO 10K	101	94	105	121	140	165	105	121	140	166
10 TO 15K	29	31	23	23	19	18	22	23	18	18
15 TO 20K	60	47	29	34	25	25	29	34	25	25
20 TO 25K	101	102	110	107	93	83	110	107	93	83
25 TO 30K	334	363	354	327	257	202	356	329	259	204
30 TO 40K	293	238	80	100	89	94	80	100	88	94
40 TO 50K	383	436	616	717	828	977	622	725	839	991
50 TO 60K	37	37	37	37	35	32	37	37	35	32
60 TO 70K	187	188	220	261	290	319	76	53	32	17
70 TO 80K	116	125	164	208	247	282	248	286	298	255
80 TO 90K	1	1	1	2	2	3	10	34	76	151
90 TO 100K	-	-	-	-	-	-	4	7	12	16
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	8	8	8	8
150 TO 170K	-	-	-	-	-	-	8	8	-	-
170 TO 200K	-	-	-	-	-	-	9	10	-	-
Total	1,643	1,661	1,740	1,938	2,022	2,200	1,725	1,883	1,922	2,061
Worst Case										
0 TO 10K	101	86	85	85	78	73	85	84	78	73
10 TO 15K	29	29	26	25	19	18	26	26	20	18
15 TO 20K	60	57	44	47	31	35	44	47	30	34
20 TO 25K	101	91	89	85	77	70	89	86	77	70
25 TO 30K	334	321	294	278	250	233	296	280	252	235
30 TO 40K	293	240	198	206	167	157	199	207	168	159
40 TO 50K	383	375	400	403	397	387	403	407	402	392
50 TO 60K	37	37	39	41	41	41	39	41	42	42
60 TO 70K	187	166	168	174	170	160	56	34	18	8
70 TO 80K	116	106	116	126	130	126	179	182	165	121
80 TO 90K	1	1	1	1	1	1	7	21	41	68
90 TO 100K	-	-	-	-	-	-	3	4	6	7
100 TO 110K	-	-	-	-	-	-	-	-	-	-
110 TO 120K	-	-	-	-	-	-	-	-	-	-
120 TO 150K	-	-	-	-	-	-	6	5	5	4
150 TO 170K	-	-	-	-	-	-	5	5	-	-
170 TO 200K	-	-	-	-	-	-	7	6	-	-
Total	1,643	1,510	1,461	1,472	1,361	1,301	1,445	1,435	1,303	1,232

Source: Richardson Lawrie Associates

Appendix A

FORECAST OF POTENTIAL CANAL TRADE BY COMMODITY AND ROUTE

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
North America East	North America West	Petroleum Coke	26	26	27	28	29	30	30	31	31	31	32	32	32	33	33	33
North America East	North America West	Misc. Metals	3	3	3	3	3	3	3	3	4	4	4	4	4	5	5	5
North America East	North America West	Lumber	270	273	275	278	281	284	289	295	301	307	313	319	326	333	340	347
North America East	North America West	Pulp	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	8
North America East	**North America West**	**All Products**	**304**	**308**	**312**	**315**	**319**	**324**	**330**	**336**	**343**	**349**	**356**	**363**	**371**	**378**	**386**	**394**
North America East	Central America West	Thermal and Metallurgical Coal	35	31	28	25	22	20	17	14	12	10	8	7	5	4	4	3
North America East	Central America West	Petroleum Coke	104	108	111	115	119	123	124	125	127	128	129	130	131	133	134	135
North America East	Central America West	Semi-finished & finished products of steel	356	220	136	84	52	32	32	32	32	32	32	32	32	32	32	32
North America East	Central America West	Steel scrap	201	241	290	348	418	502	501	499	498	496	495	501	507	513	520	526
North America East	Central America West	Misc. Fertilisers	59	60	61	62	63	65	64	65	67	69	74	75	75	76	78	80
North America East	Central America West	Misc. Ores	75	67	60	54	48	43	36	30	25	21	17	14	12	10	8	6
North America East	Central America West	Lumber	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
North America East	**Central America West**	**All Products**	**831**	**728**	**686**	**688**	**723**	**785**	**774**	**766**	**760**	**756**	**756**	**759**	**764**	**769**	**776**	**784**
North America East	South America West	Cement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North America East	South America West	Semi-finished & finished products of steel	12	12	12	13	13	13	13	14	14	14	15	15	15	15	16	16
North America East	South America West	Misc. Fertilisers	101	103	104	106	108	110	109	111	114	118	126	127	129	130	133	137
North America East	South America West	Misc. Ores	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4
North America East	South America West	Lumber	6	6	6	6	6	6	6	7	7	7	7	7	8	8	8	9
North America East	South America West	Pulp	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
North America East	South America West	Paper	216	221	226	231	237	242	249	257	265	273	281	289	297	305	314	322
North America East	**South America West**	**All Products**	**340**	**346**	**353**	**360**	**368**	**376**	**383**	**393**	**404**	**417**	**433**	**443**	**453**	**464**	**475**	**489**
North America East	Oceania	Petroleum Coke	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
North America East	Oceania	Semi-finished & finished products of steel	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
North America East	Oceania	Pulp	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
North America East	Oceania	Paper	16	16	16	17	17	17	17	18	18	18	19	19	19	20	20	20
North America East	**Oceania**	**All Products**	**24**	**24**	**24**	**24**	**24**	**25**	**25**	**25**	**26**	**26**	**26**	**27**	**27**	**27**	**28**	**28**
North America East	Far East	Ammonium Phosphate (for Phosphates)	985	1,021	1,059	1,098	1,138	1,180	1,195	1,211	1,227	1,243	1,259	1,257	1,255	1,254	1,252	1,250
North America East	Far East	Petroleum Coke	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
North America East	Far East	Semi-finished & finished products of steel	2,871	2,927	2,985	3,043	3,103	3,164	3,014	2,871	2,735	2,605	2,482	2,255	2,050	1,862	1,692	1,538
North America East	Far East	Steel scrap	421	453	487	524	564	607	607	607	607	607	607	645	686	730	776	825
North America East	Far East	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
North America East	Far East	Misc. Ores	5	5	5	5	5	6	6	6	6	6	6	6	6	6	7	7
North America East	Far East	Lumber	1,110	1,129	1,149	1,169	1,190	1,210	1,249	1,288	1,329	1,372	1,415	1,455	1,496	1,538	1,581	1,625
North America East	Far East	Pulp	495	485	476	467	458	449	443	437	431	425	419	413	408	403	397	392
North America East	Far East	Paper	109	112	116	119	122	126	131	136	142	147	153	159	165	172	178	185
North America East	**Far East**	**All Products**	**5,999**	**6,136**	**6,279**	**6,428**	**6,584**	**6,746**	**6,648**	**6,560**	**6,480**	**6,409**	**6,346**	**6,196**	**6,071**	**5,968**	**5,887**	**5,826**
North America Gulf	North America West	Misc. Fertilisers	37	38	38	39	40	40	40	41	42	43	46	47	47	48	49	50
North America Gulf	**North America West**	**All Products**	**37**	**38**	**38**	**39**	**40**	**40**	**40**	**41**	**42**	**43**	**46**	**47**	**47**	**48**	**49**	**50**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
North America Gulf	Central America West	Ammonium Phosphate (for Phosphates)	98	106	116	126	138	150	150	150	150	150	150	150	150	150	150	150
North America Gulf	Central America West	Thermal and Metallurgical Coal	12	10	8	7	6	5	5	4	4	3	3	2	2	2	1	1
North America Gulf	Central America West	Metallurgical Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North America Gulf	Central America West	Semi-finished & finished products of steel	474	138	40	12	3	1	0	0	0	0	-	0	0	0	0	-
North America Gulf	Central America West	Misc. Fertilisers	284	310	337	368	401	437	437	437	437	437	437	437	437	437	437	437
North America Gulf	**Central America West**	**All Products**	**868**	**565**	**502**	**513**	**548**	**593**	**591**	**591**	**591**	**590**	**590**	**589**	**589**	**588**	**588**	**588**
North America Gulf	South America West	Ammonium Phosphate (for Phosphates)	355	364	372	381	391	400	410	419	429	440	450	428	407	387	368	350
North America Gulf	South America West	Semi-finished & finished products of steel	12	12	12	13	13	13	13	14	14	14	15	15	15	15	16	16
North America Gulf	South America West	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
North America Gulf	South America West	Misc. Metals	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North America Gulf	South America West	Misc. Ores	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2
North America Gulf	South America West	Lumber	10	10	11	11	11	11	12	12	12	13	13	14	14	15	15	16
North America Gulf	South America West	Paper	71	73	74	76	78	79	82	84	87	90	92	95	97	100	103	106
North America Gulf	**South America West**	**All Products**	**450**	**460**	**471**	**482**	**494**	**506**	**518**	**531**	**544**	**558**	**572**	**553**	**536**	**519**	**504**	**490**
North America Gulf	Oceania	Ammonium Phosphate (for Phosphates)	1,162	1,139	1,116	1,093	1,072	1,050	1,060	1,070	1,080	1,090	1,100	1,100	1,100	1,100	1,100	1,100
North America Gulf	Oceania	Petroleum Coke	124	129	133	138	144	149	155	161	167	174	181	185	189	193	197	201
North America Gulf	Oceania	Semi-finished & finished products of steel	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
North America Gulf	Oceania	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
North America Gulf	**Oceania**	**All Products**	**1,290**	**1,271**	**1,253**	**1,236**	**1,219**	**1,203**	**1,219**	**1,235**	**1,251**	**1,268**	**1,285**	**1,289**	**1,293**	**1,297**	**1,301**	**1,305**
North America Gulf	Far East	Ammonium Phosphate (for Phosphates)	3,461	3,541	3,623	3,707	3,792	3,880	3,942	4,005	4,069	4,134	4,200	4,200	4,200	4,200	4,200	4,200
North America Gulf	Far East	Metallurgical Coke	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
North America Gulf	Far East	Petroleum Coke	140	145	150	156	161	167	168	170	171	173	174	176	178	180	182	184
North America Gulf	Far East	Semi-finished & finished products of steel	358	403	453	510	574	646	644	642	640	638	636	632	628	625	621	617
North America Gulf	Far East	Bauxite and Alumina	27	28	29	30	32	33	35	36	38	40	42	43	44	45	46	47
North America Gulf	Far East	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
North America Gulf	Far East	Misc. Ores	29	31	32	33	34	36	38	40	41	44	46	47	48	49	50	51
North America Gulf	Far East	Lumber	2,771	2,820	2,869	2,919	2,970	3,022	3,118	3,217	3,319	3,424	3,533	3,632	3,734	3,839	3,947	4,058
North America Gulf	Far East	Pulp	443	435	427	419	411	403	397	392	386	381	376	371	366	361	356	352
North America Gulf	Far East	Paper	43	44	45	47	48	49	51	54	56	58	60	62	65	67	70	73
North America Gulf	**Far East**	**All Products**	**7,289**	**7,462**	**7,645**	**7,837**	**8,039**	**8,253**	**8,410**	**8,571**	**8,737**	**8,907**	**9,083**	**9,179**	**9,279**	**9,382**	**9,488**	**9,597**
North America Gulf	South East Asia	Misc. Fertilisers	226	229	233	236	241	246	243	248	255	264	281	284	287	291	296	306
North America Gulf	**South East Asia**	**All Products**	**226**	**229**	**233**	**236**	**241**	**246**	**243**	**248**	**255**	**264**	**281**	**284**	**287**	**291**	**296**	**306**
Central America East	North America West	Sugar	39	33	28	24	20	17	17	17	17	18	18	18	19	20	21	22
Central America East	**North America West**	**All Products**	**39**	**33**	**28**	**24**	**20**	**17**	**17**	**17**	**17**	**18**	**18**	**18**	**19**	**20**	**21**	**22**
Central America East	South America West	Ammonium Phosphate (for Phosphates)	177	175	173	171	169	167	162	158	153	149	145	125	108	94	81	70
Central America East	South America West	Semi-finished & finished products of steel	10	10	10	11	11	11	11	11	12	12	12	12	13	13	13	13

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Central America East	South America West	Misc. Fertilisers	78	77	76	76	75	74	72	70	68	66	64	55	48	41	36	31
Central America East	South America West	Misc. Ores	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	9
Central America East	**South America West**	**All Products**	**272**	**269**	**266**	**264**	**261**	**260**	**253**	**247**	**241**	**235**	**230**	**202**	**178**	**157**	**139**	**123**
Central America East	Far East	Semi-finished & finished products of steel	94	154	254	417	686	1,127	959	816	695	591	503	491	479	467	455	444
Central America East	Far East	Zinc Concentrates	93	99	105	112	119	126	0	0	0	0	-	0	0	0	0	-
Central America East	Far East	Misc. Metals	10	10	10	10	10	11	11	12	12	13	14	15	16	16	17	18
Central America East	Far East	Misc. Ores	98	104	111	118	125	133	0	0	0	0	-	0	0	0	0	-
Central America East	Far East	Pulp	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7
Central America East	**Far East**	**All Products**	**301**	**373**	**485**	**663**	**946**	**1,403**	**976**	**834**	**714**	**611**	**524**	**513**	**501**	**490**	**479**	**469**
Central America East	South East Asia	Semi-finished & finished products of steel	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
Central America East	**South East Asia**	**All Products**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**
South America East	North America West	Sugar	53	50	47	44	42	39	40	40	40	41	41	41	42	42	43	43
South America East	North America West	Thermal and Metallurgical Coal	60	60	59	59	58	58	59	59	60	60	61	61	62	62	63	63
South America East	North America West	Petroleum Coke	81	84	86	89	92	95	96	97	98	99	100	101	102	104	105	106
Brazil	West Coast Usa	Semi-finished & finished products of steel	1,305	1,210	1,122	1,041	965	895	931	969	1,008	1,049	1,092	1,126	1,162	1,198	1,236	1,275
Other South America East	West Coast Usa	Semi-finished & finished products of steel	2	5	12	30	73	178	185	192	199	206	214	220	226	232	238	245
South America East	West Coast Canada	Semi-finished & finished products of steel	1,078	968	868	780	700	628	653	680	707	735	765	789	813	838	863	890
Venezuela	West Coast Usa	Semi-finished & finished products of steel	379	303	242	194	155	124	129	134	140	145	151	156	161	166	171	177
South America East	North America West	Lumber	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
South America East	North America West	Pulp	97	101	105	109	114	119	123	128	133	138	143	148	153	159	164	170
South America East	North America West	Paper	12	12	13	13	14	14	15	16	17	17	18	19	20	21	22	23
South America East	**North America West**	**All Products**	**3,068**	**2,793**	**2,557**	**2,360**	**2,214**	**2,152**	**2,233**	**2,316**	**2,403**	**2,494**	**2,588**	**2,664**	**2,743**	**2,824**	**2,908**	**2,995**
South America East	Central America West	Urea (for ammonium compounds)	10	0	0	0	0	-	0	0	0	0	200	217	235	255	277	300
South America East	Central America West	Thermal and Metallurgical Coal	198	231	271	316	370	432	442	452	463	474	485	489	493	497	502	506
South America East	Central America West	Semi-finished & finished products of steel	225	197	173	152	133	117	117	117	118	118	118	152	196	252	325	418
South America East	Central America West	Zinc Metal	0	0	0	0	0	5	0	0	0	0	-	0	0	0	0	-
South America East	Central America West	Misc. Fertilisers	117	118	120	122	124	127	125	128	131	136	145	146	148	150	153	158
South America East	Central America West	Misc. Metals	3	3	3	3	3	3	0	0	0	0	-	0	0	0	0	-
South America East	**Central America West**	**All Products**	**552**	**550**	**566**	**593**	**630**	**684**	**685**	**698**	**712**	**728**	**948**	**1,004**	**1,072**	**1,155**	**1,256**	**1,382**
South America East	South America West	Urea (for ammonium compounds)	188	213	241	273	309	350	376	404	434	466	500	519	538	558	579	600
South America East	South America West	Thermal and Metallurgical Coal	1,018	975	935	895	858	822	818	814	809	805	801	786	772	758	744	731
South America East	South America West	Semi-finished & finished products of steel	516	526	536	547	557	568	579	589	600	612	623	633	644	655	666	677
South America East	South America West	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
South America East	**South America West**	**All Products**	**1,722**	**1,714**	**1,712**	**1,715**	**1,724**	**1,740**	**1,772**	**1,807**	**1,843**	**1,882**	**1,924**	**1,938**	**1,954**	**1,971**	**1,989**	**2,008**
South America East	Oceania	Petroleum Coke	14	11	8	7	5	4	4	4	3	3	3	3	4	4	5	5
South America East	**Oceania**	**All Products**	**14**	**11**	**8**	**7**	**5**	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**4**	**4**	**5**	**5**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Venezuela	Japan	Thermal and Metallurgical Coal	20	19	18	17	17	16	16	16	16	16	16	16	16	16	16	16
Colombia	Japan	Thermal And Metallurgical Coal	79	77	75	73	71	69	69	69	69	69	69	69	69	69	69	69
Argentina	China	Primary Aluminium	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
North Brazil	China	Primary Aluminium	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
North Brazil	Japan	Primary Aluminium	211	209	207	206	204	202	202	202	202	202	202	202	202	202	202	202
South Brazil	Far East	Primary Aluminium	53	52	52	51	51	50	50	50	50	50	50	50	50	50	50	50
Venezuela	China	Primary Aluminium	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
Venezuela	Japan	Primary Aluminium	106	106	106	105	105	105	105	105	105	105	105	105	105	105	105	105
Brazil	Far East	Copper Concentrates	0	0	0	0	0	-	0	0	0	0	173	152	134	118	103	91
South America East	Far East	Misc. Ores	76	73	70	67	64	61	61	61	61	61	61	61	61	61	61	61
South America East	Far East	Lumber	116	118	121	123	126	128	133	139	144	150	156	161	167	173	179	185
South America East	Far East	Pulp	184	184	183	183	182	182	181	180	179	178	177	176	176	175	174	174
South America East	**Far East**	**All Products**	**846**	**838**	**832**	**825**	**819**	**813**	**817**	**821**	**826**	**831**	**1,009**	**993**	**979**	**968**	**959**	**952**
Caribbean Basin	North America West	Cement	0	0	0	0	0	16	16	15	15	14	14	12	11	9	8	7
Caribbean Basin	North America West	Semi-finished & finished products of steel	198	137	94	65	45	31	32	32	33	33	34	34	35	35	36	36
Caribbean Basin	North America West	Misc. Fertilisers	21	21	21	22	22	22	22	23	23	24	26	26	26	27	27	28
Caribbean Basin	**North America West**	**All Products**	**219**	**157**	**115**	**87**	**67**	**69**	**69**	**70**	**71**	**72**	**74**	**72**	**72**	**71**	**71**	**71**
Caribbean Basin	Central America West	Iron Metal	108	110	113	116	118	121	124	126	129	132	135	137	139	141	144	146
Caribbean Basin	Central America West	Semi-finished & finished products of steel	105	106	107	108	110	111	114	117	121	124	128	131	134	138	142	145
Caribbean Basin	Central America West	Misc. Fertilisers	22	22	23	23	23	24	24	24	25	26	27	28	28	28	29	30
Caribbean Basin	Central America West	Misc. Metals	42	41	41	42	42	45	46	49	53	57	61	63	66	69	71	75
Caribbean Basin	**Central America West**	**All Products**	**277**	**280**	**284**	**289**	**293**	**300**	**307**	**317**	**327**	**338**	**351**	**359**	**367**	**376**	**385**	**396**
Caribbean Basin	South America West	Urea (for ammonium compounds)	31	34	38	41	45	50	0	0	0	0	-	0	0	0	0	-
Caribbean Basin	South America West	Semi-finished & finished products of steel	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	14
Caribbean Basin	South America West	Misc. Fertilisers	40	43	48	53	58	64	0	0	0	0	-	0	0	0	0	-
Caribbean Basin	South America West	Paper	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Caribbean Basin	**South America West**	**All Products**	**95**	**102**	**110**	**119**	**128**	**139**	**25**	**25**	**26**	**26**	**26**	**26**	**27**	**27**	**27**	**27**
Caribbean Basin	Far East	Sugar	399	417	437	457	478	500	510	519	529	540	550	540	529	519	510	500
Caribbean Basin	Far East	Semi-finished & finished products of steel	16	16	15	15	14	14	14	14	14	14	14	14	14	14	14	14
Caribbean Basin	Far East	Bauxite and Alumina	63	66	68	71	74	77	81	85	89	93	98	100	103	105	107	110
Caribbean Basin	Far East	Lumber	10	10	11	12	12	13	14	14	15	16	17	18	19	20	21	22
Caribbean Basin	Far East	Pulp	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Caribbean Basin	**Far East**	**All Products**	**491**	**512**	**534**	**557**	**581**	**607**	**621**	**635**	**651**	**666**	**682**	**675**	**668**	**661**	**655**	**649**
Europe	North America West	Urea (for ammonium compounds)	50	50	50	50	50	50	0	0	0	0	-	0	0	0	0	-
Europe	West Coast Canada	Semi-finished & finished products of steel	662	640	619	599	579	560	547	534	521	509	497	503	509	515	522	528
Europe	West Coast Usa	Semi-finished & finished products of steel	1,045	1,019	994	969	945	921	899	878	857	837	817	827	837	847	858	868
Europe	North America West	Misc. Fertilisers	276	279	283	288	294	300	297	303	311	322	342	346	350	355	361	373
Europe	North America West	Misc. Metals	44	43	43	44	44	47	48	51	55	59	64	67	69	72	75	79

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Europe	North America West	Misc. Ores	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11
Europe	North America West	Lumber	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
Europe	North America West	Paper	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9
Europe	**North America West**	**All Products**	**2,092**	**2,046**	**2,004**	**1,965**	**1,927**	**1,895**	**1,808**	**1,784**	**1,763**	**1,746**	**1,740**	**1,762**	**1,786**	**1,811**	**1,836**	**1,870**
Europe	Central America West	Urea (for ammonium compounds)	662	626	592	559	529	500	435	379	330	287	250	250	250	250	250	250
Europe	Central America West	Semi-finished & finished products of steel	400	404	409	413	418	422	450	481	513	548	585	601	617	633	650	667
Europe	Central America West	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
Europe	Central America West	Misc. Metals	5	4	4	4	5	5	5	5	6	6	7	7	7	7	8	8
Europe	Central America West	Misc. Ores	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4
Europe	Central America West	Paper	4	4	4	4	4	4	5	5	5	5	5	6	6	6	6	7
Europe	**Central America West**	**All Products**	**1,073**	**1,041**	**1,012**	**984**	**958**	**935**	**899**	**873**	**857**	**850**	**851**	**867**	**884**	**900**	**918**	**936**
Europe	South America West	Soda ash (for sodium compounds)	41	44	47	50	54	58	0	0	0	0	-	0	0	0	0	50
Europe	South America West	Urea (for ammonium compounds)	741	743	745	746	748	750	692	638	588	542	500	519	538	558	579	600
Europe	South America West	Cement	6	4	3	2	1	1	1	1	1	1	1	1	1	1	1	1
Europe	South America West	Petroleum Coke	9	9	10	10	11	11	11	11	11	11	11	11	11	11	11	11
Europe	South America West	Semi-finished & finished products of steel	292	298	304	310	316	322	328	334	340	347	353	359	365	371	378	384
Europe	South America West	Refined Copper	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Europe	South America West	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
Europe	South America West	Misc. Metals	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Europe	South America West	Lumber	3	3	4	4	4	4	4	4	4	5	5	5	5	5	6	6
Europe	South America West	Paper	49	50	51	52	53	53	55	56	58	59	61	62	64	65	67	68
Europe	**South America West**	**All Products**	**1,159**	**1,169**	**1,180**	**1,192**	**1,204**	**1,217**	**1,108**	**1,062**	**1,020**	**982**	**948**	**974**	**1,001**	**1,029**	**1,058**	**1,138**
Africa	North America West	Thermal and Metallurgical Coal	0	0	0	0	0	22	22	23	23	24	24	24	24	25	25	25
Africa	North America West	Semi-finished & finished products of steel	152	148	144	140	136	132	136	139	143	147	151	170	191	215	242	272
Africa	**North America West**	**All Products**	**152**	**148**	**144**	**140**	**136**	**154**	**158**	**162**	**166**	**171**	**175**	**194**	**216**	**240**	**267**	**297**
Africa	Central America West	Semi-finished & finished products of steel	24	24	25	25	25	25	26	27	28	28	29	30	31	32	32	33
Africa	Central America West	Misc. Fertilisers	72	73	74	75	76	78	77	79	81	84	89	90	91	92	94	97
Africa	**Central America West**	**All Products**	**96**	**97**	**98**	**100**	**101**	**103**	**103**	**105**	**108**	**112**	**118**	**120**	**122**	**124**	**126**	**130**
Africa	Oceania	Ammonium Phosphate (for Phosphates)	223	220	217	214	211	208	206	205	203	202	200	205	210	215	220	225
Africa	Oceania	Misc. Fertilisers	254	250	247	243	240	237	235	233	231	229	228	233	238	244	250	256
Africa	**Oceania**	**All Products**	**477**	**470**	**464**	**457**	**451**	**445**	**441**	**438**	**434**	**431**	**428**	**438**	**448**	**459**	**470**	**481**
Middle East	Central America West	Sodium Nitrate (for Nitrates)	2	2	3	3	4	5	5	5	5	5	5	5	5	5	5	5
Middle East	Central America West	Ammonium Phosphate (for Phosphates)	0	0	0	0	0	8	0	0	0	0	-	0	0	0	0	-
Middle East	Central America West	Urea (for ammonium compounds)	0	0	0	0	0	-	0	0	0	0	50	69	95	131	181	250
Middle East	Central America West	Misc. Fertilisers	10	11	11	11	11	11	11	11	12	12	13	13	13	13	14	14
Middle East	**Central America West**	**All Products**	**12**	**13**	**14**	**14**	**15**	**24**	**16**	**16**	**17**	**17**	**68**	**87**	**113**	**150**	**200**	**269**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Middle East	South America West	Sodium Nitrate (for Nitrates)	2	0	0	0	0	-	0	0	0	0	-	0	0	0	0	5
Middle East	South America West	Ammonium Phosphate (for Phosphates)	6	6	6	5	5	5	9	17	30	55	100	112	127	142	160	180
Middle East	South America West	Misc. Fertilisers	12	12	12	12	13	13	13	13	13	14	15	15	15	15	16	16
Middle East	**South America West**	**All Products**	**20**	**18**	**18**	**18**	**18**	**18**	**22**	**30**	**44**	**69**	**115**	**127**	**142**	**158**	**176**	**201**
North America West	North America East	Petroleum Coke	242	242	242	242	242	242	242	242	242	242	242	242	242	242	242	242
North America West	North America East	Zinc Metal	35	40	46	53	61	70	68	66	64	62	60	63	66	69	72	75
North America West	North America East	Lumber	122	123	124	126	127	128	131	133	136	139	141	144	147	150	154	157
North America West	**North America East**	**All Products**	**399**	**405**	**413**	**421**	**430**	**440**	**441**	**441**	**442**	**442**	**443**	**449**	**455**	**461**	**467**	**474**
North America West	North America Gulf	Lumber	23	23	23	23	23	24	24	25	25	26	26	27	27	28	28	29
North America West	**North America Gulf**	**All Products**	**23**	**23**	**23**	**23**	**23**	**24**	**24**	**25**	**25**	**26**	**26**	**27**	**27**	**28**	**28**	**29**
North America West	Central America East	Urea (for ammonium compounds)	6	5	4	3	2	2	0	0	0	0	-	0	0	0	0	-
North America West	Central America East	Petroleum Coke	96	100	103	107	111	115	116	117	118	119	120	121	123	124	125	126
North America West	Central America East	Semi-finished & finished products of steel	69	69	68	67	67	66	68	70	72	74	76	69	62	56	51	46
North America West	Central America East	Misc. Metals	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6
North America West	Central America East	Misc. Ores	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4
North America West	**Central America East**	**All Products**	**178**	**179**	**181**	**184**	**186**	**190**	**191**	**194**	**197**	**201**	**204**	**199**	**194**	**189**	**186**	**182**
West Coast Canada	South America East	Thermal And Metallurgical Coal	1,141	1,120	1,100	1,079	1,060	1,040	1,015	990	966	943	920	925	930	935	940	946
North America West	South America East	Soda ash (for sodium compounds)	320	361	408	461	521	588	604	621	638	655	673	628	585	546	509	475
North America West	South America East	Petroleum Coke	204	212	220	228	236	245	254	263	272	281	291	297	302	308	313	319
North America West	South America East	Zinc Concentrates	0	0	0	0	0	-	0	0	0	0	105	113	121	130	140	150
North America West	South America East	Misc. Fertilisers	21	24	27	30	34	39	40	41	42	43	44	41	39	36	34	31
North America West	South America East	Misc. Ores	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	6
North America West	South America East	Lumber	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6
North America West	South America East	Pulp	39	38	38	38	38	38	37	37	37	36	36	36	36	35	35	35
North America West	South America East	Paper	72	74	75	77	79	81	83	86	88	91	94	96	99	102	105	107
North America West	**South America East**	**All Products**	**1,805**	**1,837**	**1,876**	**1,922**	**1,976**	**2,040**	**2,042**	**2,046**	**2,052**	**2,059**	**2,173**	**2,146**	**2,123**	**2,103**	**2,087**	**2,075**
North America West	Caribbean Basin	Sulphur	181	175	170	165	160	155	0	0	0	0	-	0	0	0	0	-
North America West	Caribbean Basin	Cement	0	0	0	0	0	103	104	105	105	106	107	108	108	109	109	110
North America West	Caribbean Basin	Lumber	38	38	39	39	40	40	41	41	41	41	42	42	42	43	43	43
North America West	Caribbean Basin	Pulp	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
North America West	**Caribbean Basin**	**All Products**	**221**	**216**	**211**	**206**	**201**	**300**	**146**	**147**	**148**	**149**	**151**	**151**	**152**	**153**	**154**	**155**
West Coast Canada	Europe	Thermal And Metallurgical Coal	3,460	3,397	3,335	3,274	3,214	3,156	3,079	3,004	2,931	2,860	2,790	2,777	2,763	2,749	2,736	2,722
North America West	Europe	Soda ash (for sodium compounds)	168	170	173	175	178	180	257	367	524	749	1,070	1,137	1,208	1,284	1,364	1,450
North America West	Europe	Petroleum Coke	2,393	2,478	2,567	2,659	2,754	2,852	2,886	2,920	2,955	2,990	3,026	3,060	3,094	3,129	3,164	3,199
North America West	Europe	Copper Concentrates	0	0	0	0	0	36	36	36	36	36	36	36	36	36	36	36
North America West	Europe	Zinc Concentrates	520	535	551	567	583	600	610	620	630	640	650	650	650	650	650	650
North America West	Europe	Misc. Fertilisers	57	58	59	59	60	61	87	125	178	254	363	386	410	436	463	492

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
North America West	Europe	Misc. Metals	30	30	30	30	30	32	33	35	38	41	44	46	48	49	52	54
North America West	Europe	Misc. Ores	421	434	446	459	473	515	523	531	539	548	556	556	556	556	556	556
North America West	Europe	Lumber	426	429	431	434	436	439	446	452	459	467	474	480	486	492	498	504
North America West	Europe	Pulp	1,799	1,799	1,798	1,798	1,797	1,796	1,793	1,790	1,786	1,783	1,779	1,775	1,771	1,766	1,762	1,758
North America West	Europe	Paper	423	433	444	455	467	479	493	507	522	537	552	567	581	596	612	628
North America West	**Europe**	**All Products**	**9,698**	**9,763**	**9,833**	**9,909**	**9,991**	**10,146**	**10,242**	**10,387**	**10,599**	**10,904**	**11,341**	**11,468**	**11,603**	**11,744**	**11,892**	**12,049**
North America West	Africa	Sulphur	1,126	1,100	1,074	1,049	1,024	1,000	1,055	1,114	1,176	1,241	1,310	1,346	1,383	1,421	1,460	1,500
West Coast Canada	North Africa	Thermal and Metallurgical Coal	35	34	34	33	32	32	31	30	29	29	28	28	28	28	28	27
West Coast Canada	South Africa	Thermal and Metallurgical Coal	206	202	199	195	191	188	183	179	174	170	166	165	164	164	163	162
North America West	Africa	Misc. Ores	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
North America West	Africa	Pulp	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
North America West	Africa	Paper	10	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12
North America West	**Africa**	**All Products**	**1,387**	**1,356**	**1,327**	**1,297**	**1,269**	**1,241**	**1,291**	**1,345**	**1,402**	**1,462**	**1,526**	**1,562**	**1,598**	**1,635**	**1,674**	**1,713**
North America West	Middle East	Sulphur	217	223	230	236	243	250	255	260	265	270	275	280	285	290	295	300
North America West	Middle East	Soda ash (for sodium compounds)	138	151	166	183	200	220	249	282	320	362	410	435	461	489	519	550
North America West	Middle East	Thermal and Metallurgical Coal	61	60	59	58	57	56	55	53	52	50	49	49	49	48	48	48
North America West	Middle East	Petroleum Coke	167	173	179	185	192	199	201	202	204	205	207	209	211	214	216	218
North America West	Middle East	Pulp	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3
North America West	**Middle East**	**All Products**	**587**	**611**	**638**	**666**	**696**	**729**	**763**	**801**	**843**	**891**	**944**	**976**	**1,009**	**1,044**	**1,081**	**1,119**
Central America West	North America East	Salt	882	886	889	893	896	900	919	939	959	979	1,000	928	862	800	743	690
Central America West	North America East	Sugar	495	518	542	567	593	620	620	620	620	620	620	623	627	631	634	638
Central America West	North America East	Cement	1	4	15	57	221	851	825	799	774	750	727	691	656	624	593	563
Central America West	North America East	Semi-finished & finished products of steel	500	420	353	297	250	210	208	207	205	204	202	203	204	204	205	206
Central America West	**North America East**	**All Products**	**1,878**	**1,828**	**1,799**	**1,814**	**1,960**	**2,581**	**2,572**	**2,564**	**2,558**	**2,553**	**2,549**	**2,446**	**2,349**	**2,259**	**2,175**	**2,097**
Central America West	North America Gulf	Sugar	16	18	21	24	28	32	33	33	33	33	34	34	34	35	35	35
Central America West	North America Gulf	Semi-finished & finished products of steel	600	584	569	554	539	525	511	498	484	472	459	464	469	474	480	485
Central America West	North America Gulf	Copper Concentrates	50	33	21	14	9	6	6	6	6	6	6	6	6	6	6	6
Central America West	**North America Gulf**	**All Products**	**666**	**635**	**611**	**592**	**576**	**563**	**550**	**536**	**524**	**511**	**499**	**504**	**509**	**515**	**520**	**526**
Central America West	Central America East	Sugar	31	33	34	36	38	40	0	0	0	0	-	0	0	0	0	-
Central America West	Central America East	Zinc Concentrates	190	201	212	224	237	250	239	229	219	209	200	210	220	231	243	255
Central America West	**Central America East**	**All Products**	**221**	**233**	**246**	**260**	**275**	**290**	**239**	**229**	**219**	**209**	**200**	**210**	**220**	**231**	**243**	**255**
Central America West	South America East	Ammonium Phosphate (for Phosphates)	67	72	78	85	92	100	97	94	91	88	85	76	69	62	56	50
Central America West	South America East	Semi-finished & finished products of steel	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Central America West	South America East	Copper Concentrates	0	0	0	0	0	247	247	247	247	247	247	247	247	247	247	247
Central America West	South America East	Misc. Fertilisers	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
Central America West	South America East	Lumber	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Central America West	**South America East**	**All Products**	**68**	**74**	**80**	**87**	**94**	**349**	**346**	**342**	**339**	**337**	**334**	**325**	**318**	**311**	**305**	**299**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Central America West	Caribbean Basin	Sugar	63	64	66	67	69	70	0	0	0	0	-	0	0	0	0	-
Central America West	Caribbean Basin	Semi-finished & finished products of steel	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Central America West	Caribbean Basin	Lumber	34	35	36	38	39	41	42	43	44	46	47	49	50	52	54	55
Central America West	**Caribbean Basin**	**All Products**	**99**	**101**	**104**	**107**	**109**	**112**	**44**	**45**	**46**	**48**	**49**	**51**	**52**	**54**	**56**	**58**
Central America West	Europe	Sugar	802	679	576	488	413	350	345	341	336	331	327	340	354	369	384	400
Central America West	Europe	Semi-finished & finished products of steel	350	314	282	253	227	204	185	167	151	137	124	119	115	111	107	103
Central America West	Europe	Copper Concentrates	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Central America West	Europe	Lumber	43	44	46	47	49	51	52	54	56	58	60	62	64	66	68	70
Central America West	**Europe**	**All Products**	**1,198**	**1,041**	**906**	**791**	**692**	**608**	**585**	**565**	**546**	**529**	**514**	**525**	**536**	**549**	**562**	**576**
Central America West	Africa	Sugar	210	239	272	309	352	400	366	334	305	279	255	263	272	281	290	300
Central America West	**Africa**	**All Products**	**210**	**239**	**272**	**309**	**352**	**400**	**366**	**334**	**305**	**279**	**255**	**263**	**272**	**281**	**290**	**300**
South America West	North America East	Sodium Nitrate (for Nitrates)	69	58	48	40	34	28	29	29	30	30	31	31	31	30	30	30
South America West	North America East	Salt	2,485	2,370	2,260	2,155	2,055	1,960	2,024	2,090	2,157	2,228	2,300	2,336	2,372	2,409	2,447	2,485
South America West	North America East	Sugar	89	0	0	0	0	-	0	0	0	0	69	69	70	71	71	72
South America West	North America East	Cement	14	10	8	6	4	3	3	3	3	3	3	3	3	3	3	3
South America West	North America East	Petroleum Coke	79	80	81	82	83	84	85	86	86	87	88	89	90	90	91	92
Peru	East Coast Usa	Iron Ore	73	76	80	84	88	92	91	90	90	89	88	87	86	86	85	84
Chile	East Coast Usa	Iron Ore	133	134	135	136	137	138	137	135	134	132	131	130	129	128	127	126
South America West	North America East	Semi-finished & finished products of steel	40	32	25	20	15	12	12	13	13	14	14	14	15	15	16	16
South America West	North America East	Copper Concentrates	89	104	121	142	165	193	193	193	193	193	193	193	193	193	193	193
South America West	North America East	Refined Copper	253	259	265	271	277	283	309	338	369	404	441	450	459	469	478	488
South America West	North America East	Zinc Concentrates	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	30
South America West	North America East	Misc. Fertilisers	10	8	7	6	5	4	4	4	4	4	4	4	4	4	4	4
South America West	North America East	Misc. Metals	21	21	22	22	23	23	25	28	30	33	36	37	38	38	39	40
South America West	North America East	Misc. Ores	29	34	40	46	54	63	63	63	63	63	63	63	63	63	63	73
South America West	North America East	Lumber	18	19	20	20	21	22	23	24	25	26	27	28	29	31	32	33
South America West	North America East	Pulp	13	14	14	15	15	16	17	17	18	19	19	20	21	21	22	23
South America West	North America East	Paper	4	4	4	5	5	5	5	6	6	6	6	7	7	7	8	8
South America West	**North America East**	**All Products**	**3,419**	**3,223**	**3,129**	**3,049**	**2,981**	**2,927**	**3,020**	**3,118**	**3,222**	**3,331**	**3,515**	**3,562**	**3,610**	**3,660**	**3,710**	**3,801**
South America West	North America Gulf	Sodium Nitrate (for Nitrates)	49	60	73	89	109	134	135	136	137	138	139	142	145	148	151	154
South America West	North America Gulf	Ammonium Phosphate (for Phosphates)	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	140
South America West	North America Gulf	Salt	25	36	51	72	102	145	153	162	171	180	190	0	0	0	0	-
South America West	North America Gulf	Sugar	2	2	3	3	4	4	4	4	4	4	4	4	4	4	4	4
South America West	North America Gulf	Cement	12	9	7	5	4	3	3	3	3	3	3	3	3	3	3	3
South America West	North America Gulf	Iron Ore	38	39	40	40	41	42	43	44	46	47	48	49	50	52	53	54
South America West	North America Gulf	Copper Concentrates	88	95	103	112	121	131	142	153	165	179	193	179	165	153	142	131
South America West	North America Gulf	Refined Copper	150	153	157	160	163	167	182	199	217	237	259	264	270	275	281	287
South America West	North America Gulf	Zinc Concentrates	66	0	0	0	0	-	0	0	0	0	-	0	0	0	0	75

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
South America West	North America Gulf	Zinc Metal	59	0	0	0	0	-	0	0	0	0	-	0	0	0	0	42
South America West	North America Gulf	Misc. Fertilisers	10	13	15	19	23	28	29	29	29	29	29	30	31	31	32	62
South America West	North America Gulf	Misc. Metals	6	5	5	5	5	5	6	6	7	7	8	8	8	9	9	10
South America West	North America Gulf	Misc. Ores	5	3	4	4	4	4	5	5	5	6	6	6	6	5	5	7
South America West	North America Gulf	Lumber	56	58	60	62	64	66	69	72	75	78	82	85	89	93	97	101
South America West	North America Gulf	Pulp	13	14	14	15	16	16	17	17	18	19	19	20	21	22	22	23
South America West	**North America Gulf**	**All Products**	**580**	**486**	**530**	**586**	**656**	**746**	**787**	**830**	**877**	**927**	**981**	**791**	**792**	**795**	**798**	**1,094**
South America West	Central America East	Sodium Nitrate (for Nitrates)	13	11	10	9	8	7	8	8	9	9	10	11	12	13	14	15
South America West	Central America East	Semi-finished & finished products of steel	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7
South America West	Central America East	Refined Copper	138	151	165	181	197	216	208	199	192	184	177	177	177	177	177	177
South America West	Central America East	Zinc Metal	0	0	0	0	0	32	32	33	33	34	34	34	35	35	36	36
South America West	Central America East	Misc. Fertilisers	14	12	11	10	9	8	8	9	9	10	11	12	13	14	15	16
South America West	Central America East	Misc. Metals	5	6	6	7	7	9	9	9	8	8	8	8	8	8	8	8
South America West	Central America East	Misc. Ores	22	21	20	20	21	24	24	24	24	25	26	26	27	27	28	28
South America West	Central America East	Lumber	93	100	106	114	121	129	138	148	159	171	183	196	209	224	239	256
South America West	Central America East	Pulp	5	5	6	6	6	7	7	7	8	8	9	9	9	10	10	11
South America West	Central America East	Paper	17	18	18	19	19	20	20	21	22	22	23	24	25	25	26	27
South America West	**Central America East**	**All Products**	**313**	**329**	**348**	**370**	**395**	**457**	**460**	**464**	**470**	**478**	**487**	**503**	**521**	**540**	**560**	**582**
South America West	South America East	Sugar	316	313	310	306	303	300	0	0	0	0	-	0	0	0	0	-
South America West	**South America East**	**All Products**	**316**	**313**	**310**	**306**	**303**	**300**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
South America West	Caribbean Basin	Sodium Nitrate (for Nitrates)	16	15	14	13	13	12	12	11	11	10	10	11	12	13	14	15
South America West	Caribbean Basin	Cement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peru	Caribbean Basin	Iron Ore	538	485	437	394	355	320	329	337	346	356	365	373	382	391	400	409
Chile	Caribbean Basin	Iron Ore	347	370	395	421	449	479	492	504	518	531	545	558	570	584	597	611
South America West	Caribbean Basin	Misc. Fertilisers	9	9	8	8	7	7	7	7	6	6	6	6	7	7	8	9
South America West	Caribbean Basin	Misc. Ores	56	51	46	41	37	33	34	35	36	37	38	39	40	41	42	43
South America West	Caribbean Basin	Lumber	50	52	54	56	59	61	62	64	65	66	68	69	70	72	73	74
South America West	Caribbean Basin	Paper	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5
South America West	**Caribbean Basin**	**All Products**	**1,020**	**985**	**958**	**938**	**924**	**917**	**939**	**962**	**986**	**1,011**	**1,036**	**1,060**	**1,086**	**1,112**	**1,138**	**1,166**
South America West	Europe	Sodium Nitrate (for Nitrates)	182	185	189	193	196	200	201	202	203	204	205	209	213	217	221	225
South America West	Europe	Sugar	260	280	301	323	348	374	406	441	480	521	566	575	585	594	604	614
South America West	Europe	Semi-finished & finished products of steel	16	13	11	9	7	6	6	6	6	6	6	6	6	7	7	7
Chile	Europe	Copper Concentrates	85	157	288	531	978	1,801	1,730	1,663	1,598	1,535	1,475	1,533	1,594	1,657	1,722	1,790
Peru	Europe	Copper Concentrates	1,473	1,014	698	481	331	228	272	325	388	464	554	527	501	476	452	430
South America West	Europe	Refined Copper	1,273	1,258	1,243	1,229	1,214	1,200	1,329	1,472	1,630	1,806	2,000	2,115	2,236	2,364	2,500	2,643
South America West	Europe	Zinc Concentrates	831	741	662	590	527	470	544	629	728	843	975	1,013	1,053	1,094	1,137	1,182
South America West	Europe	Misc. Fertilisers	46	47	48	49	50	51	51	51	51	52	52	53	54	55	56	57
South America West	Europe	Misc. Metals	17	17	17	17	17	16	18	20	22	25	27	29	31	32	34	36
South America West	Europe	Misc. Ores	56	45	39	38	43	59	60	61	64	67	70	72	74	76	78	80

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
South America West	Europe	Lumber	11	11	11	11	11	12	12	12	13	13	13	14	14	14	15	15
South America West	Europe	Pulp	267	273	279	285	291	297	301	305	310	314	319	323	327	331	335	339
South America West	**Europe**	**All Products**	**4,518**	**4,042**	**3,785**	**3,755**	**4,013**	**4,713**	**4,931**	**5,189**	**5,493**	**5,849**	**6,263**	**6,468**	**6,686**	**6,917**	**7,161**	**7,418**
South America West	Africa	Sodium Nitrate (for Nitrates)	27	27	27	27	27	27	28	30	32	33	35	38	40	43	47	50
South America West	Africa	Cement	0	0	0	0	0	63	60	57	54	51	48	44	41	38	35	32
South America West	Africa	Zinc Concentrates	51	50	49	47	46	45	45	45	45	45	45	45	45	45	45	45
South America West	Africa	Misc. Fertilisers	6	6	6	6	6	6	6	7	7	7	8	8	9	10	10	11
South America West	Africa	Misc. Ores	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
South America West	**Africa**	**All Products**	**86**	**85**	**84**	**82**	**81**	**143**	**141**	**140**	**139**	**138**	**138**	**137**	**137**	**138**	**139**	**140**
South America West	Middle East	Copper Concentrates	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	104
South America West	**Middle East**	**All Products**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**104**
Oceania	North America East	Cement	95	102	109	117	125	134	158	187	221	261	308	305	302	299	297	294
Oceania	North America East	Semi-finished & finished products of steel	339	294	254	220	191	165	170	175	180	185	190	195	200	206	211	217
Oceania	North America East	Bauxite and Alumina	1,593	1,659	1,728	1,800	1,875	1,953	2,051	2,154	2,262	2,376	2,495	2,553	2,612	2,672	2,734	2,797
Oceania	North America East	Misc. Ores	77	80	83	87	90	94	99	104	109	115	120	123	126	129	132	135
Oceania	North America East	Paper	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Oceania	**North America East**	**All Products**	**2,105**	**2,136**	**2,176**	**2,225**	**2,282**	**2,347**	**2,479**	**2,621**	**2,773**	**2,937**	**3,115**	**3,177**	**3,242**	**3,307**	**3,375**	**3,444**
Oceania	North America Gulf	Cement	84	90	97	104	111	119	140	166	196	232	273	271	268	265	262	259
Oceania	North America Gulf	Thermal and Metallurgical Coal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oceania	North America Gulf	Semi-finished & finished products of steel	315	295	277	259	243	228	236	244	252	261	270	279	288	297	306	316
Oceania	North America Gulf	Bauxite and Alumina	135	141	148	155	162	170	179	187	197	207	217	222	227	232	238	243
Oceania	North America Gulf	Primary Aluminium	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Oceania	North America Gulf	Misc. Metals	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Oceania	North America Gulf	Misc. Ores	107	112	117	122	128	134	141	148	155	163	171	175	179	183	188	192
Oceania	North America Gulf	Lumber	3	3	3	4	4	4	4	4	4	5	5	5	5	5	6	6
Oceania	North America Gulf	Pulp	13	13	13	14	14	15	15	15	16	16	17	17	17	18	18	19
Oceania	North America Gulf	Paper	7	7	7	8	8	8	8	9	9	10	10	11	11	12	12	12
Oceania	**North America Gulf**	**All Products**	**718**	**716**	**717**	**720**	**725**	**732**	**778**	**828**	**885**	**947**	**1,018**	**1,034**	**1,050**	**1,066**	**1,084**	**1,102**
Oceania	Central America East	Semi-finished & finished products of steel	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Oceania	Central America East	Misc. Metals	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
Oceania	Central America East	Misc. Ores	88	83	81	81	85	97	95	96	97	100	106	106	107	109	111	114
Oceania	**Central America East**	**All Products**	**92**	**86**	**84**	**85**	**89**	**101**	**99**	**100**	**102**	**104**	**111**	**111**	**113**	**115**	**116**	**120**
Oceania	Caribbean Basin	Semi-finished & finished products of steel	27	26	26	25	24	24	24	25	25	26	26	27	27	28	28	29
Oceania	**Caribbean Basin**	**All Products**	**27**	**26**	**26**	**25**	**24**	**24**	**24**	**25**	**25**	**26**	**26**	**27**	**27**	**28**	**28**	**29**
Oceania	Middle East	Semi-finished & finished products of steel	31	32	34	36	37	39	40	41	42	43	44	45	46	47	48	49
Oceania	**Middle East**	**All Products**	**31**	**32**	**34**	**36**	**37**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Far East	North America East	Cement	1,938	2,031	2,129	2,232	2,339	2,452	2,452	2,452	2,452	2,452	2,452	2,240	2,045	1,868	1,706	1,558
Far East	North America East	Metallurgical Coke	2,246	2,291	2,336	2,383	2,431	2,479	2,459	2,440	2,420	2,401	2,382	2,363	2,345	2,326	2,308	2,290
China	East Coast Usa	Semi-finished & finished products of steel	386	282	207	151	111	81	83	86	88	90	93	106	121	137	156	178
Far East	East Coast Canada	Semi-finished & finished products of steel	501	414	343	284	235	194	196	198	199	201	203	193	184	175	167	159
Japan	East Coast Usa	Semi-finished & finished products of steel	515	471	430	393	359	328	322	315	309	303	297	268	242	218	197	178
S Korea	East Coast Usa	Semi-finished & finished products of steel	634	522	429	353	290	239	246	253	260	267	275	234	199	170	144	123
Taiwan	East Coast Usa	Semi-finished & finished products of steel	336	293	255	222	193	168	173	178	183	188	194	194	193	193	192	192
Far East	North America East	Zinc Metal	0	0	0	0	0	48	0	0	0	0	-	0	0	0	0	-
Far East	North America East	Misc. Metals	44	43	43	43	44	46	0	0	0	0	-	0	0	0	0	-
Far East	North America East	Misc. Ores	323	304	296	299	313	357	350	352	358	367	389	391	396	401	407	421
Far East	North America East	Lumber	24	26	28	30	33	35	38	40	43	46	49	53	56	60	64	68
Far East	North America East	Paper	7	7	7	7	8	8	8	9	9	9	10	10	11	11	11	12
Far East	**North America East**	**All Products**	**6,953**	**6,683**	**6,504**	**6,397**	**6,354**	**6,435**	**6,327**	**6,322**	**6,322**	**6,326**	**6,344**	**6,052**	**5,792**	**5,560**	**5,354**	**5,180**
Far East	North America Gulf	Cement	1,718	1,801	1,888	1,979	2,074	2,174	2,174	2,174	2,174	2,174	2,174	1,990	1,822	1,668	1,527	1,398
Far East	North America Gulf	Metallurgical Coke	1,368	1,403	1,438	1,474	1,512	1,550	1,539	1,528	1,517	1,507	1,496	1,485	1,475	1,464	1,453	1,443
Far East	North America Gulf	Petroleum Coke	240	249	257	267	276	286	289	292	294	297	300	303	306	309	312	315
Far East	North America Gulf	Iron Metal	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
Far East	North America Gulf	Semi-finished & finished products of steel	2,201	2,046	1,901	1,767	1,642	1,526	1,569	1,613	1,658	1,704	1,752	1,740	1,729	1,717	1,705	1,694
Far East	North America Gulf	Zinc Metal	0	0	0	0	0	46	0	0	0	0	-	0	0	0	0	-
Far East	North America Gulf	Misc. Metals	102	100	100	101	101	108	0	0	0	0	-	0	0	0	0	-
Far East	North America Gulf	Misc. Ores	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-
Far East	North America Gulf	Lumber	3	3	3	3	4	4	4	4	5	5	5	6	6	7	7	7
Far East	North America Gulf	Paper	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Far East	**North America Gulf**	**All Products**	**5,673**	**5,642**	**5,629**	**5,632**	**5,651**	**5,736**	**5,617**	**5,653**	**5,690**	**5,729**	**5,769**	**5,567**	**5,379**	**5,207**	**5,047**	**4,900**
Far East	Central America East	Metallurgical Coke	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236	236
Far East	Central America East	Petroleum Coke	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4
Far East	Central America East	Semi-finished & finished products of steel	516	510	505	500	495	490	504	519	534	549	565	565	566	567	568	569
Far East	Central America East	Misc. Metals	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4
Far East	Central America East	Misc. Ores	51	48	47	47	50	56	55	56	57	58	62	62	63	64	64	67
Far East	**Central America East**	**All Products**	**807**	**799**	**793**	**788**	**785**	**788**	**801**	**816**	**832**	**849**	**868**	**870**	**871**	**873**	**876**	**879**
Far East	South America East	Semi-finished & finished products of steel	236	241	245	250	254	259	263	268	273	277	282	277	272	266	261	256
Far East	**South America East**	**All Products**	**236**	**241**	**245**	**250**	**254**	**259**	**263**	**268**	**273**	**277**	**282**	**277**	**272**	**266**	**261**	**256**
Far East	Caribbean Basin	Cement	102	91	81	72	64	57	57	57	57	57	57	57	57	57	57	57
Far East	Caribbean Basin	Semi-finished & finished products of steel	161	156	152	147	143	139	142	146	149	152	156	159	162	165	168	171
Far East	Caribbean Basin	Misc. Metals	6	6	6	6	6	6	6	7	7	8	8	9	9	9	10	10
Far East	Caribbean Basin	Misc. Ores	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
Far East	Caribbean Basin	Paper	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
Far East	**Caribbean Basin**	**All Products**	**273**	**257**	**243**	**230**	**218**	**207**	**211**	**215**	**219**	**223**	**227**	**230**	**234**	**237**	**241**	**245**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
South East Asia	North America East	Lumber	292	312	333	355	379	405	428	453	479	507	536	565	595	627	661	696
South East Asia	**North America East**	**All Products**	**292**	**312**	**333**	**355**	**379**	**405**	**428**	**453**	**479**	**507**	**536**	**565**	**595**	**627**	**661**	**696**
South East Asia	North America Gulf	Semi-finished & finished products of steel	304	257	218	184	156	132	141	151	161	172	184	199	215	232	250	270
South East Asia	North America Gulf	Lumber	177	189	202	215	230	246	260	275	290	307	325	342	361	380	401	422
South East Asia	**North America Gulf**	**All Products**	**481**	**447**	**420**	**400**	**386**	**378**	**401**	**425**	**452**	**479**	**509**	**541**	**575**	**612**	**651**	**692**
South East Asia	South America East	Thermal and Metallurgical Coal	516	531	546	561	577	593	376	239	152	96	61	0	0	0	0	-
South East Asia	**South America East**	**All Products**	**516**	**531**	**546**	**561**	**577**	**593**	**376**	**239**	**152**	**96**	**61**	**-**	**-**	**-**	**-**	**-**
Total		**All Products**	**77,729**	**76,116**	**75,641**	**75,907**	**77,047**	**80,335**	**79,480**	**80,273**	**81,356**	**82,748**	**85,133**	**85,088**	**85,460**	**85,993**	**86,692**	**88,085**
Total	**Southbound**	**All Products**	**30,636**	**30,205**	**30,230**	**30,531**	**31,100**	**32,077**	**31,517**	**31,562**	**31,679**	**31,872**	**32,595**	**32,770**	**33,014**	**33,330**	**33,724**	**34,280**
Total	**Northbound**	**All Products**	**47,093**	**45,911**	**45,412**	**45,376**	**45,947**	**48,258**	**47,962**	**48,711**	**49,677**	**50,877**	**52,538**	**52,318**	**52,446**	**52,664**	**52,968**	**53,804**
Five Year Growth Rates %		**All Products**				**1.36**					**1.17**					**0.68**		
Five Year Growth Rates %	**Southbound**	**All Products**				**1.52**					**0.32**					**1.01**		
Five Year Growth Rates %	**Northbound**	**All Products**				**1.25**					**1.71**					**0.48**		

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Commodity Summary																		
Ammonium phosphate (for phosphates)			6,533	6,644	6,759	6,881	7,007	7,148	7,231	7,328	7,432	7,550	7,689	7,654	7,626	7,603	7,586	7,715
Bauxite and Alumina			1,818	1,894	1,974	2,057	2,143	2,233	2,345	2,463	2,586	2,716	2,852	2,918	2,985	3,054	3,125	3,197
Cement			3,971	4,143	4,336	4,573	4,944	5,976	5,992	6,018	6,055	6,104	6,168	5,724	5,317	4,943	4,600	4,285
Copper concentrates			1,788	1,406	1,236	1,282	1,607	2,645	2,629	2,626	2,636	2,663	2,880	2,876	2,878	2,888	2,904	3,031
Iron Metal			149	151	154	157	159	162	165	167	170	173	176	178	180	182	185	187
Iron Ore			1,129	1,104	1,086	1,075	1,070	1,071	1,091	1,112	1,133	1,155	1,177	1,197	1,218	1,240	1,261	1,284
Lumber			5,717	5,844	5,974	6,109	6,249	6,394	6,608	6,831	7,063	7,303	7,552	7,788	8,032	8,285	8,547	8,819
Metallurgical coke			3,866	3,946	4,027	4,110	4,195	4,281	4,251	4,220	4,190	4,160	4,130	4,101	4,072	4,043	4,014	3,985
Misc. Fertilisers			1,783	1,822	1,869	1,922	1,982	2,052	2,000	2,057	2,137	2,250	2,429	2,462	2,499	2,542	2,592	2,694
Misc. metals			382	375	378	380	384	404	255	271	289	308	330	341	352	364	377	394
Misc. Ores			1,555	1,527	1,528	1,554	1,609	1,755	1,628	1,650	1,681	1,719	1,780	1,791	1,807	1,824	1,843	1,888
Paper			1,085	1,111	1,138	1,166	1,195	1,224	1,262	1,302	1,342	1,384	1,427	1,468	1,510	1,554	1,598	1,645
Petroleum coke			3,924	4,051	4,182	4,319	4,462	4,610	4,668	4,727	4,788	4,850	4,912	4,968	5,024	5,080	5,138	5,196
Primary aluminium			393	390	388	385	383	380	380	380	380	380	380	380	380	380	380	380
Pulp			3,399	3,392	3,385	3,379	3,374	3,370	3,364	3,359	3,355	3,351	3,347	3,343	3,339	3,335	3,332	3,330
Refined Copper			1,826	1,833	1,842	1,852	1,864	1,878	2,040	2,220	2,421	2,643	2,889	3,018	3,154	3,297	3,448	3,607
Salt			3,392	3,291	3,200	3,120	3,054	3,005	3,096	3,190	3,287	3,387	3,490	3,264	3,234	3,210	3,190	3,175
Semi-finished & finished products of steel			18,698	17,184	16,185	15,513	15,138	15,125	14,961	14,842	14,764	14,722	14,714	14,591	14,518	14,495	14,525	14,610
Soda ash (for sodium compounds)			667	727	794	869	953	1,046	1,110	1,270	1,482	1,766	2,153	2,200	2,255	2,319	2,392	2,525
Sodium nitrate (for nitrates)			359	358	364	375	391	413	417	421	426	430	435	446	457	469	481	499
Steel scrap			622	694	777	872	982	1,109	1,108	1,106	1,105	1,103	1,102	1,146	1,193	1,243	1,296	1,351
Sugar			2,775	2,647	2,635	2,649	2,686	2,747	2,340	2,350	2,365	2,387	2,483	2,510	2,538	2,567	2,597	2,628
Sulphur			1,524	1,498	1,474	1,450	1,427	1,405	1,310	1,374	1,441	1,511	1,585	1,626	1,668	1,711	1,755	1,800
Thermal and Metallurgical Coal			6,841	6,748	6,665	6,593	6,533	6,509	6,186	5,946	5,760	5,609	5,481	5,399	5,378	5,358	5,338	5,320
Urea (for ammonium compounds)			1,688	1,670	1,669	1,673	1,684	1,702	1,503	1,420	1,351	1,295	1,500	1,573	1,656	1,752	1,865	2,000
Zinc concentrates			1,751	1,626	1,578	1,540	1,511	1,491	1,438	1,522	1,621	1,736	1,975	2,031	2,090	2,151	2,215	2,387
Zinc Metal			94	40	46	53	61	201	100	99	97	95	94	97	100	104	107	153
Total			**77,729**	**76,116**	**75,641**	**75,907**	**77,047**	**80,335**	**79,480**	**80,273**	**81,356**	**82,748**	**85,133**	**85,088**	**85,460**	**85,993**	**86,692**	**88,085**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
North America East	North America West	Petroleum Coke	34	34	35	35	35	36	36	36	37	37
North America East	North America West	Misc. Metals	5	5	5	6	6	7	7	7	7	7
North America East	North America West	Lumber	355	363	371	379	387	394	402	409	417	425
North America East	North America West	Pulp	8	9	9	9	9	9	9	9	9	9
North America East	**North America West**	**All Products**	**402**	**411**	**419**	**428**	**438**	**446**	**454**	**462**	**470**	**479**
North America East	Central America West	Thermal and Metallurgical Coal	3	3	2	2	2	2	2	1	1	1
North America East	Central America West	Petroleum Coke	136	138	139	141	142	144	145	147	148	150
North America East	Central America West	Semi-finished & finished products of steel	32	32	32	32	32	32	32	32	32	32
North America East	Central America West	Steel scrap	548	570	593	618	643	666	690	715	741	768
North America East	Central America West	Misc. Fertilisers	76	78	79	81	84	95	94	93	92	85
North America East	Central America West	Misc. Ores	6	5	5	5	4	4	3	3	2	2
North America East	Central America West	Lumber	1	1	1	1	1	1	1	1	1	1
North America East	**Central America West**	**All Products**	**802**	**826**	**852**	**880**	**909**	**943**	**967**	**992**	**1,019**	**1,040**
North America East	South America West	Cement	0	0	0	0	0	0	0	0	0	0
North America East	South America West	Semi-finished & finished products of steel	16	16	17	17	17	17	18	18	18	18
North America East	South America West	Misc. Fertilisers	130	132	135	139	143	161	160	158	157	145
North America East	South America West	Misc. Ores	4	4	4	4	5	5	5	5	5	5
North America East	South America West	Lumber	9	9	10	10	10	11	11	11	11	12
North America East	South America West	Pulp	1	1	1	1	1	1	1	1	1	1
North America East	South America West	Paper	330	339	347	355	364	371	378	386	393	401
North America East	**South America West**	**All Products**	**490**	**502**	**513**	**526**	**540**	**566**	**572**	**578**	**585**	**581**
North America East	Oceania	Petroleum Coke	1	1	1	1	1	1	1	1	1	1
North America East	Oceania	Semi-finished & finished products of steel	6	6	6	6	6	6	6	6	6	6
North America East	Oceania	Pulp	1	1	1	1	1	1	1	1	1	1
North America East	Oceania	Paper	21	21	21	21	22	22	22	22	22	22
North America East	**Oceania**	**All Products**	**28**	**28**	**29**	**29**	**29**	**29**	**29**	**29**	**30**	**30**
North America East	Far East	Ammonium Phosphate (for Phosphates)	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250	1,250
North America East	Far East	Petroleum Coke	4	4	4	4	4	4	4	4	4	4
North America East	Far East	Semi-finished & finished products of steel	1,569	1,602	1,634	1,668	1,702	1,738	1,774	1,812	1,850	1,889
North America East	Far East	Steel scrap	825	825	824	824	824	820	816	812	808	804
North America East	Far East	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
North America East	Far East	Misc. Ores	7	7	7	7	7	7	7	7	7	7
North America East	Far East	Lumber	1,664	1,704	1,745	1,786	1,829	1,863	1,898	1,934	1,970	2,006
North America East	Far East	Pulp	387	381	376	371	366	359	352	346	339	333
North America East	Far East	Paper	192	198	205	212	220	227	233	240	247	255
North America East	**Far East**	**All Products**	**5,897**	**5,971**	**6,046**	**6,123**	**6,202**	**6,268**	**6,335**	**6,404**	**6,475**	**6,548**
North America Gulf	North America West	Misc. Fertilisers	48	49	50	51	53	59	59	58	58	53
North America Gulf	**North America West**	**All Products**	**48**	**49**	**50**	**51**	**53**	**59**	**59**	**58**	**58**	**53**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
North America Gulf	Central America West	Ammonium Phosphate (for Phosphates)	150	150	150	150	150	138	128	118	108	100
North America Gulf	Central America West	Thermal and Metallurgical Coal	1	1	1	1	1	0	0	0	0	-
North America Gulf	Central America West	Metallurgical Coke	0	0	0	0	0	0	0	0	0	0
North America Gulf	Central America West	Semi-finished & finished products of steel	0	0	0	0	-	0	0	0	0	1
North America Gulf	Central America West	Misc. Fertilisers	437	437	437	437	437	403	371	342	316	291
North America Gulf	**Central America West**	**All Products**	**588**	**588**	**588**	**588**	**588**	**541**	**499**	**460**	**424**	**392**
North America Gulf	South America West	Ammonium Phosphate (for Phosphates)	327	306	286	267	250	250	250	250	250	250
North America Gulf	South America West	Semi-finished & finished products of steel	16	16	17	17	17	17	18	18	18	18
North America Gulf	South America West	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
North America Gulf	South America West	Misc. Metals	0	0	0	0	0	0	0	0	0	0
North America Gulf	South America West	Misc. Ores	2	2	2	2	2	2	2	2	2	2
North America Gulf	South America West	Lumber	16	17	17	18	19	19	20	20	21	22
North America Gulf	South America West	Paper	108	111	114	117	120	122	124	127	129	132
North America Gulf	**South America West**	**All Products**	**470**	**453**	**436**	**421**	**408**	**411**	**414**	**417**	**421**	**424**
North America Gulf	Oceania	Ammonium Phosphate (for Phosphates)	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
North America Gulf	Oceania	Petroleum Coke	204	207	210	212	215	218	221	224	226	229
North America Gulf	Oceania	Semi-finished & finished products of steel	4	4	4	4	4	4	4	4	4	4
North America Gulf	Oceania	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
North America Gulf	**Oceania**	**All Products**	**1,308**	**1,311**	**1,313**	**1,316**	**1,319**	**1,322**	**1,325**	**1,327**	**1,330**	**1,333**
North America Gulf	Far East	Ammonium Phosphate (for Phosphates)	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
North America Gulf	Far East	Metallurgical Coke	16	16	16	16	16	16	16	16	16	16
North America Gulf	Far East	Petroleum Coke	186	189	191	194	196	198	201	203	206	208
North America Gulf	Far East	Semi-finished & finished products of steel	632	646	662	677	693	709	725	742	759	777
North America Gulf	Far East	Bauxite and Alumina	48	49	49	50	51	52	52	53	53	54
North America Gulf	Far East	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
North America Gulf	Far East	Misc. Ores	52	53	54	55	55	56	57	57	58	59
North America Gulf	Far East	Lumber	4,155	4,254	4,356	4,460	4,567	4,652	4,739	4,828	4,918	5,009
North America Gulf	Far East	Pulp	347	342	337	333	328	322	316	310	304	298
North America Gulf	Far East	Paper	75	78	81	83	86	89	92	94	97	100
North America Gulf	**Far East**	**All Products**	**9,710**	**9,827**	**9,946**	**10,068**	**10,193**	**10,294**	**10,398**	**10,503**	**10,611**	**10,722**
North America Gulf	South East Asia	Misc. Fertilisers	290	295	302	310	320	360	356	353	351	324
North America Gulf	**South East Asia**	**All Products**	**290**	**295**	**302**	**310**	**320**	**360**	**356**	**353**	**351**	**324**
Central America East	North America West	Sugar	22	22	22	22	22	22	23	23	23	23
Central America East	**North America West**	**All Products**	**22**	**22**	**22**	**22**	**22**	**22**	**23**	**23**	**23**	**23**
Central America East	South America West	Ammonium Phosphate (for Phosphates)	51	38	28	20	15	0	0	0	0	-
Central America East	South America West	Semi-finished & finished products of steel	13	14	14	14	14	14	15	15	15	15

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Central America East	South America West	Misc. Fertilisers	23	17	12	9	7	0	0	0	0	-
Central America East	South America West	Misc. Ores	9	9	9	9	10	10	10	10	10	10
Central America East	**South America West**	**All Products**	**97**	**77**	**63**	**53**	**45**	**24**	**24**	**24**	**25**	**25**
Central America East	Far East	Semi-finished & finished products of steel	451	458	465	473	480	488	496	504	512	520
Central America East	Far East	Zinc Concentrates	0	0	0	0	-	0	0	0	0	-
Central America East	Far East	Misc. Metals	18	19	19	20	23	23	24	25	25	26
Central America East	Far East	Misc. Ores	0	0	0	0	-	0	0	0	0	-
Central America East	Far East	Pulp	7	8	8	8	8	8	8	8	8	9
Central America East	**Far East**	**All Products**	**477**	**485**	**492**	**501**	**511**	**519**	**528**	**537**	**546**	**555**
Central America East	South East Asia	Semi-finished & finished products of steel	3	3	3	3	3	3	3	3	3	3
Central America East	**South East Asia**	**All Products**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
South America East	North America West	Sugar	43	44	44	44	45	45	45	45	46	46
South America East	North America West	Thermal and Metallurgical Coal	63	63	63	63	63	64	65	67	68	69
South America East	North America West	Petroleum Coke	107	108	108	109	110	111	112	114	115	116
Brazil	West Coast Usa	Semi-finished & finished products of steel	1,267	1,259	1,251	1,243	1,235	1,176	1,120	1,066	1,015	967
Other South America East	West Coast Usa	Semi-finished & finished products of steel	243	240	238	235	233	221	210	200	190	180
South America East	West Coast Canada	Semi-finished & finished products of steel	884	878	872	866	860	819	779	742	706	672
Venezuela	West Coast Usa	Semi-finished & finished products of steel	176	175	173	172	171	163	155	148	141	134
South America East	North America West	Lumber	3	3	3	3	3	3	4	4	4	4
South America East	North America West	Pulp	175	180	186	192	197	202	207	212	217	222
South America East	North America West	Paper	24	25	26	27	28	29	30	31	32	33
South America East	**North America West**	**All Products**	**2,984**	**2,974**	**2,964**	**2,954**	**2,945**	**2,833**	**2,727**	**2,627**	**2,532**	**2,443**
South America East	Central America West	Urea (for ammonium compounds)	345	396	455	522	600	534	475	423	376	335
South America East	Central America West	Thermal and Metallurgical Coal	500	494	488	482	476	467	457	448	440	431
South America East	Central America West	Semi-finished & finished products of steel	456	497	542	591	645	703	766	835	909	991
South America East	Central America West	Zinc Metal	0	0	0	0	17	21	26	32	40	50
South America East	Central America West	Misc. Fertilisers	149	152	156	160	165	186	184	182	181	167
South America East	Central America West	Misc. Metals	0	0	0	0	-	0	0	0	0	-
South America East	**Central America West**	**All Products**	**1,450**	**1,539**	**1,641**	**1,756**	**1,903**	**1,910**	**1,908**	**1,921**	**1,947**	**1,974**
South America East	South America West	Urea (for ammonium compounds)	579	558	538	519	500	469	441	414	389	365
South America East	South America West	Thermal and Metallurgical Coal	639	559	488	427	373	345	319	295	273	253
South America East	South America West	Semi-finished & finished products of steel	719	764	811	861	915	928	942	956	970	984
South America East	South America West	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
South America East	**South America West**	**All Products**	**1,937**	**1,880**	**1,837**	**1,807**	**1,788**	**1,743**	**1,702**	**1,665**	**1,632**	**1,602**
South America East	Oceania	Petroleum Coke	6	6	7	8	9	9	9	10	10	10
South America East	**Oceania**	**All Products**	**6**	**6**	**7**	**8**	**9**	**9**	**9**	**10**	**10**	**10**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Venezuela	Japan	Thermal and Metallurgical Coal	16	16	16	16	16	16	16	16	16	16
Colombia	Japan	Thermal And Metallurgical Coal	69	69	69	69	69	69	69	69	69	69
Argentina	China	Primary Aluminium	0	0	0	0	127	127	127	127	127	127
North Brazil	China	Primary Aluminium	0	0	0	0	203	203	203	203	203	203
North Brazil	Japan	Primary Aluminium	202	202	202	202	202	202	202	202	202	202
South Brazil	Far East	Primary Aluminium	58	66	76	88	101	101	101	101	101	101
Venezuela	China	Primary Aluminium	0	0	0	0	105	113	121	131	140	151
Venezuela	Japan	Primary Aluminium	105	105	106	106	106	114	122	131	140	150
Brazil	Far East	Copper Concentrates	87	82	78	75	71	65	60	55	50	46
South America East	Far East	Misc. Ores	61	61	61	61	61	61	61	61	61	61
South America East	Far East	Lumber	190	196	202	208	214	219	225	230	236	241
South America East	Far East	Pulp	173	172	172	171	170	169	167	165	164	162
South America East	**Far East**	**All Products**	**961**	**970**	**982**	**995**	**1,445**	**1,458**	**1,474**	**1,490**	**1,509**	**1,530**
Caribbean Basin	North America West	Cement	7	6	6	5	5	5	4	4	3	3
Caribbean Basin	North America West	Semi-finished & finished products of steel	36	37	37	38	38	38	38	37	37	37
Caribbean Basin	North America West	Misc. Fertilisers	26	27	28	28	29	33	32	32	32	30
Caribbean Basin	**North America West**	**All Products**	**69**	**70**	**70**	**71**	**72**	**75**	**74**	**73**	**73**	**70**
Caribbean Basin	Central America West	Iron Metal	148	150	153	155	157	159	162	164	167	169
Caribbean Basin	Central America West	Semi-finished & finished products of steel	153	161	170	179	188	196	203	211	219	228
Caribbean Basin	Central America West	Misc. Fertilisers	28	29	29	30	31	35	35	34	34	31
Caribbean Basin	Central America West	Misc. Metals	77	80	82	85	96	98	101	104	107	110
Caribbean Basin	**Central America West**	**All Products**	**407**	**420**	**434**	**448**	**472**	**488**	**501**	**514**	**527**	**539**
Caribbean Basin	South America West	Urea (for ammonium compounds)	0	0	0	0	-	0	0	0	0	-
Caribbean Basin	South America West	Semi-finished & finished products of steel	15	15	15	15	16	16	16	16	17	17
Caribbean Basin	South America West	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
Caribbean Basin	South America West	Paper	13	13	13	13	13	13	13	13	13	12
Caribbean Basin	**South America West**	**All Products**	**28**	**28**	**28**	**28**	**28**	**29**	**29**	**29**	**29**	**29**
Caribbean Basin	Far East	Sugar	500	500	500	500	500	500	500	500	500	500
Caribbean Basin	Far East	Semi-finished & finished products of steel	14	14	13	13	13	13	13	14	14	14
Caribbean Basin	Far East	Bauxite and Alumina	112	113	115	116	118	119	121	122	124	125
Caribbean Basin	Far East	Lumber	23	24	25	27	28	29	30	32	33	34
Caribbean Basin	Far East	Pulp	3	3	3	3	3	3	3	3	3	3
Caribbean Basin	**Far East**	**All Products**	**652**	**654**	**657**	**660**	**662**	**665**	**668**	**671**	**674**	**677**
Europe	North America West	Urea (for ammonium compounds)	0	0	0	0	-	0	0	0	0	-
Europe	West Coast Canada	Semi-finished & finished products of steel	293	163	91	50	28	26	24	22	21	19
Europe	West Coast Usa	Semi-finished & finished products of steel	480	266	147	81	45	42	39	36	33	31
Europe	North America West	Misc. Fertilisers	353	360	368	378	390	439	434	431	428	395
Europe	North America West	Misc. Metals	81	84	86	89	100	103	106	109	112	116

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Europe	North America West	Misc. Ores	11	11	11	11	11	11	11	11	11	11
Europe	North America West	Lumber	2	2	2	2	2	2	2	3	3	3
Europe	North America West	Paper	10	10	10	10	11	11	11	11	12	12
Europe	**North America West**	**All Products**	**1,231**	**895**	**715**	**622**	**588**	**634**	**628**	**623**	**620**	**587**
Europe	Central America West	Urea (for ammonium compounds)	0	0	0	0	-	0	0	0	0	-
Europe	Central America West	Semi-finished & finished products of steel	607	552	502	457	416	246	145	86	51	30
Europe	Central America West	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
Europe	Central America West	Misc. Metals	8	9	9	9	10	11	11	11	12	12
Europe	Central America West	Misc. Ores	4	4	4	4	4	4	4	4	4	4
Europe	Central America West	Paper	7	7	8	8	8	8	9	9	9	10
Europe	**Central America West**	**All Products**	**626**	**572**	**523**	**478**	**439**	**269**	**169**	**110**	**76**	**56**
Europe	South America West	Soda ash (for sodium compounds)	0	0	0	0	-	0	0	0	0	-
Europe	South America West	Urea (for ammonium compounds)	0	0	0	0	-	0	0	0	0	-
Europe	South America West	Cement	1	1	1	1	1	1	1	1	1	1
Europe	South America West	Petroleum Coke	11	11	11	11	11	11	11	10	10	10
Europe	South America West	Semi-finished & finished products of steel	330	284	245	210	181	173	166	158	152	145
Europe	South America West	Refined Copper	12	12	12	12	12	12	12	12	12	12
Europe	South America West	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
Europe	South America West	Misc. Metals	6	6	6	6	6	6	6	6	6	6
Europe	South America West	Lumber	6	6	6	7	7	7	7	8	8	8
Europe	South America West	Paper	70	71	73	74	76	77	79	80	81	83
Europe	**South America West**	**All Products**	**436**	**392**	**354**	**321**	**294**	**287**	**281**	**275**	**270**	**265**
Africa	North America West	Thermal and Metallurgical Coal	25	25	25	25	25	25	25	26	26	26
Africa	North America West	Semi-finished & finished products of steel	277	282	288	293	299	291	284	277	271	264
Africa	**North America West**	**All Products**	**302**	**307**	**313**	**318**	**324**	**317**	**310**	**303**	**296**	**290**
Africa	Central America West	Semi-finished & finished products of steel	34	35	36	36	37	38	39	40	41	42
Africa	Central America West	Misc. Fertilisers	92	94	96	98	101	114	113	112	111	103
Africa	**Central America West**	**All Products**	**126**	**128**	**131**	**135**	**139**	**152**	**152**	**152**	**152**	**144**
Africa	Oceania	Ammonium Phosphate (for Phosphates)	230	235	240	245	250	250	250	250	250	250
Africa	Oceania	Misc. Fertilisers	261	267	273	278	284	2,283	2,084	1,904	1,741	284
Africa	**Oceania**	**All Products**	**491**	**502**	**512**	**523**	**534**	**2,533**	**2,334**	**2,154**	**1,991**	**534**
Middle East	Central America West	Sodium Nitrate (for Nitrates)	5	5	5	5	5	5	5	5	5	5
Middle East	Central America West	Ammonium Phosphate (for Phosphates)	0	0	0	0	-	0	0	0	0	-
Middle East	Central America West	Urea (for ammonium compounds)	250	250	250	250	250	267	286	306	327	350
Middle East	Central America West	Misc. Fertilisers	13	14	14	14	15	17	16	16	16	15
Middle East	**Central America West**	**All Products**	**268**	**269**	**269**	**269**	**270**	**289**	**307**	**327**	**348**	**370**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Middle East	South America West	Sodium Nitrate (for Nitrates)	5	5	5	5	5	5	5	5	5	5
Middle East	South America West	Ammonium Phosphate (for Phosphates)	153	130	111	94	80	107	144	194	261	350
Middle East	South America West	Misc. Fertilisers	15	15	16	16	17	19	19	18	18	17
Middle East	**South America West**	**All Products**	**173**	**151**	**131**	**115**	**102**	**131**	**168**	**217**	**284**	**372**
North America West	North America East	Petroleum Coke	242	242	242	242	242	242	242	242	242	242
North America West	North America East	Zinc Metal	78	81	84	87	90	92	94	96	98	100
North America West	North America East	Lumber	160	164	168	171	175	178	182	185	188	192
North America West	**North America East**	**All Products**	**480**	**487**	**493**	**500**	**507**	**512**	**517**	**523**	**528**	**534**
North America West	North America Gulf	Lumber	30	30	31	32	32	33	34	34	35	35
North America West	**North America Gulf**	**All Products**	**30**	**30**	**31**	**32**	**32**	**33**	**34**	**34**	**35**	**35**
North America West	Central America East	Urea (for ammonium compounds)	0	0	0	0	-	0	0	0	0	-
North America West	Central America East	Petroleum Coke	127	129	130	131	132	133	135	136	138	139
North America West	Central America East	Semi-finished & finished products of steel	45	43	41	40	38	38	39	39	40	40
North America West	Central America East	Misc. Metals	6	6	6	7	7	8	8	8	8	9
North America West	Central America East	Misc. Ores	4	4	4	4	4	4	4	4	4	4
North America West	**Central America East**	**All Products**	**182**	**182**	**181**	**181**	**182**	**183**	**185**	**188**	**190**	**192**
West Coast Canada	South America East	Thermal And Metallurgical Coal	930	914	899	884	869	863	858	852	847	841
North America West	South America East	Soda ash (for sodium compounds)	595	746	936	1,173	1,470	1,510	1,552	1,594	1,638	1,683
North America West	South America East	Petroleum Coke	323	327	331	336	340	344	348	353	357	361
North America West	South America East	Zinc Concentrates	154	158	162	166	170	176	181	187	194	200
North America West	South America East	Misc. Fertilisers	39	49	62	77	97	100	103	105	108	111
North America West	South America East	Misc. Ores	6	6	6	6	7	7	7	7	8	8
North America West	South America East	Lumber	6	6	7	7	7	7	7	7	7	8
North America West	South America East	Pulp	35	34	34	34	33	33	33	32	32	31
North America West	South America East	Paper	110	113	116	118	121	124	126	129	131	134
North America West	**South America East**	**All Products**	**2,198**	**2,354**	**2,552**	**2,801**	**3,114**	**3,164**	**3,215**	**3,267**	**3,321**	**3,377**
North America West	Caribbean Basin	Sulphur	0	0	0	0	-	0	0	0	0	-
North America West	Caribbean Basin	Cement	109	109	108	108	107	105	104	102	101	99
North America West	Caribbean Basin	Lumber	44	44	44	45	45	45	45	45	45	45
North America West	Caribbean Basin	Pulp	2	2	2	2	2	2	2	2	2	2
North America West	**Caribbean Basin**	**All Products**	**155**	**155**	**154**	**154**	**154**	**152**	**151**	**149**	**147**	**146**
West Coast Canada	Europe	Thermal And Metallurgical Coal	2,705	2,687	2,670	2,653	2,635	2,619	2,602	2,585	2,568	2,552
North America West	Europe	Soda ash (for sodium compounds)	1,486	1,523	1,561	1,600	1,640	1,600	1,561	1,523	1,486	1,450
North America West	Europe	Petroleum Coke	3,233	3,267	3,302	3,337	3,372	3,407	3,443	3,479	3,516	3,553
North America West	Europe	Copper Concentrates	36	36	36	36	36	36	36	36	36	36
North America West	Europe	Zinc Concentrates	655	660	665	670	675	680	685	690	695	700
North America West	Europe	Misc. Fertilisers	505	517	530	543	557	543	530	517	505	492

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
North America West	Europe	Misc. Metals	56	57	59	61	69	71	73	75	77	80
North America West	Europe	Misc. Ores	560	564	568	572	576	580	584	588	592	597
North America West	Europe	Lumber	509	513	518	523	528	530	533	535	538	540
North America West	Europe	Pulp	1,750	1,743	1,736	1,729	1,722	1,706	1,690	1,675	1,659	1,644
North America West	Europe	Paper	642	656	671	686	702	714	726	738	750	763
North America West	**Europe**	**All Products**	**12,136**	**12,225**	**12,317**	**12,410**	**12,512**	**12,487**	**12,463**	**12,442**	**12,423**	**12,406**
North America West	Africa	Sulphur	1,547	1,595	1,645	1,697	1,750	1,750	1,750	1,750	1,750	1,750
West Coast Canada	North Africa	Thermal and Metallurgical Coal	27	27	27	27	27	26	26	26	26	26
West Coast Canada	South Africa	Thermal and Metallurgical Coal	161	160	159	158	157	156	155	154	153	152
North America West	Africa	Misc. Ores	1	1	1	1	1	1	1	1	1	1
North America West	Africa	Pulp	10	10	10	10	10	10	10	10	10	10
North America West	Africa	Paper	13	13	13	13	13	13	13	13	13	13
North America West	**Africa**	**All Products**	**1,759**	**1,806**	**1,855**	**1,906**	**1,958**	**1,957**	**1,955**	**1,954**	**1,953**	**1,952**
North America West	Middle East	Sulphur	300	300	300	300	300	300	300	300	300	300
North America West	Middle East	Soda ash (for sodium compounds)	583	618	655	694	735	770	806	844	883	925
North America West	Middle East	Thermal and Metallurgical Coal	48	47	47	46	46	46	46	45	45	45
North America West	Middle East	Petroleum Coke	220	222	225	227	229	231	234	236	239	241
North America West	Middle East	Pulp	3	3	3	3	3	3	3	3	3	3
North America West	**Middle East**	**All Products**	**1,154**	**1,190**	**1,229**	**1,270**	**1,313**	**1,350**	**1,388**	**1,428**	**1,470**	**1,514**
Central America West	North America East	Salt	671	652	634	617	600	665	736	815	903	1,000
Central America West	North America East	Sugar	642	647	651	655	660	663	667	671	674	678
Central America West	North America East	Cement	538	514	491	469	448	416	386	358	332	308
Central America West	North America East	Semi-finished & finished products of steel	211	216	221	227	232	236	239	243	247	251
Central America West	**North America East**	**All Products**	**2,062**	**2,029**	**1,998**	**1,968**	**1,940**	**1,979**	**2,028**	**2,087**	**2,156**	**2,237**
Central America West	North America Gulf	Sugar	35	36	36	36	36	36	37	37	37	37
Central America West	North America Gulf	Semi-finished & finished products of steel	490	496	501	506	512	515	518	520	523	526
Central America West	North America Gulf	Copper Concentrates	6	6	6	6	6	6	6	7	7	7
Central America West	**North America Gulf**	**All Products**	**532**	**537**	**543**	**548**	**554**	**557**	**561**	**564**	**567**	**570**
Central America West	Central America East	Sugar	0	0	0	0	-	0	0	0	0	-
Central America West	Central America East	Zinc Concentrates	264	274	284	294	305	317	330	342	356	370
Central America West	**Central America East**	**All Products**	**264**	**274**	**284**	**294**	**305**	**317**	**330**	**342**	**356**	**370**
Central America West	South America East	Ammonium Phosphate (for Phosphates)	0	0	0	0	-	0	0	0	0	-
Central America West	South America East	Semi-finished & finished products of steel	1	1	1	1	1	1	1	1	2	2
Central America West	South America East	Copper Concentrates	247	247	247	247	247	247	247	247	247	247
Central America West	South America East	Misc. Fertilisers	0	0	0	0	-	0	0	0	0	-
Central America West	South America East	Lumber	1	1	1	1	1	1	1	1	1	1
Central America West	**South America East**	**All Products**	**249**	**249**	**249**	**249**	**249**	**249**	**249**	**249**	**249**	**250**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Central America West	Caribbean Basin	Sugar	0	0	0	0	-	0	0	0	0	-
Central America West	Caribbean Basin	Semi-finished & finished products of steel	2	2	2	2	2	2	2	2	3	3
Central America West	Caribbean Basin	Lumber	57	59	61	63	65	67	69	71	73	75
Central America West	**Caribbean Basin**	**All Products**	**60**	**61**	**63**	**66**	**68**	**70**	**71**	**73**	**75**	**77**
Central America West	Europe	Sugar	405	410	415	420	425	430	435	440	445	450
Central America West	Europe	Semi-finished & finished products of steel	105	107	108	110	112	114	116	118	120	122
Central America West	Europe	Copper Concentrates	3	3	3	3	3	3	3	3	3	3
Central America West	Europe	Lumber	72	74	76	79	81	83	85	87	89	91
Central America West	**Europe**	**All Products**	**585**	**593**	**602**	**612**	**621**	**630**	**639**	**648**	**657**	**666**
Central America West	Africa	Sugar	309	319	329	339	350	359	369	379	389	400
Central America West	**Africa**	**All Products**	**309**	**319**	**329**	**339**	**350**	**359**	**369**	**379**	**389**	**400**
South America West	North America East	Sodium Nitrate (for Nitrates)	30	30	30	30	30	30	30	30	30	30
South America West	North America East	Salt	2,458	2,432	2,406	2,380	2,355	2,285	2,217	2,151	2,087	2,025
South America West	North America East	Sugar	73	73	74	74	74	75	75	76	76	77
South America West	North America East	Cement	3	3	3	3	3	3	3	3	3	3
South America West	North America East	Petroleum Coke	93	94	95	96	97	98	99	100	101	102
Peru	East Coast Usa	Iron Ore	85	85	86	86	87	87	87	87	87	87
Chile	East Coast Usa	Iron Ore	127	127	128	128	129	129	129	129	129	129
South America West	North America East	Semi-finished & finished products of steel	16	16	15	15	15	16	18	20	22	24
South America West	North America East	Copper Concentrates	193	193	193	193	193	193	193	193	193	193
South America West	North America East	Refined Copper	488	489	489	490	490	500	510	520	530	541
South America West	North America East	Zinc Concentrates	44	63	92	134	195	227	264	307	357	415
South America West	North America East	Misc. Fertilisers	4	4	4	4	4	4	4	4	4	4
South America West	North America East	Misc. Metals	40	40	40	40	40	41	42	43	44	44
South America West	North America East	Misc. Ores	78	84	94	107	127	138	150	164	180	199
South America West	North America East	Lumber	35	36	38	39	41	43	44	46	48	49
South America West	North America East	Pulp	24	24	25	26	27	27	28	28	29	30
South America West	North America East	Paper	8	9	9	9	10	10	10	11	11	11
South America West	**North America East**	**All Products**	**3,798**	**3,803**	**3,821**	**3,856**	**3,918**	**3,906**	**3,903**	**3,911**	**3,931**	**3,964**
South America West	North America Gulf	Sodium Nitrate (for Nitrates)	156	158	160	162	164	166	168	170	172	174
South America West	North America Gulf	Ammonium Phosphate (for Phosphates)	140	140	140	140	140	140	140	140	140	140
South America West	North America Gulf	Salt	0	0	0	0	-	0	0	0	0	-
South America West	North America Gulf	Sugar	4	4	4	4	5	5	5	5	5	5
South America West	North America Gulf	Cement	3	3	3	3	3	3	3	3	3	3
South America West	North America Gulf	Iron Ore	55	56	57	58	59	59	59	59	59	59
South America West	North America Gulf	Copper Concentrates	131	131	131	131	131	131	131	131	131	131
South America West	North America Gulf	Refined Copper	287	287	288	288	288	294	300	306	312	318
South America West	North America Gulf	Zinc Concentrates	81	87	94	102	110	118	126	135	145	155

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
South America West	North America Gulf	Zinc Metal	40	38	36	34	32	30	29	28	26	25
South America West	North America Gulf	Misc. Fertilisers	63	63	63	64	64	65	65	66	66	66
South America West	North America Gulf	Misc. Metals	10	10	10	10	10	10	10	10	10	11
South America West	North America Gulf	Misc. Ores	7	7	7	7	8	8	8	8	9	9
South America West	North America Gulf	Lumber	106	110	115	119	124	129	134	139	144	150
South America West	North America Gulf	Pulp	24	25	25	26	27	28	28	29	30	30
South America West	**North America Gulf**	**All Products**	**1,106**	**1,119**	**1,133**	**1,148**	**1,165**	**1,185**	**1,206**	**1,228**	**1,251**	**1,275**
South America West	Central America East	Sodium Nitrate (for Nitrates)	16	17	18	19	20	20	20	20	20	20
South America West	Central America East	Semi-finished & finished products of steel	8	8	8	8	8	8	8	8	8	8
South America West	Central America East	Refined Copper	194	213	234	256	281	292	304	316	329	342
South America West	Central America East	Zinc Metal	36	37	37	38	38	38	39	39	40	40
South America West	Central America East	Misc. Fertilisers	17	18	19	21	22	22	22	22	22	22
South America West	Central America East	Misc. Metals	8	9	10	11	12	12	13	13	14	14
South America West	Central America East	Misc. Ores	28	28	29	29	29	29	29	29	29	30
South America West	Central America East	Lumber	273	291	310	330	352	373	395	419	444	470
South America West	Central America East	Pulp	11	12	12	13	13	14	14	15	15	16
South America West	Central America East	Paper	28	29	30	31	32	33	34	35	36	37
South America West	**Central America East**	**All Products**	**620**	**661**	**706**	**754**	**806**	**841**	**877**	**916**	**956**	**998**
South America West	South America East	Sugar	0	0	0	0	-	0	0	0	0	-
South America West	**South America East**	**All Products**	-	-	-	-	-	-	-	-	-	-
South America West	Caribbean Basin	Sodium Nitrate (for Nitrates)	16	17	18	19	20	21	22	23	24	25
South America West	Caribbean Basin	Cement	0	0	0	0	0	0	0	0	0	0
Peru	Caribbean Basin	Iron Ore	417	424	432	440	448	448	448	448	448	448
Chile	Caribbean Basin	Iron Ore	622	634	646	658	670	670	670	670	670	670
South America West	Caribbean Basin	Misc. Fertilisers	9	10	10	11	12	12	13	13	14	15
South America West	Caribbean Basin	Misc. Ores	44	44	45	46	47	47	47	47	47	47
South America West	Caribbean Basin	Lumber	76	77	79	80	82	83	84	85	86	87
South America West	Caribbean Basin	Paper	5	5	5	5	5	5	5	5	5	5
South America West	**Caribbean Basin**	**All Products**	**1,188**	**1,211**	**1,235**	**1,259**	**1,283**	**1,286**	**1,288**	**1,291**	**1,294**	**1,297**
South America West	Europe	Sodium Nitrate (for Nitrates)	228	231	234	237	240	247	253	260	268	275
South America West	Europe	Sugar	663	715	772	834	900	830	765	706	651	600
South America West	Europe	Semi-finished & finished products of steel	7	7	8	8	8	8	8	8	8	8
Chile	Europe	Copper Concentrates	1,820	1,850	1,880	1,911	1,943	1,974	2,006	2,039	2,072	2,105
Peru	Europe	Copper Concentrates	408	388	368	350	332	293	258	228	201	177
South America West	Europe	Refined Copper	2,739	2,839	2,942	3,049	3,160	3,260	3,364	3,470	3,580	3,694
South America West	Europe	Zinc Concentrates	1,166	1,151	1,135	1,120	1,105	1,084	1,064	1,044	1,024	1,005
South America West	Europe	Misc. Fertilisers	58	58	59	60	61	62	64	66	68	70
South America West	Europe	Misc. Metals	38	39	40	42	43	45	46	48	49	51
South America West	Europe	Misc. Ores	80	79	79	79	79	79	78	78	77	77

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
South America West	Europe	Lumber	15	16	16	16	17	17	17	18	18	18
South America West	Europe	Pulp	343	346	350	353	357	358	360	362	363	365
South America West	**Europe**	**All Products**	**7,564**	**7,719**	**7,884**	**8,059**	**8,245**	**8,257**	**8,284**	**8,325**	**8,379**	**8,444**
South America West	Africa	Sodium Nitrate (for Nitrates)	53	56	59	62	65	68	71	74	77	80
South America West	Africa	Cement	27	22	19	16	13	16	19	23	27	33
South America West	Africa	Zinc Concentrates	45	45	45	45	45	45	45	45	45	45
South America West	Africa	Misc. Fertilisers	12	12	13	14	14	15	16	16	17	18
South America West	Africa	Misc. Ores	2	2	2	2	2	2	2	2	2	2
South America West	**Africa**	**All Products**	**138**	**137**	**137**	**138**	**139**	**145**	**152**	**160**	**168**	**178**
South America West	Middle East	Copper Concentrates	108	113	117	122	127	129	131	132	134	136
South America West	**Middle East**	**All Products**	**108**	**113**	**117**	**122**	**127**	**129**	**131**	**132**	**134**	**136**
Oceania	North America East	Cement	291	288	285	283	280	277	274	272	269	266
Oceania	North America East	Semi-finished & finished products of steel	214	211	208	206	203	199	196	192	188	185
Oceania	North America East	Bauxite and Alumina	2,836	2,875	2,915	2,955	2,996	3,029	3,063	3,097	3,132	3,167
Oceania	North America East	Misc. Ores	137	139	141	142	144	146	148	149	151	153
Oceania	North America East	Paper	2	2	2	2	2	2	2	2	2	2
Oceania	**North America East**	**All Products**	**3,479**	**3,515**	**3,551**	**3,588**	**3,625**	**3,654**	**3,683**	**3,712**	**3,742**	**3,773**
Oceania	North America Gulf	Cement	256	254	251	249	246	244	241	239	236	234
Oceania	North America Gulf	Thermal and Metallurgical Coal	0	0	0	0	0	0	0	0	0	0
Oceania	North America Gulf	Semi-finished & finished products of steel	310	304	298	292	286	278	270	263	255	248
Oceania	North America Gulf	Bauxite and Alumina	246	249	252	256	259	261	264	266	269	271
Oceania	North America Gulf	Primary Aluminium	23	23	23	23	23	23	23	23	23	23
Oceania	North America Gulf	Misc. Metals	32	32	32	32	32	32	32	32	32	32
Oceania	North America Gulf	Misc. Ores	194	197	199	202	205	206	208	210	212	214
Oceania	North America Gulf	Lumber	6	6	7	7	7	7	8	8	8	9
Oceania	North America Gulf	Pulp	19	20	20	20	21	21	21	21	22	22
Oceania	North America Gulf	Paper	13	13	14	14	15	16	16	16	17	18
Oceania	**North America Gulf**	**All Products**	**1,099**	**1,097**	**1,096**	**1,094**	**1,093**	**1,088**	**1,083**	**1,078**	**1,074**	**1,070**
Oceania	Central America East	Semi-finished & finished products of steel	3	3	3	3	3	3	3	3	3	3
Oceania	Central America East	Misc. Metals	4	4	4	4	4	5	5	5	5	5
Oceania	Central America East	Misc. Ores	114	114	115	115	117	117	117	118	118	119
Oceania	**Central America East**	**All Products**	**120**	**121**	**121**	**122**	**124**	**124**	**124**	**125**	**126**	**127**
Oceania	Caribbean Basin	Semi-finished & finished products of steel	29	30	31	31	32	32	33	34	34	35
Oceania	**Caribbean Basin**	**All Products**	**29**	**30**	**31**	**31**	**32**	**32**	**33**	**34**	**34**	**35**
Oceania	Middle East	Semi-finished & finished products of steel	50	51	52	53	54	55	56	57	58	59
Oceania	**Middle East**	**All Products**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Far East	North America East	Cement	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558	1,558
Far East	North America East	Metallurgical Coke	2,274	2,258	2,242	2,227	2,211	2,189	2,167	2,146	2,124	2,103
China	East Coast Usa	Semi-finished & finished products of steel	186	193	202	210	219	222	225	228	232	235
Far East	East Coast Canada	Semi-finished & finished products of steel	159	160	160	161	161	158	155	152	150	147
Japan	East Coast Usa	Semi-finished & finished products of steel	176	173	171	168	166	163	160	157	154	151
S Korea	East Coast Usa	Semi-finished & finished products of steel	121	120	118	117	115	109	103	98	93	88
Taiwan	East Coast Usa	Semi-finished & finished products of steel	189	187	184	182	179	171	163	156	149	142
Far East	North America East	Zinc Metal	0	0	0	0	-	0	0	0	0	-
Far East	North America East	Misc. Metals	0	0	0	0	-	0	0	0	0	-
Far East	North America East	Misc. Ores	420	421	422	424	430	430	431	433	435	439
Far East	North America East	Lumber	73	77	82	87	93	98	104	110	116	123
Far East	North America East	Paper	12	13	13	14	14	15	15	15	16	16
Far East	**North America East**	**All Products**	**5,169**	**5,160**	**5,152**	**5,147**	**5,146**	**5,113**	**5,082**	**5,053**	**5,027**	**5,002**
Far East	North America Gulf	Cement	1,398	1,398	1,398	1,398	1,398	1,398	1,398	1,398	1,398	1,398
Far East	North America Gulf	Metallurgical Coke	1,428	1,414	1,399	1,385	1,371	1,354	1,338	1,321	1,305	1,289
Far East	North America Gulf	Petroleum Coke	318	322	325	329	332	336	339	343	346	350
Far East	North America Gulf	Iron Metal	36	31	27	23	20	0	0	0	0	-
Far East	North America Gulf	Semi-finished & finished products of steel	1,721	1,748	1,775	1,803	1,831	1,813	1,795	1,777	1,759	1,742
Far East	North America Gulf	Zinc Metal	0	0	0	0	-	0	0	0	0	-
Far East	North America Gulf	Misc. Metals	0	0	0	0	-	0	0	0	0	-
Far East	North America Gulf	Misc. Ores	0	0	0	0	-	0	0	0	0	-
Far East	North America Gulf	Lumber	8	8	9	10	10	11	11	12	13	13
Far East	North America Gulf	Paper	2	2	2	2	2	2	2	2	2	2
Far East	**North America Gulf**	**All Products**	**4,910**	**4,922**	**4,935**	**4,949**	**4,964**	**4,913**	**4,883**	**4,853**	**4,823**	**4,794**
Far East	Central America East	Metallurgical Coke	236	236	236	236	236	236	236	236	236	236
Far East	Central America East	Petroleum Coke	4	4	4	4	4	4	4	4	4	4
Far East	Central America East	Semi-finished & finished products of steel	575	581	588	594	601	607	613	620	626	633
Far East	Central America East	Misc. Metals	4	4	4	4	5	5	5	5	5	5
Far East	Central America East	Misc. Ores	67	67	67	67	68	68	68	69	69	69
Far East	**Central America East**	**All Products**	**885**	**892**	**899**	**906**	**914**	**920**	**927**	**934**	**941**	**948**
Far East	South America East	Semi-finished & finished products of steel	261	265	270	274	279	284	289	293	298	303
Far East	**South America East**	**All Products**	**261**	**265**	**270**	**274**	**279**	**284**	**289**	**293**	**298**	**303**
Far East	Caribbean Basin	Cement	57	57	57	57	57	57	57	57	57	57
Far East	Caribbean Basin	Semi-finished & finished products of steel	174	178	182	185	189	193	196	200	204	208
Far East	Caribbean Basin	Misc. Metals	10	11	11	11	13	13	14	14	14	15
Far East	Caribbean Basin	Misc. Ores	3	3	3	3	3	3	3	3	3	3
Far East	Caribbean Basin	Paper	3	4	4	4	4	4	4	4	4	4
Far East	**Caribbean Basin**	**All Products**	**249**	**253**	**257**	**261**	**266**	**270**	**274**	**279**	**283**	**287**

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
South East Asia	North America East	Lumber	731	766	804	843	885	922	962	1,002	1,045	1,089
South East Asia	**North America East**	**All Products**	**731**	**766**	**804**	**843**	**885**	**922**	**962**	**1,002**	**1,045**	**1,089**
South East Asia	North America Gulf	Semi-finished & finished products of steel	285	301	318	336	355	353	352	350	349	347
South East Asia	North America Gulf	Lumber	443	465	487	511	537	559	583	608	634	660
South East Asia	**North America Gulf**	**All Products**	**728**	**766**	**806**	**848**	**892**	**913**	**935**	**958**	**982**	**1,007**
South East Asia	South America East	Thermal and Metallurgical Coal	0	0	0	0	72	48	31	21	14	9
South East Asia	**South America East**	**All Products**	**-**	**-**	**-**	**-**	**72**	**48**	**31**	**21**	**14**	**9**
Total		**All Products**	**87,165**	**87,696**	**88,529**	**89,610**	**91,480**	**93,714**	**93,783**	**94,023**	**94,417**	**93,544**
Total	**Southbound**	**All Products**	**32,779**	**32,603**	**32,643**	**32,829**	**33,594**	**35,632**	**35,426**	**35,334**	**35,340**	**34,022**
Total	**Northbound**	**All Products**	**54,387**	**55,093**	**55,885**	**56,781**	**57,887**	**58,082**	**58,357**	**58,689**	**59,077**	**59,523**
Five Year Growth Rates %		**All Products**			**0.76**					**0.45**		
Five Year Growth Rates %	**Southbound**	**All Products**			**-0.40**					**0.25**		
Five Year Growth Rates %	**Northbound**	**All Products**			**1.47**					**0.56**		

Appendix A Dry Bulk Potential Canal Trade Forecast (000 tons) at Zero Tolls, Existing Canal, Most Probable Case

Origin	Destination	Commodity	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Commodity Summary												
Ammonium phosphate (for phosphates)			7,602	7,549	7,504	7,467	7,435	7,436	7,462	7,502	7,559	7,640
Bauxite and Alumina			3,241	3,286	3,331	3,377	3,424	3,462	3,500	3,539	3,578	3,617
Cement			4,248	4,213	4,180	4,149	4,119	4,082	4,048	4,017	3,988	3,963
Copper concentrates			3,039	3,048	3,060	3,074	3,089	3,077	3,071	3,070	3,073	3,081
Iron Metal			184	181	179	178	177	159	162	164	167	169
Iron Ore			1,305	1,326	1,348	1,370	1,393	1,393	1,393	1,393	1,393	1,393
Lumber			9,068	9,325	9,591	9,865	10,149	10,389	10,636	10,890	11,152	11,422
Metallurgical coke			3,955	3,924	3,894	3,864	3,834	3,795	3,757	3,719	3,682	3,644
Misc. Fertilisers			2,649	2,697	2,756	2,825	2,907	5,026	4,772	4,544	4,339	2,738
Misc. metals			404	414	425	436	477	489	502	515	528	542
Misc. Ores			1,901	1,918	1,939	1,966	2,006	2,024	2,045	2,070	2,099	2,132
Paper			1,687	1,730	1,774	1,820	1,867	1,905	1,943	1,983	2,023	2,065
Petroleum coke			5,250	5,304	5,359	5,415	5,472	5,527	5,584	5,641	5,699	5,758
Primary aluminium			388	397	407	419	867	883	899	917	936	957
Pulp			3,323	3,316	3,309	3,304	3,298	3,275	3,253	3,232	3,211	3,191
Refined Copper			3,721	3,840	3,964	4,095	4,231	4,358	4,489	4,624	4,763	4,907
Salt			3,129	3,085	3,041	2,997	2,955	2,949	2,953	2,966	2,990	3,025
Semi-finished & finished products of steel			14,063	13,817	13,747	13,784	13,889	13,696	13,588	13,537	13,526	13,547
Soda ash (for sodium compounds)			2,664	2,887	3,151	3,466	3,845	3,880	3,919	3,961	4,008	4,058
Sodium nitrate (for nitrates)			508	518	528	538	549	561	574	587	600	614
Steel scrap			1,372	1,395	1,418	1,442	1,467	1,486	1,506	1,527	1,549	1,572
Sugar			2,697	2,770	2,847	2,929	3,017	2,966	2,920	2,880	2,845	2,815
Sulphur			1,847	1,895	1,945	1,997	2,050	2,050	2,050	2,050	2,050	2,050
Thermal and Metallurgical Coal			5,186	5,065	4,954	4,852	4,831	4,745	4,672	4,606	4,545	4,490
Urea (for ammonium compounds)			1,173	1,204	1,243	1,291	1,350	1,271	1,202	1,143	1,092	1,050
Zinc concentrates			2,409	2,438	2,477	2,531	2,605	2,646	2,695	2,751	2,815	2,890
Zinc Metal			154	155	157	158	177	182	188	195	204	215
Total			**87,165**	**87,696**	**88,529**	**89,610**	**91,480**	**93,714**	**93,783**	**94,023**	**94,417**	**93,544**

Appendix B

CARGO ALLOCATION BY ROUTE AND DWT SIZE RANGE, EXISTING CANAL AND EXPANDED CANAL, MOST PROBABLE CASE

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North America East	North America West	Greater or equal to 30,000–Less than 40,000	2.0	1.9	1.7	1.7	1.5	1.4
North America East	North America West	Greater or equal to 40,000–Less than 50,000	63.0	65.6	68.3	69.9	71.8	73.1
North America East	North America West	Greater or equal to 60,000–Less than 70,000	35.0	32.6	30.0	28.4	26.7	25.5
North America East	Central America West	Less or equal to 10,000	2.1	1.8	1.5	1.4	1.1	1.0
North America East	Central America West	Greater or equal to 20,000–Less than 25,000	6.3	5.4	4.8	4.1	4.0	3.7
North America East	Central America West	Greater or equal to 30,000–Less than 40,000	19.9	18.8	17.2	16.5	14.9	14.1
North America East	Central America West	Greater or equal to 40,000–Less than 50,000	71.7	74.0	76.5	78.1	79.9	81.2
North America East	South America West	Greater than 10,000–Less than 15,000	12.9	13.7	14.1	14.8	14.7	14.9
North America East	South America West	Greater or equal to 25,000–Less than 30,000	15.8	14.5	13.8	12.6	12.7	12.3
North America East	South America West	Greater or equal to 30,000–Less than 40,000	44.0	42.9	40.8	40.0	37.8	36.6
North America East	South America West	Greater or equal to 40,000–Less than 50,000	27.3	29.0	31.3	32.6	34.8	36.2
North America East	Oceania	Greater or equal to 30,000–Less than 40,000	62.1	60.1	57.1	55.5	52.5	50.7
North America East	Oceania	Greater or equal to 40,000–Less than 50,000	37.9	39.9	42.9	44.5	47.5	49.3
North America East	Far East	Greater or equal to 15,000–Less than 20,000	0.2	0.1	0.1	0.1	0.1	0.1
North America East	Far East	Greater or equal to 25,000–Less than 30,000	5.7	5.0	4.6	4.1	4.0	3.7
North America East	Far East	Greater or equal to 30,000–Less than 40,000	5.6	5.3	4.9	4.7	4.2	4.0
North America East	Far East	Greater or equal to 40,000–Less than 50,000	62.2	64.0	66.0	67.3	68.8	69.8
North America East	Far East	Greater or equal to 50,000–Less than 60,000	3.1	3.1	3.1	3.1	3.1	3.1
North America East	Far East	Greater or equal to 60,000–Less than 70,000	17.4	16.0	14.6	13.8	12.8	12.2
North America East	Far East	Greater or equal to 70,000–Less than 80,000	5.9	6.4	6.7	6.9	6.9	7.0
North America Gulf	North America West	Greater or equal to 40,000–Less than 50,000	100.0	100.0	100.0	100.0	100.0	100.0
North America Gulf	Central America West	Less or equal to 10,000	7.6	7.3	6.7	6.4	5.7	5.3
North America Gulf	Central America West	Greater than 10,000–Less than 15,000	4.9	5.5	6.0	6.6	6.7	7.1
North America Gulf	Central America West	Greater or equal to 15,000–Less than 20,000	14.8	15.8	16.2	17.4	17.1	17.6
North America Gulf	Central America West	Greater or equal to 20,000–Less than 25,000	17.7	16.4	16.1	14.6	15.4	15.0
North America Gulf	Central America West	Greater or equal to 25,000–Less than 30,000	25.4	24.6	24.7	23.7	24.6	24.5
North America Gulf	Central America West	Greater or equal to 30,000–Less than 40,000	29.5	30.4	30.3	31.3	30.5	30.5
North America Gulf	South America West	Less or equal to 10,000	4.0	3.7	3.3	3.1	2.6	2.3
North America Gulf	South America West	Greater than 10,000–Less than 15,000	11.0	12.0	12.3	13.3	13.0	13.3
North America Gulf	South America West	Greater or equal to 15,000–Less than 20,000	7.8	8.1	8.0	8.3	7.8	7.7
North America Gulf	South America West	Greater or equal to 20,000–Less than 25,000	16.9	15.2	14.3	12.6	12.7	12.0
North America Gulf	South America West	Greater or equal to 25,000–Less than 30,000	32.3	30.4	29.1	27.3	27.0	26.1
North America Gulf	South America West	Greater or equal to 40,000–Less than 50,000	28.0	30.5	33.0	35.3	37.0	38.6
North America Gulf	Oceania	Greater or equal to 15,000–Less than 20,000	2.1	2.1	1.9	1.9	1.8	1.7
North America Gulf	Oceania	Greater or equal to 20,000–Less than 25,000	2.1	1.8	1.6	1.4	1.3	1.2
North America Gulf	Oceania	Greater or equal to 25,000–Less than 30,000	4.9	4.3	3.9	3.5	3.4	3.2
North America Gulf	Oceania	Greater or equal to 30,000–Less than 40,000	13.4	12.6	11.4	10.9	9.8	9.2
North America Gulf	Oceania	Greater or equal to 40,000–Less than 50,000	77.4	79.2	81.1	82.4	83.8	84.7
North America Gulf	Far East	Greater or equal to 15,000–Less than 20,000	0.5	0.5	0.5	0.5	0.5	0.5
North America Gulf	Far East	Greater or equal to 20,000–Less than 25,000	0.5	0.4	0.4	0.3	0.3	0.3
North America Gulf	Far East	Greater or equal to 25,000–Less than 30,000	7.3	6.6	6.2	5.6	5.5	5.2
North America Gulf	Far East	Greater or equal to 30,000–Less than 40,000	2.1	2.1	1.9	1.9	1.7	1.6
North America Gulf	Far East	Greater or equal to 40,000–Less than 50,000	36.5	38.4	40.4	41.8	43.3	44.5
North America Gulf	Far East	Greater or equal to 50,000–Less than 60,000	9.2	9.4	9.7	9.9	10.0	10.1

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North America Gulf	Far East	Greater or equal to 60,000–Less than 70,000	35.4	33.2	31.0	29.6	28.1	27.0
North America Gulf	Far East	Greater or equal to 70,000–Less than 80,000	8.4	9.3	9.9	10.4	10.6	10.8
North America Gulf	South East Asia	Greater or equal to 15,000–Less than 20,000	11.1	11.1	10.7	10.8	10.1	9.9
North America Gulf	South East Asia	Greater or equal to 20,000–Less than 25,000	0.0	0.0	0.0	0.0	0.0	0.0
North America Gulf	South East Asia	Greater or equal to 25,000–Less than 30,000	18.9	17.2	16.1	14.7	14.4	13.8
North America Gulf	South East Asia	Greater or equal to 30,000–Less than 40,000	22.9	22.2	20.7	20.2	18.7	17.9
North America Gulf	South East Asia	Greater or equal to 40,000–Less than 50,000	47.0	49.5	52.4	54.3	56.8	58.4
Central America East	North America West	Greater or equal to 15,000–Less than 20,000	30.6	32.7	33.3	35.6	34.5	35.1
Central America East	North America West	Greater or equal to 25,000–Less than 30,000	69.4	67.3	66.7	64.4	65.5	64.9
Central America East	South America West	Greater than 10,000–Less than 15,000	21.6	25.1	26.8	30.9	30.2	31.9
Central America East	South America West	Greater or equal to 20,000–Less than 25,000	78.4	74.9	73.2	69.1	69.8	68.1
Central America East	Far East	Greater or equal to 15,000–Less than 20,000	3.8	4.1	4.1	4.4	4.3	4.3
Central America East	Far East	Greater or equal to 25,000–Less than 30,000	59.3	57.4	56.8	54.7	55.6	55.0
Central America East	Far East	Greater or equal to 30,000–Less than 40,000	30.1	31.0	30.6	31.5	30.1	29.9
Central America East	Far East	Greater or equal to 40,000–Less than 50,000	6.8	7.6	8.5	9.3	10.0	10.7
Central America East	South East Asia	Greater or equal to 20,000–Less than 25,000	100.0	100.0	100.0	100.0	100.0	100.0
South America East	North America West	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
South America East	North America West	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.5	0.4	0.4	0.3
South America East	North America West	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.7	5.4
South America East	North America West	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
South America East	North America West	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
South America East	North America West	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.9	7.9	8.0	8.1
South America East	North America West	Greater or equal to 60,000–Less than 70,000	13.4	12.1	11.0	10.4	9.8	9.4
South America East	North America West	Greater or equal to 70,000–Less than 80,000	54.8	58.3	60.9	62.7	63.9	65.0
South America East	Canada West	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
South America East	Canada West	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.5	0.4	0.4	0.3
South America East	Canada West	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.7	5.4
South America East	Canada West	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
South America East	Canada West	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
South America East	Canada West	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.9	7.9	8.0	8.1
South America East	Canada West	Greater or equal to 60,000–Less than 70,000	13.4	12.1	11.0	10.4	9.8	9.4
South America East	Canada West	Greater or equal to 70,000–Less than 80,000	54.8	58.3	60.9	62.7	63.9	65.0
South America East	Central America West	Less or equal to 10,000	0.2	0.2	0.2	0.2	0.2	0.1
South America East	Central America West	Greater than 10,000–Less than 15,000	0.3	0.3	0.4	0.4	0.4	0.4
South America East	Central America West	Greater or equal to 15,000–Less than 20,000	0.9	0.9	1.0	1.0	1.0	1.0
South America East	Central America West	Greater or equal to 20,000–Less than 25,000	5.5	5.1	4.9	4.4	4.6	4.4
South America East	Central America West	Greater or equal to 25,000–Less than 30,000	6.5	6.3	6.2	5.9	6.0	5.9
South America East	Central America West	Greater or equal to 30,000–Less than 40,000	6.2	6.4	6.3	6.4	6.1	6.1
South America East	Central America West	Greater or equal to 40,000–Less than 50,000	7.3	8.2	9.1	9.8	10.7	11.3
South America East	Central America West	Greater or equal to 60,000–Less than 70,000	73.0	72.6	71.9	71.9	71.1	70.8
South America East	South America West	Less or equal to 10,000	5.5	5.2	4.6	4.2	3.7	3.3
South America East	South America West	Greater than 10,000–Less than 15,000	4.1	4.5	4.6	5.0	4.9	5.1
South America East	South America West	Greater or equal to 15,000–Less than 20,000	7.8	8.2	8.1	8.4	8.0	8.0
South America East	South America West	Greater or equal to 20,000–Less than 25,000	15.4	13.8	13.1	11.5	11.8	11.2

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
South America East	South America West	Greater or equal to 25,000–Less than 30,000	7.6	7.1	6.9	6.5	6.5	6.3
South America East	South America West	Greater or equal to 30,000–Less than 40,000	22.2	22.2	21.4	21.4	20.2	19.8
South America East	South America West	Greater or equal to 40,000–Less than 50,000	24.4	26.5	29.0	30.9	33.0	34.7
South America East	South America West	Greater or equal to 60,000–Less than 70,000	13.0	12.6	12.3	12.1	11.8	11.6
South America East	Oceania	Greater or equal to 25,000–Less than 30,000	100.0	100.0	100.0	100.0	100.0	100.0
South America East	Far East	Greater or equal to 15,000–Less than 20,000	2.7	2.7	2.5	2.4	2.2	2.1
South America East	Far East	Greater or equal to 25,000–Less than 30,000	4.9	4.3	3.9	3.5	3.3	3.1
South America East	Far East	Greater or equal to 30,000–Less than 40,000	4.4	4.1	3.7	3.5	3.2	3.0
South America East	Far East	Greater or equal to 40,000–Less than 50,000	80.0	81.6	83.4	84.4	85.6	86.4
South America East	Far East	Greater or equal to 60,000–Less than 70,000	8.0	7.3	6.6	6.2	5.7	5.4
Argentina	China	Greater or equal to 15,000–Less than 20,000	8.1	8.6	8.6	9.1	8.7	8.8
Argentina	China	Greater or equal to 20,000–Less than 25,000	6.3	5.7	5.5	4.9	5.0	4.8
Argentina	China	Greater or equal to 25,000–Less than 30,000	45.4	43.4	42.4	40.4	40.6	39.8
Argentina	China	Greater or equal to 30,000–Less than 40,000	24.5	24.9	24.2	24.7	23.4	23.0
Argentina	China	Greater or equal to 40,000–Less than 50,000	15.7	17.4	19.2	20.9	22.2	23.6
Colombia East	Japan	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
Colombia East	Japan	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
Colombia East	Japan	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.5	3.3
Colombia East	Japan	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Brazil	WC USA	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
Brazil	WC USA	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.5	0.4	0.4	0.3
Brazil	WC USA	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.7	5.4
Brazil	WC USA	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
Brazil	WC USA	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
Brazil	WC USA	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.9	7.9	8.0	8.1
Brazil	WC USA	Greater or equal to 60,000–Less than 70,000	13.4	12.1	11.0	10.4	9.8	9.4
Brazil	WC USA	Greater or equal to 70,000–Less than 80,000	54.8	58.3	60.9	62.7	63.9	65.0
Brazil	Far East	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
Brazil	Far East	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
Brazil	Far East	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.5	3.3
Brazil	Far East	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Venezuela	WC USA	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
Venezuela	WC USA	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.5	0.4	0.4	0.3
Venezuela	WC USA	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.7	5.4
Venezuela	WC USA	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
Venezuela	WC USA	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
Venezuela	WC USA	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.9	7.9	8.0	8.1
Venezuela	WC USA	Greater or equal to 60,000–Less than 70,000	13.4	12.1	11.0	10.4	9.8	9.4
Venezuela	WC USA	Greater or equal to 70,000–Less than 80,000	54.8	58.3	60.9	62.7	63.9	65.0
Venezuela	China	Greater or equal to 15,000–Less than 20,000	8.1	8.6	8.6	9.1	8.7	8.8
Venezuela	China	Greater or equal to 20,000–Less than 25,000	6.3	5.7	5.5	4.9	5.0	4.8
Venezuela	China	Greater or equal to 25,000–Less than 30,000	45.4	43.4	42.4	40.4	40.6	39.8
Venezuela	China	Greater or equal to 30,000–Less than 40,000	24.5	24.9	24.2	24.7	23.4	23.0
Venezuela	China	Greater or equal to 40,000–Less than 50,000	15.7	17.4	19.2	20.9	22.2	23.6

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Venezuela	Japan	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
Venezuela	Japan	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
Venezuela	Japan	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.5	3.3
Venezuela	Japan	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Other EC S America	WC USA	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
Other EC S America	WC USA	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.5	0.4	0.4	0.3
Other EC S America	WC USA	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.7	5.4
Other EC S America	WC USA	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
Other EC S America	WC USA	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
Other EC S America	WC USA	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.9	7.9	8.0	8.1
Other EC S America	WC USA	Greater or equal to 60,000–Less than 70,000	13.4	12.1	11.0	10.4	9.8	9.4
Other EC S America	WC USA	Greater or equal to 70,000–Less than 80,000	54.8	58.3	60.9	62.7	63.9	65.0
North Brazil	China	Greater or equal to 15,000–Less than 20,000	8.1	8.6	8.6	9.1	8.7	8.8
North Brazil	China	Greater or equal to 20,000–Less than 25,000	6.3	5.7	5.5	4.9	5.0	4.8
North Brazil	China	Greater or equal to 25,000–Less than 30,000	45.4	43.4	42.4	40.4	40.6	39.8
North Brazil	China	Greater or equal to 30,000–Less than 40,000	24.5	24.9	24.2	24.7	23.4	23.0
North Brazil	China	Greater or equal to 40,000–Less than 50,000	15.7	17.4	19.2	20.9	22.2	23.6
North Brazil	Japan	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
North Brazil	Japan	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
North Brazil	Japan	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.5	3.3
North Brazil	Japan	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
South Brazil	Far East	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
South Brazil	Far East	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
South Brazil	Far East	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.5	3.3
South Brazil	Far East	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Caribbean	North America West	Greater or equal to 25,000–Less than 30,000	34.3	33.0	33.1	31.6	32.9	32.8
Caribbean	North America West	Greater or equal to 30,000–Less than 40,000	65.7	67.0	66.9	68.4	67.1	67.2
Caribbean	Central America West	Less or equal to 10,000	81.1	81.7	80.7	81.4	78.9	77.9
Caribbean	Central America West	Greater or equal to 20,000–Less than 25,000	18.9	18.3	19.3	18.6	21.1	22.1
Caribbean	South America West	Less or equal to 10,000	5.2	5.0	4.5	4.2	3.7	3.3
Caribbean	South America West	Greater than 10,000–Less than 15,000	27.1	30.1	31.7	34.8	34.7	36.0
Caribbean	South America West	Greater or equal to 25,000–Less than 30,000	67.7	65.0	63.9	61.0	61.6	60.6
Caribbean	Far East	Greater or equal to 30,000–Less than 40,000	88.6	87.8	86.3	85.6	84.0	83.0
Caribbean	Far East	Greater or equal to 40,000–Less than 50,000	11.4	12.2	13.7	14.4	16.0	17.0
Europe	North America West	Greater or equal to 15,000–Less than 20,000	8.4	8.4	7.9	8.0	7.3	7.1
Europe	North America West	Greater or equal to 25,000–Less than 30,000	19.7	17.7	16.4	14.8	14.4	13.6
Europe	North America West	Greater or equal to 30,000–Less than 40,000	12.3	11.8	10.8	10.5	9.6	9.1
Europe	North America West	Greater or equal to 40,000–Less than 50,000	59.6	62.1	64.9	66.8	68.7	70.2
Europe	WC USA	Greater or equal to 15,000–Less than 20,000	8.4	8.4	7.9	8.0	7.3	7.1
Europe	WC USA	Greater or equal to 25,000–Less than 30,000	19.7	17.7	16.4	14.8	14.4	13.6
Europe	WC USA	Greater or equal to 30,000–Less than 40,000	12.3	11.8	10.8	10.5	9.6	9.1
Europe	WC USA	Greater or equal to 40,000–Less than 50,000	59.6	62.1	64.9	66.8	68.7	70.2
Europe	Canada West	Greater or equal to 15,000–Less than 20,000	8.4	8.4	7.9	8.0	7.3	7.1
Europe	Canada West	Greater or equal to 25,000–Less than 30,000	19.7	17.7	16.4	14.8	14.4	13.6

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Europe	Canada West	Greater or equal to 30,000–Less than 40,000	12.3	11.8	10.8	10.5	9.6	9.1
Europe	Canada West	Greater or equal to 40,000–Less than 50,000	59.6	62.1	64.9	66.8	68.7	70.2
Europe	Central America West	Greater than 10,000–Less than 15,000	1.2	1.3	1.4	1.5	1.5	1.6
Europe	Central America West	Greater or equal to 15,000–Less than 20,000	3.1	3.3	3.3	3.4	3.3	3.3
Europe	Central America West	Greater or equal to 20,000–Less than 25,000	10.0	9.1	8.7	7.8	7.9	7.6
Europe	Central America West	Greater or equal to 25,000–Less than 30,000	34.8	33.1	32.2	30.6	30.7	30.0
Europe	Central America West	Greater or equal to 30,000–Less than 40,000	31.3	31.7	30.8	31.3	29.5	29.0
Europe	Central America West	Greater or equal to 40,000–Less than 50,000	17.0	18.8	20.6	22.3	23.8	25.1
Europe	Central America West	Greater or equal to 50,000–Less than 60,000	2.6	2.8	2.9	3.1	3.3	3.4
Europe	South America West	Greater than 10,000–Less than 15,000	0.3	0.4	0.4	0.5	0.4	0.5
Europe	South America West	Greater or equal to 15,000–Less than 20,000	2.3	2.5	2.6	2.8	2.7	2.7
Europe	South America West	Greater or equal to 20,000–Less than 25,000	14.4	13.5	13.1	12.1	12.3	11.9
Europe	South America West	Greater or equal to 25,000–Less than 30,000	58.2	57.0	56.5	55.2	55.4	54.9
Europe	South America West	Greater or equal to 30,000–Less than 40,000	16.4	17.1	16.9	17.7	16.7	16.6
Europe	South America West	Greater or equal to 40,000–Less than 50,000	8.3	9.5	10.6	11.8	12.5	13.4
Africa	North America West	Greater or equal to 20,000–Less than 25,000	12.0	10.1	8.9	7.5	7.2	6.6
Africa	North America West	Greater or equal to 30,000–Less than 40,000	0.9	0.9	0.8	0.8	0.7	0.6
Africa	North America West	Greater or equal to 40,000–Less than 50,000	87.0	89.0	90.3	91.7	92.1	92.8
Africa	Central America West	Greater or equal to 15,000–Less than 20,000	4.3	4.6	4.8	5.0	5.0	5.0
Africa	Central America West	Greater or equal to 20,000–Less than 25,000	10.0	9.2	9.1	8.1	8.5	8.3
Africa	Central America West	Greater or equal to 30,000–Less than 40,000	10.2	10.5	10.5	10.7	10.4	10.3
Africa	Central America West	Greater or equal to 60,000–Less than 70,000	75.5	75.6	75.7	76.1	76.1	76.4
Africa	Oceania	Greater or equal to 30,000–Less than 40,000	7.7	7.1	6.3	6.0	5.3	5.0
Africa	Oceania	Greater or equal to 40,000–Less than 50,000	92.3	92.9	93.7	94.0	94.7	95.0
Middle East	Central America West	Greater than 10,000–Less than 15,000	100.0	100.0	100.0	100.0	100.0	100.0
Middle East	South America West	Greater or equal to 20,000–Less than 25,000	100.0	100.0	100.0	100.0	100.0	100.0
North America West	North America East	Greater or equal to 20,000–Less than 25,000	7.8	7.7	7.8	7.6	7.6	6.9
North America West	North America East	Greater or equal to 25,000–Less than 30,000	25.8	26.8	28.7	29.7	30.9	29.7
North America West	North America East	Greater or equal to 30,000–Less than 40,000	34.0	28.5	17.4	12.0	-	-
North America West	North America East	Greater or equal to 40,000–Less than 50,000	32.4	37.0	46.1	50.7	61.5	63.4
North America West	North America Gulf	Greater or equal to 25,000–Less than 30,000	9.9	8.9	7.7	7.2	6.2	5.8
North America West	North America Gulf	Greater or equal to 40,000–Less than 50,000	33.6	33.3	33.3	33.0	33.2	33.1
North America West	North America Gulf	Greater or equal to 60,000–Less than 70,000	34.6	33.3	32.4	31.6	31.1	30.6
North America West	North America Gulf	Greater or equal to 70,000–Less than 80,000	21.9	24.4	26.7	28.2	29.5	30.5
North America West	Central America East	Greater or equal to 20,000–Less than 25,000	62.0	58.5	53.6	50.5	45.9	42.9
North America West	Central America East	Greater or equal to 40,000–Less than 50,000	38.0	41.5	46.4	49.5	54.1	57.1
North America West	South America East	Greater or equal to 20,000–Less than 25,000	11.3	11.4	12.3	12.3	13.1	11.9
North America West	South America East	Greater or equal to 25,000–Less than 30,000	19.1	20.3	23.0	24.5	27.0	26.1
North America West	South America East	Greater or equal to 30,000–Less than 40,000	43.2	37.2	24.0	17.0	-	-
North America West	South America East	Greater or equal to 40,000–Less than 50,000	26.4	31.0	40.7	46.1	59.9	61.9
North America West	Caribbean	Greater or equal to 30,000–Less than 40,000	71.0	64.3	46.8	35.6	-	-
North America West	Caribbean	Greater or equal to 40,000–Less than 50,000	29.0	35.7	53.2	64.4	100.0	100.0
North America West	Europe	Greater than 10,000–Less than 15,000	0.2	0.2	0.1	0.1	0.0	-
North America West	Europe	Greater or equal to 15,000–Less than 20,000	0.2	0.1	-	-	-	-

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North America West	Europe	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.1	0.1
North America West	Europe	Greater or equal to 25,000–Less than 30,000	2.9	2.6	2.3	2.1	1.9	1.7
North America West	Europe	Greater or equal to 30,000–Less than 40,000	3.3	2.4	1.2	0.7	-	-
North America West	Europe	Greater or equal to 40,000–Less than 50,000	21.1	20.9	21.1	20.9	21.2	21.0
North America West	Europe	Greater or equal to 50,000–Less than 60,000	3.9	3.7	3.3	3.2	2.9	2.7
North America West	Europe	Greater or equal to 60,000–Less than 70,000	41.6	40.1	39.2	38.3	37.8	37.1
North America West	Europe	Greater or equal to 70,000–Less than 80,000	25.8	28.9	31.8	33.6	35.3	36.4
North America West	Europe	Greater or equal to 80,000–Less than 90,000	0.8	0.8	0.9	0.9	0.9	0.9
North America West	Africa	Greater or equal to 30,000–Less than 40,000	5.2	3.8	1.9	1.2	-	-
North America West	Africa	Greater or equal to 40,000–Less than 50,000	37.4	37.7	38.7	38.7	39.6	39.5
North America West	Africa	Greater or equal to 50,000–Less than 60,000	12.5	12.0	10.9	10.8	9.8	9.4
North America West	Africa	Greater or equal to 60,000–Less than 70,000	29.2	28.6	28.5	28.0	28.1	27.7
North America West	Africa	Greater or equal to 70,000–Less than 80,000	15.6	17.8	19.9	21.2	22.6	23.4
North America West	Middle East	Greater or equal to 60,000–Less than 70,000	85.3	83.3	81.7	80.4	79.4	78.6
North America West	Middle East	Greater or equal to 70,000–Less than 80,000	14.7	16.7	18.3	19.6	20.6	21.4
Canada West	South America East	Greater or equal to 60,000–Less than 70,000	5.2	4.5	4.1	3.7	3.5	3.4
Canada West	South America East	Greater or equal to 70,000–Less than 80,000	94.8	95.5	95.9	96.3	96.5	96.6
Canada West	Europe	Greater or equal to 30,000–Less than 40,000	0.6	0.4	0.2	0.1	-	-
Canada West	Europe	Greater or equal to 40,000–Less than 50,000	3.8	3.6	3.5	3.4	3.3	3.3
Canada West	Europe	Greater or equal to 50,000–Less than 60,000	1.7	1.5	1.3	1.2	1.1	1.0
Canada West	Europe	Greater or equal to 60,000–Less than 70,000	41.8	38.6	36.2	34.5	33.2	32.2
Canada West	Europe	Greater or equal to 70,000–Less than 80,000	52.1	55.9	58.8	60.8	62.3	63.5
Canada West	South Africa	Greater or equal to 70,000–Less than 80,000	100.0	100.0	100.0	100.0	100.0	100.0
Canada West	North Africa	Greater or equal to 60,000–Less than 70,000	100.0	100.0	100.0	100.0	100.0	100.0
Central America West	North America East	Less or equal to 10,000	1.5	-	-	-	-	-
Central America West	North America East	Greater or equal to 15,000–Less than 20,000	1.2	0.6	-	-	-	-
Central America West	North America East	Greater or equal to 20,000–Less than 25,000	2.8	2.6	2.3	2.1	1.9	1.7
Central America West	North America East	Greater or equal to 25,000–Less than 30,000	12.6	12.2	11.4	11.1	10.2	9.6
Central America West	North America East	Greater or equal to 30,000–Less than 40,000	14.8	11.5	6.2	4.0	-	-
Central America West	North America East	Greater or equal to 40,000–Less than 50,000	47.0	51.6	56.7	58.5	62.3	62.8
Central America West	North America East	Greater or equal to 60,000–Less than 70,000	15.9	16.5	17.5	17.7	18.4	18.3
Central America West	North America East	Greater or equal to 70,000–Less than 80,000	4.2	5.0	6.0	6.6	7.2	7.6
Central America West	North America Gulf	Less or equal to 10,000	0.3	-	-	-	-	-
Central America West	North America Gulf	Greater than 10,000–Less than 15,000	2.4	2.2	1.5	1.4	0.2	-
Central America West	North America Gulf	Greater or equal to 20,000–Less than 25,000	7.2	7.2	7.6	7.4	7.7	6.9
Central America West	North America Gulf	Greater or equal to 25,000–Less than 30,000	8.8	9.3	10.2	10.7	11.5	11.0
Central America West	North America Gulf	Greater or equal to 30,000–Less than 40,000	41.7	35.4	22.3	15.5	-	-
Central America West	North America Gulf	Greater or equal to 40,000–Less than 50,000	35.2	41.1	52.9	58.8	73.9	75.5
Central America West	North America Gulf	Greater or equal to 50,000–Less than 60,000	4.4	4.9	5.5	6.1	6.7	6.6
Central America West	Central America East	Greater than 10,000–Less than 15,000	11.6	11.9	11.0	12.1	3.7	-
Central America West	Central America East	Greater or equal to 20,000–Less than 25,000	19.8	22.1	31.1	36.9	75.2	75.4
Central America West	Central America East	Greater or equal to 25,000–Less than 30,000	3.2	3.8	5.5	7.0	14.8	15.7
Central America West	Central America East	Greater or equal to 30,000–Less than 40,000	65.4	62.2	52.3	44.0	-	-
Central America West	Central America East	Greater or equal to 40,000–Less than 50,000	-	-	-	-	6.2	8.8

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Central America West	South America East	Less or equal to 10,000	5.4	-	-	-	-	-
Central America West	South America East	Greater or equal to 15,000–Less than 20,000	23.2	16.3	-	-	-	-
Central America West	South America East	Greater or equal to 20,000–Less than 25,000	0.8	1.0	1.5	1.7	2.9	2.6
Central America West	South America East	Greater or equal to 25,000–Less than 30,000	4.2	5.4	8.6	10.7	18.9	17.9
Central America West	South America East	Greater or equal to 30,000–Less than 40,000	66.4	69.6	63.1	52.3	-	-
Central America West	South America East	Greater or equal to 40,000–Less than 50,000	-	7.7	26.8	35.3	78.2	79.4
Central America West	Caribbean	Less or equal to 10,000	4.3	-	-	-	-	-
Central America West	Caribbean	Greater or equal to 25,000–Less than 30,000	2.4	2.1	1.8	1.7	1.5	1.4
Central America West	Caribbean	Greater or equal to 40,000–Less than 50,000	20.1	23.9	24.0	23.7	24.0	23.9
Central America West	Caribbean	Greater or equal to 50,000–Less than 60,000	22.0	20.6	18.4	17.9	16.0	15.4
Central America West	Caribbean	Greater or equal to 60,000–Less than 70,000	23.7	22.7	22.1	21.4	21.2	20.9
Central America West	Caribbean	Greater or equal to 70,000–Less than 80,000	27.6	30.7	33.6	35.3	37.3	38.5
Central America West	Europe	Greater or equal to 15,000–Less than 20,000	1.8	1.0	-	-	-	-
Central America West	Europe	Greater or equal to 20,000–Less than 25,000	10.1	9.6	9.0	8.4	7.8	7.2
Central America West	Europe	Greater or equal to 25,000–Less than 30,000	38.6	38.6	38.2	38.0	36.7	35.6
Central America West	Europe	Greater or equal to 30,000–Less than 40,000	12.0	9.7	5.5	3.6	-	-
Central America West	Europe	Greater or equal to 40,000–Less than 50,000	33.9	37.3	43.5	45.9	51.4	53.3
Central America West	Europe	Greater or equal to 50,000–Less than 60,000	3.6	3.8	3.9	4.1	4.0	4.0
Central America West	Africa	Greater or equal to 30,000–Less than 40,000	100.0	100.0	100.0	100.0	-	-
Central America West	Africa	Greater or equal to 40,000–Less than 50,000	-	-	-	-	100.0	100.0
South America West	North America East	Greater than 10,000–Less than 15,000	1.7	1.5	0.9	0.8	0.1	-
South America West	North America East	Greater or equal to 15,000–Less than 20,000	2.0	1.1	-	-	-	-
South America West	North America East	Greater or equal to 20,000–Less than 25,000	5.7	5.4	5.2	4.8	4.5	4.0
South America West	North America East	Greater or equal to 25,000–Less than 30,000	13.5	13.5	13.5	13.4	13.0	12.3
South America West	North America East	Greater or equal to 30,000–Less than 40,000	25.0	20.3	11.6	7.7	-	-
South America West	North America East	Greater or equal to 40,000–Less than 50,000	35.5	39.2	46.1	48.7	54.7	55.3
South America West	North America East	Greater or equal to 60,000–Less than 70,000	9.3	10.0	11.3	11.7	12.8	12.7
South America West	North America East	Greater or equal to 70,000–Less than 80,000	7.2	9.0	11.5	12.9	15.0	15.7
South America West	North America Gulf	Greater than 10,000–Less than 15,000	1.7	1.5	1.0	0.9	0.1	-
South America West	North America Gulf	Greater or equal to 15,000–Less than 20,000	2.3	1.3	-	-	-	-
South America West	North America Gulf	Greater or equal to 20,000–Less than 25,000	8.8	8.7	8.8	8.5	8.4	7.6
South America West	North America Gulf	Greater or equal to 25,000–Less than 30,000	21.8	22.7	24.2	24.8	25.7	24.6
South America West	North America Gulf	Greater or equal to 30,000–Less than 40,000	30.9	25.9	15.8	10.8	-	-
South America West	North America Gulf	Greater or equal to 40,000–Less than 50,000	17.8	20.4	26.0	28.3	34.4	35.4
South America West	North America Gulf	Greater or equal to 50,000–Less than 60,000	5.1	5.6	6.2	6.7	7.0	7.0
South America West	North America Gulf	Greater or equal to 60,000–Less than 70,000	5.6	6.2	7.5	8.0	9.3	9.5
South America West	North America Gulf	Greater or equal to 70,000–Less than 80,000	6.0	7.7	10.4	12.1	15.0	16.0
South America West	Central America East	Greater or equal to 15,000–Less than 20,000	6.9	4.0	-	-	-	-
South America West	Central America East	Greater or equal to 20,000–Less than 25,000	25.1	25.9	27.6	27.3	28.3	27.1
South America West	Central America East	Greater or equal to 25,000–Less than 30,000	49.4	53.7	59.8	63.0	68.1	69.0
South America West	Central America East	Greater or equal to 30,000–Less than 40,000	18.6	16.3	10.4	7.3	-	-
South America West	Central America East	Greater or equal to 40,000–Less than 50,000	-	-	2.2	2.4	3.6	3.9
South America West	South America East	Less or equal to 10,000	2.2	-	-	-	-	-
South America West	South America East	Greater than 10,000–Less than 15,000	3.0	2.7	1.8	1.6	0.2	-

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
South America West	South America East	Greater or equal to 20,000–Less than 25,000	15.8	15.5	15.6	15.2	15.3	14.6
South America West	South America East	Greater or equal to 25,000–Less than 30,000	67.2	69.4	73.5	75.8	80.0	80.5
South America West	South America East	Greater or equal to 30,000–Less than 40,000	11.8	9.9	5.9	4.1	-	-
South America West	South America East	Greater or equal to 40,000–Less than 50,000	-	2.5	3.1	3.4	4.4	4.9
South America West	Caribbean	Less or equal to 10,000	1.4	-	-	-	-	-
South America West	Caribbean	Greater or equal to 20,000–Less than 25,000	5.2	4.6	3.9	3.5	3.0	2.6
South America West	Caribbean	Greater or equal to 25,000–Less than 30,000	1.3	1.2	1.0	1.0	0.9	0.8
South America West	Caribbean	Greater or equal to 40,000–Less than 50,000	15.8	17.5	18.1	18.2	18.7	18.9
South America West	Caribbean	Greater or equal to 50,000–Less than 60,000	13.5	13.1	12.0	12.0	10.9	10.6
South America West	Caribbean	Greater or equal to 60,000–Less than 70,000	54.7	54.2	54.4	53.9	54.3	54.1
South America West	Caribbean	Greater or equal to 70,000–Less than 80,000	8.2	9.4	10.6	11.4	12.3	12.8
South America West	Europe	Less or equal to 10,000	0.4	-	-	-	-	-
South America West	Europe	Greater or equal to 15,000–Less than 20,000	5.5	3.2	-	-	-	-
South America West	Europe	Greater or equal to 20,000–Less than 25,000	7.5	7.7	8.1	7.9	8.0	7.4
South America West	Europe	Greater or equal to 25,000–Less than 30,000	29.1	31.2	34.6	36.0	38.2	36.9
South America West	Europe	Greater or equal to 30,000–Less than 40,000	33.3	28.9	18.2	12.7	-	-
South America West	Europe	Greater or equal to 40,000–Less than 50,000	24.2	29.1	39.2	43.4	53.8	55.7
South America West	Africa	Greater or equal to 15,000–Less than 20,000	60.6	48.2	-	-	-	-
South America West	Africa	Greater or equal to 20,000–Less than 25,000	15.2	21.2	31.3	31.2	32.5	30.2
South America West	Africa	Greater or equal to 25,000–Less than 30,000	6.0	8.9	13.7	14.6	15.8	15.5
South America West	Africa	Greater or equal to 30,000–Less than 40,000	18.2	21.6	19.0	13.5	-	-
South America West	Africa	Greater or equal to 40,000–Less than 50,000	-	-	36.0	40.7	51.7	54.3
South America West	Middle East	Greater or equal to 15,000–Less than 20,000	14.5	8.8	-	-	-	-
South America West	Middle East	Greater or equal to 20,000–Less than 25,000	85.5	91.2	95.3	94.8	93.8	93.0
South America West	Middle East	Greater or equal to 40,000–Less than 50,000	-	-	4.7	5.2	6.2	7.0
Chile	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	8.0	4.6	-	-	-	-
Chile	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	17.7	18.7	20.5	20.7	21.3	19.6
Chile	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	45.5	38.8	24.3	16.3	-	-
Chile	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	-	-	2.4	2.6	4.2	4.1
Chile	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	28.9	37.9	52.8	60.4	74.5	76.2
Chile	Caribbean	Greater or equal to 40,000–Less than 50,000	17.8	17.6	17.6	17.4	17.4	17.3
Chile	Caribbean	Greater or equal to 50,000–Less than 60,000	9.1	8.5	7.5	7.4	6.5	6.3
Chile	Caribbean	Greater or equal to 60,000–Less than 70,000	48.2	46.1	44.7	43.4	42.7	42.0
Chile	Caribbean	Greater or equal to 70,000–Less than 80,000	25.0	27.8	30.2	31.8	33.3	34.4
Chile	Europe	Less or equal to 10,000	0.4	-	-	-	-	-
Chile	Europe	Greater or equal to 15,000–Less than 20,000	5.5	3.2	-	-	-	-
Chile	Europe	Greater or equal to 20,000–Less than 25,000	7.5	7.7	8.1	7.9	8.0	7.4
Chile	Europe	Greater or equal to 25,000–Less than 30,000	29.1	31.2	34.6	36.0	38.2	36.9
Chile	Europe	Greater or equal to 30,000–Less than 40,000	33.3	28.9	18.2	12.7	-	-
Chile	Europe	Greater or equal to 40,000–Less than 50,000	24.2	29.1	39.2	43.4	53.8	55.7
Peru	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	8.0	4.6	-	-	-	-
Peru	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	17.7	18.7	20.5	20.7	21.3	19.6
Peru	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	45.5	38.8	24.3	16.3	-	-
Peru	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	-	-	2.4	2.6	4.2	4.1

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Peru	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	28.9	37.9	52.8	60.4	74.5	76.2
Peru	Caribbean	Greater or equal to 40,000–Less than 50,000	17.8	17.6	17.6	17.4	17.4	17.3
Peru	Caribbean	Greater or equal to 50,000–Less than 60,000	9.1	8.5	7.5	7.4	6.5	6.3
Peru	Caribbean	Greater or equal to 60,000–Less than 70,000	48.2	46.1	44.7	43.4	42.7	42.0
Peru	Caribbean	Greater or equal to 70,000–Less than 80,000	25.0	27.8	30.2	31.8	33.3	34.4
Peru	Europe	Less or equal to 10,000	0.4	-	-	-	-	-
Peru	Europe	Greater or equal to 15,000–Less than 20,000	5.5	3.2	-	-	-	-
Peru	Europe	Greater or equal to 20,000–Less than 25,000	7.5	7.7	8.1	7.9	8.0	7.4
Peru	Europe	Greater or equal to 25,000–Less than 30,000	29.1	31.2	34.6	36.0	38.2	36.9
Peru	Europe	Greater or equal to 30,000–Less than 40,000	33.3	28.9	18.2	12.7	-	-
Peru	Europe	Greater or equal to 40,000–Less than 50,000	24.2	29.1	39.2	43.4	53.8	55.7
Oceania	North America East	Greater or equal to 25,000–Less than 30,000	21.1	21.0	21.1	20.9	20.5	19.3
Oceania	North America East	Greater or equal to 30,000–Less than 40,000	30.1	24.1	13.8	9.1	-	-
Oceania	North America East	Greater or equal to 40,000–Less than 50,000	26.3	28.7	33.7	35.5	40.7	40.9
Oceania	North America East	Greater or equal to 50,000–Less than 60,000	8.5	8.8	9.2	9.6	9.6	9.3
Oceania	North America East	Greater or equal to 70,000–Less than 80,000	14.0	17.3	22.2	24.9	29.3	30.5
Oceania	North America Gulf	Greater or equal to 15,000–Less than 20,000	1.7	0.9	-	-	-	-
Oceania	North America Gulf	Greater or equal to 20,000–Less than 25,000	11.0	10.7	10.6	10.1	9.7	8.7
Oceania	North America Gulf	Greater or equal to 25,000–Less than 30,000	5.1	5.3	5.5	5.6	5.5	5.2
Oceania	North America Gulf	Greater or equal to 30,000–Less than 40,000	32.8	27.2	16.1	10.9	-	-
Oceania	North America Gulf	Greater or equal to 40,000–Less than 50,000	49.4	55.8	67.9	73.4	84.8	86.1
Oceania	Central America East	Greater or equal to 15,000–Less than 20,000	2.1	1.1	-	-	-	-
Oceania	Central America East	Greater or equal to 20,000–Less than 25,000	3.7	3.4	2.9	2.6	2.3	2.0
Oceania	Central America East	Greater or equal to 25,000–Less than 30,000	9.9	9.4	8.5	8.2	7.4	6.9
Oceania	Central America East	Greater or equal to 30,000–Less than 40,000	7.7	5.9	3.1	2.0	-	-
Oceania	Central America East	Greater or equal to 40,000–Less than 50,000	76.6	80.2	85.5	87.2	90.4	91.0
Oceania	Caribbean	Greater or equal to 15,000–Less than 20,000	17.0	10.4	-	-	-	-
Oceania	Caribbean	Greater or equal to 20,000–Less than 25,000	38.8	41.7	44.7	43.8	44.0	42.4
Oceania	Caribbean	Greater or equal to 25,000–Less than 30,000	34.8	39.3	44.2	46.1	48.2	49.1
Oceania	Caribbean	Greater or equal to 30,000–Less than 40,000	9.5	8.6	5.5	3.8	-	-
Oceania	Caribbean	Greater or equal to 40,000–Less than 50,000	-	-	5.6	6.2	7.8	8.5
Oceania	Middle East	Greater or equal to 25,000–Less than 30,000	100.0	100.0	100.0	100.0	100.0	100.0
Far East	North America East	Greater or equal to 15,000–Less than 20,000	2.2	1.2	-	-	-	-
Far East	North America East	Greater or equal to 20,000–Less than 25,000	0.5	0.5	0.4	0.4	0.3	0.3
Far East	North America East	Greater or equal to 25,000–Less than 30,000	23.6	23.1	22.3	21.7	20.4	19.1
Far East	North America East	Greater or equal to 30,000–Less than 40,000	20.6	16.3	8.9	5.8	-	-
Far East	North America East	Greater or equal to 40,000–Less than 50,000	17.0	18.3	21.1	21.8	24.0	24.1
Far East	North America East	Greater or equal to 50,000–Less than 60,000	1.0	1.0	1.0	1.1	1.0	1.0
Far East	North America East	Greater or equal to 60,000–Less than 70,000	17.1	17.8	19.5	19.8	21.0	20.8
Far East	North America East	Greater or equal to 70,000–Less than 80,000	18.0	21.8	26.8	29.5	33.3	34.7
Far East	North America Gulf	Greater or equal to 15,000–Less than 20,000	0.1	0.0	-	-	-	-
Far East	North America Gulf	Greater or equal to 20,000–Less than 25,000	0.8	0.7	0.6	0.6	0.5	0.4
Far East	North America Gulf	Greater or equal to 25,000–Less than 30,000	9.6	9.0	8.2	7.8	7.1	6.6
Far East	North America Gulf	Greater or equal to 30,000–Less than 40,000	11.6	8.8	4.6	2.9	-	-

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Far East	North America Gulf	Greater or equal to 40,000–Less than 50,000	32.3	33.3	35.4	35.9	37.6	37.6
Far East	North America Gulf	Greater or equal to 50,000–Less than 60,000	6.0	5.9	5.5	5.5	5.1	4.9
Far East	North America Gulf	Greater or equal to 60,000–Less than 70,000	24.6	24.7	25.4	25.4	25.9	25.6
Far East	North America Gulf	Greater or equal to 70,000–Less than 80,000	15.1	17.6	20.3	22.0	23.9	24.8
Far East	Canada East	Greater or equal to 15,000–Less than 20,000	2.9	1.4	-	-	-	-
Far East	Canada East	Greater or equal to 20,000–Less than 25,000	2.0	1.7	1.5	1.3	1.1	0.9
Far East	Canada East	Greater or equal to 25,000–Less than 30,000	16.9	15.5	13.7	12.8	11.3	10.4
Far East	Canada East	Greater or equal to 30,000–Less than 40,000	9.8	7.2	3.6	2.3	-	-
Far East	Canada East	Greater or equal to 40,000–Less than 50,000	10.5	10.6	11.5	11.4	11.8	11.6
Far East	Canada East	Greater or equal to 60,000–Less than 70,000	15.1	14.8	14.8	14.4	14.4	14.0
Far East	Canada East	Greater or equal to 70,000–Less than 80,000	42.9	48.8	54.9	57.9	61.5	63.0
Far East	Central America East	Greater or equal to 20,000–Less than 25,000	3.6	3.4	3.3	3.1	2.9	2.6
Far East	Central America East	Greater or equal to 25,000–Less than 30,000	26.6	26.6	26.7	26.6	26.0	24.6
Far East	Central America East	Greater or equal to 30,000–Less than 40,000	27.6	22.2	12.7	8.4	-	-
Far East	Central America East	Greater or equal to 40,000–Less than 50,000	23.6	25.9	30.3	32.0	36.7	37.1
Far East	Central America East	Greater or equal to 50,000–Less than 60,000	1.5	1.6	1.7	1.7	1.7	1.7
Far East	Central America East	Greater or equal to 60,000–Less than 70,000	4.5	4.8	5.4	5.6	6.2	6.2
Far East	Central America East	Greater or equal to 70,000–Less than 80,000	12.6	15.6	19.9	22.5	26.4	27.7
Far East	South America East	Greater or equal to 15,000–Less than 20,000	1.8	1.0	-	-	-	-
Far East	South America East	Greater or equal to 20,000–Less than 25,000	35.2	32.6	28.9	26.6	23.5	21.5
Far East	South America East	Greater or equal to 25,000–Less than 30,000	8.4	8.2	7.7	7.5	6.9	6.7
Far East	South America East	Greater or equal to 30,000–Less than 40,000	0.7	0.6	0.3	0.2	-	-
Far East	South America East	Greater or equal to 40,000–Less than 50,000	53.8	57.7	63.1	65.7	69.6	71.9
Far East	Caribbean	Greater or equal to 25,000–Less than 30,000	65.7	67.1	69.7	71.0	72.6	71.3
Far East	Caribbean	Greater or equal to 30,000–Less than 40,000	18.7	15.4	9.1	6.2	-	-
Far East	Caribbean	Greater or equal to 40,000–Less than 50,000	15.5	17.4	21.1	22.8	27.4	28.7
South East Asia	North America East	Greater or equal to 25,000–Less than 30,000	22.4	22.3	22.2	22.2	21.5	20.4
South East Asia	North America East	Greater or equal to 30,000–Less than 40,000	25.0	20.1	11.4	7.6	-	-
South East Asia	North America East	Greater or equal to 40,000–Less than 50,000	49.3	54.1	62.8	66.5	74.8	76.0
South East Asia	North America East	Greater or equal to 50,000–Less than 60,000	3.3	3.4	3.5	3.7	3.7	3.6
South East Asia	North America Gulf	Greater or equal to 20,000–Less than 25,000	0.1	0.1	0.1	0.1	0.1	0.1
South East Asia	North America Gulf	Greater or equal to 25,000–Less than 30,000	14.5	14.0	13.2	12.8	11.9	11.3
South East Asia	North America Gulf	Greater or equal to 30,000–Less than 40,000	14.9	11.6	6.2	4.0	-	-
South East Asia	North America Gulf	Greater or equal to 40,000–Less than 50,000	61.1	64.8	71.2	73.6	79.0	79.9
South East Asia	North America Gulf	Greater or equal to 50,000–Less than 60,000	9.4	9.5	9.3	9.5	9.0	8.8
South East Asia	South America East	Greater or equal to 15,000–Less than 20,000	34.1	21.9	-	-	-	-
South East Asia	South America East	Greater or equal to 25,000–Less than 30,000	65.9	78.1	88.1	87.4	85.8	84.9
South East Asia	South America East	Greater or equal to 40,000–Less than 50,000	-	-	11.9	12.6	14.2	15.1
China	North Atlantic United States	Greater or equal to 20,000–Less than 25,000	2.4	2.1	1.8	1.6	1.4	1.2
China	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	12.8	11.9	10.7	10.1	9.1	8.5
China	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	13.6	10.2	5.2	3.3	-	-
China	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	11.9	12.1	12.7	12.7	13.4	13.3
China	North Atlantic United States	Greater or equal to 50,000–Less than 60,000	7.1	6.9	6.5	6.4	5.9	5.7
China	North Atlantic United States	Greater or equal to 60,000–Less than 70,000	17.9	17.6	18.0	17.8	18.1	17.7

Table B-1. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Existing Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
China	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	34.2	39.2	45.0	48.1	52.1	53.6
Taiwan	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	98.9	98.5	96.9	95.2	-	-
Taiwan	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	1.1	1.5	3.1	4.8	100.0	100.0
Japan	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	2.9	1.4	-	-	-	-
Japan	North Atlantic United States	Greater or equal to 20,000–Less than 25,000	2.0	1.7	1.5	1.3	1.1	0.9
Japan	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	16.9	15.5	13.7	12.8	11.3	10.4
Japan	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	9.8	7.2	3.6	2.3	-	-
Japan	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	10.5	10.6	11.5	11.4	11.8	11.6
Japan	North Atlantic United States	Greater or equal to 60,000–Less than 70,000	15.1	14.8	14.8	14.4	14.4	14.0
Japan	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	42.9	48.8	54.9	57.9	61.5	63.0
South Korea	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	2.6	1.6	-	-	-	-
South Korea	North Atlantic United States	Greater or equal to 20,000–Less than 25,000	4.4	4.7	5.4	5.6	6.5	5.9
South Korea	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	19.7	21.9	26.6	29.4	35.4	34.1
South Korea	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	53.8	48.2	33.4	24.6	-	-
South Korea	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	19.4	23.7	34.5	40.5	58.1	60.0

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North America East	North America West	Greater or equal to 30,000–Less than 40,000	2.0	1.9	1.7	1.7	1.5	1.4
North America East	North America West	Greater or equal to 40,000–Less than 50,000	63.0	65.6	67.7	69.1	70.9	72.1
North America East	North America West	Greater or equal to 60,000–Less than 70,000	35.0	32.6	6.7	3.6	1.9	0.9
North America East	North America West	Greater or equal to 70,000–Less than 80,000	-	-	21.9	21.1	18.2	13.4
North America East	North America West	Greater or equal to 80,000–Less than 90,000	-	-	1.4	3.5	6.5	11.0
North America East	North America West	Greater or equal to 90,000–Less than 100,000	-	-	0.6	0.9	1.1	1.3
North America East	Central America West	Less or equal to 10,000	2.1	1.8	1.5	1.4	1.1	1.0
North America East	Central America West	Greater or equal to 20,000–Less than 25,000	6.3	5.4	4.8	4.1	4.0	3.7
North America East	Central America West	Greater or equal to 30,000–Less than 40,000	19.9	18.8	17.2	16.5	15.0	14.1
North America East	Central America West	Greater or equal to 40,000–Less than 50,000	71.7	74.0	76.5	78.1	79.9	81.2
North America East	South America West	Greater than 10,000–Less than 15,000	12.9	13.7	14.1	14.8	14.7	14.9
North America East	South America West	Greater or equal to 25,000–Less than 30,000	15.8	14.5	13.8	12.6	12.7	12.2
North America East	South America West	Greater or equal to 30,000–Less than 40,000	44.0	42.9	40.8	40.0	37.8	36.6
North America East	South America West	Greater or equal to 40,000–Less than 50,000	27.3	29.0	31.3	32.6	34.8	36.2
North America East	Oceania	Greater or equal to 30,000–Less than 40,000	62.1	60.1	57.1	55.6	52.6	50.8
North America East	Oceania	Greater or equal to 40,000–Less than 50,000	37.9	39.9	42.9	44.4	47.4	49.2
North America East	Far East	Greater or equal to 15,000–Less than 20,000	0.2	0.1	0.1	0.1	0.1	0.1
North America East	Far East	Greater or equal to 25,000–Less than 30,000	5.7	5.0	4.6	4.1	3.9	3.7
North America East	Far East	Greater or equal to 30,000–Less than 40,000	5.6	5.3	4.8	4.6	4.2	4.0
North America East	Far East	Greater or equal to 40,000–Less than 50,000	62.2	64.0	65.8	67.0	68.4	69.4
North America East	Far East	Greater or equal to 50,000–Less than 60,000	3.1	3.1	3.1	3.1	3.1	3.1
North America East	Far East	Greater or equal to 60,000–Less than 70,000	17.4	16.0	4.7	2.6	1.4	0.6
North America East	Far East	Greater or equal to 70,000–Less than 80,000	5.9	6.4	15.4	15.2	13.4	10.0
North America East	Far East	Greater or equal to 80,000–Less than 90,000	-	-	1.0	2.6	4.8	8.2
North America East	Far East	Greater or equal to 90,000–Less than 100,000	-	-	0.4	0.7	0.8	0.9
Canada East	Japan	Greater or equal to 150,000–Less than 170,000	-	-	-	-	100.0	100.0
Canada East	South Korea	Greater or equal to 150,000–Less than 170,000	-	-	-	-	100.0	100.0
North America Gulf	North America West	Greater or equal to 40,000–Less than 50,000	100.0	100.0	100.0	100.0	100.0	100.0
North America Gulf	Central America West	Less or equal to 10,000	7.6	7.3	6.7	6.4	5.7	5.3
North America Gulf	Central America West	Greater than 10,000–Less than 15,000	4.9	5.5	6.0	6.6	6.7	7.1
North America Gulf	Central America West	Greater or equal to 15,000–Less than 20,000	14.8	15.8	16.3	17.4	17.2	17.6
North America Gulf	Central America West	Greater or equal to 20,000–Less than 25,000	17.7	16.4	16.1	14.5	15.3	14.9
North America Gulf	Central America West	Greater or equal to 25,000–Less than 30,000	25.4	24.6	24.6	23.7	24.5	24.5
North America Gulf	Central America West	Greater or equal to 30,000–Less than 40,000	29.5	30.4	30.4	31.4	30.5	30.6
North America Gulf	South America West	Less or equal to 10,000	4.0	3.7	3.3	3.1	2.6	2.3
North America Gulf	South America West	Greater than 10,000–Less than 15,000	11.0	12.0	12.4	13.4	13.0	13.3
North America Gulf	South America West	Greater or equal to 15,000–Less than 20,000	7.8	8.1	8.0	8.3	7.8	7.8
North America Gulf	South America West	Greater or equal to 20,000–Less than 25,000	16.9	15.2	14.3	12.6	12.6	11.9
North America Gulf	South America West	Greater or equal to 25,000–Less than 30,000	32.3	30.4	29.1	27.3	26.9	26.0
North America Gulf	South America West	Greater or equal to 40,000–Less than 50,000	28.0	30.5	33.0	35.4	37.0	38.6
North America Gulf	Oceania	Greater or equal to 15,000–Less than 20,000	2.1	2.1	2.0	1.9	1.8	1.7
North America Gulf	Oceania	Greater or equal to 20,000–Less than 25,000	2.1	1.8	1.6	1.3	1.3	1.2
North America Gulf	Oceania	Greater or equal to 25,000–Less than 30,000	4.9	4.3	3.9	3.5	3.4	3.1
North America Gulf	Oceania	Greater or equal to 30,000–Less than 40,000	13.4	12.6	11.4	10.9	9.8	9.2

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North America Gulf	Oceania	Greater or equal to 40,000–Less than 50,000	77.4	79.2	81.1	82.3	83.8	84.7
North America Gulf	Far East	Greater or equal to 15,000–Less than 20,000	0.5	0.5	0.5	0.5	0.5	0.5
North America Gulf	Far East	Greater or equal to 20,000–Less than 25,000	0.5	0.4	0.4	0.3	0.3	0.3
North America Gulf	Far East	Greater or equal to 25,000–Less than 30,000	7.3	6.6	6.1	5.5	5.4	5.1
North America Gulf	Far East	Greater or equal to 30,000–Less than 40,000	2.1	2.1	1.9	1.8	1.7	1.6
North America Gulf	Far East	Greater or equal to 40,000–Less than 50,000	36.5	38.4	40.1	41.3	42.8	43.8
North America Gulf	Far East	Greater or equal to 50,000–Less than 60,000	9.2	9.4	9.6	9.7	9.8	9.9
North America Gulf	Far East	Greater or equal to 60,000–Less than 70,000	35.4	33.2	9.1	5.1	2.7	1.2
North America Gulf	Far East	Greater or equal to 70,000–Less than 80,000	8.4	9.3	29.7	29.5	26.0	19.6
North America Gulf	Far East	Greater or equal to 80,000–Less than 90,000	-	-	1.9	4.9	9.3	16.1
North America Gulf	Far East	Greater or equal to 90,000–Less than 100,000	-	-	0.8	1.3	1.5	1.9
North America Gulf	South East Asia	Greater or equal to 15,000–Less than 20,000	11.1	11.1	10.7	10.8	10.1	9.9
North America Gulf	South East Asia	Greater or equal to 20,000–Less than 25,000	0.0	0.0	0.0	0.0	0.0	0.0
North America Gulf	South East Asia	Greater or equal to 25,000–Less than 30,000	18.9	17.2	16.1	14.6	14.4	13.7
North America Gulf	South East Asia	Greater or equal to 30,000–Less than 40,000	22.9	22.2	20.7	20.2	18.7	17.9
North America Gulf	South East Asia	Greater or equal to 40,000–Less than 50,000	47.0	49.5	52.4	54.3	56.7	58.4
Central America East	North America West	Greater or equal to 15,000–Less than 20,000	30.6	32.7	33.3	35.7	34.6	35.2
Central America East	North America West	Greater or equal to 25,000–Less than 30,000	69.4	67.3	66.7	64.3	65.4	64.8
Central America East	South America West	Greater than 10,000–Less than 15,000	21.6	25.1	26.9	31.0	30.4	32.1
Central America East	South America West	Greater or equal to 20,000–Less than 25,000	78.4	74.9	73.1	69.0	69.6	67.9
Central America East	Far East	Greater or equal to 15,000–Less than 20,000	3.8	4.1	4.1	4.4	4.3	4.4
Central America East	Far East	Greater or equal to 25,000–Less than 30,000	59.3	57.4	56.8	54.6	55.5	54.9
Central America East	Far East	Greater or equal to 30,000–Less than 40,000	30.1	31.0	30.6	31.6	30.2	30.0
Central America East	Far East	Greater or equal to 40,000–Less than 50,000	6.8	7.6	8.5	9.3	10.0	10.7
Central America East	South East Asia	Greater or equal to 20,000–Less than 25,000	100.0	100.0	100.0	100.0	100.0	100.0
South America East	North America West	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
South America East	North America West	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.4	0.4	0.4	0.3
South America East	North America West	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.6	5.3
South America East	North America West	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
South America East	North America West	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
South America East	North America West	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.8	7.8	8.0	8.0
South America East	North America West	Greater or equal to 60,000–Less than 70,000	13.4	12.1	15.7	9.1	5.0	2.4
South America East	North America West	Greater or equal to 70,000–Less than 80,000	54.8	58.3	51.5	52.9	48.7	37.6
South America East	North America West	Greater or equal to 80,000–Less than 90,000	-	-	3.3	8.9	17.4	30.9
South America East	North America West	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
South America East	Canada West	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
South America East	Canada West	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.4	0.4	0.4	0.3
South America East	Canada West	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.6	5.3
South America East	Canada West	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
South America East	Canada West	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
South America East	Canada West	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.8	7.8	8.0	8.0
South America East	Canada West	Greater or equal to 60,000–Less than 70,000	13.4	12.1	15.7	9.1	5.0	2.4
South America East	Canada West	Greater or equal to 70,000–Less than 80,000	54.8	58.3	51.5	52.9	48.7	37.6
South America East	Canada West	Greater or equal to 80,000–Less than 90,000	-	-	3.3	8.9	17.4	30.9

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
South America East	Canada West	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
South America East	Central America West	Less or equal to 10,000	0.2	0.2	0.2	0.2	0.2	0.1
South America East	Central America West	Greater than 10,000–Less than 15,000	0.3	0.3	0.4	0.4	0.4	0.4
South America East	Central America West	Greater or equal to 15,000–Less than 20,000	0.9	0.9	0.9	1.0	1.0	1.0
South America East	Central America West	Greater or equal to 20,000–Less than 25,000	5.5	5.1	4.8	4.3	4.4	4.2
South America East	Central America West	Greater or equal to 25,000–Less than 30,000	6.5	6.3	6.1	5.7	5.8	5.7
South America East	Central America West	Greater or equal to 30,000–Less than 40,000	6.2	6.4	6.2	6.2	6.0	5.9
South America East	Central America West	Greater or equal to 40,000–Less than 50,000	7.3	8.2	8.9	9.6	10.3	10.9
South America East	Central America West	Greater or equal to 60,000–Less than 70,000	73.0	72.6	15.8	9.1	4.8	2.3
South America East	Central America West	Greater or equal to 70,000–Less than 80,000	-	-	51.8	52.5	47.5	36.3
South America East	Central America West	Greater or equal to 80,000–Less than 90,000	-	-	3.3	8.8	17.0	29.8
South America East	Central America West	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.2	2.7	3.4
South America East	South America West	Less or equal to 10,000	5.5	5.2	4.6	4.2	3.7	3.3
South America East	South America West	Greater than 10,000–Less than 15,000	4.1	4.5	4.6	4.9	4.9	5.0
South America East	South America West	Greater or equal to 15,000–Less than 20,000	7.8	8.2	8.1	8.4	8.0	8.0
South America East	South America West	Greater or equal to 20,000–Less than 25,000	15.4	13.8	13.0	11.4	11.7	11.1
South America East	South America West	Greater or equal to 25,000–Less than 30,000	7.6	7.1	6.9	6.4	6.5	6.3
South America East	South America West	Greater or equal to 30,000–Less than 40,000	22.2	22.2	21.3	21.3	20.2	19.7
South America East	South America West	Greater or equal to 40,000–Less than 50,000	24.4	26.5	28.9	30.8	32.8	34.5
South America East	South America West	Greater or equal to 60,000–Less than 70,000	13.0	12.6	2.7	1.6	0.8	0.4
South America East	South America West	Greater or equal to 70,000–Less than 80,000	-	-	9.0	9.0	8.1	6.1
South America East	South America West	Greater or equal to 80,000–Less than 90,000	-	-	0.6	1.5	2.9	5.0
South America East	South America West	Greater or equal to 90,000–Less than 100,000	-	-	0.3	0.4	0.5	0.6
South America East	Oceania	Greater or equal to 25,000–Less than 30,000	100.0	100.0	100.0	100.0	100.0	100.0
South America East	Far East	Greater or equal to 15,000–Less than 20,000	2.7	2.7	2.5	2.4	2.2	2.1
South America East	Far East	Greater or equal to 25,000–Less than 30,000	4.9	4.3	3.9	3.4	3.3	3.1
South America East	Far East	Greater or equal to 30,000–Less than 40,000	4.4	4.1	3.7	3.5	3.2	3.0
South America East	Far East	Greater or equal to 40,000–Less than 50,000	80.0	81.6	83.2	84.2	85.4	86.2
South America East	Far East	Greater or equal to 60,000–Less than 70,000	8.0	7.3	1.5	0.8	0.4	0.2
South America East	Far East	Greater or equal to 70,000–Less than 80,000	-	-	4.8	4.6	3.9	2.9
South America East	Far East	Greater or equal to 80,000–Less than 90,000	-	-	0.3	0.8	1.4	2.4
South America East	Far East	Greater or equal to 90,000–Less than 100,000	-	-	0.1	0.2	0.2	0.3
Argentina	China	Greater or equal to 15,000–Less than 20,000	8.1	8.6	8.6	9.1	8.8	8.8
Argentina	China	Greater or equal to 20,000–Less than 25,000	6.3	5.7	5.5	4.9	5.0	4.8
Argentina	China	Greater or equal to 25,000–Less than 30,000	45.4	43.4	42.4	40.3	40.6	39.7
Argentina	China	Greater or equal to 30,000–Less than 40,000	24.5	24.9	24.3	24.8	23.4	23.1
Argentina	China	Greater or equal to 40,000–Less than 50,000	15.7	17.4	19.2	20.9	22.3	23.6
Colombia East	Japan	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
Colombia East	Japan	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
Colombia East	Japan	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.6	3.3
Colombia East	Japan	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Brazil	WC USA	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
Brazil	WC USA	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.4	0.4	0.4	0.3
Brazil	WC USA	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.6	5.3

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Brazil	WC USA	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
Brazil	WC USA	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
Brazil	WC USA	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.8	7.8	8.0	8.0
Brazil	WC USA	Greater or equal to 60,000–Less than 70,000	13.4	12.1	15.7	9.1	5.0	2.4
Brazil	WC USA	Greater or equal to 70,000–Less than 80,000	54.8	58.3	51.5	52.9	48.7	37.6
Brazil	WC USA	Greater or equal to 80,000–Less than 90,000	-	-	3.3	8.9	17.4	30.9
Brazil	WC USA	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
Brazil	Far East	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
Brazil	Far East	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
Brazil	Far East	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.6	3.3
Brazil	Far East	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Venezuela	WC USA	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
Venezuela	WC USA	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.4	0.4	0.4	0.3
Venezuela	WC USA	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.6	5.3
Venezuela	WC USA	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
Venezuela	WC USA	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
Venezuela	WC USA	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.8	7.8	8.0	8.0
Venezuela	WC USA	Greater or equal to 60,000–Less than 70,000	13.4	12.1	15.7	9.1	5.0	2.4
Venezuela	WC USA	Greater or equal to 70,000–Less than 80,000	54.8	58.3	51.5	52.9	48.7	37.6
Venezuela	WC USA	Greater or equal to 80,000–Less than 90,000	-	-	3.3	8.9	17.4	30.9
Venezuela	WC USA	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
Venezuela	China	Greater or equal to 15,000–Less than 20,000	8.1	8.6	8.6	9.1	8.8	8.8
Venezuela	China	Greater or equal to 20,000–Less than 25,000	6.3	5.7	5.5	4.9	5.0	4.8
Venezuela	China	Greater or equal to 25,000–Less than 30,000	45.4	43.4	42.4	40.3	40.6	39.7
Venezuela	China	Greater or equal to 30,000–Less than 40,000	24.5	24.9	24.3	24.8	23.4	23.1
Venezuela	China	Greater or equal to 40,000–Less than 50,000	15.7	17.4	19.2	20.9	22.3	23.6
Venezuela	Japan	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
Venezuela	Japan	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
Venezuela	Japan	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.6	3.3
Venezuela	Japan	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Other EC S America	WC USA	Greater than 10,000–Less than 15,000	1.5	1.5	1.5	1.5	1.5	1.5
Other EC S America	WC USA	Greater or equal to 20,000–Less than 25,000	0.6	0.5	0.4	0.4	0.4	0.3
Other EC S America	WC USA	Greater or equal to 25,000–Less than 30,000	8.2	7.1	6.5	5.8	5.6	5.3
Other EC S America	WC USA	Greater or equal to 30,000–Less than 40,000	11.4	10.5	9.6	9.1	8.4	8.0
Other EC S America	WC USA	Greater or equal to 40,000–Less than 50,000	2.1	2.1	2.2	2.2	2.3	2.3
Other EC S America	WC USA	Greater or equal to 50,000–Less than 60,000	8.0	7.8	7.8	7.8	8.0	8.0
Other EC S America	WC USA	Greater or equal to 60,000–Less than 70,000	13.4	12.1	15.7	9.1	5.0	2.4
Other EC S America	WC USA	Greater or equal to 70,000–Less than 80,000	54.8	58.3	51.5	52.9	48.7	37.6
Other EC S America	WC USA	Greater or equal to 80,000–Less than 90,000	-	-	3.3	8.9	17.4	30.9
Other EC S America	WC USA	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
North Brazil	China	Greater or equal to 15,000–Less than 20,000	8.1	8.6	8.6	9.1	8.8	8.8
North Brazil	China	Greater or equal to 20,000–Less than 25,000	6.3	5.7	5.5	4.9	5.0	4.8
North Brazil	China	Greater or equal to 25,000–Less than 30,000	45.4	43.4	42.4	40.3	40.6	39.7
North Brazil	China	Greater or equal to 30,000–Less than 40,000	24.5	24.9	24.3	24.8	23.4	23.1

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North Brazil	China	Greater or equal to 40,000–Less than 50,000	15.7	17.4	19.2	20.9	22.3	23.6
North Brazil	Japan	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
North Brazil	Japan	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
North Brazil	Japan	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.6	3.3
North Brazil	Japan	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
South Brazil	Far East	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.2	0.2
South Brazil	Far East	Greater or equal to 25,000–Less than 30,000	7.5	6.6	5.9	5.2	5.0	4.6
South Brazil	Far East	Greater or equal to 30,000–Less than 40,000	5.0	4.7	4.2	4.0	3.6	3.3
South Brazil	Far East	Greater or equal to 40,000–Less than 50,000	87.2	88.5	89.7	90.6	91.3	91.9
Venezuela (by pass)	Taiwan	Greater or equal to 120,000–Less than 150,000	-	-	36.0	36.0	36.0	36.0
Venezuela (by pass)	Taiwan	Greater or equal to 150,000–Less than 170,000	-	-	64.0	64.0	64.0	64.0
Venezuela (by pass)	China	Greater or equal to 120,000–Less than 150,000	-	-	-	-	100.0	100.0
Venezuela (by pass)	Japan	Greater or equal to 120,000–Less than 150,000	-	-	-	-	36.0	36.0
Venezuela (by pass)	Japan	Greater or equal to 150,000–Less than 170,000	-	-	-	-	64.0	64.0
Venezuela (by pass)	South Korea	Greater or equal to 120,000–Less than 150,000	-	-	-	-	36.0	36.0
Venezuela (by pass)	South Korea	Greater or equal to 150,000–Less than 170,000	-	-	-	-	64.0	64.0
Caribbean	North America West	Greater or equal to 25,000–Less than 30,000	34.3	33.0	33.0	31.5	32.8	32.7
Caribbean	North America West	Greater or equal to 30,000–Less than 40,000	65.7	67.0	67.0	68.5	67.2	67.3
Caribbean	Central America West	Less or equal to 10,000	81.1	81.7	80.7	81.5	79.0	78.0
Caribbean	Central America West	Greater or equal to 20,000–Less than 25,000	18.9	18.3	19.3	18.5	21.0	22.0
Caribbean	South America West	Less or equal to 10,000	5.2	5.0	4.5	4.2	3.7	3.4
Caribbean	South America West	Greater than 10,000–Less than 15,000	27.1	30.1	31.7	34.8	34.8	36.1
Caribbean	South America West	Greater or equal to 25,000–Less than 30,000	67.7	65.0	63.8	60.9	61.5	60.5
Caribbean	Far East	Greater or equal to 30,000–Less than 40,000	88.6	87.8	86.4	85.6	84.1	83.1
Caribbean	Far East	Greater or equal to 40,000–Less than 50,000	11.4	12.2	13.6	14.4	15.9	16.9
Europe	North America West	Greater or equal to 15,000–Less than 20,000	8.4	8.4	7.9	8.0	7.4	7.1
Europe	North America West	Greater or equal to 25,000–Less than 30,000	19.7	17.7	16.4	14.8	14.3	13.5
Europe	North America West	Greater or equal to 30,000–Less than 40,000	12.3	11.8	10.8	10.5	9.6	9.1
Europe	North America West	Greater or equal to 40,000–Less than 50,000	59.6	62.1	64.9	66.8	68.7	70.2
Europe	WC USA	Greater or equal to 15,000–Less than 20,000	8.4	8.4	7.9	8.0	7.4	7.1
Europe	WC USA	Greater or equal to 25,000–Less than 30,000	19.7	17.7	16.4	14.8	14.3	13.5
Europe	WC USA	Greater or equal to 30,000–Less than 40,000	12.3	11.8	10.8	10.5	9.6	9.1
Europe	WC USA	Greater or equal to 40,000–Less than 50,000	59.6	62.1	64.9	66.8	68.7	70.2
Europe	Canada West	Greater or equal to 15,000–Less than 20,000	8.4	8.4	7.9	8.0	7.4	7.1
Europe	Canada West	Greater or equal to 25,000–Less than 30,000	19.7	17.7	16.4	14.8	14.3	13.5
Europe	Canada West	Greater or equal to 30,000–Less than 40,000	12.3	11.8	10.8	10.5	9.6	9.1
Europe	Canada West	Greater or equal to 40,000–Less than 50,000	59.6	62.1	64.9	66.8	68.7	70.2
Europe	Central America West	Greater than 10,000–Less than 15,000	1.2	1.3	1.4	1.5	1.5	1.6
Europe	Central America West	Greater or equal to 15,000–Less than 20,000	3.1	3.3	3.3	3.4	3.3	3.3
Europe	Central America West	Greater or equal to 20,000–Less than 25,000	10.0	9.1	8.7	7.7	7.9	7.6
Europe	Central America West	Greater or equal to 25,000–Less than 30,000	34.8	33.1	32.2	30.5	30.7	30.0
Europe	Central America West	Greater or equal to 30,000–Less than 40,000	31.3	31.7	30.8	31.3	29.6	29.1
Europe	Central America West	Greater or equal to 40,000–Less than 50,000	17.0	18.8	20.7	22.3	23.8	25.1
Europe	Central America West	Greater or equal to 50,000–Less than 60,000	2.6	2.8	2.9	3.1	3.3	3.4

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Europe	South America West	Greater than 10,000–Less than 15,000	0.3	0.4	0.4	0.5	0.4	0.5
Europe	South America West	Greater or equal to 15,000–Less than 20,000	2.3	2.5	2.6	2.8	2.7	2.7
Europe	South America West	Greater or equal to 20,000–Less than 25,000	14.4	13.5	13.1	12.0	12.3	11.9
Europe	South America West	Greater or equal to 25,000–Less than 30,000	58.2	57.0	56.5	55.2	55.3	54.8
Europe	South America West	Greater or equal to 30,000–Less than 40,000	16.4	17.1	16.9	17.7	16.7	16.6
Europe	South America West	Greater or equal to 40,000–Less than 50,000	8.3	9.5	10.6	11.8	12.6	13.4
Africa	North America West	Greater or equal to 20,000–Less than 25,000	12.0	10.1	8.9	7.5	7.2	6.6
Africa	North America West	Greater or equal to 30,000–Less than 40,000	0.9	0.9	0.8	0.8	0.7	0.6
Africa	North America West	Greater or equal to 40,000–Less than 50,000	87.0	89.0	90.3	91.8	92.1	92.8
Africa	Central America West	Greater or equal to 15,000–Less than 20,000	4.3	4.6	4.7	4.9	4.8	4.8
Africa	Central America West	Greater or equal to 20,000–Less than 25,000	10.0	9.2	8.9	7.9	8.2	7.9
Africa	Central America West	Greater or equal to 30,000–Less than 40,000	10.2	10.5	10.3	10.4	10.1	9.9
Africa	Central America West	Greater or equal to 60,000–Less than 70,000	75.5	75.6	16.7	9.6	5.2	2.5
Africa	Central America West	Greater or equal to 70,000–Less than 80,000	-	-	54.5	55.5	50.7	39.0
Africa	Central America West	Greater or equal to 80,000–Less than 90,000	-	-	3.5	9.3	18.1	32.1
Africa	Central America West	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.4	2.9	3.7
Africa	Oceania	Greater or equal to 30,000–Less than 40,000	7.7	7.1	6.3	6.0	5.3	5.0
Africa	Oceania	Greater or equal to 40,000–Less than 50,000	92.3	92.9	93.7	94.0	94.7	95.0
Middle East	Central America West	Greater than 10,000–Less than 15,000	100.0	100.0	100.0	100.0	100.0	100.0
Middle East	South America West	Greater or equal to 20,000–Less than 25,000	100.0	100.0	100.0	100.0	100.0	100.0
North America West	North America East	Greater or equal to 20,000–Less than 25,000	7.8	7.7	7.8	7.6	7.6	6.9
North America West	North America East	Greater or equal to 25,000–Less than 30,000	25.8	26.8	28.7	29.7	30.9	29.7
North America West	North America East	Greater or equal to 30,000–Less than 40,000	34.0	28.5	17.4	12.0	-	-
North America West	North America East	Greater or equal to 40,000–Less than 50,000	32.4	37.0	46.1	50.7	61.5	63.3
North America West	North America Gulf	Greater or equal to 25,000–Less than 30,000	9.9	8.9	7.9	7.5	6.6	6.2
North America West	North America Gulf	Greater or equal to 40,000–Less than 50,000	33.6	33.3	34.5	34.6	35.1	35.2
North America West	North America Gulf	Greater or equal to 60,000–Less than 70,000	34.6	33.3	12.6	7.2	3.9	1.9
North America West	North America Gulf	Greater or equal to 70,000–Less than 80,000	21.9	24.4	41.2	41.9	38.5	29.6
North America West	North America Gulf	Greater or equal to 80,000–Less than 90,000	-	-	2.6	7.0	13.7	24.3
North America West	North America Gulf	Greater or equal to 90,000–Less than 100,000	-	-	1.2	1.8	2.2	2.8
North America West	Central America East	Greater or equal to 20,000–Less than 25,000	62.0	58.5	53.6	50.5	45.9	42.9
North America West	Central America East	Greater or equal to 40,000–Less than 50,000	38.0	41.5	46.4	49.5	54.1	57.1
North America West	South America East	Greater or equal to 20,000–Less than 25,000	11.3	11.4	12.3	12.3	13.1	11.9
North America West	South America East	Greater or equal to 25,000–Less than 30,000	19.1	20.3	23.0	24.5	27.0	26.1
North America West	South America East	Greater or equal to 30,000–Less than 40,000	43.2	37.2	24.0	17.0	-	-
North America West	South America East	Greater or equal to 40,000–Less than 50,000	26.4	31.0	40.7	46.1	59.9	61.9
North America West	Caribbean	Greater or equal to 30,000–Less than 40,000	71.0	64.3	46.8	35.6	-	-
North America West	Caribbean	Greater or equal to 40,000–Less than 50,000	29.0	35.7	53.2	64.4	100.0	100.0
North America West	Europe	Greater than 10,000–Less than 15,000	0.2	0.2	0.1	0.1	0.0	-
North America West	Europe	Greater or equal to 15,000–Less than 20,000	0.2	0.1	-	-	-	-
North America West	Europe	Greater or equal to 20,000–Less than 25,000	0.3	0.2	0.2	0.2	0.1	0.1
North America West	Europe	Greater or equal to 25,000–Less than 30,000	2.9	2.6	2.4	2.3	2.0	1.9
North America West	Europe	Greater or equal to 30,000–Less than 40,000	3.3	2.4	1.2	0.8	-	-
North America West	Europe	Greater or equal to 40,000–Less than 50,000	21.1	20.9	22.0	22.1	22.6	22.7

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
North America West	Europe	Greater or equal to 50,000–Less than 60,000	3.9	3.7	3.4	3.4	3.1	3.0
North America West	Europe	Greater or equal to 60,000–Less than 70,000	41.6	40.1	15.4	8.9	4.9	2.3
North America West	Europe	Greater or equal to 70,000–Less than 80,000	25.8	28.9	50.6	51.5	47.6	36.5
North America West	Europe	Greater or equal to 80,000–Less than 90,000	0.8	0.8	3.2	8.6	17.0	30.0
North America West	Europe	Greater or equal to 90,000–Less than 100,000	-	-	1.4	2.2	2.8	3.5
North America West	Africa	Greater or equal to 30,000–Less than 40,000	5.2	3.8	2.0	1.3	-	-
North America West	Africa	Greater or equal to 40,000–Less than 50,000	37.4	37.7	39.9	40.3	41.6	41.8
North America West	Africa	Greater or equal to 50,000–Less than 60,000	12.5	12.0	11.3	11.3	10.3	10.0
North America West	Africa	Greater or equal to 60,000–Less than 70,000	29.2	28.6	10.2	5.9	3.2	1.5
North America West	Africa	Greater or equal to 70,000–Less than 80,000	15.6	17.8	33.5	34.1	31.7	24.3
North America West	Africa	Greater or equal to 80,000–Less than 90,000	-	-	2.1	5.7	11.3	20.0
North America West	Africa	Greater or equal to 90,000–Less than 100,000	-	-	0.9	1.5	1.8	2.3
North America West	Middle East	Greater or equal to 60,000–Less than 70,000	85.3	83.3	21.9	12.5	6.7	3.2
North America West	Middle East	Greater or equal to 70,000–Less than 80,000	14.7	16.7	71.6	72.3	65.9	50.5
North America West	Middle East	Greater or equal to 80,000–Less than 90,000	-	-	4.6	12.1	23.5	41.5
North America West	Middle East	Greater or equal to 90,000–Less than 100,000	-	-	2.0	3.1	3.8	4.8
Canada West	South America East	Greater or equal to 60,000–Less than 70,000	5.2	4.5	21.9	12.5	6.7	3.2
Canada West	South America East	Greater or equal to 70,000–Less than 80,000	94.8	95.5	71.6	72.3	65.9	50.5
Canada West	South America East	Greater or equal to 80,000–Less than 90,000	-	-	4.6	12.1	23.5	41.5
Canada West	South America East	Greater or equal to 90,000–Less than 100,000	-	-	2.0	3.1	3.8	4.8
Canada West	Europe	Greater or equal to 30,000–Less than 40,000	0.6	0.4	0.2	0.1	-	-
Canada West	Europe	Greater or equal to 40,000–Less than 50,000	3.8	3.6	3.6	3.5	3.5	3.5
Canada West	Europe	Greater or equal to 50,000–Less than 60,000	1.7	1.5	1.4	1.3	1.2	1.1
Canada West	Europe	Greater or equal to 60,000–Less than 70,000	41.8	38.6	20.7	11.9	6.4	3.1
Canada West	Europe	Greater or equal to 70,000–Less than 80,000	52.1	55.9	67.8	68.7	62.8	48.2
Canada West	Europe	Greater or equal to 80,000–Less than 90,000	-	-	4.3	11.5	22.4	39.6
Canada West	Europe	Greater or equal to 90,000–Less than 100,000	-	-	1.9	2.9	3.6	4.6
Canada West	South Africa	Greater or equal to 60,000–Less than 70,000	-	-	21.9	12.5	6.7	3.2
Canada West	South Africa	Greater or equal to 70,000–Less than 80,000	100.0	100.0	71.6	72.3	65.9	50.5
Canada West	South Africa	Greater or equal to 80,000–Less than 90,000	-	-	4.6	12.1	23.5	41.5
Canada West	South Africa	Greater or equal to 90,000–Less than 100,000	-	-	2.0	3.1	3.8	4.8
Canada West	North Africa	Greater or equal to 60,000–Less than 70,000	100.0	100.0	21.9	12.5	6.7	3.2
Canada West	North Africa	Greater or equal to 70,000–Less than 80,000	-	-	71.6	72.3	65.9	50.5
Canada West	North Africa	Greater or equal to 80,000–Less than 90,000	-	-	4.6	12.1	23.5	41.5
Canada West	North Africa	Greater or equal to 90,000–Less than 100,000	-	-	2.0	3.1	3.8	4.8
West Coast Canada (by pass	South America East	Greater or equal to 120,000–Less than 150,000	-	-	29.0	29.0	29.0	29.0
West Coast Canada (by pass	South America East	Greater or equal to 150,000–Less than 170,000	-	-	46.4	46.4	46.4	46.4
West Coast Canada (by pass	South America East	Greater or equal to 170,000–Less than 200,000	-	-	24.5	24.5	24.5	24.5
West Coast Canada (by pass	Europe	Greater or equal to 120,000–Less than 150,000	-	-	29.9	29.9	29.9	29.9
West Coast Canada (by pass	Europe	Greater or equal to 150,000–Less than 170,000	-	-	30.3	30.3	30.3	30.3
West Coast Canada (by pass	Europe	Greater or equal to 170,000–Less than 200,000	-	-	39.8	39.8	39.8	39.8
West Coast Canada (by pass	North Africa	Greater or equal to 120,000–Less than 150,000	-	-	100.0	100.0	100.0	100.0
Central America West	North America East	Less or equal to 10,000	1.5	-	-	-	-	-
Central America West	North America East	Greater or equal to 15,000–Less than 20,000	1.2	0.6	-	-	-	-

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Central America West	North America East	Greater or equal to 20,000–Less than 25,000	2.8	2.6	2.4	2.2	1.9	1.7
Central America West	North America East	Greater or equal to 25,000–Less than 30,000	12.6	12.2	11.7	11.4	10.6	10.0
Central America West	North America East	Greater or equal to 30,000–Less than 40,000	14.8	11.5	6.3	4.1	-	-
Central America West	North America East	Greater or equal to 40,000–Less than 50,000	47.0	51.6	57.7	60.0	64.3	65.2
Central America West	North America East	Greater or equal to 60,000–Less than 70,000	15.9	16.5	4.8	2.8	1.6	0.7
Central America West	North America East	Greater or equal to 70,000–Less than 80,000	4.2	5.0	15.7	16.1	15.3	11.7
Central America West	North America East	Greater or equal to 80,000–Less than 90,000	-	-	1.0	2.7	5.5	9.6
Central America West	North America East	Greater or equal to 90,000–Less than 100,000	-	-	0.4	0.7	0.9	1.1
Central America West	North America Gulf	Less or equal to 10,000	0.3	-	-	-	-	-
Central America West	North America Gulf	Greater than 10,000–Less than 15,000	2.4	2.2	1.5	1.4	0.2	-
Central America West	North America Gulf	Greater or equal to 20,000–Less than 25,000	7.2	7.2	7.6	7.4	7.7	6.9
Central America West	North America Gulf	Greater or equal to 25,000–Less than 30,000	8.8	9.3	10.2	10.7	11.5	11.0
Central America West	North America Gulf	Greater or equal to 30,000–Less than 40,000	41.7	35.4	22.3	15.5	-	-
Central America West	North America Gulf	Greater or equal to 40,000–Less than 50,000	35.2	41.1	52.9	58.8	73.9	75.5
Central America West	North America Gulf	Greater or equal to 50,000–Less than 60,000	4.4	4.9	5.6	6.1	6.7	6.6
Central America West	Central America East	Greater than 10,000–Less than 15,000	11.6	11.9	11.0	12.1	3.7	-
Central America West	Central America East	Greater or equal to 20,000–Less than 25,000	19.8	22.1	31.1	36.9	75.2	75.5
Central America West	Central America East	Greater or equal to 25,000–Less than 30,000	3.2	3.8	5.5	7.0	14.8	15.8
Central America West	Central America East	Greater or equal to 30,000–Less than 40,000	65.4	62.2	52.3	44.0	-	-
Central America West	Central America East	Greater or equal to 40,000–Less than 50,000	-	-	-	-	6.2	8.7
Central America West	South America East	Less or equal to 10,000	5.4	-	-	-	-	-
Central America West	South America East	Greater or equal to 15,000–Less than 20,000	23.2	16.3	-	-	-	-
Central America West	South America East	Greater or equal to 20,000–Less than 25,000	0.8	1.0	1.5	1.7	3.0	2.7
Central America West	South America East	Greater or equal to 25,000–Less than 30,000	4.2	5.4	8.6	10.7	18.9	18.0
Central America West	South America East	Greater or equal to 30,000–Less than 40,000	66.4	69.6	63.1	52.3	-	-
Central America West	South America East	Greater or equal to 40,000–Less than 50,000	-	7.7	26.8	35.3	78.1	79.4
Central America West	Caribbean	Less or equal to 10,000	4.3	-	-	-	-	-
Central America West	Caribbean	Greater or equal to 25,000–Less than 30,000	2.4	2.1	1.9	1.7	1.5	1.4
Central America West	Caribbean	Greater or equal to 40,000–Less than 50,000	20.1	23.9	24.6	24.4	24.9	24.9
Central America West	Caribbean	Greater or equal to 50,000–Less than 60,000	22.0	20.6	18.8	18.5	16.6	16.1
Central America West	Caribbean	Greater or equal to 60,000–Less than 70,000	23.7	22.7	12.0	6.9	3.8	1.9
Central America West	Caribbean	Greater or equal to 70,000–Less than 80,000	27.6	30.7	39.1	40.0	37.5	29.1
Central America West	Caribbean	Greater or equal to 80,000–Less than 90,000	-	-	2.5	6.7	13.4	23.9
Central America West	Caribbean	Greater or equal to 90,000–Less than 100,000	-	-	1.1	1.7	2.2	2.8
Central America West	Europe	Greater or equal to 15,000–Less than 20,000	1.8	1.0	-	-	-	-
Central America West	Europe	Greater or equal to 20,000–Less than 25,000	10.1	9.6	9.0	8.4	7.8	7.2
Central America West	Europe	Greater or equal to 25,000–Less than 30,000	38.6	38.6	38.2	38.0	36.7	35.6
Central America West	Europe	Greater or equal to 30,000–Less than 40,000	12.0	9.7	5.5	3.6	-	-
Central America West	Europe	Greater or equal to 40,000–Less than 50,000	33.9	37.3	43.5	45.9	51.4	53.3
Central America West	Europe	Greater or equal to 50,000–Less than 60,000	3.6	3.8	3.9	4.1	4.0	4.0
Central America West	Africa	Greater or equal to 30,000–Less than 40,000	100.0	100.0	100.0	100.0	-	-
Central America West	Africa	Greater or equal to 40,000–Less than 50,000	-	-	-	-	100.0	100.0
South America West	North America East	Greater than 10,000–Less than 15,000	1.7	1.5	1.0	0.8	0.1	-
South America West	North America East	Greater or equal to 15,000–Less than 20,000	2.0	1.1	-	-	-	-

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
South America West	North America East	Greater or equal to 20,000–Less than 25,000	5.7	5.4	5.2	4.9	4.6	4.1
South America West	North America East	Greater or equal to 25,000–Less than 30,000	13.5	13.5	13.7	13.7	13.3	12.6
South America West	North America East	Greater or equal to 30,000–Less than 40,000	25.0	20.3	11.7	7.8	-	-
South America West	North America East	Greater or equal to 40,000–Less than 50,000	35.5	39.2	46.7	49.5	55.9	56.8
South America West	North America East	Greater or equal to 60,000–Less than 70,000	9.3	10.0	4.8	2.9	1.8	0.9
South America West	North America East	Greater or equal to 70,000–Less than 80,000	7.2	9.0	15.6	16.9	17.2	13.4
South America West	North America East	Greater or equal to 80,000–Less than 90,000	-	-	1.0	2.8	6.1	11.0
South America West	North America East	Greater or equal to 90,000–Less than 100,000	-	-	0.4	0.7	1.0	1.3
South America West	North America Gulf	Greater than 10,000–Less than 15,000	1.7	1.5	1.0	0.9	0.1	-
South America West	North America Gulf	Greater or equal to 15,000–Less than 20,000	2.3	1.3	-	-	-	-
South America West	North America Gulf	Greater or equal to 20,000–Less than 25,000	8.8	8.7	8.9	8.6	8.6	7.8
South America West	North America Gulf	Greater or equal to 25,000–Less than 30,000	21.8	22.7	24.4	25.1	26.1	25.1
South America West	North America Gulf	Greater or equal to 30,000–Less than 40,000	30.9	25.9	15.9	10.9	-	-
South America West	North America Gulf	Greater or equal to 40,000–Less than 50,000	17.8	20.4	26.2	28.6	35.0	36.0
South America West	North America Gulf	Greater or equal to 50,000–Less than 60,000	5.1	5.6	6.2	6.7	7.1	7.1
South America West	North America Gulf	Greater or equal to 60,000–Less than 70,000	5.6	6.2	3.8	2.4	1.6	0.8
South America West	North America Gulf	Greater or equal to 70,000–Less than 80,000	6.0	7.7	12.3	13.9	15.2	12.1
South America West	North America Gulf	Greater or equal to 80,000–Less than 90,000	-	-	0.8	2.3	5.4	10.0
South America West	North America Gulf	Greater or equal to 90,000–Less than 100,000	-	-	0.3	0.6	0.9	1.2
South America West	Central America East	Greater or equal to 15,000–Less than 20,000	6.9	4.0	-	-	-	-
South America West	Central America East	Greater or equal to 20,000–Less than 25,000	25.1	25.9	27.6	27.3	28.3	27.1
South America West	Central America East	Greater or equal to 25,000–Less than 30,000	49.4	53.7	59.8	63.0	68.1	69.0
South America West	Central America East	Greater or equal to 30,000–Less than 40,000	18.6	16.3	10.4	7.3	-	-
South America West	Central America East	Greater or equal to 40,000–Less than 50,000	-	-	2.2	2.4	3.6	3.9
South America West	South America East	Less or equal to 10,000	2.2	-	-	-	-	-
South America West	South America East	Greater than 10,000–Less than 15,000	3.0	2.7	1.8	1.6	0.2	-
South America West	South America East	Greater or equal to 20,000–Less than 25,000	15.8	15.5	15.6	15.2	15.3	14.6
South America West	South America East	Greater or equal to 25,000–Less than 30,000	67.2	69.4	73.5	75.8	80.0	80.5
South America West	South America East	Greater or equal to 30,000–Less than 40,000	11.8	9.9	5.9	4.1	-	-
South America West	South America East	Greater or equal to 40,000–Less than 50,000	-	2.5	3.1	3.4	4.4	4.9
South America West	Caribbean	Less or equal to 10,000	1.4	-	-	-	-	-
South America West	Caribbean	Greater or equal to 20,000–Less than 25,000	5.2	4.6	4.1	3.7	3.3	3.0
South America West	Caribbean	Greater or equal to 25,000–Less than 30,000	1.3	1.2	1.1	1.1	1.0	0.9
South America West	Caribbean	Greater or equal to 40,000–Less than 50,000	15.8	17.5	19.2	19.7	20.7	21.2
South America West	Caribbean	Greater or equal to 50,000–Less than 60,000	13.5	13.1	12.7	13.0	12.0	11.9
South America West	Caribbean	Greater or equal to 60,000–Less than 70,000	54.7	54.2	13.8	7.8	4.2	2.0
South America West	Caribbean	Greater or equal to 70,000–Less than 80,000	8.2	9.4	45.0	45.2	41.6	31.8
South America West	Caribbean	Greater or equal to 80,000–Less than 90,000	-	-	2.9	7.6	14.8	26.1
South America West	Caribbean	Greater or equal to 90,000–Less than 100,000	-	-	1.3	1.9	2.4	3.0
South America West	Europe	Less or equal to 10,000	0.4	-	-	-	-	-
South America West	Europe	Greater or equal to 15,000–Less than 20,000	5.5	3.2	-	-	-	-
South America West	Europe	Greater or equal to 20,000–Less than 25,000	7.5	7.7	8.1	7.9	8.0	7.4
South America West	Europe	Greater or equal to 25,000–Less than 30,000	29.1	31.2	34.6	36.1	38.2	36.9
South America West	Europe	Greater or equal to 30,000–Less than 40,000	33.3	28.9	18.2	12.6	-	-

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
South America West	Europe	Greater or equal to 40,000–Less than 50,000	24.2	29.1	39.2	43.4	53.8	55.7
South America West	Africa	Greater or equal to 15,000–Less than 20,000	60.6	48.2	-	-	-	-
South America West	Africa	Greater or equal to 20,000–Less than 25,000	15.2	21.2	31.3	31.3	32.5	30.2
South America West	Africa	Greater or equal to 25,000–Less than 30,000	6.0	8.9	13.7	14.6	15.8	15.5
South America West	Africa	Greater or equal to 30,000–Less than 40,000	18.2	21.6	19.0	13.5	-	-
South America West	Africa	Greater or equal to 40,000–Less than 50,000	-	-	36.0	40.7	51.7	54.3
South America West	Middle East	Greater or equal to 15,000–Less than 20,000	14.5	8.8	-	-	-	-
South America West	Middle East	Greater or equal to 20,000–Less than 25,000	85.5	91.2	95.3	94.8	93.8	93.0
South America West	Middle East	Greater or equal to 40,000–Less than 50,000	-	-	4.7	5.2	6.2	7.0
Chile	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	8.0	4.6	-	-	-	-
Chile	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	17.7	18.7	20.5	20.7	21.3	19.6
Chile	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	45.5	38.8	24.3	16.3	-	-
Chile	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	-	-	2.4	2.6	4.2	4.1
Chile	North Atlantic United States	Greater or equal to 60,000–Less than 70,000	-	-	11.5	7.5	5.0	2.5
Chile	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	28.9	37.9	37.8	43.7	49.1	38.5
Chile	North Atlantic United States	Greater or equal to 80,000–Less than 90,000	-	-	2.4	7.3	17.5	31.7
Chile	North Atlantic United States	Greater or equal to 90,000–Less than 100,000	-	-	1.1	1.9	2.8	3.7
Chile	Caribbean	Greater or equal to 40,000–Less than 50,000	17.8	17.6	18.4	18.5	18.8	18.9
Chile	Caribbean	Greater or equal to 50,000–Less than 60,000	9.1	8.5	7.9	7.9	7.1	6.9
Chile	Caribbean	Greater or equal to 60,000–Less than 70,000	48.2	46.1	16.1	9.2	5.0	2.4
Chile	Caribbean	Greater or equal to 70,000–Less than 80,000	25.0	27.8	52.7	53.3	48.9	37.5
Chile	Caribbean	Greater or equal to 80,000–Less than 90,000	-	-	3.4	8.9	17.4	30.8
Chile	Caribbean	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
Chile	Europe	Less or equal to 10,000	0.4	-	-	-	-	-
Chile	Europe	Greater or equal to 15,000–Less than 20,000	5.5	3.2	-	-	-	-
Chile	Europe	Greater or equal to 20,000–Less than 25,000	7.5	7.7	8.1	7.9	8.0	7.4
Chile	Europe	Greater or equal to 25,000–Less than 30,000	29.1	31.2	34.6	36.1	38.2	36.9
Chile	Europe	Greater or equal to 30,000–Less than 40,000	33.3	28.9	18.2	12.6	-	-
Chile	Europe	Greater or equal to 40,000–Less than 50,000	24.2	29.1	39.2	43.4	53.8	55.7
Peru	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	8.0	4.6	-	-	-	-
Peru	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	17.7	18.7	20.5	20.7	21.3	19.6
Peru	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	45.5	38.8	24.3	16.3	-	-
Peru	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	-	-	2.4	2.6	4.2	4.1
Peru	North Atlantic United States	Greater or equal to 60,000–Less than 70,000	-	-	11.5	7.5	5.0	2.5
Peru	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	28.9	37.9	37.8	43.7	49.1	38.5
Peru	North Atlantic United States	Greater or equal to 80,000–Less than 90,000	-	-	2.4	7.3	17.5	31.7
Peru	North Atlantic United States	Greater or equal to 90,000–Less than 100,000	-	-	1.1	1.9	2.8	3.7
Peru	Caribbean	Greater or equal to 40,000–Less than 50,000	17.8	17.6	18.4	18.5	18.8	18.9
Peru	Caribbean	Greater or equal to 50,000–Less than 60,000	9.1	8.5	7.9	7.9	7.1	6.9
Peru	Caribbean	Greater or equal to 60,000–Less than 70,000	48.2	46.1	16.1	9.2	5.0	2.4
Peru	Caribbean	Greater or equal to 70,000–Less than 80,000	25.0	27.8	52.7	53.3	48.9	37.5
Peru	Caribbean	Greater or equal to 80,000–Less than 90,000	-	-	3.4	8.9	17.4	30.8
Peru	Caribbean	Greater or equal to 90,000–Less than 100,000	-	-	1.5	2.3	2.8	3.6
Peru	Europe	Less or equal to 10,000	0.4	-	-	-	-	-

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Peru	Europe	Greater or equal to 15,000–Less than 20,000	5.5	3.2	-	-	-	-
Peru	Europe	Greater or equal to 20,000–Less than 25,000	7.5	7.7	8.1	7.9	8.0	7.4
Peru	Europe	Greater or equal to 25,000–Less than 30,000	29.1	31.2	34.6	36.1	38.2	36.9
Peru	Europe	Greater or equal to 30,000–Less than 40,000	33.3	28.9	18.2	12.6	-	-
Peru	Europe	Greater or equal to 40,000–Less than 50,000	24.2	29.1	39.2	43.4	53.8	55.7
Oceania	North America East	Greater or equal to 25,000–Less than 30,000	21.1	21.0	21.1	20.9	20.5	19.3
Oceania	North America East	Greater or equal to 30,000–Less than 40,000	30.1	24.1	13.8	9.1	-	-
Oceania	North America East	Greater or equal to 40,000–Less than 50,000	26.3	28.7	33.7	35.5	40.7	40.9
Oceania	North America East	Greater or equal to 50,000–Less than 60,000	8.5	8.8	9.2	9.6	9.6	9.3
Oceania	North America East	Greater or equal to 60,000–Less than 70,000	-	-	4.8	3.1	2.0	1.0
Oceania	North America East	Greater or equal to 70,000–Less than 80,000	14.0	17.3	15.9	18.0	19.3	15.4
Oceania	North America East	Greater or equal to 80,000–Less than 90,000	-	-	1.0	3.0	6.9	12.7
Oceania	North America East	Greater or equal to 90,000–Less than 100,000	-	-	0.4	0.8	1.1	1.5
Oceania (by pass)	North America East	Greater or equal to 120,000–Less than 150,000	-	-	100.0	100.0	36.6	36.6
Oceania (by pass)	North America East	Greater or equal to 150,000–Less than 170,000	-	-	-	-	43.7	43.7
Oceania (by pass)	North America East	Greater or equal to 170,000–Less than 200,000	-	-	-	-	19.7	19.7
Oceania	North America Gulf	Greater or equal to 15,000–Less than 20,000	1.7	0.9	-	-	-	-
Oceania	North America Gulf	Greater or equal to 20,000–Less than 25,000	11.0	10.7	10.6	10.1	9.7	8.7
Oceania	North America Gulf	Greater or equal to 25,000–Less than 30,000	5.1	5.3	5.5	5.6	5.5	5.2
Oceania	North America Gulf	Greater or equal to 30,000–Less than 40,000	32.8	27.2	16.1	10.9	-	-
Oceania	North America Gulf	Greater or equal to 40,000–Less than 50,000	49.4	55.8	67.9	73.4	84.8	86.1
Oceania (by pass)	North America Gulf	Greater or equal to 120,000–Less than 150,000	-	-	36.6	36.6	36.6	36.6
Oceania (by pass)	North America Gulf	Greater or equal to 150,000–Less than 170,000	-	-	43.7	43.7	43.7	43.7
Oceania (by pass)	North America Gulf	Greater or equal to 170,000–Less than 200,000	-	-	19.7	19.7	19.7	19.7
Oceania	Central America East	Greater or equal to 15,000–Less than 20,000	2.1	1.1	-	-	-	-
Oceania	Central America East	Greater or equal to 20,000–Less than 25,000	3.7	3.4	2.9	2.6	2.3	2.0
Oceania	Central America East	Greater or equal to 25,000–Less than 30,000	9.9	9.4	8.5	8.2	7.4	6.9
Oceania	Central America East	Greater or equal to 30,000–Less than 40,000	7.7	5.9	3.1	2.0	-	-
Oceania	Central America East	Greater or equal to 40,000–Less than 50,000	76.6	80.2	85.5	87.2	90.4	91.0
Oceania (by pass)	Central America East	Greater or equal to 120,000–Less than 150,000	-	-	36.6	36.6	36.6	36.6
Oceania (by pass)	Central America East	Greater or equal to 150,000–Less than 170,000	-	-	43.7	43.7	43.7	43.7
Oceania (by pass)	Central America East	Greater or equal to 170,000–Less than 200,000	-	-	19.7	19.7	19.7	19.7
Oceania	Caribbean	Greater or equal to 15,000–Less than 20,000	17.0	10.4	-	-	-	-
Oceania	Caribbean	Greater or equal to 20,000–Less than 25,000	38.8	41.7	44.7	43.8	44.0	42.4
Oceania	Caribbean	Greater or equal to 25,000–Less than 30,000	34.8	39.3	44.2	46.1	48.2	49.1
Oceania	Caribbean	Greater or equal to 30,000–Less than 40,000	9.5	8.6	5.5	3.8	-	-
Oceania	Caribbean	Greater or equal to 40,000–Less than 50,000	-	-	5.6	6.2	7.8	8.5
Oceania	Middle East	Greater or equal to 25,000–Less than 30,000	100.0	100.0	100.0	100.0	100.0	100.0
Far East	North America East	Greater or equal to 15,000–Less than 20,000	2.2	1.2	-	-	-	-
Far East	North America East	Greater or equal to 20,000–Less than 25,000	0.5	0.5	0.4	0.4	0.4	0.3
Far East	North America East	Greater or equal to 25,000–Less than 30,000	23.6	23.1	22.8	22.3	21.2	20.0
Far East	North America East	Greater or equal to 30,000–Less than 40,000	20.6	16.3	9.1	6.0	-	-
Far East	North America East	Greater or equal to 40,000–Less than 50,000	17.0	18.3	21.5	22.4	24.9	25.1
Far East	North America East	Greater or equal to 50,000–Less than 60,000	1.0	1.0	1.1	1.1	1.1	1.0

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
Far East	North America East	Greater or equal to 60,000–Less than 70,000	17.1	17.8	9.9	6.0	3.5	1.7
Far East	North America East	Greater or equal to 70,000–Less than 80,000	18.0	21.8	32.3	34.6	34.6	27.0
Far East	North America East	Greater or equal to 80,000–Less than 90,000	-	-	2.1	5.8	12.4	22.2
Far East	North America East	Greater or equal to 90,000–Less than 100,000	-	-	0.9	1.5	2.0	2.6
Far East	North America Gulf	Greater or equal to 15,000–Less than 20,000	0.1	0.0	-	-	-	-
Far East	North America Gulf	Greater or equal to 20,000–Less than 25,000	0.8	0.7	0.6	0.6	0.5	0.5
Far East	North America Gulf	Greater or equal to 25,000–Less than 30,000	9.6	9.0	8.4	8.1	7.4	7.0
Far East	North America Gulf	Greater or equal to 30,000–Less than 40,000	11.6	8.8	4.7	3.0	-	-
Far East	North America Gulf	Greater or equal to 40,000–Less than 50,000	32.3	33.3	36.3	37.2	39.3	39.6
Far East	North America Gulf	Greater or equal to 50,000–Less than 60,000	6.0	5.9	5.7	5.7	5.3	5.2
Far East	North America Gulf	Greater or equal to 60,000–Less than 70,000	24.6	24.7	9.7	5.7	3.2	1.5
Far East	North America Gulf	Greater or equal to 70,000–Less than 80,000	15.1	17.6	31.7	32.8	31.3	24.1
Far East	North America Gulf	Greater or equal to 80,000–Less than 90,000	-	-	2.0	5.5	11.2	19.8
Far East	North America Gulf	Greater or equal to 90,000–Less than 100,000	-	-	0.9	1.4	1.8	2.3
Far East	Canada East	Greater or equal to 15,000–Less than 20,000	2.9	1.4	-	-	-	-
Far East	Canada East	Greater or equal to 20,000–Less than 25,000	2.0	1.7	1.5	1.3	1.1	1.0
Far East	Canada East	Greater or equal to 25,000–Less than 30,000	16.9	15.5	13.9	13.1	11.6	10.7
Far East	Canada East	Greater or equal to 30,000–Less than 40,000	9.8	7.2	3.7	2.3	-	-
Far East	Canada East	Greater or equal to 40,000–Less than 50,000	10.5	10.6	11.7	11.6	12.0	11.9
Far East	Canada East	Greater or equal to 60,000–Less than 70,000	15.1	14.8	15.1	9.0	5.1	2.5
Far East	Canada East	Greater or equal to 70,000–Less than 80,000	42.9	48.8	49.5	51.8	49.6	38.5
Far East	Canada East	Greater or equal to 80,000–Less than 90,000	-	-	3.2	8.7	17.7	31.7
Far East	Canada East	Greater or equal to 90,000–Less than 100,000	-	-	1.4	2.2	2.9	3.7
Far East	Central America East	Greater or equal to 20,000–Less than 25,000	3.6	3.4	3.3	3.1	2.9	2.6
Far East	Central America East	Greater or equal to 25,000–Less than 30,000	26.6	26.6	26.9	26.8	26.3	24.9
Far East	Central America East	Greater or equal to 30,000–Less than 40,000	27.6	22.2	12.8	8.5	-	-
Far East	Central America East	Greater or equal to 40,000–Less than 50,000	23.6	25.9	30.5	32.3	37.1	37.6
Far East	Central America East	Greater or equal to 50,000–Less than 60,000	1.5	1.6	1.7	1.8	1.8	1.7
Far East	Central America East	Greater or equal to 60,000–Less than 70,000	4.5	4.8	5.4	3.4	2.1	1.1
Far East	Central America East	Greater or equal to 70,000–Less than 80,000	12.6	15.6	17.8	19.9	21.0	16.7
Far East	Central America East	Greater or equal to 80,000–Less than 90,000	-	-	1.1	3.3	7.5	13.7
Far East	Central America East	Greater or equal to 90,000–Less than 100,000	-	-	0.5	0.9	1.2	1.6
Far East	South America East	Greater or equal to 15,000–Less than 20,000	1.8	1.0	-	-	-	-
Far East	South America East	Greater or equal to 20,000–Less than 25,000	35.2	32.6	28.9	26.6	23.5	21.5
Far East	South America East	Greater or equal to 25,000–Less than 30,000	8.4	8.2	7.7	7.5	6.9	6.7
Far East	South America East	Greater or equal to 30,000–Less than 40,000	0.7	0.6	0.3	0.2	-	-
Far East	South America East	Greater or equal to 40,000–Less than 50,000	53.8	57.7	63.1	65.6	69.6	71.9
Far East	Caribbean	Greater or equal to 25,000–Less than 30,000	65.7	67.1	69.7	71.0	72.7	71.3
Far East	Caribbean	Greater or equal to 30,000–Less than 40,000	18.7	15.4	9.1	6.2	-	-
Far East	Caribbean	Greater or equal to 40,000–Less than 50,000	15.5	17.4	21.1	22.8	27.3	28.7
South East Asia	North America East	Greater or equal to 25,000–Less than 30,000	22.4	22.3	22.2	22.2	21.5	20.4
South East Asia	North America East	Greater or equal to 30,000–Less than 40,000	25.0	20.1	11.4	7.6	-	-
South East Asia	North America East	Greater or equal to 40,000–Less than 50,000	49.3	54.1	62.8	66.5	74.8	76.0
South East Asia	North America East	Greater or equal to 50,000–Less than 60,000	3.3	3.4	3.5	3.7	3.7	3.6

Table B-2. Cargo Allocation by Route and DWT Size Range on Canal Routes by Route, Expanded Canal Most Probable Case, No Tolls, Selected Years 2000-2025. (percent)

Origin	Destination	DWT Range	2000	2005	2010	2015	2020	2025
South East Asia	North America Gulf	Greater or equal to 20,000–Less than 25,000	0.1	0.1	0.1	0.1	0.1	0.1
South East Asia	North America Gulf	Greater or equal to 25,000–Less than 30,000	14.5	14.0	13.2	12.8	11.9	11.3
South East Asia	North America Gulf	Greater or equal to 30,000–Less than 40,000	14.9	11.6	6.2	4.0	-	-
South East Asia	North America Gulf	Greater or equal to 40,000–Less than 50,000	61.1	64.8	71.2	73.6	79.0	79.9
South East Asia	North America Gulf	Greater or equal to 50,000–Less than 60,000	9.4	9.5	9.3	9.5	9.0	8.8
South East Asia	South America East	Greater or equal to 15,000–Less than 20,000	34.1	21.9	-	-	-	-
South East Asia	South America East	Greater or equal to 25,000–Less than 30,000	65.9	78.1	88.1	87.4	85.8	85.0
South East Asia	South America East	Greater or equal to 40,000–Less than 50,000	-	-	11.9	12.6	14.2	15.0
China	North Atlantic United States	Greater or equal to 20,000–Less than 25,000	2.4	2.1	1.8	1.6	1.4	1.2
China	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	12.8	11.9	10.9	10.4	9.4	8.8
China	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	13.6	10.2	5.3	3.4	-	-
China	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	11.9	12.1	13.0	13.1	13.9	13.8
China	North Atlantic United States	Greater or equal to 50,000–Less than 60,000	7.1	6.9	6.6	6.6	6.1	5.9
China	North Atlantic United States	Greater or equal to 60,000–Less than 70,000	17.9	17.6	13.6	8.1	4.7	2.3
China	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	34.2	39.2	44.6	47.0	45.6	35.5
China	North Atlantic United States	Greater or equal to 80,000–Less than 90,000	-	-	2.8	7.9	16.3	29.2
China	North Atlantic United States	Greater or equal to 90,000–Less than 100,000	-	-	1.3	2.0	2.6	3.4
Taiwan	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	98.9	98.5	96.9	95.2	-	-
Taiwan	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	1.1	1.5	3.1	4.8	100.0	100.0
Japan	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	2.9	1.4	-	-	-	-
Japan	North Atlantic United States	Greater or equal to 20,000–Less than 25,000	2.0	1.7	1.5	1.3	1.1	1.0
Japan	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	16.9	15.5	13.9	13.1	11.6	10.7
Japan	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	9.8	7.2	3.7	2.3	-	-
Japan	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	10.5	10.6	11.7	11.6	12.0	11.9
Japan	North Atlantic United States	Greater or equal to 60,000–Less than 70,000	15.1	14.8	15.1	9.0	5.1	2.5
Japan	North Atlantic United States	Greater or equal to 70,000–Less than 80,000	42.9	48.8	49.5	51.8	49.6	38.5
Japan	North Atlantic United States	Greater or equal to 80,000–Less than 90,000	-	-	3.2	8.7	17.7	31.7
Japan	North Atlantic United States	Greater or equal to 90,000–Less than 100,000	-	-	1.4	2.2	2.9	3.7
South Korea	North Atlantic United States	Greater or equal to 15,000–Less than 20,000	2.6	1.6	-	-	-	-
South Korea	North Atlantic United States	Greater or equal to 20,000–Less than 25,000	4.4	4.7	5.4	5.6	6.5	5.9
South Korea	North Atlantic United States	Greater or equal to 25,000–Less than 30,000	19.7	21.9	26.6	29.4	35.4	34.1
South Korea	North Atlantic United States	Greater or equal to 30,000–Less than 40,000	53.8	48.2	33.4	24.6	-	-
South Korea	North Atlantic United States	Greater or equal to 40,000–Less than 50,000	19.4	23.7	34.5	40.5	58.1	60.0

Source: Richardson Lawrie Associates

Appendix C

OCEAN FREIGHT RATES EXCLUDING TOLLS FOR CANAL ROUTES AND LEAST-COST ALTERNATIVE ROUTES

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	North America East	New York	North America West	Los Angeles	58.30	24.42	20.23	17.43	15.23	13.27	12.21	10.82	10.53	10.88	11.34	19.00
2000	North America East	New York	Central America West	Lazaro Cardenas	41.75	18.22	16.05	14.28	12.41	10.66	9.66	8.36	8.08	8.19	8.30	13.73
2000	North America East	New York	South America West	Matarani	44.26	19.55	17.22	15.56	13.92	11.92	10.82	9.37	9.04	9.17	9.27	15.32
2000	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	86.99	35.85	31.69	26.77	22.65	18.88	16.43	13.92	13.29	13.44	13.64	22.29
2000	North America East	New York	Oceania	Brisbane	81.33	33.99	30.13	25.91	22.23	19.03	17.09	14.85	14.32	14.46	14.64	24.03
2000	East Coast USA	Norfolk	Taiwan	Kaohsiung	87.37	35.92	31.37	26.61	22.83	19.36	16.79	14.43	13.74	13.87	14.04	23.04
2000	East Coast USA	Norfolk	Korea	Kwangyang	83.04	34.27	29.87	25.38	21.84	18.61	16.17	13.96	13.31	13.45	13.60	22.34
2000	East Coast USA	Norfolk	Japan	Mizushima	85.95	35.35	30.56	26.07	22.43	19.28	16.93	14.79	14.22	14.49	14.86	24.90
2000	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	83.76	34.47	30.46	25.71	21.92	18.42	15.98	13.61	13.00	13.14	13.30	21.68
2000	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	86.66	35.55	31.15	26.39	22.52	19.10	16.73	14.44	13.91	14.19	14.56	24.24
2000	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	86.87	36.00	31.90	27.07	22.99	19.24	16.80	14.26	13.70	13.91	14.13	23.06
2000	North America East	New York	Far East	Guangzhou	91.19	37.79	33.20	28.32	24.03	20.16	17.88	15.24	14.57	14.77	15.01	24.66
2000	North America East	New York	Far East	Guangzhou	91.19	37.79	33.20	28.32	24.03	20.16	17.88	15.24	14.57	14.77	15.01	24.66
2000	North America Gulf	Tampa	North America West	Los Angeles	53.64	22.66	18.68	16.55	14.68	12.82	11.69	10.51	10.46	10.82	11.29	18.92
2000	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.20	16.53	14.57	13.44	11.90	10.24	9.17	8.07	8.04	8.15	8.26	13.68
2000	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.20	16.53	14.57	13.44	11.90	10.24	9.17	8.07	8.04	8.15	8.26	13.68
2000	North America Gulf	Tampa	South America West	Matarani	39.71	17.85	15.73	14.73	13.40	11.50	10.33	9.07	8.99	9.12	9.23	15.26
2000	North America Gulf	Tampa	South America West	Matarani	39.71	17.85	15.73	14.73	13.40	11.50	10.33	9.07	8.99	9.12	9.23	15.26
2000	North America Gulf	Tampa	Oceania	Auckland	68.41	28.88	25.69	22.60	19.64	16.90	15.17	13.44	13.19	13.33	13.51	22.21
2000	North America Gulf	Tampa	Oceania	Auckland	68.41	28.88	25.69	22.60	19.64	16.90	15.17	13.44	13.19	13.33	13.51	22.21
2000	North America Gulf	Mobile	Far East	Osaka	81.89	33.40	28.86	24.61	21.20	18.27	16.06	14.08	13.55	13.82	14.18	23.80
2000	North America Gulf	Tampa	Far East	Guangzhou	85.90	35.59	31.29	27.12	23.21	19.49	17.18	14.79	14.38	14.58	14.82	24.37
2000	North America Gulf	Tampa	Far East	Guangzhou	85.90	35.59	31.29	27.12	23.21	19.49	17.18	14.79	14.38	14.58	14.82	24.37
2000	North America Gulf	Tampa	South East Asia	Bangkok	93.45	39.29	34.98	30.64	26.34	22.27	19.80	17.18	16.90	17.34	17.50	28.72
2000	Central America East	Puerto Limon	North America West	Los Angeles	39.03	17.38	15.04	13.48	12.28	10.85	9.82	8.83	8.72	9.04	9.47	15.74
2000	Central America East	Puerto Limon	South America West	Matarani	24.94	12.48	12.01	11.60	10.95	9.49	8.43	7.37	7.23	7.32	7.39	12.05
2000	Central America East	Puerto Limon	South America West	Matarani	24.94	12.48	12.01	11.60	10.95	9.49	8.43	7.37	7.23	7.32	7.39	12.05
2000	Central America East	Puerto Limon	Far East	Guangzhou	72.22	30.94	28.18	24.52	21.19	17.84	15.58	13.33	12.83	12.99	13.19	21.51
2000	Central America East	Puerto Limon	South East Asia	Jakarta	82.16	37.86	35.85	32.54	29.30	25.86	24.70	20.88	20.10	20.36	20.65	33.73
2000	South America East	Santos	North America West	Los Angeles	70.44	29.52	25.05	21.69	18.99	16.52	14.85	13.24	12.86	13.25	13.77	22.74
2000	Other South America East	Buenos Aires	West Coast USA	Los Angeles	81.94	34.11	28.81	24.94	21.86	18.94	16.86	14.88	14.51	14.91	15.32	25.26
2000	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	54.70	22.69	18.91	16.26	14.39	12.42	11.07	9.81	9.54	9.85	10.29	17.09

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 DWT)											
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	South America East	Buenos Aires	West Coast Canada	Los Angeles	81.94	34.11	28.81	24.94	21.86	18.94	16.86	14.88	14.51	14.91	15.32	25.26
2000	Brazil	Santos	West Coast USA	Los Angeles	70.44	29.52	25.05	21.69	18.99	16.52	14.85	13.24	12.86	13.25	13.77	22.74
2000	South America East	Ponta da Madeira	North America West	Los Angeles	58.76	24.74	20.84	17.92	15.64	13.62	12.25	10.86	10.52	10.90	11.42	18.96
2000	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	33.36	14.43	12.86	11.49	10.37	8.95	7.76	6.80	6.54	6.59	6.64	10.80
2000	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	25.48	12.14	10.97	9.98	9.07	7.92	6.95	6.13	5.97	6.06	6.13	10.04
2000	South America East	Puerto Bolivar	South America West	Huasco	31.46	16.32	14.51	12.99	11.78	10.80	9.78	8.49	8.11	8.26	8.32	13.65
2000	South America East	Puerto La Cruz	South America West	Matarani	35.89	15.77	14.04	12.78	11.89	10.22	8.92	7.81	7.50	7.57	7.62	12.40
2000	South America East	Santos	Oceania	Brisbane	95.14	39.90	35.67	30.80	26.52	22.73	20.11	17.60	16.97	17.15	17.40	28.31
2000	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	86.40	35.43	31.14	26.40	22.61	18.87	16.24	13.79	13.11	13.19	13.35	21.72
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	85.06	35.24	31.02	26.49	22.65	18.91	16.41	13.95	13.35	13.51	13.72	22.35
2000	Venezuela	Puerto Ordaz	Korea	Kwangyang	81.80	33.65	29.52	25.07	21.53	18.05	15.55	13.28	12.62	12.72	12.85	20.93
2000	Venezuela	Puerto Ordaz	Japan	Mizushima	84.66	34.70	30.19	25.74	22.11	18.71	16.30	14.10	13.52	13.76	14.10	23.48
2000	North Brazil	Ponta da Madeira	Korea	Kwangyang	85.86	35.70	31.45	26.73	22.78	19.25	16.73	14.33	13.60	13.78	13.99	22.80
2000	North Brazil	Ponta da Madeira	Japan	Mizushima	88.72	36.76	32.12	27.40	23.36	19.92	17.48	15.14	14.50	14.81	15.23	25.35
2000	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	89.12	37.29	32.95	28.14	23.90	20.11	17.59	15.00	14.33	14.56	14.85	24.22
2000	Venezuela	Puerto Ordaz	Japan	Shimizu	84.43	35.14	30.94	26.84	23.10	20.14	17.85	15.94	15.45	16.10	16.90	29.00
2000	North Brazil	Saã Luiz	Japan	Shimizu	86.83	36.46	32.16	28.10	24.18	21.33	19.13	17.28	16.78	17.50	18.35	31.36
2000	South Brazil	Sépetiba, Bahia de	Far East	Guangzhou	105.93	44.17	39.20	33.42	28.33	23.73	20.70	17.61	16.78	17.02	17.34	28.28
2000	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	92.21	38.45	34.05	29.26	24.99	21.10	18.54	16.00	15.33	15.55	15.83	25.81
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	85.96	35.51	31.27	26.65	22.94	19.25	16.66	14.25	13.57	13.71	13.89	22.59
2000	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	112.65	46.73	41.11	35.30	30.21	25.47	22.23	19.05	18.31	18.56	18.74	30.53
2000	Colombia	Puerto Bolivar	Japan	Mizushima	72.42	30.55	26.60	22.77	19.74	16.93	14.82	12.96	12.48	12.72	13.07	21.81
2000	Brazil	Saã Luiz	Far East	Guangzhou	92.21	38.45	34.05	29.26	24.99	21.10	18.54	16.00	15.33	15.55	15.83	25.81
2000	South America East	Ponta da Madeira	Far East	Mizushima	88.72	36.76	32.12	27.40	23.36	19.92	17.48	15.14	14.50	14.81	15.23	25.35
2000	Caribbean Basin	Kingston	North America West	Los Angeles	42.19	20.41	18.13	16.98	15.71	14.61	13.19	11.81	11.69	12.27	12.97	21.84
2000	Caribbean Basin	Kingston	North America West	Los Angeles	42.19	20.41	18.13	16.98	15.71	14.61	13.19	11.81	11.69	12.27	12.97	21.84
2000	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.54	14.16	13.91	13.79	12.86	11.98	10.62	9.33	9.23	9.57	9.91	16.55
2000	Caribbean Basin	Kingston	South America West	Matarani	28.06	15.49	15.09	15.08	14.37	13.24	11.79	10.34	10.19	10.54	10.88	18.14
2000	Caribbean Basin	Kingston	Far East	Guangzhou	75.61	34.06	31.35	28.09	24.69	21.66	19.00	16.34	15.84	16.26	16.74	27.68
2000	Caribbean Basin	Kingston	Far East	Guangzhou	75.61	34.06	31.35	28.09	24.69	21.66	19.00	16.34	15.84	16.26	16.74	27.68
2000	Europe	Rotterdam	West Coast Canada	Los Angeles	69.19	28.83	25.03	21.46	18.87	16.21	14.55	12.84	12.59	13.04	13.47	22.25
2000	Europe	Rotterdam	West Coast USA	Los Angeles	69.19	28.83	25.03	21.46	18.87	16.21	14.55	12.84	12.59	13.04	13.47	22.25

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	Europe	Rotterdam	North America West	Los Angeles	69.19	28.83	25.03	21.46	18.87	16.21	14.55	12.84	12.59	13.04	13.47	22.25
2000	Europe	Rotterdam	Central America West	Lazaro Cardenas	52.64	22.65	20.86	18.31	16.05	13.61	12.00	10.38	10.14	10.35	10.42	16.98
2000	Europe	Rotterdam	South America West	Matarani	55.15	23.97	22.03	19.59	17.55	14.87	13.16	11.39	11.10	11.32	11.39	18.57
2000	Africa	Durban	North America West	Los Angeles	83.42	34.77	30.37	26.03	22.69	19.62	17.60	15.51	15.21	15.78	16.30	26.85
2000	Africa	Safi	Central America West	Lazaro Cardenas	48.20	21.07	19.46	17.21	15.08	13.06	11.64	10.19	10.04	10.36	10.48	17.08
2000	Africa	Safi	Oceania	Auckland	79.32	33.34	30.52	26.32	22.78	19.68	17.62	15.54	15.17	15.52	15.71	25.58
2000	Middle East	Damman	Central America West	Lazaro Cardenas	84.28	36.06	32.83	28.55	24.65	20.96	18.45	15.90	15.48	15.83	16.02	26.07
2000	Middle East	Damman	South America West	Matarani	86.80	37.39	34.00	29.83	26.15	22.22	19.61	16.91	16.44	16.81	16.99	27.67
2000	Middle East	Damman	South America West	Matarani	86.80	37.39	34.00	29.83	26.15	22.22	19.61	16.91	16.44	16.81	16.99	27.67
2000	North America West	Vancouver	North America East	Philadelphia	58.49	23.75	21.63	19.10	17.15	14.06	12.52	10.51	10.44	10.35	9.80	16.49
2000	North America West	Vancouver	North America Gulf	New Orleans	55.66	22.91	20.84	18.88	17.16	14.07	12.39	10.52	10.70	10.61	10.05	16.91
2000	North America West	Vancouver	Central America East	Tampico	47.55	20.15	19.35	17.57	16.20	13.33	11.57	9.75	9.79	9.68	9.15	15.21
2000	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	67.00	27.09	25.08	22.25	20.10	16.57	14.52	12.33	12.27	12.16	11.55	19.18
2000	North America West	Vancouver	South America East	Sepetiba, Bahia de	67.00	27.09	25.08	22.25	20.10	16.57	14.52	12.33	12.27	12.16	11.55	19.18
2000	North America West	Vancouver	Caribbean Basin	San Juan	45.08	20.84	20.40	19.41	18.37	16.05	14.05	11.92	12.08	12.19	11.75	19.91
2000	West Coast USA	Los Angeles	Europe	Rotterdam	69.25	28.34	26.05	23.06	21.20	17.57	15.77	13.48	13.71	13.87	13.37	22.45
2000	West Coast Canada	Vancouver	Europe	Rotterdam	69.68	28.33	26.82	23.61	21.38	17.38	15.17	12.70	12.75	12.71	11.97	19.88
2000	North America West	Vancouver	Europe	Rotterdam	69.68	28.33	26.82	23.61	21.38	17.38	15.17	12.70	12.75	12.71	11.97	19.88
2000	West Coast Canada	Vancouver	North Africa	Alexandria	78.24	32.11	30.40	26.84	24.19	19.88	17.44	14.67	14.77	14.81	14.01	23.25
2000	West Coast Canada	Vancouver	South Africa	Durban	85.19	34.90	33.03	29.13	26.21	21.49	18.83	15.80	15.88	15.91	15.05	24.96
2000	North America West	Vancouver	Africa	Safi	65.97	27.21	25.76	22.79	20.62	17.03	14.99	12.68	12.80	12.89	12.19	20.24
2000	North America West	Vancouver	Middle East	Aqaba (El Akaba)	81.50	33.42	31.63	27.91	25.14	20.63	18.09	15.20	15.29	15.33	14.50	24.05
2000	Central America West	Puerto Quetzal	North America East	Philadelphia	36.11	16.01	15.23	14.26	13.44	11.73	10.55	8.86	8.90	8.83	8.35	14.06
2000	Central America West	Puerto Quetzal	North America East	Philadelphia	36.11	16.01	15.23	14.26	13.44	11.73	10.55	8.86	8.90	8.83	8.35	14.06
2000	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	33.15	15.09	14.37	13.99	13.41	11.70	10.38	8.85	9.14	9.07	8.58	14.45
2000	Central America West	Puerto Quetzal	North America Gulf	New Orleans	33.15	15.09	14.37	13.99	13.41	11.70	10.38	8.85	9.14	9.07	8.58	14.45
2000	Central America West	Puerto Quetzal	Central America East	Tampico	25.06	12.36	12.91	12.70	12.48	10.98	9.58	8.09	8.24	8.14	7.69	12.77
2000	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	45.20	19.69	19.00	17.70	16.66	14.45	12.72	10.83	10.86	10.77	10.22	16.95
2000	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.47	13.01	13.93	14.53	14.64	13.70	12.06	10.26	10.53	10.66	10.31	17.50
2000	Central America West	Puerto Quetzal	Europe	Rotterdam	48.01	21.02	20.81	19.13	18.00	15.29	13.41	11.23	11.37	11.34	10.67	17.69
2000	Central America West	Puerto Quetzal	Africa	Safi	44.17	19.83	19.69	18.26	17.19	14.92	13.20	11.18	11.41	11.51	10.88	18.04
2000	Peru	San Nicolas	East Coast USA	Baltimore	43.96	18.63	16.91	15.19	13.71	11.28	9.96	8.34	8.32	8.27	7.86	13.32

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	Chile	Antofagasta	East Coast USA	Baltimore	48.10	22.20	20.62	18.80	17.23	14.88	13.47	11.25	11.18	11.13	10.51	17.73
2000	South America West	Matarani	North America East	Philadelphia	44.50	19.29	18.00	16.78	15.70	12.96	11.77	9.88	9.89	9.79	9.24	15.53
2000	South America West	Callao	North America East	Philadelphia	41.62	18.13	16.90	15.83	14.85	12.29	11.19	9.41	9.43	9.34	8.81	14.82
2000	South America West	San Nicolas	North America Gulf	Mobile	40.23	17.05	15.37	13.81	12.68	10.58	9.32	7.90	7.84	7.79	7.37	12.45
2000	South America West	Matarani	North America Gulf	South Louisiana	41.62	18.41	17.18	16.54	15.69	12.95	11.62	9.88	10.14	10.04	9.49	15.94
2000	South America West	Callao	North America Gulf	South Louisiana	38.74	17.25	16.08	15.59	14.85	12.28	11.04	9.41	9.67	9.59	9.06	15.23
2000	South America West	Callao	Central America East	Tampico	30.64	14.51	14.61	14.29	13.90	11.55	10.23	8.64	8.77	8.66	8.16	13.54
2000	South America West	Callao	South America East	Puerto La Cruz	35.77	16.50	16.17	15.27	14.71	12.31	11.03	9.20	9.17	9.05	8.52	14.12
2000	Chile	Antofagasta	Caribbean Basin	Point Lisas	34.44	17.49	16.55	15.24	14.21	12.49	11.23	9.33	9.24	9.20	8.65	14.44
2000	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.30	13.92	12.83	11.63	10.70	8.89	7.72	6.42	6.38	6.34	6.00	10.03
2000	South America West	Callao	Caribbean Basin	San Juan	28.12	15.18	15.65	16.12	16.07	14.27	12.71	10.82	11.06	11.18	10.77	18.25
2000	Peru	Matarani	Europe	Rotterdam	56.00	24.06	23.36	21.45	20.08	16.38	14.51	12.15	12.27	12.22	11.48	19.03
2000	Chile	Antofagasta	Europe	Rotterdam	59.01	26.66	25.64	23.13	21.28	18.00	16.20	13.48	13.47	13.45	12.61	20.94
2000	South America West	Callao	Europe	Rotterdam	53.13	22.90	22.27	20.50	19.24	15.71	13.93	11.68	11.80	11.77	11.05	18.32
2000	South America West	Callao	Africa	Safi	49.36	21.75	21.18	19.66	18.45	15.36	13.74	11.65	11.85	11.94	11.27	18.68
2000	South America West	Matarani	Middle East	Aqaba (El Akaba)	68.02	29.27	28.29	25.86	23.93	19.72	17.50	14.70	14.86	14.89	14.05	23.28
2000	Oceania	Newcastle	North America East	Baltimore	86.42	35.37	32.64	28.76	25.68	20.92	18.25	15.21	15.04	14.85	14.06	23.52
2000	Oceania	Bunbury	North America East	Philadelphia	96.33	39.33	36.33	32.10	28.51	23.14	20.55	17.05	16.92	16.68	15.75	26.25
2000	Oceania	Newcastle	North America Gulf	Mobile	82.50	33.70	31.02	27.31	24.58	20.17	17.56	14.74	14.53	14.33	13.53	22.59
2000	Oceania	Bunbury	North America Gulf	South Louisiana	93.26	38.36	35.43	31.77	28.44	23.08	20.35	17.01	17.14	16.90	15.96	26.61
2000	Oceania	Newcastle	Central America East	Tampico	74.70	31.36	29.94	26.82	24.35	19.84	17.24	14.38	14.27	14.04	13.25	21.91
2000	Oceania	Bunbury	Central America East	Tampico	85.19	35.63	33.96	30.48	27.50	22.35	19.55	16.25	16.24	15.98	15.08	24.93
2000	Oceania	Bunbury	Caribbean Basin	San Juan	82.49	36.22	34.92	32.25	29.60	25.02	21.99	18.40	18.52	18.48	17.67	29.62
2000	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	121.46	50.08	47.33	41.83	37.32	30.35	26.68	22.20	22.23	22.11	20.87	34.52
2000	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83
2000	Korea	Guangzhou	East Coast USA	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83
2000	Far East	Guangzhou	East Coast Canada	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83
2000	Taiwan	Guangzhou	East Coast USA	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83
2000	Japan	Kobe	East Coast USA	Philadelphia	88.01	36.11	33.64	30.14	26.89	22.57	20.37	17.46	17.67	17.93	17.46	30.37
2000	Far East	Guangzhou	North America East	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83
2000	Far East	Guangzhou	North America East	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83
2000	Far East	Guangzhou	North America East	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	Far East	Guangzhou	North America Gulf	South Louisiana	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21
2000	Far East	Guangzhou	North America Gulf	South Louisiana	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21
2000	Far East	Guangzhou	North America Gulf	New Orleans	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21
2000	Far East	Guangzhou	North America Gulf	South Louisiana	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21
2000	Far East	Guangzhou	Central America East	Tampico	83.18	34.68	33.36	29.90	26.96	21.85	19.08	15.82	15.81	15.62	14.80	24.51
2000	Far East	Guangzhou	South America East	Puerto La Cruz	88.21	36.61	34.87	30.85	27.73	22.58	19.85	16.36	16.20	15.99	15.14	25.07
2000	Far East	Guangzhou	Caribbean Basin	San Juan	80.57	35.31	34.35	31.69	29.08	24.53	21.52	17.97	18.09	18.11	17.39	29.19
2000	South East Asia	Manado	North America East	Philadelphia	93.65	40.48	39.27	36.15	33.55	28.51	27.49	22.58	22.50	22.28	21.09	35.22
2000	South East Asia	Bangkok	North America Gulf	New Orleans	96.60	39.86	37.57	33.96	30.53	24.88	22.11	18.60	18.97	18.99	17.90	29.85
2000	South East Asia	Manado	North America Gulf	New Orleans	90.80	39.62	38.47	35.91	33.55	28.51	27.35	22.59	22.75	22.53	21.33	35.63
2000	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	102.47	41.69	39.03	34.71	31.43	26.14	23.57	19.65	19.56	19.37	18.35	30.43
2005	North America East	New York	North America West	Los Angeles	56.58	23.95	17.63	15.34	13.56	11.93	10.83	9.60	9.09	9.50	9.95	17.08
2005	North America East	New York	Central America West	Lazaro Cardenas	40.42	17.90	13.77	12.37	10.89	9.44	8.37	7.20	6.68	6.84	6.94	11.87
2005	North America East	New York	South America West	Matarani	42.92	19.22	14.90	13.59	12.29	10.63	9.45	8.14	7.54	7.72	7.82	13.35
2005	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	83.20	34.80	26.06	22.24	19.08	16.06	13.62	11.47	10.41	10.66	10.83	18.38
2005	North America East	New York	Oceania	Brisbane	78.05	33.07	25.21	21.90	19.03	16.45	14.42	12.45	11.44	11.69	11.86	20.20
2005	East Coast USA	Norfolk	Taiwan	Kaohsiung	83.75	34.91	26.09	22.37	19.43	16.64	14.10	12.04	10.95	11.18	11.34	19.31
2005	East Coast USA	Norfolk	Korea	Kwangyang	79.68	33.33	24.94	21.43	18.67	16.07	13.65	11.73	10.69	10.93	11.07	18.84
2005	East Coast USA	Norfolk	Japan	Mizushima	82.63	34.42	25.69	22.17	19.30	16.77	14.44	12.58	11.63	12.00	12.35	21.44
2005	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	80.06	33.45	24.99	21.32	18.43	15.65	13.22	11.19	10.16	10.40	10.54	17.86
2005	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	83.01	34.54	25.74	22.05	19.06	16.35	14.01	12.04	11.10	11.47	11.83	20.46
2005	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	83.04	34.94	26.21	22.50	19.39	16.39	13.97	11.78	10.79	11.09	11.30	19.12
2005	North America East	New York	Far East	Guangzhou	87.40	36.71	27.71	23.90	20.54	17.41	15.11	12.83	11.74	12.03	12.25	20.84
2005	North America East	New York	Far East	Guangzhou	87.40	36.71	27.71	23.90	20.54	17.41	15.11	12.83	11.74	12.03	12.25	20.84
2005	North America Gulf	Tampa	North America West	Los Angeles	52.32	22.34	16.38	14.63	13.12	11.57	10.41	9.35	9.04	9.45	9.91	17.04
2005	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.23	16.34	12.56	11.69	10.47	9.10	7.97	6.97	6.64	6.80	6.90	11.84
2005	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.23	16.34	12.56	11.69	10.47	9.10	7.97	6.97	6.64	6.80	6.90	11.84
2005	North America Gulf	Tampa	South America West	Matarani	38.72	17.66	13.68	12.91	11.87	10.28	9.04	7.91	7.50	7.69	7.78	13.31
2005	North America Gulf	Tampa	South America West	Matarani	38.72	17.66	13.68	12.91	11.87	10.28	9.04	7.91	7.50	7.69	7.78	13.31
2005	North America Gulf	Tampa	Oceania	Auckland	66.05	28.27	21.64	19.24	16.92	14.71	12.90	11.36	10.61	10.86	11.02	18.81
2005	North America Gulf	Tampa	Oceania	Auckland	66.05	28.27	21.64	19.24	16.92	14.71	12.90	11.36	10.61	10.86	11.02	18.81
2005	North America Gulf	Mobile	Far East	Osaka	79.06	32.64	24.32	20.98	18.29	15.94	13.74	12.02	11.13	11.49	11.84	20.58

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 DWT)											
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	North America Gulf	Tampa	Far East	Guangzhou	82.73	34.75	26.17	22.94	19.89	16.88	14.55	12.47	11.60	11.89	12.12	20.65
2005	North America Gulf	Tampa	Far East	Guangzhou	82.73	34.75	26.17	22.94	19.89	16.88	14.55	12.47	11.60	11.89	12.12	20.65
2005	North America Gulf	Tampa	South East Asia	Bangkok	89.90	38.34	29.17	25.84	22.52	19.25	16.71	14.43	13.55	14.06	14.21	24.21
2005	Central America East	Puerto Limon	North America West	Los Angeles	38.19	17.75	13.48	12.24	11.27	10.01	8.89	7.92	7.51	7.89	8.32	14.23
2005	Central America East	Puerto Limon	South America West	Matarani	24.42	12.90	10.69	10.47	10.02	8.70	7.51	6.46	5.95	6.12	6.19	10.52
2005	Central America East	Puerto Limon	South America West	Matarani	24.42	12.90	10.69	10.47	10.02	8.70	7.51	6.46	5.95	6.12	6.19	10.52
2005	Central America East	Puerto Limon	Far East	Guangzhou	69.69	31.54	24.38	21.53	18.84	15.95	13.55	11.42	10.37	10.63	10.82	18.31
2005	Central America East	Puerto Limon	South East Asia	Jakarta	79.31	38.81	31.06	28.65	26.18	23.25	21.64	17.98	16.28	16.74	17.03	28.97
2005	South America East	Santos	North America West	Los Angeles	66.67	28.21	20.81	18.20	16.16	14.23	12.59	11.21	10.50	10.96	11.48	19.52
2005	Other South America East	Buenos Aires	West Coast USA	Los Angeles	77.73	32.63	24.10	21.06	18.72	16.40	14.37	12.65	11.92	12.41	12.81	21.72
2005	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	52.37	21.93	16.08	13.96	12.53	10.92	9.60	8.50	8.02	8.37	8.80	15.00
2005	South America East	Buenos Aires	West Coast Canada	Los Angeles	77.73	32.63	24.10	21.06	18.72	16.40	14.37	12.65	11.92	12.41	12.81	21.72
2005	Brazil	Santos	West Coast USA	Los Angeles	66.67	28.21	20.81	18.20	16.16	14.23	12.59	11.21	10.50	10.96	11.48	19.52
2005	South America East	Ponta da Madeira	North America West	Los Angeles	55.94	23.80	17.49	15.19	13.45	11.86	10.52	9.33	8.74	9.18	9.69	16.52
2005	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	31.87	13.98	10.77	9.72	8.92	7.76	6.55	5.69	5.20	5.30	5.34	9.01
2005	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	24.21	11.76	9.10	8.40	7.75	6.85	5.85	5.12	4.75	4.87	4.94	8.40
2005	South America East	Puerto Bolivar	South America West	Huasco	29.96	15.87	12.49	11.35	10.46	9.73	8.73	7.53	6.98	7.17	7.22	12.12
2005	South America East	Puerto La Cruz	South America West	Matarani	34.37	15.31	11.90	10.94	10.33	8.95	7.63	6.63	6.07	6.18	6.23	10.49
2005	South America East	Santos	Oceania	Brisbane	89.04	37.76	28.78	25.09	21.91	18.98	16.38	14.24	13.03	13.33	13.56	22.93
2005	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	81.13	33.61	25.17	21.54	18.71	15.76	13.20	11.13	10.06	10.24	10.37	17.51
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	79.97	33.49	25.22	21.76	18.88	15.91	13.49	11.40	10.42	10.66	10.84	18.28
2005	Venezuela	Puerto Ordaz	Korea	Kwangyang	76.92	31.96	23.96	20.55	17.90	15.14	12.72	10.79	9.77	9.96	10.07	17.00
2005	Venezuela	Puerto Ordaz	Japan	Mizushima	79.84	33.04	24.70	21.27	18.52	15.84	13.50	11.64	10.71	11.02	11.35	19.59
2005	North Brazil	Ponta da Madeira	Korea	Kwangyang	80.49	33.84	25.37	21.78	18.81	16.07	13.64	11.62	10.50	10.76	10.95	18.52
2005	North Brazil	Ponta da Madeira	Japan	Mizushima	83.41	34.92	26.11	22.50	19.44	16.77	14.42	12.46	11.43	11.83	12.23	21.11
2005	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	83.55	35.36	26.63	22.99	19.79	16.84	14.41	12.23	11.14	11.47	11.73	19.80
2005	Venezuela	Puerto Ordaz	Japan	Shimizu	79.76	33.54	25.46	22.31	19.47	17.18	14.90	13.29	12.31	12.98	13.68	24.37
2005	North Brazil	Saã Luiz	Japan	Shimizu	81.67	34.65	26.29	23.22	20.24	18.10	15.90	14.34	13.30	14.05	14.81	26.29
2005	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	99.15	41.81	31.60	27.22	23.38	19.80	16.87	14.28	12.97	13.31	13.60	22.99
2005	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	86.29	36.37	27.49	23.87	20.66	17.64	15.15	13.02	11.88	12.20	12.46	21.05
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	80.80	33.72	25.42	21.89	19.12	16.19	13.68	11.64	10.58	10.81	10.97	18.46
2005	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	105.65	44.26	33.39	28.97	25.14	21.41	18.26	15.57	14.30	14.67	14.82	24.98

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	Colombia	Puerto Bolivar	Japan	Mizushima	68.06	29.04	21.68	18.77	16.49	14.32	12.27	10.70	9.89	10.22	10.55	18.26
2005	Brazil	Saã Luiz	Far East	Guangzhou	86.29	36.37	27.49	23.87	20.66	17.64	15.15	13.02	11.88	12.20	12.46	21.05
2005	South America East	Ponta da Madeira	Far East	Mizushima	83.41	34.92	26.11	22.50	19.44	16.77	14.42	12.46	11.43	11.83	12.23	21.11
2005	Caribbean Basin	Kingston	North America West	Los Angeles	40.77	20.07	15.51	14.66	13.76	12.94	11.44	10.20	9.69	10.29	10.93	19.01
2005	Caribbean Basin	Kingston	North America West	Los Angeles	40.77	20.07	15.51	14.66	13.76	12.94	11.44	10.20	9.69	10.29	10.93	19.01
2005	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	24.56	13.99	11.63	11.67	11.07	10.43	8.96	7.80	7.26	7.62	7.91	13.79
2005	Caribbean Basin	Kingston	South America West	Matarani	27.06	15.31	12.76	12.89	12.48	11.62	10.05	8.74	8.13	8.51	8.79	15.26
2005	Caribbean Basin	Kingston	Far East	Guangzhou	71.85	32.96	25.70	23.33	20.83	18.48	15.78	13.48	12.39	12.88	13.28	22.85
2005	Caribbean Basin	Kingston	Far East	Guangzhou	71.85	32.96	25.70	23.33	20.83	18.48	15.78	13.48	12.39	12.88	13.28	22.85
2005	Europe	Rotterdam	West Coast Canada	Los Angeles	66.63	28.08	21.10	18.31	16.33	14.19	12.52	11.06	10.48	10.98	11.40	19.40
2005	Europe	Rotterdam	West Coast USA	Los Angeles	66.63	28.08	21.10	18.31	16.33	14.19	12.52	11.06	10.48	10.98	11.40	19.40
2005	Europe	Rotterdam	North America West	Los Angeles	66.63	28.08	21.10	18.31	16.33	14.19	12.52	11.06	10.48	10.98	11.40	19.40
2005	Europe	Rotterdam	Central America West	Lazaro Cardenas	50.45	22.04	17.24	15.33	13.65	11.70	10.06	8.66	8.06	8.32	8.38	14.18
2005	Europe	Rotterdam	South America West	Matarani	52.95	23.36	18.37	16.55	15.05	12.88	11.13	9.59	8.92	9.20	9.26	15.65
2005	Africa	Durban	North America West	Los Angeles	82.05	35.02	26.25	22.79	20.12	17.56	15.42	13.52	12.71	13.35	13.86	23.59
2005	Africa	Safi	Central America West	Lazaro Cardenas	47.38	21.30	16.60	14.87	13.22	11.55	10.00	8.68	8.08	8.43	8.55	14.52
2005	Africa	Safi	Oceania	Auckland	77.87	33.62	26.01	22.72	19.92	17.36	15.11	13.21	12.19	12.63	12.81	21.72
2005	Middle East	Damman	Central America West	Lazaro Cardenas	79.79	34.69	26.70	23.49	20.59	17.70	15.15	12.96	11.96	12.38	12.55	21.27
2005	Middle East	Damman	South America West	Matarani	82.29	36.02	27.83	24.71	22.00	18.88	16.24	13.90	12.82	13.26	13.44	22.75
2005	Middle East	Damman	South America West	Matarani	82.29	36.02	27.83	24.71	22.00	18.88	16.24	13.90	12.82	13.26	13.44	22.75
2005	North America West	Vancouver	North America East	Philadelphia	56.09	23.06	18.32	16.35	14.84	12.28	10.71	8.95	8.56	8.58	8.14	14.15
2005	North America West	Vancouver	North America Gulf	New Orleans	53.47	22.30	17.69	16.19	14.87	12.31	10.62	8.97	8.75	8.78	8.33	14.50
2005	North America West	Vancouver	Central America East	Tampico	45.34	19.55	16.00	14.70	13.77	11.44	9.66	8.08	7.71	7.72	7.32	12.65
2005	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	63.74	26.13	20.66	18.53	16.97	14.14	12.09	10.21	9.67	9.71	9.25	15.94
2005	North America West	Vancouver	South America East	Sepetiba, Bahia de	63.74	26.13	20.66	18.53	16.97	14.14	12.09	10.21	9.67	9.71	9.25	15.94
2005	North America West	Vancouver	Caribbean Basin	San Juan	43.05	20.35	16.97	16.34	15.70	13.87	11.80	9.93	9.53	9.73	9.40	16.59
2005	West Coast USA	Los Angeles	Europe	Rotterdam	66.19	27.45	21.85	19.56	18.25	15.29	13.50	11.54	11.33	11.60	11.24	19.45
2005	West Coast Canada	Vancouver	Europe	Rotterdam	66.20	27.31	22.08	19.67	18.06	14.82	12.62	10.53	10.09	10.18	9.60	16.53
2005	North America West	Vancouver	Europe	Rotterdam	66.20	27.31	22.08	19.67	18.06	14.82	12.62	10.53	10.09	10.18	9.60	16.53
2005	West Coast Canada	Vancouver	North Africa	Alexandria	74.27	30.97	24.87	22.20	20.30	16.84	14.39	12.03	11.50	11.68	11.07	19.11
2005	West Coast Canada	Vancouver	South Africa	Durban	80.82	33.62	26.99	24.06	21.96	18.18	15.51	12.93	12.34	12.52	11.87	20.48
2005	North America West	Vancouver	Africa	Safi	62.71	26.28	21.15	18.92	17.36	14.48	12.41	10.43	10.01	10.20	9.67	16.71

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	North America West	Vancouver	Middle East	Aqaba (El Akaba)	77.34	32.21	25.86	23.08	21.08	17.47	14.92	12.45	11.90	12.07	11.45	19.75
2005	Central America West	Puerto Quetzal	North America East	Philadelphia	35.04	16.01	13.39	12.67	12.08	10.60	9.31	7.75	7.43	7.45	7.06	12.31
2005	Central America West	Puerto Quetzal	North America East	Philadelphia	35.04	16.01	13.39	12.67	12.08	10.60	9.31	7.75	7.43	7.45	7.06	12.31
2005	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	32.28	15.16	12.69	12.46	12.08	10.60	9.18	7.74	7.60	7.63	7.24	12.65
2005	Central America West	Puerto Quetzal	North America Gulf	New Orleans	32.28	15.16	12.69	12.46	12.08	10.60	9.18	7.74	7.60	7.63	7.24	12.65
2005	Central America West	Puerto Quetzal	Central America East	Tampico	24.17	12.46	11.05	11.03	11.03	9.77	8.26	6.87	6.57	6.59	6.25	10.82
2005	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	43.35	19.57	16.17	15.26	14.58	12.75	10.93	9.19	8.70	8.75	8.33	14.36
2005	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	21.75	13.22	12.01	12.70	13.01	12.25	10.43	8.74	8.40	8.63	8.37	14.87
2005	Central America West	Puerto Quetzal	Europe	Rotterdam	45.97	20.87	17.71	16.50	15.76	13.49	11.51	9.54	9.16	9.25	8.71	15.00
2005	Central America West	Puerto Quetzal	Africa	Safi	42.33	19.77	16.70	15.70	15.01	13.13	11.28	9.43	9.06	9.26	8.78	15.18
2005	Peru	San Nicolas	East Coast USA	Baltimore	42.60	18.30	14.68	13.34	12.18	10.11	8.78	7.33	7.06	7.08	6.73	11.72
2005	Chile	Antofagasta	East Coast USA	Baltimore	46.54	21.83	18.06	16.68	15.48	13.55	12.14	10.09	9.75	9.78	9.23	15.93
2005	South America West	Matarani	North America East	Philadelphia	43.05	18.93	15.57	14.66	13.86	11.55	10.27	8.58	8.25	8.26	7.80	13.53
2005	South America West	Callao	North America East	Philadelphia	40.33	17.82	14.68	13.88	13.16	10.99	9.80	8.20	7.90	7.90	7.47	12.95
2005	South America West	San Nicolas	North America Gulf	Mobile	39.06	16.78	13.43	12.21	11.32	9.53	8.26	6.97	6.69	6.70	6.34	11.02
2005	South America West	Matarani	North America Gulf	South Louisiana	40.36	18.13	14.91	14.48	13.88	11.56	10.16	8.59	8.43	8.45	7.99	13.87
2005	South America West	Callao	North America Gulf	South Louisiana	37.64	17.02	14.02	13.69	13.18	11.00	9.69	8.21	8.08	8.09	7.65	13.30
2005	South America West	Callao	Central America East	Tampico	29.52	14.28	12.34	12.22	12.08	10.14	8.74	7.32	7.04	7.04	6.64	11.45
2005	South America West	Callao	South America East	Puerto La Cruz	34.81	16.39	13.82	13.20	12.90	10.88	9.49	7.85	7.42	7.41	6.98	12.01
2005	Chile	Antofagasta	Caribbean Basin	Point Lisas	33.16	17.19	14.35	13.42	12.72	11.35	10.08	8.33	8.00	8.02	7.54	12.88
2005	Peru	San Nicolas	Caribbean Basin	Point Lisas	29.21	13.67	10.97	10.09	9.42	7.92	6.73	5.57	5.31	5.32	5.04	8.67
2005	South America West	Callao	Caribbean Basin	San Juan	27.16	15.05	13.29	13.85	14.00	12.56	10.87	9.17	8.85	9.05	8.73	15.40
2005	Peru	Matarani	Europe	Rotterdam	53.55	23.40	19.54	18.17	17.25	14.22	12.29	10.25	9.87	9.94	9.34	16.04
2005	Chile	Antofagasta	Europe	Rotterdam	56.44	25.97	21.74	19.90	18.59	15.95	14.15	11.72	11.30	11.38	10.67	18.21
2005	South America West	Callao	Europe	Rotterdam	50.83	22.29	18.65	17.39	16.55	13.65	11.82	9.87	9.52	9.59	9.01	15.47
2005	South America West	Callao	Africa	Safi	47.27	21.23	17.68	16.61	15.82	13.30	11.60	9.76	9.42	9.60	9.07	15.63
2005	South America West	Matarani	Middle East	Aqaba (El Akaba)	64.93	28.45	23.46	21.70	20.38	16.96	14.66	12.23	11.73	11.89	11.24	19.36
2005	Oceania	Newcastle	North America East	Baltimore	82.65	34.19	27.46	24.43	22.06	18.13	15.50	12.87	12.22	12.18	11.55	19.95
2005	Oceania	Bunbury	North America East	Philadelphia	91.94	37.93	30.46	27.18	24.42	19.99	17.39	14.37	13.69	13.62	12.88	22.19
2005	Oceania	Newcastle	North America Gulf	Mobile	78.94	32.59	26.13	23.23	21.14	17.50	14.94	12.48	11.82	11.77	11.14	19.20
2005	Oceania	Bunbury	North America Gulf	South Louisiana	89.07	37.04	29.73	26.92	24.37	19.96	17.23	14.34	13.84	13.78	13.04	22.48
2005	Oceania	Newcastle	Central America East	Tampico	71.10	30.26	24.76	22.43	20.65	16.98	14.39	11.93	11.28	11.22	10.60	18.18

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	Oceania	Bunbury	Central America East	Tampico	80.97	34.31	28.05	25.45	23.28	19.10	16.29	13.46	12.81	12.74	12.04	20.64
2005	Oceania	Bunbury	Caribbean Basin	San Juan	78.46	35.00	28.92	27.00	25.13	21.47	18.37	15.27	14.60	14.73	14.11	24.57
2005	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	115.30	48.12	38.97	34.80	31.44	25.81	22.14	18.31	17.47	17.56	16.61	28.49
2005	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Korea	Guangzhou	East Coast USA	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Far East	Guangzhou	East Coast Canada	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Taiwan	Guangzhou	East Coast USA	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Japan	Kobe	East Coast USA	Philadelphia	83.99	34.90	28.21	25.54	23.05	19.56	17.30	14.77	14.35	14.71	14.37	25.89
2005	Far East	Guangzhou	North America East	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Far East	Guangzhou	North America East	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Far East	Guangzhou	North America East	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77
2005	Far East	Guangzhou	North America Gulf	South Louisiana	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09
2005	Far East	Guangzhou	North America Gulf	South Louisiana	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09
2005	Far East	Guangzhou	North America Gulf	New Orleans	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09
2005	Far East	Guangzhou	North America Gulf	South Louisiana	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09
2005	Far East	Guangzhou	Central America East	Tampico	78.83	33.39	27.36	24.82	22.72	18.59	15.83	13.04	12.41	12.41	11.78	20.24
2005	Far East	Guangzhou	South America East	Puerto La Cruz	84.05	35.46	28.80	25.77	23.50	19.31	16.56	13.56	12.78	12.76	12.11	20.79
2005	Far East	Guangzhou	Caribbean Basin	San Juan	76.42	34.13	28.27	26.40	24.59	20.98	17.93	14.86	14.21	14.40	13.85	24.17
2005	South East Asia	Manado	North America East	Philadelphia	89.12	39.10	32.39	30.19	28.45	24.50	23.15	18.90	17.98	18.02	17.10	29.63
2005	South East Asia	Bangkok	North America Gulf	New Orleans	91.81	38.32	30.95	28.29	25.77	21.23	18.45	15.44	15.05	15.24	14.38	24.89
2005	South East Asia	Manado	North America Gulf	New Orleans	86.48	38.32	31.76	30.02	28.48	24.53	23.04	18.91	18.17	18.21	17.28	29.98
2005	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	96.93	39.87	31.69	28.54	26.26	22.14	19.63	16.28	15.49	15.52	14.74	25.32
2010	North America East	New York	North America West	Los Angeles	57.17	24.22	17.83	15.52	13.71	12.05	10.93	9.68	9.17	9.58	10.03	17.21
2010	North America East	New York	Central America West	Lazaro Cardenas	40.89	18.13	13.94	12.53	11.02	9.55	8.46	7.28	6.75	6.91	7.01	11.99
2010	North America East	New York	South America West	Matarani	43.39	19.45	15.07	13.75	12.43	10.74	9.55	8.22	7.62	7.80	7.90	13.47
2010	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	84.46	35.39	26.51	22.63	19.40	16.32	13.84	11.65	10.58	10.82	11.00	18.66
2010	North America East	New York	Oceania	Brisbane	79.12	33.58	25.60	22.24	19.31	16.69	14.62	12.62	11.60	11.84	12.02	20.47
2010	East Coast USA	Norfolk	Taiwan	Kaohsiung	84.94	35.46	26.51	22.73	19.74	16.90	14.31	12.21	11.11	11.34	11.50	19.57
2010	East Coast USA	Norfolk	Korea	Kwangyang	80.80	33.85	25.34	21.77	18.95	16.30	13.84	11.89	10.84	11.08	11.22	19.08
2010	East Coast USA	Norfolk	Japan	Mizushima	83.73	34.93	26.08	22.50	19.58	17.01	14.63	12.74	11.77	12.14	12.50	21.68
2010	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	81.29	34.02	25.42	21.69	18.74	15.91	13.43	11.36	10.32	10.57	10.70	18.13
2010	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	84.23	35.10	26.17	22.42	19.37	16.61	14.22	12.21	11.26	11.64	11.99	20.72

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	84.32	35.53	26.67	22.89	19.71	16.66	14.19	11.96	10.96	11.26	11.47	19.40
2010	North America East	New York	Far East	Guangzhou	88.64	37.29	28.14	24.28	20.86	17.67	15.33	13.00	11.91	12.20	12.42	21.11
2010	North America East	New York	Far East	Guangzhou	88.64	37.29	28.14	24.28	20.86	17.67	15.33	13.00	11.91	12.20	12.42	21.11
2010	North America Gulf	Tampa	North America West	Los Angeles	52.82	22.57	16.56	14.79	13.25	11.68	10.51	9.43	9.11	9.52	9.99	17.16
2010	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.62	16.53	12.71	11.83	10.58	9.20	8.05	7.04	6.70	6.87	6.97	11.95
2010	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.62	16.53	12.71	11.83	10.58	9.20	8.05	7.04	6.70	6.87	6.97	11.95
2010	North America Gulf	Tampa	South America West	Matarani	39.12	17.85	13.83	13.05	11.99	10.39	9.13	7.98	7.57	7.76	7.86	13.43
2010	North America Gulf	Tampa	South America West	Matarani	39.12	17.85	13.83	13.05	11.99	10.39	9.13	7.98	7.57	7.76	7.86	13.43
2010	North America Gulf	Tampa	Oceania	Auckland	66.91	28.67	21.95	19.51	17.16	14.90	13.06	11.50	10.75	10.99	11.15	19.04
2010	North America Gulf	Tampa	Oceania	Auckland	66.91	28.67	21.95	19.51	17.16	14.90	13.06	11.50	10.75	10.99	11.15	19.04
2010	North America Gulf	Mobile	Far East	Osaka	80.09	33.11	24.68	21.28	18.55	16.15	13.92	12.17	11.27	11.63	11.98	20.81
2010	North America Gulf	Tampa	Far East	Guangzhou	83.88	35.27	26.57	23.29	20.18	17.12	14.75	12.64	11.75	12.05	12.28	20.90
2010	North America Gulf	Tampa	Far East	Guangzhou	83.88	35.27	26.57	23.29	20.18	17.12	14.75	12.64	11.75	12.05	12.28	20.90
2010	North America Gulf	Tampa	South East Asia	Bangkok	91.17	38.93	29.62	26.24	22.85	19.52	16.94	14.62	13.73	14.24	14.40	24.51
2010	Central America East	Puerto Limon	North America West	Los Angeles	38.62	17.98	13.66	12.39	11.41	10.12	8.99	8.00	7.58	7.96	8.40	14.36
2010	Central America East	Puerto Limon	South America West	Matarani	24.74	13.09	10.84	10.61	10.14	8.80	7.59	6.53	6.02	6.19	6.26	10.63
2010	Central America East	Puerto Limon	South America West	Matarani	24.74	13.09	10.84	10.61	10.14	8.80	7.59	6.53	6.02	6.19	6.26	10.63
2010	Central America East	Puerto Limon	Far East	Guangzhou	70.80	32.10	24.82	21.91	19.16	16.21	13.77	11.60	10.53	10.80	10.99	18.58
2010	Central America East	Puerto Limon	South East Asia	Jakarta	80.59	39.50	31.61	29.15	26.61	23.61	21.94	18.23	16.51	16.97	17.26	29.35
2010	South America East	Santos	North America West	Los Angeles	67.56	28.62	21.13	18.47	16.39	14.42	12.75	11.35	10.63	11.09	11.61	19.73
2010	Other South America East	Buenos Aires	West Coast USA	Los Angeles	78.71	33.09	24.45	21.37	18.98	16.62	14.55	12.80	12.06	12.55	12.95	21.95
2010	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	52.95	22.20	16.29	14.14	12.69	11.05	9.71	8.59	8.10	8.45	8.88	15.13
2010	South America East	Buenos Aires	West Coast Canada	Los Angeles	78.71	33.09	24.45	21.37	18.98	16.62	14.55	12.80	12.06	12.55	12.95	21.95
2010	Brazil	Santos	West Coast USA	Los Angeles	67.56	28.62	21.13	18.47	16.39	14.42	12.75	11.35	10.63	11.09	11.61	19.73
2010	South America East	Ponta da Madeira	North America West	Los Angeles	56.63	24.13	17.74	15.40	13.62	12.01	10.64	9.43	8.84	9.27	9.78	16.68
2010	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	32.26	14.17	10.92	9.85	9.03	7.86	6.63	5.76	5.26	5.36	5.41	9.12
2010	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	24.55	11.93	9.24	8.52	7.86	6.94	5.92	5.19	4.80	4.93	5.00	8.50
2010	South America East	Puerto Bolivar	South America West	Huasco	30.36	16.06	12.63	11.48	10.56	9.82	8.80	7.59	7.03	7.23	7.28	12.22
2010	South America East	Puerto La Cruz	South America West	Matarani	34.77	15.50	12.06	11.08	10.45	9.05	7.72	6.70	6.14	6.25	6.30	10.60
2010	South America East	Santos	Oceania	Brisbane	90.44	38.42	29.29	25.54	22.28	19.30	16.65	14.46	13.23	13.54	13.77	23.28
2010	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	82.37	34.19	25.62	21.92	19.03	16.02	13.42	11.31	10.23	10.40	10.54	17.79
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	81.18	34.05	25.65	22.13	19.19	16.16	13.70	11.58	10.58	10.83	11.01	18.55

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	Venezuela	Puerto Ordaz	Korea	Kwangyang	78.07	32.50	24.38	20.90	18.20	15.39	12.92	10.96	9.93	10.11	10.23	17.26
2010	Venezuela	Puerto Ordaz	Japan	Mizushima	80.98	33.57	25.11	21.62	18.82	16.08	13.70	11.81	10.86	11.18	11.51	19.85
2010	North Brazil	Ponta da Madeira	Korea	Kwangyang	81.75	34.42	25.82	22.17	19.14	16.35	13.86	11.80	10.67	10.94	11.13	18.80
2010	North Brazil	Ponta da Madeira	Japan	Mizushima	84.66	35.50	26.55	22.89	19.76	17.04	14.64	12.65	11.60	12.00	12.41	21.39
2010	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	84.86	35.97	27.10	23.39	20.13	17.12	14.64	12.41	11.32	11.65	11.90	20.09
2010	Venezuela	Puerto Ordaz	Japan	Shimizu	80.85	34.06	25.87	22.66	19.77	17.43	15.11	13.46	12.47	13.15	13.85	24.66
2010	North Brazil	Saã Luiz	Japan	Shimizu	82.86	35.21	26.73	23.60	20.57	18.38	16.13	14.54	13.48	14.24	15.00	26.61
2010	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	100.73	42.54	32.16	27.70	23.79	20.13	17.15	14.51	13.18	13.53	13.82	23.35
2010	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	87.66	37.01	27.98	24.29	21.02	17.94	15.40	13.22	12.07	12.40	12.65	21.36
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	82.02	34.28	25.85	22.26	19.43	16.45	13.90	11.81	10.74	10.97	11.13	18.74
2010	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	107.26	45.01	33.97	29.47	25.56	21.76	18.55	15.80	14.52	14.89	15.05	25.35
2010	Colombia	Puerto Bolivar	Japan	Mizushima	69.08	29.51	22.04	19.08	16.76	14.54	12.45	10.85	10.03	10.36	10.69	18.50
2010	Brazil	Saã Luiz	Far East	Guangzhou	87.66	37.01	27.98	24.29	21.02	17.94	15.40	13.22	12.07	12.40	12.65	21.36
2010	South America East	Ponta da Madeira	Far East	Mizushima	84.66	35.50	26.55	22.89	19.76	17.04	14.64	12.65	11.60	12.00	12.41	21.39
2010	Caribbean Basin	Kingston	North America West	Los Angeles	41.23	20.31	15.70	14.84	13.92	13.08	11.55	10.30	9.78	10.39	11.03	19.18
2010	Caribbean Basin	Kingston	North America West	Los Angeles	41.23	20.31	15.70	14.84	13.92	13.08	11.55	10.30	9.78	10.39	11.03	19.18
2010	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	24.90	14.19	11.79	11.83	11.21	10.56	9.07	7.89	7.35	7.71	8.00	13.94
2010	Caribbean Basin	Kingston	South America West	Matarani	27.41	15.51	12.92	13.05	12.63	11.75	10.15	8.83	8.22	8.60	8.89	15.43
2010	Caribbean Basin	Kingston	Far East	Guangzhou	72.97	33.51	26.13	23.71	21.16	18.76	16.01	13.67	12.57	13.06	13.47	23.16
2010	Caribbean Basin	Kingston	Far East	Guangzhou	72.97	33.51	26.13	23.71	21.16	18.76	16.01	13.67	12.57	13.06	13.47	23.16
2010	Europe	Rotterdam	West Coast Canada	Los Angeles	67.50	28.48	21.41	18.57	16.55	14.38	12.68	11.18	10.59	11.10	11.52	19.60
2010	Europe	Rotterdam	West Coast USA	Los Angeles	67.50	28.48	21.41	18.57	16.55	14.38	12.68	11.18	10.59	11.10	11.52	19.60
2010	Europe	Rotterdam	North America West	Los Angeles	67.50	28.48	21.41	18.57	16.55	14.38	12.68	11.18	10.59	11.10	11.52	19.60
2010	Europe	Rotterdam	Central America West	Lazaro Cardenas	51.21	22.40	17.52	15.57	13.85	11.87	10.20	8.78	8.17	8.43	8.49	14.36
2010	Europe	Rotterdam	South America West	Matarani	53.72	23.72	18.65	16.80	15.26	13.06	11.28	9.72	9.04	9.32	9.38	15.84
2010	Africa	Durban	North America West	Los Angeles	83.21	35.57	26.66	23.14	20.43	17.82	15.63	13.70	12.87	13.51	14.03	23.87
2010	Africa	Safi	Central America West	Lazaro Cardenas	48.10	21.65	16.88	15.12	13.43	11.73	10.15	8.80	8.19	8.55	8.67	14.72
2010	Africa	Safi	Oceania	Auckland	79.08	34.19	26.46	23.11	20.26	17.64	15.34	13.41	12.38	12.82	13.00	22.04
2010	Middle East	Damman	Central America West	Lazaro Cardenas	81.07	35.30	27.17	23.90	20.94	17.99	15.39	13.16	12.15	12.57	12.75	21.59
2010	Middle East	Damman	South America West	Matarani	83.58	36.62	28.30	25.12	22.35	19.18	16.48	14.11	13.01	13.46	13.63	23.07
2010	Middle East	Damman	South America West	Matarani	83.58	36.62	28.30	25.12	22.35	19.18	16.48	14.11	13.01	13.46	13.63	23.07
2010	North America West	Vancouver	North America East	Philadelphia	56.78	23.38	18.57	16.57	15.03	12.44	10.84	9.06	8.66	8.68	8.23	14.30

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					Vessel Size Range (000 DWT)										
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	North America West	Vancouver	North America Gulf	New Orleans	54.12	22.59	17.93	16.40	15.07	12.47	10.74	9.08	8.85	8.88	8.43	14.66
2010	North America West	Vancouver	Central America East	Tampico	46.00	19.86	16.25	14.93	13.98	11.61	9.80	8.19	7.82	7.83	7.42	12.81
2010	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	64.67	26.55	21.00	18.83	17.23	14.35	12.27	10.36	9.81	9.85	9.38	16.15
2010	North America West	Vancouver	South America East	Sepetiba, Bahia de	64.67	26.55	21.00	18.83	17.23	14.35	12.27	10.36	9.81	9.85	9.38	16.15
2010	North America West	Vancouver	Caribbean Basin	San Juan	43.66	20.65	17.22	16.58	15.92	14.06	11.95	10.05	9.65	9.86	9.52	16.79
2010	West Coast USA	Los Angeles	Europe	Rotterdam	67.06	27.84	22.17	19.85	18.50	15.49	13.66	11.68	11.46	11.73	11.36	19.65
2010	West Coast Canada	Vancouver	Europe	Rotterdam	67.19	27.75	22.44	19.99	18.34	15.04	12.81	10.68	10.24	10.32	9.74	16.75
2010	North America West	Vancouver	Europe	Rotterdam	67.19	27.75	22.44	19.99	18.34	15.04	12.81	10.68	10.24	10.32	9.74	16.75
2010	West Coast Canada	Vancouver	North Africa	Alexandria	75.40	31.49	25.29	22.58	20.63	17.11	14.61	12.21	11.67	11.85	11.24	19.39
2010	West Coast Canada	Vancouver	South Africa	Durban	82.06	34.19	27.45	24.47	22.33	18.48	15.76	13.13	12.53	12.71	12.05	20.78
2010	North America West	Vancouver	Africa	Safi	63.65	26.71	21.50	19.24	17.64	14.71	12.60	10.59	10.15	10.35	9.81	16.94
2010	North America West	Vancouver	Middle East	Aqaba (El Akaba)	78.52	32.75	26.30	23.47	21.42	17.75	15.15	12.64	12.08	12.25	11.62	20.04
2010	Central America West	Puerto Quetzal	North America East	Philadelphia	35.44	16.22	13.57	12.84	12.23	10.73	9.42	7.83	7.51	7.53	7.14	12.44
2010	Central America West	Puerto Quetzal	North America East	Philadelphia	35.44	16.22	13.57	12.84	12.23	10.73	9.42	7.83	7.51	7.53	7.14	12.44
2010	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	32.62	15.35	12.85	12.62	12.23	10.72	9.28	7.82	7.68	7.71	7.32	12.78
2010	Central America West	Puerto Quetzal	North America Gulf	New Orleans	32.62	15.35	12.85	12.62	12.23	10.72	9.28	7.82	7.68	7.71	7.32	12.78
2010	Central America West	Puerto Quetzal	Central America East	Tampico	24.53	12.66	11.23	11.20	11.19	9.90	8.37	6.96	6.66	6.68	6.33	10.96
2010	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	44.00	19.90	16.45	15.52	14.81	12.94	11.09	9.32	8.83	8.87	8.45	14.56
2010	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.06	13.41	12.19	12.89	13.18	12.40	10.56	8.85	8.50	8.74	8.47	15.04
2010	Central America West	Puerto Quetzal	Europe	Rotterdam	46.69	21.23	18.01	16.78	16.01	13.70	11.68	9.68	9.29	9.38	8.83	15.21
2010	Central America West	Puerto Quetzal	Africa	Safi	42.99	20.12	17.00	15.97	15.25	13.33	11.45	9.57	9.19	9.40	8.91	15.39
2010	Peru	San Nicolas	East Coast USA	Baltimore	43.07	18.52	14.86	13.50	12.32	10.22	8.87	7.40	7.13	7.15	6.79	11.83
2010	Chile	Antofagasta	East Coast USA	Baltimore	47.07	22.08	18.27	16.86	15.64	13.67	12.24	10.17	9.83	9.86	9.31	16.06
2010	South America West	Matarani	North America East	Philadelphia	43.54	19.17	15.77	14.84	14.03	11.68	10.38	8.67	8.34	8.34	7.88	13.66
2010	South America West	Callao	North America East	Philadelphia	40.77	18.03	14.86	14.04	13.31	11.10	9.90	8.28	7.98	7.98	7.54	13.08
2010	South America West	San Nicolas	North America Gulf	Mobile	39.47	16.97	13.58	12.34	11.44	9.63	8.34	7.04	6.76	6.76	6.40	11.12
2010	South America West	Matarani	North America Gulf	South Louisiana	40.80	18.35	15.09	14.65	14.04	11.69	10.26	8.68	8.52	8.53	8.07	14.00
2010	South America West	Callao	North America Gulf	South Louisiana	38.03	17.21	14.19	13.85	13.32	11.12	9.78	8.29	8.16	8.17	7.72	13.42
2010	South America West	Callao	Central America East	Tampico	29.93	14.49	12.52	12.39	12.24	10.26	8.84	7.41	7.13	7.13	6.72	11.58
2010	South America West	Callao	South America East	Puerto La Cruz	35.20	16.59	13.99	13.36	13.05	11.01	9.59	7.94	7.50	7.49	7.06	12.14
2010	Chile	Antofagasta	Caribbean Basin	Point Lisas	33.61	17.41	14.53	13.58	12.85	11.45	10.17	8.40	8.07	8.09	7.61	12.99
2010	Peru	San Nicolas	Caribbean Basin	Point Lisas	29.61	13.85	11.12	10.22	9.53	8.01	6.80	5.63	5.37	5.38	5.09	8.76

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 DWT)											
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	South America West	Callao	Caribbean Basin	San Juan	27.52	15.25	13.46	14.02	14.17	12.71	10.99	9.27	8.95	9.15	8.82	15.57
2010	Peru	Matarani	Europe	Rotterdam	54.34	23.77	19.85	18.45	17.51	14.42	12.46	10.38	10.00	10.07	9.47	16.25
2010	Chile	Antofagasta	Europe	Rotterdam	57.27	26.36	22.06	20.18	18.84	16.15	14.31	11.85	11.42	11.51	10.78	18.41
2010	South America West	Callao	Europe	Rotterdam	51.58	22.64	18.94	17.65	16.79	13.85	11.98	9.99	9.64	9.71	9.12	15.66
2010	South America West	Callao	Africa	Safi	47.96	21.56	17.96	16.87	16.06	13.49	11.75	9.89	9.54	9.73	9.19	15.83
2010	South America West	Matarani	Middle East	Aqaba (El Akaba)	65.93	28.93	23.85	22.06	20.70	17.22	14.88	12.40	11.90	12.06	11.40	19.63
2010	Oceania	Newcastle	North America East	Baltimore	83.87	34.75	27.91	24.84	22.42	18.42	15.74	13.06	12.41	12.37	11.72	20.24
2010	Oceania	Bunbury	North America East	Philadelphia	93.33	38.56	30.99	27.65	24.83	20.32	17.67	14.59	13.90	13.83	13.08	22.52
2010	Oceania	Newcastle	North America Gulf	Mobile	80.09	33.11	26.56	23.62	21.48	17.78	15.16	12.67	12.00	11.95	11.30	19.47
2010	Oceania	Bunbury	North America Gulf	South Louisiana	90.41	37.66	30.23	27.38	24.77	20.28	17.50	14.56	14.05	13.99	13.24	22.81
2010	Oceania	Newcastle	Central America East	Tampico	72.27	30.80	25.22	22.84	21.01	17.27	14.63	12.12	11.47	11.41	10.78	18.47
2010	Oceania	Bunbury	Central America East	Tampico	82.33	34.94	28.57	25.92	23.70	19.43	16.57	13.68	13.02	12.95	12.24	20.98
2010	Oceania	Bunbury	Caribbean Basin	San Juan	79.76	35.62	29.44	27.48	25.56	21.82	18.66	15.51	14.83	14.96	14.32	24.94
2010	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	117.26	49.01	39.71	35.46	32.03	26.28	22.53	18.63	17.78	17.87	16.90	28.97
2010	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Korea	Guangzhou	East Coast USA	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Far East	Guangzhou	East Coast Canada	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Taiwan	Guangzhou	East Coast USA	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Japan	Kobe	East Coast USA	Philadelphia	85.17	35.44	28.66	25.94	23.41	19.84	17.54	14.97	14.54	14.90	14.56	26.20
2010	Far East	Guangzhou	North America East	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Far East	Guangzhou	North America East	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Far East	Guangzhou	North America East	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	13.47	13.47	12.80	22.07
2010	Far East	Guangzhou	North America Gulf	South Louisiana	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	13.64	13.65	12.97	22.39
2010	Far East	Guangzhou	North America Gulf	South Louisiana	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	13.64	13.65	12.97	22.39
2010	Far East	Guangzhou	North America Gulf	New Orleans	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	13.64	13.65	12.97	22.39
2010	Far East	Guangzhou	North America Gulf	South Louisiana	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	13.64	13.65	12.97	22.39
2010	Far East	Guangzhou	Central America East	Tampico	80.13	33.99	27.85	25.26	23.11	18.90	16.08	13.25	12.61	12.60	11.97	20.55
2010	Far East	Guangzhou	South America East	Puerto La Cruz	85.33	36.05	29.29	26.20	23.89	19.62	16.81	13.76	12.98	12.96	12.29	21.09
2010	Far East	Guangzhou	Caribbean Basin	San Juan	77.66	34.72	28.76	26.85	25.00	21.31	18.20	15.09	14.42	14.62	14.05	24.51
2010	South East Asia	Manado	North America East	Philadelphia	90.40	39.70	32.89	30.65	28.86	24.84	23.44	19.13	18.21	18.24	17.30	29.98
2010	South East Asia	Bangkok	North America Gulf	New Orleans	93.14	38.92	31.44	28.73	26.16	21.55	18.70	15.66	15.26	15.45	14.58	25.21
2010	South East Asia	Manado	North America Gulf	New Orleans	87.71	38.91	32.25	30.47	28.88	24.86	23.33	19.14	18.39	18.43	17.49	30.32

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)										
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	98.46	40.55	32.24	29.03	26.69	22.49	19.92	16.51	15.71	15.74	14.95	25.67
2015	North America East	New York	North America West	Los Angeles	57.75	24.52	18.07	15.72	13.88	12.20	11.05	9.78	9.26	9.67	10.13	17.37
2015	North America East	New York	Central America West	Lazaro Cardenas	41.35	18.37	14.14	12.70	11.17	9.67	8.56	7.37	6.83	6.99	7.09	12.13
2015	North America East	New York	South America West	Matarani	43.87	19.70	15.27	13.93	12.59	10.87	9.65	8.31	7.70	7.89	7.98	13.61
2015	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	85.74	36.03	27.02	23.07	19.78	16.63	14.10	11.86	10.77	11.02	11.20	18.98
2015	North America East	New York	Oceania	Brisbane	80.21	34.13	26.05	22.63	19.64	16.96	14.85	12.81	11.78	12.03	12.20	20.76
2015	East Coast USA	Norfolk	Taiwan	Kaohsiung	86.16	36.07	27.00	23.16	20.09	17.19	14.55	12.42	11.29	11.52	11.69	19.88
2015	East Coast USA	Norfolk	Korea	Kwangyang	81.93	34.41	25.79	22.16	19.28	16.58	14.07	12.08	11.01	11.25	11.39	19.37
2015	East Coast USA	Norfolk	Japan	Mizushima	84.85	35.49	26.53	22.88	19.91	17.28	14.85	12.93	11.95	12.32	12.67	21.96
2015	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	82.54	34.65	25.92	22.12	19.11	16.21	13.68	11.57	10.51	10.76	10.90	18.44
2015	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	85.46	35.72	26.66	22.85	19.74	16.91	14.47	12.42	11.45	11.83	12.18	21.04
2015	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	85.61	36.18	27.19	23.34	20.09	16.97	14.45	12.17	11.15	11.46	11.66	19.72
2015	North America East	New York	Far East	Guangzhou	89.90	37.92	28.65	24.72	21.23	17.97	15.58	13.21	12.10	12.39	12.61	21.43
2015	North America East	New York	Far East	Guangzhou	89.90	37.92	28.65	24.72	21.23	17.97	15.58	13.21	12.10	12.39	12.61	21.43
2015	North America Gulf	Tampa	North America West	Los Angeles	53.32	22.82	16.75	14.96	13.40	11.81	10.61	9.52	9.19	9.61	10.07	17.30
2015	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.00	16.73	12.87	11.97	10.71	9.30	8.13	7.11	6.77	6.94	7.04	12.07
2015	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.00	16.73	12.87	11.97	10.71	9.30	8.13	7.11	6.77	6.94	7.04	12.07
2015	North America Gulf	Tampa	South America West	Matarani	39.51	18.05	14.00	13.20	12.12	10.50	9.22	8.06	7.64	7.83	7.93	13.55
2015	North America Gulf	Tampa	South America West	Matarani	39.51	18.05	14.00	13.20	12.12	10.50	9.22	8.06	7.64	7.83	7.93	13.55
2015	North America Gulf	Tampa	Oceania	Auckland	67.77	29.11	22.30	19.82	17.42	15.12	13.24	11.66	10.89	11.14	11.30	19.28
2015	North America Gulf	Tampa	Oceania	Auckland	67.77	29.11	22.30	19.82	17.42	15.12	13.24	11.66	10.89	11.14	11.30	19.28
2015	North America Gulf	Mobile	Far East	Osaka	81.12	33.62	25.08	21.63	18.84	16.40	14.12	12.34	11.42	11.79	12.14	21.07
2015	North America Gulf	Tampa	Far East	Guangzhou	85.03	35.85	27.02	23.68	20.52	17.40	14.98	12.83	11.93	12.23	12.46	21.20
2015	North America Gulf	Tampa	Far East	Guangzhou	85.03	35.85	27.02	23.68	20.52	17.40	14.98	12.83	11.93	12.23	12.46	21.20
2015	North America Gulf	Tampa	South East Asia	Bangkok	92.45	39.57	30.13	26.69	23.24	19.84	17.21	14.84	13.93	14.45	14.61	24.86
2015	Central America East	Puerto Limon	North America West	Los Angeles	39.05	18.23	13.86	12.58	11.57	10.25	9.09	8.09	7.66	8.05	8.48	14.49
2015	Central America East	Puerto Limon	South America West	Matarani	25.05	13.28	11.00	10.77	10.29	8.92	7.69	6.61	6.09	6.26	6.34	10.76
2015	Central America East	Puerto Limon	South America West	Matarani	25.05	13.28	11.00	10.77	10.29	8.92	7.69	6.61	6.09	6.26	6.34	10.76
2015	Central America East	Puerto Limon	Far East	Guangzhou	71.94	32.74	25.33	22.36	19.55	16.53	14.03	11.81	10.72	10.99	11.18	18.90
2015	Central America East	Puerto Limon	South East Asia	Jakarta	81.89	40.27	32.24	29.72	27.11	24.02	22.30	18.51	16.76	17.23	17.53	29.79
2015	South America East	Santos	North America West	Los Angeles	68.47	29.08	21.50	18.79	16.67	14.65	12.94	11.51	10.78	11.24	11.76	19.98
2015	Other South America East	Buenos Aires	West Coast USA	Los Angeles	79.73	33.60	24.86	21.73	19.28	16.87	14.76	12.98	12.22	12.71	13.11	22.22

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	53.55	22.50	16.53	14.34	12.86	11.20	9.83	8.69	8.19	8.55	8.98	15.29
2015	South America East	Buenos Aires	West Coast Canada	Los Angeles	79.73	33.60	24.86	21.73	19.28	16.87	14.76	12.98	12.22	12.71	13.11	22.22
2015	Brazil	Santos	West Coast USA	Los Angeles	68.47	29.08	21.50	18.79	16.67	14.65	12.94	11.51	10.78	11.24	11.76	19.98
2015	South America East	Ponta da Madeira	North America West	Los Angeles	57.34	24.48	18.02	15.65	13.83	12.18	10.79	9.55	8.95	9.39	9.89	16.86
2015	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	32.65	14.38	11.09	10.00	9.16	7.97	6.72	5.84	5.34	5.43	5.48	9.24
2015	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	24.89	12.11	9.39	8.65	7.97	7.03	6.00	5.25	4.87	4.99	5.07	8.60
2015	South America East	Puerto Bolivar	South America West	Huasco	30.76	16.27	12.80	11.62	10.68	9.92	8.88	7.66	7.10	7.29	7.35	12.33
2015	South America East	Puerto La Cruz	South America West	Matarani	35.18	15.71	12.23	11.24	10.59	9.17	7.81	6.78	6.21	6.33	6.37	10.73
2015	South America East	Santos	Oceania	Brisbane	91.90	39.16	29.89	26.07	22.73	19.67	16.96	14.72	13.48	13.79	14.02	23.68
2015	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	83.66	34.83	26.13	22.37	19.41	16.33	13.68	11.53	10.43	10.61	10.74	18.12
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	82.42	34.67	26.15	22.57	19.56	16.46	13.95	11.79	10.77	11.02	11.20	18.87
2015	Venezuela	Puerto Ordaz	Korea	Kwangyang	79.27	33.10	24.86	21.32	18.55	15.68	13.17	11.16	10.11	10.30	10.42	17.57
2015	Venezuela	Puerto Ordaz	Japan	Mizushima	82.16	34.16	25.59	22.03	19.17	16.37	13.94	12.01	11.04	11.36	11.69	20.15
2015	North Brazil	Ponta da Madeira	Korea	Kwangyang	83.07	35.08	26.35	22.63	19.52	16.66	14.13	12.02	10.87	11.14	11.33	19.14
2015	North Brazil	Ponta da Madeira	Japan	Mizushima	85.96	36.15	27.08	23.34	20.14	17.36	14.90	12.86	11.80	12.20	12.61	21.72
2015	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	86.22	36.66	27.65	23.87	20.53	17.45	14.91	12.64	11.53	11.86	12.12	20.44
2015	Venezuela	Puerto Ordaz	Japan	Shimizu	81.99	34.64	26.34	23.08	20.11	17.72	15.35	13.67	12.66	13.34	14.05	24.99
2015	North Brazil	Saã Luiz	Japan	Shimizu	84.10	35.84	27.23	24.05	20.95	18.69	16.40	14.76	13.69	14.45	15.22	26.97
2015	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	102.38	43.37	32.83	28.28	24.28	20.53	17.48	14.78	13.43	13.78	14.08	23.77
2015	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	89.08	37.72	28.55	24.80	21.44	18.28	15.69	13.46	12.30	12.62	12.88	21.73
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	83.28	34.92	26.36	22.70	19.80	16.75	14.15	12.03	10.94	11.17	11.33	19.06
2015	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	108.94	45.85	34.65	30.06	26.06	22.17	18.89	16.09	14.78	15.16	15.32	25.79
2015	Colombia	Puerto Bolivar	Japan	Mizushima	70.15	30.05	22.47	19.45	17.08	14.80	12.67	11.04	10.20	10.53	10.86	18.78
2015	Brazil	Saã Luiz	Far East	Guangzhou	89.08	37.72	28.55	24.80	21.44	18.28	15.69	13.46	12.30	12.62	12.88	21.73
2015	South America East	Ponta da Madeira	Far East	Mizushima	85.96	36.15	27.08	23.34	20.14	17.36	14.90	12.86	11.80	12.20	12.61	21.72
2015	Caribbean Basin	Kingston	North America West	Los Angeles	41.69	20.56	15.91	15.03	14.09	13.22	11.68	10.40	9.87	10.49	11.13	19.36
2015	Caribbean Basin	Kingston	North America West	Los Angeles	41.69	20.56	15.91	15.03	14.09	13.22	11.68	10.40	9.87	10.49	11.13	19.36
2015	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.23	14.39	11.96	11.99	11.36	10.69	9.17	7.97	7.43	7.80	8.09	14.10
2015	Caribbean Basin	Kingston	South America West	Matarani	27.75	15.72	13.10	13.22	12.78	11.88	10.26	8.92	8.30	8.70	8.98	15.59
2015	Caribbean Basin	Kingston	Far East	Guangzhou	74.12	34.11	26.62	24.14	21.53	19.07	16.27	13.89	12.76	13.27	13.68	23.51
2015	Caribbean Basin	Kingston	Far East	Guangzhou	74.12	34.11	26.62	24.14	21.53	19.07	16.27	13.89	12.76	13.27	13.68	23.51
2015	Europe	Rotterdam	West Coast Canada	Los Angeles	68.39	28.92	21.76	18.88	16.81	14.59	12.85	11.33	10.73	11.24	11.66	19.83

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Europe	Rotterdam	West Coast USA	Los Angeles	68.39	28.92	21.76	18.88	16.81	14.59	12.85	11.33	10.73	11.24	11.66	19.83
2015	Europe	Rotterdam	North America West	Los Angeles	68.39	28.92	21.76	18.88	16.81	14.59	12.85	11.33	10.73	11.24	11.66	19.83
2015	Europe	Rotterdam	Central America West	Lazaro Cardenas	51.98	22.78	17.83	15.85	14.09	12.06	10.36	8.91	8.29	8.56	8.62	14.58
2015	Europe	Rotterdam	South America West	Matarani	54.49	24.11	18.96	17.08	15.50	13.26	11.45	9.85	9.16	9.45	9.51	16.06
2015	Africa	Durban	North America West	Los Angeles	84.39	36.16	27.14	23.56	20.78	18.11	15.87	13.91	13.06	13.71	14.22	24.19
2015	Africa	Safi	Central America West	Lazaro Cardenas	48.83	22.03	17.19	15.39	13.66	11.92	10.31	8.94	8.32	8.69	8.81	14.94
2015	Africa	Safi	Oceania	Auckland	80.33	34.83	26.98	23.56	20.64	17.96	15.61	13.64	12.59	13.04	13.22	22.39
2015	Middle East	Damman	Central America West	Lazaro Cardenas	82.38	35.96	27.70	24.37	21.34	18.32	15.67	13.40	12.36	12.79	12.97	21.96
2015	Middle East	Damman	South America West	Matarani	84.90	37.29	28.84	25.60	22.76	19.51	16.76	14.34	13.23	13.69	13.86	23.45
2015	Middle East	Damman	South America West	Matarani	84.90	37.29	28.84	25.60	22.76	19.51	16.76	14.34	13.23	13.69	13.86	23.45
2015	North America West	Vancouver	North America East	Philadelphia	57.48	23.72	18.86	16.83	15.26	12.62	11.00	9.18	8.78	8.79	8.34	14.48
2015	North America West	Vancouver	North America Gulf	New Orleans	54.77	22.92	18.20	16.65	15.29	12.64	10.89	9.20	8.97	8.99	8.53	14.84
2015	North America West	Vancouver	Central America East	Tampico	46.66	20.19	16.53	15.19	14.21	11.79	9.95	8.32	7.94	7.95	7.53	13.00
2015	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	65.61	27.01	21.39	19.18	17.55	14.60	12.47	10.53	9.97	10.01	9.53	16.40
2015	North America West	Vancouver	South America East	Sepetiba, Bahia de	65.61	27.01	21.39	19.18	17.55	14.60	12.47	10.53	9.97	10.01	9.53	16.40
2015	North America West	Vancouver	Caribbean Basin	San Juan	44.27	20.97	17.50	16.84	16.16	14.26	12.11	10.19	9.77	9.99	9.64	17.01
2015	West Coast USA	Los Angeles	Europe	Rotterdam	67.95	28.27	22.54	20.18	18.79	15.73	13.86	11.83	11.61	11.88	11.50	19.88
2015	West Coast Canada	Vancouver	Europe	Rotterdam	68.19	28.24	22.86	20.36	18.67	15.31	13.03	10.86	10.41	10.49	9.89	17.01
2015	North America West	Vancouver	Europe	Rotterdam	68.19	28.24	22.86	20.36	18.67	15.31	13.03	10.86	10.41	10.49	9.89	17.01
2015	West Coast Canada	Vancouver	North Africa	Alexandria	76.55	32.06	25.78	23.01	21.01	17.42	14.87	12.42	11.87	12.05	11.42	19.70
2015	West Coast Canada	Vancouver	South Africa	Durban	83.32	34.82	27.98	24.95	22.75	18.81	16.04	13.36	12.75	12.93	12.25	21.12
2015	North America West	Vancouver	Africa	Safi	64.60	27.19	21.90	19.60	17.96	14.96	12.81	10.76	10.32	10.51	9.97	17.20
2015	North America West	Vancouver	Middle East	Aqaba (El Akaba)	79.72	33.35	26.81	23.92	21.83	18.07	15.42	12.86	12.28	12.46	11.81	20.36
2015	Central America West	Puerto Quetzal	North America East	Philadelphia	35.85	16.45	13.77	13.03	12.41	10.87	9.54	7.93	7.60	7.62	7.23	12.58
2015	Central America West	Puerto Quetzal	North America East	Philadelphia	35.85	16.45	13.77	13.03	12.41	10.87	9.54	7.93	7.60	7.62	7.23	12.58
2015	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	32.98	15.56	13.03	12.80	12.39	10.86	9.39	7.91	7.76	7.80	7.40	12.92
2015	Central America West	Puerto Quetzal	North America Gulf	New Orleans	32.98	15.56	13.03	12.80	12.39	10.86	9.39	7.91	7.76	7.80	7.40	12.92
2015	Central America West	Puerto Quetzal	Central America East	Tampico	24.90	12.88	11.43	11.40	11.37	10.05	8.49	7.06	6.75	6.77	6.42	11.11
2015	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	44.69	20.28	16.78	15.83	15.09	13.17	11.27	9.47	8.97	9.02	8.58	14.78
2015	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.37	13.62	12.38	13.08	13.37	12.56	10.69	8.95	8.60	8.85	8.58	15.23
2015	Central America West	Puerto Quetzal	Europe	Rotterdam	47.44	21.64	18.37	17.11	16.31	13.94	11.88	9.84	9.44	9.53	8.98	15.45
2015	Central America West	Puerto Quetzal	Africa	Safi	43.69	20.51	17.34	16.29	15.54	13.56	11.64	9.72	9.34	9.55	9.05	15.63

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Peru	San Nicolas	East Coast USA	Baltimore	43.55	18.76	15.06	13.68	12.48	10.35	8.98	7.48	7.21	7.23	6.87	11.96
2015	Chile	Antofagasta	East Coast USA	Baltimore	47.61	22.36	18.50	17.07	15.82	13.82	12.36	10.27	9.92	9.95	9.40	16.20
2015	South America West	Matarani	North America East	Philadelphia	44.04	19.42	15.98	15.04	14.21	11.82	10.51	8.77	8.43	8.44	7.97	13.81
2015	South America West	Callao	North America East	Philadelphia	41.22	18.26	15.06	14.23	13.48	11.24	10.01	8.38	8.06	8.07	7.62	13.21
2015	South America West	San Nicolas	North America Gulf	Mobile	39.89	17.18	13.76	12.50	11.58	9.74	8.43	7.12	6.83	6.84	6.47	11.23
2015	South America West	Matarani	North America Gulf	South Louisiana	41.24	18.58	15.29	14.84	14.21	11.83	10.38	8.77	8.61	8.62	8.15	14.15
2015	South America West	Callao	North America Gulf	South Louisiana	38.43	17.42	14.36	14.02	13.48	11.24	9.89	8.37	8.24	8.25	7.80	13.55
2015	South America West	Callao	Central America East	Tampico	30.33	14.71	12.71	12.57	12.41	10.40	8.96	7.50	7.21	7.22	6.81	11.72
2015	South America West	Callao	South America East	Puerto La Cruz	35.59	16.81	14.18	13.54	13.21	11.13	9.70	8.02	7.59	7.58	7.14	12.28
2015	Chile	Antofagasta	Caribbean Basin	Point Lisas	34.06	17.64	14.72	13.75	13.01	11.58	10.27	8.48	8.15	8.17	7.68	13.11
2015	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.00	14.05	11.29	10.37	9.66	8.11	6.89	5.70	5.44	5.45	5.15	8.87
2015	South America West	Callao	Caribbean Basin	San Juan	27.88	15.46	13.65	14.21	14.35	12.86	11.11	9.37	9.05	9.26	8.92	15.74
2015	Peru	Matarani	Europe	Rotterdam	55.16	24.19	20.20	18.78	17.80	14.65	12.65	10.54	10.15	10.22	9.61	16.48
2015	Chile	Antofagasta	Europe	Rotterdam	58.13	26.79	22.43	20.51	19.13	16.38	14.50	12.00	11.57	11.66	10.92	18.63
2015	South America West	Callao	Europe	Rotterdam	52.35	23.03	19.28	17.96	17.07	14.07	12.16	10.14	9.78	9.86	9.26	15.89
2015	South America West	Callao	Africa	Safi	48.68	21.93	18.28	17.17	16.32	13.70	11.93	10.03	9.69	9.87	9.32	16.06
2015	South America West	Matarani	Middle East	Aqaba (El Akaba)	66.96	29.45	24.30	22.47	21.07	17.51	15.13	12.60	12.09	12.26	11.59	19.93
2015	Oceania	Newcastle	North America East	Baltimore	85.18	35.39	28.46	25.34	22.86	18.77	16.03	13.30	12.63	12.59	11.93	20.59
2015	Oceania	Bunbury	North America East	Philadelphia	94.84	39.30	31.62	28.22	25.34	20.72	18.00	14.86	14.16	14.09	13.33	22.92
2015	Oceania	Newcastle	North America Gulf	Mobile	81.33	33.72	27.08	24.08	21.90	18.11	15.44	12.89	12.21	12.16	11.50	19.80
2015	Oceania	Bunbury	North America Gulf	South Louisiana	91.85	38.37	30.84	27.93	25.26	20.67	17.83	14.82	14.30	14.24	13.48	23.21
2015	Oceania	Newcastle	Central America East	Tampico	73.53	31.42	25.75	23.32	21.44	17.62	14.92	12.36	11.69	11.63	10.98	18.82
2015	Oceania	Bunbury	Central America East	Tampico	83.78	35.66	29.19	26.49	24.20	19.83	16.90	13.95	13.29	13.21	12.48	21.38
2015	Oceania	Bunbury	Caribbean Basin	San Juan	81.16	36.33	30.05	28.05	26.07	22.23	19.00	15.79	15.10	15.23	14.58	25.37
2015	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	119.37	50.05	40.61	36.27	32.75	26.85	23.01	19.02	18.15	18.24	17.25	29.55
2015	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44
2015	Korea	Guangzhou	East Coast USA	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44
2015	Far East	Guangzhou	East Coast Canada	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44
2015	Taiwan	Guangzhou	East Coast USA	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44
2015	Japan	Kobe	East Coast USA	Philadelphia	86.41	36.05	29.19	26.42	23.83	20.18	17.82	15.20	14.76	15.13	14.77	26.57
2015	Far East	Guangzhou	North America East	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44
2015	Far East	Guangzhou	North America East	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 DWT) 0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Far East	Guangzhou	North America East	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	13.71	13.71	13.02	22.44
2015	Far East	Guangzhou	North America Gulf	South Louisiana	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	13.87	13.88	13.18	22.75
2015	Far East	Guangzhou	North America Gulf	South Louisiana	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	13.87	13.88	13.18	22.75
2015	Far East	Guangzhou	North America Gulf	New Orleans	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	13.87	13.88	13.18	22.75
2015	Far East	Guangzhou	North America Gulf	South Louisiana	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	13.87	13.88	13.18	22.75
2015	Far East	Guangzhou	Central America East	Tampico	81.48	34.66	28.43	25.78	23.57	19.27	16.39	13.49	12.85	12.84	12.19	20.92
2015	Far East	Guangzhou	South America East	Puerto La Cruz	86.66	36.71	29.86	26.71	24.34	19.98	17.11	14.01	13.21	13.19	12.50	21.45
2015	Far East	Guangzhou	Caribbean Basin	San Juan	78.96	35.37	29.33	27.38	25.46	21.69	18.51	15.34	14.67	14.86	14.29	24.91
2015	South East Asia	Manado	North America East	Philadelphia	91.71	40.35	33.46	31.16	29.33	25.21	23.76	19.39	18.46	18.49	17.54	30.37
2015	South East Asia	Bangkok	North America Gulf	New Orleans	94.50	39.58	32.00	29.24	26.62	21.91	19.01	15.90	15.49	15.69	14.80	25.58
2015	South East Asia	Manado	North America Gulf	New Orleans	88.97	39.54	32.79	30.97	29.34	25.23	23.64	19.40	18.64	18.68	17.72	30.71
2015	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	100.03	41.30	32.88	29.60	27.20	22.89	20.26	16.78	15.98	16.00	15.19	26.07
2020	North America East	New York	North America West	Los Angeles	58.34	24.84	18.32	15.94	14.07	12.35	11.19	9.89	9.36	9.77	10.23	17.53
2020	North America East	New York	Central America West	Lazaro Cardenas	41.81	18.63	14.35	12.89	11.33	9.80	8.67	7.46	6.91	7.08	7.18	12.27
2020	North America East	New York	South America West	Matarani	44.34	19.96	15.49	14.13	12.76	11.00	9.77	8.41	7.79	7.98	8.07	13.76
2020	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	87.04	36.72	27.58	23.57	20.19	16.97	14.38	12.09	10.98	11.24	11.42	19.34
2020	North America East	New York	Oceania	Brisbane	81.31	34.72	26.54	23.06	20.01	17.26	15.10	13.02	11.97	12.22	12.40	21.09
2020	East Coast USA	Norfolk	Taiwan	Kaohsiung	87.38	36.72	27.53	23.62	20.49	17.51	14.82	12.64	11.50	11.73	11.90	20.22
2020	East Coast USA	Norfolk	Korea	Kwangyang	83.07	35.02	26.28	22.59	19.65	16.88	14.32	12.29	11.20	11.44	11.59	19.69
2020	East Coast USA	Norfolk	Japan	Mizushima	85.97	36.09	27.02	23.31	20.27	17.58	15.10	13.13	12.13	12.51	12.87	22.28
2020	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	83.80	35.32	26.47	22.60	19.51	16.54	13.96	11.80	10.72	10.97	11.11	18.79
2020	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	86.71	36.39	27.20	23.32	20.13	17.23	14.74	12.64	11.65	12.03	12.39	21.38
2020	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	86.92	36.88	27.75	23.84	20.51	17.31	14.73	12.41	11.37	11.68	11.88	20.08
2020	North America East	New York	Far East	Guangzhou	91.18	38.60	29.21	25.21	21.63	18.30	15.86	13.44	12.31	12.61	12.83	21.78
2020	North America East	New York	Far East	Guangzhou	91.18	38.60	29.21	25.21	21.63	18.30	15.86	13.44	12.31	12.61	12.83	21.78
2020	North America Gulf	Tampa	North America West	Los Angeles	53.81	23.08	16.96	15.15	13.56	11.94	10.72	9.61	9.28	9.69	10.16	17.44
2020	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.37	16.93	13.04	12.13	10.84	9.41	8.23	7.19	6.84	7.02	7.12	12.20
2020	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.37	16.93	13.04	12.13	10.84	9.41	8.23	7.19	6.84	7.02	7.12	12.20
2020	North America Gulf	Tampa	South America West	Matarani	39.89	18.26	14.17	13.36	12.26	10.61	9.32	8.14	7.72	7.91	8.01	13.68
2020	North America Gulf	Tampa	South America West	Matarani	39.89	18.26	14.17	13.36	12.26	10.61	9.32	8.14	7.72	7.91	8.01	13.68
2020	North America Gulf	Tampa	Oceania	Auckland	68.63	29.56	22.68	20.16	17.71	15.36	13.44	11.83	11.05	11.30	11.46	19.55
2020	North America Gulf	Tampa	Oceania	Auckland	68.63	29.56	22.68	20.16	17.71	15.36	13.44	11.83	11.05	11.30	11.46	19.55

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	North America Gulf	Mobile	Far East	Osaka	82.16	34.16	25.52	22.02	19.17	16.67	14.34	12.52	11.59	11.96	12.31	21.35
2020	North America Gulf	Tampa	Far East	Guangzhou	86.19	36.45	27.52	24.12	20.88	17.70	15.23	13.04	12.12	12.43	12.65	21.52
2020	North America Gulf	Tampa	Far East	Guangzhou	86.19	36.45	27.52	24.12	20.88	17.70	15.23	13.04	12.12	12.43	12.65	21.52
2020	North America Gulf	Tampa	South East Asia	Bangkok	93.74	40.25	30.69	27.18	23.65	20.18	17.49	15.08	14.15	14.68	14.84	25.23
2020	Central America East	Puerto Limon	North America West	Los Angeles	39.48	18.50	14.09	12.78	11.74	10.39	9.21	8.19	7.75	8.13	8.57	14.64
2020	Central America East	Puerto Limon	South America West	Matarani	25.36	13.49	11.18	10.94	10.44	9.04	7.79	6.69	6.16	6.34	6.42	10.89
2020	Central America East	Puerto Limon	South America West	Matarani	25.36	13.49	11.18	10.94	10.44	9.04	7.79	6.69	6.16	6.34	6.42	10.89
2020	Central America East	Puerto Limon	Far East	Guangzhou	73.10	33.44	25.90	22.87	19.98	16.87	14.32	12.04	10.93	11.20	11.40	19.26
2020	Central America East	Puerto Limon	South East Asia	Jakarta	83.22	41.10	32.94	30.35	27.65	24.47	22.68	18.82	17.04	17.51	17.81	30.26
2020	South America East	Santos	North America West	Los Angeles	69.42	29.58	21.91	19.15	16.97	14.90	13.16	11.69	10.94	11.41	11.92	20.25
2020	Other South America East	Buenos Aires	West Coast USA	Los Angeles	80.78	34.16	25.32	22.13	19.62	17.15	14.99	13.18	12.40	12.90	13.30	22.52
2020	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	54.15	22.82	16.79	14.57	13.06	11.36	9.96	8.80	8.29	8.65	9.08	15.46
2020	South America East	Buenos Aires	West Coast Canada	Los Angeles	80.78	34.16	25.32	22.13	19.62	17.15	14.99	13.18	12.40	12.90	13.30	22.52
2020	Brazil	Santos	West Coast USA	Los Angeles	69.42	29.58	21.91	19.15	16.97	14.90	13.16	11.69	10.94	11.41	11.92	20.25
2020	South America East	Ponta da Madeira	North America West	Los Angeles	58.06	24.87	18.33	15.93	14.07	12.37	10.95	9.68	9.07	9.51	10.02	17.07
2020	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	33.04	14.60	11.27	10.17	9.30	8.08	6.81	5.92	5.41	5.51	5.56	9.37
2020	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	25.23	12.31	9.54	8.79	8.10	7.14	6.09	5.33	4.93	5.06	5.14	8.72
2020	South America East	Puerto Bolivar	South America West	Huasco	31.16	16.49	12.98	11.78	10.82	10.03	8.97	7.74	7.17	7.37	7.42	12.45
2020	South America East	Puerto La Cruz	South America West	Matarani	35.58	15.94	12.41	11.41	10.73	9.29	7.91	6.87	6.29	6.41	6.45	10.87
2020	South America East	Santos	Oceania	Brisbane	93.41	39.96	30.55	26.65	23.23	20.08	17.31	15.01	13.75	14.06	14.29	24.13
2020	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	84.98	35.53	26.71	22.88	19.83	16.68	13.97	11.77	10.65	10.83	10.97	18.49
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	83.70	35.35	26.71	23.05	19.97	16.80	14.23	12.02	10.98	11.24	11.42	19.23
2020	Venezuela	Puerto Ordaz	Korea	Kwangyang	80.50	33.75	25.39	21.79	18.94	16.00	13.44	11.39	10.32	10.51	10.63	17.91
2020	Venezuela	Puerto Ordaz	Japan	Mizushima	83.37	34.80	26.11	22.49	19.56	16.69	14.21	12.23	11.25	11.57	11.90	20.49
2020	North Brazil	Ponta da Madeira	Korea	Kwangyang	84.41	35.79	26.93	23.14	19.96	17.02	14.42	12.27	11.10	11.37	11.56	19.51
2020	North Brazil	Ponta da Madeira	Japan	Mizushima	87.29	36.85	27.65	23.85	20.57	17.71	15.20	13.11	12.03	12.43	12.84	22.09
2020	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	87.61	37.40	28.25	24.40	20.98	17.81	15.22	12.90	11.76	12.10	12.36	20.83
2020	Venezuela	Puerto Ordaz	Japan	Shimizu	83.16	35.26	26.85	23.53	20.50	18.04	15.62	13.89	12.87	13.56	14.27	25.36
2020	North Brazil	Saã Luiz	Japan	Shimizu	85.37	36.52	27.80	24.55	21.37	19.04	16.69	15.01	13.92	14.69	15.46	27.38
2020	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	104.07	44.26	33.56	28.92	24.82	20.97	17.85	15.09	13.71	14.07	14.36	24.24
2020	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	90.55	38.49	29.19	25.36	21.92	18.67	16.02	13.73	12.55	12.88	13.14	22.15
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	84.57	35.60	26.92	23.19	20.22	17.09	14.44	12.26	11.15	11.39	11.55	19.42

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	110.67	46.76	35.40	30.72	26.61	22.62	19.28	16.41	15.08	15.46	15.62	26.28
2020	Colombia	Puerto Bolivar	Japan	Mizushima	71.24	30.62	22.94	19.87	17.43	15.09	12.91	11.24	10.38	10.72	11.05	19.08
2020	Brazil	Saã Luiz	Far East	Guangzhou	90.55	38.49	29.19	25.36	21.92	18.67	16.02	13.73	12.55	12.88	13.14	22.15
2020	South America East	Ponta da Madeira	Far East	Mizushima	87.29	36.85	27.65	23.85	20.57	17.71	15.20	13.11	12.03	12.43	12.84	22.09
2020	Caribbean Basin	Kingston	North America West	Los Angeles	42.14	20.83	16.13	15.24	14.27	13.38	11.80	10.51	9.97	10.59	11.24	19.54
2020	Caribbean Basin	Kingston	North America West	Los Angeles	42.14	20.83	16.13	15.24	14.27	13.38	11.80	10.51	9.97	10.59	11.24	19.54
2020	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.56	14.59	12.14	12.16	11.51	10.81	9.28	8.06	7.52	7.89	8.18	14.26
2020	Caribbean Basin	Kingston	South America West	Matarani	28.09	15.92	13.28	13.40	12.94	12.02	10.37	9.01	8.39	8.79	9.08	15.75
2020	Caribbean Basin	Kingston	Far East	Guangzhou	75.28	34.75	27.15	24.62	21.93	19.41	16.55	14.12	12.98	13.49	13.90	23.88
2020	Caribbean Basin	Kingston	Far East	Guangzhou	75.28	34.75	27.15	24.62	21.93	19.41	16.55	14.12	12.98	13.49	13.90	23.88
2020	Europe	Rotterdam	West Coast Canada	Los Angeles	69.29	29.39	22.14	19.21	17.09	14.83	13.05	11.49	10.88	11.39	11.82	20.08
2020	Europe	Rotterdam	West Coast USA	Los Angeles	69.29	29.39	22.14	19.21	17.09	14.83	13.05	11.49	10.88	11.39	11.82	20.08
2020	Europe	Rotterdam	North America West	Los Angeles	69.29	29.39	22.14	19.21	17.09	14.83	13.05	11.49	10.88	11.39	11.82	20.08
2020	Europe	Rotterdam	Central America West	Lazaro Cardenas	52.75	23.19	18.17	16.15	14.34	12.27	10.53	9.06	8.43	8.70	8.76	14.80
2020	Europe	Rotterdam	South America West	Matarani	55.27	24.52	19.31	17.38	15.76	13.47	11.63	10.00	9.30	9.59	9.65	16.29
2020	Africa	Durban	North America West	Los Angeles	85.60	36.80	27.66	24.02	21.17	18.43	16.15	14.13	13.27	13.92	14.44	24.54
2020	Africa	Safi	Central America West	Lazaro Cardenas	49.57	22.43	17.52	15.69	13.91	12.13	10.49	9.08	8.46	8.83	8.95	15.18
2020	Africa	Safi	Oceania	Auckland	81.60	35.51	27.54	24.06	21.06	18.31	15.91	13.89	12.82	13.27	13.46	22.78
2020	Middle East	Damman	Central America West	Lazaro Cardenas	83.72	36.67	28.29	24.89	21.78	18.68	15.98	13.65	12.60	13.03	13.21	22.36
2020	Middle East	Damman	South America West	Matarani	86.25	38.01	29.43	26.13	23.20	19.88	17.07	14.60	13.47	13.93	14.11	23.85
2020	Middle East	Damman	South America West	Matarani	86.25	38.01	29.43	26.13	23.20	19.88	17.07	14.60	13.47	13.93	14.11	23.85
2020	North America West	Vancouver	North America East	Philadelphia	58.19	24.08	19.17	17.11	15.52	12.82	11.17	9.32	8.91	8.92	8.46	14.68
2020	North America West	Vancouver	North America Gulf	New Orleans	55.42	23.26	18.49	16.92	15.53	12.83	11.05	9.33	9.09	9.11	8.65	15.03
2020	North America West	Vancouver	Central America East	Tampico	47.32	20.54	16.84	15.47	14.46	11.99	10.12	8.45	8.07	8.07	7.65	13.20
2020	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	66.57	27.50	21.82	19.57	17.89	14.87	12.70	10.71	10.15	10.19	9.69	16.67
2020	North America West	Vancouver	South America East	Sepetiba, Bahia de	66.57	27.50	21.82	19.57	17.89	14.87	12.70	10.71	10.15	10.19	9.69	16.67
2020	North America West	Vancouver	Caribbean Basin	San Juan	44.88	21.31	17.80	17.12	16.41	14.46	12.28	10.33	9.91	10.12	9.77	17.23
2020	West Coast USA	Los Angeles	Europe	Rotterdam	68.84	28.73	22.94	20.54	19.12	15.98	14.07	12.01	11.77	12.04	11.66	20.13
2020	West Coast Canada	Vancouver	Europe	Rotterdam	69.21	28.77	23.31	20.77	19.04	15.60	13.27	11.05	10.59	10.68	10.07	17.30
2020	North America West	Vancouver	Europe	Rotterdam	69.21	28.77	23.31	20.77	19.04	15.60	13.27	11.05	10.59	10.68	10.07	17.30
2020	West Coast Canada	Vancouver	North Africa	Alexandria	77.71	32.66	26.30	23.49	21.44	17.76	15.15	12.64	12.09	12.27	11.63	20.04
2020	West Coast Canada	Vancouver	South Africa	Durban	84.60	35.48	28.55	25.47	23.21	19.18	16.35	13.61	12.99	13.16	12.48	21.49

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 DWT)											
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	North America West	Vancouver	Africa	Safi	65.56	27.69	22.33	19.99	18.31	15.24	13.05	10.95	10.50	10.70	10.14	17.48
2020	North America West	Vancouver	Middle East	Aqaba (El Akaba)	80.94	33.98	27.36	24.42	22.27	18.42	15.71	13.10	12.51	12.69	12.03	20.72
2020	Central America West	Puerto Quetzal	North America East	Philadelphia	36.27	16.70	14.00	13.24	12.60	11.03	9.67	8.03	7.70	7.72	7.32	12.74
2020	Central America West	Puerto Quetzal	North America East	Philadelphia	36.27	16.70	14.00	13.24	12.60	11.03	9.67	8.03	7.70	7.72	7.32	12.74
2020	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	33.34	15.78	13.23	12.99	12.57	11.00	9.51	8.01	7.86	7.89	7.49	13.07
2020	Central America West	Puerto Quetzal	North America Gulf	New Orleans	33.34	15.78	13.23	12.99	12.57	11.00	9.51	8.01	7.86	7.89	7.49	13.07
2020	Central America West	Puerto Quetzal	Central America East	Tampico	25.27	13.11	11.64	11.60	11.56	10.20	8.61	7.16	6.85	6.87	6.51	11.27
2020	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	45.40	20.69	17.14	16.17	15.39	13.41	11.48	9.63	9.13	9.17	8.73	15.03
2020	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.69	13.84	12.59	13.29	13.57	12.73	10.83	9.06	8.71	8.96	8.68	15.41
2020	Central America West	Puerto Quetzal	Europe	Rotterdam	48.22	22.09	18.77	17.48	16.64	14.20	12.10	10.01	9.61	9.70	9.14	15.71
2020	Central America West	Puerto Quetzal	Africa	Safi	44.40	20.93	17.71	16.64	15.85	13.81	11.86	9.89	9.50	9.71	9.21	15.90
2020	Peru	San Nicolas	East Coast USA	Baltimore	44.04	19.02	15.28	13.88	12.66	10.49	9.09	7.58	7.30	7.32	6.95	12.10
2020	Chile	Antofagasta	East Coast USA	Baltimore	48.16	22.65	18.75	17.30	16.03	13.97	12.49	10.38	10.02	10.05	9.49	16.36
2020	South America West	Matarani	North America East	Philadelphia	44.54	19.69	16.22	15.27	14.41	11.98	10.64	8.88	8.54	8.54	8.07	13.97
2020	South America West	Callao	North America East	Philadelphia	41.67	18.51	15.27	14.43	13.66	11.38	10.14	8.47	8.16	8.16	7.71	13.36
2020	South America West	San Nicolas	North America Gulf	Mobile	40.31	17.40	13.95	12.67	11.74	9.86	8.53	7.20	6.91	6.91	6.54	11.35
2020	South America West	Matarani	North America Gulf	South Louisiana	41.69	18.82	15.51	15.04	14.40	11.97	10.50	8.87	8.71	8.72	8.24	14.30
2020	South America West	Callao	North America Gulf	South Louisiana	38.82	17.64	14.56	14.20	13.65	11.37	10.00	8.46	8.33	8.34	7.89	13.69
2020	South America West	Callao	Central America East	Tampico	30.73	14.93	12.91	12.77	12.59	10.54	9.07	7.60	7.31	7.31	6.89	11.87
2020	South America West	Callao	South America East	Puerto La Cruz	35.96	17.03	14.37	13.72	13.38	11.27	9.81	8.11	7.67	7.66	7.22	12.42
2020	Chile	Antofagasta	Caribbean Basin	Point Lisas	34.52	17.89	14.94	13.95	13.17	11.71	10.38	8.57	8.23	8.25	7.76	13.24
2020	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.39	14.26	11.47	10.53	9.81	8.22	6.98	5.77	5.51	5.52	5.22	8.98
2020	South America West	Callao	Caribbean Basin	San Juan	28.23	15.67	13.85	14.40	14.53	13.00	11.23	9.47	9.15	9.36	9.02	15.91
2020	Peru	Matarani	Europe	Rotterdam	56.00	24.63	20.59	19.14	18.12	14.91	12.87	10.71	10.32	10.39	9.76	16.74
2020	Chile	Antofagasta	Europe	Rotterdam	59.00	27.25	22.83	20.88	19.45	16.63	14.71	12.17	11.73	11.82	11.08	18.89
2020	South America West	Callao	Europe	Rotterdam	53.13	23.44	19.64	18.30	17.37	14.31	12.36	10.30	9.94	10.01	9.40	16.13
2020	South America West	Callao	Africa	Safi	49.40	22.32	18.62	17.49	16.61	13.93	12.12	10.19	9.84	10.02	9.47	16.30
2020	South America West	Matarani	Middle East	Aqaba (El Akaba)	68.01	30.01	24.79	22.93	21.48	17.83	15.40	12.82	12.31	12.47	11.79	20.26
2020	Oceania	Newcastle	North America East	Baltimore	86.55	36.09	29.08	25.89	23.35	19.16	16.36	13.56	12.89	12.84	12.17	20.98
2020	Oceania	Bunbury	North America East	Philadelphia	96.42	40.11	32.33	28.86	25.90	21.17	18.39	15.17	14.46	14.38	13.60	23.38
2020	Oceania	Newcastle	North America Gulf	Mobile	82.63	34.38	27.66	24.61	22.36	18.48	15.75	13.15	12.46	12.40	11.73	20.18
2020	Oceania	Bunbury	North America Gulf	South Louisiana	93.37	39.14	31.52	28.56	25.81	21.10	18.20	15.12	14.59	14.53	13.74	23.65

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	Oceania	Newcastle	Central America East	Tampico	74.84	32.10	26.35	23.87	21.93	18.00	15.25	12.62	11.94	11.88	11.22	19.21
2020	Oceania	Bunbury	Central America East	Tampico	85.31	36.45	29.88	27.12	24.76	20.27	17.28	14.26	13.58	13.50	12.76	21.84
2020	Oceania	Bunbury	Caribbean Basin	San Juan	82.62	37.09	30.73	28.68	26.63	22.68	19.38	16.10	15.40	15.53	14.86	25.85
2020	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	121.59	51.19	41.61	37.18	33.55	27.49	23.55	19.45	18.58	18.66	17.64	30.20
2020	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Korea	Guangzhou	East Coast USA	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Far East	Guangzhou	East Coast Canada	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Taiwan	Guangzhou	East Coast USA	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Japan	Kobe	East Coast USA	Philadelphia	87.69	36.71	29.77	26.95	24.29	20.55	18.14	15.46	15.01	15.38	15.01	26.97
2020	Far East	Guangzhou	North America East	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Far East	Guangzhou	North America East	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Far East	Guangzhou	North America East	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	13.98	13.97	13.26	22.85
2020	Far East	Guangzhou	North America Gulf	South Louisiana	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	14.13	14.13	13.43	23.15
2020	Far East	Guangzhou	North America Gulf	South Louisiana	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	14.13	14.13	13.43	23.15
2020	Far East	Guangzhou	North America Gulf	New Orleans	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	14.13	14.13	13.43	23.15
2020	Far East	Guangzhou	North America Gulf	South Louisiana	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	14.13	14.13	13.43	23.15
2020	Far East	Guangzhou	Central America East	Tampico	82.89	35.38	29.06	26.36	24.08	19.67	16.73	13.77	13.11	13.10	12.43	21.33
2020	Far East	Guangzhou	South America East	Puerto La Cruz	88.03	37.43	30.48	27.28	24.84	20.37	17.44	14.27	13.47	13.44	12.74	21.85
2020	Far East	Guangzhou	Caribbean Basin	San Juan	80.31	36.08	29.95	27.95	25.98	22.10	18.86	15.62	14.94	15.13	14.54	25.34
2020	South East Asia	Manado	North America East	Philadelphia	93.03	41.04	34.06	31.72	29.83	25.61	24.11	19.67	18.72	18.75	17.79	30.78
2020	South East Asia	Bangkok	North America Gulf	New Orleans	95.88	40.28	32.62	29.80	27.12	22.30	19.34	16.17	15.76	15.95	15.04	25.99
2020	South East Asia	Manado	North America Gulf	New Orleans	90.23	40.20	33.38	31.51	29.82	25.61	23.98	19.67	18.90	18.94	17.97	31.12
2020	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	101.63	42.10	33.58	30.24	27.76	23.34	20.63	17.09	16.27	16.29	15.46	26.52
2025	North America East	New York	North America West	Los Angeles	58.96	25.18	18.61	16.20	14.29	12.53	11.33	10.02	9.47	9.88	10.34	17.72
2025	North America East	New York	Central America West	Lazaro Cardenas	42.30	18.91	14.58	13.10	11.50	9.95	8.80	7.56	7.01	7.17	7.27	12.43
2025	North America East	New York	South America West	Matarani	44.83	20.24	15.73	14.34	12.94	11.15	9.90	8.51	7.88	8.07	8.17	13.93
2025	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	88.40	37.48	28.21	24.12	20.66	17.35	14.70	12.36	11.23	11.48	11.66	19.74
2025	North America East	New York	Oceania	Brisbane	82.48	35.37	27.08	23.54	20.41	17.60	15.39	13.26	12.19	12.44	12.62	21.45
2025	East Coast USA	Norfolk	Taiwan	Kaohsiung	88.68	37.44	28.12	24.14	20.93	17.88	15.13	12.89	11.73	11.97	12.13	20.60
2025	East Coast USA	Norfolk	Korea	Kwangyang	84.27	35.69	26.84	23.08	20.06	17.22	14.61	12.52	11.42	11.66	11.81	20.04
2025	East Coast USA	Norfolk	Japan	Mizushima	87.16	36.75	27.56	23.79	20.68	17.91	15.38	13.37	12.35	12.72	13.08	22.63
2025	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	85.13	36.05	27.08	23.14	19.97	16.91	14.27	12.05	10.96	11.21	11.35	19.18

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	88.02	37.12	27.81	23.85	20.58	17.60	15.05	12.90	11.89	12.27	12.63	21.77
2025	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	88.29	37.64	28.39	24.40	20.98	17.69	15.06	12.67	11.61	11.92	12.13	20.49
2025	North America East	New York	Far East	Guangzhou	92.53	39.35	29.82	25.75	22.09	18.68	16.18	13.70	12.55	12.85	13.07	22.18
2025	North America East	New York	Far East	Guangzhou	92.53	39.35	29.82	25.75	22.09	18.68	16.18	13.70	12.55	12.85	13.07	22.18
2025	North America Gulf	Tampa	North America West	Los Angeles	54.33	23.37	17.20	15.36	13.74	12.08	10.84	9.71	9.37	9.79	10.26	17.60
2025	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.75	17.16	13.22	12.30	10.99	9.53	8.32	7.27	6.92	7.10	7.20	12.33
2025	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.75	17.16	13.22	12.30	10.99	9.53	8.32	7.27	6.92	7.10	7.20	12.33
2025	North America Gulf	Tampa	South America West	Matarani	40.28	18.49	14.36	13.53	12.41	10.73	9.42	8.22	7.80	7.99	8.09	13.82
2025	North America Gulf	Tampa	South America West	Matarani	40.28	18.49	14.36	13.53	12.41	10.73	9.42	8.22	7.80	7.99	8.09	13.82
2025	North America Gulf	Tampa	Oceania	Auckland	69.54	30.06	23.09	20.53	18.02	15.62	13.66	12.01	11.22	11.48	11.64	19.84
2025	North America Gulf	Tampa	Oceania	Auckland	69.54	30.06	23.09	20.53	18.02	15.62	13.66	12.01	11.22	11.48	11.64	19.84
2025	North America Gulf	Mobile	Far East	Osaka	83.25	34.74	26.01	22.44	19.53	16.97	14.60	12.73	11.79	12.15	12.51	21.67
2025	North America Gulf	Tampa	Far East	Guangzhou	87.41	37.11	28.06	24.61	21.29	18.03	15.51	13.27	12.34	12.65	12.87	21.88
2025	North America Gulf	Tampa	Far East	Guangzhou	87.41	37.11	28.06	24.61	21.29	18.03	15.51	13.27	12.34	12.65	12.87	21.88
2025	North America Gulf	Tampa	South East Asia	Bangkok	95.09	40.99	31.30	27.73	24.12	20.56	17.81	15.35	14.40	14.93	15.09	25.65
2025	Central America East	Puerto Limon	North America West	Los Angeles	39.94	18.80	14.34	13.00	11.94	10.55	9.34	8.29	7.84	8.23	8.67	14.81
2025	Central America East	Puerto Limon	South America West	Matarani	25.68	13.72	11.38	11.13	10.60	9.17	7.90	6.78	6.24	6.42	6.50	11.04
2025	Central America East	Puerto Limon	South America West	Matarani	25.68	13.72	11.38	11.13	10.60	9.17	7.90	6.78	6.24	6.42	6.50	11.04
2025	Central America East	Puerto Limon	Far East	Guangzhou	74.33	34.22	26.55	23.45	20.46	17.26	14.65	12.30	11.17	11.44	11.64	19.65
2025	Central America East	Puerto Limon	South East Asia	Jakarta	84.63	42.02	33.72	31.06	28.26	24.96	23.11	19.16	17.34	17.83	18.13	30.79
2025	South America East	Santos	North America West	Los Angeles	70.42	30.13	22.36	19.56	17.31	15.18	13.40	11.88	11.13	11.59	12.11	20.56
2025	Other South America East	Buenos Aires	West Coast USA	Los Angeles	81.91	34.77	25.83	22.58	20.01	17.47	15.26	13.40	12.61	13.11	13.51	22.86
2025	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	54.78	23.17	17.08	14.83	13.27	11.53	10.11	8.93	8.41	8.77	9.20	15.66
2025	South America East	Buenos Aires	West Coast Canada	Los Angeles	81.91	34.77	25.83	22.58	20.01	17.47	15.26	13.40	12.61	13.11	13.51	22.86
2025	Brazil	Santos	West Coast USA	Los Angeles	70.42	30.13	22.36	19.56	17.31	15.18	13.40	11.88	11.13	11.59	12.11	20.56
2025	South America East	Ponta da Madeira	North America West	Los Angeles	58.83	25.29	18.69	16.24	14.33	12.59	11.13	9.83	9.21	9.65	10.16	17.30
2025	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	33.46	14.84	11.47	10.35	9.46	8.21	6.92	6.01	5.50	5.60	5.64	9.51
2025	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	25.59	12.51	9.72	8.95	8.23	7.25	6.18	5.41	5.01	5.14	5.21	8.85
2025	South America East	Puerto Bolivar	South America West	Huasco	31.58	16.73	13.18	11.95	10.97	10.15	9.07	7.82	7.25	7.45	7.50	12.58
2025	South America East	Puerto La Cruz	South America West	Matarani	36.00	16.18	12.62	11.59	10.90	9.42	8.02	6.96	6.38	6.50	6.54	11.01
2025	South America East	Santos	Oceania	Brisbane	95.02	40.84	31.29	27.32	23.79	20.54	17.70	15.34	14.05	14.37	14.60	24.64
2025	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	86.39	36.30	27.35	23.44	20.31	17.07	14.30	12.04	10.90	11.09	11.23	18.91

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 DWT) 0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	85.06	36.09	27.33	23.60	20.43	17.18	14.55	12.28	11.23	11.48	11.67	19.63
2025	Venezuela	Puerto Ordaz	Korea	Kwangyang	81.81	34.46	25.99	22.31	19.39	16.37	13.74	11.64	10.55	10.75	10.87	18.30
2025	Venezuela	Puerto Ordaz	Japan	Mizushima	84.67	35.51	26.70	23.01	19.99	17.05	14.51	12.48	11.48	11.81	12.14	20.88
2025	North Brazil	Ponta da Madeira	Korea	Kwangyang	85.85	36.58	27.59	23.72	20.44	17.42	14.76	12.54	11.36	11.63	11.83	19.94
2025	North Brazil	Ponta da Madeira	Japan	Mizushima	88.71	37.63	28.30	24.42	21.05	18.10	15.53	13.38	12.28	12.69	13.10	22.52
2025	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	89.11	38.21	28.93	25.01	21.48	18.23	15.57	13.18	12.03	12.36	12.63	21.27
2025	Venezuela	Puerto Ordaz	Japan	Shimizu	84.41	35.95	27.43	24.05	20.93	18.39	15.92	14.14	13.10	13.80	14.51	25.76
2025	North Brazil	Saã Luiz	Japan	Shimizu	86.74	37.27	28.43	25.11	21.84	19.44	17.03	15.29	14.18	14.96	15.73	27.82
2025	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	105.88	45.25	34.38	29.65	25.43	21.47	18.28	15.44	14.04	14.39	14.69	24.77
2025	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	92.12	39.35	29.91	25.99	22.45	19.11	16.39	14.04	12.83	13.16	13.43	22.62
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	85.96	36.36	27.55	23.75	20.69	17.48	14.76	12.53	11.40	11.64	11.80	19.83
2025	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	112.53	47.77	36.24	31.47	27.24	23.14	19.71	16.77	15.41	15.79	15.96	26.83
2025	Colombia	Puerto Bolivar	Japan	Mizushima	72.41	31.26	23.47	20.34	17.82	15.42	13.19	11.47	10.59	10.93	11.26	19.43
2025	Brazil	Saã Luiz	Far East	Guangzhou	92.12	39.35	29.91	25.99	22.45	19.11	16.39	14.04	12.83	13.16	13.43	22.62
2025	South America East	Ponta da Madeira	Far East	Mizushima	88.71	37.63	28.30	24.42	21.05	18.10	15.53	13.38	12.28	12.69	13.10	22.52
2025	Caribbean Basin	Kingston	North America West	Los Angeles	42.62	21.11	16.38	15.46	14.47	13.54	11.94	10.63	10.08	10.70	11.36	19.73
2025	Caribbean Basin	Kingston	North America West	Los Angeles	42.62	21.11	16.38	15.46	14.47	13.54	11.94	10.63	10.08	10.70	11.36	19.73
2025	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.90	14.81	12.33	12.34	11.67	10.95	9.39	8.16	7.60	7.99	8.28	14.42
2025	Caribbean Basin	Kingston	South America West	Matarani	28.43	16.15	13.47	13.59	13.10	12.15	10.49	9.11	8.48	8.89	9.18	15.92
2025	Caribbean Basin	Kingston	Far East	Guangzhou	76.51	35.44	27.73	25.15	22.38	19.78	16.86	14.38	13.22	13.73	14.15	24.29
2025	Caribbean Basin	Kingston	Far East	Guangzhou	76.51	35.44	27.73	25.15	22.38	19.78	16.86	14.38	13.22	13.73	14.15	24.29
2025	Europe	Rotterdam	West Coast Canada	Los Angeles	70.24	29.90	22.57	19.59	17.41	15.09	13.27	11.68	11.05	11.56	11.99	20.36
2025	Europe	Rotterdam	West Coast USA	Los Angeles	70.24	29.90	22.57	19.59	17.41	15.09	13.27	11.68	11.05	11.56	11.99	20.36
2025	Europe	Rotterdam	North America West	Los Angeles	70.24	29.90	22.57	19.59	17.41	15.09	13.27	11.68	11.05	11.56	11.99	20.36
2025	Europe	Rotterdam	Central America West	Lazaro Cardenas	53.56	23.63	18.54	16.48	14.62	12.50	10.73	9.22	8.58	8.85	8.92	15.06
2025	Europe	Rotterdam	South America West	Matarani	56.09	24.97	19.68	17.72	16.05	13.71	11.82	10.17	9.46	9.75	9.81	16.55
2025	Africa	Durban	North America West	Los Angeles	86.88	37.50	28.25	24.54	21.61	18.79	16.45	14.38	13.51	14.16	14.68	24.94
2025	Africa	Safi	Central America West	Lazaro Cardenas	50.36	22.88	17.89	16.02	14.20	12.36	10.68	9.25	8.62	8.99	9.11	15.44
2025	Africa	Safi	Oceania	Auckland	82.96	36.25	28.17	24.62	21.53	18.70	16.24	14.16	13.08	13.54	13.72	23.22
2025	Middle East	Damman	Central America West	Lazaro Cardenas	85.14	37.46	28.95	25.48	22.27	19.09	16.32	13.94	12.87	13.31	13.49	22.80
2025	Middle East	Damman	South America West	Matarani	87.68	38.79	30.09	26.72	23.70	20.29	17.42	14.89	13.74	14.21	14.38	24.30
2025	Middle East	Damman	South America West	Matarani	87.68	38.79	30.09	26.72	23.70	20.29	17.42	14.89	13.74	14.21	14.38	24.30

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	North America West	Vancouver	North America East	Philadelphia	58.93	24.49	19.53	17.43	15.80	13.04	11.36	9.47	9.05	9.06	8.60	14.91
2025	North America West	Vancouver	North America Gulf	New Orleans	56.11	23.63	18.82	17.22	15.80	13.04	11.23	9.47	9.23	9.25	8.78	15.25
2025	North America West	Vancouver	Central America East	Tampico	48.02	20.93	17.18	15.78	14.73	12.21	10.30	8.60	8.21	8.22	7.78	13.42
2025	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	67.58	28.05	22.29	20.00	18.27	15.18	12.96	10.92	10.34	10.38	9.88	16.98
2025	North America West	Vancouver	South America East	Sepetiba, Bahia de	67.58	28.05	22.29	20.00	18.27	15.18	12.96	10.92	10.34	10.38	9.88	16.98
2025	North America West	Vancouver	Caribbean Basin	San Juan	45.53	21.67	18.12	17.43	16.69	14.69	12.47	10.48	10.06	10.27	9.92	17.47
2025	West Coast USA	Los Angeles	Europe	Rotterdam	69.79	29.24	23.39	20.95	19.48	16.27	14.31	12.20	11.96	12.22	11.83	20.42
2025	West Coast Canada	Vancouver	Europe	Rotterdam	70.28	29.34	23.82	21.24	19.45	15.92	13.54	11.27	10.80	10.88	10.26	17.62
2025	North America West	Vancouver	Europe	Rotterdam	70.28	29.34	23.82	21.24	19.45	15.92	13.54	11.27	10.80	10.88	10.26	17.62
2025	West Coast Canada	Vancouver	North Africa	Alexandria	78.94	33.33	26.89	24.03	21.91	18.13	15.47	12.90	12.34	12.51	11.86	20.42
2025	West Coast Canada	Vancouver	South Africa	Durban	85.95	36.21	29.20	26.06	23.73	19.59	16.70	13.89	13.26	13.43	12.73	21.91
2025	North America West	Vancouver	Africa	Safi	66.57	28.24	22.82	20.43	18.70	15.55	13.31	11.16	10.71	10.90	10.33	17.80
2025	North America West	Vancouver	Middle East	Aqaba (El Akaba)	82.22	34.68	27.97	24.98	22.76	18.82	16.05	13.36	12.77	12.94	12.27	21.12
2025	Central America West	Puerto Quetzal	North America East	Philadelphia	36.72	16.98	14.25	13.48	12.81	11.20	9.82	8.15	7.81	7.83	7.42	12.91
2025	Central America West	Puerto Quetzal	North America East	Philadelphia	36.72	16.98	14.25	13.48	12.81	11.20	9.82	8.15	7.81	7.83	7.42	12.91
2025	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	33.72	16.03	13.45	13.21	12.77	11.15	9.64	8.11	7.96	7.99	7.59	13.23
2025	Central America West	Puerto Quetzal	North America Gulf	New Orleans	33.72	16.03	13.45	13.21	12.77	11.15	9.64	8.11	7.96	7.99	7.59	13.23
2025	Central America West	Puerto Quetzal	Central America East	Tampico	25.66	13.37	11.88	11.83	11.76	10.37	8.75	7.27	6.95	6.98	6.61	11.44
2025	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	46.16	21.15	17.55	16.55	15.74	13.69	11.71	9.82	9.30	9.35	8.90	15.31
2025	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	23.02	14.08	12.81	13.52	13.78	12.90	10.97	9.18	8.82	9.07	8.80	15.61
2025	Central America West	Puerto Quetzal	Europe	Rotterdam	49.06	22.59	19.22	17.90	17.01	14.50	12.35	10.21	9.79	9.89	9.31	16.01
2025	Central America West	Puerto Quetzal	Africa	Safi	45.17	21.39	18.13	17.03	16.20	14.09	12.09	10.08	9.68	9.90	9.38	16.19
2025	Peru	San Nicolas	East Coast USA	Baltimore	44.54	19.30	15.53	14.10	12.86	10.64	9.22	7.68	7.40	7.42	7.05	12.26
2025	Chile	Antofagasta	East Coast USA	Baltimore	48.74	22.98	19.04	17.55	16.25	14.15	12.64	10.50	10.14	10.17	9.60	16.54
2025	South America West	Matarani	North America East	Philadelphia	45.07	19.99	16.49	15.51	14.63	12.15	10.79	9.00	8.65	8.65	8.17	14.15
2025	South America West	Callao	North America East	Philadelphia	42.15	18.78	15.51	14.65	13.86	11.54	10.27	8.58	8.26	8.27	7.81	13.53
2025	South America West	San Nicolas	North America Gulf	Mobile	40.75	17.64	14.16	12.87	11.91	10.00	8.65	7.29	6.99	7.00	6.62	11.49
2025	South America West	Matarani	North America Gulf	South Louisiana	42.16	19.09	15.74	15.27	14.60	12.13	10.64	8.98	8.81	8.83	8.34	14.47
2025	South America West	Callao	North America Gulf	South Louisiana	39.24	17.88	14.77	14.41	13.83	11.51	10.12	8.56	8.42	8.44	7.98	13.85
2025	South America West	Callao	Central America East	Tampico	31.16	15.18	13.14	12.98	12.78	10.69	9.20	7.70	7.41	7.41	6.99	12.03
2025	South America West	Callao	South America East	Puerto La Cruz	36.34	17.26	14.59	13.92	13.56	11.41	9.93	8.21	7.77	7.76	7.31	12.57
2025	Chile	Antofagasta	Caribbean Basin	Point Lisas	35.00	18.16	15.17	14.16	13.36	11.86	10.51	8.67	8.33	8.35	7.85	13.39

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.81	14.49	11.67	10.71	9.97	8.35	7.09	5.86	5.59	5.60	5.30	9.11
2025	South America West	Callao	Caribbean Basin	San Juan	28.60	15.90	14.06	14.61	14.73	13.16	11.37	9.57	9.25	9.47	9.13	16.09
2025	Peru	Matarani	Europe	Rotterdam	56.88	25.12	21.03	19.54	18.48	15.19	13.11	10.90	10.50	10.57	9.93	17.03
2025	Chile	Antofagasta	Europe	Rotterdam	59.94	27.76	23.28	21.29	19.81	16.92	14.95	12.37	11.92	12.00	11.25	19.17
2025	South America West	Callao	Europe	Rotterdam	53.96	23.90	20.05	18.68	17.71	14.57	12.59	10.48	10.11	10.19	9.57	16.40
2025	South America West	Callao	Africa	Safi	50.17	22.75	19.01	17.84	16.93	14.18	12.34	10.36	10.01	10.19	9.63	16.56
2025	South America West	Matarani	Middle East	Aqaba (El Akaba)	69.13	30.63	25.34	23.44	21.93	18.19	15.70	13.07	12.54	12.71	12.01	20.63
2025	Oceania	Newcastle	North America East	Baltimore	88.04	36.87	29.78	26.53	23.91	19.61	16.74	13.87	13.18	13.13	12.44	21.43
2025	Oceania	Bunbury	North America East	Philadelphia	98.14	41.01	33.13	29.60	26.55	21.68	18.83	15.52	14.80	14.72	13.92	23.90
2025	Oceania	Newcastle	North America Gulf	Mobile	84.03	35.12	28.32	25.21	22.89	18.90	16.11	13.43	12.73	12.67	11.98	20.60
2025	Oceania	Bunbury	North America Gulf	South Louisiana	95.02	40.01	32.29	29.27	26.44	21.60	18.62	15.46	14.92	14.86	14.05	24.16
2025	Oceania	Newcastle	Central America East	Tampico	76.26	32.86	27.03	24.49	22.48	18.44	15.61	12.92	12.23	12.16	11.49	19.65
2025	Oceania	Bunbury	Central America East	Tampico	86.97	37.33	30.67	27.85	25.40	20.78	17.71	14.60	13.92	13.83	13.07	22.35
2025	Oceania	Bunbury	Caribbean Basin	San Juan	84.22	37.95	31.50	29.39	27.26	23.18	19.81	16.44	15.74	15.87	15.18	26.38
2025	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	124.01	52.47	42.74	38.23	34.47	28.22	24.17	19.95	19.06	19.14	18.09	30.95
2025	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Korea	Guangzhou	East Coast USA	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Far East	Guangzhou	East Coast Canada	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Taiwan	Guangzhou	East Coast USA	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Japan	Kobe	East Coast USA	Philadelphia	89.07	37.44	30.42	27.55	24.82	20.98	18.50	15.75	15.29	15.66	15.27	27.42
2025	Far East	Guangzhou	North America East	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Far East	Guangzhou	North America East	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Far East	Guangzhou	North America East	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	14.28	14.27	13.55	23.31
2025	Far East	Guangzhou	North America Gulf	South Louisiana	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	14.43	14.42	13.70	23.61
2025	Far East	Guangzhou	North America Gulf	South Louisiana	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	14.43	14.42	13.70	23.61
2025	Far East	Guangzhou	North America Gulf	New Orleans	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	14.43	14.42	13.70	23.61
2025	Far East	Guangzhou	North America Gulf	South Louisiana	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	14.43	14.42	13.70	23.61
2025	Far East	Guangzhou	Central America East	Tampico	84.39	36.18	29.77	27.02	24.65	20.13	17.12	14.08	13.41	13.40	12.71	21.79
2025	Far East	Guangzhou	South America East	Puerto La Cruz	89.49	38.21	31.18	27.92	25.40	20.82	17.82	14.57	13.76	13.73	13.02	22.30
2025	Far East	Guangzhou	Caribbean Basin	San Juan	81.76	36.86	30.65	28.60	26.55	22.55	19.24	15.93	15.24	15.44	14.83	25.81
2025	South East Asia	Manado	North America East	Philadelphia	94.43	41.79	34.73	32.34	30.38	26.05	24.49	19.98	19.02	19.05	18.06	31.24
2025	South East Asia	Bangkok	North America Gulf	New Orleans	97.35	41.06	33.30	30.44	27.67	22.74	19.71	16.47	16.05	16.24	15.32	26.44

Table C-1. Ocean Freight Rates Excluding Tolls for Existing Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	South East Asia	Manado	North America Gulf	New Orleans	91.58	40.93	34.02	32.12	30.36	26.04	24.35	19.97	19.19	19.23	18.24	31.57
2025	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	103.33	42.99	34.36	30.95	28.39	23.84	21.05	17.43	16.60	16.62	15.77	27.02

Source: Richardson Lawrie Associates

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	North America East	New York	North America West	Los Angeles	107.33	44.43	38.08	32.47	27.93	23.74	21.23	18.37	17.70	18.09	18.64	30.84
2000	North America East	New York	Central America West	Lazaro Cardenas	91.43	38.50	34.15	29.53	25.28	21.28	18.80	16.01	15.35	15.50	15.69	25.73
2000	North America East	New York	South America West	Matarani	78.01	33.30	29.49	25.90	22.64	19.12	17.02	14.55	13.97	14.12	14.28	23.45
2000	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	93.49	38.44	33.99	28.70	24.28	20.22	17.58	14.89	14.21	14.36	14.57	23.80
2000	North America East	New York	Oceania	Brisbane	100.07	41.60	36.92	31.62	27.05	23.00	20.51	17.71	17.03	17.19	17.40	28.52
2000	East Coast USA	Norfolk	Taiwan	Kaohsiung	102.77	43.29	37.93	32.13	27.48	23.20	20.10	17.19	16.37	16.51	16.71	27.38
2000	East Coast USA	Norfolk	Korea	Kwangyang	108.92	45.90	40.24	34.12	29.21	24.69	21.41	18.35	17.47	17.63	17.83	29.21
2000	East Coast USA	Norfolk	Japan	Mizushima	114.06	47.90	41.76	35.50	30.39	25.85	22.58	19.52	18.71	19.01	19.43	32.32
2000	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	99.34	43.30	38.33	32.33	27.51	23.03	19.94	16.93	16.16	16.31	16.51	26.89
2000	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	104.47	45.30	39.84	33.71	28.69	24.19	21.12	18.11	17.40	17.69	18.10	30.00
2000	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	98.45	43.19	38.31	32.47	27.55	23.00	20.04	16.96	16.27	16.49	16.75	27.30
2000	North America East	New York	Far East	Guangzhou	101.70	43.54	38.33	32.63	27.67	23.16	20.47	17.40	16.63	16.83	17.09	28.05
2000	North America East	New York	Far East	Guangzhou	101.70	43.54	38.33	32.63	27.67	23.16	20.47	17.40	16.63	16.83	17.09	28.05
2000	North America Gulf	Tampa	North America West	Los Angeles	111.05	45.85	39.42	34.00	29.41	24.98	22.16	19.28	18.81	19.21	19.78	32.71
2000	North America Gulf	Tampa	Central America West	Lazaro Cardenas	91.30	38.38	34.10	29.89	25.77	21.70	19.04	16.34	15.91	16.06	16.26	26.67
2000	North America Gulf	Tampa	Central America West	Lazaro Cardenas	91.30	38.38	34.10	29.89	25.77	21.70	19.04	16.34	15.91	16.06	16.26	26.67
2000	North America Gulf	Tampa	South America West	Matarani	78.12	33.35	29.58	26.38	23.23	19.61	17.32	14.93	14.57	14.72	14.90	24.47
2000	North America Gulf	Tampa	South America West	Matarani	78.12	33.35	29.58	26.38	23.23	19.61	17.32	14.93	14.57	14.72	14.90	24.47
2000	North America Gulf	Tampa	Oceania	Auckland	91.72	38.26	34.07	29.65	25.59	21.80	19.40	16.98	16.56	16.72	16.93	27.77
2000	North America Gulf	Tampa	Oceania	Auckland	91.72	38.26	34.07	29.65	25.59	21.80	19.40	16.98	16.56	16.72	16.93	27.77
2000	North America Gulf	Mobile	Far East	Osaka	118.23	48.06	41.96	35.63	30.50	25.95	22.68	19.62	18.83	19.12	19.54	32.51
2000	North America Gulf	Tampa	Far East	Guangzhou	105.86	43.62	38.46	33.14	28.29	23.68	20.79	17.81	17.26	17.47	17.75	29.12
2000	North America Gulf	Tampa	Far East	Guangzhou	105.86	43.62	38.46	33.14	28.29	23.68	20.79	17.81	17.26	17.47	17.75	29.12
2000	North America Gulf	Tampa	South East Asia	Bangkok	101.39	42.45	37.79	32.99	28.33	23.90	21.20	18.36	18.02	18.46	18.64	30.57
2000	Central America East	Puerto Limon	North America West	Los Angeles	144.28	60.58	53.59	46.00	39.71	33.49	29.32	25.14	24.21	24.60	25.22	41.31
2000	Central America East	Puerto Limon	South America West	Matarani	68.35	30.26	27.87	24.97	22.23	18.79	16.44	14.07	13.59	13.71	13.86	22.56
2000	Central America East	Puerto Limon	South America West	Matarani	68.35	30.26	27.87	24.97	22.23	18.79	16.44	14.07	13.59	13.71	13.86	22.56
2000	Central America East	Puerto Limon	Far East	Guangzhou	96.75	40.96	37.11	32.05	27.54	23.07	20.09	17.10	16.41	16.59	16.83	27.42
2000	Central America East	Puerto Limon	South East Asia	Jakarta	86.42	39.55	37.34	33.78	30.36	26.72	25.44	21.50	20.69	20.96	21.25	34.70
2000	South America East	Santos	North America West	Los Angeles	73.80	30.84	26.22	22.66	19.81	17.19	15.43	13.72	13.32	13.71	14.24	23.50
2000	Other South America East	Buenos Aires	West Coast USA	Los Angeles	72.96	30.33	25.43	22.06	19.43	16.92	15.13	13.43	13.12	13.52	13.92	22.97
2000	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	98.96	40.91	35.16	29.99	25.98	21.98	19.31	16.71	16.10	16.44	16.96	27.92

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	South America East	Buenos Aires	West Coast Canada	Los Angeles	72.96	30.33	25.43	22.06	19.43	16.92	15.13	13.43	13.12	13.52	13.92	22.97
2000	Brazil	Santos	West Coast USA	Los Angeles	73.80	30.84	26.22	22.66	19.81	17.19	15.43	13.72	13.32	13.71	14.24	23.50
2000	South America East	Ponta da Madeira	North America West	Los Angeles	87.33	36.48	31.30	26.76	23.10	19.78	17.55	15.29	14.74	15.14	15.71	25.93
2000	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	82.82	34.80	31.02	26.85	23.33	19.64	16.97	14.51	13.88	13.96	14.10	22.91
2000	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	80.77	34.92	31.28	27.16	23.56	19.88	17.25	14.76	14.18	14.30	14.48	23.58
2000	South America East	Puerto Bolivar	South America West	Huasco	62.63	29.13	25.93	22.64	19.92	17.51	15.56	13.34	12.71	12.89	13.00	21.26
2000	South America East	Puerto La Cruz	South America West	Matarani	68.56	29.20	26.01	22.90	20.42	17.26	14.99	12.89	12.33	12.42	12.53	20.38
2000	South America East	Santos	Oceania	Brisbane	65.30	27.50	24.59	21.41	18.60	16.17	14.47	12.87	12.48	12.63	12.82	20.89
2000	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	97.63	40.01	35.20	29.83	25.50	21.25	18.29	15.51	14.74	14.83	15.01	24.41
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	103.05	42.61	37.58	32.02	27.32	22.76	19.73	16.73	15.99	16.16	16.40	26.71
2000	Venezuela	Puerto Ordaz	Korea	Kwangyang	104.03	42.77	37.64	31.93	27.32	22.82	19.66	16.72	15.90	16.01	16.18	26.33
2000	Venezuela	Puerto Ordaz	Japan	Mizushima	109.26	44.80	39.18	33.34	28.52	24.00	20.85	17.91	17.15	17.40	17.79	29.46
2000	North Brazil	Ponta da Madeira	Korea	Kwangyang	92.42	38.34	33.79	28.70	24.44	20.62	17.91	15.31	14.54	14.71	14.94	24.34
2000	North Brazil	Ponta da Madeira	Japan	Mizushima	97.64	40.38	35.33	30.10	25.65	21.79	19.10	16.50	15.79	16.10	16.54	27.47
2000	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	91.43	38.18	33.72	28.79	24.44	20.55	17.97	15.32	14.63	14.87	15.15	24.72
2000	Venezuela	Puerto Ordaz	Japan	Shimizu	112.18	46.54	41.09	35.42	30.34	26.11	22.99	20.25	19.54	20.22	21.06	35.76
2000	North Brazil	Saã Luiz	Japan	Shimizu	98.90	41.38	36.53	31.79	27.30	23.90	21.34	19.13	18.54	19.26	20.14	34.27
2000	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	81.24	33.90	30.03	25.64	21.76	18.30	16.02	13.69	13.05	13.27	13.55	22.13
2000	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	84.92	35.37	31.29	26.91	23.00	19.45	17.12	14.82	14.20	14.42	14.68	23.94
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	106.16	43.78	38.64	32.88	28.19	23.58	20.39	17.37	16.54	16.70	16.91	27.50
2000	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	86.83	36.00	31.51	27.17	23.35	19.79	17.34	14.96	14.42	14.65	14.78	24.09
2000	Colombia	Puerto Bolivar	Japan	Mizushima	107.37	44.92	39.41	33.60	28.88	24.47	21.31	18.40	17.65	17.92	18.32	30.35
2000	Brazil	Saã Luiz	Far East	Guangzhou	84.92	35.37	31.29	26.91	23.00	19.45	17.12	14.82	14.20	14.42	14.68	23.94
2000	South America East	Ponta da Madeira	Far East	Mizushima	97.64	40.38	35.33	30.10	25.65	21.79	19.10	16.50	15.79	16.10	16.54	27.47
2000	Caribbean Basin	Kingston	North America West	Los Angeles	96.92	42.83	38.13	33.85	29.95	26.36	23.31	20.27	19.73	20.35	21.15	35.13
2000	Caribbean Basin	Kingston	North America West	Los Angeles	96.92	42.83	38.13	33.85	29.95	26.36	23.31	20.27	19.73	20.35	21.15	35.13
2000	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	80.92	36.86	34.16	30.87	27.27	23.87	20.86	17.90	17.37	17.75	18.19	29.99
2000	Caribbean Basin	Kingston	South America West	Matarani	67.31	31.55	29.41	27.16	24.57	21.65	19.03	16.40	15.95	16.33	16.74	27.65
2000	Caribbean Basin	Kingston	Far East	Guangzhou	95.90	42.33	38.72	34.30	29.93	25.97	22.72	19.45	18.80	19.23	19.75	32.56
2000	Caribbean Basin	Kingston	Far East	Guangzhou	95.90	42.33	38.72	34.30	29.93	25.97	22.72	19.45	18.80	19.23	19.75	32.56
2000	Europe	Rotterdam	West Coast Canada	Los Angeles	103.14	42.58	37.30	31.80	27.59	23.41	20.75	18.04	17.53	18.01	18.50	30.42
2000	Europe	Rotterdam	West Coast USA	Los Angeles	103.14	42.58	37.30	31.80	27.59	23.41	20.75	18.04	17.53	18.01	18.50	30.42

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	Europe	Rotterdam	North America West	Los Angeles	103.14	42.58	37.30	31.80	27.59	23.41	20.75	18.04	17.53	18.01	18.50	30.42
2000	Europe	Rotterdam	Central America West	Lazaro Cardenas	87.24	36.66	33.37	28.85	24.94	20.95	18.33	15.67	15.18	15.41	15.55	25.30
2000	Europe	Rotterdam	South America West	Matarani	73.83	31.50	28.75	25.25	22.32	18.80	16.55	14.22	13.80	14.04	14.14	23.03
2000	Africa	Durban	North America West	Los Angeles	86.19	35.83	31.30	26.80	23.34	20.15	18.05	15.89	15.57	16.15	16.67	27.45
2000	Africa	Safi	Central America West	Lazaro Cardenas	77.37	32.79	29.93	26.02	22.51	19.19	16.93	14.62	14.26	14.60	14.77	24.05
2000	Africa	Safi	Oceania	Auckland	77.80	32.67	29.90	25.78	22.33	19.30	17.29	15.27	14.91	15.26	15.44	25.14
2000	Middle East	Damman	Central America West	Lazaro Cardenas	91.19	38.82	35.28	30.60	26.38	22.39	19.68	16.93	16.46	16.82	17.02	27.69
2000	Middle East	Damman	South America West	Matarani	87.42	37.57	34.15	29.95	26.25	22.30	19.68	16.96	16.49	16.86	17.04	27.75
2000	Middle East	Damman	South America West	Matarani	87.42	37.57	34.15	29.95	26.25	22.30	19.68	16.96	16.49	16.86	17.04	27.75
2000	North America West	Vancouver	North America East	Philadelphia	108.34	43.63	40.42	35.45	31.59	25.56	22.43	18.56	18.38	18.14	17.17	28.65
2000	North America West	Vancouver	North America Gulf	New Orleans	111.23	45.06	41.79	37.11	33.26	26.89	23.44	19.50	19.55	19.30	18.26	30.47
2000	North America West	Vancouver	Central America East	Tampico	103.93	42.63	40.61	36.07	32.54	26.34	22.79	18.86	18.77	18.50	17.48	28.97
2000	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	72.13	29.07	26.95	23.86	21.53	17.70	15.49	13.12	13.04	12.92	12.27	20.37
2000	North America West	Vancouver	South America East	Sepetiba, Bahia de	72.13	29.07	26.95	23.86	21.53	17.70	15.49	13.12	13.04	12.92	12.27	20.37
2000	North America West	Vancouver	Caribbean Basin	San Juan	93.64	40.20	38.71	35.34	32.43	27.25	23.70	19.77	19.82	19.78	18.93	31.75
2000	West Coast USA	Los Angeles	Europe	Rotterdam	103.32	41.90	38.87	34.21	31.05	25.40	22.52	18.97	19.12	19.18	18.39	30.74
2000	West Coast Canada	Vancouver	Europe	Rotterdam	103.94	41.97	39.71	34.83	31.29	25.26	21.96	18.22	18.19	18.05	17.02	28.22
2000	North America West	Vancouver	Europe	Rotterdam	103.94	41.97	39.71	34.83	31.29	25.26	21.96	18.22	18.19	18.05	17.02	28.22
2000	West Coast Canada	Vancouver	North Africa	Alexandria	89.12	40.08	37.41	33.02	30.10	24.83	21.78	18.31	18.11	18.07	17.09	28.29
2000	West Coast Canada	Vancouver	South Africa	Durban	87.29	35.67	33.75	29.74	26.75	21.91	19.19	16.10	16.17	16.19	15.32	25.40
2000	North America West	Vancouver	Africa	Safi	95.33	38.89	36.79	32.39	29.09	23.78	20.80	17.40	17.46	17.46	16.51	27.38
2000	North America West	Vancouver	Middle East	Aqaba (El Akaba)	91.37	37.30	35.30	31.09	27.94	22.86	20.01	16.76	16.83	16.84	15.92	26.41
2000	Central America West	Puerto Quetzal	North America East	Philadelphia	90.70	38.19	36.14	32.52	29.55	24.55	21.60	17.82	17.73	17.48	16.53	27.55
2000	Central America West	Puerto Quetzal	North America East	Philadelphia	90.70	38.19	36.14	32.52	29.55	24.55	21.60	17.82	17.73	17.48	16.53	27.55
2000	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	93.68	39.69	37.57	34.23	31.28	25.93	22.64	18.78	18.92	18.67	17.65	29.42
2000	Central America West	Puerto Quetzal	North America Gulf	New Orleans	93.68	39.69	37.57	34.23	31.28	25.93	22.64	18.78	18.92	18.67	17.65	29.42
2000	Central America West	Puerto Quetzal	Central America East	Tampico	86.42	37.29	36.43	33.23	30.59	25.40	22.01	18.16	18.16	17.88	16.89	27.94
2000	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	52.43	22.57	21.70	20.05	18.73	16.09	14.14	11.97	11.99	11.88	11.27	18.68
2000	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	75.72	34.64	34.33	32.34	30.36	26.21	22.84	19.00	19.13	19.10	18.28	30.66
2000	Central America West	Puerto Quetzal	Europe	Rotterdam	86.42	36.60	35.50	31.95	29.31	24.30	21.16	17.51	17.56	17.42	16.41	27.16
2000	Central America West	Puerto Quetzal	Africa	Safi	77.48	33.33	32.42	29.37	26.99	22.71	19.92	16.63	16.77	16.77	15.85	26.25
2000	Peru	San Nicolas	East Coast USA	Baltimore	81.28	33.63	31.06	27.52	24.60	19.95	17.43	14.40	14.29	14.13	13.39	22.46

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	Chile	Antofagasta	East Coast USA	Baltimore	78.56	34.43	32.16	28.84	26.10	21.93	19.55	16.19	16.04	15.91	15.02	25.17
2000	South America West	Matarani	North America East	Philadelphia	79.40	33.31	31.23	28.31	25.87	21.06	18.74	15.54	15.47	15.27	14.42	24.07
2000	South America West	Callao	North America East	Philadelphia	81.31	34.07	31.96	28.94	26.43	21.50	19.13	15.85	15.78	15.57	14.70	24.54
2000	South America West	San Nicolas	North America Gulf	Mobile	82.72	34.13	31.49	27.86	25.08	20.45	17.82	14.81	14.65	14.47	13.67	22.87
2000	South America West	Matarani	North America Gulf	South Louisiana	82.33	34.77	32.63	30.00	27.57	22.41	19.76	16.49	16.65	16.44	15.53	25.92
2000	South America West	Callao	North America Gulf	South Louisiana	84.23	35.54	33.35	30.63	28.13	22.85	20.15	16.80	16.96	16.74	15.81	26.38
2000	South America West	Callao	Central America East	Tampico	76.95	33.12	32.19	29.60	27.42	22.31	19.51	16.17	16.19	15.95	15.04	24.89
2000	South America West	Callao	South America East	Puerto La Cruz	72.17	31.12	29.97	27.30	25.32	20.76	18.31	15.11	14.99	14.76	13.91	23.03
2000	Chile	Antofagasta	Caribbean Basin	Point Lisas	58.88	27.28	25.79	23.29	21.32	18.14	16.10	13.29	13.14	13.02	12.26	20.40
2000	Peru	San Nicolas	Caribbean Basin	Point Lisas	61.61	26.48	24.69	21.96	19.82	16.15	13.97	11.50	11.38	11.24	10.64	17.68
2000	South America West	Callao	Caribbean Basin	San Juan	66.48	30.59	30.20	28.80	27.26	23.18	20.39	17.05	17.20	17.20	16.46	27.65
2000	Peru	Matarani	Europe	Rotterdam	75.05	31.68	30.55	27.71	25.60	20.78	18.29	15.22	15.29	15.19	14.29	23.66
2000	Chile	Antofagasta	Europe	Rotterdam	74.34	32.78	31.41	28.15	25.71	21.52	19.24	15.94	15.89	15.83	14.86	24.65
2000	South America West	Callao	Europe	Rotterdam	78.16	32.93	31.74	28.74	26.51	21.50	18.91	15.73	15.79	15.68	14.75	24.42
2000	South America West	Callao	Africa	Safi	68.20	29.28	28.29	25.84	23.91	19.69	17.48	14.68	14.84	14.88	14.04	23.25
2000	South America West	Matarani	Middle East	Aqaba (El Akaba)	83.26	35.36	34.03	30.85	28.33	23.22	20.51	17.15	17.27	17.26	16.29	26.97
2000	Oceania	Newcastle	North America East	Baltimore	107.01	43.68	40.48	35.60	31.72	25.72	22.38	18.57	18.36	18.11	17.13	28.59
2000	Oceania	Bunbury	North America East	Philadelphia	96.38	39.28	36.27	32.03	28.45	23.08	20.50	17.01	16.88	16.64	15.71	26.19
2000	Oceania	Newcastle	North America Gulf	Mobile	108.53	44.22	40.94	35.97	32.23	26.25	22.80	19.00	18.74	18.46	17.43	29.03
2000	Oceania	Bunbury	North America Gulf	South Louisiana	100.06	41.06	37.96	33.98	30.38	24.62	21.68	18.09	18.20	17.94	16.95	28.24
2000	Oceania	Newcastle	Central America East	Tampico	101.82	42.32	40.27	35.85	32.32	26.18	22.71	18.82	18.65	18.34	17.31	28.61
2000	Oceania	Bunbury	Central America East	Tampico	92.84	38.67	36.82	32.97	29.70	24.09	21.05	17.47	17.44	17.16	16.19	26.77
2000	Oceania	Bunbury	Caribbean Basin	San Juan	81.43	35.72	34.43	31.81	29.21	24.70	21.71	18.18	18.29	18.26	17.46	29.28
2000	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	51.83	21.68	20.50	18.34	16.58	13.82	12.43	10.63	10.81	10.90	10.29	17.04
2000	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61
2000	Korea	Guangzhou	East Coast USA	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61
2000	Far East	Guangzhou	East Coast Canada	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61
2000	Taiwan	Guangzhou	East Coast USA	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61
2000	Japan	Kobe	East Coast USA	Philadelphia	116.36	49.00	45.82	40.76	36.27	30.04	26.81	22.69	22.84	22.99	22.25	38.28
2000	Far East	Guangzhou	North America East	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61
2000	Far East	Guangzhou	North America East	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61
2000	Far East	Guangzhou	North America East	Philadelphia	105.95	44.54	41.53	36.58	32.45	26.19	23.14	19.10	18.95	18.73	17.75	29.61

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2000	Far East	Guangzhou	North America Gulf	South Louisiana	113.38	46.27	43.18	38.48	34.33	27.69	24.29	20.16	20.25	20.01	18.97	31.62
2000	Far East	Guangzhou	North America Gulf	South Louisiana	113.38	46.27	43.18	38.48	34.33	27.69	24.29	20.16	20.25	20.01	18.97	31.62
2000	Far East	Guangzhou	North America Gulf	New Orleans	113.38	46.27	43.18	38.48	34.33	27.69	24.29	20.16	20.25	20.01	18.97	31.62
2000	Far East	Guangzhou	North America Gulf	South Louisiana	113.38	46.27	43.18	38.48	34.33	27.69	24.29	20.16	20.25	20.01	18.97	31.62
2000	Far East	Guangzhou	Central America East	Tampico	106.12	43.85	42.02	37.45	33.63	27.15	23.65	19.54	19.48	19.22	18.20	30.13
2000	Far East	Guangzhou	South America East	Puerto La Cruz	101.01	41.71	39.67	35.02	31.42	25.51	22.38	18.41	18.22	17.98	17.02	28.17
2000	Far East	Guangzhou	Caribbean Basin	San Juan	95.03	41.07	39.78	36.42	33.25	27.85	24.38	20.29	20.38	20.37	19.52	32.71
2000	South East Asia	Manado	North America East	Philadelphia	104.42	44.79	43.34	39.68	36.67	30.99	29.62	24.31	24.22	23.96	22.68	37.85
2000	South East Asia	Bangkok	North America Gulf	New Orleans	105.66	43.41	40.91	36.86	33.09	26.91	23.86	20.02	20.37	20.37	19.20	32.00
2000	South East Asia	Manado	North America Gulf	New Orleans	108.13	46.47	44.94	41.53	38.52	32.46	30.75	25.35	25.49	25.21	23.87	39.82
2000	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	71.32	29.21	27.20	24.39	22.32	18.86	17.30	14.56	14.52	14.42	13.68	22.72
2005	North America East	New York	North America West	Los Angeles	103.15	43.23	32.09	27.66	24.11	20.71	18.18	15.70	14.59	15.08	15.62	26.66
2005	North America East	New York	Central America West	Lazaro Cardenas	87.60	37.44	28.42	24.86	21.57	18.34	15.82	13.38	12.25	12.50	12.68	21.58
2005	North America East	New York	South America West	Matarani	74.97	32.48	24.83	22.06	19.54	16.65	14.50	12.33	11.31	11.56	11.71	19.92
2005	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	89.37	37.30	27.93	23.83	20.44	17.18	14.56	12.25	11.12	11.37	11.56	19.61
2005	North America East	New York	Oceania	Brisbane	95.86	40.41	30.71	26.58	23.03	19.77	17.20	14.76	13.52	13.80	14.00	23.84
2005	East Coast USA	Norfolk	Taiwan	Kaohsiung	98.17	42.00	31.41	26.90	23.30	19.86	16.79	14.27	12.96	13.22	13.42	22.82
2005	East Coast USA	Norfolk	Korea	Kwangyang	104.05	44.54	33.35	28.59	24.79	21.16	17.92	15.27	13.88	14.17	14.36	24.40
2005	East Coast USA	Norfolk	Japan	Mizushima	109.11	46.52	34.76	29.89	25.91	22.27	19.04	16.40	15.07	15.50	15.90	27.44
2005	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	94.65	41.95	31.36	26.74	23.07	19.51	16.45	13.87	12.58	12.86	13.03	22.07
2005	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	99.71	43.93	32.78	28.04	24.19	20.62	17.58	15.00	13.77	14.19	14.58	25.11
2005	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	93.83	41.87	31.41	26.92	23.17	19.54	16.60	13.97	12.76	13.09	13.33	22.55
2005	North America East	New York	Far East	Guangzhou	97.18	42.26	31.86	27.44	23.56	19.92	17.21	14.57	13.32	13.63	13.88	23.58
2005	North America East	New York	Far East	Guangzhou	97.18	42.26	31.86	27.44	23.56	19.92	17.21	14.57	13.32	13.63	13.88	23.58
2005	North America Gulf	Tampa	North America West	Los Angeles	107.11	44.78	33.19	28.94	25.37	21.78	18.96	16.46	15.45	15.97	16.53	28.23
2005	North America Gulf	Tampa	Central America West	Lazaro Cardenas	87.86	37.48	28.39	25.17	22.00	18.72	16.02	13.66	12.67	12.94	13.14	22.38
2005	North America Gulf	Tampa	Central America West	Lazaro Cardenas	87.86	37.48	28.39	25.17	22.00	18.72	16.02	13.66	12.67	12.94	13.14	22.38
2005	North America Gulf	Tampa	South America West	Matarani	75.38	32.65	24.91	22.46	20.04	17.10	14.75	12.65	11.78	12.04	12.20	20.78
2005	North America Gulf	Tampa	South America West	Matarani	75.38	32.65	24.91	22.46	20.04	17.10	14.75	12.65	11.78	12.04	12.20	20.78
2005	North America Gulf	Tampa	Oceania	Auckland	88.30	37.35	28.43	25.01	21.87	18.82	16.34	14.23	13.20	13.49	13.69	23.33
2005	North America Gulf	Tampa	Oceania	Auckland	88.30	37.35	28.43	25.01	21.87	18.82	16.34	14.23	13.20	13.49	13.69	23.33
2005	North America Gulf	Mobile	Far East	Osaka	113.75	46.83	34.94	30.01	26.02	22.38	19.14	16.50	15.18	15.61	16.02	27.65

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	North America Gulf	Tampa	Far East	Guangzhou	101.78	42.51	31.98	27.88	24.12	20.40	17.50	14.92	13.81	14.14	14.40	24.50
2005	North America Gulf	Tampa	Far East	Guangzhou	101.78	42.51	31.98	27.88	24.12	20.40	17.50	14.92	13.81	14.14	14.40	24.50
2005	North America Gulf	Tampa	South East Asia	Bangkok	97.48	41.40	31.44	27.77	24.17	20.62	17.86	15.38	14.41	14.93	15.10	25.71
2005	Central America East	Puerto Limon	North America West	Los Angeles	139.12	61.47	46.41	40.37	35.29	29.96	25.57	21.64	19.78	20.35	20.94	35.52
2005	Central America East	Puerto Limon	South America West	Matarani	66.06	30.90	24.24	22.04	19.89	16.89	14.36	12.09	10.99	11.24	11.38	19.27
2005	Central America East	Puerto Limon	South America West	Matarani	66.06	30.90	24.24	22.04	19.89	16.89	14.36	12.09	10.99	11.24	11.38	19.27
2005	Central America East	Puerto Limon	Far East	Guangzhou	93.21	41.68	32.01	28.04	24.40	20.56	17.41	14.59	13.20	13.51	13.74	23.23
2005	Central America East	Puerto Limon	South East Asia	Jakarta	83.40	40.52	32.33	29.73	27.10	24.01	22.27	18.50	16.75	17.21	17.51	29.78
2005	South America East	Santos	North America West	Los Angeles	69.80	29.45	21.74	18.98	16.82	14.77	13.05	11.60	10.85	11.31	11.83	20.12
2005	Other South America East	Buenos Aires	West Coast USA	Los Angeles	69.39	29.09	21.41	18.76	16.75	14.75	12.99	11.50	10.88	11.35	11.74	19.91
2005	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	93.46	39.01	28.97	24.96	21.94	18.75	16.17	13.96	12.94	13.38	13.88	23.57
2005	South America East	Buenos Aires	West Coast Canada	Los Angeles	69.39	29.09	21.41	18.76	16.75	14.75	12.99	11.50	10.88	11.35	11.74	19.91
2005	Brazil	Santos	West Coast USA	Los Angeles	69.80	29.45	21.74	18.98	16.82	14.77	13.05	11.60	10.85	11.31	11.83	20.12
2005	South America East	Ponta da Madeira	North America West	Los Angeles	82.47	34.81	25.79	22.27	19.50	16.89	14.74	12.83	11.91	12.40	12.95	22.03
2005	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	77.78	33.08	25.18	22.02	19.43	16.51	13.89	11.79	10.71	10.89	11.02	18.59
2005	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	75.53	33.12	25.22	22.15	19.52	16.64	14.06	11.94	10.91	11.13	11.29	19.12
2005	South America East	Puerto Bolivar	South America West	Huasco	58.89	27.88	21.55	19.08	17.06	15.23	13.34	11.36	10.44	10.69	10.79	18.14
2005	South America East	Puerto La Cruz	South America West	Matarani	64.71	27.90	21.40	19.05	17.26	14.71	12.47	10.65	9.70	9.87	9.97	16.80
2005	South America East	Santos	Oceania	Brisbane	61.33	26.13	19.99	17.57	15.47	13.62	11.89	10.50	9.65	9.90	10.08	17.06
2005	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	91.55	37.90	28.40	24.29	21.06	17.70	14.84	12.49	11.29	11.48	11.64	19.65
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	96.67	40.39	30.42	26.19	22.67	19.06	16.13	13.60	12.40	12.68	12.89	21.73
2005	Venezuela	Puerto Ordaz	Korea	Kwangyang	97.55	40.51	30.41	26.04	22.60	19.05	16.00	13.51	12.23	12.46	12.61	21.28
2005	Venezuela	Puerto Ordaz	Japan	Mizushima	102.67	42.50	31.84	27.36	23.73	20.17	17.13	14.66	13.43	13.79	14.16	24.33
2005	North Brazil	Ponta da Madeira	Korea	Kwangyang	86.57	36.31	27.23	23.36	20.16	17.19	14.58	12.39	11.20	11.48	11.68	19.74
2005	North Brazil	Ponta da Madeira	Japan	Mizushima	91.69	38.31	28.66	24.67	21.29	18.31	15.71	13.54	12.40	12.81	13.23	22.79
2005	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	85.69	36.20	27.24	23.51	20.23	17.20	14.71	12.48	11.37	11.70	11.96	20.20
2005	Venezuela	Puerto Ordaz	Japan	Shimizu	105.52	44.23	33.52	29.19	25.35	22.07	19.00	16.69	15.38	16.11	16.85	29.72
2005	North Brazil	Saã Luiz	Japan	Shimizu	92.88	39.27	29.76	26.17	22.77	20.20	17.66	15.80	14.62	15.39	16.17	28.58
2005	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	76.22	32.18	24.32	20.98	18.05	15.35	13.14	11.18	10.17	10.47	10.72	18.12
2005	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	79.53	33.48	25.30	21.99	19.06	16.29	14.02	12.08	11.03	11.34	11.59	19.57
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	99.55	41.48	31.27	26.87	23.38	19.73	16.66	14.11	12.81	13.07	13.27	22.34
2005	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	81.68	34.19	25.78	22.46	19.57	16.76	14.37	12.33	11.37	11.69	11.81	19.89

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	Colombia	Puerto Bolivar	Japan	Mizushima	100.50	42.51	31.84	27.44	23.91	20.49	17.44	15.00	13.77	14.17	14.55	25.02
2005	Brazil	Saã Luiz	Far East	Guangzhou	79.53	33.48	25.30	21.99	19.06	16.29	14.02	12.08	11.03	11.34	11.59	19.57
2005	South America East	Ponta da Madeira	Far East	Mizushima	91.69	38.31	28.66	24.67	21.29	18.31	15.71	13.54	12.40	12.81	13.23	22.79
2005	Caribbean Basin	Kingston	North America West	Los Angeles	92.42	41.49	31.60	28.38	25.50	22.71	19.62	16.99	15.81	16.52	17.25	29.68
2005	Caribbean Basin	Kingston	North America West	Los Angeles	92.42	41.49	31.60	28.38	25.50	22.71	19.62	16.99	15.81	16.52	17.25	29.68
2005	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	76.83	35.67	27.92	25.56	22.95	20.32	17.25	14.67	13.46	13.92	14.30	24.59
2005	Caribbean Basin	Kingston	South America West	Matarani	64.10	30.66	24.28	22.72	20.88	18.61	15.90	13.60	12.51	12.97	13.31	22.90
2005	Caribbean Basin	Kingston	Far East	Guangzhou	90.99	40.86	31.63	28.37	25.15	22.08	18.79	15.98	14.64	15.17	15.60	26.77
2005	Caribbean Basin	Kingston	Far East	Guangzhou	90.99	40.86	31.63	28.37	25.15	22.08	18.79	15.98	14.64	15.17	15.60	26.77
2005	Europe	Rotterdam	West Coast Canada	Los Angeles	98.92	41.32	31.03	26.76	23.57	20.22	17.57	15.26	14.27	14.83	15.31	26.01
2005	Europe	Rotterdam	West Coast USA	Los Angeles	98.92	41.32	31.03	26.76	23.57	20.22	17.57	15.26	14.27	14.83	15.31	26.01
2005	Europe	Rotterdam	North America West	Los Angeles	98.92	41.32	31.03	26.76	23.57	20.22	17.57	15.26	14.27	14.83	15.31	26.01
2005	Europe	Rotterdam	Central America West	Lazaro Cardenas	83.37	35.53	27.36	23.95	21.02	17.84	15.20	12.94	11.92	12.25	12.37	20.92
2005	Europe	Rotterdam	South America West	Matarani	70.71	30.61	23.80	21.17	19.00	16.18	13.89	11.89	10.99	11.31	11.40	19.26
2005	Africa	Durban	North America West	Los Angeles	84.76	36.09	27.03	23.45	20.69	18.03	15.81	13.85	13.00	13.64	14.16	24.10
2005	Africa	Safi	Central America West	Lazaro Cardenas	75.95	33.08	25.46	22.42	19.68	16.93	14.51	12.42	11.46	11.87	12.04	20.41
2005	Africa	Safi	Oceania	Auckland	76.38	32.94	25.49	22.26	19.53	17.03	14.83	12.98	11.98	12.41	12.59	21.36
2005	Middle East	Damman	Central America West	Lazaro Cardenas	86.29	37.32	28.67	25.16	22.02	18.88	16.15	13.79	12.70	13.14	13.32	22.57
2005	Middle East	Damman	South America West	Matarani	82.87	36.20	27.95	24.81	22.08	18.94	16.29	13.94	12.86	13.30	13.48	22.82
2005	Middle East	Damman	South America West	Matarani	82.87	36.20	27.95	24.81	22.08	18.94	16.29	13.94	12.86	13.30	13.48	22.82
2005	North America West	Vancouver	North America East	Philadelphia	103.04	42.05	33.41	29.62	26.72	21.82	18.71	15.40	14.59	14.56	13.81	23.88
2005	North America West	Vancouver	North America Gulf	New Orleans	105.80	43.46	34.52	30.98	28.12	22.96	19.54	16.16	15.47	15.45	14.65	25.36
2005	North America West	Vancouver	Central America East	Tampico	98.43	41.02	33.07	29.71	27.21	22.24	18.71	15.37	14.53	14.49	13.73	23.66
2005	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	68.57	28.03	22.16	19.84	18.14	15.07	12.87	10.84	10.26	10.30	9.80	16.89
2005	North America West	Vancouver	South America East	Sepetiba, Bahia de	68.57	28.03	22.16	19.84	18.14	15.07	12.87	10.84	10.26	10.30	9.80	16.89
2005	North America West	Vancouver	Caribbean Basin	San Juan	88.78	38.84	31.67	29.26	27.27	23.17	19.59	16.20	15.40	15.56	14.92	26.08
2005	West Coast USA	Los Angeles	Europe	Rotterdam	98.28	40.40	32.14	28.61	26.35	21.80	18.95	15.94	15.44	15.68	15.11	26.08
2005	West Coast Canada	Vancouver	Europe	Rotterdam	98.47	40.34	32.43	28.77	26.21	21.36	18.10	14.95	14.22	14.28	13.49	23.20
2005	North America West	Vancouver	Europe	Rotterdam	98.47	40.34	32.43	28.77	26.21	21.36	18.10	14.95	14.22	14.28	13.49	23.20
2005	West Coast Canada	Vancouver	North Africa	Alexandria	84.36	38.36	31.18	27.78	25.65	21.34	18.32	15.31	14.49	14.60	13.83	23.66
2005	West Coast Canada	Vancouver	South Africa	Durban	82.78	34.36	27.56	24.56	22.41	18.53	15.81	13.17	12.57	12.74	12.08	20.84
2005	North America West	Vancouver	Africa	Safi	90.36	37.44	30.01	26.71	24.33	20.08	17.11	14.21	13.54	13.71	13.00	22.42

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	North America West	Vancouver	Middle East	Aqaba (El Akaba)	86.63	35.92	28.80	25.65	23.38	19.32	16.47	13.70	13.06	13.23	12.54	21.64
2005	Central America West	Puerto Quetzal	North America East	Philadelphia	86.85	37.77	30.84	28.07	25.84	21.63	18.56	15.15	14.33	14.30	13.54	23.40
2005	Central America West	Puerto Quetzal	North America East	Philadelphia	86.85	37.77	30.84	28.07	25.84	21.63	18.56	15.15	14.33	14.30	13.54	23.40
2005	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	89.72	39.29	32.04	29.54	27.34	22.83	19.43	15.95	15.26	15.23	14.43	24.95
2005	Central America West	Puerto Quetzal	North America Gulf	New Orleans	89.72	39.29	32.04	29.54	27.34	22.83	19.43	15.95	15.26	15.23	14.43	24.95
2005	Central America West	Puerto Quetzal	Central America East	Tampico	82.40	36.92	30.67	28.35	26.50	22.17	18.65	15.19	14.34	14.29	13.53	23.29
2005	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	50.21	22.40	18.43	17.24	16.35	14.16	12.11	10.14	9.58	9.63	9.16	15.78
2005	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	72.29	34.44	29.02	27.72	26.42	23.00	19.45	15.96	15.13	15.31	14.69	25.69
2005	Central America West	Puerto Quetzal	Europe	Rotterdam	82.41	36.16	29.96	27.31	25.41	21.23	18.00	14.74	14.01	14.06	13.26	22.78
2005	Central America West	Puerto Quetzal	Africa	Safi	73.94	33.02	27.32	25.07	23.38	19.83	16.90	13.93	13.26	13.42	12.72	21.92
2005	Peru	San Nicolas	East Coast USA	Baltimore	77.93	32.70	26.17	23.45	21.24	17.38	14.87	12.23	11.65	11.64	11.04	19.12
2005	Chile	Antofagasta	East Coast USA	Baltimore	75.37	33.57	27.43	24.92	22.86	19.46	17.10	14.08	13.49	13.49	12.75	21.96
2005	South America West	Matarani	North America East	Philadelphia	76.09	32.39	26.31	24.12	22.32	18.34	15.97	13.17	12.55	12.52	11.83	20.45
2005	South America West	Callao	North America East	Philadelphia	77.89	33.13	26.90	24.64	22.79	18.71	16.28	13.42	12.78	12.75	12.06	20.83
2005	South America West	San Nicolas	North America Gulf	Mobile	79.28	33.18	26.52	23.73	21.64	17.81	15.20	12.56	11.93	11.90	11.26	19.46
2005	South America West	Matarani	North America Gulf	South Louisiana	78.90	33.84	27.45	25.52	23.76	19.49	16.81	13.94	13.45	13.42	12.70	21.95
2005	South America West	Callao	North America Gulf	South Louisiana	80.70	34.58	28.04	26.03	24.22	19.87	17.12	14.19	13.68	13.65	12.92	22.33
2005	South America West	Callao	Central America East	Tampico	73.35	32.16	26.61	24.78	23.33	19.16	16.31	13.42	12.75	12.71	12.00	20.64
2005	South America West	Callao	South America East	Puerto La Cruz	69.27	30.43	25.02	23.06	21.72	17.97	15.43	12.64	11.90	11.85	11.19	19.23
2005	Chile	Antofagasta	Caribbean Basin	Point Lisas	56.29	26.60	21.86	20.03	18.62	16.09	14.06	11.53	11.00	11.00	10.36	17.71
2005	Peru	San Nicolas	Caribbean Basin	Point Lisas	58.85	25.73	20.60	18.56	17.00	14.00	11.83	9.68	9.16	9.14	8.65	14.87
2005	South America West	Callao	Caribbean Basin	San Juan	63.48	29.85	25.10	24.25	23.31	20.03	17.13	14.21	13.57	13.74	13.16	23.02
2005	Peru	Matarani	Europe	Rotterdam	71.59	30.72	25.37	23.30	21.84	17.90	15.38	12.73	12.20	12.25	11.53	19.79
2005	Chile	Antofagasta	Europe	Rotterdam	70.95	31.84	26.43	24.02	22.27	18.91	16.62	13.71	13.16	13.23	12.42	21.22
2005	South America West	Callao	Europe	Rotterdam	74.52	31.92	26.33	24.15	22.60	18.51	15.89	13.14	12.58	12.63	11.89	20.41
2005	South America West	Callao	Africa	Safi	65.10	28.46	23.45	21.69	20.36	16.94	14.65	12.22	11.72	11.88	11.23	19.34
2005	South America West	Matarani	Middle East	Aqaba (El Akaba)	79.35	34.30	28.11	25.80	24.04	19.89	17.13	14.21	13.59	13.73	12.99	22.35
2005	Oceania	Newcastle	North America East	Baltimore	102.12	42.14	33.85	30.07	27.10	22.18	18.90	15.61	14.80	14.74	13.97	24.10
2005	Oceania	Bunbury	North America East	Philadelphia	91.98	37.88	30.41	27.12	24.37	19.94	17.35	14.33	13.65	13.59	12.86	22.14
2005	Oceania	Newcastle	North America Gulf	Mobile	103.55	42.65	34.23	30.38	27.53	22.63	19.24	15.96	15.09	15.02	14.21	24.45
2005	Oceania	Bunbury	North America Gulf	South Louisiana	95.50	39.62	31.79	28.74	25.99	21.25	18.32	15.22	14.66	14.60	13.82	23.81
2005	Oceania	Newcastle	Central America East	Tampico	96.74	40.74	33.20	29.88	27.31	22.32	18.88	15.55	14.69	14.60	13.80	23.65

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2005	Oceania	Bunbury	Central America East	Tampico	88.21	37.22	30.38	27.50	25.11	20.56	17.52	14.45	13.74	13.66	12.92	22.14
2005	Oceania	Bunbury	Caribbean Basin	San Juan	77.46	34.52	28.52	26.64	24.81	21.20	18.14	15.09	14.43	14.56	13.94	24.29
2005	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	49.47	20.97	17.07	15.43	14.13	11.89	10.44	8.87	8.59	8.75	8.27	14.22
2005	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Korea	Guangzhou	East Coast USA	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Far East	Guangzhou	East Coast Canada	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Taiwan	Guangzhou	East Coast USA	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Japan	Kobe	East Coast USA	Philadelphia	110.55	47.20	38.07	34.22	30.82	25.79	22.53	19.00	18.31	18.65	18.10	32.28
2005	Far East	Guangzhou	North America East	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Far East	Guangzhou	North America East	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Far East	Guangzhou	North America East	Philadelphia	100.60	42.88	34.46	30.68	27.55	22.45	19.42	15.96	15.18	15.16	14.40	24.83
2005	Far East	Guangzhou	North America Gulf	South Louisiana	107.78	44.57	35.80	32.25	29.14	23.73	20.36	16.82	16.16	16.15	15.34	26.46
2005	Far East	Guangzhou	North America Gulf	South Louisiana	107.78	44.57	35.80	32.25	29.14	23.73	20.36	16.82	16.16	16.15	15.34	26.46
2005	Far East	Guangzhou	North America Gulf	New Orleans	107.78	44.57	35.80	32.25	29.14	23.73	20.36	16.82	16.16	16.15	15.34	26.46
2005	Far East	Guangzhou	North America Gulf	South Louisiana	107.78	44.57	35.80	32.25	29.14	23.73	20.36	16.82	16.16	16.15	15.34	26.46
2005	Far East	Guangzhou	Central America East	Tampico	100.46	42.15	34.37	30.99	28.24	23.02	19.55	16.04	15.23	15.20	14.43	24.78
2005	Far East	Guangzhou	South America East	Puerto La Cruz	96.12	40.32	32.69	29.18	26.56	21.76	18.61	15.22	14.34	14.31	13.57	23.30
2005	Far East	Guangzhou	Caribbean Basin	San Juan	90.04	39.63	32.67	30.27	28.05	23.75	20.25	16.74	15.97	16.15	15.51	27.01
2005	South East Asia	Manado	North America East	Philadelphia	99.12	43.19	35.64	33.04	31.01	26.55	24.86	20.28	19.28	19.31	18.32	31.73
2005	South East Asia	Bangkok	North America Gulf	New Orleans	100.34	41.69	33.62	30.63	27.87	22.91	19.85	16.58	16.12	16.30	15.39	26.61
2005	South East Asia	Manado	North America Gulf	New Orleans	102.79	44.83	36.93	34.56	32.54	27.79	25.78	21.12	20.24	20.27	19.23	33.32
2005	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	67.63	28.01	22.24	20.21	18.80	16.13	14.59	12.21	11.67	11.73	11.15	19.16
2010	North America East	New York	North America West	Los Angeles	104.51	43.86	32.57	28.08	24.45	20.99	18.42	15.89	14.77	15.26	15.80	26.96
2010	North America East	New York	Central America West	Lazaro Cardenas	88.85	38.03	28.88	25.25	21.90	18.61	16.04	13.57	12.42	12.67	12.86	21.87
2010	North America East	New York	South America West	Matarani	75.98	32.95	25.20	22.38	19.81	16.88	14.68	12.48	11.46	11.71	11.86	20.17
2010	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	90.74	37.93	28.41	24.24	20.78	17.47	14.80	12.44	11.29	11.55	11.74	19.90
2010	North America East	New York	Oceania	Brisbane	97.22	41.05	31.20	27.00	23.39	20.08	17.45	14.97	13.72	14.00	14.20	24.16
2010	East Coast USA	Norfolk	Taiwan	Kaohsiung	99.49	42.68	31.93	27.34	23.68	20.17	17.05	14.49	13.16	13.42	13.61	23.14
2010	East Coast USA	Norfolk	Korea	Kwangyang	105.45	45.26	33.90	29.06	25.19	21.49	18.19	15.49	14.09	14.38	14.57	24.74
2010	East Coast USA	Norfolk	Japan	Mizushima	110.54	47.25	35.32	30.37	26.31	22.61	19.32	16.63	15.28	15.71	16.12	27.79
2010	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	96.01	42.68	31.92	27.22	23.47	19.84	16.72	14.09	12.78	13.07	13.24	22.41
2010	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	101.09	44.67	33.34	28.52	24.60	20.95	17.85	15.23	13.98	14.40	14.79	25.46

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	95.17	42.59	31.96	27.39	23.56	19.86	16.87	14.19	12.96	13.30	13.53	22.89
2010	North America East	New York	Far East	Guangzhou	98.46	42.94	32.38	27.88	23.94	20.22	17.47	14.78	13.51	13.83	14.07	23.90
2010	North America East	New York	Far East	Guangzhou	98.46	42.94	32.38	27.88	23.94	20.22	17.47	14.78	13.51	13.83	14.07	23.90
2010	North America Gulf	Tampa	North America West	Los Angeles	108.52	45.43	33.68	29.36	25.73	22.08	19.20	16.66	15.63	16.16	16.72	28.54
2010	North America Gulf	Tampa	Central America West	Lazaro Cardenas	89.10	38.06	28.83	25.55	22.33	18.99	16.24	13.85	12.85	13.12	13.31	22.67
2010	North America Gulf	Tampa	Central America West	Lazaro Cardenas	89.10	38.06	28.83	25.55	22.33	18.99	16.24	13.85	12.85	13.12	13.31	22.67
2010	North America Gulf	Tampa	South America West	Matarani	76.39	33.12	25.27	22.78	20.32	17.32	14.94	12.81	11.92	12.19	12.35	21.03
2010	North America Gulf	Tampa	South America West	Matarani	76.39	33.12	25.27	22.78	20.32	17.32	14.94	12.81	11.92	12.19	12.35	21.03
2010	North America Gulf	Tampa	Oceania	Auckland	89.53	37.92	28.87	25.39	22.19	19.09	16.57	14.42	13.38	13.67	13.87	23.63
2010	North America Gulf	Tampa	Oceania	Auckland	89.53	37.92	28.87	25.39	22.19	19.09	16.57	14.42	13.38	13.67	13.87	23.63
2010	North America Gulf	Mobile	Far East	Osaka	115.35	47.56	35.49	30.48	26.42	22.71	19.41	16.73	15.38	15.82	16.23	27.99
2010	North America Gulf	Tampa	Far East	Guangzhou	103.25	43.18	32.49	28.31	24.49	20.70	17.75	15.13	14.00	14.34	14.60	24.83
2010	North America Gulf	Tampa	Far East	Guangzhou	103.25	43.18	32.49	28.31	24.49	20.70	17.75	15.13	14.00	14.34	14.60	24.83
2010	North America Gulf	Tampa	South East Asia	Bangkok	98.88	42.04	31.94	28.20	24.54	20.92	18.11	15.59	14.60	15.13	15.30	26.04
2010	Central America East	Puerto Limon	North America West	Los Angeles	141.27	62.55	47.24	41.10	35.90	30.45	25.98	21.98	20.08	20.65	21.25	36.03
2010	Central America East	Puerto Limon	South America West	Matarani	67.08	31.43	24.65	22.42	20.21	17.16	14.58	12.27	11.15	11.40	11.55	19.54
2010	Central America East	Puerto Limon	South America West	Matarani	67.08	31.43	24.65	22.42	20.21	17.16	14.58	12.27	11.15	11.40	11.55	19.54
2010	Central America East	Puerto Limon	Far East	Guangzhou	94.72	42.44	32.60	28.55	24.83	20.91	17.70	14.82	13.42	13.73	13.96	23.59
2010	Central America East	Puerto Limon	South East Asia	Jakarta	84.74	41.24	32.91	30.25	27.55	24.38	22.59	18.76	16.98	17.45	17.75	30.18
2010	South America East	Santos	North America West	Los Angeles	70.73	29.88	22.07	19.26	17.07	14.98	13.22	11.74	10.98	11.45	11.97	20.34
2010	Other South America East	Buenos Aires	West Coast USA	Los Angeles	70.23	29.48	21.71	19.01	16.97	14.94	13.14	11.63	11.00	11.47	11.86	20.11
2010	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	94.75	39.61	29.43	25.35	22.27	19.03	16.39	14.14	13.12	13.55	14.06	23.86
2010	South America East	Buenos Aires	West Coast Canada	Los Angeles	70.23	29.48	21.71	19.01	16.97	14.94	13.14	11.63	11.00	11.47	11.86	20.11
2010	Brazil	Santos	West Coast USA	Los Angeles	70.73	29.88	22.07	19.26	17.07	14.98	13.22	11.74	10.98	11.45	11.97	20.34
2010	South America East	Ponta da Madeira	North America West	Los Angeles	83.62	35.34	26.20	22.62	19.80	17.14	14.94	13.00	12.06	12.56	13.11	22.29
2010	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	78.96	33.64	25.61	22.39	19.75	16.78	14.11	11.97	10.88	11.07	11.19	18.87
2010	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	76.76	33.69	25.66	22.54	19.85	16.92	14.29	12.13	11.08	11.31	11.47	19.41
2010	South America East	Puerto Bolivar	South America West	Huasco	59.79	28.30	21.87	19.36	17.30	15.42	13.49	11.49	10.56	10.81	10.91	18.34
2010	South America East	Puerto La Cruz	South America West	Matarani	65.63	28.34	21.74	19.35	17.51	14.93	12.64	10.79	9.83	10.01	10.11	17.03
2010	South America East	Santos	Oceania	Brisbane	62.25	26.57	20.33	17.87	15.73	13.83	12.06	10.66	9.79	10.04	10.22	17.30
2010	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	92.97	38.55	28.90	24.72	21.42	18.01	15.08	12.70	11.48	11.67	11.83	19.96
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	98.16	41.08	30.96	26.65	23.06	19.37	16.39	13.81	12.60	12.88	13.09	22.06

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	Venezuela	Puerto Ordaz	Korea	Kwangyang	99.07	41.21	30.95	26.50	22.99	19.37	16.26	13.73	12.43	12.66	12.81	21.61
2010	Venezuela	Puerto Ordaz	Japan	Mizushima	104.21	43.22	32.38	27.82	24.12	20.50	17.40	14.88	13.64	14.00	14.37	24.67
2010	North Brazil	Ponta da Madeira	Korea	Kwangyang	87.94	36.95	27.71	23.77	20.51	17.48	14.81	12.59	11.38	11.66	11.87	20.04
2010	North Brazil	Ponta da Madeira	Japan	Mizushima	93.09	38.95	29.15	25.10	21.65	18.61	15.95	13.74	12.59	13.00	13.42	23.10
2010	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	87.04	36.82	27.73	23.92	20.58	17.49	14.94	12.67	11.55	11.88	12.14	20.50
2010	Venezuela	Puerto Ordaz	Japan	Shimizu	107.06	44.95	34.08	29.67	25.76	22.41	19.28	16.93	15.60	16.33	17.08	30.11
2010	North Brazil	Saã Luiz	Japan	Shimizu	94.26	39.91	30.27	26.61	23.14	20.51	17.92	16.02	14.83	15.61	16.39	28.95
2010	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	77.41	32.73	24.74	21.35	18.36	15.60	13.35	11.35	10.33	10.63	10.88	18.39
2010	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	80.78	34.06	25.75	22.38	19.38	16.56	14.25	12.26	11.21	11.52	11.76	19.86
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	101.09	42.19	31.82	27.34	23.78	20.06	16.93	14.33	13.01	13.28	13.47	22.69
2010	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	82.88	34.75	26.21	22.83	19.88	17.02	14.58	12.51	11.54	11.86	11.98	20.17
2010	Colombia	Puerto Bolivar	Japan	Mizushima	102.09	43.25	32.40	27.92	24.32	20.83	17.72	15.23	13.99	14.38	14.77	25.37
2010	Brazil	Saã Luiz	Far East	Guangzhou	80.78	34.06	25.75	22.38	19.38	16.56	14.25	12.26	11.21	11.52	11.76	19.86
2010	South America East	Ponta da Madeira	Far East	Mizushima	93.09	38.95	29.15	25.10	21.65	18.61	15.95	13.74	12.59	13.00	13.42	23.10
2010	Caribbean Basin	Kingston	North America West	Los Angeles	93.75	42.13	32.10	28.82	25.88	23.03	19.89	17.22	16.01	16.73	17.46	30.04
2010	Caribbean Basin	Kingston	North America West	Los Angeles	93.75	42.13	32.10	28.82	25.88	23.03	19.89	17.22	16.01	16.73	17.46	30.04
2010	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	78.05	36.27	28.39	25.98	23.31	20.63	17.50	14.88	13.66	14.13	14.50	24.93
2010	Caribbean Basin	Kingston	South America West	Matarani	65.07	31.15	24.67	23.07	21.19	18.88	16.12	13.78	12.68	13.14	13.49	23.20
2010	Caribbean Basin	Kingston	Far East	Guangzhou	92.44	41.56	32.17	28.85	25.55	22.42	19.07	16.21	14.86	15.39	15.83	27.15
2010	Caribbean Basin	Kingston	Far East	Guangzhou	92.44	41.56	32.17	28.85	25.55	22.42	19.07	16.21	14.86	15.39	15.83	27.15
2010	Europe	Rotterdam	West Coast Canada	Los Angeles	100.34	41.96	31.53	27.19	23.92	20.52	17.82	15.46	14.45	15.02	15.51	26.33
2010	Europe	Rotterdam	West Coast USA	Los Angeles	100.34	41.96	31.53	27.19	23.92	20.52	17.82	15.46	14.45	15.02	15.51	26.33
2010	Europe	Rotterdam	North America West	Los Angeles	100.34	41.96	31.53	27.19	23.92	20.52	17.82	15.46	14.45	15.02	15.51	26.33
2010	Europe	Rotterdam	Central America West	Lazaro Cardenas	84.68	36.13	27.83	24.35	21.37	18.13	15.44	13.13	12.10	12.43	12.55	21.22
2010	Europe	Rotterdam	South America West	Matarani	71.78	31.11	24.19	21.51	19.29	16.41	14.09	12.05	11.14	11.46	11.55	19.52
2010	Africa	Durban	North America West	Los Angeles	85.96	36.65	27.46	23.82	21.00	18.29	16.02	14.03	13.17	13.82	14.33	24.39
2010	Africa	Safi	Central America West	Lazaro Cardenas	77.16	33.65	25.90	22.81	20.01	17.20	14.73	12.61	11.63	12.05	12.22	20.71
2010	Africa	Safi	Oceania	Auckland	77.57	33.50	25.93	22.64	19.86	17.30	15.06	13.18	12.17	12.60	12.78	21.67
2010	Middle East	Damman	Central America West	Lazaro Cardenas	87.67	37.98	29.17	25.60	22.39	19.19	16.40	14.00	12.91	13.34	13.53	22.91
2010	Middle East	Damman	South America West	Matarani	84.17	36.81	28.42	25.22	22.43	19.24	16.53	14.15	13.05	13.50	13.67	23.14
2010	Middle East	Damman	South America West	Matarani	84.17	36.81	28.42	25.22	22.43	19.24	16.53	14.15	13.05	13.50	13.67	23.14
2010	North America West	Vancouver	North America East	Philadelphia	104.52	42.71	33.95	30.09	27.14	22.16	18.99	15.62	14.80	14.77	14.00	24.21

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	North America West	Vancouver	North America Gulf	New Orleans	107.32	44.15	35.08	31.48	28.56	23.31	19.82	16.39	15.70	15.67	14.86	25.71
2010	North America West	Vancouver	Central America East	Tampico	99.97	41.73	33.64	30.23	27.67	22.60	19.01	15.61	14.76	14.72	13.95	24.02
2010	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	69.58	28.48	22.53	20.16	18.43	15.30	13.06	11.00	10.41	10.45	9.94	17.12
2010	North America West	Vancouver	South America East	Sepetiba, Bahia de	69.58	28.48	22.53	20.16	18.43	15.30	13.06	11.00	10.41	10.45	9.94	17.12
2010	North America West	Vancouver	Caribbean Basin	San Juan	90.16	39.48	32.20	29.75	27.70	23.52	19.88	16.44	15.62	15.79	15.14	26.44
2010	West Coast USA	Los Angeles	Europe	Rotterdam	99.69	41.03	32.66	29.07	26.75	22.12	19.22	16.15	15.64	15.88	15.29	26.40
2010	West Coast Canada	Vancouver	Europe	Rotterdam	100.00	41.02	32.99	29.26	26.64	21.71	18.39	15.18	14.44	14.50	13.69	23.54
2010	North America West	Vancouver	Europe	Rotterdam	100.00	41.02	32.99	29.26	26.64	21.71	18.39	15.18	14.44	14.50	13.69	23.54
2010	West Coast Canada	Vancouver	North Africa	Alexandria	85.55	38.90	31.62	28.17	26.00	21.62	18.55	15.50	14.67	14.78	14.00	23.94
2010	West Coast Canada	Vancouver	South Africa	Durban	84.06	34.94	28.04	24.98	22.78	18.83	16.05	13.37	12.76	12.93	12.26	21.14
2010	North America West	Vancouver	Africa	Safi	91.76	38.07	30.53	27.17	24.74	20.41	17.38	14.43	13.75	13.92	13.19	22.75
2010	North America West	Vancouver	Middle East	Aqaba (El Akaba)	87.97	36.53	29.30	26.09	23.77	19.63	16.72	13.91	13.26	13.43	12.73	21.96
2010	Central America West	Puerto Quetzal	North America East	Philadelphia	88.16	38.41	31.37	28.55	26.26	21.97	18.84	15.38	14.55	14.51	13.74	23.74
2010	Central America West	Puerto Quetzal	North America East	Philadelphia	88.16	38.41	31.37	28.55	26.26	21.97	18.84	15.38	14.55	14.51	13.74	23.74
2010	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	91.07	39.96	32.59	30.05	27.79	23.19	19.73	16.19	15.48	15.45	14.64	25.31
2010	Central America West	Puerto Quetzal	North America Gulf	New Orleans	91.07	39.96	32.59	30.05	27.79	23.19	19.73	16.19	15.48	15.45	14.64	25.31
2010	Central America West	Puerto Quetzal	Central America East	Tampico	83.78	37.61	31.24	28.87	26.96	22.54	18.96	15.44	14.57	14.53	13.75	23.66
2010	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	50.98	22.79	18.75	17.54	16.62	14.38	12.29	10.28	9.73	9.77	9.29	16.00
2010	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	73.48	35.05	29.55	28.21	26.87	23.36	19.75	16.20	15.37	15.55	14.91	26.06
2010	Central America West	Puerto Quetzal	Europe	Rotterdam	83.77	36.82	30.52	27.81	25.86	21.59	18.30	14.97	14.23	14.28	13.47	23.14
2010	Central America West	Puerto Quetzal	Africa	Safi	75.16	33.63	27.83	25.53	23.79	20.16	17.18	14.15	13.47	13.64	12.92	22.26
2010	Peru	San Nicolas	East Coast USA	Baltimore	79.01	33.19	26.57	23.81	21.55	17.63	15.08	12.39	11.81	11.79	11.19	19.37
2010	Chile	Antofagasta	East Coast USA	Baltimore	76.40	34.04	27.82	25.26	23.16	19.70	17.30	14.24	13.64	13.64	12.89	22.20
2010	South America West	Matarani	North America East	Philadelphia	77.15	32.88	26.72	24.48	22.65	18.60	16.18	13.34	12.71	12.68	11.99	20.70
2010	South America West	Callao	North America East	Philadelphia	78.98	33.63	27.32	25.01	23.12	18.98	16.50	13.60	12.95	12.92	12.21	21.09
2010	South America West	San Nicolas	North America Gulf	Mobile	80.39	33.68	26.93	24.09	21.95	18.06	15.41	12.73	12.09	12.05	11.41	19.71
2010	South America West	Matarani	North America Gulf	South Louisiana	80.00	34.36	27.87	25.90	24.10	19.77	17.04	14.13	13.62	13.60	12.86	22.23
2010	South America West	Callao	North America Gulf	South Louisiana	81.83	35.11	28.47	26.43	24.58	20.15	17.36	14.38	13.86	13.83	13.09	22.62
2010	South America West	Callao	Central America East	Tampico	74.51	32.70	27.06	25.20	23.70	19.46	16.55	13.61	12.94	12.89	12.18	20.94
2010	South America West	Callao	South America East	Puerto La Cruz	70.25	30.90	25.42	23.42	22.04	18.22	15.64	12.81	12.06	12.02	11.34	19.49
2010	Chile	Antofagasta	Caribbean Basin	Point Lisas	57.14	27.00	22.18	20.31	18.87	16.28	14.22	11.66	11.12	11.12	10.47	17.90
2010	Peru	San Nicolas	Caribbean Basin	Point Lisas	59.75	26.15	20.93	18.86	17.26	14.21	12.00	9.81	9.29	9.27	8.77	15.07

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	South America West	Callao	Caribbean Basin	San Juan	64.46	30.33	25.51	24.63	23.66	20.32	17.37	14.40	13.76	13.93	13.34	23.32
2010	Peru	Matarani	Europe	Rotterdam	72.69	31.23	25.80	23.68	22.19	18.17	15.61	12.91	12.37	12.43	11.69	20.07
2010	Chile	Antofagasta	Europe	Rotterdam	72.03	32.35	26.84	24.38	22.59	19.16	16.83	13.88	13.32	13.39	12.57	21.47
2010	South America West	Callao	Europe	Rotterdam	75.68	32.46	26.78	24.55	22.96	18.79	16.13	13.33	12.76	12.82	12.06	20.70
2010	South America West	Callao	Africa	Safi	66.10	28.93	23.84	22.04	20.68	17.20	14.86	12.39	11.89	12.05	11.39	19.61
2010	South America West	Matarani	Middle East	Aqaba (El Akaba)	80.60	34.88	28.59	26.23	24.43	20.21	17.39	14.42	13.79	13.94	13.18	22.67
2010	Oceania	Newcastle	North America East	Baltimore	103.69	42.85	34.44	30.59	27.57	22.54	19.20	15.86	15.04	14.98	14.19	24.46
2010	Oceania	Bunbury	North America East	Philadelphia	93.38	38.51	30.93	27.59	24.78	20.27	17.62	14.56	13.87	13.80	13.05	22.47
2010	Oceania	Newcastle	North America Gulf	Mobile	105.15	43.37	34.83	30.91	28.00	23.00	19.55	16.21	15.33	15.25	14.43	24.83
2010	Oceania	Bunbury	North America Gulf	South Louisiana	96.96	40.29	32.34	29.23	26.43	21.60	18.61	15.45	14.89	14.83	14.03	24.16
2010	Oceania	Newcastle	Central America East	Tampico	98.37	41.49	33.83	30.43	27.80	22.72	19.21	15.82	14.94	14.85	14.04	24.04
2010	Oceania	Bunbury	Central America East	Tampico	89.69	37.91	30.95	28.01	25.57	20.92	17.82	14.70	13.98	13.90	13.14	22.51
2010	Oceania	Bunbury	Caribbean Basin	San Juan	78.74	35.13	29.03	27.11	25.23	21.54	18.43	15.32	14.65	14.79	14.16	24.66
2010	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	50.24	21.33	17.37	15.70	14.36	12.08	10.60	9.01	8.72	8.89	8.40	14.43
2010	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Korea	Guangzhou	East Coast USA	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Far East	Guangzhou	East Coast Canada	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Taiwan	Guangzhou	East Coast USA	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Japan	Kobe	East Coast USA	Philadelphia	112.07	47.98	38.71	34.80	31.33	26.20	22.87	19.27	18.58	18.91	18.35	32.71
2010	Far East	Guangzhou	North America East	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Far East	Guangzhou	North America East	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Far East	Guangzhou	North America East	Philadelphia	102.00	43.60	35.05	31.20	28.01	22.81	19.72	16.20	15.41	15.39	14.61	25.19
2010	Far East	Guangzhou	North America Gulf	South Louisiana	109.43	45.32	36.41	32.79	29.62	24.11	20.68	17.07	16.41	16.39	15.57	26.85
2010	Far East	Guangzhou	North America Gulf	South Louisiana	109.43	45.32	36.41	32.79	29.62	24.11	20.68	17.07	16.41	16.39	15.57	26.85
2010	Far East	Guangzhou	North America Gulf	New Orleans	109.43	45.32	36.41	32.79	29.62	24.11	20.68	17.07	16.41	16.39	15.57	26.85
2010	Far East	Guangzhou	North America Gulf	South Louisiana	109.43	45.32	36.41	32.79	29.62	24.11	20.68	17.07	16.41	16.39	15.57	26.85
2010	Far East	Guangzhou	Central America East	Tampico	102.13	42.92	35.00	31.56	28.74	23.42	19.88	16.31	15.48	15.45	14.66	25.17
2010	Far East	Guangzhou	South America East	Puerto La Cruz	97.61	41.01	33.25	29.69	27.00	22.12	18.90	15.45	14.56	14.53	13.78	23.65
2010	Far East	Guangzhou	Caribbean Basin	San Juan	91.53	40.32	33.24	30.80	28.52	24.14	20.57	17.00	16.22	16.40	15.74	27.40
2010	South East Asia	Manado	North America East	Philadelphia	100.45	43.87	36.21	33.55	31.47	26.92	25.18	20.54	19.53	19.55	18.55	32.11
2010	South East Asia	Bangkok	North America Gulf	New Orleans	101.81	42.35	34.16	31.12	28.30	23.26	20.14	16.81	16.34	16.53	15.60	26.96
2010	South East Asia	Manado	North America Gulf	New Orleans	104.29	45.53	37.51	35.09	33.02	28.18	26.12	21.39	20.50	20.53	19.48	33.73

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)										
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2010	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	68.66	28.47	22.61	20.54	19.09	16.37	14.79	12.37	11.83	11.89	11.30	19.39
2015	North America East	New York	North America West	Los Angeles	105.90	44.56	33.13	28.56	24.86	21.33	18.70	16.12	14.98	15.48	16.02	27.31
2015	North America East	New York	Central America West	Lazaro Cardenas	90.13	38.67	29.40	25.71	22.29	18.92	16.31	13.79	12.62	12.88	13.06	22.20
2015	North America East	New York	South America West	Matarani	77.01	33.47	25.62	22.75	20.13	17.14	14.90	12.66	11.62	11.87	12.03	20.44
2015	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	92.13	38.63	28.97	24.72	21.19	17.80	15.07	12.67	11.50	11.76	11.95	20.25
2015	North America East	New York	Oceania	Brisbane	98.62	41.75	31.77	27.50	23.81	20.42	17.74	15.21	13.94	14.23	14.43	24.53
2015	East Coast USA	Norfolk	Taiwan	Kaohsiung	100.82	43.44	32.53	27.86	24.12	20.54	17.35	14.74	13.39	13.65	13.85	23.52
2015	East Coast USA	Norfolk	Korea	Kwangyang	106.88	46.06	34.54	29.62	25.66	21.88	18.51	15.76	14.33	14.62	14.81	25.14
2015	East Coast USA	Norfolk	Japan	Mizushima	111.99	48.06	35.97	30.93	26.79	23.00	19.64	16.90	15.53	15.96	16.36	28.19
2015	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	97.39	43.49	32.56	27.77	23.94	20.22	17.04	14.36	13.03	13.31	13.49	22.82
2015	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	102.49	45.48	33.99	29.09	25.07	21.34	18.18	15.50	14.22	14.65	15.04	25.87
2015	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	96.53	43.39	32.59	27.94	24.03	20.24	17.18	14.44	13.20	13.54	13.77	23.28
2015	North America East	New York	Far East	Guangzhou	99.77	43.69	32.98	28.40	24.37	20.58	17.77	15.03	13.73	14.05	14.30	24.27
2015	North America East	New York	Far East	Guangzhou	99.77	43.69	32.98	28.40	24.37	20.58	17.77	15.03	13.73	14.05	14.30	24.27
2015	North America Gulf	Tampa	North America West	Los Angeles	109.95	46.13	34.23	29.85	26.14	22.41	19.49	16.90	15.85	16.38	16.94	28.90
2015	North America Gulf	Tampa	Central America West	Lazaro Cardenas	90.35	38.69	29.33	26.00	22.71	19.30	16.50	14.06	13.04	13.32	13.51	23.00
2015	North America Gulf	Tampa	Central America West	Lazaro Cardenas	90.35	38.69	29.33	26.00	22.71	19.30	16.50	14.06	13.04	13.32	13.51	23.00
2015	North America Gulf	Tampa	South America West	Matarani	77.39	33.63	25.67	23.14	20.63	17.58	15.15	12.98	12.09	12.35	12.52	21.30
2015	North America Gulf	Tampa	South America West	Matarani	77.39	33.63	25.67	23.14	20.63	17.58	15.15	12.98	12.09	12.35	12.52	21.30
2015	North America Gulf	Tampa	Oceania	Auckland	90.76	38.54	29.36	25.83	22.56	19.40	16.82	14.63	13.58	13.87	14.07	23.96
2015	North America Gulf	Tampa	Oceania	Auckland	90.76	38.54	29.36	25.83	22.56	19.40	16.82	14.63	13.58	13.87	14.07	23.96
2015	North America Gulf	Mobile	Far East	Osaka	116.97	48.35	36.12	31.03	26.89	23.10	19.72	16.99	15.63	16.06	16.47	28.39
2015	North America Gulf	Tampa	Far East	Guangzhou	104.72	43.91	33.06	28.82	24.91	21.05	18.04	15.37	14.22	14.56	14.82	25.20
2015	North America Gulf	Tampa	Far East	Guangzhou	104.72	43.91	33.06	28.82	24.91	21.05	18.04	15.37	14.22	14.56	14.82	25.20
2015	North America Gulf	Tampa	South East Asia	Bangkok	100.28	42.74	32.50	28.70	24.95	21.26	18.40	15.83	14.82	15.36	15.53	26.42
2015	Central America East	Puerto Limon	North America West	Los Angeles	143.50	63.79	48.23	41.96	36.62	31.05	26.48	22.38	20.44	21.02	21.62	36.62
2015	Central America East	Puerto Limon	South America West	Matarani	68.13	32.03	25.14	22.85	20.59	17.46	14.83	12.48	11.34	11.59	11.74	19.86
2015	Central America East	Puerto Limon	South America West	Matarani	68.13	32.03	25.14	22.85	20.59	17.46	14.83	12.48	11.34	11.59	11.74	19.86
2015	Central America East	Puerto Limon	Far East	Guangzhou	96.28	43.31	33.29	29.16	25.35	21.33	18.05	15.11	13.67	13.99	14.22	24.02
2015	Central America East	Puerto Limon	South East Asia	Jakarta	86.12	42.05	33.57	30.85	28.07	24.81	22.96	19.06	17.25	17.73	18.03	30.63
2015	South America East	Santos	North America West	Los Angeles	71.71	30.37	22.46	19.61	17.36	15.22	13.42	11.91	11.14	11.61	12.13	20.60
2015	Other South America East	Buenos Aires	West Coast USA	Los Angeles	71.10	29.92	22.06	19.32	17.23	15.15	13.32	11.78	11.14	11.61	12.00	20.34

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	96.09	40.28	29.97	25.82	22.67	19.35	16.66	14.37	13.32	13.76	14.27	24.20
2015	South America East	Buenos Aires	West Coast Canada	Los Angeles	71.10	29.92	22.06	19.32	17.23	15.15	13.32	11.78	11.14	11.61	12.00	20.34
2015	Brazil	Santos	West Coast USA	Los Angeles	71.71	30.37	22.46	19.61	17.36	15.22	13.42	11.91	11.14	11.61	12.13	20.60
2015	South America East	Ponta da Madeira	North America West	Los Angeles	84.81	35.94	26.68	23.04	20.15	17.43	15.18	13.20	12.25	12.74	13.30	22.59
2015	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	80.19	34.26	26.11	22.84	20.13	17.09	14.36	12.18	11.08	11.27	11.39	19.20
2015	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	78.03	34.34	26.19	23.00	20.24	17.24	14.55	12.35	11.29	11.52	11.68	19.75
2015	South America East	Puerto Bolivar	South America West	Huasco	60.71	28.77	22.24	19.68	17.57	15.65	13.68	11.65	10.70	10.96	11.06	18.58
2015	South America East	Puerto La Cruz	South America West	Matarani	66.58	28.82	22.13	19.69	17.81	15.17	12.85	10.96	9.99	10.17	10.27	17.29
2015	South America East	Santos	Oceania	Brisbane	63.21	27.06	20.72	18.22	16.03	14.08	12.27	10.84	9.96	10.21	10.39	17.58
2015	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	94.45	39.29	29.50	25.24	21.86	18.36	15.38	12.94	11.70	11.90	12.06	20.34
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	99.71	41.86	31.58	27.19	23.51	19.75	16.70	14.07	12.84	13.12	13.33	22.46
2015	Venezuela	Puerto Ordaz	Korea	Kwangyang	100.64	42.00	31.58	27.05	23.45	19.75	16.58	14.00	12.67	12.90	13.06	22.01
2015	Venezuela	Puerto Ordaz	Japan	Mizushima	105.81	44.02	33.03	28.38	24.59	20.88	17.72	15.15	13.88	14.25	14.62	25.08
2015	North Brazil	Ponta da Madeira	Korea	Kwangyang	89.37	37.66	28.29	24.27	20.93	17.83	15.10	12.83	11.60	11.88	12.09	20.41
2015	North Brazil	Ponta da Madeira	Japan	Mizushima	94.54	39.68	29.73	25.60	22.07	18.96	16.25	13.98	12.81	13.23	13.65	23.47
2015	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	88.44	37.52	28.29	24.41	20.99	17.82	15.22	12.90	11.76	12.10	12.36	20.85
2015	Venezuela	Puerto Ordaz	Japan	Shimizu	108.67	45.76	34.74	30.25	26.24	22.81	19.62	17.21	15.86	16.60	17.35	30.56
2015	North Brazil	Saã Luiz	Japan	Shimizu	95.70	40.64	30.85	27.13	23.58	20.88	18.23	16.28	15.07	15.85	16.64	29.36
2015	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	78.64	33.35	25.23	21.78	18.72	15.90	13.60	11.56	10.51	10.82	11.07	18.70
2015	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	82.08	34.72	26.27	22.83	19.77	16.88	14.51	12.49	11.41	11.73	11.97	20.20
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	102.69	43.00	32.46	27.90	24.25	20.45	17.25	14.60	13.26	13.53	13.73	23.09
2015	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	84.12	35.37	26.71	23.27	20.25	17.32	14.83	12.72	11.74	12.06	12.18	20.50
2015	Colombia	Puerto Bolivar	Japan	Mizushima	103.74	44.07	33.07	28.50	24.81	21.23	18.06	15.51	14.24	14.64	15.03	25.80
2015	Brazil	Saã Luiz	Far East	Guangzhou	82.08	34.72	26.27	22.83	19.77	16.88	14.51	12.49	11.41	11.73	11.97	20.20
2015	South America East	Ponta da Madeira	Far East	Mizushima	94.54	39.68	29.73	25.60	22.07	18.96	16.25	13.98	12.81	13.23	13.65	23.47
2015	Caribbean Basin	Kingston	North America West	Los Angeles	95.11	42.84	32.67	29.33	26.31	23.39	20.19	17.47	16.24	16.96	17.70	30.43
2015	Caribbean Basin	Kingston	North America West	Los Angeles	95.11	42.84	32.67	29.33	26.31	23.39	20.19	17.47	16.24	16.96	17.70	30.43
2015	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	79.29	36.93	28.92	26.46	23.72	20.98	17.79	15.12	13.88	14.35	14.73	25.31
2015	Caribbean Basin	Kingston	South America West	Matarani	66.06	31.67	25.10	23.46	21.53	19.16	16.36	13.98	12.86	13.33	13.68	23.52
2015	Caribbean Basin	Kingston	Far East	Guangzhou	93.92	42.32	32.79	29.40	26.02	22.81	19.40	16.48	15.10	15.64	16.09	27.58
2015	Caribbean Basin	Kingston	Far East	Guangzhou	93.92	42.32	32.79	29.40	26.02	22.81	19.40	16.48	15.10	15.64	16.09	27.58
2015	Europe	Rotterdam	West Coast Canada	Los Angeles	101.79	42.67	32.09	27.68	24.34	20.86	18.10	15.70	14.67	15.25	15.73	26.69

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Europe	Rotterdam	West Coast USA	Los Angeles	101.79	42.67	32.09	27.68	24.34	20.86	18.10	15.70	14.67	15.25	15.73	26.69
2015	Europe	Rotterdam	North America West	Los Angeles	101.79	42.67	32.09	27.68	24.34	20.86	18.10	15.70	14.67	15.25	15.73	26.69
2015	Europe	Rotterdam	Central America West	Lazaro Cardenas	86.01	36.80	28.36	24.82	21.76	18.45	15.71	13.36	12.31	12.64	12.76	21.57
2015	Europe	Rotterdam	South America West	Matarani	72.86	31.64	24.62	21.89	19.62	16.68	14.31	12.24	11.32	11.64	11.73	19.81
2015	Africa	Durban	North America West	Los Angeles	87.19	37.26	27.96	24.25	21.37	18.59	16.28	14.24	13.37	14.02	14.53	24.72
2015	Africa	Safi	Central America West	Lazaro Cardenas	78.39	34.28	26.41	23.26	20.38	17.51	14.99	12.83	11.84	12.26	12.43	21.05
2015	Africa	Safi	Oceania	Auckland	78.79	34.12	26.43	23.09	20.24	17.62	15.32	13.40	12.37	12.82	12.99	22.02
2015	Middle East	Damman	Central America West	Lazaro Cardenas	89.10	38.70	29.75	26.11	22.83	19.55	16.70	14.25	13.14	13.58	13.77	23.31
2015	Middle East	Damman	South America West	Matarani	85.50	37.48	28.97	25.70	22.84	19.58	16.81	14.39	13.27	13.73	13.90	23.51
2015	Middle East	Damman	South America West	Matarani	85.50	37.48	28.97	25.70	22.84	19.58	16.81	14.39	13.27	13.73	13.90	23.51
2015	North America West	Vancouver	North America East	Philadelphia	106.04	43.45	34.57	30.65	27.63	22.55	19.31	15.88	15.05	15.01	14.23	24.59
2015	North America West	Vancouver	North America Gulf	New Orleans	108.88	44.91	35.72	32.06	29.07	23.71	20.16	16.66	15.96	15.93	15.10	26.11
2015	North America West	Vancouver	Central America East	Tampico	101.55	42.51	34.31	30.82	28.19	23.02	19.36	15.89	15.03	14.99	14.19	24.43
2015	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	70.60	28.98	22.95	20.54	18.76	15.57	13.29	11.18	10.58	10.62	10.11	17.39
2015	North America West	Vancouver	South America East	Sepetiba, Bahia de	70.60	28.98	22.95	20.54	18.76	15.57	13.29	11.18	10.58	10.62	10.11	17.39
2015	North America West	Vancouver	Caribbean Basin	San Juan	91.57	40.19	32.80	30.30	28.20	23.92	20.21	16.71	15.88	16.05	15.38	26.85
2015	West Coast USA	Los Angeles	Europe	Rotterdam	101.13	41.74	33.25	29.60	27.22	22.49	19.53	16.40	15.88	16.12	15.52	26.77
2015	West Coast Canada	Vancouver	Europe	Rotterdam	101.56	41.79	33.64	29.84	27.15	22.11	18.73	15.45	14.70	14.76	13.93	23.94
2015	North America West	Vancouver	Europe	Rotterdam	101.56	41.79	33.64	29.84	27.15	22.11	18.73	15.45	14.70	14.76	13.93	23.94
2015	West Coast Canada	Vancouver	North Africa	Alexandria	86.75	39.49	32.13	28.62	26.40	21.94	18.82	15.72	14.88	14.99	14.20	24.27
2015	West Coast Canada	Vancouver	South Africa	Durban	85.35	35.58	28.58	25.47	23.21	19.18	16.34	13.60	12.98	13.15	12.47	21.49
2015	North America West	Vancouver	Africa	Safi	93.19	38.78	31.12	27.71	25.21	20.79	17.69	14.69	14.00	14.16	13.42	23.13
2015	North America West	Vancouver	Middle East	Aqaba (El Akaba)	89.33	37.21	29.87	26.60	24.23	19.99	17.03	14.15	13.50	13.67	12.95	22.32
2015	Central America West	Puerto Quetzal	North America East	Philadelphia	89.54	39.14	32.00	29.13	26.77	22.38	19.18	15.65	14.80	14.76	13.98	24.13
2015	Central America West	Puerto Quetzal	North America East	Philadelphia	89.54	39.14	32.00	29.13	26.77	22.38	19.18	15.65	14.80	14.76	13.98	24.13
2015	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	92.50	40.72	33.25	30.65	28.33	23.62	20.09	16.47	15.76	15.72	14.89	25.73
2015	Central America West	Puerto Quetzal	North America Gulf	New Orleans	92.50	40.72	33.25	30.65	28.33	23.62	20.09	16.47	15.76	15.72	14.89	25.73
2015	Central America West	Puerto Quetzal	Central America East	Tampico	85.24	38.39	31.92	29.50	27.52	22.99	19.33	15.74	14.85	14.81	14.01	24.10
2015	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	51.80	23.23	19.13	17.90	16.94	14.64	12.51	10.46	9.89	9.93	9.45	16.26
2015	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	74.74	35.75	30.16	28.78	27.38	23.78	20.10	16.48	15.63	15.81	15.16	26.49
2015	Central America West	Puerto Quetzal	Europe	Rotterdam	85.21	37.59	31.18	28.42	26.40	22.02	18.65	15.26	14.50	14.55	13.72	23.55
2015	Central America West	Puerto Quetzal	Africa	Safi	76.44	34.32	28.43	26.08	24.28	20.56	17.51	14.42	13.72	13.89	13.16	22.66

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Peru	San Nicolas	East Coast USA	Baltimore	80.13	33.75	27.04	24.23	21.92	17.92	15.32	12.59	11.99	11.98	11.36	19.65
2015	Chile	Antofagasta	East Coast USA	Baltimore	77.46	34.57	28.26	25.66	23.51	19.98	17.53	14.43	13.82	13.82	13.05	22.47
2015	South America West	Matarani	North America East	Philadelphia	78.24	33.43	27.18	24.91	23.03	18.90	16.44	13.54	12.90	12.87	12.17	21.00
2015	South America West	Callao	North America East	Philadelphia	80.10	34.20	27.80	25.45	23.51	19.29	16.76	13.80	13.15	13.12	12.40	21.40
2015	South America West	San Nicolas	North America Gulf	Mobile	81.53	34.24	27.41	24.52	22.33	18.36	15.66	12.93	12.28	12.24	11.59	20.00
2015	South America West	Matarani	North America Gulf	South Louisiana	81.13	34.93	28.36	26.35	24.50	20.09	17.30	14.34	13.83	13.80	13.05	22.55
2015	South America West	Callao	North America Gulf	South Louisiana	83.00	35.69	28.98	26.89	24.99	20.47	17.63	14.60	14.07	14.04	13.28	22.94
2015	South America West	Callao	Central America East	Tampico	75.70	33.31	27.58	25.68	24.13	19.80	16.84	13.84	13.16	13.11	12.38	21.28
2015	South America West	Callao	South America East	Puerto La Cruz	71.25	31.42	25.86	23.82	22.41	18.51	15.88	13.00	12.25	12.20	11.51	19.78
2015	Chile	Antofagasta	Caribbean Basin	Point Lisas	58.01	27.43	22.55	20.64	19.16	16.51	14.41	11.81	11.27	11.26	10.61	18.13
2015	Peru	San Nicolas	Caribbean Basin	Point Lisas	60.68	26.61	21.32	19.21	17.57	14.45	12.20	9.97	9.44	9.42	8.92	15.31
2015	South America West	Callao	Caribbean Basin	San Juan	65.47	30.86	25.97	25.06	24.05	20.64	17.63	14.61	13.97	14.14	13.54	23.65
2015	Peru	Matarani	Europe	Rotterdam	73.83	31.80	26.29	24.13	22.59	18.49	15.87	13.13	12.58	12.63	11.88	20.38
2015	Chile	Antofagasta	Europe	Rotterdam	73.15	32.90	27.31	24.81	22.97	19.45	17.08	14.08	13.51	13.58	12.75	21.76
2015	South America West	Callao	Europe	Rotterdam	76.87	33.05	27.29	25.01	23.38	19.12	16.40	13.55	12.98	13.03	12.26	21.03
2015	South America West	Callao	Africa	Safi	67.13	29.46	24.29	22.46	21.05	17.49	15.11	12.59	12.08	12.25	11.57	19.91
2015	South America West	Matarani	Middle East	Aqaba (El Akaba)	81.89	35.53	29.15	26.74	24.89	20.57	17.69	14.67	14.03	14.18	13.40	23.04
2015	Oceania	Newcastle	North America East	Baltimore	105.38	43.68	35.14	31.23	28.13	22.99	19.58	16.16	15.33	15.26	14.46	24.91
2015	Oceania	Bunbury	North America East	Philadelphia	94.89	39.25	31.57	28.16	25.28	20.67	17.96	14.83	14.13	14.06	13.30	22.87
2015	Oceania	Newcastle	North America Gulf	Mobile	106.87	44.21	35.55	31.56	28.57	23.46	19.93	16.52	15.63	15.55	14.70	25.28
2015	Oceania	Bunbury	North America Gulf	South Louisiana	98.53	41.06	33.00	29.83	26.96	22.02	18.97	15.74	15.17	15.10	14.29	24.59
2015	Oceania	Newcastle	Central America East	Tampico	100.13	42.36	34.57	31.11	28.40	23.20	19.61	16.14	15.25	15.16	14.32	24.52
2015	Oceania	Bunbury	Central America East	Tampico	91.29	38.70	31.63	28.63	26.11	21.36	18.19	14.99	14.26	14.18	13.40	22.95
2015	Oceania	Bunbury	Caribbean Basin	San Juan	80.12	35.83	29.64	27.67	25.73	21.94	18.77	15.60	14.92	15.05	14.41	25.08
2015	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	51.07	21.74	17.72	16.02	14.65	12.31	10.79	9.17	8.88	9.04	8.55	14.67
2015	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62
2015	Korea	Guangzhou	East Coast USA	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62
2015	Far East	Guangzhou	East Coast Canada	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62
2015	Taiwan	Guangzhou	East Coast USA	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62
2015	Japan	Kobe	East Coast USA	Philadelphia	113.67	48.86	39.47	35.48	31.93	26.68	23.28	19.60	18.90	19.23	18.65	33.22
2015	Far East	Guangzhou	North America East	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62
2015	Far East	Guangzhou	North America East	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2015	Far East	Guangzhou	North America East	Philadelphia	103.47	44.41	35.75	31.82	28.56	23.25	20.08	16.49	15.69	15.67	14.88	25.62
2015	Far East	Guangzhou	North America Gulf	South Louisiana	111.16	46.17	37.14	33.45	30.20	24.56	21.06	17.38	16.70	16.69	15.84	27.30
2015	Far East	Guangzhou	North America Gulf	South Louisiana	111.16	46.17	37.14	33.45	30.20	24.56	21.06	17.38	16.70	16.69	15.84	27.30
2015	Far East	Guangzhou	North America Gulf	New Orleans	111.16	46.17	37.14	33.45	30.20	24.56	21.06	17.38	16.70	16.69	15.84	27.30
2015	Far East	Guangzhou	North America Gulf	South Louisiana	111.16	46.17	37.14	33.45	30.20	24.56	21.06	17.38	16.70	16.69	15.84	27.30
2015	Far East	Guangzhou	Central America East	Tampico	103.88	43.78	35.74	32.23	29.33	23.89	20.27	16.62	15.79	15.76	14.95	25.64
2015	Far East	Guangzhou	South America East	Puerto La Cruz	99.16	41.78	33.91	30.28	27.53	22.53	19.25	15.73	14.83	14.80	14.03	24.06
2015	Far East	Guangzhou	Caribbean Basin	San Juan	93.08	41.10	33.91	31.41	29.07	24.58	20.94	17.30	16.51	16.69	16.01	27.86
2015	South East Asia	Manado	North America East	Philadelphia	101.81	44.61	36.84	34.13	31.99	27.34	25.54	20.83	19.81	19.83	18.81	32.55
2015	South East Asia	Bangkok	North America Gulf	New Orleans	103.32	43.08	34.79	31.68	28.80	23.65	20.47	17.08	16.60	16.79	15.84	27.37
2015	South East Asia	Manado	North America Gulf	New Orleans	105.83	46.30	38.17	35.70	33.57	28.62	26.49	21.69	20.79	20.82	19.75	34.18
2015	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	69.72	28.98	23.03	20.93	19.43	16.64	15.02	12.55	12.01	12.06	11.46	19.67
2020	North America East	New York	North America West	Los Angeles	107.30	45.30	33.73	29.09	25.31	21.69	19.01	16.38	15.21	15.71	16.25	27.70
2020	North America East	New York	Central America West	Lazaro Cardenas	91.42	39.37	29.97	26.21	22.71	19.27	16.60	14.03	12.84	13.10	13.28	22.57
2020	North America East	New York	South America West	Matarani	78.04	34.03	26.08	23.15	20.47	17.42	15.14	12.86	11.80	12.06	12.21	20.74
2020	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	93.53	39.38	29.57	25.25	21.63	18.16	15.38	12.92	11.73	11.99	12.18	20.63
2020	North America East	New York	Oceania	Brisbane	100.03	42.51	32.39	28.05	24.27	20.80	18.07	15.48	14.19	14.48	14.68	24.94
2020	East Coast USA	Norfolk	Taiwan	Kaohsiung	102.18	44.25	33.19	28.44	24.61	20.94	17.69	15.01	13.64	13.91	14.10	23.94
2020	East Coast USA	Norfolk	Korea	Kwangyang	108.33	46.92	35.24	30.23	26.17	22.30	18.86	16.05	14.60	14.89	15.09	25.59
2020	East Coast USA	Norfolk	Japan	Mizushima	113.46	48.93	36.68	31.55	27.31	23.43	20.00	17.20	15.80	16.23	16.64	28.65
2020	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	98.78	44.35	33.26	28.39	24.46	20.65	17.40	14.65	13.29	13.58	13.76	23.26
2020	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	103.91	46.36	34.70	29.71	25.60	21.77	18.54	15.79	14.50	14.92	15.32	26.32
2020	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	97.90	44.24	33.29	28.55	24.54	20.66	17.53	14.73	13.47	13.81	14.04	23.72
2020	North America East	New York	Far East	Guangzhou	101.10	44.49	33.63	28.97	24.85	20.97	18.10	15.30	13.98	14.31	14.55	24.69
2020	North America East	New York	Far East	Guangzhou	101.10	44.49	33.63	28.97	24.85	20.97	18.10	15.30	13.98	14.31	14.55	24.69
2020	North America Gulf	Tampa	North America West	Los Angeles	111.38	46.87	34.84	30.38	26.59	22.78	19.80	17.15	16.09	16.62	17.18	29.30
2020	North America Gulf	Tampa	Central America West	Lazaro Cardenas	91.61	39.35	29.87	26.48	23.11	19.63	16.78	14.30	13.26	13.54	13.73	23.36
2020	North America Gulf	Tampa	Central America West	Lazaro Cardenas	91.61	39.35	29.87	26.48	23.11	19.63	16.78	14.30	13.26	13.54	13.73	23.36
2020	North America Gulf	Tampa	South America West	Matarani	78.40	34.16	26.11	23.53	20.96	17.85	15.37	13.17	12.26	12.53	12.70	21.60
2020	North America Gulf	Tampa	South America West	Matarani	78.40	34.16	26.11	23.53	20.96	17.85	15.37	13.17	12.26	12.53	12.70	21.60
2020	North America Gulf	Tampa	Oceania	Auckland	92.01	39.19	29.90	26.31	22.96	19.73	17.10	14.87	13.80	14.09	14.30	24.33
2020	North America Gulf	Tampa	Oceania	Auckland	92.01	39.19	29.90	26.31	22.96	19.73	17.10	14.87	13.80	14.09	14.30	24.33

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	North America Gulf	Mobile	Far East	Osaka	118.60	49.19	36.81	31.63	27.39	23.51	20.07	17.28	15.89	16.33	16.74	28.84
2020	North America Gulf	Tampa	Far East	Guangzhou	106.21	44.68	33.69	29.37	25.38	21.43	18.36	15.64	14.47	14.81	15.07	25.61
2020	North America Gulf	Tampa	Far East	Guangzhou	106.21	44.68	33.69	29.37	25.38	21.43	18.36	15.64	14.47	14.81	15.07	25.61
2020	North America Gulf	Tampa	South East Asia	Bangkok	101.70	43.48	33.11	29.24	25.41	21.63	18.71	16.09	15.07	15.61	15.78	26.82
2020	Central America East	Puerto Limon	North America West	Los Angeles	145.77	65.13	49.33	42.93	37.44	31.72	27.03	22.82	20.84	21.43	22.02	37.29
2020	Central America East	Puerto Limon	South America West	Matarani	69.20	32.69	25.68	23.34	21.00	17.80	15.11	12.71	11.54	11.80	11.95	20.20
2020	Central America East	Puerto Limon	South America West	Matarani	69.20	32.69	25.68	23.34	21.00	17.80	15.11	12.71	11.54	11.80	11.95	20.20
2020	Central America East	Puerto Limon	Far East	Guangzhou	97.87	44.26	34.07	29.85	25.92	21.80	18.44	15.42	13.95	14.27	14.51	24.49
2020	Central America East	Puerto Limon	South East Asia	Jakarta	87.52	42.92	34.30	31.51	28.64	25.28	23.36	19.38	17.53	18.02	18.32	31.12
2020	South America East	Santos	North America West	Los Angeles	72.71	30.90	22.89	19.99	17.68	15.48	13.65	12.09	11.31	11.78	12.30	20.89
2020	Other South America East	Buenos Aires	West Coast USA	Los Angeles	71.99	30.39	22.44	19.66	17.52	15.39	13.52	11.95	11.29	11.77	12.16	20.60
2020	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	97.47	41.00	30.56	26.34	23.11	19.71	16.96	14.62	13.55	14.00	14.50	24.58
2020	South America East	Buenos Aires	West Coast Canada	Los Angeles	71.99	30.39	22.44	19.66	17.52	15.39	13.52	11.95	11.29	11.77	12.16	20.60
2020	Brazil	Santos	West Coast USA	Los Angeles	72.71	30.90	22.89	19.99	17.68	15.48	13.65	12.09	11.31	11.78	12.30	20.89
2020	South America East	Ponta da Madeira	North America West	Los Angeles	86.03	36.58	27.20	23.50	20.54	17.75	15.45	13.42	12.45	12.95	13.50	22.93
2020	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	81.45	34.93	26.67	23.33	20.54	17.43	14.65	12.42	11.29	11.49	11.61	19.57
2020	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	79.34	35.04	26.76	23.51	20.67	17.59	14.85	12.60	11.51	11.75	11.91	20.13
2020	South America East	Puerto Bolivar	South America West	Huasco	61.66	29.28	22.66	20.04	17.88	15.89	13.89	11.82	10.86	11.12	11.22	18.85
2020	South America East	Puerto La Cruz	South America West	Matarani	67.56	29.34	22.56	20.08	18.14	15.44	13.07	11.15	10.16	10.35	10.44	17.58
2020	South America East	Santos	Oceania	Brisbane	64.20	27.58	21.16	18.61	16.36	14.35	12.51	11.03	10.14	10.40	10.58	17.88
2020	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	95.97	40.09	30.15	25.81	22.34	18.76	15.72	13.22	11.96	12.16	12.32	20.76
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	101.30	42.70	32.27	27.80	24.02	20.16	17.05	14.36	13.10	13.39	13.60	22.90
2020	Venezuela	Puerto Ordaz	Korea	Kwangyang	102.25	42.85	32.27	27.66	23.96	20.17	16.93	14.29	12.95	13.18	13.33	22.46
2020	Venezuela	Puerto Ordaz	Japan	Mizushima	107.45	44.88	33.73	29.00	25.12	21.31	18.08	15.44	14.16	14.53	14.90	25.53
2020	North Brazil	Ponta da Madeira	Korea	Kwangyang	90.83	38.43	28.92	24.83	21.40	18.21	15.42	13.10	11.85	12.13	12.34	20.81
2020	North Brazil	Ponta da Madeira	Japan	Mizushima	96.02	40.46	30.38	26.17	22.55	19.35	16.57	14.25	13.06	13.48	13.90	23.89
2020	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	89.88	38.28	28.91	24.96	21.45	18.20	15.54	13.16	12.00	12.34	12.60	21.25
2020	Venezuela	Puerto Ordaz	Japan	Shimizu	110.32	46.64	35.46	30.89	26.78	23.25	20.00	17.52	16.15	16.90	17.65	31.05
2020	North Brazil	Saā Luiz	Japan	Shimizu	97.19	41.43	31.51	27.71	24.07	21.28	18.57	16.57	15.33	16.12	16.92	29.82
2020	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	79.90	34.01	25.78	22.26	19.12	16.23	13.87	11.79	10.73	11.03	11.29	19.06
2020	North Brazil	Saā Luiz	China & Hong Kong	Guangzhou	83.42	35.42	26.85	23.35	20.20	17.23	14.81	12.73	11.64	11.96	12.20	20.58
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	104.34	43.86	33.17	28.53	24.77	20.88	17.61	14.90	13.54	13.81	14.01	23.55

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	85.41	36.05	27.26	23.76	20.66	17.66	15.12	12.96	11.95	12.28	12.40	20.86
2020	Colombia	Puerto Bolivar	Japan	Mizushima	105.45	44.97	33.80	29.15	25.35	21.68	18.43	15.82	14.53	14.93	15.32	26.27
2020	Brazil	Saã Luiz	Far East	Guangzhou	83.42	35.42	26.85	23.35	20.20	17.23	14.81	12.73	11.64	11.96	12.20	20.58
2020	South America East	Ponta da Madeira	Far East	Mizushima	96.02	40.46	30.38	26.17	22.55	19.35	16.57	14.25	13.06	13.48	13.90	23.89
2020	Caribbean Basin	Kingston	North America West	Los Angeles	96.48	43.59	33.29	29.88	26.78	23.78	20.52	17.74	16.50	17.22	17.96	30.86
2020	Caribbean Basin	Kingston	North America West	Los Angeles	96.48	43.59	33.29	29.88	26.78	23.78	20.52	17.74	16.50	17.22	17.96	30.86
2020	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	80.55	37.62	29.50	26.98	24.17	21.34	18.10	15.38	14.12	14.60	14.98	25.72
2020	Caribbean Basin	Kingston	South America West	Matarani	67.06	32.23	25.56	23.88	21.89	19.46	16.61	14.19	13.06	13.53	13.89	23.86
2020	Caribbean Basin	Kingston	Far East	Guangzhou	95.42	43.14	33.47	30.00	26.53	23.23	19.75	16.77	15.38	15.92	16.37	28.04
2020	Caribbean Basin	Kingston	Far East	Guangzhou	95.42	43.14	33.47	30.00	26.53	23.23	19.75	16.77	15.38	15.92	16.37	28.04
2020	Europe	Rotterdam	West Coast Canada	Los Angeles	103.25	43.43	32.72	28.22	24.80	21.24	18.42	15.96	14.92	15.49	15.98	27.09
2020	Europe	Rotterdam	West Coast USA	Los Angeles	103.25	43.43	32.72	28.22	24.80	21.24	18.42	15.96	14.92	15.49	15.98	27.09
2020	Europe	Rotterdam	North America West	Los Angeles	103.25	43.43	32.72	28.22	24.80	21.24	18.42	15.96	14.92	15.49	15.98	27.09
2020	Europe	Rotterdam	Central America West	Lazaro Cardenas	87.36	37.50	28.95	25.34	22.19	18.81	16.01	13.60	12.54	12.88	13.00	21.95
2020	Europe	Rotterdam	South America West	Matarani	73.95	32.21	25.09	22.31	19.98	16.97	14.56	12.44	11.51	11.83	11.92	20.13
2020	Africa	Durban	North America West	Los Angeles	88.45	37.93	28.50	24.73	21.77	18.93	16.56	14.48	13.58	14.24	14.76	25.08
2020	Africa	Safi	Central America West	Lazaro Cardenas	79.65	34.95	26.96	23.75	20.80	17.86	15.28	13.07	12.06	12.49	12.66	21.43
2020	Africa	Safi	Oceania	Auckland	80.04	34.79	26.98	23.57	20.65	17.96	15.61	13.64	12.60	13.05	13.23	22.40
2020	Middle East	Damman	Central America West	Lazaro Cardenas	90.56	39.47	30.39	26.68	23.30	19.94	17.03	14.53	13.39	13.84	14.03	23.74
2020	Middle East	Damman	South America West	Matarani	86.86	38.20	29.56	26.23	23.29	19.95	17.12	14.64	13.52	13.97	14.15	23.92
2020	Middle East	Damman	South America West	Matarani	86.86	38.20	29.56	26.23	23.29	19.95	17.12	14.64	13.52	13.97	14.15	23.92
2020	North America West	Vancouver	North America East	Philadelphia	107.57	44.24	35.25	31.27	28.17	22.98	19.68	16.17	15.32	15.29	14.49	25.01
2020	North America West	Vancouver	North America Gulf	New Orleans	110.45	45.73	36.42	32.70	29.64	24.16	20.54	16.96	16.24	16.21	15.37	26.55
2020	North America West	Vancouver	Central America East	Tampico	103.15	43.34	35.03	31.48	28.77	23.48	19.75	16.20	15.32	15.28	14.47	24.88
2020	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	71.64	29.52	23.41	20.96	19.14	15.87	13.54	11.38	10.77	10.81	10.28	17.68
2020	North America West	Vancouver	South America East	Sepetiba, Bahia de	71.64	29.52	23.41	20.96	19.14	15.87	13.54	11.38	10.77	10.81	10.28	17.68
2020	North America West	Vancouver	Caribbean Basin	San Juan	92.99	40.94	33.46	30.91	28.74	24.36	20.57	17.00	16.16	16.32	15.64	27.29
2020	West Coast USA	Los Angeles	Europe	Rotterdam	102.59	42.49	33.91	30.19	27.75	22.90	19.87	16.67	16.15	16.38	15.76	27.18
2020	West Coast Canada	Vancouver	Europe	Rotterdam	103.15	42.60	34.35	30.48	27.72	22.56	19.10	15.75	14.99	15.04	14.20	24.38
2020	North America West	Vancouver	Europe	Rotterdam	103.15	42.60	34.35	30.48	27.72	22.56	19.10	15.75	14.99	15.04	14.20	24.38
2020	West Coast Canada	Vancouver	North Africa	Alexandria	87.97	40.13	32.68	29.13	26.84	22.30	19.11	15.96	15.11	15.22	14.41	24.62
2020	West Coast Canada	Vancouver	South Africa	Durban	86.67	36.27	29.17	26.00	23.68	19.55	16.66	13.86	13.23	13.40	12.70	21.87

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	North America West	Vancouver	Africa	Safi	94.64	39.53	31.77	28.30	25.74	21.20	18.04	14.97	14.27	14.43	13.67	23.54
2020	North America West	Vancouver	Middle East	Aqaba (El Akaba)	90.71	37.92	30.49	27.17	24.73	20.39	17.36	14.42	13.75	13.92	13.19	22.72
2020	Central America West	Puerto Quetzal	North America East	Philadelphia	90.98	39.95	32.71	29.78	27.35	22.83	19.57	15.95	15.09	15.05	14.25	24.58
2020	Central America West	Puerto Quetzal	North America East	Philadelphia	90.98	39.95	32.71	29.78	27.35	22.83	19.57	15.95	15.09	15.05	14.25	24.58
2020	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	93.98	41.56	33.98	31.33	28.93	24.09	20.49	16.79	16.06	16.02	15.18	26.20
2020	Central America West	Puerto Quetzal	North America Gulf	New Orleans	93.98	41.56	33.98	31.33	28.93	24.09	20.49	16.79	16.06	16.02	15.18	26.20
2020	Central America West	Puerto Quetzal	Central America East	Tampico	86.75	39.25	32.67	30.20	28.14	23.48	19.74	16.06	15.16	15.11	14.30	24.58
2020	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	52.64	23.71	19.56	18.29	17.29	14.92	12.75	10.65	10.07	10.11	9.62	16.54
2020	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	76.05	36.51	30.83	29.42	27.95	24.24	20.48	16.78	15.92	16.11	15.44	26.96
2020	Central America West	Puerto Quetzal	Europe	Rotterdam	86.70	38.42	31.91	29.09	26.99	22.49	19.05	15.57	14.80	14.84	14.00	24.02
2020	Central America West	Puerto Quetzal	Africa	Safi	77.77	35.08	29.09	26.70	24.82	20.99	17.87	14.71	14.00	14.17	13.42	23.09
2020	Peru	San Nicolas	East Coast USA	Baltimore	81.26	34.34	27.56	24.70	22.33	18.24	15.59	12.80	12.20	12.18	11.55	19.97
2020	Chile	Antofagasta	East Coast USA	Baltimore	78.54	35.14	28.76	26.11	23.90	20.29	17.79	14.64	14.01	14.01	13.24	22.78
2020	South America West	Matarani	North America East	Philadelphia	79.36	34.02	27.70	25.38	23.45	19.23	16.72	13.77	13.12	13.08	12.37	21.33
2020	South America West	Callao	North America East	Philadelphia	81.25	34.80	28.33	25.93	23.94	19.63	17.05	14.03	13.37	13.33	12.60	21.74
2020	South America West	San Nicolas	North America Gulf	Mobile	82.69	34.85	27.93	25.00	22.75	18.69	15.94	13.15	12.49	12.45	11.78	20.33
2020	South America West	Matarani	North America Gulf	South Louisiana	82.29	35.54	28.90	26.85	24.95	20.43	17.59	14.57	14.06	14.03	13.26	22.90
2020	South America West	Callao	North America Gulf	South Louisiana	84.19	36.32	29.53	27.40	25.44	20.83	17.93	14.84	14.31	14.28	13.50	23.30
2020	South America West	Callao	Central America East	Tampico	76.92	33.96	28.15	26.20	24.59	20.17	17.15	14.09	13.40	13.35	12.61	21.65
2020	South America West	Callao	South America East	Puerto La Cruz	72.26	31.97	26.34	24.27	22.80	18.82	16.14	13.21	12.45	12.40	11.70	20.09
2020	Chile	Antofagasta	Caribbean Basin	Point Lisas	58.90	27.90	22.95	21.01	19.48	16.77	14.62	11.98	11.43	11.43	10.76	18.38
2020	Peru	San Nicolas	Caribbean Basin	Point Lisas	61.62	27.10	21.75	19.59	17.91	14.72	12.43	10.15	9.62	9.59	9.08	15.58
2020	South America West	Callao	Caribbean Basin	San Juan	66.50	31.42	26.46	25.53	24.47	20.97	17.92	14.84	14.19	14.36	13.75	24.01
2020	Peru	Matarani	Europe	Rotterdam	75.00	32.42	26.83	24.63	23.03	18.84	16.16	13.36	12.80	12.85	12.09	20.73
2020	Chile	Antofagasta	Europe	Rotterdam	74.30	33.51	27.83	25.28	23.39	19.78	17.35	14.30	13.72	13.79	12.94	22.09
2020	South America West	Callao	Europe	Rotterdam	78.10	33.70	27.85	25.53	23.84	19.49	16.71	13.80	13.21	13.26	12.48	21.39
2020	South America West	Callao	Africa	Safi	68.19	30.02	24.78	22.91	21.46	17.81	15.38	12.81	12.29	12.46	11.77	20.24
2020	South America West	Matarani	Middle East	Aqaba (El Akaba)	83.21	36.23	29.76	27.30	25.39	20.96	18.02	14.93	14.28	14.43	13.64	23.45
2020	Oceania	Newcastle	North America East	Baltimore	107.15	44.58	35.94	31.95	28.76	23.49	20.00	16.50	15.66	15.59	14.77	25.41
2020	Oceania	Bunbury	North America East	Philadelphia	96.47	40.06	32.27	28.80	25.85	21.12	18.34	15.14	14.43	14.35	13.57	23.32
2020	Oceania	Newcastle	North America Gulf	Mobile	108.67	45.13	36.35	32.29	29.22	23.97	20.37	16.87	15.96	15.88	15.01	25.79
2020	Oceania	Bunbury	North America Gulf	South Louisiana	100.17	41.90	33.74	30.51	27.56	22.49	19.37	16.06	15.48	15.41	14.58	25.07

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2020	Oceania	Newcastle	Central America East	Tampico	101.97	43.30	35.40	31.87	29.07	23.73	20.06	16.50	15.60	15.50	14.65	25.06
2020	Oceania	Bunbury	Central America East	Tampico	92.96	39.56	32.39	29.33	26.73	21.84	18.60	15.32	14.58	14.50	13.70	23.44
2020	Oceania	Bunbury	Caribbean Basin	San Juan	81.56	36.58	30.31	28.29	26.28	22.39	19.14	15.90	15.22	15.35	14.69	25.55
2020	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	51.93	22.19	18.12	16.38	14.97	12.57	11.01	9.35	9.05	9.22	8.71	14.95
2020	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Korea	Guangzhou	East Coast USA	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Far East	Guangzhou	East Coast Canada	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Taiwan	Guangzhou	East Coast USA	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Japan	Kobe	East Coast USA	Philadelphia	115.34	49.82	40.31	36.25	32.61	27.22	23.74	19.97	19.25	19.59	18.99	33.78
2020	Far East	Guangzhou	North America East	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Far East	Guangzhou	North America East	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Far East	Guangzhou	North America East	Philadelphia	105.00	45.29	36.52	32.52	29.17	23.73	20.49	16.82	16.01	15.98	15.17	26.11
2020	Far East	Guangzhou	North America Gulf	South Louisiana	112.96	47.08	37.93	34.18	30.84	25.07	21.49	17.72	17.04	17.01	16.15	27.81
2020	Far East	Guangzhou	North America Gulf	South Louisiana	112.96	47.08	37.93	34.18	30.84	25.07	21.49	17.72	17.04	17.01	16.15	27.81
2020	Far East	Guangzhou	North America Gulf	New Orleans	112.96	47.08	37.93	34.18	30.84	25.07	21.49	17.72	17.04	17.01	16.15	27.81
2020	Far East	Guangzhou	North America Gulf	South Louisiana	112.96	47.08	37.93	34.18	30.84	25.07	21.49	17.72	17.04	17.01	16.15	27.81
2020	Far East	Guangzhou	Central America East	Tampico	105.71	44.72	36.56	32.97	29.99	24.41	20.71	16.97	16.13	16.09	15.26	26.17
2020	Far East	Guangzhou	South America East	Puerto La Cruz	100.76	42.60	34.63	30.94	28.11	22.99	19.64	16.04	15.13	15.09	14.31	24.53
2020	Far East	Guangzhou	Caribbean Basin	San Juan	94.69	41.94	34.65	32.09	29.68	25.06	21.34	17.62	16.83	17.01	16.31	28.36
2020	South East Asia	Manado	North America East	Philadelphia	103.19	45.39	37.53	34.76	32.55	27.79	25.93	21.14	20.11	20.13	19.09	33.01
2020	South East Asia	Bangkok	North America Gulf	New Orleans	104.85	43.86	35.47	32.30	29.35	24.09	20.84	17.38	16.89	17.08	16.11	27.82
2020	South East Asia	Manado	North America Gulf	New Orleans	107.39	47.11	38.88	36.36	34.16	29.09	26.89	22.02	21.11	21.13	20.04	34.67
2020	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	70.79	29.52	23.50	21.35	19.81	16.94	15.27	12.76	12.20	12.26	11.65	19.97
2025	North America East	New York	North America West	Los Angeles	108.79	46.12	34.41	29.69	25.81	22.11	19.36	16.66	15.47	15.98	16.52	28.13
2025	North America East	New York	Central America West	Lazaro Cardenas	92.79	40.13	30.60	26.77	23.18	19.66	16.93	14.30	13.09	13.35	13.54	22.98
2025	North America East	New York	South America West	Matarani	79.13	34.64	26.59	23.61	20.86	17.73	15.40	13.08	12.00	12.26	12.42	21.08
2025	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	95.00	40.20	30.25	25.85	22.14	18.57	15.72	13.20	11.99	12.26	12.45	21.07
2025	North America East	New York	Oceania	Brisbane	101.53	43.34	33.09	28.66	24.79	21.23	18.43	15.78	14.46	14.75	14.96	25.40
2025	East Coast USA	Norfolk	Taiwan	Kaohsiung	103.61	45.14	33.93	29.09	25.16	21.39	18.07	15.33	13.93	14.20	14.40	24.41
2025	East Coast USA	Norfolk	Korea	Kwangyang	109.86	47.86	36.02	30.92	26.75	22.78	19.27	16.38	14.90	15.20	15.39	26.09
2025	East Coast USA	Norfolk	Japan	Mizushima	115.01	49.89	37.47	32.25	27.90	23.91	20.41	17.53	16.11	16.54	16.95	29.15
2025	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	100.25	45.29	34.04	29.08	25.04	21.12	17.80	14.98	13.60	13.89	14.07	23.76

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	105.40	47.32	35.50	30.42	26.19	22.26	18.95	16.13	14.80	15.23	15.63	26.83
2025	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	99.35	45.17	34.06	29.24	25.11	21.13	17.93	15.06	13.76	14.11	14.35	24.22
2025	North America East	New York	Far East	Guangzhou	102.50	45.38	34.36	29.62	25.40	21.42	18.47	15.61	14.27	14.59	14.84	25.16
2025	North America East	New York	Far East	Guangzhou	102.50	45.38	34.36	29.62	25.40	21.42	18.47	15.61	14.27	14.59	14.84	25.16
2025	North America Gulf	Tampa	North America West	Los Angeles	112.88	47.69	35.51	30.98	27.09	23.20	20.14	17.44	16.36	16.89	17.45	29.74
2025	North America Gulf	Tampa	Central America West	Lazaro Cardenas	92.93	40.07	30.47	27.01	23.56	20.00	17.09	14.55	13.50	13.78	13.98	23.76
2025	North America Gulf	Tampa	Central America West	Lazaro Cardenas	92.93	40.07	30.47	27.01	23.56	20.00	17.09	14.55	13.50	13.78	13.98	23.76
2025	North America Gulf	Tampa	South America West	Matarani	79.46	34.74	26.59	23.96	21.33	18.15	15.63	13.38	12.46	12.73	12.90	21.92
2025	North America Gulf	Tampa	South America West	Matarani	79.46	34.74	26.59	23.96	21.33	18.15	15.63	13.38	12.46	12.73	12.90	21.92
2025	North America Gulf	Tampa	Oceania	Auckland	93.32	39.90	30.50	26.84	23.41	20.10	17.42	15.13	14.04	14.34	14.54	24.73
2025	North America Gulf	Tampa	Oceania	Auckland	93.32	39.90	30.50	26.84	23.41	20.10	17.42	15.13	14.04	14.34	14.54	24.73
2025	North America Gulf	Mobile	Far East	Osaka	120.31	50.12	37.58	32.31	27.96	23.98	20.47	17.61	16.19	16.63	17.05	29.33
2025	North America Gulf	Tampa	Far East	Guangzhou	107.77	45.52	34.39	29.99	25.90	21.86	18.72	15.93	14.74	15.09	15.35	26.06
2025	North America Gulf	Tampa	Far East	Guangzhou	107.77	45.52	34.39	29.99	25.90	21.86	18.72	15.93	14.74	15.09	15.35	26.06
2025	North America Gulf	Tampa	South East Asia	Bangkok	103.19	44.29	33.78	29.84	25.92	22.05	19.06	16.38	15.34	15.89	16.06	27.28
2025	Central America East	Puerto Limon	North America West	Los Angeles	148.21	66.63	50.57	44.03	38.36	32.47	27.67	23.33	21.30	21.89	22.49	38.05
2025	Central America East	Puerto Limon	South America West	Matarani	70.34	33.41	26.28	23.89	21.47	18.17	15.43	12.96	11.77	12.03	12.18	20.59
2025	Central America East	Puerto Limon	South America West	Matarani	70.34	33.41	26.28	23.89	21.47	18.17	15.43	12.96	11.77	12.03	12.18	20.59
2025	Central America East	Puerto Limon	Far East	Guangzhou	99.57	45.31	34.94	30.63	26.57	22.33	18.88	15.78	14.28	14.60	14.83	25.03
2025	Central America East	Puerto Limon	South East Asia	Jakarta	89.01	43.89	35.12	32.25	29.27	25.79	23.80	19.73	17.85	18.35	18.65	31.67
2025	South America East	Santos	North America West	Los Angeles	73.78	31.48	23.38	20.42	18.05	15.78	13.90	12.30	11.50	11.98	12.50	21.21
2025	Other South America East	Buenos Aires	West Coast USA	Los Angeles	72.95	30.90	22.88	20.04	17.84	15.66	13.74	12.14	11.47	11.95	12.34	20.89
2025	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	98.94	41.81	31.23	26.93	23.60	20.12	17.31	14.90	13.81	14.26	14.77	25.02
2025	South America East	Buenos Aires	West Coast Canada	Los Angeles	72.95	30.90	22.88	20.04	17.84	15.66	13.74	12.14	11.47	11.95	12.34	20.89
2025	Brazil	Santos	West Coast USA	Los Angeles	73.78	31.48	23.38	20.42	18.05	15.78	13.90	12.30	11.50	11.98	12.50	21.21
2025	South America East	Ponta da Madeira	North America West	Los Angeles	87.33	37.29	27.79	24.02	20.98	18.11	15.76	13.67	12.69	13.18	13.74	23.32
2025	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	82.80	35.67	27.29	23.88	21.01	17.81	14.97	12.69	11.54	11.74	11.87	19.98
2025	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	80.74	35.81	27.41	24.08	21.15	17.98	15.19	12.88	11.77	12.01	12.17	20.55
2025	South America East	Puerto Bolivar	South America West	Huasco	62.66	29.83	23.12	20.45	18.22	16.18	14.13	12.02	11.04	11.30	11.41	19.15
2025	South America East	Puerto La Cruz	South America West	Matarani	68.60	29.92	23.04	20.51	18.51	15.74	13.32	11.36	10.36	10.54	10.64	17.91
2025	South America East	Santos	Oceania	Brisbane	65.26	28.16	21.65	19.04	16.73	14.66	12.77	11.25	10.35	10.60	10.79	18.22
2025	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	97.59	40.98	30.89	26.46	22.89	19.21	16.09	13.53	12.25	12.45	12.61	21.24

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					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	103.00	43.63	33.04	28.48	24.59	20.63	17.45	14.68	13.40	13.69	13.91	23.40
2025	Venezuela	Puerto Ordaz	Korea	Kwangyang	103.98	43.79	33.06	28.36	24.55	20.65	17.34	14.62	13.25	13.49	13.64	22.97
2025	Venezuela	Puerto Ordaz	Japan	Mizushima	109.20	45.84	34.53	29.71	25.71	21.80	18.49	15.78	14.47	14.84	15.21	26.05
2025	North Brazil	Ponta da Madeira	Korea	Kwangyang	92.39	39.28	29.63	25.45	21.92	18.64	15.79	13.40	12.13	12.41	12.62	21.27
2025	North Brazil	Ponta da Madeira	Japan	Mizushima	97.61	41.33	31.10	26.80	23.08	19.79	16.94	14.55	13.34	13.77	14.19	24.35
2025	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	91.41	39.12	29.61	25.57	21.97	18.62	15.90	13.46	12.28	12.62	12.88	21.71
2025	Venezuela	Puerto Ordaz	Japan	Shimizu	112.09	47.61	36.27	31.61	27.39	23.75	20.42	17.87	16.48	17.23	17.99	31.61
2025	North Brazil	Saã Luiz	Japan	Shimizu	98.78	42.30	32.24	28.36	24.62	21.74	18.96	16.89	15.63	16.43	17.23	30.33
2025	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	81.25	34.75	26.39	22.80	19.58	16.60	14.19	12.04	10.97	11.27	11.53	19.45
2025	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	84.86	36.20	27.50	23.92	20.68	17.63	15.15	13.01	11.90	12.22	12.47	21.01
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	106.10	44.82	33.97	29.24	25.37	21.36	18.02	15.23	13.85	14.13	14.32	24.07
2025	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	86.78	36.80	27.88	24.31	21.13	18.04	15.44	13.22	12.20	12.53	12.65	21.27
2025	Colombia	Puerto Bolivar	Japan	Mizushima	107.27	45.96	34.63	29.88	25.97	22.18	18.86	16.17	14.85	15.26	15.65	26.81
2025	Brazil	Saã Luiz	Far East	Guangzhou	84.86	36.20	27.50	23.92	20.68	17.63	15.15	13.01	11.90	12.22	12.47	21.01
2025	South America East	Ponta da Madeira	Far East	Mizushima	97.61	41.33	31.10	26.80	23.08	19.79	16.94	14.55	13.34	13.77	14.19	24.35
2025	Caribbean Basin	Kingston	North America West	Los Angeles	97.94	44.41	33.98	30.50	27.31	24.22	20.88	18.04	16.77	17.50	18.25	31.34
2025	Caribbean Basin	Kingston	North America West	Los Angeles	97.94	44.41	33.98	30.50	27.31	24.22	20.88	18.04	16.77	17.50	18.25	31.34
2025	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	81.89	38.38	30.14	27.56	24.66	21.75	18.44	15.66	14.38	14.87	15.25	26.17
2025	Caribbean Basin	Kingston	South America West	Matarani	68.11	32.84	26.08	24.35	22.30	19.80	16.89	14.42	13.27	13.75	14.11	24.23
2025	Caribbean Basin	Kingston	Far East	Guangzhou	97.01	44.04	34.22	30.68	27.10	23.70	20.15	17.10	15.68	16.23	16.68	28.55
2025	Caribbean Basin	Kingston	Far East	Guangzhou	97.01	44.04	34.22	30.68	27.10	23.70	20.15	17.10	15.68	16.23	16.68	28.55
2025	Europe	Rotterdam	West Coast Canada	Los Angeles	104.81	44.26	33.41	28.84	25.32	21.66	18.78	16.25	15.19	15.77	16.25	27.55
2025	Europe	Rotterdam	West Coast USA	Los Angeles	104.81	44.26	33.41	28.84	25.32	21.66	18.78	16.25	15.19	15.77	16.25	27.55
2025	Europe	Rotterdam	North America West	Los Angeles	104.81	44.26	33.41	28.84	25.32	21.66	18.78	16.25	15.19	15.77	16.25	27.55
2025	Europe	Rotterdam	Central America West	Lazaro Cardenas	88.79	38.27	29.59	25.91	22.68	19.20	16.34	13.88	12.80	13.14	13.26	22.38
2025	Europe	Rotterdam	South America West	Matarani	75.11	32.84	25.62	22.78	20.37	17.30	14.83	12.67	11.72	12.05	12.14	20.48
2025	Africa	Durban	North America West	Los Angeles	89.78	38.66	29.11	25.27	22.23	19.30	16.88	14.74	13.83	14.49	15.01	25.49
2025	Africa	Safi	Central America West	Lazaro Cardenas	80.99	35.69	27.58	24.30	21.26	18.24	15.61	13.33	12.31	12.74	12.92	21.85
2025	Africa	Safi	Oceania	Auckland	81.36	35.51	27.60	24.12	21.11	18.34	15.93	13.91	12.85	13.30	13.49	22.82
2025	Middle East	Damman	Central America West	Lazaro Cardenas	92.11	40.32	31.10	27.31	23.84	20.38	17.40	14.84	13.68	14.13	14.33	24.22
2025	Middle East	Damman	South America West	Matarani	88.30	38.99	30.22	26.82	23.79	20.36	17.47	14.93	13.79	14.25	14.43	24.37
2025	Middle East	Damman	South America West	Matarani	88.30	38.99	30.22	26.82	23.79	20.36	17.47	14.93	13.79	14.25	14.43	24.37

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	North America West	Vancouver	North America East	Philadelphia	109.20	45.11	36.02	31.96	28.78	23.46	20.09	16.50	15.64	15.60	14.78	25.49
2025	North America West	Vancouver	North America Gulf	New Orleans	112.13	46.62	37.21	33.42	30.28	24.66	20.96	17.30	16.57	16.53	15.67	27.05
2025	North America West	Vancouver	Central America East	Tampico	104.85	44.25	35.83	32.22	29.42	24.00	20.18	16.55	15.66	15.61	14.78	25.39
2025	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	72.74	30.11	23.93	21.44	19.55	16.20	13.82	11.61	10.99	11.02	10.48	18.02
2025	North America West	Vancouver	South America East	Sepetiba, Bahia de	72.74	30.11	23.93	21.44	19.55	16.20	13.82	11.61	10.99	11.02	10.48	18.02
2025	North America West	Vancouver	Caribbean Basin	San Juan	94.49	41.76	34.19	31.58	29.34	24.83	20.97	17.32	16.47	16.63	15.94	27.78
2025	West Coast USA	Los Angeles	Europe	Rotterdam	104.14	43.31	34.64	30.85	28.33	23.37	20.27	16.99	16.44	16.67	16.04	27.63
2025	West Coast Canada	Vancouver	Europe	Rotterdam	104.83	43.50	35.14	31.20	28.35	23.06	19.53	16.09	15.31	15.36	14.50	24.88
2025	North America West	Vancouver	Europe	Rotterdam	104.83	43.50	35.14	31.20	28.35	23.06	19.53	16.09	15.31	15.36	14.50	24.88
2025	West Coast Canada	Vancouver	North Africa	Alexandria	89.26	40.83	33.30	29.69	27.34	22.69	19.45	16.22	15.37	15.47	14.65	25.02
2025	West Coast Canada	Vancouver	South Africa	Durban	88.06	37.02	29.83	26.61	24.21	19.98	17.02	14.14	13.50	13.67	12.95	22.29
2025	North America West	Vancouver	Africa	Safi	96.17	40.35	32.50	28.96	26.32	21.67	18.43	15.28	14.57	14.73	13.96	24.01
2025	North America West	Vancouver	Middle East	Aqaba (El Akaba)	92.18	38.71	31.18	27.80	25.28	20.83	17.74	14.72	14.04	14.21	13.46	23.17
2025	Central America West	Puerto Quetzal	North America East	Philadelphia	92.53	40.85	33.50	30.51	28.00	23.35	20.00	16.29	15.41	15.37	14.55	25.08
2025	Central America West	Puerto Quetzal	North America East	Philadelphia	92.53	40.85	33.50	30.51	28.00	23.35	20.00	16.29	15.41	15.37	14.55	25.08
2025	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	95.59	42.49	34.80	32.10	29.61	24.63	20.94	17.15	16.40	16.36	15.49	26.73
2025	Central America West	Puerto Quetzal	North America Gulf	New Orleans	95.59	42.49	34.80	32.10	29.61	24.63	20.94	17.15	16.40	16.36	15.49	26.73
2025	Central America West	Puerto Quetzal	Central America East	Tampico	88.38	40.20	33.53	30.99	28.84	24.03	20.21	16.43	15.51	15.46	14.63	25.12
2025	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	53.55	24.25	20.03	18.74	17.69	15.24	13.01	10.86	10.27	10.31	9.81	16.86
2025	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	77.45	37.35	31.59	30.13	28.59	24.75	20.91	17.12	16.24	16.43	15.75	27.48
2025	Central America West	Puerto Quetzal	Europe	Rotterdam	88.31	39.36	32.74	29.86	27.67	23.03	19.51	15.93	15.14	15.18	14.32	24.55
2025	Central America West	Puerto Quetzal	Africa	Safi	79.21	35.92	29.85	27.39	25.44	21.48	18.29	15.04	14.31	14.48	13.71	23.58
2025	Peru	San Nicolas	East Coast USA	Baltimore	82.48	35.00	28.13	25.22	22.79	18.60	15.90	13.05	12.43	12.41	11.77	20.34
2025	Chile	Antofagasta	East Coast USA	Baltimore	79.69	35.77	29.31	26.61	24.34	20.64	18.08	14.87	14.24	14.24	13.45	23.12
2025	South America West	Matarani	North America East	Philadelphia	80.55	34.66	28.27	25.91	23.92	19.60	17.03	14.02	13.36	13.32	12.59	21.71
2025	South America West	Callao	North America East	Philadelphia	82.48	35.47	28.92	26.48	24.43	20.01	17.37	14.29	13.62	13.58	12.83	22.12
2025	South America West	San Nicolas	North America Gulf	Mobile	83.94	35.52	28.52	25.54	23.23	19.07	16.25	13.41	12.73	12.69	12.01	20.70
2025	South America West	Matarani	North America Gulf	South Louisiana	83.53	36.22	29.50	27.40	25.44	20.82	17.92	14.84	14.31	14.28	13.50	23.29
2025	South America West	Callao	North America Gulf	South Louisiana	85.46	37.02	30.14	27.97	25.95	21.23	18.27	15.11	14.57	14.53	13.74	23.71
2025	South America West	Callao	Central America East	Tampico	78.22	34.67	28.79	26.79	25.12	20.58	17.50	14.37	13.66	13.61	12.86	22.07
2025	South America West	Callao	South America East	Puerto La Cruz	73.33	32.57	26.88	24.76	23.24	19.17	16.44	13.44	12.67	12.63	11.91	20.44
2025	Chile	Antofagasta	Caribbean Basin	Point Lisas	59.84	28.42	23.41	21.42	19.85	17.05	14.86	12.18	11.61	11.61	10.93	18.66

Table C-2. Ocean Freight Rates Excluding Panama Canal Tolls for Existing Canal, Least Cost Alternative and By Pass Routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 DWT)											
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
2025	Peru	San Nicolas	Caribbean Basin	Point Lisas	62.63	27.65	22.23	20.03	18.29	15.02	12.68	10.36	9.81	9.78	9.26	15.88
2025	South America West	Callao	Caribbean Basin	San Juan	67.59	32.04	27.02	26.05	24.94	21.35	18.23	15.09	14.43	14.60	13.98	24.40
2025	Peru	Matarani	Europe	Rotterdam	76.25	33.10	27.43	25.18	23.52	19.22	16.49	13.62	13.05	13.10	12.33	21.12
2025	Chile	Antofagasta	Europe	Rotterdam	75.52	34.17	28.42	25.81	23.86	20.15	17.67	14.55	13.96	14.03	13.17	22.46
2025	South America West	Callao	Europe	Rotterdam	79.40	34.41	28.49	26.11	24.35	19.89	17.05	14.07	13.48	13.52	12.72	21.80
2025	South America West	Callao	Africa	Safi	69.31	30.64	25.33	23.42	21.91	18.17	15.68	13.05	12.53	12.69	11.99	20.61
2025	South America West	Matarani	Middle East	Aqaba (El Akaba)	84.62	37.00	30.45	27.94	25.95	21.41	18.40	15.23	14.57	14.72	13.91	23.90
2025	Oceania	Newcastle	North America East	Baltimore	109.08	45.59	36.84	32.77	29.48	24.07	20.49	16.89	16.03	15.96	15.12	25.99
2025	Oceania	Bunbury	North America East	Philadelphia	98.19	40.96	33.08	29.54	26.50	21.63	18.78	15.49	14.77	14.69	13.88	23.84
2025	Oceania	Newcastle	North America Gulf	Mobile	110.63	46.16	37.27	33.12	29.95	24.56	20.86	17.26	16.35	16.26	15.37	26.38
2025	Oceania	Bunbury	North America Gulf	South Louisiana	101.97	42.84	34.58	31.28	28.24	23.03	19.82	16.43	15.84	15.76	14.91	25.62
2025	Oceania	Newcastle	Central America East	Tampico	103.97	44.36	36.35	32.74	29.83	24.33	20.57	16.91	16.00	15.90	15.02	25.67
2025	Oceania	Bunbury	Central America East	Tampico	94.79	40.52	33.25	30.12	27.42	22.40	19.07	15.70	14.95	14.86	14.04	24.00
2025	Oceania	Bunbury	Caribbean Basin	San Juan	83.13	37.43	31.06	28.99	26.90	22.88	19.56	16.24	15.55	15.68	15.00	26.08
2025	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	52.87	22.69	18.56	16.79	15.33	12.86	11.26	9.54	9.25	9.41	8.89	15.25
2025	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Korea	Guangzhou	East Coast USA	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Far East	Guangzhou	East Coast Canada	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Taiwan	Guangzhou	East Coast USA	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Japan	Kobe	East Coast USA	Philadelphia	117.13	50.89	41.26	37.11	33.37	27.83	24.25	20.39	19.66	19.99	19.37	34.41
2025	Far East	Guangzhou	North America East	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Far East	Guangzhou	North America East	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Far East	Guangzhou	North America East	Philadelphia	106.65	46.28	37.39	33.32	29.87	24.28	20.96	17.20	16.37	16.34	15.50	26.66
2025	Far East	Guangzhou	North America Gulf	South Louisiana	114.89	48.10	38.84	35.00	31.56	25.65	21.98	18.11	17.41	17.39	16.50	28.39
2025	Far East	Guangzhou	North America Gulf	South Louisiana	114.89	48.10	38.84	35.00	31.56	25.65	21.98	18.11	17.41	17.39	16.50	28.39
2025	Far East	Guangzhou	North America Gulf	New Orleans	114.89	48.10	38.84	35.00	31.56	25.65	21.98	18.11	17.41	17.39	16.50	28.39
2025	Far East	Guangzhou	North America Gulf	South Louisiana	114.89	48.10	38.84	35.00	31.56	25.65	21.98	18.11	17.41	17.39	16.50	28.39
2025	Far East	Guangzhou	Central America East	Tampico	107.67	45.75	37.48	33.82	30.73	24.99	21.20	17.37	16.51	16.47	15.62	26.76

Table C-3. Least Cost Alternative Routes Existing Canal - 2002

				Vessel Size Range (000 dwt)											
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
North America East	New York	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America East	New York	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America East	New York	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
East Coast Canada	Sept Iles (Seve	Oceania	Whyalla	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America East	New York	Oceania	Brisbane	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
East Coast USA	Norfolk	Taiwan	Kaohsiung	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast USA	Norfolk	Korea	Kwangyang	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast USA	Norfolk	Japan	Mizushima	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast Canada	Sept Iles (Seve	Korea	Kwangyang	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast Canada	Sept Iles (Seve	Japan	Mizushima	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast Canada	Sept Iles (Seve	China & Hong Kong	Shanghai	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America East	New York	Far East	Guangzhou	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America East	New York	Far East	Guangzhou	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America Gulf	Tampa	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Tampa	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Tampa	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Tampa	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Tampa	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Tampa	Oceania	Auckland	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Tampa	Oceania	Auckland	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America Gulf	Mobile	Far East	Osaka	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America Gulf	Tampa	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America Gulf	Tampa	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America Gulf	Tampa	South East Asia	Bangkok	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Central America East	Puerto Limon	North America West	Los Angeles	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Central America East	Puerto Limon	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America East	Puerto Limon	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America East	Puerto Limon	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Central America East	Puerto Limon	South East Asia	Jakarta	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South America East	Santos	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Other South America E	Buenos Aires	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Buenos Aires	West Coast Canada	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH

Table C-3. Least Cost Alternative Routes Existing Canal - 2002

				Vessel Size Range (000 dwt)											
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
Brazil	Santos	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Ponta da Mad	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Puerto La Cru	Central America West	Lazaro Cardena	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Puerto Bolivar	Central America West	Lazaro Cardena	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Puerto Bolivar	South America West	Huasco	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Puerto La Cru	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Santos	Oceania	Brisbane	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	Korea	Kwangyang	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	Japan	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Ponta da Mad	Korea	Kwangyang	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Ponta da Mad	Japan	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Ponta da Mad	China & Hong Kong	Shanghai	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	Japan	Shimizu	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Saã Luiz	Japan	Shimizu	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South Brazil	Sepetiba, Bahi	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Colombia	Puerto Bolivar	Japan	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Brazil	Saã Luiz	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South America East	Ponta da Mad	Far East	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Caribbean Basin	Kingston	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Caribbean Basin	Kingston	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Caribbean Basin	Kingston	Central America West	Lazaro Cardena	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Caribbean Basin	Kingston	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Caribbean Basin	Kingston	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Caribbean Basin	Kingston	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Europe	Rotterdam	West Coast Canada	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Europe	Rotterdam	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Europe	Rotterdam	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Europe	Rotterdam	Central America West	Lazaro Cardena	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH

Table C-3. Least Cost Alternative Routes Existing Canal - 2002

				Vessel Size Range (000 dwt)											
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
Europe	Rotterdam	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Africa	Durban	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Africa	Safi	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Africa	Safi	Oceania	Auckland	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Middle East	Damman	Central America West	Lazaro Cardenas	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Middle East	Damman	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Middle East	Damman	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	North America Gulf	New Orleans	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
West Coast Canada	Vancouver	South America East	Sepetiba, Bahia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	South America East	Sepetiba, Bahia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	Caribbean Basin	San Juan	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
West Coast USA	Los Angeles	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
West Coast Canada	Vancouver	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
West Coast Canada	Vancouver	North Africa	Alexandria	S	S	S	S	S	S	S	S	S	S	S	S
West Coast Canada	Vancouver	South Africa	Durban	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America West	Vancouver	Africa	Safi	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	Middle East	Aqaba (El Akaba	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Central America West	Puerto Quetzal	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	North America Gulf	South Louisiana	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	North America Gulf	New Orleans	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	Caribbean Basin	San Juan	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Central America West	Puerto Quetzal	Africa	Safi	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Peru	San Nicolas	East Coast USA	Baltimore	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Chile	Antofagasta	East Coast USA	Baltimore	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Matarani	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH

Table C-3. Least Cost Alternative Routes Existing Canal - 2002

				Vessel Size Range (000 dwt)											
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
South America West	San Nicolas	North America Gulf	Mobile	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Matarani	North America Gulf	South Louisiana	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	North America Gulf	South Louisiana	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	South America East	Puerto La Cruz	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Chile	Antofagasta	Caribbean Basin	Point Lisas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Peru	San Nicolas	Caribbean Basin	Point Lisas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	Caribbean Basin	San Juan	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Peru	Matarani	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Chile	Antofagasta	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	Africa	Safi	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Matarani	Middle East	Aqaba (El Akaba	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Oceania	Newcastle	North America East	Baltimore	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Oceania	Bunbury	North America East	Philadelphia	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Oceania	Newcastle	North America Gulf	Mobile	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Oceania	Bunbury	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Oceania	Newcastle	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Oceania	Bunbury	Central America East	Tampico	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Oceania	Bunbury	Caribbean Basin	San Juan	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Oceania	Bunbury	Middle East	Aqaba (El Akaba	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Korea	Guangzhou	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	East Coast Canada	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Taiwan	Guangzhou	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Japan	Kobe	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America Gulf	New Orleans	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH

Table C-3. Least Cost Alternative Routes Existing Canal - 2002

				Vessel Size Range (000 dwt)											
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k
Far East	Guangzhou	Central America East	Tampico	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	South America East	Puerto La Cruz	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Far East	Guangzhou	Caribbean Basin	San Juan	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South East Asia	Manado	North America East	Philadelphia	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South East Asia	Bangkok	North America Gulf	New Orleans	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South East Asia	Manado	North America Gulf	New Orleans	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
South East Asia	PT Kaltim Prir	South America East	Sepetiba, Bahia	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH

Source: Richardson Lawrie Associates

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	North America East	New York	North America West	Los Angeles	58.30	24.42	20.23	17.43	15.23	13.27	12.21	10.82	10.53	10.88	11.34	19.00					
2000	North America East	New York	Central America West	Lazaro Cardenas	41.75	18.22	16.05	14.28	12.41	10.66	9.66	8.36	8.08	8.19	8.30	13.73					
2000	North America East	New York	South America West	Matarani	44.26	19.55	17.22	15.56	13.92	11.92	10.82	9.37	9.04	9.17	9.27	15.32					
2000	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	86.99	35.85	31.69	26.77	22.65	18.88	16.43	13.92	13.29	13.44	13.64	22.29					
2000	North America East	New York	Oceania	Brisbane	81.33	33.99	30.13	25.91	22.23	19.03	17.09	14.85	14.32	14.46	14.64	24.03					
2000	East Coast USA	Norfolk	Taiwan	Kaohsiung	87.37	35.92	31.37	26.61	22.83	19.36	16.79	14.43	13.74	13.87	14.04	23.04					
2000	East Coast USA	Norfolk	Korea	Kwangyang	83.04	34.27	29.87	25.38	21.84	18.61	16.17	13.96	13.31	13.45	13.60	22.34					
2000	East Coast USA	Norfolk	Japan	Mizushima	85.95	35.35	30.56	26.07	22.43	19.28	16.93	14.79	14.22	14.49	14.86	24.90					
2000	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	83.76	34.47	30.46	25.71	21.92	18.42	15.98	13.61	13.00	13.14	13.30	21.68					
2000	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	86.66	35.55	31.15	26.39	22.52	19.10	16.73	14.44	13.91	14.19	14.56	24.24					
2000	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	86.87	36.00	31.90	27.07	22.99	19.24	16.80	14.26	13.70	13.91	14.13	23.06					
2000	North America East	New York	Far East	Guangzhou	91.19	37.79	33.20	28.32	24.03	20.16	17.88	15.24	14.57	14.77	15.01	24.66					
2000	North America East	New York	Far East	Guangzhou	91.19	37.79	33.20	28.32	24.03	20.16	17.88	15.24	14.57	14.77	15.01	24.66					
2000	North America Gulf	Tampa	North America West	Los Angeles	53.64	22.66	18.68	16.55	14.68	12.82	11.69	10.51	10.46	10.82	11.29	18.92					
2000	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.20	16.53	14.57	13.44	11.90	10.24	9.17	8.07	8.04	8.15	8.26	13.68					
2000	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.20	16.53	14.57	13.44	11.90	10.24	9.17	8.07	8.04	8.15	8.26	13.68					
2000	North America Gulf	Tampa	South America West	Matarani	39.71	17.85	15.73	14.73	13.40	11.50	10.33	9.07	8.99	9.12	9.23	15.26					
2000	North America Gulf	Tampa	South America West	Matarani	39.71	17.85	15.73	14.73	13.40	11.50	10.33	9.07	8.99	9.12	9.23	15.26					
2000	North America Gulf	Tampa	Oceania	Auckland	68.41	28.88	25.69	22.60	19.64	16.90	15.17	13.44	13.19	13.33	13.51	22.21					
2000	North America Gulf	Tampa	Oceania	Auckland	68.41	28.88	25.69	22.60	19.64	16.90	15.17	13.44	13.19	13.33	13.51	22.21					
2000	North America Gulf	Mobile	Far East	Osaka	81.89	33.40	28.86	24.61	21.20	18.27	16.06	14.08	13.55	13.82	14.18	23.80					
2000	North America Gulf	Tampa	Far East	Guangzhou	85.90	35.59	31.29	27.12	23.21	19.49	17.18	14.79	14.38	14.58	14.82	24.37					
2000	North America Gulf	Tampa	Far East	Guangzhou	85.90	35.59	31.29	27.12	23.21	19.49	17.18	14.79	14.38	14.58	14.82	24.37					
2000	North America Gulf	Tampa	South East Asia	Bangkok	93.45	39.29	34.98	30.64	26.34	22.27	19.80	17.18	16.90	17.34	17.50	28.72					
2000	Central America East	Puerto Limon	North America West	Los Angeles	39.03	17.38	15.04	13.48	12.28	10.85	9.82	8.83	8.72	9.04	9.47	15.74					
2000	Central America East	Puerto Limon	South America West	Matarani	24.94	12.48	12.01	11.60	10.95	9.49	8.43	7.37	7.23	7.32	7.39	12.05					
2000	Central America East	Puerto Limon	South America West	Matarani	24.94	12.48	12.01	11.60	10.95	9.49	8.43	7.37	7.23	7.32	7.39	12.05					
2000	Central America East	Puerto Limon	Far East	Guangzhou	72.22	30.94	28.18	24.52	21.19	17.84	15.58	13.33	12.83	12.99	13.19	21.51					
2000	Central America East	Puerto Limon	South East Asia	Jakarta	82.16	37.86	35.85	32.54	29.30	25.86	24.70	20.88	20.10	20.36	20.65	33.73					
2000	South America East	Santos	North America West	Los Angeles	70.44	29.52	25.05	21.69	18.99	16.52	14.85	13.24	12.86	13.25	13.77	22.74					
2000	Other South America East	Buenos Aires	West Coast USA	Los Angeles	81.94	34.11	28.81	24.94	21.86	18.94	16.86	14.88	14.51	14.91	15.32	25.26					
2000	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	54.70	22.69	18.91	16.26	14.39	12.42	11.07	9.81	9.54	9.85	10.29	17.09					
2000	South America East	Buenos Aires	West Coast Canada	Los Angeles	81.94	34.11	28.81	24.94	21.86	18.94	16.86	14.88	14.51	14.91	15.32	25.26					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	Brazil	Santos	West Coast USA	Los Angeles	70.44	29.52	25.05	21.69	18.99	16.52	14.85	13.24	12.86	13.25	13.77	22.74					
2000	South America East	Ponta da Madeira	North America West	Los Angeles	58.76	24.74	20.84	17.92	15.64	13.62	12.25	10.86	10.52	10.90	11.42	18.96					
2000	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	33.36	14.43	12.86	11.49	10.37	8.95	7.76	6.80	6.54	6.59	6.64	10.80					
2000	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	25.48	12.14	10.97	9.98	9.07	7.92	6.95	6.13	5.97	6.06	6.13	10.04					
2000	South America East	Puerto Bolivar	South America West	Huasco	31.46	16.32	14.51	12.99	11.78	10.80	9.78	8.49	8.11	8.26	8.32	13.65					
2000	South America East	Puerto La Cruz	South America West	Matarani	35.89	15.77	14.04	12.78	11.89	10.22	8.92	7.81	7.50	7.57	7.62	12.40					
2000	South America East	Santos	Oceania	Brisbane	95.14	39.90	35.67	30.80	26.52	22.73	20.11	17.60	16.97	17.15	17.40	28.31					
2000	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	86.40	35.43	31.14	26.40	22.61	18.87	16.24	13.79	13.11	13.19	13.35	21.72					
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	85.06	35.24	31.02	26.49	22.65	18.91	16.41	13.95	13.35	13.51	13.72	22.35					
2000	Venezuela	Puerto Ordaz	Korea	Kwangyang	81.80	33.65	29.52	25.07	21.53	18.05	15.55	13.28	12.62	12.72	12.85	20.93					
2000	Venezuela	Puerto Ordaz	Japan	Mizushima	84.66	34.70	30.19	25.74	22.11	18.71	16.30	14.10	13.52	13.76	14.10	23.48					
2000	North Brazil	Ponta da Madeira	Korea	Kwangyang	85.86	35.70	31.45	26.73	22.78	19.25	16.73	14.33	13.60	13.78	13.99	22.80					
2000	North Brazil	Ponta da Madeira	Japan	Mizushima	88.72	36.76	32.12	27.40	23.36	19.92	17.48	15.14	14.50	14.81	15.23	25.35					
2000	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	89.12	37.29	32.95	28.14	23.90	20.11	17.59	15.00	14.33	14.56	14.85	24.22					
2000	Venezuela	Puerto Ordaz	Japan	Shimizu	84.43	35.14	30.94	26.84	23.10	20.14	17.85	15.94	15.45	16.10	16.90	29.00					
2000	North Brazil	Saã Luiz	Japan	Shimizu	86.83	36.46	32.16	28.10	24.18	21.33	19.13	17.28	16.78	17.50	18.35	31.36					
2000	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	105.93	44.17	39.20	33.42	28.33	23.73	20.70	17.61	16.78	17.02	17.34	28.28					
2000	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	92.21	38.45	34.05	29.26	24.99	21.10	18.54	16.00	15.33	15.55	15.83	25.81					
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	85.96	35.51	31.27	26.65	22.94	19.25	16.66	14.25	13.57	13.71	13.89	22.59					
2000	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	112.65	46.73	41.11	35.30	30.21	25.47	22.23	19.05	18.31	18.56	18.74	30.53					
2000	Colombia	Puerto Bolivar	Japan	Mizushima	72.42	30.55	26.60	22.77	19.74	16.93	14.82	12.96	12.48	12.72	13.07	21.81					
2000	Brazil	Saã Luiz	Far East	Guangzhou	92.21	38.45	34.05	29.26	24.99	21.10	18.54	16.00	15.33	15.55	15.83	25.81					
2000	South America East	Ponta da Madeira	Far East	Mizushima	88.72	36.76	32.12	27.40	23.36	19.92	17.48	15.14	14.50	14.81	15.23	25.35					
2000	Caribbean Basin	Kingston	North America West	Los Angeles	42.19	20.41	18.13	16.98	15.71	14.61	13.19	11.81	11.69	12.27	12.97	21.84					
2000	Caribbean Basin	Kingston	North America West	Los Angeles	42.19	20.41	18.13	16.98	15.71	14.61	13.19	11.81	11.69	12.27	12.97	21.84					
2000	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.54	14.16	13.91	13.79	12.86	11.98	10.62	9.33	9.23	9.57	9.91	16.55					
2000	Caribbean Basin	Kingston	South America West	Matarani	28.06	15.49	15.09	15.08	14.37	13.24	11.79	10.34	10.19	10.54	10.88	18.14					
2000	Caribbean Basin	Kingston	Far East	Guangzhou	75.61	34.06	31.35	28.09	24.69	21.66	19.00	16.34	15.84	16.26	16.74	27.68					
2000	Caribbean Basin	Kingston	Far East	Guangzhou	75.61	34.06	31.35	28.09	24.69	21.66	19.00	16.34	15.84	16.26	16.74	27.68					
2000	Europe	Rotterdam	West Coast Canada	Los Angeles	69.19	28.83	25.03	21.46	18.87	16.21	14.55	12.84	12.59	13.04	13.47	22.25					
2000	Europe	Rotterdam	West Coast USA	Los Angeles	69.19	28.83	25.03	21.46	18.87	16.21	14.55	12.84	12.59	13.04	13.47	22.25					
2000	Europe	Rotterdam	North America West	Los Angeles	69.19	28.83	25.03	21.46	18.87	16.21	14.55	12.84	12.59	13.04	13.47	22.25					
2000	Europe	Rotterdam	Central America West	Lazaro Cardenas	52.64	22.65	20.86	18.31	16.05	13.61	12.00	10.38	10.14	10.35	10.42	16.98					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	Europe	Rotterdam	South America West	Matarani	55.15	23.97	22.03	19.59	17.55	14.87	13.16	11.39	11.10	11.32	11.39	18.57					
2000	Africa	Durban	North America West	Los Angeles	83.42	34.77	30.37	26.03	22.69	19.62	17.60	15.51	15.21	15.78	16.30	26.85					
2000	Africa	Safi	Central America West	Lazaro Cardenas	48.20	21.07	19.46	17.21	15.08	13.06	11.64	10.19	10.04	10.36	10.48	17.08					
2000	Africa	Safi	Oceania	Auckland	79.32	33.34	30.52	26.32	22.78	19.68	17.62	15.54	15.17	15.52	15.71	25.58					
2000	Middle East	Damman	Central America West	Lazaro Cardenas	84.28	36.06	32.83	28.55	24.65	20.96	18.45	15.90	15.48	15.83	16.02	26.07					
2000	Middle East	Damman	South America West	Matarani	86.80	37.39	34.00	29.83	26.15	22.22	19.61	16.91	16.44	16.81	16.99	27.67					
2000	Middle East	Damman	South America West	Matarani	86.80	37.39	34.00	29.83	26.15	22.22	19.61	16.91	16.44	16.81	16.99	27.67					
2000	North America West	Vancouver	North America East	Philadelphia	58.49	23.75	21.63	19.10	17.15	14.06	12.52	10.51	10.44	10.35	9.80	16.49					
2000	North America West	Vancouver	North America Gulf	New Orleans	55.66	22.91	20.84	18.88	17.16	14.07	12.39	10.52	10.70	10.61	10.05	16.91					
2000	North America West	Vancouver	Central America East	Tampico	47.55	20.15	19.35	17.57	16.20	13.33	11.57	9.75	9.79	9.68	9.15	15.21					
2000	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	67.00	27.09	25.08	22.25	20.10	16.57	14.52	12.33	12.27	12.16	11.55	19.18					
2000	North America West	Vancouver	South America East	Sepetiba, Bahia de	67.00	27.09	25.08	22.25	20.10	16.57	14.52	12.33	12.27	12.16	11.55	19.18					
2000	North America West	Vancouver	Caribbean Basin	San Juan	45.08	20.84	20.40	19.41	18.37	16.05	14.05	11.92	12.08	12.19	11.75	19.91					
2000	West Coast USA	Los Angeles	Europe	Rotterdam	69.25	28.34	26.05	23.06	21.20	17.57	15.77	13.48	13.71	13.87	13.37	22.45					
2000	West Coast Canada	Vancouver	Europe	Rotterdam	69.68	28.33	26.82	23.61	21.38	17.38	15.17	12.70	12.75	12.71	11.97	19.88					
2000	North America West	Vancouver	Europe	Rotterdam	69.68	28.33	26.82	23.61	21.38	17.38	15.17	12.70	12.75	12.71	11.97	19.88					
2000	West Coast Canada	Vancouver	North Africa	Alexandria	78.24	32.11	30.40	26.84	24.19	19.88	17.44	14.67	14.77	14.81	14.01	23.25					
2000	West Coast Canada	Vancouver	South Africa	Durban	85.19	34.90	33.03	29.13	26.21	21.49	18.83	15.80	15.88	15.91	15.05	24.96					
2000	North America West	Vancouver	Africa	Safi	65.97	27.21	25.76	22.79	20.62	17.03	14.99	12.68	12.80	12.89	12.19	20.24					
2000	North America West	Vancouver	Middle East	Aqaba (El Akaba)	81.50	33.42	31.63	27.91	25.14	20.63	18.09	15.20	15.29	15.33	14.50	24.05					
2000	Central America West	Puerto Quetzal	North America East	Philadelphia	36.11	16.01	15.23	14.26	13.44	11.73	10.55	8.86	8.90	8.83	8.35	14.06					
2000	Central America West	Puerto Quetzal	North America East	Philadelphia	36.11	16.01	15.23	14.26	13.44	11.73	10.55	8.86	8.90	8.83	8.35	14.06					
2000	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	33.15	15.09	14.37	13.99	13.41	11.70	10.38	8.85	9.14	9.07	8.58	14.45					
2000	Central America West	Puerto Quetzal	North America Gulf	New Orleans	33.15	15.09	14.37	13.99	13.41	11.70	10.38	8.85	9.14	9.07	8.58	14.45					
2000	Central America West	Puerto Quetzal	Central America East	Tampico	25.06	12.36	12.91	12.70	12.48	10.98	9.58	8.09	8.24	8.14	7.69	12.77					
2000	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	45.20	19.69	19.00	17.70	16.66	14.45	12.72	10.83	10.86	10.77	10.22	16.95					
2000	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.47	13.01	13.93	14.53	14.64	13.70	12.06	10.26	10.53	10.66	10.31	17.50					
2000	Central America West	Puerto Quetzal	Europe	Rotterdam	48.01	21.02	20.81	19.13	18.00	15.29	13.41	11.23	11.37	11.34	10.67	17.69					
2000	Central America West	Puerto Quetzal	Africa	Safi	44.17	19.83	19.69	18.26	17.19	14.92	13.20	11.18	11.41	11.51	10.88	18.04					
2000	Peru	San Nicolas	East Coast USA	Baltimore	43.96	18.63	16.91	15.19	13.71	11.28	9.96	8.34	8.32	8.27	7.86	13.32					
2000	Chile	Antofagasta	East Coast USA	Baltimore	48.10	22.20	20.62	18.80	17.23	14.88	13.47	11.25	11.18	11.13	10.51	17.73					
2000	South America West	Matarani	North America East	Philadelphia	44.50	19.29	18.00	16.78	15.70	12.96	11.77	9.88	9.89	9.79	9.24	15.53					
2000	South America West	Callao	North America East	Philadelphia	41.62	18.13	16.90	15.83	14.85	12.29	11.19	9.41	9.43	9.34	8.81	14.82					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	South America West	San Nicolas	North America Gulf	Mobile	40.23	17.05	15.37	13.81	12.68	10.58	9.32	7.90	7.84	7.79	7.37	12.45					
2000	South America West	Matarani	North America Gulf	South Louisiana	41.62	18.41	17.18	16.54	15.69	12.95	11.62	9.88	10.14	10.04	9.49	15.94					
2000	South America West	Callao	North America Gulf	South Louisiana	38.74	17.25	16.08	15.59	14.85	12.28	11.04	9.41	9.67	9.59	9.06	15.23					
2000	South America West	Callao	Central America East	Tampico	30.64	14.51	14.61	14.29	13.90	11.55	10.23	8.64	8.77	8.66	8.16	13.54					
2000	South America West	Callao	South America East	Puerto La Cruz	35.77	16.50	16.17	15.27	14.71	12.31	11.03	9.20	9.17	9.05	8.52	14.12					
2000	Chile	Antofagasta	Caribbean Basin	Point Lisas	34.44	17.49	16.55	15.24	14.21	12.49	11.23	9.33	9.24	9.20	8.65	14.44					
2000	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.30	13.92	12.83	11.63	10.70	8.89	7.72	6.42	6.38	6.34	6.00	10.03					
2000	South America West	Callao	Caribbean Basin	San Juan	28.12	15.18	15.65	16.12	16.07	14.27	12.71	10.82	11.06	11.18	10.77	18.25					
2000	Peru	Matarani	Europe	Rotterdam	56.00	24.06	23.36	21.45	20.08	16.38	14.51	12.15	12.27	12.22	11.48	19.03					
2000	Chile	Antofagasta	Europe	Rotterdam	59.01	26.66	25.64	23.13	21.28	18.00	16.20	13.48	13.47	13.45	12.61	20.94					
2000	South America West	Callao	Europe	Rotterdam	53.13	22.90	22.27	20.50	19.24	15.71	13.93	11.68	11.80	11.77	11.05	18.32					
2000	South America West	Callao	Africa	Safi	49.36	21.75	21.18	19.66	18.45	15.36	13.74	11.65	11.85	11.94	11.27	18.68					
2000	South America West	Matarani	Middle East	Aqaba (El Akaba)	68.02	29.27	28.29	25.86	23.93	19.72	17.50	14.70	14.86	14.89	14.05	23.28					
2000	Oceania	Newcastle	North America East	Baltimore	86.42	35.37	32.64	28.76	25.68	20.92	18.25	15.21	15.04	14.85	14.06	23.52					
2000	Oceania	Bunbury	North America East	Philadelphia	96.33	39.33	36.33	32.10	28.51	23.14	20.55	17.05	16.92	16.68	15.75	26.25					
2000	Oceania	Newcastle	North America Gulf	Mobile	82.50	33.70	31.02	27.31	24.58	20.17	17.56	14.74	14.53	14.33	13.53	22.59					
2000	Oceania	Bunbury	North America Gulf	South Louisiana	93.26	38.36	35.43	31.77	28.44	23.08	20.35	17.01	17.14	16.90	15.96	26.61					
2000	Oceania	Newcastle	Central America East	Tampico	74.70	31.36	29.94	26.82	24.35	19.84	17.24	14.38	14.27	14.04	13.25	21.91					
2000	Oceania	Bunbury	Central America East	Tampico	85.19	35.63	33.96	30.48	27.50	22.35	19.55	16.25	16.24	15.98	15.08	24.93					
2000	Oceania	Bunbury	Caribbean Basin	San Juan	82.49	36.22	34.92	32.25	29.60	25.02	21.99	18.40	18.52	18.48	17.67	29.62					
2000	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	121.46	50.08	47.33	41.83	37.32	30.35	26.68	22.20	22.23	22.11	20.87	34.52					
2000	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Korea	Guangzhou	East Coast USA	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Far East	Guangzhou	East Coast Canada	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Taiwan	Guangzhou	East Coast USA	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Japan	Kobe	East Coast USA	Philadelphia	88.01	36.11	33.64	30.14	26.89	22.57	20.37	17.46	17.67	17.93	17.46	30.37					
2000	Far East	Guangzhou	North America East	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Far East	Guangzhou	North America East	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Far East	Guangzhou	North America East	Philadelphia	94.23	38.34	35.69	31.49	27.96	22.62	20.06	16.60	16.48	16.31	15.46	25.83					
2000	Far East	Guangzhou	North America Gulf	South Louisiana	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21					
2000	Far East	Guangzhou	North America Gulf	South Louisiana	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21					
2000	Far East	Guangzhou	North America Gulf	New Orleans	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21					
2000	Far East	Guangzhou	North America Gulf	South Louisiana	91.26	37.43	34.84	31.21	27.91	22.59	19.89	16.58	16.71	16.54	15.69	26.21					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	Far East	Guangzhou	Central America East	Tampico	83.18	34.68	33.36	29.90	26.96	21.85	19.08	15.82	15.81	15.62	14.80	24.51					
2000	Far East	Guangzhou	South America East	Puerto La Cruz	88.21	36.61	34.87	30.85	27.73	22.58	19.85	16.36	16.20	15.99	15.14	25.07					
2000	Far East	Guangzhou	Caribbean Basin	San Juan	80.57	35.31	34.35	31.69	29.08	24.53	21.52	17.97	18.09	18.11	17.39	29.19					
2000	South East Asia	Manado	North America East	Philadelphia	93.65	40.48	39.27	36.15	33.55	28.51	27.49	22.58	22.50	22.28	21.09	35.22					
2000	South East Asia	Bangkok	North America Gulf	New Orleans	96.60	39.86	37.57	33.96	30.53	24.88	22.11	18.60	18.97	18.99	17.90	29.85					
2000	South East Asia	Manado	North America Gulf	New Orleans	90.80	39.62	38.47	35.91	33.55	28.51	27.35	22.59	22.75	22.53	21.33	35.63					
2000	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	102.47	41.69	39.03	34.71	31.43	26.14	23.57	19.65	19.56	19.37	18.35	30.43					
2005	North America East	New York	North America West	Los Angeles	56.58	23.95	17.63	15.34	13.56	11.93	10.83	9.60	9.09	9.50	9.95	17.08					
2005	North America East	New York	Central America West	Lazaro Cardenas	40.42	17.90	13.77	12.37	10.89	9.44	8.37	7.20	6.68	6.84	6.94	11.87					
2005	North America East	New York	South America West	Matarani	42.92	19.22	14.90	13.59	12.29	10.63	9.45	8.14	7.54	7.72	7.82	13.35					
2005	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	83.20	34.80	26.06	22.24	19.08	16.06	13.62	11.47	10.41	10.66	10.83	18.38					
2005	North America East	New York	Oceania	Brisbane	78.05	33.07	25.21	21.90	19.03	16.45	14.42	12.45	11.44	11.69	11.86	20.20					
2005	East Coast USA	Norfolk	Taiwan	Kaohsiung	83.75	34.91	26.09	22.37	19.43	16.64	14.10	12.04	10.95	11.18	11.34	19.31					
2005	East Coast USA	Norfolk	Korea	Kwangyang	79.68	33.33	24.94	21.43	18.67	16.07	13.65	11.73	10.69	10.93	11.07	18.84					
2005	East Coast USA	Norfolk	Japan	Mizushima	82.63	34.42	25.69	22.17	19.30	16.77	14.44	12.58	11.63	12.00	12.35	21.44					
2005	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	80.06	33.45	24.99	21.32	18.43	15.65	13.22	11.19	10.16	10.40	10.54	17.86					
2005	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	83.01	34.54	25.74	22.05	19.06	16.35	14.01	12.04	11.10	11.47	11.83	20.46					
2005	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	83.04	34.94	26.21	22.50	19.39	16.39	13.97	11.78	10.79	11.09	11.30	19.12					
2005	North America East	New York	Far East	Guangzhou	87.40	36.71	27.71	23.90	20.54	17.41	15.11	12.83	11.74	12.03	12.25	20.84					
2005	North America East	New York	Far East	Guangzhou	87.40	36.71	27.71	23.90	20.54	17.41	15.11	12.83	11.74	12.03	12.25	20.84					
2005	North America Gulf	Tampa	North America West	Los Angeles	52.32	22.34	16.38	14.63	13.12	11.57	10.41	9.35	9.04	9.45	9.91	17.04					
2005	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.23	16.34	12.56	11.69	10.47	9.10	7.97	6.97	6.64	6.80	6.90	11.84					
2005	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.23	16.34	12.56	11.69	10.47	9.10	7.97	6.97	6.64	6.80	6.90	11.84					
2005	North America Gulf	Tampa	South America West	Matarani	38.72	17.66	13.68	12.91	11.87	10.28	9.04	7.91	7.50	7.69	7.78	13.31					
2005	North America Gulf	Tampa	South America West	Matarani	38.72	17.66	13.68	12.91	11.87	10.28	9.04	7.91	7.50	7.69	7.78	13.31					
2005	North America Gulf	Tampa	Oceania	Auckland	66.05	28.27	21.64	19.24	16.92	14.71	12.90	11.36	10.61	10.86	11.02	18.81					
2005	North America Gulf	Tampa	Oceania	Auckland	66.05	28.27	21.64	19.24	16.92	14.71	12.90	11.36	10.61	10.86	11.02	18.81					
2005	North America Gulf	Mobile	Far East	Osaka	79.06	32.64	24.32	20.98	18.29	15.94	13.74	12.02	11.13	11.49	11.84	20.58					
2005	North America Gulf	Tampa	Far East	Guangzhou	82.73	34.75	26.17	22.94	19.89	16.88	14.55	12.47	11.60	11.89	12.12	20.65					
2005	North America Gulf	Tampa	Far East	Guangzhou	82.73	34.75	26.17	22.94	19.89	16.88	14.55	12.47	11.60	11.89	12.12	20.65					
2005	North America Gulf	Tampa	South East Asia	Bangkok	89.90	38.34	29.17	25.84	22.52	19.25	16.71	14.43	13.55	14.06	14.21	24.21					
2005	Central America East	Puerto Limon	North America West	Los Angeles	38.19	17.75	13.48	12.24	11.27	10.01	8.89	7.92	7.51	7.89	8.32	14.23					
2005	Central America East	Puerto Limon	South America West	Matarani	24.42	12.90	10.69	10.47	10.02	8.70	7.51	6.46	5.95	6.12	6.19	10.52					

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					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	Central America East	Puerto Limon	South America West	Matarani	24.42	12.90	10.69	10.47	10.02	8.70	7.51	6.46	5.95	6.12	6.19	10.52					
2005	Central America East	Puerto Limon	Far East	Guangzhou	69.69	31.54	24.38	21.53	18.84	15.95	13.55	11.42	10.37	10.63	10.82	18.31					
2005	Central America East	Puerto Limon	South East Asia	Jakarta	79.31	38.81	31.06	28.65	26.18	23.25	21.64	17.98	16.28	16.74	17.03	28.97					
2005	South America East	Santos	North America West	Los Angeles	66.67	28.21	20.81	18.20	16.16	14.23	12.59	11.21	10.50	10.96	11.48	19.52					
2005	Other South America East	Buenos Aires	West Coast USA	Los Angeles	77.73	32.63	24.10	21.06	18.72	16.40	14.37	12.65	11.92	12.41	12.81	21.72					
2005	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	52.37	21.93	16.08	13.96	12.53	10.92	9.60	8.50	8.02	8.37	8.80	15.00					
2005	South America East	Buenos Aires	West Coast Canada	Los Angeles	77.73	32.63	24.10	21.06	18.72	16.40	14.37	12.65	11.92	12.41	12.81	21.72					
2005	Brazil	Santos	West Coast USA	Los Angeles	66.67	28.21	20.81	18.20	16.16	14.23	12.59	11.21	10.50	10.96	11.48	19.52					
2005	South America East	Ponta da Madeira	North America West	Los Angeles	55.94	23.80	17.49	15.19	13.45	11.86	10.52	9.33	8.74	9.18	9.69	16.52					
2005	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	31.87	13.98	10.77	9.72	8.92	7.76	6.55	5.69	5.20	5.30	5.34	9.01					
2005	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	24.21	11.76	9.10	8.40	7.75	6.85	5.85	5.12	4.75	4.87	4.94	8.40					
2005	South America East	Puerto Bolivar	South America West	Huasco	29.96	15.87	12.49	11.35	10.46	9.73	8.73	7.53	6.98	7.17	7.22	12.12					
2005	South America East	Puerto La Cruz	South America West	Matarani	34.37	15.31	11.90	10.94	10.33	8.95	7.63	6.63	6.07	6.18	6.23	10.49					
2005	South America East	Santos	Oceania	Brisbane	89.04	37.76	28.78	25.09	21.91	18.98	16.38	14.24	13.03	13.33	13.56	22.93					
2005	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	81.13	33.61	25.17	21.54	18.71	15.76	13.20	11.13	10.06	10.24	10.37	17.51					
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	79.97	33.49	25.22	21.76	18.88	15.91	13.49	11.40	10.42	10.66	10.84	18.28					
2005	Venezuela	Puerto Ordaz	Korea	Kwangyang	76.92	31.96	23.96	20.55	17.90	15.14	12.72	10.79	9.77	9.96	10.07	17.00					
2005	Venezuela	Puerto Ordaz	Japan	Mizushima	79.84	33.04	24.70	21.27	18.52	15.84	13.50	11.64	10.71	11.02	11.35	19.59					
2005	North Brazil	Ponta da Madeira	Korea	Kwangyang	80.49	33.84	25.37	21.78	18.81	16.07	13.64	11.62	10.50	10.76	10.95	18.52					
2005	North Brazil	Ponta da Madeira	Japan	Mizushima	83.41	34.92	26.11	22.50	19.44	16.77	14.42	12.46	11.43	11.83	12.23	21.11					
2005	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	83.55	35.36	26.63	22.99	19.79	16.84	14.41	12.23	11.14	11.47	11.73	19.80					
2005	Venezuela	Puerto Ordaz	Japan	Shimizu	79.76	33.54	25.46	22.31	19.47	17.18	14.90	13.29	12.31	12.98	13.68	24.37					
2005	North Brazil	Saã Luiz	Japan	Shimizu	81.67	34.65	26.29	23.22	20.24	18.10	15.90	14.34	13.30	14.05	14.81	26.29					
2005	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	99.15	41.81	31.60	27.22	23.38	19.80	16.87	14.28	12.97	13.31	13.60	22.99					
2005	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	86.29	36.37	27.49	23.87	20.66	17.64	15.15	13.02	11.88	12.20	12.46	21.05					
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	80.80	33.72	25.42	21.89	19.12	16.19	13.68	11.64	10.58	10.81	10.97	18.46					
2005	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	105.65	44.26	33.39	28.97	25.14	21.41	18.26	15.57	14.30	14.67	14.82	24.98					
2005	Colombia	Puerto Bolivar	Japan	Mizushima	68.06	29.04	21.68	18.77	16.49	14.32	12.27	10.70	9.89	10.22	10.55	18.26					
2005	Brazil	Saã Luiz	Far East	Guangzhou	86.29	36.37	27.49	23.87	20.66	17.64	15.15	13.02	11.88	12.20	12.46	21.05					
2005	South America East	Ponta da Madeira	Far East	Mizushima	83.41	34.92	26.11	22.50	19.44	16.77	14.42	12.46	11.43	11.83	12.23	21.11					
2005	Caribbean Basin	Kingston	North America West	Los Angeles	40.77	20.07	15.51	14.66	13.76	12.94	11.44	10.20	9.69	10.29	10.93	19.01					
2005	Caribbean Basin	Kingston	North America West	Los Angeles	40.77	20.07	15.51	14.66	13.76	12.94	11.44	10.20	9.69	10.29	10.93	19.01					
2005	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	24.56	13.99	11.63	11.67	11.07	10.43	8.96	7.80	7.26	7.62	7.91	13.79					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	Caribbean Basin	Kingston	South America West	Matarani	27.06	15.31	12.76	12.89	12.48	11.62	10.05	8.74	8.13	8.51	8.79	15.26					
2005	Caribbean Basin	Kingston	Far East	Guangzhou	71.85	32.96	25.70	23.33	20.83	18.48	15.78	13.48	12.39	12.88	13.28	22.85					
2005	Caribbean Basin	Kingston	Far East	Guangzhou	71.85	32.96	25.70	23.33	20.83	18.48	15.78	13.48	12.39	12.88	13.28	22.85					
2005	Europe	Rotterdam	West Coast Canada	Los Angeles	66.63	28.08	21.10	18.31	16.33	14.19	12.52	11.06	10.48	10.98	11.40	19.40					
2005	Europe	Rotterdam	West Coast USA	Los Angeles	66.63	28.08	21.10	18.31	16.33	14.19	12.52	11.06	10.48	10.98	11.40	19.40					
2005	Europe	Rotterdam	North America West	Los Angeles	66.63	28.08	21.10	18.31	16.33	14.19	12.52	11.06	10.48	10.98	11.40	19.40					
2005	Europe	Rotterdam	Central America West	Lazaro Cardenas	50.45	22.04	17.24	15.33	13.65	11.70	10.06	8.66	8.06	8.32	8.38	14.18					
2005	Europe	Rotterdam	South America West	Matarani	52.95	23.36	18.37	16.55	15.05	12.88	11.13	9.59	8.92	9.20	9.26	15.65					
2005	Africa	Durban	North America West	Los Angeles	82.05	35.02	26.25	22.79	20.12	17.56	15.42	13.52	12.71	13.35	13.86	23.59					
2005	Africa	Safi	Central America West	Lazaro Cardenas	47.38	21.30	16.60	14.87	13.22	11.55	10.00	8.68	8.08	8.43	8.55	14.52					
2005	Africa	Safi	Oceania	Auckland	77.87	33.62	26.01	22.72	19.92	17.36	15.11	13.21	12.19	12.63	12.81	21.72					
2005	Middle East	Damman	Central America West	Lazaro Cardenas	79.79	34.69	26.70	23.49	20.59	17.70	15.15	12.96	11.96	12.38	12.55	21.27					
2005	Middle East	Damman	South America West	Matarani	82.29	36.02	27.83	24.71	22.00	18.88	16.24	13.90	12.82	13.26	13.44	22.75					
2005	Middle East	Damman	South America West	Matarani	82.29	36.02	27.83	24.71	22.00	18.88	16.24	13.90	12.82	13.26	13.44	22.75					
2005	North America West	Vancouver	North America East	Philadelphia	56.09	23.06	18.32	16.35	14.84	12.28	10.71	8.95	8.56	8.58	8.14	14.15					
2005	North America West	Vancouver	North America Gulf	New Orleans	53.47	22.30	17.69	16.19	14.87	12.31	10.62	8.97	8.75	8.78	8.33	14.50					
2005	North America West	Vancouver	Central America East	Tampico	45.34	19.55	16.00	14.70	13.77	11.44	9.66	8.08	7.71	7.72	7.32	12.65					
2005	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	63.74	26.13	20.66	18.53	16.97	14.14	12.09	10.21	9.67	9.71	9.25	15.94					
2005	North America West	Vancouver	South America East	Sepetiba, Bahia de	63.74	26.13	20.66	18.53	16.97	14.14	12.09	10.21	9.67	9.71	9.25	15.94					
2005	North America West	Vancouver	Caribbean Basin	San Juan	43.05	20.35	16.97	16.34	15.70	13.87	11.80	9.93	9.53	9.73	9.40	16.59					
2005	West Coast USA	Los Angeles	Europe	Rotterdam	66.19	27.45	21.85	19.56	18.25	15.29	13.50	11.54	11.33	11.60	11.24	19.45					
2005	West Coast Canada	Vancouver	Europe	Rotterdam	66.20	27.31	22.08	19.67	18.06	14.82	12.62	10.53	10.09	10.18	9.60	16.53					
2005	North America West	Vancouver	Europe	Rotterdam	66.20	27.31	22.08	19.67	18.06	14.82	12.62	10.53	10.09	10.18	9.60	16.53					
2005	West Coast Canada	Vancouver	North Africa	Alexandria	74.27	30.97	24.87	22.20	20.30	16.84	14.39	12.03	11.50	11.68	11.07	19.11					
2005	West Coast Canada	Vancouver	South Africa	Durban	80.82	33.62	26.99	24.06	21.96	18.18	15.51	12.93	12.34	12.52	11.87	20.48					
2005	North America West	Vancouver	Africa	Safi	62.71	26.28	21.15	18.92	17.36	14.48	12.41	10.43	10.01	10.20	9.67	16.71					
2005	North America West	Vancouver	Middle East	Aqaba (El Akaba)	77.34	32.21	25.86	23.08	21.08	17.47	14.92	12.45	11.90	12.07	11.45	19.75					
2005	Central America West	Puerto Quetzal	North America East	Philadelphia	35.04	16.01	13.39	12.67	12.08	10.60	9.31	7.75	7.43	7.45	7.06	12.31					
2005	Central America West	Puerto Quetzal	North America East	Philadelphia	35.04	16.01	13.39	12.67	12.08	10.60	9.31	7.75	7.43	7.45	7.06	12.31					
2005	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	32.28	15.16	12.69	12.46	12.08	10.60	9.18	7.74	7.60	7.63	7.24	12.65					
2005	Central America West	Puerto Quetzal	North America Gulf	New Orleans	32.28	15.16	12.69	12.46	12.08	10.60	9.18	7.74	7.60	7.63	7.24	12.65					
2005	Central America West	Puerto Quetzal	Central America East	Tampico	24.17	12.46	11.05	11.03	11.03	9.77	8.26	6.87	6.57	6.59	6.25	10.82					
2005	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	43.35	19.57	16.17	15.26	14.58	12.75	10.93	9.19	8.70	8.75	8.33	14.36					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	21.75	13.22	12.01	12.70	13.01	12.25	10.43	8.74	8.40	8.63	8.37	14.87					
2005	Central America West	Puerto Quetzal	Europe	Rotterdam	45.97	20.87	17.71	16.50	15.76	13.49	11.51	9.54	9.16	9.25	8.71	15.00					
2005	Central America West	Puerto Quetzal	Africa	Safi	42.33	19.77	16.70	15.70	15.01	13.13	11.28	9.43	9.06	9.26	8.78	15.18					
2005	Peru	San Nicolas	East Coast USA	Baltimore	42.60	18.30	14.68	13.34	12.18	10.11	8.78	7.33	7.06	7.08	6.73	11.72					
2005	Chile	Antofagasta	East Coast USA	Baltimore	46.54	21.83	18.06	16.68	15.48	13.55	12.14	10.09	9.75	9.78	9.23	15.93					
2005	South America West	Matarani	North America East	Philadelphia	43.05	18.93	15.57	14.66	13.86	11.55	10.27	8.58	8.25	8.26	7.80	13.53					
2005	South America West	Callao	North America East	Philadelphia	40.33	17.82	14.68	13.88	13.16	10.99	9.80	8.20	7.90	7.90	7.47	12.95					
2005	South America West	San Nicolas	North America Gulf	Mobile	39.06	16.78	13.43	12.21	11.32	9.53	8.26	6.97	6.69	6.70	6.34	11.02					
2005	South America West	Matarani	North America Gulf	South Louisiana	40.36	18.13	14.91	14.48	13.88	11.56	10.16	8.59	8.43	8.45	7.99	13.87					
2005	South America West	Callao	North America Gulf	South Louisiana	37.64	17.02	14.02	13.69	13.18	11.00	9.69	8.21	8.08	8.09	7.65	13.30					
2005	South America West	Callao	Central America East	Tampico	29.52	14.28	12.34	12.22	12.08	10.14	8.74	7.32	7.04	7.04	6.64	11.45					
2005	South America West	Callao	South America East	Puerto La Cruz	34.81	16.39	13.82	13.20	12.90	10.88	9.49	7.85	7.42	7.41	6.98	12.01					
2005	Chile	Antofagasta	Caribbean Basin	Point Lisas	33.16	17.19	14.35	13.42	12.72	11.35	10.08	8.33	8.00	8.02	7.54	12.88					
2005	Peru	San Nicolas	Caribbean Basin	Point Lisas	29.21	13.67	10.97	10.09	9.42	7.92	6.73	5.57	5.31	5.32	5.04	8.67					
2005	South America West	Callao	Caribbean Basin	San Juan	27.16	15.05	13.29	13.85	14.00	12.56	10.87	9.17	8.85	9.05	8.73	15.40					
2005	Peru	Matarani	Europe	Rotterdam	53.55	23.40	19.54	18.17	17.25	14.22	12.29	10.25	9.87	9.94	9.34	16.04					
2005	Chile	Antofagasta	Europe	Rotterdam	56.44	25.97	21.74	19.90	18.59	15.95	14.15	11.72	11.30	11.38	10.67	18.21					
2005	South America West	Callao	Europe	Rotterdam	50.83	22.29	18.65	17.39	16.55	13.65	11.82	9.87	9.52	9.59	9.01	15.47					
2005	South America West	Callao	Africa	Safi	47.27	21.23	17.68	16.61	15.82	13.30	11.60	9.76	9.42	9.60	9.07	15.63					
2005	South America West	Matarani	Middle East	Aqaba (El Akaba)	64.93	28.45	23.46	21.70	20.38	16.96	14.66	12.23	11.73	11.89	11.24	19.36					
2005	Oceania	Newcastle	North America East	Baltimore	82.65	34.19	27.46	24.43	22.06	18.13	15.50	12.87	12.22	12.18	11.55	19.95					
2005	Oceania	Bunbury	North America East	Philadelphia	91.94	37.93	30.46	27.18	24.42	19.99	17.39	14.37	13.69	13.62	12.88	22.19					
2005	Oceania	Newcastle	North America Gulf	Mobile	78.94	32.59	26.13	23.23	21.14	17.50	14.94	12.48	11.82	11.77	11.14	19.20					
2005	Oceania	Bunbury	North America Gulf	South Louisiana	89.07	37.04	29.73	26.92	24.37	19.96	17.23	14.34	13.84	13.78	13.04	22.48					
2005	Oceania	Newcastle	Central America East	Tampico	71.10	30.26	24.76	22.43	20.65	16.98	14.39	11.93	11.28	11.22	10.60	18.18					
2005	Oceania	Bunbury	Central America East	Tampico	80.97	34.31	28.05	25.45	23.28	19.10	16.29	13.46	12.81	12.74	12.04	20.64					
2005	Oceania	Bunbury	Caribbean Basin	San Juan	78.46	35.00	28.92	27.00	25.13	21.47	18.37	15.27	14.60	14.73	14.11	24.57					
2005	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	115.30	48.12	38.97	34.80	31.44	25.81	22.14	18.31	17.47	17.56	16.61	28.49					
2005	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Korea	Guangzhou	East Coast USA	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Far East	Guangzhou	East Coast Canada	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Taiwan	Guangzhou	East Coast USA	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Japan	Kobe	East Coast USA	Philadelphia	83.99	34.90	28.21	25.54	23.05	19.56	17.30	14.77	14.35	14.71	14.37	25.89					

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					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	Far East	Guangzhou	North America East	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Far East	Guangzhou	North America East	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Far East	Guangzhou	North America East	Philadelphia	89.71	36.96	29.74	26.52	23.83	19.46	16.91	13.93	13.28	13.28	12.62	21.77					
2005	Far East	Guangzhou	North America Gulf	South Louisiana	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09					
2005	Far East	Guangzhou	North America Gulf	South Louisiana	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09					
2005	Far East	Guangzhou	North America Gulf	New Orleans	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09					
2005	Far East	Guangzhou	North America Gulf	South Louisiana	86.95	36.13	29.05	26.30	23.82	19.46	16.78	13.93	13.45	13.45	12.79	22.09					
2005	Far East	Guangzhou	Central America East	Tampico	78.83	33.39	27.36	24.82	22.72	18.59	15.83	13.04	12.41	12.41	11.78	20.24					
2005	Far East	Guangzhou	South America East	Puerto La Cruz	84.05	35.46	28.80	25.77	23.50	19.31	16.56	13.56	12.78	12.76	12.11	20.79					
2005	Far East	Guangzhou	Caribbean Basin	San Juan	76.42	34.13	28.27	26.40	24.59	20.98	17.93	14.86	14.21	14.40	13.85	24.17					
2005	South East Asia	Manado	North America East	Philadelphia	89.12	39.10	32.39	30.19	28.45	24.50	23.15	18.90	17.98	18.02	17.10	29.63					
2005	South East Asia	Bangkok	North America Gulf	New Orleans	91.81	38.32	30.95	28.29	25.77	21.23	18.45	15.44	15.05	15.24	14.38	24.89					
2005	South East Asia	Manado	North America Gulf	New Orleans	86.48	38.32	31.76	30.02	28.48	24.53	23.04	18.91	18.17	18.21	17.28	29.98					
2005	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	96.93	39.87	31.69	28.54	26.26	22.14	19.63	16.28	15.49	15.52	14.74	25.32					
2010	North America East	New York	North America West	Los Angeles	57.17	24.22	17.83	15.52	13.71	12.05	10.93	9.68	8.37	8.38	8.00	8.19					
2010	North America East	New York	Central America West	Lazaro Cardenas	40.89	18.13	13.94	12.53	11.02	9.55	8.46	7.28	6.16	6.05	5.59	5.70					
2010	North America East	New York	South America West	Matarani	43.39	19.45	15.07	13.75	12.43	10.74	9.55	8.22	6.95	6.83	6.30	6.41					
2010	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	84.46	35.39	26.51	22.63	19.40	16.32	13.84	11.65	9.65	9.47	8.77	8.88	8.51	8.47	7.80	7.67	7.50
2010	North America East	New York	Oceania	Brisbane	79.12	33.58	25.60	22.24	19.31	16.69	14.62	12.62	10.58	10.37	9.58	9.74					
2010	East Coast USA	Norfolk	Taiwan	Kaohsiung	84.94	35.46	26.51	22.73	19.74	16.90	12.51	12.21	10.14	9.92	9.17	9.31	8.86	8.94	8.31	8.40	8.23
2010	East Coast USA	Norfolk	Korea	Kwangyang	80.80	33.85	25.34	21.77	18.95	16.30	13.84	11.89	9.89	9.70	8.94	8.18	8.68	8.77	8.19	8.31	8.14
2010	East Coast USA	Norfolk	Japan	Mizushima	83.73	34.93	26.08	22.50	19.58	17.01	14.63	12.74	10.75	10.63	9.97	10.31	9.74	9.88	9.37	9.56	9.41
2010	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	81.29	34.02	25.42	21.69	18.74	15.91	13.43	11.36	9.42	9.25	8.53	8.62	8.24	8.26	7.60	7.58	7.41
2010	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	84.23	35.10	26.17	22.42	19.37	16.61	14.22	12.21	10.28	10.19	9.56	9.86	9.31	9.37	8.79	8.83	8.68
2010	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	84.32	35.53	26.67	22.89	19.71	16.66	14.19	11.96	10.00	9.86	9.14	9.23	8.89	8.87	8.22	8.11	7.95
2010	North America East	New York	Far East	Guangzhou	88.64	37.29	28.14	24.28	20.86	17.67	15.33	13.00	10.86	10.68	9.90	10.04					
2010	North America East	New York	Far East	Guangzhou	88.64	37.29	28.14	24.28	20.86	17.67	15.33	13.00	10.86	10.68	9.90	10.04					
2010	North America Gulf	Tampa	North America West	Los Angeles	52.82	22.57	16.56	14.79	13.25	11.68	10.51	9.43	8.31	8.34	7.96	8.16					
2010	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.62	16.53	12.71	11.83	10.58	9.20	8.05	7.04	6.12	6.01	5.56	5.69					
2010	North America Gulf	Tampa	Central America West	Lazaro Cardenas	36.62	16.53	12.71	11.83	10.58	9.20	8.05	7.04	6.12	6.01	5.56	5.69					
2010	North America Gulf	Tampa	South America West	Matarani	39.12	17.85	13.83	13.05	11.99	10.39	9.13	7.98	6.91	6.79	6.26	6.39					
2010	North America Gulf	Tampa	South America West	Matarani	39.12	17.85	13.83	13.05	11.99	10.39	9.13	7.98	6.91	6.79	6.26	6.39					
2010	North America Gulf	Tampa	Oceania	Auckland	66.91	28.67	21.95	19.51	17.16	14.90	13.06	11.50	9.81	9.62	8.89	9.06					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	North America Gulf	Tampa	Oceania	Auckland	66.91	28.67	21.95	19.51	17.16	14.90	13.06	11.50	9.81	9.62	8.89	9.06					
2010	North America Gulf	Mobile	Far East	Osaka	80.09	33.11	24.68	21.28	18.55	16.15	13.92	12.17	10.28	10.18	9.55	9.90	9.37	9.51	9.03	9.22	9.07
2010	North America Gulf	Tampa	Far East	Guangzhou	83.88	35.27	26.57	23.29	20.18	17.12	14.75	12.64	10.72	10.55	9.79	9.94					
2010	North America Gulf	Tampa	Far East	Guangzhou	83.88	35.27	26.57	23.29	20.18	17.12	14.75	12.64	10.72	10.55	9.79	9.94					
2010	North America Gulf	Tampa	South East Asia	Bangkok	91.17	38.93	29.62	26.24	22.85	19.52	16.94	14.62	12.53	12.47	11.48	11.66					
2010	Central America East	Puerto Limon	North America West	Los Angeles	38.62	17.98	13.66	12.39	11.41	10.12	8.99	8.00	6.92	6.97	6.69	6.83					
2010	Central America East	Puerto Limon	South America West	Matarani	24.74	13.09	10.84	10.61	10.14	8.80	7.59	6.53	5.49	5.42	4.99	5.06					
2010	Central America East	Puerto Limon	South America West	Matarani	24.74	13.09	10.84	10.61	10.14	8.80	7.59	6.53	5.49	5.42	4.99	5.06					
2010	Central America East	Puerto Limon	Far East	Guangzhou	70.80	32.10	24.82	21.91	19.16	16.21	13.77	11.60	9.61	9.45	8.76	8.84					
2010	Central America East	Puerto Limon	South East Asia	Jakarta	80.59	39.50	31.61	29.15	26.61	23.61	21.94	18.23	15.07	14.86	13.76	13.96					
2010	South America East	Santos	North America West	Los Angeles	67.56	28.62	21.13	18.47	16.39	14.42	12.75	11.35	9.70	9.71	9.25	9.39					
2010	Other South America East	Buenos Aires	West Coast USA	Los Angeles	78.71	33.09	24.45	21.37	18.98	16.62	14.55	12.80	11.00	10.98	10.32	10.44					
2010	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	52.95	22.20	16.29	14.14	12.69	11.05	9.71	8.59	7.39	7.40	7.08	7.20					
2010	South America East	Buenos Aires	West Coast Canada	Los Angeles	78.71	33.09	24.45	21.37	18.98	16.62	14.55	12.80	11.00	10.98	10.32	10.44					
2010	Brazil	Santos	West Coast USA	Los Angeles	67.56	28.62	21.13	18.47	16.39	14.42	12.75	11.35	9.70	9.71	9.25	9.39					
2010	South America East	Ponta da Madeira	North America West	Los Angeles	56.63	24.13	17.74	15.40	13.62	12.01	10.64	9.43	8.06	8.12	7.80	7.93					
2010	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	32.26	14.17	10.92	9.85	9.03	7.86	6.63	5.76	4.80	4.69	4.31	4.34					
2010	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	24.55	11.93	9.24	8.52	7.86	6.94	5.92	5.19	4.38	4.31	3.99	4.04					
2010	South America East	Puerto Bolivar	South America West	Huasco	30.36	16.06	12.63	11.48	10.56	9.82	8.80	7.59	6.42	6.33	5.80	5.81	5.44	5.57	5.47	5.68	5.62
2010	South America East	Puerto La Cruz	South America West	Matarani	34.77	15.50	12.06	11.08	10.45	9.05	7.72	6.70	5.60	5.48	5.02	5.04					
2010	South America East	Santos	Oceania	Brisbane	90.44	38.42	29.29	25.54	22.28	19.30	16.65	14.46	12.08	11.85	10.98	11.07					
2010	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	82.37	34.19	25.62	21.92	19.03	16.02	13.42	11.31	9.33	9.11	8.40	8.46	8.08	8.07	7.41	7.36	7.19
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	81.18	34.05	25.65	22.13	19.19	16.16	13.70	11.58	9.65	9.48	8.77	8.83	8.53	8.51	7.89	7.80	7.64
2010	Venezuela	Puerto Ordaz	Korea	Kwangyang	78.07	32.50	24.38	20.90	18.20	15.39	12.92	10.96	9.06	8.85	8.16	8.21	7.87	7.88	7.27	7.25	7.09
2010	Venezuela	Puerto Ordaz	Japan	Mizushima	80.98	33.57	25.11	21.62	18.82	16.08	13.70	11.81	9.91	9.79	9.17	9.44	8.93	8.99	8.45	8.50	8.35
2010	North Brazil	Ponta da Madeira	Korea	Kwangyang	81.75	34.42	25.82	22.17	19.14	16.35	13.86	11.80	9.73	9.57	8.87	8.94	8.57	8.59	7.96	7.94	7.78
2010	North Brazil	Ponta da Madeira	Japan	Mizushima	84.66	35.50	26.55	22.89	19.76	17.04	14.64	12.65	10.59	10.51	9.89	10.18	9.63	9.70	9.14	9.19	9.04
2010	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	84.86	35.97	27.10	23.39	20.13	17.12	14.64	12.41	10.33	10.20	9.49	9.56	9.23	9.22	8.58	8.49	8.32
2010	Venezuela	Puerto Ordaz	Japan	Shimizu	80.85	34.06	25.87	22.66	19.77	17.43	15.11	13.46	11.38	11.51	11.04	11.73					
2010	North Brazil	Saã Luiz	Japan	Shimizu	82.86	35.21	26.73	23.60	20.57	18.38	16.13	14.54	12.30	12.46	11.96	12.66					
2010	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	100.73	42.54	32.16	27.70	23.79	20.13	17.15	14.51	12.03	11.84	11.02	11.11					
2010	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	87.66	37.01	27.98	24.29	21.02	17.94	15.40	13.22	11.02	10.85	10.09	10.16					
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	82.02	34.28	25.85	22.26	19.43	16.45	13.90	11.81	9.80	9.61	8.87	8.91					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	107.26	45.01	33.97	29.47	25.56	21.76	18.55	15.80	13.25	13.03	12.00	12.06					
2010	Colombia	Puerto Bolivar	Japan	Mizushima	69.08	29.51	22.04	19.08	16.76	14.54	12.45	10.85	9.15	9.07	8.52	8.80	8.31	8.45	8.01	8.19	8.06
2010	Brazil	Saã Luiz	Far East	Guangzhou	87.66	37.01	27.98	24.29	21.02	17.94	15.40	13.22	11.02	10.85	10.09	10.16					
2010	South America East	Ponta da Madeira	Far East	Mizushima	84.66	35.50	26.55	22.89	19.76	17.04	14.64	12.65	10.59	10.51	9.89	10.18	9.63	9.70	9.14	9.19	9.04
2010	Caribbean Basin	Kingston	North America West	Los Angeles	41.23	20.31	15.70	14.84	13.92	13.08	11.55	10.30	8.92	9.09	8.79	9.12					
2010	Caribbean Basin	Kingston	North America West	Los Angeles	41.23	20.31	15.70	14.84	13.92	13.08	11.55	10.30	8.92	9.09	8.79	9.12					
2010	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	24.90	14.19	11.79	11.83	11.21	10.56	9.07	7.89	6.71	6.75	6.38	6.63					
2010	Caribbean Basin	Kingston	South America West	Matarani	27.41	15.51	12.92	13.05	12.63	11.75	10.15	8.83	7.50	7.53	7.08	7.34					
2010	Caribbean Basin	Kingston	Far East	Guangzhou	72.97	33.51	26.13	23.71	21.16	18.76	16.01	13.67	11.47	11.43	10.74	11.02					
2010	Caribbean Basin	Kingston	Far East	Guangzhou	72.97	33.51	26.13	23.71	21.16	18.76	16.01	13.67	11.47	11.43	10.74	11.02					
2010	Europe	Rotterdam	West Coast Canada	Los Angeles	67.50	28.48	21.41	18.57	16.55	14.38	12.68	11.18	9.67	9.72	9.19	9.32					
2010	Europe	Rotterdam	West Coast USA	Los Angeles	67.50	28.48	21.41	18.57	16.55	14.38	12.68	11.18	9.67	9.72	9.19	9.32					
2010	Europe	Rotterdam	North America West	Los Angeles	67.50	28.48	21.41	18.57	16.55	14.38	12.68	11.18	9.67	9.72	9.19	9.32					
2010	Europe	Rotterdam	Central America West	Lazaro Cardenas	51.21	22.40	17.52	15.57	13.85	11.87	10.20	8.78	7.45	7.38	6.77	6.83					
2010	Europe	Rotterdam	South America West	Matarani	53.72	23.72	18.65	16.80	15.26	13.06	11.28	9.72	8.25	8.16	7.48	7.54					
2010	Africa	Durban	North America West	Los Angeles	83.21	35.57	26.66	23.14	20.43	17.82	15.63	13.70	11.75	11.83	11.18	11.36					
2010	Africa	Safi	Central America West	Lazaro Cardenas	48.10	21.65	16.88	15.12	13.43	11.73	10.15	8.80	7.48	7.49	6.91	7.00					
2010	Africa	Safi	Oceania	Auckland	79.08	34.19	26.46	23.11	20.26	17.64	15.34	13.41	11.30	11.22	10.36	10.48					
2010	Middle East	Damman	Central America West	Lazaro Cardenas	81.07	35.30	27.17	23.90	20.94	17.99	15.39	13.16	11.08	11.00	10.16	10.27					
2010	Middle East	Damman	South America West	Matarani	83.58	36.62	28.30	25.12	22.35	19.18	16.48	14.11	11.88	11.78	10.87	10.98					
2010	Middle East	Damman	South America West	Matarani	83.58	36.62	28.30	25.12	22.35	19.18	16.48	14.11	11.88	11.78	10.87	10.98					
2010	North America West	Vancouver	North America East	Philadelphia	56.78	23.38	18.57	16.57	15.03	12.44	10.84	9.06	7.62	7.50	6.94	7.08					
2010	North America West	Vancouver	North America Gulf	New Orleans	54.12	22.59	17.93	16.40	15.07	12.47	10.74	9.08	7.79	7.67	7.11	7.25					
2010	North America West	Vancouver	Central America East	Tampico	46.00	19.86	16.25	14.93	13.98	11.61	9.80	8.19	6.88	6.76	6.26	6.34	6.04	5.88	5.43	5.46	5.35
2010	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	64.67	26.55	21.00	18.83	17.23	14.35	12.27	10.36	8.63	8.51	7.91	7.99	7.57	7.37	6.82	6.82	6.69
2010	North America West	Vancouver	South America East	Sepetiba, Bahia de	64.67	26.55	21.00	18.83	17.23	14.35	12.27	10.36	8.63	8.51	7.91	7.99	7.57	7.37	6.82	6.82	6.69
2010	North America West	Vancouver	Caribbean Basin	San Juan	43.66	20.65	17.22	16.58	15.92	14.06	11.95	10.05	8.49	8.52	8.03	8.31					
2010	West Coast USA	Los Angeles	Europe	Rotterdam	67.06	27.84	22.17	19.85	18.50	15.49	13.66	11.68	10.08	10.13	9.58	9.72					
2010	West Coast Canada	Vancouver	Europe	Rotterdam	67.19	27.75	22.44	19.99	18.34	15.04	12.81	10.68	9.01	8.92	8.21	8.29	7.91	7.70	7.14	7.15	7.01
2010	North America West	Vancouver	Europe	Rotterdam	67.19	27.75	22.44	19.99	18.34	15.04	12.81	10.68	9.01	8.92	8.21	8.29	7.91	7.70	7.14	7.15	7.01
2010	West Coast Canada	Vancouver	North Africa	Alexandria	75.40	31.49	25.29	22.58	20.63	17.11	14.61	12.21	10.27	10.24	9.47	9.59	9.08	8.80	8.07	8.02	7.85
2010	West Coast Canada	Vancouver	South Africa	Durban	82.06	34.19	27.45	24.47	22.33	18.48	15.76	13.13	11.03	10.98	10.16	10.28	9.72	9.42	8.62	8.56	8.38
2010	North America West	Vancouver	Africa	Safi	63.65	26.71	21.50	19.24	17.64	14.71	12.60	10.59	8.93	8.94	8.27	8.38					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	North America West	Vancouver	Middle East	Aqaba (El Akaba)	78.52	32.75	26.30	23.47	21.42	17.75	15.15	12.64	10.62	10.59	9.79	9.91					
2010	Central America West	Puerto Quetzal	North America East	Philadelphia	35.44	16.22	13.57	12.84	12.23	10.73	9.42	7.83	6.61	6.50	6.02	6.15					
2010	Central America West	Puerto Quetzal	North America East	Philadelphia	35.44	16.22	13.57	12.84	12.23	10.73	9.42	7.83	6.61	6.50	6.02	6.15					
2010	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	32.62	15.35	12.85	12.62	12.23	10.72	9.28	7.82	6.76	6.66	6.17	6.32					
2010	Central America West	Puerto Quetzal	North America Gulf	New Orleans	32.62	15.35	12.85	12.62	12.23	10.72	9.28	7.82	6.76	6.66	6.17	6.32					
2010	Central America West	Puerto Quetzal	Central America East	Tampico	24.53	12.66	11.23	11.20	11.19	9.90	8.37	6.96	5.86	5.77	5.34	5.42					
2010	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	44.00	19.90	16.45	15.52	14.81	12.94	11.09	9.32	7.77	7.67	7.12	7.20					
2010	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.06	13.41	12.19	12.89	13.18	12.40	10.56	8.85	7.48	7.55	7.14	7.44					
2010	Central America West	Puerto Quetzal	Europe	Rotterdam	46.69	21.23	18.01	16.78	16.01	13.70	11.68	9.68	8.17	8.11	7.45	7.52					
2010	Central America West	Puerto Quetzal	Africa	Safi	42.99	20.12	17.00	15.97	15.25	13.33	11.45	9.57	8.08	8.12	7.51	7.62					
2010	Peru	San Nicolas	East Coast USA	Baltimore	43.07	18.52	14.86	13.50	12.32	10.22	8.87	7.40	6.27	6.18	5.73	5.85	5.70	5.56	5.32	5.38	5.29
2010	Chile	Antofagasta	East Coast USA	Baltimore	47.07	22.08	18.27	16.86	15.64	13.67	12.24	10.17	8.65	8.52	7.85	7.94	7.92	7.76	7.52	7.63	7.54
2010	South America West	Matarani	North America East	Philadelphia	43.54	19.17	15.77	14.84	14.03	11.68	10.38	8.67	7.34	7.21	6.64	6.76					
2010	South America West	Callao	North America East	Philadelphia	40.77	18.03	14.86	14.04	13.31	11.10	9.90	8.28	7.02	6.90	6.36	6.47					
2010	South America West	San Nicolas	North America Gulf	Mobile	39.47	16.97	13.58	12.34	11.44	9.63	8.34	7.04	5.94	5.84	5.40	5.50	5.34	5.27	5.06	5.22	5.13
2010	South America West	Matarani	North America Gulf	South Louisiana	40.80	18.35	15.09	14.65	14.04	11.69	10.26	8.68	7.49	7.37	6.80	6.93					
2010	South America West	Callao	North America Gulf	South Louisiana	38.03	17.21	14.19	13.85	13.32	11.12	9.78	8.29	7.18	7.06	6.51	6.64					
2010	South America West	Callao	Central America East	Tampico	29.93	14.49	12.52	12.39	12.24	10.26	8.84	7.41	6.27	6.16	5.67	5.73					
2010	South America West	Callao	South America East	Puerto La Cruz	35.20	16.59	13.99	13.36	13.05	11.01	9.59	7.94	6.60	6.47	5.95	6.01					
2010	Chile	Antofagasta	Caribbean Basin	Point Lisas	33.61	17.41	14.53	13.58	12.85	11.45	10.17	8.40	7.10	6.99	6.41	6.43	6.53	6.41	6.21	6.31	6.24
2010	Peru	San Nicolas	Caribbean Basin	Point Lisas	29.61	13.85	11.12	10.22	9.53	8.01	6.80	5.63	4.73	4.65	4.29	4.33	4.31	4.21	4.02	4.06	3.99
2010	South America West	Callao	Caribbean Basin	San Juan	27.52	15.25	13.46	14.02	14.17	12.71	10.99	9.27	7.87	7.91	7.44	7.70					
2010	Peru	Matarani	Europe	Rotterdam	54.34	23.77	19.85	18.45	17.51	14.42	12.46	10.38	8.80	8.70	7.98	8.04					
2010	Chile	Antofagasta	Europe	Rotterdam	57.27	26.36	22.06	20.18	18.84	16.15	14.31	11.85	10.05	9.94	9.09	9.11	9.04	8.80	8.35	8.37	8.26
2010	South America West	Callao	Europe	Rotterdam	51.58	22.64	18.94	17.65	16.79	13.85	11.98	9.99	8.48	8.39	7.69	7.75					
2010	South America West	Callao	Africa	Safi	47.96	21.56	17.96	16.87	16.06	13.49	11.75	9.89	8.40	8.40	7.75	7.83					
2010	South America West	Matarani	Middle East	Aqaba (El Akaba)	65.93	28.93	23.85	22.06	20.70	17.22	14.88	12.40	10.47	10.42	9.61	9.71					
2010	Oceania	Newcastle	North America East	Baltimore	83.87	34.75	27.91	24.84	22.42	18.42	15.74	13.06	10.92	10.69	9.88	10.01	9.53	9.28	8.68	8.71	8.54
2010	Oceania	Bunbury	North America East	Philadelphia	93.33	38.56	30.99	27.65	24.83	20.32	17.67	14.59	12.23	11.95	11.03	11.14					
2010	Oceania	Newcastle	North America Gulf	Mobile	80.09	33.11	26.56	23.62	21.48	17.78	15.16	12.67	10.56	10.32	9.53	9.64	9.14	8.95	8.40	8.53	8.36
2010	Oceania	Bunbury	North America Gulf	South Louisiana	90.41	37.66	30.23	27.38	24.77	20.28	17.50	14.56	12.36	12.09	11.16	11.29					
2010	Oceania	Newcastle	Central America East	Tampico	72.27	30.80	25.22	22.84	21.01	17.27	14.63	12.12	10.09	9.85	9.08	9.14	8.69	8.42	7.73	7.69	7.52
2010	Oceania	Bunbury	Central America East	Tampico	82.33	34.94	28.57	25.92	23.70	19.43	16.57	13.68	11.46	11.19	10.32	10.38					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	Oceania	Bunbury	Caribbean Basin	San Juan	79.76	35.62	29.44	27.48	25.56	21.82	18.66	15.51	13.05	12.93	12.08	12.34					
2010	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	117.26	49.01	39.71	35.46	32.03	26.28	22.53	18.63	15.64	15.44	14.25	14.33					
2010	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Korea	Guangzhou	East Coast USA	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Far East	Guangzhou	East Coast Canada	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Taiwan	Guangzhou	East Coast USA	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Japan	Kobe	East Coast USA	Philadelphia	85.17	35.44	28.66	25.94	23.41	19.84	17.54	14.97	12.79	12.88	12.27	12.97					
2010	Far East	Guangzhou	North America East	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Far East	Guangzhou	North America East	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Far East	Guangzhou	North America East	Philadelphia	91.04	37.57	30.23	26.96	24.22	19.77	17.16	14.14	11.85	11.64	10.79	10.92					
2010	Far East	Guangzhou	North America Gulf	South Louisiana	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	12.00	11.79	10.93	11.08					
2010	Far East	Guangzhou	North America Gulf	South Louisiana	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	12.00	11.79	10.93	11.08					
2010	Far East	Guangzhou	North America Gulf	New Orleans	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	12.00	11.79	10.93	11.08					
2010	Far East	Guangzhou	North America Gulf	South Louisiana	88.23	36.72	29.53	26.73	24.20	19.76	17.03	14.13	12.00	11.79	10.93	11.08					
2010	Far East	Guangzhou	Central America East	Tampico	80.13	33.99	27.85	25.26	23.11	18.90	16.08	13.25	11.10	10.89	10.09	10.17					
2010	Far East	Guangzhou	South America East	Puerto La Cruz	85.33	36.05	29.29	26.20	23.89	19.62	16.81	13.76	11.42	11.19	10.36	10.44					
2010	Far East	Guangzhou	Caribbean Basin	San Juan	77.66	34.72	28.76	26.85	25.00	21.31	18.20	15.09	12.69	12.63	11.85	12.13					
2010	South East Asia	Manado	North America East	Philadelphia	90.40	39.70	32.89	30.65	28.86	24.84	23.44	19.13	16.02	15.76	14.59	14.83					
2010	South East Asia	Bangkok	North America Gulf	New Orleans	93.14	38.92	31.44	28.73	26.16	21.55	18.70	15.66	13.42	13.35	12.29	12.47					
2010	South East Asia	Manado	North America Gulf	New Orleans	87.71	38.91	32.25	30.47	28.88	24.86	23.33	19.14	16.18	15.93	14.75	15.00					
2010	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	98.46	40.55	32.24	29.03	26.69	22.49	19.92	16.51	13.82	13.60	12.60	12.70					
2015	North America East	New York	North America West	Los Angeles	57.75	24.52	18.07	15.72	13.88	12.20	11.05	9.78	8.45	8.46	8.07	8.26					
2015	North America East	New York	Central America West	Lazaro Cardenas	41.35	18.37	14.14	12.70	11.17	9.67	8.56	7.37	6.23	6.12	5.65	5.77					
2015	North America East	New York	South America West	Matarani	43.87	19.70	15.27	13.93	12.59	10.87	9.65	8.31	7.03	6.90	6.36	6.48					
2015	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	85.74	36.03	27.02	23.07	19.78	16.63	14.10	11.86	9.83	9.65	8.93	9.03	8.65	8.61	7.93	7.80	7.63
2015	North America East	New York	Oceania	Brisbane	80.21	34.13	26.05	22.63	19.64	16.96	14.85	12.81	10.75	10.53	9.72	9.88					
2015	East Coast USA	Norfolk	Taiwan	Kaohsiung	86.16	36.07	27.00	23.16	20.09	17.19	12.73	12.42	10.31	10.09	9.32	9.46	9.00	9.07	8.44	8.53	8.35
2015	East Coast USA	Norfolk	Korea	Kwangyang	81.93	34.41	25.79	22.16	19.28	16.58	14.07	12.08	10.05	9.85	9.08	8.30	8.80	8.89	8.31	8.43	8.26
2015	East Coast USA	Norfolk	Japan	Mizushima	84.85	35.49	26.53	22.88	19.91	17.28	14.85	12.93	10.90	10.78	10.10	10.45	9.87	10.01	9.49	9.68	9.53
2015	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	82.54	34.65	25.92	22.12	19.11	16.21	13.68	11.57	9.59	9.42	8.69	8.77	8.38	8.39	7.74	7.71	7.54
2015	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	85.46	35.72	26.66	22.85	19.74	16.91	14.47	12.42	10.45	10.35	9.71	10.01	9.45	9.51	8.92	8.96	8.80
2015	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	85.61	36.18	27.19	23.34	20.09	16.97	14.45	12.17	10.18	10.03	9.30	9.38	9.04	9.02	8.35	8.25	8.08
2015	North America East	New York	Far East	Guangzhou	89.90	37.92	28.65	24.72	21.23	17.97	15.58	13.21	11.04	10.85	10.06	10.19					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	North America East	New York	Far East	Guangzhou	89.90	37.92	28.65	24.72	21.23	17.97	15.58	13.21	11.04	10.85	10.06	10.19					
2015	North America Gulf	Tampa	North America West	Los Angeles	53.32	22.82	16.75	14.96	13.40	11.81	10.61	9.52	8.39	8.41	8.03	8.23					
2015	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.00	16.73	12.87	11.97	10.71	9.30	8.13	7.11	6.18	6.08	5.61	5.74					
2015	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.00	16.73	12.87	11.97	10.71	9.30	8.13	7.11	6.18	6.08	5.61	5.74					
2015	North America Gulf	Tampa	South America West	Matarani	39.51	18.05	14.00	13.20	12.12	10.50	9.22	8.06	6.97	6.86	6.32	6.45					
2015	North America Gulf	Tampa	South America West	Matarani	39.51	18.05	14.00	13.20	12.12	10.50	9.22	8.06	6.97	6.86	6.32	6.45					
2015	North America Gulf	Tampa	Oceania	Auckland	67.77	29.11	22.30	19.82	17.42	15.12	13.24	11.66	9.94	9.75	9.01	9.17					
2015	North America Gulf	Tampa	Oceania	Auckland	67.77	29.11	22.30	19.82	17.42	15.12	13.24	11.66	9.94	9.75	9.01	9.17					
2015	North America Gulf	Mobile	Far East	Osaka	81.12	33.62	25.08	21.63	18.84	16.40	14.12	12.34	10.42	10.32	9.68	10.02	9.48	9.62	9.14	9.33	9.18
2015	North America Gulf	Tampa	Far East	Guangzhou	85.03	35.85	27.02	23.68	20.52	17.40	14.98	12.83	10.89	10.71	9.93	10.08					
2015	North America Gulf	Tampa	Far East	Guangzhou	85.03	35.85	27.02	23.68	20.52	17.40	14.98	12.83	10.89	10.71	9.93	10.08					
2015	North America Gulf	Tampa	South East Asia	Bangkok	92.45	39.57	30.13	26.69	23.24	19.84	17.21	14.84	12.71	12.65	11.65	11.83					
2015	Central America East	Puerto Limon	North America West	Los Angeles	39.05	18.23	13.86	12.58	11.57	10.25	9.09	8.09	6.99	7.04	6.76	6.89					
2015	Central America East	Puerto Limon	South America West	Matarani	25.05	13.28	11.00	10.77	10.29	8.92	7.69	6.61	5.56	5.48	5.05	5.12					
2015	Central America East	Puerto Limon	South America West	Matarani	25.05	13.28	11.00	10.77	10.29	8.92	7.69	6.61	5.56	5.48	5.05	5.12					
2015	Central America East	Puerto Limon	Far East	Guangzhou	71.94	32.74	25.33	22.36	19.55	16.53	14.03	11.81	9.78	9.62	8.91	8.99					
2015	Central America East	Puerto Limon	South East Asia	Jakarta	81.89	40.27	32.24	29.72	27.11	24.02	22.30	18.51	15.30	15.09	13.97	14.17					
2015	South America East	Santos	North America West	Los Angeles	68.47	29.08	21.50	18.79	16.67	14.65	12.94	11.51	9.83	9.84	9.37	9.50					
2015	Other South America East	Buenos Aires	West Coast USA	Los Angeles	79.73	33.60	24.86	21.73	19.28	16.87	14.76	12.98	11.15	11.13	10.46	10.57					
2015	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	53.55	22.50	16.53	14.34	12.86	11.20	9.83	8.69	7.47	7.48	7.16	7.27					
2015	South America East	Buenos Aires	West Coast Canada	Los Angeles	79.73	33.60	24.86	21.73	19.28	16.87	14.76	12.98	11.15	11.13	10.46	10.57					
2015	Brazil	Santos	West Coast USA	Los Angeles	68.47	29.08	21.50	18.79	16.67	14.65	12.94	11.51	9.83	9.84	9.37	9.50					
2015	South America East	Ponta da Madeira	North America West	Los Angeles	57.34	24.48	18.02	15.65	13.83	12.18	10.79	9.55	8.16	8.22	7.89	8.02					
2015	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	32.65	14.38	11.09	10.00	9.16	7.97	6.72	5.84	4.87	4.76	4.37	4.40					
2015	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	24.89	12.11	9.39	8.65	7.97	7.03	6.00	5.25	4.44	4.37	4.04	4.09					
2015	South America East	Puerto Bolivar	South America West	Huasco	30.76	16.27	12.80	11.62	10.68	9.92	8.88	7.66	6.48	6.38	5.86	5.86	5.48	5.61	5.51	5.72	5.66
2015	South America East	Puerto La Cruz	South America West	Matarani	35.18	15.71	12.23	11.24	10.59	9.17	7.81	6.78	5.67	5.54	5.08	5.10					
2015	South America East	Santos	Oceania	Brisbane	91.90	39.16	29.89	26.07	22.73	19.67	16.96	14.72	12.30	12.07	11.17	11.27					
2015	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	83.66	34.83	26.13	22.37	19.41	16.33	13.68	11.53	9.52	9.28	8.56	8.62	8.22	8.22	7.54	7.50	7.33
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	82.42	34.67	26.15	22.57	19.56	16.46	13.95	11.79	9.83	9.65	8.93	8.98	8.67	8.65	8.02	7.93	7.77
2015	Venezuela	Puerto Ordaz	Korea	Kwangyang	79.27	33.10	24.86	21.32	18.55	15.68	13.17	11.16	9.23	9.02	8.31	8.36	8.01	8.02	7.40	7.38	7.22
2015	Venezuela	Puerto Ordaz	Japan	Mizushima	82.16	34.16	25.59	22.03	19.17	16.37	13.94	12.01	10.08	9.95	9.32	9.59	9.07	9.13	8.57	8.63	8.48
2015	North Brazil	Ponta da Madeira	Korea	Kwangyang	83.07	35.08	26.35	22.63	19.52	16.66	14.13	12.02	9.92	9.75	9.04	9.10	8.72	8.74	8.10	8.08	7.92

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	North Brazil	Ponta da Madeira	Japan	Mizushima	85.96	36.15	27.08	23.34	20.14	17.36	14.90	12.86	10.77	10.68	10.05	10.33	9.78	9.85	9.27	9.33	9.17
2015	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	86.22	36.66	27.65	23.87	20.53	17.45	14.91	12.64	10.52	10.38	9.66	9.73	9.39	9.37	8.72	8.63	8.46
2015	Venezuela	Puerto Ordaz	Japan	Shimizu	81.99	34.64	26.34	23.08	20.11	17.72	15.35	13.67	11.55	11.68	11.20	11.89					
2015	North Brazil	Saã Luiz	Japan	Shimizu	84.10	35.84	27.23	24.05	20.95	18.69	16.40	14.76	12.49	12.65	12.14	12.83					
2015	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	102.38	43.37	32.83	28.28	24.28	20.53	17.48	14.78	12.26	12.06	11.22	11.31					
2015	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	89.08	37.72	28.55	24.80	21.44	18.28	15.69	13.46	11.22	11.05	10.27	10.34					
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	83.28	34.92	26.36	22.70	19.80	16.75	14.15	12.03	9.98	9.78	9.03	9.07					
2015	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	108.94	45.85	34.65	30.06	26.06	22.17	18.89	16.09	13.49	13.27	12.21	12.27					
2015	Colombia	Puerto Bolivar	Japan	Mizushima	70.15	30.05	22.47	19.45	17.08	14.80	12.67	11.04	9.30	9.22	8.66	8.93	8.44	8.57	8.13	8.31	8.17
2015	Brazil	Saã Luiz	Far East	Guangzhou	89.08	37.72	28.55	24.80	21.44	18.28	15.69	13.46	11.22	11.05	10.27	10.34					
2015	South America East	Ponta da Madeira	Far East	Mizushima	85.96	36.15	27.08	23.34	20.14	17.36	14.90	12.86	10.77	10.68	10.05	10.33	9.78	9.85	9.27	9.33	9.17
2015	Caribbean Basin	Kingston	North America West	Los Angeles	41.69	20.56	15.91	15.03	14.09	13.22	11.68	10.40	9.01	9.18	8.88	9.21					
2015	Caribbean Basin	Kingston	North America West	Los Angeles	41.69	20.56	15.91	15.03	14.09	13.22	11.68	10.40	9.01	9.18	8.88	9.21					
2015	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.23	14.39	11.96	11.99	11.36	10.69	9.17	7.97	6.78	6.83	6.45	6.71					
2015	Caribbean Basin	Kingston	South America West	Matarani	27.75	15.72	13.10	13.22	12.78	11.88	10.26	8.92	7.58	7.61	7.16	7.42					
2015	Caribbean Basin	Kingston	Far East	Guangzhou	74.12	34.11	26.62	24.14	21.53	19.07	16.27	13.89	11.65	11.61	10.90	11.18					
2015	Caribbean Basin	Kingston	Far East	Guangzhou	74.12	34.11	26.62	24.14	21.53	19.07	16.27	13.89	11.65	11.61	10.90	11.18					
2015	Europe	Rotterdam	West Coast Canada	Los Angeles	68.39	28.92	21.76	18.88	16.81	14.59	12.85	11.33	9.79	9.84	9.30	9.43					
2015	Europe	Rotterdam	West Coast USA	Los Angeles	68.39	28.92	21.76	18.88	16.81	14.59	12.85	11.33	9.79	9.84	9.30	9.43					
2015	Europe	Rotterdam	North America West	Los Angeles	68.39	28.92	21.76	18.88	16.81	14.59	12.85	11.33	9.79	9.84	9.30	9.43					
2015	Europe	Rotterdam	Central America West	Lazaro Cardenas	51.98	22.78	17.83	15.85	14.09	12.06	10.36	8.91	7.57	7.49	6.87	6.93					
2015	Europe	Rotterdam	South America West	Matarani	54.49	24.11	18.96	17.08	15.50	13.26	11.45	9.85	8.36	8.27	7.58	7.64					
2015	Africa	Durban	North America West	Los Angeles	84.39	36.16	27.14	23.56	20.78	18.11	15.87	13.91	11.92	12.00	11.34	11.51					
2015	Africa	Safi	Central America West	Lazaro Cardenas	48.83	22.03	17.19	15.39	13.66	11.92	10.31	8.94	7.60	7.61	7.02	7.11					
2015	Africa	Safi	Oceania	Auckland	80.33	34.83	26.98	23.56	20.64	17.96	15.61	13.64	11.49	11.41	10.54	10.65					
2015	Middle East	Damman	Central America West	Lazaro Cardenas	82.38	35.96	27.70	24.37	21.34	18.32	15.67	13.40	11.28	11.20	10.34	10.45					
2015	Middle East	Damman	South America West	Matarani	84.90	37.29	28.84	25.60	22.76	19.51	16.76	14.34	12.08	11.98	11.05	11.15					
2015	Middle East	Damman	South America West	Matarani	84.90	37.29	28.84	25.60	22.76	19.51	16.76	14.34	12.08	11.98	11.05	11.15					
2015	North America West	Vancouver	North America East	Philadelphia	57.48	23.72	18.86	16.83	15.26	12.62	11.00	9.18	7.72	7.60	7.03	7.17					
2015	North America West	Vancouver	North America Gulf	New Orleans	54.77	22.92	18.20	16.65	15.29	12.64	10.89	9.20	7.89	7.77	7.20	7.34					
2015	North America West	Vancouver	Central America East	Tampico	46.66	20.19	16.53	15.19	14.21	11.79	9.95	8.32	6.98	6.87	6.35	6.43	6.12	5.97	5.51	5.54	5.42
2015	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	65.61	27.01	21.39	19.18	17.55	14.60	12.47	10.53	8.77	8.65	8.03	8.11	7.69	7.48	6.92	6.93	6.79
2015	North America West	Vancouver	South America East	Sepetiba, Bahia de	65.61	27.01	21.39	19.18	17.55	14.60	12.47	10.53	8.77	8.65	8.03	8.11	7.69	7.48	6.92	6.93	6.79

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	North America West	Vancouver	Caribbean Basin	San Juan	44.27	20.97	17.50	16.84	16.16	14.26	12.11	10.19	8.60	8.63	8.13	8.41					
2015	West Coast USA	Los Angeles	Europe	Rotterdam	67.95	28.27	22.54	20.18	18.79	15.73	13.86	11.83	10.21	10.26	9.70	9.84					
2015	West Coast Canada	Vancouver	Europe	Rotterdam	68.19	28.24	22.86	20.36	18.67	15.31	13.03	10.86	9.15	9.06	8.34	8.42	8.03	7.81	7.25	7.26	7.12
2015	North America West	Vancouver	Europe	Rotterdam	68.19	28.24	22.86	20.36	18.67	15.31	13.03	10.86	9.15	9.06	8.34	8.42	8.03	7.81	7.25	7.26	7.12
2015	West Coast Canada	Vancouver	North Africa	Alexandria	76.55	32.06	25.78	23.01	21.01	17.42	14.87	12.42	10.44	10.41	9.63	9.75	9.22	8.94	8.20	8.15	7.98
2015	West Coast Canada	Vancouver	South Africa	Durban	83.32	34.82	27.98	24.95	22.75	18.81	16.04	13.36	11.22	11.17	10.33	10.45	9.88	9.57	8.76	8.70	8.51
2015	North America West	Vancouver	Africa	Safi	64.60	27.19	21.90	19.60	17.96	14.96	12.81	10.76	9.08	9.08	8.40	8.51					
2015	North America West	Vancouver	Middle East	Aqaba (El Akaba)	79.72	33.35	26.81	23.92	21.83	18.07	15.42	12.86	10.81	10.77	9.96	10.08					
2015	Central America West	Puerto Quetzal	North America East	Philadelphia	35.85	16.45	13.77	13.03	12.41	10.87	9.54	7.93	6.69	6.58	6.09	6.23					
2015	Central America West	Puerto Quetzal	North America East	Philadelphia	35.85	16.45	13.77	13.03	12.41	10.87	9.54	7.93	6.69	6.58	6.09	6.23					
2015	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	32.98	15.56	13.03	12.80	12.39	10.86	9.39	7.91	6.83	6.74	6.24	6.39					
2015	Central America West	Puerto Quetzal	North America Gulf	New Orleans	32.98	15.56	13.03	12.80	12.39	10.86	9.39	7.91	6.83	6.74	6.24	6.39					
2015	Central America West	Puerto Quetzal	Central America East	Tampico	24.90	12.88	11.43	11.40	11.37	10.05	8.49	7.06	5.94	5.85	5.41	5.50					
2015	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	44.69	20.28	16.78	15.83	15.09	13.17	11.27	9.47	7.89	7.79	7.24	7.31					
2015	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.37	13.62	12.38	13.08	13.37	12.56	10.69	8.95	7.57	7.64	7.23	7.53					
2015	Central America West	Puerto Quetzal	Europe	Rotterdam	47.44	21.64	18.37	17.11	16.31	13.94	11.88	9.84	8.31	8.24	7.57	7.64					
2015	Central America West	Puerto Quetzal	Africa	Safi	43.69	20.51	17.34	16.29	15.54	13.56	11.64	9.72	8.22	8.25	7.63	7.74					
2015	Peru	San Nicolas	East Coast USA	Baltimore	43.55	18.76	15.06	13.68	12.48	10.35	8.98	7.48	6.34	6.25	5.79	5.92	5.75	5.62	5.38	5.44	5.35
2015	Chile	Antofagasta	East Coast USA	Baltimore	47.61	22.36	18.50	17.07	15.82	13.82	12.36	10.27	8.73	8.60	7.92	8.02	7.99	7.83	7.58	7.69	7.60
2015	South America West	Matarani	North America East	Philadelphia	44.04	19.42	15.98	15.04	14.21	11.82	10.51	8.77	7.42	7.29	6.72	6.83					
2015	South America West	Callao	North America East	Philadelphia	41.22	18.26	15.06	14.23	13.48	11.24	10.01	8.38	7.09	6.97	6.43	6.54					
2015	South America West	San Nicolas	North America Gulf	Mobile	39.89	17.18	13.76	12.50	11.58	9.74	8.43	7.12	6.01	5.91	5.45	5.56	5.39	5.32	5.11	5.27	5.18
2015	South America West	Matarani	North America Gulf	South Louisiana	41.24	18.58	15.29	14.84	14.21	11.83	10.38	8.77	7.58	7.45	6.87	7.00					
2015	South America West	Callao	North America Gulf	South Louisiana	38.43	17.42	14.36	14.02	13.48	11.24	9.89	8.37	7.25	7.13	6.58	6.71					
2015	South America West	Callao	Central America East	Tampico	30.33	14.71	12.71	12.57	12.41	10.40	8.96	7.50	6.35	6.23	5.74	5.80					
2015	South America West	Callao	South America East	Puerto La Cruz	35.59	16.81	14.18	13.54	13.21	11.13	9.70	8.02	6.67	6.55	6.02	6.07					
2015	Chile	Antofagasta	Caribbean Basin	Point Lisas	34.06	17.64	14.72	13.75	13.01	11.58	10.27	8.48	7.17	7.06	6.48	6.49	6.59	6.47	6.27	6.36	6.29
2015	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.00	14.05	11.29	10.37	9.66	8.11	6.89	5.70	4.78	4.71	4.35	4.39	4.36	4.26	4.07	4.11	4.04
2015	South America West	Callao	Caribbean Basin	San Juan	27.88	15.46	13.65	14.21	14.35	12.86	11.11	9.37	7.96	8.00	7.52	7.79					
2015	Peru	Matarani	Europe	Rotterdam	55.16	24.19	20.20	18.78	17.80	14.65	12.65	10.54	8.93	8.83	8.10	8.16					
2015	Chile	Antofagasta	Europe	Rotterdam	58.13	26.79	22.43	20.51	19.13	16.38	14.50	12.00	10.18	10.07	9.21	9.22	9.14	8.90	8.44	8.47	8.35
2015	South America West	Callao	Europe	Rotterdam	52.35	23.03	19.28	17.96	17.07	14.07	12.16	10.14	8.61	8.52	7.81	7.86					
2015	South America West	Callao	Africa	Safi	48.68	21.93	18.28	17.17	16.32	13.70	11.93	10.03	8.52	8.53	7.86	7.94					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	South America West	Matarani	Middle East	Aqaba (El Akaba)	66.96	29.45	24.30	22.47	21.07	17.51	15.13	12.60	10.64	10.59	9.77	9.86					
2015	Oceania	Newcastle	North America East	Baltimore	85.18	35.39	28.46	25.34	22.86	18.77	16.03	13.30	11.11	10.88	10.06	10.19	9.69	9.43	8.83	8.86	8.68
2015	Oceania	Bunbury	North America East	Philadelphia	94.84	39.30	31.62	28.22	25.34	20.72	18.00	14.86	12.46	12.17	11.23	11.34					
2015	Oceania	Newcastle	North America Gulf	Mobile	81.33	33.72	27.08	24.08	21.90	18.11	15.44	12.89	10.74	10.51	9.70	9.80	9.29	9.10	8.53	8.67	8.49
2015	Oceania	Bunbury	North America Gulf	South Louisiana	91.85	38.37	30.84	27.93	25.26	20.67	17.83	14.82	12.58	12.31	11.36	11.48					
2015	Oceania	Newcastle	Central America East	Tampico	73.53	31.42	25.75	23.32	21.44	17.62	14.92	12.36	10.29	10.05	9.26	9.31	8.85	8.57	7.87	7.83	7.66
2015	Oceania	Bunbury	Central America East	Tampico	83.78	35.66	29.19	26.49	24.20	19.83	16.90	13.95	11.69	11.42	10.52	10.58					
2015	Oceania	Bunbury	Caribbean Basin	San Juan	81.16	36.33	30.05	28.05	26.07	22.23	19.00	15.79	13.28	13.16	12.29	12.55					
2015	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	119.37	50.05	40.61	36.27	32.75	26.85	23.01	19.02	15.97	15.76	14.54	14.62					
2015	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Korea	Guangzhou	East Coast USA	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Far East	Guangzhou	East Coast Canada	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Taiwan	Guangzhou	East Coast USA	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Japan	Kobe	East Coast USA	Philadelphia	86.41	36.05	29.19	26.42	23.83	20.18	17.82	15.20	12.99	13.07	12.45	13.15					
2015	Far East	Guangzhou	North America East	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Far East	Guangzhou	North America East	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Far East	Guangzhou	North America East	Philadelphia	92.44	38.25	30.81	27.48	24.68	20.13	17.47	14.39	12.06	11.84	10.97	11.10					
2015	Far East	Guangzhou	North America Gulf	South Louisiana	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	12.20	11.99	11.12	11.26					
2015	Far East	Guangzhou	North America Gulf	South Louisiana	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	12.20	11.99	11.12	11.26					
2015	Far East	Guangzhou	North America Gulf	New Orleans	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	12.20	11.99	11.12	11.26					
2015	Far East	Guangzhou	North America Gulf	South Louisiana	89.57	37.38	30.09	27.24	24.64	20.11	17.32	14.37	12.20	11.99	11.12	11.26					
2015	Far East	Guangzhou	Central America East	Tampico	81.48	34.66	28.43	25.78	23.57	19.27	16.39	13.49	11.30	11.09	10.27	10.35					
2015	Far East	Guangzhou	South America East	Puerto La Cruz	86.66	36.71	29.86	26.71	24.34	19.98	17.11	14.01	11.62	11.39	10.54	10.62					
2015	Far East	Guangzhou	Caribbean Basin	San Juan	78.96	35.37	29.33	27.38	25.46	21.69	18.51	15.34	12.91	12.84	12.04	12.32					
2015	South East Asia	Manado	North America East	Philadelphia	91.71	40.35	33.46	31.16	29.33	25.21	23.76	19.39	16.24	15.97	14.78	15.03					
2015	South East Asia	Bangkok	North America Gulf	New Orleans	94.50	39.58	32.00	29.24	26.62	21.91	19.01	15.90	13.63	13.56	12.48	12.66					
2015	South East Asia	Manado	North America Gulf	New Orleans	88.97	39.54	32.79	30.97	29.34	25.23	23.64	19.40	16.40	16.14	14.94	15.19					
2015	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	100.03	41.30	32.88	29.60	27.20	22.89	20.26	16.78	14.05	13.83	12.81	12.90					
2020	North America East	New York	North America West	Los Angeles	58.34	24.84	18.32	15.94	14.07	12.35	11.19	9.89	8.54	8.55	8.15	8.34					
2020	North America East	New York	Central America West	Lazaro Cardenas	41.81	18.63	14.35	12.89	11.33	9.80	8.67	7.46	6.31	6.20	5.72	5.84					
2020	North America East	New York	South America West	Matarani	44.34	19.96	15.49	14.13	12.76	11.00	9.77	8.41	7.11	6.98	6.44	6.55					
2020	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	87.04	36.72	27.58	23.57	20.19	16.97	14.38	12.09	10.02	9.84	9.10	9.20	8.73	8.38	7.39	7.15	6.98
2020	North America East	New York	Oceania	Brisbane	81.31	34.72	26.54	23.06	20.01	17.26	15.10	13.02	10.92	10.70	9.88	10.03					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	East Coast USA	Norfolk	Taiwan	Kaohsiung	87.38	36.72	27.53	23.62	20.49	17.51	12.97	12.64	10.49	10.27	9.48	9.62	9.07	8.81	7.85	7.80	7.63
2020	East Coast USA	Norfolk	Korea	Kwangyang	83.07	35.02	26.28	22.59	19.65	16.88	14.32	12.29	10.22	10.02	9.24	8.44	8.87	8.63	7.73	7.70	7.54
2020	East Coast USA	Norfolk	Japan	Mizushima	85.97	36.09	27.02	23.31	20.27	17.58	15.10	13.13	11.07	10.95	10.26	10.60	9.92	9.69	8.81	8.83	8.67
2020	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	83.80	35.32	26.47	22.60	19.51	16.54	13.96	11.80	9.78	9.60	8.86	8.94	8.46	8.16	7.21	7.07	6.90
2020	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	86.71	36.39	27.20	23.32	20.13	17.23	14.74	12.64	10.64	10.53	9.88	10.17	9.52	9.22	8.29	8.19	8.03
2020	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	86.92	36.88	27.75	23.84	20.51	17.31	14.73	12.41	10.38	10.22	9.47	9.55	9.12	8.76	7.78	7.55	7.39
2020	North America East	New York	Far East	Guangzhou	91.18	38.60	29.21	25.21	21.63	18.30	15.86	13.44	11.23	11.04	10.23	10.36					
2020	North America East	New York	Far East	Guangzhou	91.18	38.60	29.21	25.21	21.63	18.30	15.86	13.44	11.23	11.04	10.23	10.36					
2020	North America Gulf	Tampa	North America West	Los Angeles	53.81	23.08	16.96	15.15	13.56	11.94	10.72	9.61	8.47	8.49	8.10	8.30					
2020	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.37	16.93	13.04	12.13	10.84	9.41	8.23	7.19	6.25	6.14	5.68	5.80					
2020	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.37	16.93	13.04	12.13	10.84	9.41	8.23	7.19	6.25	6.14	5.68	5.80					
2020	North America Gulf	Tampa	South America West	Matarani	39.89	18.26	14.17	13.36	12.26	10.61	9.32	8.14	7.04	6.92	6.39	6.51					
2020	North America Gulf	Tampa	South America West	Matarani	39.89	18.26	14.17	13.36	12.26	10.61	9.32	8.14	7.04	6.92	6.39	6.51					
2020	North America Gulf	Tampa	Oceania	Auckland	68.63	29.56	22.68	20.16	17.71	15.36	13.44	11.83	10.08	9.89	9.14	9.30					
2020	North America Gulf	Tampa	Oceania	Auckland	68.63	29.56	22.68	20.16	17.71	15.36	13.44	11.83	10.08	9.89	9.14	9.30					
2020	North America Gulf	Mobile	Far East	Osaka	82.16	34.16	25.52	22.02	19.17	16.67	14.34	12.52	10.58	10.47	9.81	10.16	9.52	9.31	8.47	8.50	8.35
2020	North America Gulf	Tampa	Far East	Guangzhou	86.19	36.45	27.52	24.12	20.88	17.70	15.23	13.04	11.06	10.88	10.09	10.24					
2020	North America Gulf	Tampa	Far East	Guangzhou	86.19	36.45	27.52	24.12	20.88	17.70	15.23	13.04	11.06	10.88	10.09	10.24					
2020	North America Gulf	Tampa	South East Asia	Bangkok	93.74	40.25	30.69	27.18	23.65	20.18	17.49	15.08	12.92	12.85	11.83	12.00					
2020	Central America East	Puerto Limon	North America West	Los Angeles	39.48	18.50	14.09	12.78	11.74	10.39	9.21	8.19	7.07	7.12	6.83	6.97					
2020	Central America East	Puerto Limon	South America West	Matarani	25.36	13.49	11.18	10.94	10.44	9.04	7.79	6.69	5.62	5.55	5.12	5.18					
2020	Central America East	Puerto Limon	South America West	Matarani	25.36	13.49	11.18	10.94	10.44	9.04	7.79	6.69	5.62	5.55	5.12	5.18					
2020	Central America East	Puerto Limon	Far East	Guangzhou	73.10	33.44	25.90	22.87	19.98	16.87	14.32	12.04	9.97	9.81	9.08	9.16					
2020	Central America East	Puerto Limon	South East Asia	Jakarta	83.22	41.10	32.94	30.35	27.65	24.47	22.68	18.82	15.55	15.33	14.20	14.40					
2020	South America East	Santos	North America West	Los Angeles	69.42	29.58	21.91	19.15	16.97	14.90	13.16	11.69	9.98	9.99	9.51	9.63					
2020	Other South America East	Buenos Aires	West Coast USA	Los Angeles	80.78	34.16	25.32	22.13	19.62	17.15	14.99	13.18	11.32	11.29	10.60	10.71					
2020	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	54.15	22.82	16.79	14.57	13.06	11.36	9.96	8.80	7.57	7.57	7.24	7.36					
2020	South America East	Buenos Aires	West Coast Canada	Los Angeles	80.78	34.16	25.32	22.13	19.62	17.15	14.99	13.18	11.32	11.29	10.60	10.71					
2020	Brazil	Santos	West Coast USA	Los Angeles	69.42	29.58	21.91	19.15	16.97	14.90	13.16	11.69	9.98	9.99	9.51	9.63					
2020	South America East	Ponta da Madeira	North America West	Los Angeles	58.06	24.87	18.33	15.93	14.07	12.37	10.95	9.68	8.28	8.33	7.99	8.12					
2020	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	33.04	14.60	11.27	10.17	9.30	8.08	6.81	5.92	4.94	4.82	4.43	4.46					
2020	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	25.23	12.31	9.54	8.79	8.10	7.14	6.09	5.33	4.50	4.43	4.10	4.15					
2020	South America East	Puerto Bolivar	South America West	Huasco	31.16	16.49	12.98	11.78	10.82	10.03	8.97	7.74	6.54	6.45	5.91	5.92	5.48	5.41	5.09	5.19	5.13

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	South America East	Puerto La Cruz	South America West	Matarani	35.58	15.94	12.41	11.41	10.73	9.29	7.91	6.87	5.74	5.61	5.15	5.17					
2020	South America East	Santos	Oceania	Brisbane	93.41	39.96	30.55	26.65	23.23	20.08	17.31	15.01	12.55	12.31	11.39	11.48					
2020	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	84.98	35.53	26.71	22.88	19.83	16.68	13.97	11.77	9.72	9.48	8.75	8.80	8.31	8.00	7.04	6.89	6.72
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	83.70	35.35	26.71	23.05	19.97	16.80	14.23	12.02	10.02	9.84	9.10	9.15	8.76	8.41	7.48	7.27	7.10
2020	Venezuela	Puerto Ordaz	Korea	Kwangyang	80.50	33.75	25.39	21.79	18.94	16.00	13.44	11.39	9.42	9.20	8.47	8.52	8.09	7.80	6.90	6.77	6.61
2020	Venezuela	Puerto Ordaz	Japan	Mizushima	83.37	34.80	26.11	22.49	19.56	16.69	14.21	12.23	10.26	10.13	9.49	9.75	9.14	8.86	7.98	7.89	7.74
2020	North Brazil	Ponta da Madeira	Korea	Kwangyang	84.41	35.79	26.93	23.14	19.96	17.02	14.42	12.27	10.13	9.95	9.22	9.28	8.81	8.51	7.55	7.41	7.25
2020	North Brazil	Ponta da Madeira	Japan	Mizushima	87.29	36.85	27.65	23.85	20.57	17.71	15.20	13.11	10.97	10.88	10.23	10.51	9.86	9.56	8.63	8.54	8.38
2020	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	87.61	37.40	28.25	24.40	20.98	17.81	15.22	12.90	10.73	10.59	9.85	9.91	9.48	9.11	8.13	7.91	7.74
2020	Venezuela	Puerto Ordaz	Japan	Shimizu	83.16	35.26	26.85	23.53	20.50	18.04	15.62	13.89	11.74	11.87	11.38	12.06					
2020	North Brazil	Saã Luiz	Japan	Shimizu	85.37	36.52	27.80	24.55	21.37	19.04	16.69	15.01	12.70	12.86	12.33	13.02					
2020	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	104.07	44.26	33.56	28.92	24.82	20.97	17.85	15.09	12.52	12.32	11.45	11.53					
2020	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	90.55	38.49	29.19	25.36	21.92	18.67	16.02	13.73	11.45	11.27	10.47	10.54					
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	84.57	35.60	26.92	23.19	20.22	17.09	14.44	12.26	10.18	9.97	9.21	9.24					
2020	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	110.67	46.76	35.40	30.72	26.61	22.62	19.28	16.41	13.76	13.53	12.45	12.50					
2020	Colombia	Puerto Bolivar	Japan	Mizushima	71.24	30.62	22.94	19.87	17.43	15.09	12.91	11.24	9.47	9.38	8.81	9.08	8.50	8.32	7.56	7.59	7.45
2020	Brazil	Saã Luiz	Far East	Guangzhou	90.55	38.49	29.19	25.36	21.92	18.67	16.02	13.73	11.45	11.27	10.47	10.54					
2020	South America East	Ponta da Madeira	Far East	Mizushima	87.29	36.85	27.65	23.85	20.57	17.71	15.20	13.11	10.97	10.88	10.23	10.51	9.86	9.56	8.63	8.54	8.38
2020	Caribbean Basin	Kingston	North America West	Los Angeles	42.14	20.83	16.13	15.24	14.27	13.38	11.80	10.51	9.10	9.27	8.96	9.29					
2020	Caribbean Basin	Kingston	North America West	Los Angeles	42.14	20.83	16.13	15.24	14.27	13.38	11.80	10.51	9.10	9.27	8.96	9.29					
2020	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.56	14.59	12.14	12.16	11.51	10.81	9.28	8.06	6.86	6.91	6.52	6.78					
2020	Caribbean Basin	Kingston	South America West	Matarani	28.09	15.92	13.28	13.40	12.94	12.02	10.37	9.01	7.66	7.69	7.24	7.49					
2020	Caribbean Basin	Kingston	Far East	Guangzhou	75.28	34.75	27.15	24.62	21.93	19.41	16.55	14.12	11.84	11.81	11.08	11.36					
2020	Caribbean Basin	Kingston	Far East	Guangzhou	75.28	34.75	27.15	24.62	21.93	19.41	16.55	14.12	11.84	11.81	11.08	11.36					
2020	Europe	Rotterdam	West Coast Canada	Los Angeles	69.29	29.39	22.14	19.21	17.09	14.83	13.05	11.49	9.93	9.97	9.42	9.55					
2020	Europe	Rotterdam	West Coast USA	Los Angeles	69.29	29.39	22.14	19.21	17.09	14.83	13.05	11.49	9.93	9.97	9.42	9.55					
2020	Europe	Rotterdam	North America West	Los Angeles	69.29	29.39	22.14	19.21	17.09	14.83	13.05	11.49	9.93	9.97	9.42	9.55					
2020	Europe	Rotterdam	Central America West	Lazaro Cardenas	52.75	23.19	18.17	16.15	14.34	12.27	10.53	9.06	7.69	7.61	6.98	7.04					
2020	Europe	Rotterdam	South America West	Matarani	55.27	24.52	19.31	17.38	15.76	13.47	11.63	10.00	8.49	8.40	7.70	7.75					
2020	Africa	Durban	North America West	Los Angeles	85.60	36.80	27.66	24.02	21.17	18.43	16.15	14.13	12.11	12.19	11.51	11.68					
2020	Africa	Safi	Central America West	Lazaro Cardenas	49.57	22.43	17.52	15.69	13.91	12.13	10.49	9.08	7.72	7.73	7.14	7.22					
2020	Africa	Safi	Oceania	Auckland	81.60	35.51	27.54	24.06	21.06	18.31	15.91	13.89	11.70	11.62	10.73	10.84					
2020	Middle East	Damman	Central America West	Lazaro Cardenas	83.72	36.67	28.29	24.89	21.78	18.68	15.98	13.65	11.50	11.41	10.53	10.64					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	Middle East	Damman	South America West	Matarani	86.25	38.01	29.43	26.13	23.20	19.88	17.07	14.60	12.30	12.20	11.25	11.35					
2020	Middle East	Damman	South America West	Matarani	86.25	38.01	29.43	26.13	23.20	19.88	17.07	14.60	12.30	12.20	11.25	11.35					
2020	North America West	Vancouver	North America East	Philadelphia	58.19	24.08	19.17	17.11	15.52	12.82	11.17	9.32	7.84	7.71	7.13	7.27					
2020	North America West	Vancouver	North America Gulf	New Orleans	55.42	23.26	18.49	16.92	15.53	12.83	11.05	9.33	8.00	7.87	7.29	7.44					
2020	North America West	Vancouver	Central America East	Tampico	47.32	20.54	16.84	15.47	14.46	11.99	10.12	8.45	7.10	6.98	6.45	6.53	6.21	6.01	5.32	5.09	4.96
2020	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	66.57	27.50	21.82	19.57	17.89	14.87	12.70	10.71	8.93	8.80	8.17	8.25	7.81	7.55	6.69	6.37	6.22
2020	North America West	Vancouver	South America East	Sepetiba, Bahia de	66.57	27.50	21.82	19.57	17.89	14.87	12.70	10.71	8.93	8.80	8.17	8.25	7.81	7.55	6.69	6.37	6.22
2020	North America West	Vancouver	Caribbean Basin	San Juan	44.88	21.31	17.80	17.12	16.41	14.46	12.28	10.33	8.72	8.75	8.24	8.52					
2020	West Coast USA	Los Angeles	Europe	Rotterdam	68.84	28.73	22.94	20.54	19.12	15.98	14.07	12.01	10.36	10.40	9.83	9.96					
2020	West Coast Canada	Vancouver	Europe	Rotterdam	69.21	28.77	23.31	20.77	19.04	15.60	13.27	11.05	9.32	9.22	8.49	8.56	8.16	7.88	7.01	6.67	6.52
2020	North America West	Vancouver	Europe	Rotterdam	69.21	28.77	23.31	20.77	19.04	15.60	13.27	11.05	9.32	9.22	8.49	8.56	8.16	7.88	7.01	6.67	6.52
2020	West Coast Canada	Vancouver	North Africa	Alexandria	77.71	32.66	26.30	23.49	21.44	17.76	15.15	12.64	10.64	10.60	9.80	9.92	9.38	9.03	7.94	7.50	7.31
2020	West Coast Canada	Vancouver	South Africa	Durban	84.60	35.48	28.55	25.47	23.21	19.18	16.35	13.61	11.43	11.37	10.52	10.63	10.05	9.67	8.49	8.01	7.81
2020	North America West	Vancouver	Africa	Safi	65.56	27.69	22.33	19.99	18.31	15.24	13.05	10.95	9.24	9.24	8.55	8.65					
2020	North America West	Vancouver	Middle East	Aqaba (El Akaba)	80.94	33.98	27.36	24.42	22.27	18.42	15.71	13.10	11.01	10.96	10.14	10.25					
2020	Central America West	Puerto Quetzal	North America East	Philadelphia	36.27	16.70	14.00	13.24	12.60	11.03	9.67	8.03	6.77	6.67	6.17	6.30					
2020	Central America West	Puerto Quetzal	North America East	Philadelphia	36.27	16.70	14.00	13.24	12.60	11.03	9.67	8.03	6.77	6.67	6.17	6.30					
2020	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	33.34	15.78	13.23	12.99	12.57	11.00	9.51	8.01	6.91	6.82	6.32	6.47					
2020	Central America West	Puerto Quetzal	North America Gulf	New Orleans	33.34	15.78	13.23	12.99	12.57	11.00	9.51	8.01	6.91	6.82	6.32	6.47					
2020	Central America West	Puerto Quetzal	Central America East	Tampico	25.27	13.11	11.64	11.60	11.56	10.20	8.61	7.16	6.02	5.94	5.49	5.57					
2020	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	45.40	20.69	17.14	16.17	15.39	13.41	11.48	9.63	8.03	7.93	7.36	7.44					
2020	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	22.69	13.84	12.59	13.29	13.57	12.73	10.83	9.06	7.66	7.74	7.32	7.63					
2020	Central America West	Puerto Quetzal	Europe	Rotterdam	48.22	22.09	18.77	17.48	16.64	14.20	12.10	10.01	8.45	8.38	7.70	7.77					
2020	Central America West	Puerto Quetzal	Africa	Safi	44.40	20.93	17.71	16.64	15.85	13.81	11.86	9.89	8.36	8.39	7.76	7.87					
2020	Peru	San Nicolas	East Coast USA	Baltimore	44.04	19.02	15.28	13.88	12.66	10.49	9.09	7.58	6.42	6.32	5.86	5.99	5.82	5.65	5.18	4.97	4.87
2020	Chile	Antofagasta	East Coast USA	Baltimore	48.16	22.65	18.75	17.30	16.03	13.97	12.49	10.38	8.82	8.69	8.00	8.10	8.06	7.85	7.28	7.02	6.91
2020	South America West	Matarani	North America East	Philadelphia	44.54	19.69	16.22	15.27	14.41	11.98	10.64	8.88	7.51	7.38	6.80	6.91					
2020	South America West	Callao	North America East	Philadelphia	41.67	18.51	15.27	14.43	13.66	11.38	10.14	8.47	7.18	7.05	6.50	6.61					
2020	South America West	San Nicolas	North America Gulf	Mobile	40.31	17.40	13.95	12.67	11.74	9.86	8.53	7.20	6.08	5.97	5.52	5.62	5.45	5.34	4.91	4.82	4.72
2020	South America West	Matarani	North America Gulf	South Louisiana	41.69	18.82	15.51	15.04	14.40	11.97	10.50	8.87	7.66	7.53	6.95	7.08					
2020	South America West	Callao	North America Gulf	South Louisiana	38.82	17.64	14.56	14.20	13.65	11.37	10.00	8.46	7.33	7.21	6.65	6.78					
2020	South America West	Callao	Central America East	Tampico	30.73	14.93	12.91	12.77	12.59	10.54	9.07	7.60	6.43	6.32	5.81	5.87					
2020	South America West	Callao	South America East	Puerto La Cruz	35.96	17.03	14.37	13.72	13.38	11.27	9.81	8.11	6.75	6.62	6.09	6.14					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	Chile	Antofagasta	Caribbean Basin	Point Lisas	34.52	17.89	14.94	13.95	13.17	11.71	10.38	8.57	7.24	7.13	6.54	6.55	6.65	6.48	6.02	5.81	5.72
2020	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.39	14.26	11.47	10.53	9.81	8.22	6.98	5.77	4.85	4.77	4.40	4.44	4.41	4.28	3.92	3.76	3.68
2020	South America West	Callao	Caribbean Basin	San Juan	28.23	15.67	13.85	14.40	14.53	13.00	11.23	9.47	8.05	8.09	7.61	7.87					
2020	Peru	Matarani	Europe	Rotterdam	56.00	24.63	20.59	19.14	18.12	14.91	12.87	10.71	9.08	8.98	8.23	8.28					
2020	Chile	Antofagasta	Europe	Rotterdam	59.00	27.25	22.83	20.88	19.45	16.63	14.71	12.17	10.32	10.21	9.34	9.35	9.26	8.95	8.14	7.75	7.62
2020	South America West	Callao	Europe	Rotterdam	53.13	23.44	19.64	18.30	17.37	14.31	12.36	10.30	8.74	8.65	7.93	7.98					
2020	South America West	Callao	Africa	Safi	49.40	22.32	18.62	17.49	16.61	13.93	12.12	10.19	8.65	8.66	7.98	8.06					
2020	South America West	Matarani	Middle East	Aqaba (El Akaba)	68.01	30.01	24.79	22.93	21.48	17.83	15.40	12.82	10.83	10.78	9.94	10.03					
2020	Oceania	Newcastle	North America East	Baltimore	86.55	36.09	29.08	25.89	23.35	19.16	16.36	13.56	11.34	11.10	10.26	10.38	9.87	9.54	8.56	8.16	7.97
2020	Oceania	Bunbury	North America East	Philadelphia	96.42	40.11	32.33	28.86	25.90	21.17	18.39	15.17	12.72	12.43	11.47	11.57					
2020	Oceania	Newcastle	North America Gulf	Mobile	82.63	34.38	27.66	24.61	22.36	18.48	15.75	13.15	10.96	10.71	9.89	9.98	9.46	9.20	8.27	7.98	7.80
2020	Oceania	Bunbury	North America Gulf	South Louisiana	93.37	39.14	31.52	28.56	25.81	21.10	18.20	15.12	12.84	12.55	11.59	11.70					
2020	Oceania	Newcastle	Central America East	Tampico	74.84	32.10	26.35	23.87	21.93	18.00	15.25	12.62	10.51	10.26	9.46	9.50	9.03	8.69	7.65	7.23	7.05
2020	Oceania	Bunbury	Central America East	Tampico	85.31	36.45	29.88	27.12	24.76	20.27	17.28	14.26	11.95	11.67	10.76	10.80					
2020	Oceania	Bunbury	Caribbean Basin	San Juan	82.62	37.09	30.73	28.68	26.63	22.68	19.38	16.10	13.55	13.42	12.53	12.79					
2020	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	121.59	51.19	41.61	37.18	33.55	27.49	23.55	19.45	16.34	16.12	14.87	14.94					
2020	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Korea	Guangzhou	East Coast USA	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Far East	Guangzhou	East Coast Canada	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Taiwan	Guangzhou	East Coast USA	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Japan	Kobe	East Coast USA	Philadelphia	87.69	36.71	29.77	26.95	24.29	20.55	18.14	15.46	13.21	13.29	12.65	13.34					
2020	Far East	Guangzhou	North America East	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Far East	Guangzhou	North America East	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Far East	Guangzhou	North America East	Philadelphia	93.90	38.99	31.46	28.07	25.19	20.54	17.82	14.66	12.30	12.07	11.18	11.30					
2020	Far East	Guangzhou	North America Gulf	South Louisiana	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	12.43	12.21	11.32	11.46					
2020	Far East	Guangzhou	North America Gulf	South Louisiana	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	12.43	12.21	11.32	11.46					
2020	Far East	Guangzhou	North America Gulf	New Orleans	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	12.43	12.21	11.32	11.46					
2020	Far East	Guangzhou	North America Gulf	South Louisiana	90.97	38.09	30.71	27.81	25.15	20.51	17.66	14.64	12.43	12.21	11.32	11.46					
2020	Far East	Guangzhou	Central America East	Tampico	82.89	35.38	29.06	26.36	24.08	19.67	16.73	13.77	11.54	11.32	10.48	10.55					
2020	Far East	Guangzhou	South America East	Puerto La Cruz	88.03	37.43	30.48	27.28	24.84	20.37	17.44	14.27	11.85	11.61	10.74	10.81					
2020	Far East	Guangzhou	Caribbean Basin	San Juan	80.31	36.08	29.95	27.95	25.98	22.10	18.86	15.62	13.14	13.08	12.26	12.54					
2020	South East Asia	Manado	North America East	Philadelphia	93.03	41.04	34.06	31.72	29.83	25.61	24.11	19.67	16.47	16.20	15.00	15.23					
2020	South East Asia	Bangkok	North America Gulf	New Orleans	95.88	40.28	32.62	29.80	27.12	22.30	19.34	16.17	13.86	13.78	12.68	12.86					

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					Vessel Size Range (000 dwt)															
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	South East Asia	Manado	North America Gulf	New Orleans	90.23	40.20	33.38	31.51	29.82	25.61	23.98	19.67	16.63	16.37	15.15	15.40					
2020	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	101.63	42.10	33.58	30.24	27.76	23.34	20.63	17.09	14.31	14.08	13.04	13.12					
2025	North America East	New York	North America West	Los Angeles	58.96	25.18	18.61	16.20	14.29	12.53	11.33	10.02	8.65	8.65	8.25	8.43					
2025	North America East	New York	Central America West	Lazaro Cardenas	42.30	18.91	14.58	13.10	11.50	9.95	8.80	7.56	6.39	6.28	5.80	5.91					
2025	North America East	New York	South America West	Matarani	44.83	20.24	15.73	14.34	12.94	11.15	9.90	8.51	7.20	7.07	6.52	6.63					
2025	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	88.40	37.48	28.21	24.12	20.66	17.35	14.70	12.36	10.24	10.05	9.30	9.39	8.91	8.54	7.54	7.30	7.13
2025	North America East	New York	Oceania	Brisbane	82.48	35.37	27.08	23.54	20.41	17.60	15.39	13.26	11.12	10.89	10.06	10.21					
2025	East Coast USA	Norfolk	Taiwan	Kaohsiung	88.68	37.44	28.12	24.14	20.93	17.88	13.23	12.89	10.71	10.47	9.67	9.80	9.23	8.96	8.00	7.95	7.77
2025	East Coast USA	Norfolk	Korea	Kwangyang	84.27	35.69	26.84	23.08	20.06	17.22	14.61	12.52	10.42	10.21	9.41	8.59	9.02	8.77	7.86	7.84	7.67
2025	East Coast USA	Norfolk	Japan	Mizushima	87.16	36.75	27.56	23.79	20.68	17.91	15.38	13.37	11.27	11.14	10.43	10.77	10.07	9.83	8.94	8.96	8.80
2025	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	85.13	36.05	27.08	23.14	19.97	16.91	14.27	12.05	10.00	9.81	9.05	9.13	8.63	8.32	7.36	7.21	7.04
2025	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	88.02	37.12	27.81	23.85	20.58	17.60	15.05	12.90	10.85	10.74	10.07	10.36	9.68	9.38	8.44	8.34	8.17
2025	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	88.29	37.64	28.39	24.40	20.98	17.69	15.06	12.67	10.60	10.44	9.67	9.75	9.29	8.93	7.93	7.70	7.53
2025	North America East	New York	Far East	Guangzhou	92.53	39.35	29.82	25.75	22.09	18.68	16.18	13.70	11.45	11.25	10.42	10.55					
2025	North America East	New York	Far East	Guangzhou	92.53	39.35	29.82	25.75	22.09	18.68	16.18	13.70	11.45	11.25	10.42	10.55					
2025	North America Gulf	Tampa	North America West	Los Angeles	54.33	23.37	17.20	15.36	13.74	12.08	10.84	9.71	8.56	8.57	8.18	8.37					
2025	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.75	17.16	13.22	12.30	10.99	9.53	8.32	7.27	6.32	6.21	5.74	5.87					
2025	North America Gulf	Tampa	Central America West	Lazaro Cardenas	37.75	17.16	13.22	12.30	10.99	9.53	8.32	7.27	6.32	6.21	5.74	5.87					
2025	North America Gulf	Tampa	South America West	Matarani	40.28	18.49	14.36	13.53	12.41	10.73	9.42	8.22	7.12	7.00	6.45	6.58					
2025	North America Gulf	Tampa	South America West	Matarani	40.28	18.49	14.36	13.53	12.41	10.73	9.42	8.22	7.12	7.00	6.45	6.58					
2025	North America Gulf	Tampa	Oceania	Auckland	69.54	30.06	23.09	20.53	18.02	15.62	13.66	12.01	10.24	10.05	9.28	9.44					
2025	North America Gulf	Tampa	Oceania	Auckland	69.54	30.06	23.09	20.53	18.02	15.62	13.66	12.01	10.24	10.05	9.28	9.44					
2025	North America Gulf	Mobile	Far East	Osaka	83.25	34.74	26.01	22.44	19.53	16.97	14.60	12.73	10.76	10.64	9.97	10.31	9.66	9.44	8.59	8.63	8.47
2025	North America Gulf	Tampa	Far East	Guangzhou	87.41	37.11	28.06	24.61	21.29	18.03	15.51	13.27	11.26	11.07	10.26	10.41					
2025	North America Gulf	Tampa	Far East	Guangzhou	87.41	37.11	28.06	24.61	21.29	18.03	15.51	13.27	11.26	11.07	10.26	10.41					
2025	North America Gulf	Tampa	South East Asia	Bangkok	95.09	40.99	31.30	27.73	24.12	20.56	17.81	15.35	13.14	13.07	12.03	12.20					
2025	Central America East	Puerto Limon	North America West	Los Angeles	39.94	18.80	14.34	13.00	11.94	10.55	9.34	8.29	7.16	7.21	6.91	7.04					
2025	Central America East	Puerto Limon	South America West	Matarani	25.68	13.72	11.38	11.13	10.60	9.17	7.90	6.78	5.70	5.62	5.18	5.25					
2025	Central America East	Puerto Limon	South America West	Matarani	25.68	13.72	11.38	11.13	10.60	9.17	7.90	6.78	5.70	5.62	5.18	5.25					
2025	Central America East	Puerto Limon	Far East	Guangzhou	74.33	34.22	26.55	23.45	20.46	17.26	14.65	12.30	10.19	10.02	9.28	9.35					
2025	Central America East	Puerto Limon	South East Asia	Jakarta	84.63	42.02	33.72	31.06	28.26	24.96	23.11	19.16	15.82	15.61	14.45	14.65					
2025	South America East	Santos	North America West	Los Angeles	70.42	30.13	22.36	19.56	17.31	15.18	13.40	11.88	10.15	10.15	9.66	9.78					
2025	Other South America East	Buenos Aires	West Coast USA	Los Angeles	81.91	34.77	25.83	22.58	20.01	17.47	15.26	13.40	11.51	11.47	10.77	10.88					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	54.78	23.17	17.08	14.83	13.27	11.53	10.11	8.93	7.67	7.68	7.34	7.45					
2025	South America East	Buenos Aires	West Coast Canada	Los Angeles	81.91	34.77	25.83	22.58	20.01	17.47	15.26	13.40	11.51	11.47	10.77	10.88					
2025	Brazil	Santos	West Coast USA	Los Angeles	70.42	30.13	22.36	19.56	17.31	15.18	13.40	11.88	10.15	10.15	9.66	9.78					
2025	South America East	Ponta da Madeira	North America West	Los Angeles	58.83	25.29	18.69	16.24	14.33	12.59	11.13	9.83	8.40	8.45	8.10	8.23					
2025	South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	33.46	14.84	11.47	10.35	9.46	8.21	6.92	6.01	5.01	4.90	4.50	4.52					
2025	South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	25.59	12.51	9.72	8.95	8.23	7.25	6.18	5.41	4.57	4.50	4.16	4.21					
2025	South America East	Puerto Bolivar	South America West	Huasco	31.58	16.73	13.18	11.95	10.97	10.15	9.07	7.82	6.61	6.52	5.98	5.98	5.54	5.46	5.13	5.24	5.17
2025	South America East	Puerto La Cruz	South America West	Matarani	36.00	16.18	12.62	11.59	10.90	9.42	8.02	6.96	5.82	5.69	5.22	5.24					
2025	South America East	Santos	Oceania	Brisbane	95.02	40.84	31.29	27.32	23.79	20.54	17.70	15.34	12.82	12.58	11.64	11.72					
2025	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	86.39	36.30	27.35	23.44	20.31	17.07	14.30	12.04	9.95	9.70	8.95	9.00	8.50	8.18	7.20	7.05	6.87
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	85.06	36.09	27.33	23.60	20.43	17.18	14.55	12.28	10.25	10.05	9.30	9.34	8.93	8.58	7.63	7.42	7.25
2025	Venezuela	Puerto Ordaz	Korea	Kwangyang	81.81	34.46	25.99	22.31	19.39	16.37	13.74	11.64	9.63	9.41	8.66	8.71	8.26	7.96	7.05	6.92	6.75
2025	Venezuela	Puerto Ordaz	Japan	Mizushima	84.67	35.51	26.70	23.01	19.99	17.05	14.51	12.48	10.48	10.33	9.68	9.93	9.31	9.02	8.12	8.04	7.88
2025	North Brazil	Ponta da Madeira	Korea	Kwangyang	85.85	36.58	27.59	23.72	20.44	17.42	14.76	12.54	10.36	10.18	9.43	9.49	9.00	8.68	7.72	7.57	7.40
2025	North Brazil	Ponta da Madeira	Japan	Mizushima	88.71	37.63	28.30	24.42	21.05	18.10	15.53	13.38	11.21	11.11	10.44	10.71	10.04	9.74	8.79	8.70	8.53
2025	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	89.11	38.21	28.93	25.01	21.48	18.23	15.57	13.18	10.98	10.82	10.07	10.12	9.67	9.30	8.30	8.08	7.91
2025	Venezuela	Puerto Ordaz	Japan	Shimizu	84.41	35.95	27.43	24.05	20.93	18.39	15.92	14.14	11.96	12.08	11.57	12.26					
2025	North Brazil	Saã Luiz	Japan	Shimizu	86.74	37.27	28.43	25.11	21.84	19.44	17.03	15.29	12.94	13.09	12.54	13.24					
2025	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	105.88	45.25	34.38	29.65	25.43	21.47	18.28	15.44	12.81	12.60	11.71	11.78					
2025	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	92.12	39.35	29.91	25.99	22.45	19.11	16.39	14.04	11.71	11.52	10.70	10.76					
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	85.96	36.36	27.55	23.75	20.69	17.48	14.76	12.53	10.41	10.19	9.41	9.43					
2025	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	112.53	47.77	36.24	31.47	27.24	23.14	19.71	16.77	14.06	13.82	12.72	12.76					
2025	Colombia	Puerto Bolivar	Japan	Mizushima	72.41	31.26	23.47	20.34	17.82	15.42	13.19	11.47	9.67	9.57	8.98	9.24	8.65	8.46	7.69	7.73	7.58
2025	Brazil	Saã Luiz	Far East	Guangzhou	92.12	39.35	29.91	25.99	22.45	19.11	16.39	14.04	11.71	11.52	10.70	10.76					
2025	South America East	Ponta da Madeira	Far East	Mizushima	88.71	37.63	28.30	24.42	21.05	18.10	15.53	13.38	11.21	11.11	10.44	10.71	10.04	9.74	8.79	8.70	8.53
2025	Caribbean Basin	Kingston	North America West	Los Angeles	42.62	21.11	16.38	15.46	14.47	13.54	11.94	10.63	9.20	9.37	9.05	9.39					
2025	Caribbean Basin	Kingston	North America West	Los Angeles	42.62	21.11	16.38	15.46	14.47	13.54	11.94	10.63	9.20	9.37	9.05	9.39					
2025	Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	25.90	14.81	12.33	12.34	11.67	10.95	9.39	8.16	6.94	6.99	6.60	6.86					
2025	Caribbean Basin	Kingston	South America West	Matarani	28.43	16.15	13.47	13.59	13.10	12.15	10.49	9.11	7.74	7.78	7.32	7.57					
2025	Caribbean Basin	Kingston	Far East	Guangzhou	76.51	35.44	27.73	25.15	22.38	19.78	16.86	14.38	12.06	12.02	11.28	11.55					
2025	Caribbean Basin	Kingston	Far East	Guangzhou	76.51	35.44	27.73	25.15	22.38	19.78	16.86	14.38	12.06	12.02	11.28	11.55					
2025	Europe	Rotterdam	West Coast Canada	Los Angeles	70.24	29.90	22.57	19.59	17.41	15.09	13.27	11.68	10.08	10.12	9.56	9.69					
2025	Europe	Rotterdam	West Coast USA	Los Angeles	70.24	29.90	22.57	19.59	17.41	15.09	13.27	11.68	10.08	10.12	9.56	9.69					

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					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	Europe	Rotterdam	North America West	Los Angeles	70.24	29.90	22.57	19.59	17.41	15.09	13.27	11.68	10.08	10.12	9.56	9.69					
2025	Europe	Rotterdam	Central America West	Lazaro Cardenas	53.56	23.63	18.54	16.48	14.62	12.50	10.73	9.22	7.83	7.75	7.11	7.16					
2025	Europe	Rotterdam	South America West	Matarani	56.09	24.97	19.68	17.72	16.05	13.71	11.82	10.17	8.63	8.53	7.82	7.87					
2025	Africa	Durban	North America West	Los Angeles	86.88	37.50	28.25	24.54	21.61	18.79	16.45	14.38	12.33	12.40	11.70	11.86					
2025	Africa	Safi	Central America West	Lazaro Cardenas	50.36	22.88	17.89	16.02	14.20	12.36	10.68	9.25	7.86	7.87	7.26	7.35					
2025	Africa	Safi	Oceania	Auckland	82.96	36.25	28.17	24.62	21.53	18.70	16.24	14.16	11.94	11.85	10.94	11.05					
2025	Middle East	Damman	Central America West	Lazaro Cardenas	85.14	37.46	28.95	25.48	22.27	19.09	16.32	13.94	11.74	11.65	10.75	10.85					
2025	Middle East	Damman	South America West	Matarani	87.68	38.79	30.09	26.72	23.70	20.29	17.42	14.89	12.54	12.44	11.47	11.56					
2025	Middle East	Damman	South America West	Matarani	87.68	38.79	30.09	26.72	23.70	20.29	17.42	14.89	12.54	12.44	11.47	11.56					
2025	North America West	Vancouver	North America East	Philadelphia	58.93	24.49	19.53	17.43	15.80	13.04	11.36	9.47	7.97	7.83	7.25	7.38					
2025	North America West	Vancouver	North America Gulf	New Orleans	56.11	23.63	18.82	17.22	15.80	13.04	11.23	9.47	8.12	7.99	7.40	7.54					
2025	North America West	Vancouver	Central America East	Tampico	48.02	20.93	17.18	15.78	14.73	12.21	10.30	8.60	7.22	7.10	6.56	6.64	6.31	6.11	5.41	5.17	5.05
2025	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	67.58	28.05	22.29	20.00	18.27	15.18	12.96	10.92	9.10	8.97	8.33	8.40	7.95	7.68	6.82	6.48	6.33
2025	North America West	Vancouver	South America East	Sepetiba, Bahia de	67.58	28.05	22.29	20.00	18.27	15.18	12.96	10.92	9.10	8.97	8.33	8.40	7.95	7.68	6.82	6.48	6.33
2025	North America West	Vancouver	Caribbean Basin	San Juan	45.53	21.67	18.12	17.43	16.69	14.69	12.47	10.48	8.85	8.88	8.36	8.64					
2025	West Coast USA	Los Angeles	Europe	Rotterdam	69.79	29.24	23.39	20.95	19.48	16.27	14.31	12.20	10.52	10.56	9.97	10.10					
2025	West Coast Canada	Vancouver	Europe	Rotterdam	70.28	29.34	23.82	21.24	19.45	15.92	13.54	11.27	9.50	9.40	8.65	8.72	8.30	8.02	7.14	6.80	6.64
2025	North America West	Vancouver	Europe	Rotterdam	70.28	29.34	23.82	21.24	19.45	15.92	13.54	11.27	9.50	9.40	8.65	8.72	8.30	8.02	7.14	6.80	6.64
2025	West Coast Canada	Vancouver	North Africa	Alexandria	78.94	33.33	26.89	24.03	21.91	18.13	15.47	12.90	10.85	10.81	10.00	10.10	9.55	9.20	8.09	7.64	7.45
2025	West Coast Canada	Vancouver	South Africa	Durban	85.95	36.21	29.20	26.06	23.73	19.59	16.70	13.89	11.67	11.60	10.73	10.84	10.24	9.85	8.65	8.17	7.96
2025	North America West	Vancouver	Africa	Safi	66.57	28.24	22.82	20.43	18.70	15.55	13.31	11.16	9.42	9.42	8.71	8.81					
2025	North America West	Vancouver	Middle East	Aqaba (El Akaba)	82.22	34.68	27.97	24.98	22.76	18.82	16.05	13.36	11.23	11.18	10.34	10.45					
2025	Central America West	Puerto Quetzal	North America East	Philadelphia	36.72	16.98	14.25	13.48	12.81	11.20	9.82	8.15	6.87	6.76	6.26	6.39					
2025	Central America West	Puerto Quetzal	North America East	Philadelphia	36.72	16.98	14.25	13.48	12.81	11.20	9.82	8.15	6.87	6.76	6.26	6.39					
2025	Central America West	Puerto Quetzal	North America Gulf	South Louisiana	33.72	16.03	13.45	13.21	12.77	11.15	9.64	8.11	7.00	6.91	6.40	6.55					
2025	Central America West	Puerto Quetzal	North America Gulf	New Orleans	33.72	16.03	13.45	13.21	12.77	11.15	9.64	8.11	7.00	6.91	6.40	6.55					
2025	Central America West	Puerto Quetzal	Central America East	Tampico	25.66	13.37	11.88	11.83	11.76	10.37	8.75	7.27	6.12	6.03	5.58	5.66					
2025	Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	46.16	21.15	17.55	16.55	15.74	13.69	11.71	9.82	8.18	8.08	7.50	7.57					
2025	Central America West	Puerto Quetzal	Caribbean Basin	San Juan	23.02	14.08	12.81	13.52	13.78	12.90	10.97	9.18	7.76	7.84	7.42	7.73					
2025	Central America West	Puerto Quetzal	Europe	Rotterdam	49.06	22.59	19.22	17.90	17.01	14.50	12.35	10.21	8.62	8.54	7.85	7.92					
2025	Central America West	Puerto Quetzal	Africa	Safi	45.17	21.39	18.13	17.03	16.20	14.09	12.09	10.08	8.52	8.55	7.91	8.01					
2025	Peru	San Nicolas	East Coast USA	Baltimore	44.54	19.30	15.53	14.10	12.86	10.64	9.22	7.68	6.51	6.41	5.94	6.06	5.89	5.71	5.24	5.03	4.93
2025	Chile	Antofagasta	East Coast USA	Baltimore	48.74	22.98	19.04	17.55	16.25	14.15	12.64	10.50	8.92	8.78	8.09	8.18	8.14	7.92	7.35	7.09	6.98

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					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	South America West	Matarani	North America East	Philadelphia	45.07	19.99	16.49	15.51	14.63	12.15	10.79	9.00	7.61	7.48	6.89	7.00					
2025	South America West	Callao	North America East	Philadelphia	42.15	18.78	15.51	14.65	13.86	11.54	10.27	8.58	7.27	7.14	6.58	6.69					
2025	South America West	San Nicolas	North America Gulf	Mobile	40.75	17.64	14.16	12.87	11.91	10.00	8.65	7.29	6.15	6.05	5.59	5.69	5.51	5.40	4.97	4.87	4.77
2025	South America West	Matarani	North America Gulf	South Louisiana	42.16	19.09	15.74	15.27	14.60	12.13	10.64	8.98	7.75	7.63	7.04	7.16					
2025	South America West	Callao	North America Gulf	South Louisiana	39.24	17.88	14.77	14.41	13.83	11.51	10.12	8.56	7.41	7.29	6.73	6.85					
2025	South America West	Callao	Central America East	Tampico	31.16	15.18	13.14	12.98	12.78	10.69	9.20	7.70	6.52	6.40	5.89	5.95					
2025	South America West	Callao	South America East	Puerto La Cruz	36.34	17.26	14.59	13.92	13.56	11.41	9.93	8.21	6.83	6.70	6.16	6.22					
2025	Chile	Antofagasta	Caribbean Basin	Point Lisas	35.00	18.16	15.17	14.16	13.36	11.86	10.51	8.67	7.33	7.21	6.62	6.63	6.72	6.55	6.08	5.87	5.78
2025	Peru	San Nicolas	Caribbean Basin	Point Lisas	30.81	14.49	11.67	10.71	9.97	8.35	7.09	5.86	4.92	4.84	4.47	4.51	4.47	4.34	3.97	3.81	3.73
2025	South America West	Callao	Caribbean Basin	San Juan	28.60	15.90	14.06	14.61	14.73	13.16	11.37	9.57	8.14	8.18	7.69	7.96					
2025	Peru	Matarani	Europe	Rotterdam	56.88	25.12	21.03	19.54	18.48	15.19	13.11	10.90	9.24	9.13	8.38	8.43					
2025	Chile	Antofagasta	Europe	Rotterdam	59.94	27.76	23.28	21.29	19.81	16.92	14.95	12.37	10.49	10.37	9.48	9.49	9.39	9.07	8.25	7.86	7.72
2025	South America West	Callao	Europe	Rotterdam	53.96	23.90	20.05	18.68	17.71	14.57	12.59	10.48	8.90	8.80	8.07	8.12					
2025	South America West	Callao	Africa	Safi	50.17	22.75	19.01	17.84	16.93	14.18	12.34	10.36	8.80	8.81	8.12	8.20					
2025	South America West	Matarani	Middle East	Aqaba (El Akaba)	69.13	30.63	25.34	23.44	21.93	18.19	15.70	13.07	11.03	10.98	10.12	10.21					
2025	Oceania	Newcastle	North America East	Baltimore	88.04	36.87	29.78	26.53	23.91	19.61	16.74	13.87	11.60	11.35	10.49	10.60	10.07	9.74	8.74	8.34	8.14
2025	Oceania	Bunbury	North America East	Philadelphia	98.14	41.01	33.13	29.60	26.55	21.68	18.83	15.52	13.02	12.72	11.73	11.82					
2025	Oceania	Newcastle	North America Gulf	Mobile	84.03	35.12	28.32	25.21	22.89	18.90	16.11	13.43	11.20	10.95	10.10	10.19	9.66	9.39	8.45	8.15	7.96
2025	Oceania	Bunbury	North America Gulf	South Louisiana	95.02	40.01	32.29	29.27	26.44	21.60	18.62	15.46	13.13	12.84	11.85	11.95					
2025	Oceania	Newcastle	Central America East	Tampico	76.26	32.86	27.03	24.49	22.48	18.44	15.61	12.92	10.76	10.51	9.69	9.72	9.23	8.88	7.83	7.40	7.22
2025	Oceania	Bunbury	Central America East	Tampico	86.97	37.33	30.67	27.85	25.40	20.78	17.71	14.60	12.24	11.95	11.02	11.06					
2025	Oceania	Bunbury	Caribbean Basin	San Juan	84.22	37.95	31.50	29.39	27.26	23.18	19.81	16.44	13.85	13.71	12.80	13.05					
2025	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	124.01	52.47	42.74	38.23	34.47	28.22	24.17	19.95	16.77	16.54	15.25	15.31					
2025	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Korea	Guangzhou	East Coast USA	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Far East	Guangzhou	East Coast Canada	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Taiwan	Guangzhou	East Coast USA	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Japan	Kobe	East Coast USA	Philadelphia	89.07	37.44	30.42	27.55	24.82	20.98	18.50	15.75	13.45	13.53	12.88	13.57					
2025	Far East	Guangzhou	North America East	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Far East	Guangzhou	North America East	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Far East	Guangzhou	North America East	Philadelphia	95.46	39.82	32.19	28.73	25.78	21.01	18.21	14.98	12.56	12.33	11.42	11.54					
2025	Far East	Guangzhou	North America Gulf	South Louisiana	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	12.69	12.46	11.55	11.68					
2025	Far East	Guangzhou	North America Gulf	South Louisiana	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	12.69	12.46	11.55	11.68					

Table C-4. Ocean Freight Rates Excluding Tolls for Expanded Canal, Via Panama Canal, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	Far East	Guangzhou	North America Gulf	New Orleans	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	12.69	12.46	11.55	11.68					
2025	Far East	Guangzhou	North America Gulf	South Louisiana	92.46	38.88	31.41	28.45	25.71	20.96	18.04	14.94	12.69	12.46	11.55	11.68					
2025	Far East	Guangzhou	Central America East	Tampico	84.39	36.18	29.77	27.02	24.65	20.13	17.12	14.08	11.80	11.58	10.72	10.78					
2025	Far East	Guangzhou	South America East	Puerto La Cruz	89.49	38.21	31.18	27.92	25.40	20.82	17.82	14.57	12.10	11.86	10.97	11.03					
2025	Far East	Guangzhou	Caribbean Basin	San Juan	81.76	36.86	30.65	28.60	26.55	22.55	19.24	15.93	13.41	13.34	12.50	12.77					
2025	South East Asia	Manado	North America East	Philadelphia	94.43	41.79	34.73	32.34	30.38	26.05	24.49	19.98	16.73	16.46	15.23	15.46					
2025	South East Asia	Bangkok	North America Gulf	New Orleans	97.35	41.06	33.30	30.44	27.67	22.74	19.71	16.47	14.12	14.03	12.91	13.08					
2025	South East Asia	Manado	North America Gulf	New Orleans	91.58	40.93	34.02	32.12	30.36	26.04	24.35	19.97	16.88	16.61	15.38	15.62					
2025	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	103.33	42.99	34.36	30.95	28.39	23.84	21.05	17.43	14.60	14.36	13.29	13.37					

Source: Richardson Lawrie Associates

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 dwt)																		
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	North America East	New York	North America West	Los Angeles	107.3	44.4	38.1	32.5	27.9	23.7	21.2	18.4	17.7	18.1	18.6	30.8					
2000	North America East	New York	Central America (incl. N	Lazaro Cardenas	91.4	38.5	34.1	29.5	25.3	21.3	18.8	16.0	15.4	15.5	15.7	25.7					
2000	North America East	New York	South America West	Matarani	78.0	33.3	29.5	25.9	22.6	19.1	17.0	14.6	14.0	14.1	14.3	23.5					
2000	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	93.5	38.4	34.0	28.7	24.3	20.2	17.6	14.9	14.2	14.4	14.6	23.8				8.0	
2000	North America East	New York	Oceania	Brisbane	100.1	41.6	36.9	31.6	27.0	23.0	20.5	17.7	17.0	17.2	17.4	28.5					
2000	East Coast USA	Norfolk	Taiwan	Kaohsiung	102.8	43.3	37.9	32.1	27.5	23.2	20.1	17.2	16.4	16.5	16.7	27.4			11.2	11.0	10.7
2000	East Coast USA	Norfolk	Korea	Kwangyang	108.9	45.9	40.2	34.1	29.2	24.7	21.4	18.3	17.5	17.6	17.8	29.2			10.7	10.5	10.3
2000	East Coast USA	Norfolk	Japan	Mizushima	114.1	47.9	41.8	35.5	30.4	25.8	22.6	19.5	18.7	19.0	19.4	32.3			11.9	11.6	11.4
2000	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	99.3	43.3	38.3	32.3	27.5	23.0	19.9	16.9	16.2	16.3	16.5	26.9			9.5	9.2	9.1
2000	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	104.5	45.3	39.8	33.7	28.7	24.2	21.1	18.1	17.4	17.7	18.1	30.0			10.6	10.4	10.4
2000	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	98.5	43.2	38.3	32.5	27.5	23.0	20.0	17.0	16.3	16.5	16.7	27.3			9.7	9.3	9.1
2000	North America East	New York	Far East	Guangzhou	101.7	43.5	38.3	32.6	27.7	23.2	20.5	17.4	16.6	16.8	17.1	28.1					
2000	North America East	New York	Far East	Guangzhou	101.7	43.5	38.3	32.6	27.7	23.2	20.5	17.4	16.6	16.8	17.1	28.1					
2000	North America Gulf	Tampa	North America West	Los Angeles	111.0	45.9	39.4	34.0	29.4	25.0	22.2	19.3	18.8	19.2	19.8	32.7					
2000	North America Gulf	Tampa	Central America (incl. N	Lazaro Cardenas	91.3	38.4	34.1	29.9	25.8	21.7	19.0	16.3	15.9	16.1	16.3	26.7					
2000	North America Gulf	Tampa	Central America (incl. N	Lazaro Cardenas	91.3	38.4	34.1	29.9	25.8	21.7	19.0	16.3	15.9	16.1	16.3	26.7					
2000	North America Gulf	Tampa	South America West	Matarani	78.1	33.4	29.6	26.4	23.2	19.6	17.3	14.9	14.6	14.7	14.9	24.5					
2000	North America Gulf	Tampa	South America West	Matarani	78.1	33.4	29.6	26.4	23.2	19.6	17.3	14.9	14.6	14.7	14.9	24.5					
2000	North America Gulf	Tampa	Oceania	Auckland	91.7	38.3	34.1	29.7	25.6	21.8	19.4	17.0	16.6	16.7	16.9	27.8					
2000	North America Gulf	Tampa	Oceania	Auckland	91.7	38.3	34.1	29.7	25.6	21.8	19.4	17.0	16.6	16.7	16.9	27.8					
2000	North America Gulf	Mobile	Far East	Osaka	118.2	48.1	42.0	35.6	30.5	25.9	22.7	19.6	18.8	19.1	19.5	32.5			12.0	11.7	11.5
2000	North America Gulf	Tampa	Far East	Guangzhou	105.9	43.6	38.5	33.1	28.3	23.7	20.8	17.8	17.3	17.5	17.7	29.1					
2000	North America Gulf	Tampa	Far East	Guangzhou	105.9	43.6	38.5	33.1	28.3	23.7	20.8	17.8	17.3	17.5	17.7	29.1					
2000	North America Gulf	Tampa	South East Asia	Bangkok	101.4	42.4	37.8	33.0	28.3	23.9	21.2	18.4	18.0	18.5	18.6	30.6					
2000	Central America (incl. Mexic	Puerto Limon	North America West	Los Angeles	144.3	60.6	53.6	46.0	39.7	33.5	29.3	25.1	24.2	24.6	25.2	41.3					
2000	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	68.4	30.3	27.9	25.0	22.2	18.8	16.4	14.1	13.6	13.7	13.9	22.6					
2000	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	68.4	30.3	27.9	25.0	22.2	18.8	16.4	14.1	13.6	13.7	13.9	22.6					
2000	Central America (incl. Mexic	Puerto Limon	Far East	Guangzhou	96.8	41.0	37.1	32.0	27.5	23.1	20.1	17.1	16.4	16.6	16.8	27.4					
2000	Central America (incl. Mexic	Puerto Limon	South East Asia	Jakarta	86.4	39.5	37.3	33.8	30.4	26.7	25.4	21.5	20.7	21.0	21.2	34.7					
2000	South America East	Santos	North America West	Los Angeles	73.8	30.8	26.2	22.7	19.8	17.2	15.4	13.7	13.3	13.7	14.2	23.5					
2000	Other South America East	Buenos Aires	West Coast USA	Los Angeles	73.0	30.3	25.4	22.1	19.4	16.9	15.1	13.4	13.1	13.5	13.9	23.0					
2000	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	99.0	40.9	35.2	30.0	26.0	22.0	19.3	16.7	16.1	16.4	17.0	27.9					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	South America East	Buenos Aires	West Coast Canada	Los Angeles	73.0	30.3	25.4	22.1	19.4	16.9	15.1	13.4	13.1	13.5	13.9	23.0					
2000	Brazil	Santos	West Coast USA	Los Angeles	73.8	30.8	26.2	22.7	19.8	17.2	15.4	13.7	13.3	13.7	14.2	23.5					
2000	South America East	Ponta da Madeira	North America West	Los Angeles	87.3	36.5	31.3	26.8	23.1	19.8	17.5	15.3	14.7	15.1	15.7	25.9					
2000	South America East	Puerto La Cruz	Central America (incl. N	Lazaro Cardenas	82.8	34.8	31.0	26.8	23.3	19.6	17.0	14.5	13.9	14.0	14.1	22.9					
2000	South America East	Puerto Bolivar	Central America (incl. N	Lazaro Cardenas	80.8	34.9	31.3	27.2	23.6	19.9	17.3	14.8	14.2	14.3	14.5	23.6					
2000	South America East	Puerto Bolivar	South America West	Huasco	62.6	29.1	25.9	22.6	19.9	17.5	15.6	13.3	12.7	12.9	13.0	21.3					
2000	South America East	Puerto La Cruz	South America West	Matarani	68.6	29.2	26.0	22.9	20.4	17.3	15.0	12.9	12.3	12.4	12.5	20.4					
2000	South America East	Santos	Oceania	Brisbane	65.3	27.5	24.6	21.4	18.6	16.2	14.5	12.9	12.5	12.6	12.8	20.9					
2000	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	97.6	40.0	35.2	29.8	25.5	21.3	18.3	15.5	14.7	14.8	15.0	24.4			9.9	9.6	10.0
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	103.0	42.6	37.6	32.0	27.3	22.8	19.7	16.7	16.0	16.2	16.4	26.7			9.5	9.1	8.9
2000	Venezuela	Puerto Ordaz	Korea	Kwangyang	104.0	42.8	37.6	31.9	27.3	22.8	19.7	16.7	15.9	16.0	16.2	26.3			9.3	9.0	8.9
2000	Venezuela	Puerto Ordaz	Japan	Mizushima	109.3	44.8	39.2	33.3	28.5	24.0	20.9	17.9	17.2	17.4	17.8	29.5			10.4	10.2	10.2
2000	North Brazil	Ponta da Madeira	Korea	Kwangyang	92.4	38.3	33.8	28.7	24.4	20.6	17.9	15.3	14.5	14.7	14.9	24.3			8.7	8.4	8.3
2000	North Brazil	Ponta da Madeira	Japan	Mizushima	97.6	40.4	35.3	30.1	25.6	21.8	19.1	16.5	15.8	16.1	16.5	27.5			9.8	9.6	9.6
2000	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	91.4	38.2	33.7	28.8	24.4	20.6	18.0	15.3	14.6	14.9	15.2	24.7			8.9	8.5	8.4
2000	Venezuela	Puerto Ordaz	Japan	Shimizu	112.2	46.5	41.1	35.4	30.3	26.1	23.0	20.3	19.5	20.2	21.1	35.8					
2000	North Brazil	Saã Luiz	Japan	Shimizu	98.9	41.4	36.5	31.8	27.3	23.9	21.3	19.1	18.5	19.3	20.1	34.3					
2000	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	81.2	33.9	30.0	25.6	21.8	18.3	16.0	13.7	13.1	13.3	13.5	22.1					
2000	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	84.9	35.4	31.3	26.9	23.0	19.5	17.1	14.8	14.2	14.4	14.7	23.9					
2000	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	106.2	43.8	38.6	32.9	28.2	23.6	20.4	17.4	16.5	16.7	16.9	27.5					
2000	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	86.8	36.0	31.5	27.2	23.4	19.8	17.3	15.0	14.4	14.6	14.8	24.1					
2000	Colombia	Puerto Bolivar	Japan	Mizushima	107.4	44.9	39.4	33.6	28.9	24.5	21.3	18.4	17.6	17.9	18.3	30.3					
2000	Brazil	Saã Luiz	Far East	Guangzhou	84.9	35.4	31.3	26.9	23.0	19.5	17.1	14.8	14.2	14.4	14.7	23.9					
2000	South America East	Ponta da Madeira	Far East	Mizushima	97.6	40.4	35.3	30.1	25.6	21.8	19.1	16.5	15.8	16.1	16.5	27.5					
2000	Caribbean Basin	Kingston	North America West	Los Angeles	96.9	42.8	38.1	33.9	30.0	26.4	23.3	20.3	19.7	20.4	21.2	35.1					
2000	Caribbean Basin	Kingston	North America West	Los Angeles	96.9	42.8	38.1	33.9	30.0	26.4	23.3	20.3	19.7	20.4	21.2	35.1					
2000	Caribbean Basin	Kingston	Central America (incl. N	Lazaro Cardenas	80.9	36.9	34.2	30.9	27.3	23.9	20.9	17.9	17.4	17.7	18.2	30.0					
2000	Caribbean Basin	Kingston	South America West	Matarani	67.3	31.6	29.4	27.2	24.6	21.7	19.0	16.4	15.9	16.3	16.7	27.6					
2000	Caribbean Basin	Kingston	Far East	Guangzhou	95.9	42.3	38.7	34.3	29.9	26.0	22.7	19.5	18.8	19.2	19.7	32.6					
2000	Caribbean Basin	Kingston	Far East	Guangzhou	95.9	42.3	38.7	34.3	29.9	26.0	22.7	19.5	18.8	19.2	19.7	32.6					
2000	Europe	Rotterdam	West Coast Canada	Los Angeles	103.1	42.6	37.3	31.8	27.6	23.4	20.8	18.0	17.5	18.0	18.5	30.4					
2000	Europe	Rotterdam	West Coast USA	Los Angeles	103.1	42.6	37.3	31.8	27.6	23.4	20.8	18.0	17.5	18.0	18.5	30.4					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	Europe	Rotterdam	North America West	Los Angeles	103.1	42.6	37.3	31.8	27.6	23.4	20.8	18.0	17.5	18.0	18.5	30.4					
2000	Europe	Rotterdam	Central America (incl. M	Lazaro Cardenas	87.2	36.7	33.4	28.8	24.9	20.9	18.3	15.7	15.2	15.4	15.5	25.3					
2000	Europe	Rotterdam	South America West	Matarani	73.8	31.5	28.7	25.2	22.3	18.8	16.6	14.2	13.8	14.0	14.1	23.0					
2000	Africa	Durban	North America West	Los Angeles	86.2	35.8	31.3	26.8	23.3	20.1	18.1	15.9	15.6	16.2	16.7	27.5					
2000	Africa	Safi	Central America (incl. M	Lazaro Cardenas	77.4	32.8	29.9	26.0	22.5	19.2	16.9	14.6	14.3	14.6	14.8	24.0					
2000	Africa	Safi	Oceania	Auckland	77.8	32.7	29.9	25.8	22.3	19.3	17.3	15.3	14.9	15.3	15.4	25.1					
2000	Middle East	Damman	Central America (incl. M	Lazaro Cardenas	91.2	38.8	35.3	30.6	26.4	22.4	19.7	16.9	16.5	16.8	17.0	27.7					
2000	Middle East	Damman	South America West	Matarani	87.4	37.6	34.2	29.9	26.3	22.3	19.7	17.0	16.5	16.9	17.0	27.7					
2000	Middle East	Damman	South America West	Matarani	87.4	37.6	34.2	29.9	26.3	22.3	19.7	17.0	16.5	16.9	17.0	27.7					
2000	North America West	Vancouver	North America East	Philadelphia	108.3	43.6	40.4	35.5	31.6	25.6	22.4	18.6	18.4	18.1	17.2	28.7					
2000	North America West	Vancouver	North America Gulf	New Orleans	111.2	45.1	41.8	37.1	33.3	26.9	23.4	19.5	19.6	19.3	18.3	30.5					
2000	North America West	Vancouver	Central America (incl. M	Tampico	103.9	42.6	40.6	36.1	32.5	26.3	22.8	18.9	18.8	18.5	17.5	29.0					
2000	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	72.1	29.1	26.9	23.9	21.5	17.7	15.5	13.1	13.0	12.9	12.3	20.4				7.6	8.0
2000	North America West	Vancouver	South America East	Sepetiba, Bahia de	72.1	29.1	26.9	23.9	21.5	17.7	15.5	13.1	13.0	12.9	12.3	20.4					
2000	North America West	Vancouver	Caribbean Basin	San Juan	93.6	40.2	38.7	35.3	32.4	27.3	23.7	19.8	19.8	19.8	18.9	31.8					
2000	West Coast USA	Los Angeles	Europe	Rotterdam	103.3	41.9	38.9	34.2	31.0	25.4	22.5	19.0	19.1	19.2	18.4	30.7					
2000	West Coast Canada	Vancouver	Europe	Rotterdam	103.9	42.0	39.7	34.8	31.3	25.3	22.0	18.2	18.2	18.1	17.0	28.2			10.5	10.7	10.7
2000	North America West	Vancouver	Europe	Rotterdam	103.9	42.0	39.7	34.8	31.3	25.3	22.0	18.2	18.2	18.1	17.0	28.2					
2000	West Coast Canada	Vancouver	North Africa	Alexandria	89.1	40.1	37.4	33.0	30.1	24.8	21.8	18.3	18.1	18.1	17.1	28.3			11.4		
2000	West Coast Canada	Vancouver	South Africa	Durban	87.3	35.7	33.7	29.7	26.8	21.9	19.2	16.1	16.2	16.2	15.3	25.4					
2000	North America West	Vancouver	Africa	Safi	95.3	38.9	36.8	32.4	29.1	23.8	20.8	17.4	17.5	17.5	16.5	27.4					
2000	North America West	Vancouver	Middle East	Aqaba (El Akaba)	91.4	37.3	35.3	31.1	27.9	22.9	20.0	16.8	16.8	16.8	15.9	26.4					
2000	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	90.7	38.2	36.1	32.5	29.6	24.6	21.6	17.8	17.7	17.5	16.5	27.6					
2000	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	90.7	38.2	36.1	32.5	29.6	24.6	21.6	17.8	17.7	17.5	16.5	27.6					
2000	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	South Louisiana	93.7	39.7	37.6	34.2	31.3	25.9	22.6	18.8	18.9	18.7	17.7	29.4					
2000	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	New Orleans	93.7	39.7	37.6	34.2	31.3	25.9	22.6	18.8	18.9	18.7	17.7	29.4					
2000	Central America (incl. Mexic	Puerto Quetzal	Central America (incl. M	Tampico	86.4	37.3	36.4	33.2	30.6	25.4	22.0	18.2	18.2	17.9	16.9	27.9					
2000	Central America (incl. Mexic	Puerto Quetzal	South America East	Sepetiba, Bahia de	52.4	22.6	21.7	20.0	18.7	16.1	14.1	12.0	12.0	11.9	11.3	18.7					
2000	Central America (incl. Mexic	Puerto Quetzal	Caribbean Basin	San Juan	75.7	34.6	34.3	32.3	30.4	26.2	22.8	19.0	19.1	19.1	18.3	30.7					
2000	Central America (incl. Mexic	Puerto Quetzal	Europe	Rotterdam	86.4	36.6	35.5	31.9	29.3	24.3	21.2	17.5	17.6	17.4	16.4	27.2					
2000	Central America (incl. Mexic	Puerto Quetzal	Africa	Safi	77.5	33.3	32.4	29.4	27.0	22.7	19.9	16.6	16.8	16.8	15.8	26.2					
2000	Peru	San Nicolas	East Coast USA	Baltimore	81.3	33.6	31.1	27.5	24.6	19.9	17.4	14.4	14.3	14.1	13.4	22.5					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	Chile	Antofagasta	East Coast USA	Baltimore	78.6	34.4	32.2	28.8	26.1	21.9	19.6	16.2	16.0	15.9	15.0	25.2				9.1	
2000	South America West	Matarani	North America East	Philadelphia	79.4	33.3	31.2	28.3	25.9	21.1	18.7	15.5	15.5	15.3	14.4	24.1					
2000	South America West	Callao	North America East	Philadelphia	81.3	34.1	32.0	28.9	26.4	21.5	19.1	15.9	15.8	15.6	14.7	24.5					
2000	South America West	San Nicolas	North America Gulf	Mobile	82.7	34.1	31.5	27.9	25.1	20.5	17.8	14.8	14.6	14.5	13.7	22.9					
2000	South America West	Matarani	North America Gulf	South Louisiana	82.3	34.8	32.6	30.0	27.6	22.4	19.8	16.5	16.7	16.4	15.5	25.9					
2000	South America West	Callao	North America Gulf	South Louisiana	84.2	35.5	33.4	30.6	28.1	22.9	20.1	16.8	17.0	16.7	15.8	26.4					
2000	South America West	Callao	Central America (incl. M	Tampico	76.9	33.1	32.2	29.6	27.4	22.3	19.5	16.2	16.2	15.9	15.0	24.9					
2000	South America West	Callao	South America East	Puerto La Cruz	72.2	31.1	30.0	27.3	25.3	20.8	18.3	15.1	15.0	14.8	13.9	23.0					
2000	Chile	Antofagasta	Caribbean Basin	Point Lisas	58.9	27.3	25.8	23.3	21.3	18.1	16.1	13.3	13.1	13.0	12.3	20.4				7.5	
2000	Peru	San Nicolas	Caribbean Basin	Point Lisas	61.6	26.5	24.7	22.0	19.8	16.2	14.0	11.5	11.4	11.2	10.6	17.7					
2000	South America West	Callao	Caribbean Basin	San Juan	66.5	30.6	30.2	28.8	27.3	23.2	20.4	17.0	17.2	17.2	16.5	27.6					
2000	Peru	Matarani	Europe	Rotterdam	75.1	31.7	30.6	27.7	25.6	20.8	18.3	15.2	15.3	15.2	14.3	23.7					
2000	Chile	Antofagasta	Europe	Rotterdam	74.3	32.8	31.4	28.1	25.7	21.5	19.2	15.9	15.9	15.8	14.9	24.7					
2000	South America West	Callao	Europe	Rotterdam	78.2	32.9	31.7	28.7	26.5	21.5	18.9	15.7	15.8	15.7	14.7	24.4					
2000	South America West	Callao	Africa	Safi	68.2	29.3	28.3	25.8	23.9	19.7	17.5	14.7	14.8	14.9	14.0	23.3					
2000	South America West	Matarani	Middle East	Aqaba (El Akaba)	83.3	35.4	34.0	30.9	28.3	23.2	20.5	17.1	17.3	17.3	16.3	27.0					
2000	Oceania	Newcastle	North America East	Baltimore	107.0	43.7	40.5	35.6	31.7	25.7	22.4	18.6	18.4	18.1	17.1	28.6			11.1	10.7	10.5
2000	Oceania	Bunbury	North America East	Philadelphia	96.4	39.3	36.3	32.0	28.5	23.1	20.5	17.0	16.9	16.6	15.7	26.2					
2000	Oceania	Newcastle	North America Gulf	Mobile	108.5	44.2	40.9	36.0	32.2	26.3	22.8	19.0	18.7	18.5	17.4	29.0			11.3	11.0	10.8
2000	Oceania	Bunbury	North America Gulf	South Louisiana	100.1	41.1	38.0	34.0	30.4	24.6	21.7	18.1	18.2	17.9	16.9	28.2					
2000	Oceania	Newcastle	Central America (incl. M	Tampico	101.8	42.3	40.3	35.8	32.3	26.2	22.7	18.8	18.7	18.3	17.3	28.6			10.9	10.5	10.3
2000	Oceania	Bunbury	Central America (incl. M	Tampico	92.8	38.7	36.8	33.0	29.7	24.1	21.1	17.5	17.4	17.2	16.2	26.8					
2000	Oceania	Bunbury	Caribbean Basin	San Juan	81.4	35.7	34.4	31.8	29.2	24.7	21.7	18.2	18.3	18.3	17.5	29.3					
2000	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	51.8	21.7	20.5	18.3	16.6	13.8	12.4	10.6	10.8	10.9	10.3	17.0					
2000	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					
2000	Korea	Guangzhou	East Coast USA	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					
2000	Far East	Guangzhou	East Coast Canada	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					
2000	Taiwan	Guangzhou	East Coast USA	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					
2000	Japan	Kobe	East Coast USA	Philadelphia	116.4	49.0	45.8	40.8	36.3	30.0	26.8	22.7	22.8	23.0	22.3	38.3					
2000	Far East	Guangzhou	North America East	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					
2000	Far East	Guangzhou	North America East	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					
2000	Far East	Guangzhou	North America East	Philadelphia	106.0	44.5	41.5	36.6	32.4	26.2	23.1	19.1	19.0	18.7	17.8	29.6					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2000	Far East	Guangzhou	North America Gulf	South Louisiana	113.4	46.3	43.2	38.5	34.3	27.7	24.3	20.2	20.2	20.0	19.0	31.6					
2000	Far East	Guangzhou	North America Gulf	South Louisiana	113.4	46.3	43.2	38.5	34.3	27.7	24.3	20.2	20.2	20.0	19.0	31.6					
2000	Far East	Guangzhou	North America Gulf	New Orleans	113.4	46.3	43.2	38.5	34.3	27.7	24.3	20.2	20.2	20.0	19.0	31.6					
2000	Far East	Guangzhou	North America Gulf	South Louisiana	113.4	46.3	43.2	38.5	34.3	27.7	24.3	20.2	20.2	20.0	19.0	31.6					
2000	Far East	Guangzhou	Central America (incl. M	Tampico	106.1	43.9	42.0	37.4	33.6	27.2	23.7	19.5	19.5	19.2	18.2	30.1					
2000	Far East	Guangzhou	South America East	Puerto La Cruz	101.0	41.7	39.7	35.0	31.4	25.5	22.4	18.4	18.2	18.0	17.0	28.2					
2000	Far East	Guangzhou	Caribbean Basin	San Juan	95.0	41.1	39.8	36.4	33.3	27.8	24.4	20.3	20.4	20.4	19.5	32.7					
2000	South East Asia	Manado	North America East	Philadelphia	104.4	44.8	43.3	39.7	36.7	31.0	29.6	24.3	24.2	24.0	22.7	37.8					
2000	South East Asia	Bangkok	North America Gulf	New Orleans	105.7	43.4	40.9	36.9	33.1	26.9	23.9	20.0	20.4	20.4	19.2	32.0					
2000	South East Asia	Manado	North America Gulf	New Orleans	108.1	46.5	44.9	41.5	38.5	32.5	30.7	25.4	25.5	25.2	23.9	39.8					
2000	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	71.3	29.2	27.2	24.4	22.3	18.9	17.3	14.6	14.5	14.4	13.7	22.7					
2005	North America East	New York	North America West	Los Angeles	103.1	43.2	32.1	27.7	24.1	20.7	18.2	15.7	14.6	15.1	15.6	26.7					
2005	North America East	New York	Central America (incl. M	Lazaro Cardenas	87.6	37.4	28.4	24.9	21.6	18.3	15.8	13.4	12.2	12.5	12.7	21.6					
2005	North America East	New York	South America West	Matarani	75.0	32.5	24.8	22.1	19.5	16.7	14.5	12.3	11.3	11.6	11.7	19.9					
2005	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	89.4	37.3	27.9	23.8	20.4	17.2	14.6	12.3	11.1	11.4	11.6	19.6				6.1	
2005	North America East	New York	Oceania	Brisbane	95.9	40.4	30.7	26.6	23.0	19.8	17.2	14.8	13.5	13.8	14.0	23.8					
2005	East Coast USA	Norfolk	Taiwan	Kaohsiung	98.2	42.0	31.4	26.9	23.3	19.9	16.8	14.3	13.0	13.2	13.4	22.8			8.9	8.5	8.2
2005	East Coast USA	Norfolk	Korea	Kwangyang	104.0	44.5	33.3	28.6	24.8	21.2	17.9	15.3	13.9	14.2	14.4	24.4			8.5	8.1	7.9
2005	East Coast USA	Norfolk	Japan	Mizushima	109.1	46.5	34.8	29.9	25.9	22.3	19.0	16.4	15.1	15.5	15.9	27.4			9.6	9.2	9.0
2005	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	94.6	42.0	31.4	26.7	23.1	19.5	16.5	13.9	12.6	12.9	13.0	22.1			7.3	6.9	6.8
2005	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	99.7	43.9	32.8	28.0	24.2	20.6	17.6	15.0	13.8	14.2	14.6	25.1			8.4	8.1	8.1
2005	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	93.8	41.9	31.4	26.9	23.2	19.5	16.6	14.0	12.8	13.1	13.3	22.6			7.6	7.1	6.9
2005	North America East	New York	Far East	Guangzhou	97.2	42.3	31.9	27.4	23.6	19.9	17.2	14.6	13.3	13.6	13.9	23.6					
2005	North America East	New York	Far East	Guangzhou	97.2	42.3	31.9	27.4	23.6	19.9	17.2	14.6	13.3	13.6	13.9	23.6					
2005	North America Gulf	Tampa	North America West	Los Angeles	107.1	44.8	33.2	28.9	25.4	21.8	19.0	16.5	15.4	16.0	16.5	28.2					
2005	North America Gulf	Tampa	Central America (incl. M	Lazaro Cardenas	87.9	37.5	28.4	25.2	22.0	18.7	16.0	13.7	12.7	12.9	13.1	22.4					
2005	North America Gulf	Tampa	Central America (incl. M	Lazaro Cardenas	87.9	37.5	28.4	25.2	22.0	18.7	16.0	13.7	12.7	12.9	13.1	22.4					
2005	North America Gulf	Tampa	South America West	Matarani	75.4	32.7	24.9	22.5	20.0	17.1	14.7	12.6	11.8	12.0	12.2	20.8					
2005	North America Gulf	Tampa	South America West	Matarani	75.4	32.7	24.9	22.5	20.0	17.1	14.7	12.6	11.8	12.0	12.2	20.8					
2005	North America Gulf	Tampa	Oceania	Auckland	88.3	37.3	28.4	25.0	21.9	18.8	16.3	14.2	13.2	13.5	13.7	23.3					
2005	North America Gulf	Tampa	Oceania	Auckland	88.3	37.3	28.4	25.0	21.9	18.8	16.3	14.2	13.2	13.5	13.7	23.3					
2005	North America Gulf	Mobile	Far East	Osaka	113.7	46.8	34.9	30.0	26.0	22.4	19.1	16.5	15.2	15.6	16.0	27.6			9.7	9.3	9.1

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	North America Gulf	Tampa	Far East	Guangzhou	101.8	42.5	32.0	27.9	24.1	20.4	17.5	14.9	13.8	14.1	14.4	24.5					
2005	North America Gulf	Tampa	Far East	Guangzhou	101.8	42.5	32.0	27.9	24.1	20.4	17.5	14.9	13.8	14.1	14.4	24.5					
2005	North America Gulf	Tampa	South East Asia	Bangkok	97.5	41.4	31.4	27.8	24.2	20.6	17.9	15.4	14.4	14.9	15.1	25.7					
2005	Central America (incl. Mexic	Puerto Limon	North America West	Los Angeles	139.1	61.5	46.4	40.4	35.3	30.0	25.6	21.6	19.8	20.3	20.9	35.5					
2005	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	66.1	30.9	24.2	22.0	19.9	16.9	14.4	12.1	11.0	11.2	11.4	19.3					
2005	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	66.1	30.9	24.2	22.0	19.9	16.9	14.4	12.1	11.0	11.2	11.4	19.3					
2005	Central America (incl. Mexic	Puerto Limon	Far East	Guangzhou	93.2	41.7	32.0	28.0	24.4	20.6	17.4	14.6	13.2	13.5	13.7	23.2					
2005	Central America (incl. Mexic	Puerto Limon	South East Asia	Jakarta	83.4	40.5	32.3	29.7	27.1	24.0	22.3	18.5	16.8	17.2	17.5	29.8					
2005	South America East	Santos	North America West	Los Angeles	69.8	29.4	21.7	19.0	16.8	14.8	13.1	11.6	10.8	11.3	11.8	20.1					
2005	Other South America East	Buenos Aires	West Coast USA	Los Angeles	69.4	29.1	21.4	18.8	16.7	14.8	13.0	11.5	10.9	11.4	11.7	19.9					
2005	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	93.5	39.0	29.0	25.0	21.9	18.8	16.2	14.0	12.9	13.4	13.9	23.6					
2005	South America East	Buenos Aires	West Coast Canada	Los Angeles	69.4	29.1	21.4	18.8	16.7	14.8	13.0	11.5	10.9	11.4	11.7	19.9					
2005	Brazil	Santos	West Coast USA	Los Angeles	69.8	29.4	21.7	19.0	16.8	14.8	13.1	11.6	10.8	11.3	11.8	20.1					
2005	South America East	Ponta da Madeira	North America West	Los Angeles	82.5	34.8	25.8	22.3	19.5	16.9	14.7	12.8	11.9	12.4	13.0	22.0					
2005	South America East	Puerto La Cruz	Central America (incl. M	Lazaro Cardenas	77.8	33.1	25.2	22.0	19.4	16.5	13.9	11.8	10.7	10.9	11.0	18.6					
2005	South America East	Puerto Bolivar	Central America (incl. M	Lazaro Cardenas	75.5	33.1	25.2	22.2	19.5	16.6	14.1	11.9	10.9	11.1	11.3	19.1					
2005	South America East	Puerto Bolivar	South America West	Huasco	58.9	27.9	21.5	19.1	17.1	15.2	13.3	11.4	10.4	10.7	10.8	18.1					
2005	South America East	Puerto La Cruz	South America West	Matarani	64.7	27.9	21.4	19.0	17.3	14.7	12.5	10.6	9.7	9.9	10.0	16.8					
2005	South America East	Santos	Oceania	Brisbane	61.3	26.1	20.0	17.6	15.5	13.6	11.9	10.5	9.7	9.9	10.1	17.1					
2005	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	91.6	37.9	28.4	24.3	21.1	17.7	14.8	12.5	11.3	11.5	11.6	19.6			7.5	7.1	7.4
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	96.7	40.4	30.4	26.2	22.7	19.1	16.1	13.6	12.4	12.7	12.9	21.7			7.4	6.9	6.7
2005	Venezuela	Puerto Ordaz	Korea	Kwangyang	97.6	40.5	30.4	26.0	22.6	19.0	16.0	13.5	12.2	12.5	12.6	21.3			7.1	6.7	6.6
2005	Venezuela	Puerto Ordaz	Japan	Mizushima	102.7	42.5	31.8	27.4	23.7	20.2	17.1	14.7	13.4	13.8	14.2	24.3			8.2	7.9	7.8
2005	North Brazil	Ponta da Madeira	Korea	Kwangyang	86.6	36.3	27.2	23.4	20.2	17.2	14.6	12.4	11.2	11.5	11.7	19.7			6.7	6.3	6.2
2005	North Brazil	Ponta da Madeira	Japan	Mizushima	91.7	38.3	28.7	24.7	21.3	18.3	15.7	13.5	12.4	12.8	13.2	22.8			7.8	7.5	7.5
2005	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	85.7	36.2	27.2	23.5	20.2	17.2	14.7	12.5	11.4	11.7	12.0	20.2			6.9	6.5	6.4
2005	Venezuela	Puerto Ordaz	Japan	Shimizu	105.5	44.2	33.5	29.2	25.3	22.1	19.0	16.7	15.4	16.1	16.8	29.7					
2005	North Brazil	Saã Luiz	Japan	Shimizu	92.9	39.3	29.8	26.2	22.8	20.2	17.7	15.8	14.6	15.4	16.2	28.6					
2005	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	76.2	32.2	24.3	21.0	18.1	15.3	13.1	11.2	10.2	10.5	10.7	18.1					
2005	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	79.5	33.5	25.3	22.0	19.1	16.3	14.0	12.1	11.0	11.3	11.6	19.6					
2005	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	99.5	41.5	31.3	26.9	23.4	19.7	16.7	14.1	12.8	13.1	13.3	22.3					
2005	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	81.7	34.2	25.8	22.5	19.6	16.8	14.4	12.3	11.4	11.7	11.8	19.9					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																	
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	Colombia	Puerto Bolivar	Japan	Mizushima	100.5	42.5	31.8	27.4	23.9	20.5	17.4	15.0	13.8	14.2	14.6	25.0					
2005	Brazil	Saã Luiz	Far East	Guangzhou	79.5	33.5	25.3	22.0	19.1	16.3	14.0	12.1	11.0	11.3	11.6	19.6					
2005	South America East	Ponta da Madeira	Far East	Mizushima	91.7	38.3	28.7	24.7	21.3	18.3	15.7	13.5	12.4	12.8	13.2	22.8					
2005	Caribbean Basin	Kingston	North America West	Los Angeles	92.4	41.5	31.6	28.4	25.5	22.7	19.6	17.0	15.8	16.5	17.2	29.7					
2005	Caribbean Basin	Kingston	North America West	Los Angeles	92.4	41.5	31.6	28.4	25.5	22.7	19.6	17.0	15.8	16.5	17.2	29.7					
2005	Caribbean Basin	Kingston	Central America (incl. N	Lazaro Cardenas	76.8	35.7	27.9	25.6	22.9	20.3	17.2	14.7	13.5	13.9	14.3	24.6					
2005	Caribbean Basin	Kingston	South America West	Matarani	64.1	30.7	24.3	22.7	20.9	18.6	15.9	13.6	12.5	13.0	13.3	22.9					
2005	Caribbean Basin	Kingston	Far East	Guangzhou	91.0	40.9	31.6	28.4	25.1	22.1	18.8	16.0	14.6	15.2	15.6	26.8					
2005	Caribbean Basin	Kingston	Far East	Guangzhou	91.0	40.9	31.6	28.4	25.1	22.1	18.8	16.0	14.6	15.2	15.6	26.8					
2005	Europe	Rotterdam	West Coast Canada	Los Angeles	98.9	41.3	31.0	26.8	23.6	20.2	17.6	15.3	14.3	14.8	15.3	26.0					
2005	Europe	Rotterdam	West Coast USA	Los Angeles	98.9	41.3	31.0	26.8	23.6	20.2	17.6	15.3	14.3	14.8	15.3	26.0					
2005	Europe	Rotterdam	North America West	Los Angeles	98.9	41.3	31.0	26.8	23.6	20.2	17.6	15.3	14.3	14.8	15.3	26.0					
2005	Europe	Rotterdam	Central America (incl. N	Lazaro Cardenas	83.4	35.5	27.4	23.9	21.0	17.8	15.2	12.9	11.9	12.2	12.4	20.9					
2005	Europe	Rotterdam	South America West	Matarani	70.7	30.6	23.8	21.2	19.0	16.2	13.9	11.9	11.0	11.3	11.4	19.3					
2005	Africa	Durban	North America West	Los Angeles	84.8	36.1	27.0	23.4	20.7	18.0	15.8	13.8	13.0	13.6	14.2	24.1					
2005	Africa	Safi	Central America (incl. N	Lazaro Cardenas	75.9	33.1	25.5	22.4	19.7	16.9	14.5	12.4	11.5	11.9	12.0	20.4					
2005	Africa	Safi	Oceania	Auckland	76.4	32.9	25.5	22.3	19.5	17.0	14.8	13.0	12.0	12.4	12.6	21.4					
2005	Middle East	Damman	Central America (incl. N	Lazaro Cardenas	86.3	37.3	28.7	25.2	22.0	18.9	16.1	13.8	12.7	13.1	13.3	22.6					
2005	Middle East	Damman	South America West	Matarani	82.9	36.2	27.9	24.8	22.1	18.9	16.3	13.9	12.9	13.3	13.5	22.8					
2005	Middle East	Damman	South America West	Matarani	82.9	36.2	27.9	24.8	22.1	18.9	16.3	13.9	12.9	13.3	13.5	22.8					
2005	North America West	Vancouver	North America East	Philadelphia	103.0	42.0	33.4	29.6	26.7	21.8	18.7	15.4	14.6	14.6	13.8	23.9					
2005	North America West	Vancouver	North America Gulf	New Orleans	105.8	43.5	34.5	31.0	28.1	23.0	19.5	16.2	15.5	15.4	14.7	25.4					
2005	North America West	Vancouver	Central America (incl. N	Tampico	98.4	41.0	33.1	29.7	27.2	22.2	18.7	15.4	14.5	14.5	13.7	23.7					
2005	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	68.6	28.0	22.2	19.8	18.1	15.1	12.9	10.8	10.3	10.3	9.8	16.9				5.9	6.1
2005	North America West	Vancouver	South America East	Sepetiba, Bahia de	68.6	28.0	22.2	19.8	18.1	15.1	12.9	10.8	10.3	10.3	9.8	16.9					
2005	North America West	Vancouver	Caribbean Basin	San Juan	88.8	38.8	31.7	29.3	27.3	23.2	19.6	16.2	15.4	15.6	14.9	26.1					
2005	West Coast USA	Los Angeles	Europe	Rotterdam	98.3	40.4	32.1	28.6	26.3	21.8	19.0	15.9	15.4	15.7	15.1	26.1					
2005	West Coast Canada	Vancouver	Europe	Rotterdam	98.5	40.3	32.4	28.8	26.2	21.4	18.1	14.9	14.2	14.3	13.5	23.2			8.2	8.2	8.1
2005	North America West	Vancouver	Europe	Rotterdam	98.5	40.3	32.4	28.8	26.2	21.4	18.1	14.9	14.2	14.3	13.5	23.2					
2005	West Coast Canada	Vancouver	North Africa	Alexandria	84.4	38.4	31.2	27.8	25.6	21.3	18.3	15.3	14.5	14.6	13.8	23.7			9.1		
2005	West Coast Canada	Vancouver	South Africa	Durban	82.8	34.4	27.6	24.6	22.4	18.5	15.8	13.2	12.6	12.7	12.1	20.8					
2005	North America West	Vancouver	Africa	Safi	90.4	37.4	30.0	26.7	24.3	20.1	17.1	14.2	13.5	13.7	13.0	22.4					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	North America West	Vancouver	Middle East	Aqaba (El Akaba)	86.6	35.9	28.8	25.7	23.4	19.3	16.5	13.7	13.1	13.2	12.5	21.6					
2005	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	86.9	37.8	30.8	28.1	25.8	21.6	18.6	15.1	14.3	14.3	13.5	23.4					
2005	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	86.9	37.8	30.8	28.1	25.8	21.6	18.6	15.1	14.3	14.3	13.5	23.4					
2005	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	South Louisiana	89.7	39.3	32.0	29.5	27.3	22.8	19.4	16.0	15.3	15.2	14.4	25.0					
2005	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	New Orleans	89.7	39.3	32.0	29.5	27.3	22.8	19.4	16.0	15.3	15.2	14.4	25.0					
2005	Central America (incl. Mexic	Puerto Quetzal	Central America (incl. M	Tampico	82.4	36.9	30.7	28.3	26.5	22.2	18.7	15.2	14.3	14.3	13.5	23.3					
2005	Central America (incl. Mexic	Puerto Quetzal	South America East	Sepetiba, Bahia de	50.2	22.4	18.4	17.2	16.3	14.2	12.1	10.1	9.6	9.6	9.2	15.8					
2005	Central America (incl. Mexic	Puerto Quetzal	Caribbean Basin	San Juan	72.3	34.4	29.0	27.7	26.4	23.0	19.4	16.0	15.1	15.3	14.7	25.7					
2005	Central America (incl. Mexic	Puerto Quetzal	Europe	Rotterdam	82.4	36.2	30.0	27.3	25.4	21.2	18.0	14.7	14.0	14.1	13.3	22.8					
2005	Central America (incl. Mexic	Puerto Quetzal	Africa	Safi	73.9	33.0	27.3	25.1	23.4	19.8	16.9	13.9	13.3	13.4	12.7	21.9					
2005	Peru	San Nicolas	East Coast USA	Baltimore	77.9	32.7	26.2	23.5	21.2	17.4	14.9	12.2	11.7	11.6	11.0	19.1					
2005	Chile	Antofagasta	East Coast USA	Baltimore	75.4	33.6	27.4	24.9	22.9	19.5	17.1	14.1	13.5	13.5	12.7	22.0				7.6	
2005	South America West	Matarani	North America East	Philadelphia	76.1	32.4	26.3	24.1	22.3	18.3	16.0	13.2	12.5	12.5	11.8	20.4					
2005	South America West	Callao	North America East	Philadelphia	77.9	33.1	26.9	24.6	22.8	18.7	16.3	13.4	12.8	12.7	12.1	20.8					
2005	South America West	San Nicolas	North America Gulf	Mobile	79.3	33.2	26.5	23.7	21.6	17.8	15.2	12.6	11.9	11.9	11.3	19.5					
2005	South America West	Matarani	North America Gulf	South Louisiana	78.9	33.8	27.5	25.5	23.8	19.5	16.8	13.9	13.4	13.4	12.7	22.0					
2005	South America West	Callao	North America Gulf	South Louisiana	80.7	34.6	28.0	26.0	24.2	19.9	17.1	14.2	13.7	13.7	12.9	22.3					
2005	South America West	Callao	Central America (incl. M	Tampico	73.4	32.2	26.6	24.8	23.3	19.2	16.3	13.4	12.7	12.7	12.0	20.6					
2005	South America West	Callao	South America East	Puerto La Cruz	69.3	30.4	25.0	23.1	21.7	18.0	15.4	12.6	11.9	11.9	11.2	19.2					
2005	Chile	Antofagasta	Caribbean Basin	Point Lisas	56.3	26.6	21.9	20.0	18.6	16.1	14.1	11.5	11.0	11.0	10.4	17.7				6.3	
2005	Peru	San Nicolas	Caribbean Basin	Point Lisas	58.8	25.7	20.6	18.6	17.0	14.0	11.8	9.7	9.2	9.1	8.7	14.9					
2005	South America West	Callao	Caribbean Basin	San Juan	63.5	29.9	25.1	24.2	23.3	20.0	17.1	14.2	13.6	13.7	13.2	23.0					
2005	Peru	Matarani	Europe	Rotterdam	71.6	30.7	25.4	23.3	21.8	17.9	15.4	12.7	12.2	12.3	11.5	19.8					
2005	Chile	Antofagasta	Europe	Rotterdam	71.0	31.8	26.4	24.0	22.3	18.9	16.6	13.7	13.2	13.2	12.4	21.2					
2005	South America West	Callao	Europe	Rotterdam	74.5	31.9	26.3	24.1	22.6	18.5	15.9	13.1	12.6	12.6	11.9	20.4					
2005	South America West	Callao	Africa	Safi	65.1	28.5	23.4	21.7	20.4	16.9	14.6	12.2	11.7	11.9	11.2	19.3					
2005	South America West	Matarani	Middle East	Aqaba (El Akaba)	79.4	34.3	28.1	25.8	24.0	19.9	17.1	14.2	13.6	13.7	13.0	22.3					
2005	Oceania	Newcastle	North America East	Baltimore	102.1	42.1	33.8	30.1	27.1	22.2	18.9	15.6	14.8	14.7	14.0	24.1			8.9	8.4	8.2
2005	Oceania	Bunbury	North America East	Philadelphia	92.0	37.9	30.4	27.1	24.4	19.9	17.4	14.3	13.7	13.6	12.9	22.1					
2005	Oceania	Newcastle	North America Gulf	Mobile	103.6	42.6	34.2	30.4	27.5	22.6	19.2	16.0	15.1	15.0	14.2	24.5			9.1	8.7	8.4
2005	Oceania	Bunbury	North America Gulf	South Louisiana	95.5	39.6	31.8	28.7	26.0	21.3	18.3	15.2	14.7	14.6	13.8	23.8					
2005	Oceania	Newcastle	Central America (incl. M	Tampico	96.7	40.7	33.2	29.9	27.3	22.3	18.9	15.6	14.7	14.6	13.8	23.7			8.5	8.0	7.8

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2005	Oceania	Bunbury	Central America (incl. N	Tampico	88.2	37.2	30.4	27.5	25.1	20.6	17.5	14.5	13.7	13.7	12.9	22.1					
2005	Oceania	Bunbury	Caribbean Basin	San Juan	77.5	34.5	28.5	26.6	24.8	21.2	18.1	15.1	14.4	14.6	13.9	24.3					
2005	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	49.5	21.0	17.1	15.4	14.1	11.9	10.4	8.9	8.6	8.8	8.3	14.2					
2005	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	100.6	42.9	34.5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Korea	Guangzhou	East Coast USA	Philadelphia	100.6	42.9	34.5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Far East	Guangzhou	East Coast Canada	Philadelphia	100.6	42.9	34.5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Taiwan	Guangzhou	East Coast USA	Philadelphia	100.6	42.9	34.5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Japan	Kobe	East Coast USA	Philadelphia	110.6	47.2	38.1	34.2	30.8	25.8	22.5	19.0	18.3	18.6	18.1	32.3					
2005	Far East	Guangzhou	North America East	Philadelphia	100.6	42.9	34.5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Far East	Guangzhou	North America East	Philadelphia	100.6	42.9	34.5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Far East	Guangzhou	North America East	Philadelphia	100.6	42.9	34,5	30.7	27.6	22.4	19.4	16.0	15.2	15.2	14.4	24.8					
2005	Far East	Guangzhou	North America Gulf	South Louisiana	107.8	44.6	35.8	32.2	29.1	23.7	20.4	16.8	16.2	16.1	15.3	26.5					
2005	Far East	Guangzhou	North America Gulf	South Louisiana	107.8	44.6	35.8	32.2	29.1	23.7	20.4	16.8	16.2	16.1	15.3	26.5					
2005	Far East	Guangzhou	North America Gulf	New Orleans	107.8	44.6	35.8	32.2	29.1	23.7	20.4	16.8	16.2	16.1	15.3	26.5					
2005	Far East	Guangzhou	North America Gulf	South Louisiana	107.8	44.6	35.8	32.2	29.1	23.7	20.4	16.8	16.2	16.1	15.3	26.5					
2005	Far East	Guangzhou	Central America (incl. N	Tampico	100.5	42.2	34.4	31.0	28.2	23.0	19.5	16.0	15.2	15.2	14.4	24.8					
2005	Far East	Guangzhou	South America East	Puerto La Cruz	96.1	40.3	32.7	29.2	26.6	21.8	18.6	15.2	14.3	14.3	13.6	23.3					
2005	Far East	Guangzhou	Caribbean Basin	San Juan	90.0	39.6	32.7	30.3	28.1	23.8	20.3	16.7	16.0	16.2	15.5	27.0					
2005	South East Asia	Manado	North America East	Philadelphia	99.1	43.2	35.6	33.0	31.0	26.5	24.9	20.3	19.3	19.3	18.3	31.7					
2005	South East Asia	Bangkok	North America Gulf	New Orleans	100.3	41.7	33.6	30.6	27.9	22.9	19.9	16.6	16.1	16.3	15.4	26.6					
2005	South East Asia	Manado	North America Gulf	New Orleans	102.8	44.8	36.9	34.6	32.5	27.8	25.8	21.1	20.2	20.3	19.2	33.3					
2005	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	67.6	28.0	22.2	20.2	18.8	16.1	14.6	12.2	11.7	11.7	11.2	19.2					
2010	North America East	New York	North America West	Los Angeles	104.5	43.9	32.6	28.1	24.5	21.0	18.4	15.9	13.5	13.4	12.6	12.8					
2010	North America East	New York	Central America (incl. N	Lazaro Cardenas	88.9	38.0	28.9	25.3	21.9	18.6	16.0	13.6	11.3	11.1	10.2	10.4					
2010	North America East	New York	South America West	Matarani	76.0	33.0	25.2	22.4	19.8	16.9	14.7	12.5	10.5	10.2	9.5	9.6					
2010	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	90.7	37.9	28.4	24.2	20.8	17.5	14.8	12.4	10.3	10.1	9.4	9.5	9.1	9.0	8.3	6.2	8.0
2010	North America East	New York	Oceania	Brisbane	97.2	41.0	31.2	27.0	23.4	20.1	17.5	15.0	12.5	12.3	11.3	11.5					
2010	East Coast USA	Norfolk	Taiwan	Kaohsiung	99.5	42.7	31.9	27.3	23.7	20.2	14.9	14.5	12.0	11.7	10.9	11.0	10.5	10.5	9.0	8.6	8.4
2010	East Coast USA	Norfolk	Korea	Kwangyang	105.5	45.3	33.9	29.1	25.2	21.5	18.2	15.5	12.9	12.6	11.6	10.6	11.2	11.3	8.6	8.2	8.0
2010	East Coast USA	Norfolk	Japan	Mizushima	110.5	47.3	35.3	30.4	26.3	22.6	19.3	16.6	13.9	13.8	12.8	13.2	12.5	12.6	9.7	9.4	9.2
2010	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	96.0	42.7	31.9	27.2	23.5	19.8	16.7	14.1	11.7	11.4	10.6	10.7	10.2	10.2	7.5	7.0	6.9
2010	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	101.1	44.7	33.3	28.5	24.6	21.0	17.9	15.2	12.8	12.6	11.8	12.1	11.4	11.5	8.5	8.2	8.2

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	95.2	42.6	32.0	27.4	23.6	19.9	16.9	14.2	11.8	11.6	10.8	10.9	10.5	10.4	7.7	7.2	7.1
2010	North America East	New York	Far East	Guangzhou	98.5	42.9	32.4	27.9	23.9	20.2	17.5	14.8	12.3	12.1	11.2	11.4					
2010	North America East	New York	Far East	Guangzhou	98.5	42.9	32.4	27.9	23.9	20.2	17.5	14.8	12.3	12.1	11.2	11.4					
2010	North America Gulf	Tampa	North America West	Los Angeles	108.5	45.4	33.7	29.4	25.7	22.1	19.2	16.7	14.3	14.1	13.3	13.6					
2010	North America Gulf	Tampa	Central America (incl. M	Lazaro Cardenas	89.1	38.1	28.8	25.6	22.3	19.0	16.2	13.9	11.7	11.5	10.6	10.8					
2010	North America Gulf	Tampa	Central America (incl. M	Lazaro Cardenas	89.1	38.1	28.8	25.6	22.3	19.0	16.2	13.9	11.7	11.5	10.6	10.8					
2010	North America Gulf	Tampa	South America West	Matarani	76.4	33.1	25.3	22.8	20.3	17.3	14.9	12.8	10.9	10.7	9.8	10.0					
2010	North America Gulf	Tampa	South America West	Matarani	76.4	33.1	25.3	22.8	20.3	17.3	14.9	12.8	10.9	10.7	9.8	10.0					
2010	North America Gulf	Tampa	Oceania	Auckland	89.5	37.9	28.9	25.4	22.2	19.1	16.6	14.4	12.2	12.0	11.1	11.2					
2010	North America Gulf	Tampa	Oceania	Auckland	89.5	37.9	28.9	25.4	22.2	19.1	16.6	14.4	12.2	12.0	11.1	11.2					
2010	North America Gulf	Mobile	Far East	Osaka	115.4	47.6	35.5	30.5	26.4	22.7	19.4	16.7	14.0	13.8	12.9	13.3	12.6	12.7	9.8	9.4	9.2
2010	North America Gulf	Tampa	Far East	Guangzhou	103.2	43.2	32.5	28.3	24.5	20.7	17.7	15.1	12.8	12.6	11.6	11.8					
2010	North America Gulf	Tampa	Far East	Guangzhou	103.2	43.2	32.5	28.3	24.5	20.7	17.7	15.1	12.8	12.6	11.6	11.8					
2010	North America Gulf	Tampa	South East Asia	Bangkok	98.9	42.0	31.9	28.2	24.5	20.9	18.1	15.6	13.3	13.2	12.2	12.4					
2010	Central America (incl. Mexic	Puerto Limon	North America West	Los Angeles	141.3	62.6	47.2	41.1	35.9	30.5	26.0	22.0	18.3	18.1	16.9	17.1					
2010	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	67.1	31.4	24.7	22.4	20.2	17.2	14.6	12.3	10.2	10.0	9.2	9.3					
2010	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	67.1	31.4	24.7	22.4	20.2	17.2	14.6	12.3	10.2	10.0	9.2	9.3					
2010	Central America (incl. Mexic	Puerto Limon	Far East	Guangzhou	94.7	42.4	32.6	28.5	24.8	20.9	17.7	14.8	12.2	12.0	11.1	11.2					
2010	Central America (incl. Mexic	Puerto Limon	South East Asia	Jakarta	84.7	41.2	32.9	30.2	27.6	24.4	22.6	18.8	15.5	15.3	14.2	14.4					
2010	South America East	Santos	North America West	Los Angeles	70.7	29.9	22.1	19.3	17.1	15.0	13.2	11.7	10.0	10.0	9.5	9.7					
2010	Other South America East	Buenos Aires	West Coast USA	Los Angeles	70.2	29.5	21.7	19.0	17.0	14.9	13.1	11.6	10.0	10.0	9.5	9.6					
2010	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	94.8	39.6	29.4	25.4	22.3	19.0	16.4	14.1	12.0	11.9	11.2	11.3					
2010	South America East	Buenos Aires	West Coast Canada	Los Angeles	70.2	29.5	21.7	19.0	17.0	14.9	13.1	11.6	10.0	10.0	9.5	9.6					
2010	Brazil	Santos	West Coast USA	Los Angeles	70.7	29.9	22.1	19.3	17.1	15.0	13.2	11.7	10.0	10.0	9.5	9.7					
2010	South America East	Ponta da Madeira	North America West	Los Angeles	83.6	35.3	26.2	22.6	19.8	17.1	14.9	13.0	11.0	11.0	10.5	10.6					
2010	South America East	Puerto La Cruz	Central America (incl. M	Lazaro Cardenas	79.0	33.6	25.6	22.4	19.8	16.8	14.1	12.0	9.9	9.7	8.9	9.0					
2010	South America East	Puerto Bolivar	Central America (incl. M	Lazaro Cardenas	76.8	33.7	25.7	22.5	19.8	16.9	14.3	12.1	10.1	9.9	9.1	9.2					
2010	South America East	Puerto Bolivar	South America West	Huasco	59.8	28.3	21.9	19.4	17.3	15.4	13.5	11.5	9.6	9.5	8.7	8.7	8.2	8.3	7.9	8.1	8.0
2010	South America East	Puerto La Cruz	South America West	Matarani	65.6	28.3	21.7	19.3	17.5	14.9	12.6	10.8	9.0	8.8	8.1	8.1					
2010	South America East	Santos	Oceania	Brisbane	62.3	26.6	20.3	17.9	15.7	13.8	12.1	10.7	8.9	8.8	8.2	8.2					
2010	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	93.0	38.6	28.9	24.7	21.4	18.0	15.1	12.7	10.5	10.2	9.4	9.5	9.1	9.0	7.6	7.2	7.5
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	98.2	41.1	31.0	26.6	23.1	19.4	16.4	13.8	11.5	11.3	10.4	10.5	10.1	10.1	7.5	7.0	6.8

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	Venezuela	Puerto Ordaz	Korea	Kwangyang	99.1	41.2	30.9	26.5	23.0	19.4	16.3	13.7	11.3	11.1	10.2	10.3	9.8	9.8	7.2	6.8	6.7
2010	Venezuela	Puerto Ordaz	Japan	Mizushima	104.2	43.2	32.4	27.8	24.1	20.5	17.4	14.9	12.4	12.3	11.5	11.7	11.1	11.1	8.3	8.0	8.0
2010	North Brazil	Ponta da Madeira	Korea	Kwangyang	87.9	36.9	27.7	23.8	20.5	17.5	14.8	12.6	10.4	10.2	9.5	9.5	9.1	9.1	6.8	6.4	6.3
2010	North Brazil	Ponta da Madeira	Japan	Mizushima	93.1	39.0	29.2	25.1	21.6	18.6	16.0	13.7	11.5	11.4	10.7	11.0	10.4	10.5	7.9	7.6	7.6
2010	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	87.0	36.8	27.7	23.9	20.6	17.5	14.9	12.7	10.5	10.4	9.7	9.8	9.4	9.4	7.0	6.6	6.4
2010	Venezuela	Puerto Ordaz	Japan	Shimizu	107.1	44.9	34.1	29.7	25.8	22.4	19.3	16.9	14.2	14.3	13.6	14.3					
2010	North Brazil	Saã Luiz	Japan	Shimizu	94.3	39.9	30.3	26.6	23.1	20.5	17.9	16.0	13.5	13.7	13.1	13.8					
2010	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	77.4	32.7	24.7	21.3	18.4	15.6	13.4	11.4	9.4	9.3	8.7	8.7					
2010	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	80.8	34.1	25.7	22.4	19.4	16.6	14.2	12.3	10.2	10.1	9.4	9.4					
2010	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	101.1	42.2	31.8	27.3	23.8	20.1	16.9	14.3	11.9	11.6	10.7	10.8					
2010	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	82.9	34.7	26.2	22.8	19.9	17.0	14.6	12.5	10.5	10.4	9.5	9.6					
2010	Colombia	Puerto Bolivar	Japan	Mizushima	102.1	43.2	32.4	27.9	24.3	20.8	17.7	15.2	12.8	12.6	11.8	12.1	11.4	11.5	10.8	10.9	10.7
2010	Brazil	Saã Luiz	Far East	Guangzhou	80.8	34.1	25.7	22.4	19.4	16.6	14.2	12.3	10.2	10.1	9.4	9.4					
2010	South America East	Ponta da Madeira	Far East	Mizushima	93.1	39.0	29.2	25.1	21.6	18.6	16.0	13.7	11.5	11.4	10.7	11.0	10.4	10.5	9.8	9.9	9.7
2010	Caribbean Basin	Kingston	North America West	Los Angeles	93.7	42.1	32.1	28.8	25.9	23.0	19.9	17.2	14.6	14.6	13.9	14.3					
2010	Caribbean Basin	Kingston	North America West	Los Angeles	93.7	42.1	32.1	28.8	25.9	23.0	19.9	17.2	14.6	14.6	13.9	14.3					
2010	Caribbean Basin	Kingston	Central America (incl. N	Lazaro Cardenas	78.0	36.3	28.4	26.0	23.3	20.6	17.5	14.9	12.5	12.4	11.6	11.9					
2010	Caribbean Basin	Kingston	South America West	Matarani	65.1	31.1	24.7	23.1	21.2	18.9	16.1	13.8	11.6	11.5	10.8	11.0					
2010	Caribbean Basin	Kingston	Far East	Guangzhou	92.4	41.6	32.2	28.9	25.6	22.4	19.1	16.2	13.6	13.5	12.6	12.9					
2010	Caribbean Basin	Kingston	Far East	Guangzhou	92.4	41.6	32.2	28.9	25.6	22.4	19.1	16.2	13.6	13.5	12.6	12.9					
2010	Europe	Rotterdam	West Coast Canada	Los Angeles	100.3	42.0	31.5	27.2	23.9	20.5	17.8	15.5	13.2	13.2	12.4	12.5					
2010	Europe	Rotterdam	West Coast USA	Los Angeles	100.3	42.0	31.5	27.2	23.9	20.5	17.8	15.5	13.2	13.2	12.4	12.5					
2010	Europe	Rotterdam	North America West	Los Angeles	100.3	42.0	31.5	27.2	23.9	20.5	17.8	15.5	13.2	13.2	12.4	12.5					
2010	Europe	Rotterdam	Central America (incl. N	Lazaro Cardenas	84.7	36.1	27.8	24.4	21.4	18.1	15.4	13.1	11.0	10.9	10.0	10.1					
2010	Europe	Rotterdam	South America West	Matarani	71.8	31.1	24.2	21.5	19.3	16.4	14.1	12.1	10.2	10.0	9.2	9.3					
2010	Africa	Durban	North America West	Los Angeles	86.0	36.6	27.5	23.8	21.0	18.3	16.0	14.0	12.0	12.1	11.4	11.6					
2010	Africa	Safi	Central America (incl. N	Lazaro Cardenas	77.2	33.7	25.9	22.8	20.0	17.2	14.7	12.6	10.6	10.6	9.7	9.9					
2010	Africa	Safi	Oceania	Auckland	77.6	33.5	25.9	22.6	19.9	17.3	15.1	13.2	11.1	11.0	10.2	10.3					
2010	Middle East	Damman	Central America (incl. N	Lazaro Cardenas	87.7	38.0	29.2	25.6	22.4	19.2	16.4	14.0	11.8	11.7	10.8	10.9					
2010	Middle East	Damman	South America West	Matarani	84.2	36.8	28.4	25.2	22.4	19.2	16.5	14.1	11.9	11.8	10.9	11.0					
2010	Middle East	Damman	South America West	Matarani	84.2	36.8	28.4	25.2	22.4	19.2	16.5	14.1	11.9	11.8	10.9	11.0					
2010	North America West	Vancouver	North America East	Philadelphia	104.5	42.7	33.9	30.1	27.1	22.2	19.0	15.6	13.0	12.8	11.8	12.0					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	North America West	Vancouver	North America Gulf	New Orleans	107.3	44.2	35.1	31.5	28.6	23.3	19.8	16.4	13.8	13.5	12.5	12.7					
2010	North America West	Vancouver	Central America (incl. N	Tampico	100.0	41.7	33.6	30.2	27.7	22.6	19.0	15.6	13.0	12.7	11.8	11.9	11.2	10.9	9.9	9.8	9.6
2010	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	69.6	28.5	22.5	20.2	18.4	15.3	13.1	11.0	9.2	9.0	8.4	8.5	8.0	7.8	7.2	6.0	6.2
2010	North America West	Vancouver	South America East	Sepetiba, Bahia de	69.6	28.5	22.5	20.2	18.4	15.3	13.1	11.0	9.2	9.0	8.4	8.5	8.0	7.8	7.2	7.2	7.0
2010	North America West	Vancouver	Caribbean Basin	San Juan	90.2	39.5	32.2	29.7	27.7	23.5	19.9	16.4	13.7	13.6	12.8	13.1					
2010	West Coast USA	Los Angeles	Europe	Rotterdam	99.7	41.0	32.7	29.1	26.8	22.1	19.2	16.1	13.8	13.7	12.9	13.1					
2010	West Coast Canada	Vancouver	Europe	Rotterdam	100.0	41.0	33.0	29.3	26.6	21.7	18.4	15.2	12.7	12.5	11.5	11.6	11.1	10.7	8.3	8.3	8.3
2010	North America West	Vancouver	Europe	Rotterdam	100.0	41.0	33.0	29.3	26.6	21.7	18.4	15.2	12.7	12.5	11.5	11.6	11.1	10.7	9.9	9.8	9.6
2010	West Coast Canada	Vancouver	North Africa	Alexandria	85.5	38.9	31.6	28.2	26.0	21.6	18.5	15.5	12.9	12.8	11.8	11.8	11.2	10.8	9.2	9.8	9.6
2010	West Coast Canada	Vancouver	South Africa	Durban	84.1	34.9	28.0	25.0	22.8	18.8	16.1	13.4	11.2	11.2	10.3	10.5	9.9	9.6	8.8	8.7	8.5
2010	North America West	Vancouver	Africa	Safi	91.8	38.1	30.5	27.2	24.7	20.4	17.4	14.4	12.1	12.0	11.1	11.3					
2010	North America West	Vancouver	Middle East	Aqaba (El Akaba)	88.0	36.5	29.3	26.1	23.8	19.6	16.7	13.9	11.7	11.6	10.7	10.9					
2010	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	88.2	38.4	31.4	28.6	26.3	22.0	18.8	15.4	12.8	12.5	11.6	11.7					
2010	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	88.2	38.4	31.4	28.6	26.3	22.0	18.8	15.4	12.8	12.5	11.6	11.7					
2010	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	South Louisiana	91.1	40.0	32.6	30.0	27.8	23.2	19.7	16.2	13.6	13.4	12.3	12.5					
2010	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	New Orleans	91.1	40.0	32.6	30.0	27.8	23.2	19.7	16.2	13.6	13.4	12.3	12.5					
2010	Central America (incl. Mexic	Puerto Quetzal	Central America (incl. N	Tampico	83.8	37.6	31.2	28.9	27.0	22.5	19.0	15.4	12.8	12.6	11.6	11.7					
2010	Central America (incl. Mexic	Puerto Quetzal	South America East	Sepetiba, Bahia de	51.0	22.8	18.8	17.5	16.6	14.4	12.3	10.3	8.6	8.4	7.8	7.9					
2010	Central America (incl. Mexic	Puerto Quetzal	Caribbean Basin	San Juan	73.5	35.1	29.5	28.2	26.9	23.4	19.7	16.2	13.5	13.4	12.6	12.9					
2010	Central America (incl. Mexic	Puerto Quetzal	Europe	Rotterdam	83.8	36.8	30.5	27.8	25.9	21.6	18.3	15.0	12.5	12.3	11.4	11.4					
2010	Central America (incl. Mexic	Puerto Quetzal	Africa	Safi	75.2	33.6	27.8	25.5	23.8	20.2	17.2	14.2	11.9	11.8	10.9	11.0					
2010	Peru	San Nicolas	East Coast USA	Baltimore	79.0	33.2	26.6	23.8	21.5	17.6	15.1	12.4	10.4	10.2	9.4	9.6	9.2	8.9	8.4	8.3	8.2
2010	Chile	Antofagasta	East Coast USA	Baltimore	76.4	34.0	27.8	25.3	23.2	19.7	17.3	14.2	12.0	11.8	10.9	11.0	10.8	10.5	10.0	7.7	9.9
2010	South America West	Matarani	North America East	Philadelphia	77.1	32.9	26.7	24.5	22.6	18.6	16.2	13.3	11.2	11.0	10.1	10.2					
2010	South America West	Callao	North America East	Philadelphia	79.0	33.6	27.3	25.0	23.1	19.0	16.5	13.6	11.4	11.2	10.3	10.4					
2010	South America West	San Nicolas	North America Gulf	Mobile	80.4	33.7	26.9	24.1	22.0	18.1	15.4	12.7	10.6	10.4	9.6	9.8	9.3	9.1	8.5	8.6	8.4
2010	South America West	Matarani	North America Gulf	South Louisiana	80.0	34.4	27.9	25.9	24.1	19.8	17.0	14.1	12.0	11.7	10.8	11.0					
2010	South America West	Callao	North America Gulf	South Louisiana	81.8	35.1	28.5	26.4	24.6	20.1	17.4	14.4	12.2	12.0	11.0	11.2					
2010	South America West	Callao	Central America (incl. N	Tampico	74.5	32.7	27.1	25.2	23.7	19.5	16.6	13.6	11.4	11.1	10.3	10.4					
2010	South America West	Callao	South America East	Puerto La Cruz	70.3	30.9	25.4	23.4	22.0	18.2	15.6	12.8	10.6	10.4	9.6	9.6					
2010	Chile	Antofagasta	Caribbean Basin	Point Lisas	57.1	27.0	22.2	20.3	18.9	16.3	14.2	11.7	9.8	9.6	8.8	8.9	8.8	8.6	8.2	6.3	8.1
2010	Peru	San Nicolas	Caribbean Basin	Point Lisas	59.8	26.1	20.9	18.9	17.3	14.2	12.0	9.8	8.2	8.0	7.4	7.5	7.2	7.0	6.6	6.5	6.4

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	South America West	Callao	Caribbean Basin	San Juan	64.5	30.3	25.5	24.6	23.7	20.3	17.4	14.4	12.1	12.0	11.2	11.5					
2010	Peru	Matarani	Europe	Rotterdam	72.7	31.2	25.8	23.7	22.2	18.2	15.6	12.9	10.9	10.7	9.9	9.9					
2010	Chile	Antofagasta	Europe	Rotterdam	72.0	32.3	26.8	24.4	22.6	19.2	16.8	13.9	11.7	11.6	10.6	10.6	10.5	10.2	9.6	9.6	9.4
2010	South America West	Callao	Europe	Rotterdam	75.7	32.5	26.8	24.5	23.0	18.8	16.1	13.3	11.2	11.1	10.2	10.2					
2010	South America West	Callao	Africa	Safi	66.1	28.9	23.8	22.0	20.7	17.2	14.9	12.4	10.5	10.4	9.6	9.7					
2010	South America West	Matarani	Middle East	Aqaba (El Akaba)	80.6	34.9	28.6	26.2	24.4	20.2	17.4	14.4	12.1	12.0	11.1	11.2					
2010	Oceania	Newcastle	North America East	Baltimore	103.7	42.9	34.4	30.6	27.6	22.5	19.2	15.9	13.2	12.9	12.0	12.1	11.5	11.2	9.0	8.6	8.4
2010	Oceania	Bunbury	North America East	Philadelphia	93.4	38.5	30.9	27.6	24.8	20.3	17.6	14.6	12.2	11.9	11.0	11.1					
2010	Oceania	Newcastle	North America Gulf	Mobile	105.2	43.4	34.8	30.9	28.0	23.0	19.6	16.2	13.5	13.2	12.2	12.3	11.6	11.3	9.2	8.8	8.6
2010	Oceania	Bunbury	North America Gulf	South Louisiana	97.0	40.3	32.3	29.2	26.4	21.6	18.6	15.5	13.1	12.8	11.8	12.0					
2010	Oceania	Newcastle	Central America (incl. N	Tampico	98.4	41.5	33.8	30.4	27.8	22.7	19.2	15.8	13.1	12.8	11.8	11.9	11.3	10.9	8.7	8.2	8.0
2010	Oceania	Bunbury	Central America (incl. N	Tampico	89.7	37.9	31.0	28.0	25.6	20.9	17.8	14.7	12.3	12.0	11.1	11.1					
2010	Oceania	Bunbury	Caribbean Basin	San Juan	78.7	35.1	29.0	27.1	25.2	21.5	18.4	15.3	12.9	12.8	11.9	12.2					
2010	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	50.2	21.3	17.4	15.7	14.4	12.1	10.6	9.0	7.7	7.7	7.1	7.1					
2010	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Korea	Guangzhou	East Coast USA	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Far East	Guangzhou	East Coast Canada	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Taiwan	Guangzhou	East Coast USA	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Japan	Kobe	East Coast USA	Philadelphia	112.1	48.0	38.7	34.8	31.3	26.2	22.9	19.3	16.3	16.3	15.5	16.2					
2010	Far East	Guangzhou	North America East	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Far East	Guangzhou	North America East	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Far East	Guangzhou	North America East	Philadelphia	102.0	43.6	35.1	31.2	28.0	22.8	19.7	16.2	13.6	13.3	12.3	12.5					
2010	Far East	Guangzhou	North America Gulf	South Louisiana	109.4	45.3	36.4	32.8	29.6	24.1	20.7	17.1	14.4	14.2	13.1	13.3					
2010	Far East	Guangzhou	North America Gulf	South Louisiana	109.4	45.3	36.4	32.8	29.6	24.1	20.7	17.1	14.4	14.2	13.1	13.3					
2010	Far East	Guangzhou	North America Gulf	New Orleans	109.4	45.3	36.4	32.8	29.6	24.1	20.7	17.1	14.4	14.2	13.1	13.3					
2010	Far East	Guangzhou	North America Gulf	South Louisiana	109.4	45.3	36.4	32.8	29.6	24.1	20.7	17.1	14.4	14.2	13.1	13.3					
2010	Far East	Guangzhou	Central America (incl. N	Tampico	102.1	42.9	35.0	31.6	28.7	23.4	19.9	16.3	13.6	13.4	12.4	12.5					
2010	Far East	Guangzhou	South America East	Puerto La Cruz	97.6	41.0	33.3	29.7	27.0	22.1	18.9	15.5	12.8	12.6	11.6	11.7					
2010	Far East	Guangzhou	Caribbean Basin	San Juan	91.5	40.3	33.2	30.8	28.5	24.1	20.6	17.0	14.3	14.2	13.3	13.6					
2010	South East Asia	Manado	North America East	Philadelphia	100.5	43.9	36.2	33.6	31.5	26.9	25.2	20.5	17.2	16.9	15.6	15.9					
2010	South East Asia	Bangkok	North America Gulf	New Orleans	101.8	42.4	34.2	31.1	28.3	23.3	20.1	16.8	14.4	14.3	13.2	13.3					
2010	South East Asia	Manado	North America Gulf	New Orleans	104.3	45.5	37.5	35.1	33.0	28.2	26.1	21.4	18.0	17.7	16.4	16.7					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2010	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	68.7	28.5	22.6	20.5	19.1	16.4	14.8	12.4	10.4	10.3	9.5	9.6					
2015	North America East	New York	North America West	Los Angeles	105.9	44.6	33.1	28.6	24.9	21.3	18.7	16.1	13.7	13.5	12.8	13.0					
2015	North America East	New York	Central America (incl.	Lazaro Cardenas	90.1	38.7	29.4	25.7	22.3	18.9	16.3	13.8	11.5	11.3	10.4	10.6					
2015	North America East	New York	South America West	Matarani	77.0	33.5	25.6	22.7	20.1	17.1	14.9	12.7	10.6	10.4	9.6	9.7					
2015	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	92.1	38.6	29.0	24.7	21.2	17.8	15.1	12.7	10.5	10.3	9.5	9.6	9.2	9.2	8.4	6.3	8.1
2015	North America East	New York	Oceania	Brisbane	98.6	41.8	31.8	27.5	23.8	20.4	17.7	15.2	12.7	12.5	11.5	11.7					
2015	East Coast USA	Norfolk	Taiwan	Kaohsiung	100.8	43.4	32.5	27.9	24.1	20.5	15.2	14.7	12.2	12.0	11.0	11.2	10.6	10.7	9.1	8.7	8.5
2015	East Coast USA	Norfolk	Korea	Kwangyang	106.9	46.1	34.5	29.6	25.7	21.9	18.5	15.8	13.1	12.8	11.8	10.8	11.4	11.5	8.8	8.4	8.2
2015	East Coast USA	Norfolk	Japan	Mizushima	112.0	48.1	36.0	30.9	26.8	23.0	19.6	16.9	14.2	14.0	13.0	13.4	12.7	12.8	9.9	9.5	9.3
2015	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	97.4	43.5	32.6	27.8	23.9	20.2	17.0	14.4	11.9	11.7	10.8	10.9	10.3	10.3	7.6	7.1	7.0
2015	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	102.5	45.5	34.0	29.1	25.1	21.3	18.2	15.5	13.0	12.8	12.0	12.3	11.6	11.7	8.7	8.3	8.3
2015	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	96.5	43.4	32.6	27.9	24.0	20.2	17.2	14.4	12.0	11.9	11.0	11.1	10.6	10.6	7.9	7.4	7.2
2015	North America East	New York	Far East	Guangzhou	99.8	43.7	33.0	28.4	24.4	20.6	17.8	15.0	12.5	12.3	11.4	11.5					
2015	North America East	New York	Far East	Guangzhou	99.8	43.7	33.0	28.4	24.4	20.6	17.8	15.0	12.5	12.3	11.4	11.5					
2015	North America Gulf	Tampa	North America West	Los Angeles	109.9	46.1	34.2	29.8	26.1	22.4	19.5	16.9	14.5	14.3	13.5	13.7					
2015	North America Gulf	Tampa	Central America (incl.	Lazaro Cardenas	90.4	38.7	29.3	26.0	22.7	19.3	16.5	14.1	11.9	11.7	10.8	10.9					
2015	North America Gulf	Tampa	Central America (incl.	Lazaro Cardenas	90.4	38.7	29.3	26.0	22.7	19.3	16.5	14.1	11.9	11.7	10.8	10.9					
2015	North America Gulf	Tampa	South America West	Matarani	77.4	33.6	25.7	23.1	20.6	17.6	15.1	13.0	11.0	10.8	10.0	10.1					
2015	North America Gulf	Tampa	South America West	Matarani	77.4	33.6	25.7	23.1	20.6	17.6	15.1	13.0	11.0	10.8	10.0	10.1					
2015	North America Gulf	Tampa	Oceania	Auckland	90.8	38.5	29.4	25.8	22.6	19.4	16.8	14.6	12.4	12.1	11.2	11.4					
2015	North America Gulf	Tampa	Oceania	Auckland	90.8	38.5	29.4	25.8	22.6	19.4	16.8	14.6	12.4	12.1	11.2	11.4					
2015	North America Gulf	Mobile	Far East	Osaka	117.0	48.4	36.1	31.0	26.9	23.1	19.7	17.0	14.3	14.1	13.1	13.5	12.8	12.9	10.0	9.5	9.3
2015	North America Gulf	Tampa	Far East	Guangzhou	104.7	43.9	33.1	28.8	24.9	21.1	18.0	15.4	13.0	12.7	11.8	12.0					
2015	North America Gulf	Tampa	Far East	Guangzhou	104.7	43.9	33.1	28.8	24.9	21.1	18.0	15.4	13.0	12.7	11.8	12.0					
2015	North America Gulf	Tampa	South East Asia	Bangkok	100.3	42.7	32.5	28.7	25.0	21.3	18.4	15.8	13.5	13.4	12.4	12.6					
2015	Central America (incl. Mexic	Puerto Limon	North America West	Los Angeles	143.5	63.8	48.2	42.0	36.6	31.1	26.5	22.4	18.7	18.4	17.2	17.4					
2015	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	68.1	32.0	25.1	22.9	20.6	17.5	14.8	12.5	10.3	10.1	9.4	9.4					
2015	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	68.1	32.0	25.1	22.9	20.6	17.5	14.8	12.5	10.3	10.1	9.4	9.4					
2015	Central America (incl. Mexic	Puerto Limon	Far East	Guangzhou	96.3	43.3	33.3	29.2	25.3	21.3	18.0	15.1	12.5	12.2	11.3	11.4					
2015	Central America (incl. Mexic	Puerto Limon	South East Asia	Jakarta	86.1	42.1	33.6	30.8	28.1	24.8	23.0	19.1	15.7	15.5	14.4	14.6					
2015	South America East	Santos	North America West	Los Angeles	71.7	30.4	22.5	19.6	17.4	15.2	13.4	11.9	10.2	10.2	9.7	9.8					
2015	Other South America East	Buenos Aires	West Coast USA	Los Angeles	71.1	29.9	22.1	19.3	17.2	15.2	13.3	11.8	10.2	10.2	9.6	9.7					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 dwt)																
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	96.1	40.3	30.0	25.8	22.7	19.4	16.7	14.4	12.2	12.0	11.4	11.5					
2015	South America East	Buenos Aires	West Coast Canada	Los Angeles	71.1	29.9	22.1	19.3	17.2	15.2	13.3	11.8	10.2	10.2	9.6	9.7					
2015	Brazil	Santos	West Coast USA	Los Angeles	71.7	30.4	22.5	19.6	17.4	15.2	13.4	11.9	10.2	10.2	9.7	9.8					
2015	South America East	Ponta da Madeira	North America West	Los Angeles	84.8	35.9	26.7	23.0	20.1	17.4	15.2	13.2	11.2	11.2	10.6	10.7					
2015	South America East	Puerto La Cruz	Central America (incl. N	Lazaro Cardenas	80.2	34.3	26.1	22.8	20.1	17.1	14.4	12.2	10.1	9.9	9.1	9.1					
2015	South America East	Puerto Bolivar	Central America (incl. N	Lazaro Cardenas	78.0	34.3	26.2	23.0	20.2	17.2	14.6	12.4	10.3	10.1	9.3	9.4					
2015	South America East	Puerto Bolivar	South America West	Huasco	60.7	28.8	22.2	19.7	17.6	15.6	13.7	11.6	9.8	9.6	8.8	8.8	8.3	8.4	8.0	8.2	8.0
2015	South America East	Puerto La Cruz	South America West	Matarani	66.6	28.8	22.1	19.7	17.8	15.2	12.8	11.0	9.1	8.9	8.2	8.2					
2015	South America East	Santos	Oceania	Brisbane	63.2	27.1	20.7	18.2	16.0	14.1	12.3	10.8	9.1	8.9	8.3	8.4					
2015	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	94.5	39.3	29.5	25.2	21.9	18.4	15.4	12.9	10.7	10.4	9.6	9.7	9.2	9.2	7.8	7.3	7.7
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	99.7	41.9	31.6	27.2	23.5	19.7	16.7	14.1	11.7	11.5	10.6	10.7	10.3	10.2	7.6	7.1	6.9
2015	Venezuela	Puerto Ordaz	Korea	Kwangyang	100.6	42.0	31.6	27.1	23.4	19.7	16.6	14.0	11.6	11.3	10.4	10.5	10.0	10.0	7.3	6.9	6.8
2015	Venezuela	Puerto Ordaz	Japan	Mizushima	105.8	44.0	33.0	28.4	24.6	20.9	17.7	15.1	12.7	12.5	11.7	11.9	11.3	11.3	8.4	8.1	8.1
2015	North Brazil	Ponta da Madeira	Korea	Kwangyang	89.4	37.7	28.3	24.3	20.9	17.8	15.1	12.8	10.6	10.4	9.6	9.7	9.3	9.3	6.9	6.5	6.4
2015	North Brazil	Ponta da Madeira	Japan	Mizushima	94.5	39.7	29.7	25.6	22.1	19.0	16.2	14.0	11.7	11.6	10.9	11.2	10.6	10.6	8.0	7.7	7.7
2015	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	88.4	37.5	28.3	24.4	21.0	17.8	15.2	12.9	10.7	10.6	9.9	9.9	9.6	9.6	7.1	6.7	6.6
2015	Venezuela	Puerto Ordaz	Japan	Shimizu	108.7	45.8	34.7	30.2	26.2	22.8	19.6	17.2	14.5	14.5	13.8	14.5					
2015	North Brazil	Saã Luiz	Japan	Shimizu	95.7	40.6	30.9	27.1	23.6	20.9	18.2	16.3	13.7	13.9	13.3	14.0					
2015	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	78.6	33.3	25.2	21.8	18.7	15.9	13.6	11.6	9.6	9.5	8.8	8.9					
2015	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	82.1	34.7	26.3	22.8	19.8	16.9	14.5	12.5	10.4	10.3	9.5	9.6					
2015	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	102.7	43.0	32.5	27.9	24.2	20.4	17.2	14.6	12.1	11.8	10.9	11.0					
2015	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	84.1	35.4	26.7	23.3	20.3	17.3	14.8	12.7	10.7	10.6	9.7	9.8					
2015	Colombia	Puerto Bolivar	Japan	Mizushima	103.7	44.1	33.1	28.5	24.8	21.2	18.1	15.5	13.0	12.8	12.0	12.3	11.6	11.7	11.0	11.0	10.8
2015	Brazil	Saã Luiz	Far East	Guangzhou	82.1	34.7	26.3	22.8	19.8	16.9	14.5	12.5	10.4	10.3	9.5	9.6					
2015	South America East	Ponta da Madeira	Far East	Mizushima	94.5	39.7	29.7	25.6	22.1	19.0	16.2	14.0	11.7	11.6	10.9	11.2	10.6	10.6	10.0	10.0	9.8
2015	Caribbean Basin	Kingston	North America West	Los Angeles	95.1	42.8	32.7	29.3	26.3	23.4	20.2	17.5	14.8	14.8	14.1	14.5					
2015	Caribbean Basin	Kingston	North America West	Los Angeles	95.1	42.8	32.7	29.3	26.3	23.4	20.2	17.5	14.8	14.8	14.1	14.5					
2015	Caribbean Basin	Kingston	Central America (incl. N	Lazaro Cardenas	79.3	36.9	28.9	26.5	23.7	21.0	17.8	15.1	12.7	12.6	11.7	12.0					
2015	Caribbean Basin	Kingston	South America West	Matarani	66.1	31.7	25.1	23.5	21.5	19.2	16.4	14.0	11.7	11.7	10.9	11.2					
2015	Caribbean Basin	Kingston	Far East	Guangzhou	93.9	42.3	32.8	29.4	26.0	22.8	19.4	16.5	13.8	13.7	12.8	13.1					
2015	Caribbean Basin	Kingston	Far East	Guangzhou	93.9	42.3	32.8	29.4	26.0	22.8	19.4	16.5	13.8	13.7	12.8	13.1					
2015	Europe	Rotterdam	West Coast Canada	Los Angeles	101.8	42.7	32.1	27.7	24.3	20.9	18.1	15.7	13.4	13.3	12.5	12.7					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)															
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	Europe	Rotterdam	West Coast USA	Los Angeles	101.8	42.7	32.1	27.7	24.3	20.9	18.1	15.7	13.4	13.3	12.5	12.7					
2015	Europe	Rotterdam	North America West	Los Angeles	101.8	42.7	32.1	27.7	24.3	20.9	18.1	15.7	13.4	13.3	12.5	12.7					
2015	Europe	Rotterdam	Central America (incl.	Lazaro Cardenas	86.0	36.8	28.4	24.8	21.8	18.5	15.7	13.4	11.2	11.1	10.2	10.3					
2015	Europe	Rotterdam	South America West	Matarani	72.9	31.6	24.6	21.9	19.6	16.7	14.3	12.2	10.3	10.2	9.4	9.4					
2015	Africa	Durban	North America West	Los Angeles	87.2	37.3	28.0	24.2	21.4	18.6	16.3	14.2	12.2	12.3	11.6	11.8					
2015	Africa	Safi	Central America (incl.	Lazaro Cardenas	78.4	34.3	26.4	23.3	20.4	17.5	15.0	12.8	10.8	10.7	9.9	10.0					
2015	Africa	Safi	Oceania	Auckland	78.8	34.1	26.4	23.1	20.2	17.6	15.3	13.4	11.3	11.2	10.4	10.5					
2015	Middle East	Damman	Central America (incl.	Lazaro Cardenas	89.1	38.7	29.8	26.1	22.8	19.6	16.7	14.3	12.0	11.9	11.0	11.1					
2015	Middle East	Damman	South America West	Matarani	85.5	37.5	29.0	25.7	22.8	19.6	16.8	14.4	12.1	12.0	11.1	11.2					
2015	Middle East	Damman	South America West	Matarani	85.5	37.5	29.0	25.7	22.8	19.6	16.8	14.4	12.1	12.0	11.1	11.2					
2015	North America West	Vancouver	North America East	Philadelphia	106.0	43.4	34.6	30.6	27.6	22.5	19.3	15.9	13.2	13.0	12.0	12.2					
2015	North America West	Vancouver	North America Gulf	New Orleans	108.9	44.9	35.7	32.1	29.1	23.7	20.2	16.7	14.0	13.8	12.7	12.9					
2015	North America West	Vancouver	Central America (incl.	Tampico	101.6	42.5	34.3	30.8	28.2	23.0	19.4	15.9	13.2	12.9	12.0	12.1	11.4	11.0	10.1	10.0	9.8
2015	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	70.6	29.0	22.9	20.5	18.8	15.6	13.3	11.2	9.3	9.2	8.5	8.6	8.1	7.9	7.3	6.0	6.3
2015	North America West	Vancouver	South America East	Sepetiba, Bahia de	70.6	29.0	22.9	20.5	18.8	15.6	13.3	11.2	9.3	9.2	8.5	8.6	8.1	7.9	7.3	7.3	7.2
2015	North America West	Vancouver	Caribbean Basin	San Juan	91.6	40.2	32.8	30.3	28.2	23.9	20.2	16.7	14.0	13.9	13.0	13.3					
2015	West Coast USA	Los Angeles	Europe	Rotterdam	101.1	41.7	33.3	29.6	27.2	22.5	19.5	16.4	14.0	13.9	13.1	13.2					
2015	West Coast Canada	Vancouver	Europe	Rotterdam	101.6	41.8	33.6	29.8	27.2	22.1	18.7	15.4	12.9	12.7	11.7	11.8	11.2	10.9	8.4	8.4	8.4
2015	North America West	Vancouver	Europe	Rotterdam	101.6	41.8	33.6	29.8	27.2	22.1	18.7	15.4	12.9	12.7	11.7	11.8	11.2	10.9	10.0	9.9	9.7
2015	West Coast Canada	Vancouver	North Africa	Alexandria	86.7	39.5	32.1	28.6	26.4	21.9	18.8	15.7	13.1	13.0	12.0	12.0	11.3	11.0	9.3	10.0	9.7
2015	West Coast Canada	Vancouver	South Africa	Durban	85.4	35.6	28.6	25.5	23.2	19.2	16.3	13.6	11.4	11.4	10.5	10.6	10.1	9.7	8.9	8.8	8.7
2015	North America West	Vancouver	Africa	Safi	93.2	38.8	31.1	27.7	25.2	20.8	17.7	14.7	12.3	12.2	11.3	11.4					
2015	North America West	Vancouver	Middle East	Aqaba (El Akaba)	89.3	37.2	29.9	26.6	24.2	20.0	17.0	14.2	11.9	11.8	10.9	11.0					
2015	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	89.5	39.1	32.0	29.1	26.8	22.4	19.2	15.6	13.0	12.8	11.8	11.9					
2015	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	89.5	39.1	32.0	29.1	26.8	22.4	19.2	15.6	13.0	12.8	11.8	11.9					
2015	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	South Louisiana	92.5	40.7	33.2	30.7	28.3	23.6	20.1	16.5	13.9	13.6	12.6	12.7					
2015	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	New Orleans	92.5	40.7	33.2	30.7	28.3	23.6	20.1	16.5	13.9	13.6	12.6	12.7					
2015	Central America (incl. Mexic	Puerto Quetzal	Central America (incl.	Tampico	85.2	38.4	31.9	29.5	27.5	23.0	19.3	15.7	13.1	12.8	11.8	11.9					
2015	Central America (incl. Mexic	Puerto Quetzal	South America East	Sepetiba, Bahia de	51.8	23.2	19.1	17.9	16.9	14.6	12.5	10.5	8.7	8.6	8.0	8.0					
2015	Central America (incl. Mexic	Puerto Quetzal	Caribbean Basin	San Juan	74.7	35.8	30.2	28.8	27.4	23.8	20.1	16.5	13.8	13.7	12.8	13.1					
2015	Central America (incl. Mexic	Puerto Quetzal	Europe	Rotterdam	85.2	37.6	31.2	28.4	26.4	22.0	18.7	15.3	12.8	12.6	11.6	11.7					
2015	Central America (incl. Mexic	Puerto Quetzal	Africa	Safi	76.4	34.3	28.4	26.1	24.3	20.6	17.5	14.4	12.1	12.0	11.1	11.2					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	Peru	San Nicolas	East Coast USA	Baltimore	80.1	33.7	27.0	24.2	21.9	17.9	15.3	12.6	10.6	10.3	9.6	9.7	9.3	9.0	8.5	8.4	8.3
2015	Chile	Antofagasta	East Coast USA	Baltimore	77.5	34.6	28.3	25.7	23.5	20.0	17.5	14.4	12.2	11.9	11.0	11.1	10.9	10.6	10.1	7.8	10.0
2015	South America West	Matarani	North America East	Philadelphia	78.2	33.4	27.2	24.9	23.0	18.9	16.4	13.5	11.4	11.1	10.3	10.4					
2015	South America West	Callao	North America East	Philadelphia	80.1	34.2	27.8	25.4	23.5	19.3	16.8	13.8	11.6	11.3	10.5	10.6					
2015	South America West	San Nicolas	North America Gulf	Mobile	81.5	34.2	27.4	24.5	22.3	18.4	15.7	12.9	10.8	10.6	9.8	9.9	9.5	9.2	8.6	8.7	8.5
2015	South America West	Matarani	North America Gulf	South Louisiana	81.1	34.9	28.4	26.4	24.5	20.1	17.3	14.3	12.2	11.9	11.0	11.2					
2015	South America West	Callao	North America Gulf	South Louisiana	83.0	35.7	29.0	26.9	25.0	20.5	17.6	14.6	12.4	12.1	11.2	11.4					
2015	South America West	Callao	Central America (incl.	Tampico	75.7	33.3	27.6	25.7	24.1	19.8	16.8	13.8	11.6	11.3	10.4	10.5					
2015	South America West	Callao	South America East	Puerto La Cruz	71.3	31.4	25.9	23.8	22.4	18.5	15.9	13.0	10.8	10.5	9.7	9.8					
2015	Chile	Antofagasta	Caribbean Basin	Point Lisas	58.0	27.4	22.5	20.6	19.2	16.5	14.4	11.8	9.9	9.7	8.9	9.0	8.9	8.7	8.3	6.4	8.2
2015	Peru	San Nicolas	Caribbean Basin	Point Lisas	60.7	26.6	21.3	19.2	17.6	14.4	12.2	10.0	8.3	8.1	7.5	7.6	7.3	7.1	6.7	6.6	6.5
2015	South America West	Callao	Caribbean Basin	San Juan	65.5	30.9	26.0	25.1	24.1	20.6	17.6	14.6	12.3	12.2	11.4	11.7					
2015	Peru	Matarani	Europe	Rotterdam	73.8	31.8	26.3	24.1	22.6	18.5	15.9	13.1	11.1	10.9	10.0	10.1					
2015	Chile	Antofagasta	Europe	Rotterdam	73.2	32.9	27.3	24.8	23.0	19.5	17.1	14.1	11.9	11.7	10.7	10.8	10.6	10.3	9.7	9.7	9.5
2015	South America West	Callao	Europe	Rotterdam	76.9	33.1	27.3	25.0	23.4	19.1	16.4	13.6	11.4	11.3	10.3	10.4					
2015	South America West	Callao	Africa	Safi	67.1	29.5	24.3	22.5	21.1	17.5	15.1	12.6	10.6	10.6	9.8	9.9					
2015	South America West	Matarani	Middle East	Aqaba (El Akaba)	81.9	35.5	29.2	26.7	24.9	20.6	17.7	14.7	12.3	12.2	11.3	11.4					
2015	Oceania	Newcastle	North America East	Baltimore	105.4	43.7	35.1	31.2	28.1	23.0	19.6	16.2	13.5	13.2	12.2	12.3	11.7	11.4	9.2	8.7	8.5
2015	Oceania	Bunbury	North America East	Philadelphia	94.9	39.2	31.6	28.2	25.3	20.7	18.0	14.8	12.4	12.1	11.2	11.3					
2015	Oceania	Newcastle	North America Gulf	Mobile	106.9	44.2	35.5	31.6	28.6	23.5	19.9	16.5	13.7	13.4	12.4	12.5	11.8	11.5	9.4	8.9	8.7
2015	Oceania	Bunbury	North America Gulf	South Louisiana	98.5	41.1	33.0	29.8	27.0	22.0	19.0	15.7	13.3	13.0	12.0	12.2					
2015	Oceania	Newcastle	Central America (incl.	Tampico	100.1	42.4	34.6	31.1	28.4	23.2	19.6	16.1	13.4	13.1	12.1	12.1	11.5	11.1	8.9	8.3	8.1
2015	Oceania	Bunbury	Central America (incl.	Tampico	91.3	38.7	31.6	28.6	26.1	21.4	18.2	15.0	12.5	12.3	11.3	11.4					
2015	Oceania	Bunbury	Caribbean Basin	San Juan	80.1	35.8	29.6	27.7	25.7	21.9	18.8	15.6	13.1	13.0	12.2	12.4					
2015	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	51.1	21.7	17.7	16.0	14.7	12.3	10.8	9.2	7.8	7.8	7.2	7.3					
2015	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					
2015	Korea	Guangzhou	East Coast USA	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					
2015	Far East	Guangzhou	East Coast Canada	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					
2015	Taiwan	Guangzhou	East Coast USA	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					
2015	Japan	Kobe	East Coast USA	Philadelphia	113.7	48.9	39.5	35.5	31.9	26.7	23.3	19.6	16.6	16.6	15.7	16.4					
2015	Far East	Guangzhou	North America East	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					
2015	Far East	Guangzhou	North America East	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2015	Far East	Guangzhou	North America East	Philadelphia	103.5	44.4	35.7	31.8	28.6	23.2	20.1	16.5	13.8	13.5	12.5	12.7					
2015	Far East	Guangzhou	North America Gulf	South Louisiana	111.2	46.2	37.1	33.4	30.2	24.6	21.1	17.4	14.7	14.4	13.4	13.5					
2015	Far East	Guangzhou	North America Gulf	South Louisiana	111.2	46.2	37.1	33.4	30.2	24.6	21.1	17.4	14.7	14.4	13.4	13.5					
2015	Far East	Guangzhou	North America Gulf	New Orleans	111.2	46.2	37.1	33.4	30.2	24.6	21.1	17.4	14.7	14.4	13.4	13.5					
2015	Far East	Guangzhou	North America Gulf	South Louisiana	111.2	46.2	37.1	33.4	30.2	24.6	21.1	17.4	14.7	14.4	13.4	13.5					
2015	Far East	Guangzhou	Central America (incl. N	Tampico	103.9	43.8	35.7	32.2	29.3	23.9	20.3	16.6	13.9	13.6	12.6	12.7					
2015	Far East	Guangzhou	South America East	Puerto La Cruz	99.2	41.8	33.9	30.3	27.5	22.5	19.3	15.7	13.0	12.8	11.8	11.9					
2015	Far East	Guangzhou	Caribbean Basin	San Juan	93.1	41.1	33.9	31.4	29.1	24.6	20.9	17.3	14.5	14.4	13.5	13.8					
2015	South East Asia	Manado	North America East	Philadelphia	101.8	44.6	36.8	34.1	32.0	27.3	25.5	20.8	17.4	17.1	15.9	16.1					
2015	South East Asia	Bangkok	North America Gulf	New Orleans	103.3	43.1	34.8	31.7	28.8	23.7	20.5	17.1	14.6	14.5	13.4	13.5					
2015	South East Asia	Manado	North America Gulf	New Orleans	105.8	46.3	38.2	35.7	33.6	28.6	26.5	21.7	18.3	18.0	16.6	16.9					
2015	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	69.7	29.0	23.0	20.9	19.4	16.6	15.0	12.6	10.6	10.4	9.7	9.7					
2020	North America East	New York	North America West	Los Angeles	107.3	45.3	33.7	29.1	25.3	21.7	19.0	16.4	13.9	13.8	13.0	13.2					
2020	North America East	New York	Central America (incl. N	Lazaro Cardenas	91.4	39.4	30.0	26.2	22.7	19.3	16.6	14.0	11.7	11.5	10.6	10.7					
2020	North America East	New York	South America West	Matarani	78.0	34.0	26.1	23.2	20.5	17.4	15.1	12.9	10.8	10.6	9.7	9.9					
2020	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	93.5	39.4	29.6	25.3	21.6	18.2	15.4	12.9	10.7	10.5	9.7	9.8	9.3	8.9	7.9	6.4	7.4
2020	North America East	New York	Oceania	Brisbane	100.0	42.5	32.4	28.0	24.3	20.8	18.1	15.5	12.9	12.7	11.7	11.9					
2020	East Coast USA	Norfolk	Taiwan	Kaohsiung	102.2	44.3	33.2	28.4	24.6	20.9	15.5	15.0	12.4	12.2	11.2	11.4	10.7	10.4	9.2	8.9	8.6
2020	East Coast USA	Norfolk	Korea	Kwangyang	108.3	46.9	35.2	30.2	26.2	22.3	18.9	16.1	13.3	13.0	12.0	11.0	11.5	11.1	8.9	8.5	8.3
2020	East Coast USA	Norfolk	Japan	Mizushima	113.5	48.9	36.7	31.6	27.3	23.4	20.0	17.2	14.4	14.2	13.3	13.6	12.8	12.4	10.0	9.6	9.4
2020	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	98.8	44.3	33.3	28.4	24.5	20.6	17.4	14.6	12.1	11.9	11.0	11.1	10.5	10.1	7.7	7.3	7.2
2020	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	103.9	46.4	34.7	29.7	25.6	21.8	18.5	15.8	13.2	13.1	12.2	12.5	11.7	11.3	8.8	8.5	8.4
2020	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	97.9	44.2	33.3	28.6	24.5	20.7	17.5	14.7	12.3	12.1	11.2	11.3	10.7	10.3	8.0	7.5	7.3
2020	North America East	New York	Far East	Guangzhou	101.1	44.5	33.6	29.0	24.9	21.0	18.1	15.3	12.8	12.5	11.6	11.7					
2020	North America East	New York	Far East	Guangzhou	101.1	44.5	33.6	29.0	24.9	21.0	18.1	15.3	12.8	12.5	11.6	11.7					
2020	North America Gulf	Tampa	North America West	Los Angeles	111.4	46.9	34.8	30.4	26.6	22.8	19.8	17.2	14.7	14.5	13.7	13.9					
2020	North America Gulf	Tampa	Central America (incl. N	Lazaro Cardenas	91.6	39.3	29.9	26.5	23.1	19.6	16.8	14.3	12.1	11.9	10.9	11.1					
2020	North America Gulf	Tampa	Central America (incl. N	Lazaro Cardenas	91.6	39.3	29.9	26.5	23.1	19.6	16.8	14.3	12.1	11.9	10.9	11.1					
2020	North America Gulf	Tampa	South America West	Matarani	78.4	34.2	26.1	23.5	21.0	17.8	15.4	13.2	11.2	11.0	10.1	10.3					
2020	North America Gulf	Tampa	South America West	Matarani	78.4	34.2	26.1	23.5	21.0	17.8	15.4	13.2	11.2	11.0	10.1	10.3					
2020	North America Gulf	Tampa	Oceania	Auckland	92.0	39.2	29.9	26.3	23.0	19.7	17.1	14.9	12.6	12.3	11.4	11.6					
2020	North America Gulf	Tampa	Oceania	Auckland	92.0	39.2	29.9	26.3	23.0	19.7	17.1	14.9	12.6	12.3	11.4	11.6					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

Year	Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 dwt)																
					0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	North America Gulf	Mobile	Far East	Osaka	118.6	49.2	36.8	31.6	27.4	23.5	20.1	17.3	14.5	14.3	13.3	13.7	12.9	12.5	10.1	9.7	9.5
2020	North America Gulf	Tampa	Far East	Guangzhou	106.2	44.7	33.7	29.4	25.4	21.4	18.4	15.6	13.2	13.0	12.0	12.2					
2020	North America Gulf	Tampa	Far East	Guangzhou	106.2	44.7	33.7	29.4	25.4	21.4	18.4	15.6	13.2	13.0	12.0	12.2					
2020	North America Gulf	Tampa	South East Asia	Bangkok	101.7	43.5	33.1	29.2	25.4	21.6	18.7	16.1	13.8	13.7	12.6	12.8					
2020	Central America (incl. Mexic	Puerto Limon	North America West	Los Angeles	145.8	65.1	49.3	42.9	37.4	31.7	27.0	22.8	19.0	18.8	17.6	17.7					
2020	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	69.2	32.7	25.7	23.3	21.0	17.8	15.1	12.7	10.5	10.3	9.5	9.6					
2020	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	69.2	32.7	25.7	23.3	21.0	17.8	15.1	12.7	10.5	10.3	9.5	9.6					
2020	Central America (incl. Mexic	Puerto Limon	Far East	Guangzhou	97.9	44.3	34.1	29.8	25.9	21.8	18.4	15.4	12.7	12.5	11.6	11.7					
2020	Central America (incl. Mexic	Puerto Limon	South East Asia	Jakarta	87.5	42.9	34.3	31.5	28.6	25.3	23.4	19.4	16.0	15.8	14.6	14.8					
2020	South America East	Santos	North America West	Los Angeles	72.7	30.9	22.9	20.0	17.7	15.5	13.6	12.1	10.3	10.3	9.8	9.9					
2020	Other South America East	Buenos Aires	West Coast USA	Los Angeles	72.0	30.4	22.4	19.7	17.5	15.4	13.5	12.0	10.3	10.3	9.7	9.8					
2020	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	97.5	41.0	30.6	26.3	23.1	19.7	17.0	14.6	12.4	12.3	11.6	11.7					
2020	South America East	Buenos Aires	West Coast Canada	Los Angeles	72.0	30.4	22.4	19.7	17.5	15.4	13.5	12.0	10.3	10.3	9.7	9.8					
2020	Brazil	Santos	West Coast USA	Los Angeles	72.7	30.9	22.9	20.0	17.7	15.5	13.6	12.1	10.3	10.3	9.8	9.9					
2020	South America East	Ponta da Madeira	North America West	Los Angeles	86.0	36.6	27.2	23.5	20.5	17.7	15.5	13.4	11.4	11.3	10.8	10.9					
2020	South America East	Puerto La Cruz	Central America (incl.	Lazaro Cardenas	81.4	34.9	26.7	23.3	20.5	17.4	14.6	12.4	10.3	10.1	9.3	9.3					
2020	South America East	Puerto Bolivar	Central America (incl.	Lazaro Cardenas	79.3	35.0	26.8	23.5	20.7	17.6	14.9	12.6	10.5	10.3	9.5	9.6					
2020	South America East	Puerto Bolivar	South America West	Huasco	61.7	29.3	22.7	20.0	17.9	15.9	13.9	11.8	9.9	9.7	8.9	9.0	8.3	8.1	7.4	7.4	7.3
2020	South America East	Puerto La Cruz	South America West	Matarani	67.6	29.3	22.6	20.1	18.1	15.4	13.1	11.2	9.3	9.1	8.3	8.4					
2020	South America East	Santos	Oceania	Brisbane	64.2	27.6	21.2	18.6	16.4	14.4	12.5	11.0	9.3	9.1	8.4	8.5					
2020	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	96.0	40.1	30.2	25.8	22.3	18.8	15.7	13.2	10.9	10.6	9.8	9.9	9.3	9.0	7.9	7.5	7.5
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	101.3	42.7	32.3	27.8	24.0	20.2	17.0	14.4	12.0	11.7	10.8	10.9	10.4	10.0	7.8	7.3	7.1
2020	Venezuela	Puerto Ordaz	Korea	Kwangyang	102.3	42.8	32.3	27.7	24.0	20.2	16.9	14.3	11.8	11.5	10.6	10.7	10.1	9.7	7.5	7.1	7.0
2020	Venezuela	Puerto Ordaz	Japan	Mizushima	107.4	44.9	33.7	29.0	25.1	21.3	18.1	15.4	12.9	12.7	11.9	12.1	11.4	11.0	8.6	8.2	8.2
2020	North Brazil	Ponta da Madeira	Korea	Kwangyang	90.8	38.4	28.9	24.8	21.4	18.2	15.4	13.1	10.8	10.6	9.8	9.9	9.4	9.1	7.0	6.6	6.5
2020	North Brazil	Ponta da Madeira	Japan	Mizushima	96.0	40.5	30.4	26.2	22.5	19.3	16.6	14.2	11.9	11.8	11.1	11.4	10.7	10.3	8.1	7.8	7.8
2020	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	89.9	38.3	28.9	25.0	21.4	18.2	15.5	13.2	11.0	10.8	10.0	10.1	9.7	9.3	7.3	6.8	6.7
2020	Venezuela	Puerto Ordaz	Japan	Shimizu	110.3	46.6	35.5	30.9	26.8	23.3	20.0	17.5	14.7	14.8	14.1	14.8					
2020	North Brazil	Saā Luiz	Japan	Shimizu	97.2	41.4	31.5	27.7	24.1	21.3	18.6	16.6	14.0	14.1	13.5	14.2					
2020	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	79.9	34.0	25.8	22.3	19.1	16.2	13.9	11.8	9.8	9.7	9.0	9.1					
2020	North Brazil	Saā Luiz	China & Hong Kong	Guangzhou	83.4	35.4	26.8	23.3	20.2	17.2	14.8	12.7	10.6	10.5	9.7	9.8					
2020	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	104.3	43.9	33.2	28.5	24.8	20.9	17.6	14.9	12.4	12.1	11.2	11.2					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	85.4	36.0	27.3	23.8	20.7	17.7	15.1	13.0	10.9	10.8	9.9	9.9					
2020	Colombia	Puerto Bolivar	Japan	Mizushima	105.4	45.0	33.8	29.1	25.4	21.7	18.4	15.8	13.3	13.1	12.2	12.5	11.7	11.4	10.2	10.1	9.9
2020	Brazil	Saã Luiz	Far East	Guangzhou	83.4	35.4	26.8	23.3	20.2	17.2	14.8	12.7	10.6	10.5	9.7	9.8					
2020	South America East	Ponta da Madeira	Far East	Mizushima	96.0	40.5	30.4	26.2	22.5	19.3	16.6	14.2	11.9	11.8	11.1	11.4	10.7	10.3	9.3	9.2	9.0
2020	Caribbean Basin	Kingston	North America West	Los Angeles	96.5	43.6	33.3	29.9	26.8	23.8	20.5	17.7	15.1	15.1	14.3	14.7					
2020	Caribbean Basin	Kingston	North America West	Los Angeles	96.5	43.6	33.3	29.9	26.8	23.8	20.5	17.7	15.1	15.1	14.3	14.7					
2020	Caribbean Basin	Kingston	Central America (incl. N	Lazaro Cardenas	80.6	37.6	29.5	27.0	24.2	21.3	18.1	15.4	12.9	12.8	11.9	12.2					
2020	Caribbean Basin	Kingston	South America West	Matarani	67.1	32.2	25.6	23.9	21.9	19.5	16.6	14.2	11.9	11.8	11.1	11.4					
2020	Caribbean Basin	Kingston	Far East	Guangzhou	95.4	43.1	33.5	30.0	26.5	23.2	19.8	16.8	14.0	13.9	13.0	13.3					
2020	Caribbean Basin	Kingston	Far East	Guangzhou	95.4	43.1	33.5	30.0	26.5	23.2	19.8	16.8	14.0	13.9	13.0	13.3					
2020	Europe	Rotterdam	West Coast Canada	Los Angeles	103.3	43.4	32.7	28.2	24.8	21.2	18.4	16.0	13.6	13.6	12.7	12.9					
2020	Europe	Rotterdam	West Coast USA	Los Angeles	103.3	43.4	32.7	28.2	24.8	21.2	18.4	16.0	13.6	13.6	12.7	12.9					
2020	Europe	Rotterdam	North America West	Los Angeles	103.3	43.4	32.7	28.2	24.8	21.2	18.4	16.0	13.6	13.6	12.7	12.9					
2020	Europe	Rotterdam	Central America (incl. N	Lazaro Cardenas	87.4	37.5	28.9	25.3	22.2	18.8	16.0	13.6	11.4	11.3	10.4	10.4					
2020	Europe	Rotterdam	South America West	Matarani	74.0	32.2	25.1	22.3	20.0	17.0	14.6	12.4	10.5	10.4	9.5	9.6					
2020	Africa	Durban	North America West	Los Angeles	88.4	37.9	28.5	24.7	21.8	18.9	16.6	14.5	12.4	12.5	11.8	11.9					
2020	Africa	Safi	Central America (incl. N	Lazaro Cardenas	79.7	35.0	27.0	23.7	20.8	17.9	15.3	13.1	11.0	10.9	10.1	10.2					
2020	Africa	Safi	Oceania	Auckland	80.0	34.8	27.0	23.6	20.6	18.0	15.6	13.6	11.5	11.4	10.5	10.7					
2020	Middle East	Damman	Central America (incl. N	Lazaro Cardenas	90.6	39.5	30.4	26.7	23.3	19.9	17.0	14.5	12.2	12.1	11.2	11.3					
2020	Middle East	Damman	South America West	Matarani	86.9	38.2	29.6	26.2	23.3	19.9	17.1	14.6	12.3	12.2	11.3	11.4					
2020	Middle East	Damman	South America West	Matarani	86.9	38.2	29.6	26.2	23.3	19.9	17.1	14.6	12.3	12.2	11.3	11.4					
2020	North America West	Vancouver	North America East	Philadelphia	107.6	44.2	35.3	31.3	28.2	23.0	19.7	16.2	13.5	13.2	12.2	12.4					
2020	North America West	Vancouver	North America Gulf	New Orleans	110.5	45.7	36.4	32.7	29.6	24.2	20.5	17.0	14.3	14.0	13.0	13.1					
2020	North America West	Vancouver	Central America (incl. N	Tampico	103.2	43.3	35.0	31.5	28.8	23.5	19.7	16.2	13.5	13.2	12.2	12.3	11.6	11.2	9.8	9.2	9.0
2020	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	71.6	29.5	23.4	21.0	19.1	15.9	13.5	11.4	9.5	9.3	8.7	8.8	8.3	8.0	7.1	6.1	6.4
2020	North America West	Vancouver	South America East	Sepetiba, Bahia de	71.6	29.5	23.4	21.0	19.1	15.9	13.5	11.4	9.5	9.3	8.7	8.8	8.3	8.0	7.1	6.7	6.6
2020	North America West	Vancouver	Caribbean Basin	San Juan	93.0	40.9	33.5	30.9	28.7	24.4	20.6	17.0	14.2	14.1	13.2	13.5					
2020	West Coast USA	Los Angeles	Europe	Rotterdam	102.6	42.5	33.9	30.2	27.7	22.9	19.9	16.7	14.2	14.2	13.3	13.4					
2020	West Coast Canada	Vancouver	Europe	Rotterdam	103.1	42.6	34.3	30.5	27.7	22.6	19.1	15.7	13.2	13.0	12.0	12.1	11.4	11.0	8.6	8.6	8.6
2020	North America West	Vancouver	Europe	Rotterdam	103.1	42.6	34.3	30.5	27.7	22.6	19.1	15.7	13.2	13.0	12.0	12.1	11.4	11.0	9.7	9.2	8.9
2020	West Coast Canada	Vancouver	North Africa	Alexandria	88.0	40.1	32.7	29.1	26.8	22.3	19.1	16.0	13.3	13.1	12.1	12.2	11.5	11.0	9.4	9.1	8.9
2020	West Coast Canada	Vancouver	South Africa	Durban	86.7	36.3	29.2	26.0	23.7	19.6	16.7	13.9	11.6	11.6	10.7	10.8	10.2	9.8	8.6	8.1	7.9

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	North America West	Vancouver	Africa	Safi	94.6	39.5	31.8	28.3	25.7	21.2	18.0	15.0	12.6	12.5	11.5	11.6					
2020	North America West	Vancouver	Middle East	Aqaba (El Akaba)	90.7	37.9	30.5	27.2	24.7	20.4	17.4	14.4	12.1	12.0	11.1	11.2					
2020	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	91.0	39.9	32.7	29.8	27.3	22.8	19.6	16.0	13.3	13.0	12.0	12.2					
2020	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	91.0	39.9	32.7	29.8	27.3	22.8	19.6	16.0	13.3	13.0	12.0	12.2					
2020	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	South Louisiana	94.0	41.6	34.0	31.3	28.9	24.1	20.5	16.8	14.1	13.8	12.8	13.0					
2020	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	New Orleans	94.0	41.6	34.0	31.3	28.9	24.1	20.5	16.8	14.1	13.8	12.8	13.0					
2020	Central America (incl. Mexic	Puerto Quetzal	Central America (incl. N	Tampico	86.8	39.2	32.7	30.2	28.1	23.5	19.7	16.1	13.3	13.1	12.1	12.2					
2020	Central America (incl. Mexic	Puerto Quetzal	South America East	Sepetiba, Bahia de	52.6	23.7	19.6	18.3	17.3	14.9	12.7	10.6	8.9	8.7	8.1	8.2					
2020	Central America (incl. Mexic	Puerto Quetzal	Caribbean Basin	San Juan	76.0	36.5	30.8	29.4	28.0	24.2	20.5	16.8	14.0	13.9	13.0	13.3					
2020	Central America (incl. Mexic	Puerto Quetzal	Europe	Rotterdam	86.7	38.4	31.9	29.1	27.0	22.5	19.1	15.6	13.0	12.8	11.8	11.9					
2020	Central America (incl. Mexic	Puerto Quetzal	Africa	Safi	77.8	35.1	29.1	26.7	24.8	21.0	17.9	14.7	12.3	12.2	11.3	11.4					
2020	Peru	San Nicolas	East Coast USA	Baltimore	81.3	34.3	27.6	24.7	22.3	18.2	15.6	12.8	10.7	10.5	9.7	9.9	9.5	9.1	8.2	7.7	7.6
2020	Chile	Antofagasta	East Coast USA	Baltimore	78.5	35.1	28.8	26.1	23.9	20.3	17.8	14.6	12.3	12.1	11.2	11.3	11.0	10.7	9.7	7.9	9.1
2020	South America West	Matarani	North America East	Philadelphia	79.4	34.0	27.7	25.4	23.4	19.2	16.7	13.8	11.5	11.3	10.4	10.6					
2020	South America West	Callao	North America East	Philadelphia	81.3	34.8	28.3	25.9	23.9	19.6	17.0	14.0	11.8	11.5	10.6	10.8					
2020	South America West	San Nicolas	North America Gulf	Mobile	82.7	34.9	27.9	25.0	22.8	18.7	15.9	13.2	11.0	10.8	9.9	10.1	9.6	9.3	8.3	8.0	7.8
2020	South America West	Matarani	North America Gulf	South Louisiana	82.3	35.5	28.9	26.8	24.9	20.4	17.6	14.6	12.4	12.1	11.2	11.3					
2020	South America West	Callao	North America Gulf	South Louisiana	84.2	36.3	29.5	27.4	25.4	20.8	17.9	14.8	12.6	12.3	11.4	11.5					
2020	South America West	Callao	Central America (incl. N	Tampico	76.9	34.0	28.2	26.2	24.6	20.2	17.1	14.1	11.8	11.5	10.6	10.7					
2020	South America West	Callao	South America East	Puerto La Cruz	72.3	32.0	26.3	24.3	22.8	18.8	16.1	13.2	11.0	10.7	9.9	9.9					
2020	Chile	Antofagasta	Caribbean Basin	Point Lisas	58.9	27.9	23.0	21.0	19.5	16.8	14.6	12.0	10.1	9.9	9.1	9.1	9.0	8.7	8.0	6.5	7.5
2020	Peru	San Nicolas	Caribbean Basin	Point Lisas	61.6	27.1	21.8	19.6	17.9	14.7	12.4	10.2	8.5	8.3	7.7	7.7	7.5	7.2	6.4	6.1	5.9
2020	South America West	Callao	Caribbean Basin	San Juan	66.5	31.4	26.5	25.5	24.5	21.0	17.9	14.8	12.5	12.4	11.6	11.9					
2020	Peru	Matarani	Europe	Rotterdam	75.0	32.4	26.8	24.6	23.0	18.8	16.2	13.4	11.3	11.1	10.2	10.3					
2020	Chile	Antofagasta	Europe	Rotterdam	74.3	33.5	27.8	25.3	23.4	19.8	17.4	14.3	12.1	11.9	10.9	10.9	10.7	10.4	9.4	8.9	8.7
2020	South America West	Callao	Europe	Rotterdam	78.1	33.7	27.9	25.5	23.8	19.5	16.7	13.8	11.6	11.5	10.5	10.6					
2020	South America West	Callao	Africa	Safi	68.2	30.0	24.8	22.9	21.5	17.8	15.4	12.8	10.8	10.8	9.9	10.0					
2020	South America West	Matarani	Middle East	Aqaba (El Akaba)	83.2	36.2	29.8	27.3	25.4	21.0	18.0	14.9	12.6	12.5	11.5	11.6					
2020	Oceania	Newcastle	North America East	Baltimore	107.2	44.6	35.9	32.0	28.8	23.5	20.0	16.5	13.8	13.5	12.4	12.6	11.9	11.5	9.4	8.9	8.7
2020	Oceania	Bunbury	North America East	Philadelphia	96.5	40.1	32.3	28.8	25.8	21.1	18.3	15.1	12.7	12.4	11.4	11.5					
2020	Oceania	Newcastle	North America Gulf	Mobile	108.7	45.1	36.4	32.3	29.2	24.0	20.4	16.9	14.0	13.7	12.7	12.8	12.1	11.7	9.5	9.1	8.9
2020	Oceania	Bunbury	North America Gulf	South Louisiana	100.2	41.9	33.7	30.5	27.6	22.5	19.4	16.1	13.6	13.3	12.3	12.4					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2020	Oceania	Newcastle	Central America (incl.	Tampico	102.0	43.3	35.4	31.9	29.1	23.7	20.1	16.5	13.7	13.4	12.3	12.4	11.7	11.3	9.1	8.5	8.3
2020	Oceania	Bunbury	Central America (incl.	Tampico	93.0	39.6	32.4	29.3	26.7	21.8	18.6	15.3	12.8	12.5	11.5	11.6					
2020	Oceania	Bunbury	Caribbean Basin	San Juan	81.6	36.6	30.3	28.3	26.3	22.4	19.1	15.9	13.4	13.3	12.4	12.6					
2020	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	51.9	22.2	18.1	16.4	15.0	12.6	11.0	9.3	8.0	8.0	7.3	7.4					
2020	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Korea	Guangzhou	East Coast USA	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Far East	Guangzhou	East Coast Canada	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Taiwan	Guangzhou	East Coast USA	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Japan	Kobe	East Coast USA	Philadelphia	115.3	49.8	40.3	36.2	32.6	27.2	23.7	20.0	16.9	16.9	16.0	16.7					
2020	Far East	Guangzhou	North America East	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Far East	Guangzhou	North America East	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Far East	Guangzhou	North America East	Philadelphia	105.0	45.3	36.5	32.5	29.2	23.7	20.5	16.8	14.1	13.8	12.8	12.9					
2020	Far East	Guangzhou	North America Gulf	South Louisiana	113.0	47.1	37.9	34.2	30.8	25.1	21.5	17.7	15.0	14.7	13.6	13.8					
2020	Far East	Guangzhou	North America Gulf	South Louisiana	113.0	47.1	37.9	34.2	30.8	25.1	21.5	17.7	15.0	14.7	13.6	13.8					
2020	Far East	Guangzhou	North America Gulf	New Orleans	113.0	47.1	37.9	34.2	30.8	25.1	21.5	17.7	15.0	14.7	13.6	13.8					
2020	Far East	Guangzhou	North America Gulf	South Louisiana	113.0	47.1	37.9	34.2	30.8	25.1	21.5	17.7	15.0	14.7	13.6	13.8					
2020	Far East	Guangzhou	Central America (incl.	Tampico	105.7	44.7	36.6	33.0	30.0	24.4	20.7	17.0	14.2	13.9	12.9	12.9					
2020	Far East	Guangzhou	South America East	Puerto La Cruz	100.8	42.6	34.6	30.9	28.1	23.0	19.6	16.0	13.3	13.0	12.1	12.1					
2020	Far East	Guangzhou	Caribbean Basin	San Juan	94.7	41.9	34.7	32.1	29.7	25.1	21.3	17.6	14.8	14.7	13.8	14.0					
2020	South East Asia	Manado	North America East	Philadelphia	103.2	45.4	37.5	34.8	32.5	27.8	25.9	21.1	17.7	17.4	16.1	16.3					
2020	South East Asia	Bangkok	North America Gulf	New Orleans	104.9	43.9	35.5	32.3	29.4	24.1	20.8	17.4	14.9	14.8	13.6	13.8					
2020	South East Asia	Manado	North America Gulf	New Orleans	107.4	47.1	38.9	36.4	34.2	29.1	26.9	22.0	18.6	18.3	16.9	17.2					
2020	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	70.8	29.5	23.5	21.4	19.8	16.9	15.3	12.8	10.7	10.6	9.8	9.9					
2025	North America East	New York	North America West	Los Angeles	108.8	46.1	34.4	29.7	25.8	22.1	19.4	16.7	14.1	14.0	13.2	13.4					
2025	North America East	New York	Central America (incl.	Lazaro Cardenas	92.8	40.1	30.6	26.8	23.2	19.7	16.9	14.3	11.9	11.7	10.8	10.9					
2025	North America East	New York	South America West	Matarani	79.1	34.6	26.6	23.6	20.9	17.7	15.4	13.1	11.0	10.7	9.9	10.0					
2025	East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	95.0	40.2	30.3	25.9	22.1	18.6	15.7	13.2	10.9	10.7	9.9	10.0	9.5	9.1	8.0	6.6	7.6
2025	North America East	New York	Oceania	Brisbane	101.5	43.3	33.1	28.7	24.8	21.2	18.4	15.8	13.2	12.9	11.9	12.1					
2025	East Coast USA	Norfolk	Taiwan	Kaohsiung	103.6	45.1	33.9	29.1	25.2	21.4	15.8	15.3	12.7	12.4	11.5	11.6	10.9	10.6	9.4	9.0	8.8
2025	East Coast USA	Norfolk	Korea	Kwangyang	109.9	47.9	36.0	30.9	26.8	22.8	19.3	16.4	13.6	13.3	12.3	11.2	11.7	11.3	9.1	8.7	8.5
2025	East Coast USA	Norfolk	Japan	Mizushima	115.0	49.9	37.5	32.3	27.9	23.9	20.4	17.5	14.7	14.5	13.5	13.9	13.0	12.6	10.2	9.8	9.6
2025	East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	100.3	45.3	34.0	29.1	25.0	21.1	17.8	15.0	12.4	12.2	11.2	11.3	10.7	10.3	7.9	7.4	7.3

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	105.4	47.3	35.5	30.4	26.2	22.3	18.9	16.1	13.5	13.3	12.5	12.8	11.9	11.5	9.0	8.6	8.6
2025	East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	99.3	45.2	34.1	29.2	25.1	21.1	17.9	15.1	12.6	12.3	11.4	11.5	11.0	10.5	8.2	7.6	7.5
2025	North America East	New York	Far East	Guangzhou	102.5	45.4	34.4	29.6	25.4	21.4	18.5	15.6	13.0	12.8	11.8	12.0					
2025	North America East	New York	Far East	Guangzhou	102.5	45.4	34.4	29.6	25.4	21.4	18.5	15.6	13.0	12.8	11.8	12.0					
2025	North America Gulf	Tampa	North America West	Los Angeles	112.9	47.7	35.5	31.0	27.1	23.2	20.1	17.4	14.9	14.8	13.9	14.1					
2025	North America Gulf	Tampa	Central America (incl. N	Lazaro Cardenas	92.9	40.1	30.5	27.0	23.6	20.0	17.1	14.6	12.3	12.1	11.1	11.3					
2025	North America Gulf	Tampa	Central America (incl. N	Lazaro Cardenas	92.9	40.1	30.5	27.0	23.6	20.0	17.1	14.6	12.3	12.1	11.1	11.3					
2025	North America Gulf	Tampa	South America West	Matarani	79.5	34.7	26.6	24.0	21.3	18.1	15.6	13.4	11.4	11.1	10.3	10.4					
2025	North America Gulf	Tampa	South America West	Matarani	79.5	34.7	26.6	24.0	21.3	18.1	15.6	13.4	11.4	11.1	10.3	10.4					
2025	North America Gulf	Tampa	Oceania	Auckland	93.3	39.9	30.5	26.8	23.4	20.1	17.4	15.1	12.8	12.6	11.6	11.8					
2025	North America Gulf	Tampa	Oceania	Auckland	93.3	39.9	30.5	26.8	23.4	20.1	17.4	15.1	12.8	12.6	11.6	11.8					
2025	North America Gulf	Mobile	Far East	Osaka	120.3	50.1	37.6	32.3	28.0	24.0	20.5	17.6	14.8	14.6	13.6	14.0	13.1	12.7	10.3	9.9	9.6
2025	North America Gulf	Tampa	Far East	Guangzhou	107.8	45.5	34.4	30.0	25.9	21.9	18.7	15.9	13.5	13.2	12.2	12.4					
2025	North America Gulf	Tampa	Far East	Guangzhou	107.8	45.5	34.4	30.0	25.9	21.9	18.7	15.9	13.5	13.2	12.2	12.4					
2025	North America Gulf	Tampa	South East Asia	Bangkok	103.2	44.3	33.8	29.8	25.9	22.0	19.1	16.4	14.0	13.9	12.8	13.0					
2025	Central America (incl. Mexic	Puerto Limon	North America West	Los Angeles	148.2	66.6	50.6	44.0	38.4	32.5	27.7	23.3	19.4	19.2	17.9	18.1					
2025	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	70.3	33.4	26.3	23.9	21.5	18.2	15.4	13.0	10.7	10.5	9.7	9.8					
2025	Central America (incl. Mexic	Puerto Limon	South America West	Matarani	70.3	33.4	26.3	23.9	21.5	18.2	15.4	13.0	10.7	10.5	9.7	9.8					
2025	Central America (incl. Mexic	Puerto Limon	Far East	Guangzhou	99.6	45.3	34.9	30.6	26.6	22.3	18.9	15.8	13.0	12.8	11.8	11.9					
2025	Central America (incl. Mexic	Puerto Limon	South East Asia	Jakarta	89.0	43.9	35.1	32.3	29.3	25.8	23.8	19.7	16.3	16.1	14.9	15.1					
2025	South America East	Santos	North America West	Los Angeles	73.8	31.5	23.4	20.4	18.0	15.8	13.9	12.3	10.5	10.5	10.0	10.1					
2025	Other South America East	Buenos Aires	West Coast USA	Los Angeles	72.9	30.9	22.9	20.0	17.8	15.7	13.7	12.1	10.5	10.5	9.8	9.9					
2025	Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	98.9	41.8	31.2	26.9	23.6	20.1	17.3	14.9	12.6	12.5	11.8	11.9					
2025	South America East	Buenos Aires	West Coast Canada	Los Angeles	72.9	30.9	22.9	20.0	17.8	15.7	13.7	12.1	10.5	10.5	9.8	9.9					
2025	Brazil	Santos	West Coast USA	Los Angeles	73.8	31.5	23.4	20.4	18.0	15.8	13.9	12.3	10.5	10.5	10.0	10.1					
2025	South America East	Ponta da Madeira	North America West	Los Angeles	87.3	37.3	27.8	24.0	21.0	18.1	15.8	13.7	11.6	11.5	11.0	11.1					
2025	South America East	Puerto La Cruz	Central America (incl. N	Lazaro Cardenas	82.8	35.7	27.3	23.9	21.0	17.8	15.0	12.7	10.5	10.3	9.5	9.5					
2025	South America East	Puerto Bolivar	Central America (incl. N	Lazaro Cardenas	80.7	35.8	27.4	24.1	21.1	18.0	15.2	12.9	10.7	10.5	9.7	9.8					
2025	South America East	Puerto Bolivar	South America West	Huasco	62.7	29.8	23.1	20.4	18.2	16.2	14.1	12.0	10.1	9.9	9.1	9.1	8.5	8.2	7.6	7.5	7.4
2025	South America East	Puerto La Cruz	South America West	Matarani	68.6	29.9	23.0	20.5	18.5	15.7	13.3	11.4	9.5	9.2	8.5	8.5					
2025	South America East	Santos	Oceania	Brisbane	65.3	28.2	21.6	19.0	16.7	14.7	12.8	11.2	9.4	9.3	8.6	8.7					
2025	Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	97.6	41.0	30.9	26.5	22.9	19.2	16.1	13.5	11.2	10.9	10.1	10.1	9.5	9.2	8.1	7.7	7.7

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	103.0	43.6	33.0	28.5	24.6	20.6	17.4	14.7	12.2	12.0	11.1	11.1	10.6	10.2	7.9	7.4	7.2
2025	Venezuela	Puerto Ordaz	Korea	Kwangyang	104.0	43.8	33.1	28.4	24.5	20.7	17.3	14.6	12.1	11.8	10.9	10.9	10.3	9.9	7.7	7.2	7.1
2025	Venezuela	Puerto Ordaz	Japan	Mizushima	109.2	45.8	34.5	29.7	25.7	21.8	18.5	15.8	13.2	13.0	12.1	12.4	11.6	11.2	8.8	8.4	8.4
2025	North Brazil	Ponta da Madeira	Korea	Kwangyang	92.4	39.3	29.6	25.5	21.9	18.6	15.8	13.4	11.1	10.9	10.1	10.1	9.6	9.2	7.2	6.8	6.7
2025	North Brazil	Ponta da Madeira	Japan	Mizushima	97.6	41.3	31.1	26.8	23.1	19.8	16.9	14.6	12.2	12.1	11.3	11.6	10.9	10.5	8.3	8.0	8.0
2025	North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	91.4	39.1	29.6	25.6	22.0	18.6	15.9	13.5	11.2	11.0	10.3	10.3	9.9	9.5	7.4	7.0	6.8
2025	Venezuela	Puerto Ordaz	Japan	Shimizu	112.1	47.6	36.3	31.6	27.4	23.8	20.4	17.9	15.0	15.1	14.3	15.0					
2025	North Brazil	Saã Luiz	Japan	Shimizu	98.8	42.3	32.2	28.4	24.6	21.7	19.0	16.9	14.3	14.4	13.7	14.4					
2025	South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	81.2	34.7	26.4	22.8	19.6	16.6	14.2	12.0	10.0	9.9	9.2	9.3					
2025	North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	84.9	36.2	27.5	23.9	20.7	17.6	15.1	13.0	10.9	10.7	9.9	10.0					
2025	Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	106.1	44.8	34.0	29.2	25.4	21.4	18.0	15.2	12.6	12.4	11.4	11.5					
2025	Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	86.8	36.8	27.9	24.3	21.1	18.0	15.4	13.2	11.1	11.0	10.1	10.1					
2025	Colombia	Puerto Bolivar	Japan	Mizushima	107.3	46.0	34.6	29.9	26.0	22.2	18.9	16.2	13.6	13.4	12.5	12.8	11.9	11.6	10.4	10.3	10.1
2025	Brazil	Saã Luiz	Far East	Guangzhou	84.9	36.2	27.5	23.9	20.7	17.6	15.1	13.0	10.9	10.7	9.9	10.0					
2025	South America East	Ponta da Madeira	Far East	Mizushima	97.6	41.3	31.1	26.8	23.1	19.8	16.9	14.6	12.2	12.1	11.3	11.6	10.9	10.5	9.5	9.3	9.2
2025	Caribbean Basin	Kingston	North America West	Los Angeles	97.9	44.4	34.0	30.5	27.3	24.2	20.9	18.0	15.3	15.3	14.5	14.9					
2025	Caribbean Basin	Kingston	North America West	Los Angeles	97.9	44.4	34.0	30.5	27.3	24.2	20.9	18.0	15.3	15.3	14.5	14.9					
2025	Caribbean Basin	Kingston	Central America (incl. N	Lazaro Cardenas	81.9	38.4	30.1	27.6	24.7	21.8	18.4	15.7	13.1	13.0	12.2	12.5					
2025	Caribbean Basin	Kingston	South America West	Matarani	68.1	32.8	26.1	24.4	22.3	19.8	16.9	14.4	12.1	12.0	11.2	11.5					
2025	Caribbean Basin	Kingston	Far East	Guangzhou	97.0	44.0	34.2	30.7	27.1	23.7	20.1	17.1	14.3	14.2	13.3	13.6					
2025	Caribbean Basin	Kingston	Far East	Guangzhou	97.0	44.0	34.2	30.7	27.1	23.7	20.1	17.1	14.3	14.2	13.3	13.6					
2025	Europe	Rotterdam	West Coast Canada	Los Angeles	104.8	44.3	33.4	28.8	25.3	21.7	18.8	16.3	13.9	13.8	13.0	13.1					
2025	Europe	Rotterdam	West Coast USA	Los Angeles	104.8	44.3	33.4	28.8	25.3	21.7	18.8	16.3	13.9	13.8	13.0	13.1					
2025	Europe	Rotterdam	North America West	Los Angeles	104.8	44.3	33.4	28.8	25.3	21.7	18.8	16.3	13.9	13.8	13.0	13.1					
2025	Europe	Rotterdam	Central America (incl. N	Lazaro Cardenas	88.8	38.3	29.6	25.9	22.7	19.2	16.3	13.9	11.7	11.5	10.6	10.6					
2025	Europe	Rotterdam	South America West	Matarani	75.1	32.8	25.6	22.8	20.4	17.3	14.8	12.7	10.7	10.5	9.7	9.7					
2025	Africa	Durban	North America West	Los Angeles	89.8	38.7	29.1	25.3	22.2	19.3	16.9	14.7	12.6	12.7	12.0	12.1					
2025	Africa	Safi	Central America (incl. N	Lazaro Cardenas	81.0	35.7	27.6	24.3	21.3	18.2	15.6	13.3	11.2	11.2	10.3	10.4					
2025	Africa	Safi	Oceania	Auckland	81.4	35.5	27.6	24.1	21.1	18.3	15.9	13.9	11.7	11.6	10.8	10.9					
2025	Middle East	Damman	Central America (incl. N	Lazaro Cardenas	92.1	40.3	31.1	27.3	23.8	20.4	17.4	14.8	12.5	12.4	11.4	11.5					
2025	Middle East	Damman	South America West	Matarani	88.3	39.0	30.2	26.8	23.8	20.4	17.5	14.9	12.6	12.5	11.5	11.6					
2025	Middle East	Damman	South America West	Matarani	88.3	39.0	30.2	26.8	23.8	20.4	17.5	14.9	12.6	12.5	11.5	11.6					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	North America West	Vancouver	North America East	Philadelphia	109.2	45.1	36.0	32.0	28.8	23.5	20.1	16.5	13.8	13.5	12.5	12.6					
2025	North America West	Vancouver	North America Gulf	New Orleans	112.1	46.6	37.2	33.4	30.3	24.7	21.0	17.3	14.6	14.3	13.2	13.4					
2025	North America West	Vancouver	Central America (incl. N	Tampico	104.8	44.3	35.8	32.2	29.4	24.0	20.2	16.5	13.8	13.5	12.5	12.6	11.9	11.4	10.0	9.4	9.2
2025	West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	72.7	30.1	23.9	21.4	19.6	16.2	13.8	11.6	9.7	9.5	8.8	8.9	8.4	8.1	7.2	6.3	6.5
2025	North America West	Vancouver	South America East	Sepetiba, Bahia de	72.7	30.1	23.9	21.4	19.6	16.2	13.8	11.6	9.7	9.5	8.8	8.9	8.4	8.1	7.2	6.8	6.7
2025	North America West	Vancouver	Caribbean Basin	San Juan	94.5	41.8	34.2	31.6	29.3	24.8	21.0	17.3	14.5	14.4	13.4	13.7					
2025	West Coast USA	Los Angeles	Europe	Rotterdam	104.1	43.3	34.6	30.9	28.3	23.4	20.3	17.0	14.5	14.4	13.5	13.7					
2025	West Coast Canada	Vancouver	Europe	Rotterdam	104.8	43.5	35.1	31.2	28.4	23.1	19.5	16.1	13.5	13.3	12.2	12.3	11.7	11.2	8.8	8.7	8.7
2025	North America West	Vancouver	Europe	Rotterdam	104.8	43.5	35.1	31.2	28.4	23.1	19.5	16.1	13.5	13.3	12.2	12.3	11.7	11.2	9.9	9.3	9.1
2025	West Coast Canada	Vancouver	North Africa	Alexandria	89.3	40.8	33.3	29.7	27.3	22.7	19.4	16.2	13.5	13.4	12.4	12.4	11.7	11.2	9.6	9.3	9.0
2025	West Coast Canada	Vancouver	South Africa	Durban	88.1	37.0	29.8	26.6	24.2	20.0	17.0	14.1	11.9	11.8	10.9	11.0	10.4	10.0	8.8	8.3	8.1
2025	North America West	Vancouver	Africa	Safi	96.2	40.4	32.5	29.0	26.3	21.7	18.4	15.3	12.8	12.7	11.8	11.9					
2025	North America West	Vancouver	Middle East	Aqaba (El Akaba)	92.2	38.7	31.2	27.8	25.3	20.8	17.7	14.7	12.4	12.3	11.3	11.5					
2025	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	92.5	40.8	33.5	30.5	28.0	23.3	20.0	16.3	13.6	13.3	12.3	12.4					
2025	Central America (incl. Mexic	Puerto Quetzal	North America East	Philadelphia	92.5	40.8	33.5	30.5	28.0	23.3	20.0	16.3	13.6	13.3	12.3	12.4					
2025	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	South Louisiana	95.6	42.5	34.8	32.1	29.6	24.6	20.9	17.1	14.4	14.1	13.1	13.2					
2025	Central America (incl. Mexic	Puerto Quetzal	North America Gulf	New Orleans	95.6	42.5	34.8	32.1	29.6	24.6	20.9	17.1	14.4	14.1	13.1	13.2					
2025	Central America (incl. Mexic	Puerto Quetzal	Central America (incl. N	Tampico	88.4	40.2	33.5	31.0	28.8	24.0	20.2	16.4	13.6	13.4	12.3	12.4					
2025	Central America (incl. Mexic	Puerto Quetzal	South America East	Sepetiba, Bahia de	53.6	24.2	20.0	18.7	17.7	15.2	13.0	10.9	9.0	8.9	8.3	8.3					
2025	Central America (incl. Mexic	Puerto Quetzal	Caribbean Basin	San Juan	77.5	37.4	31.6	30.1	28.6	24.8	20.9	17.1	14.3	14.2	13.3	13.6					
2025	Central America (incl. Mexic	Puerto Quetzal	Europe	Rotterdam	88.3	39.4	32.7	29.9	27.7	23.0	19.5	15.9	13.3	13.1	12.1	12.1					
2025	Central America (incl. Mexic	Puerto Quetzal	Africa	Safi	79.2	35.9	29.8	27.4	25.4	21.5	18.3	15.0	12.6	12.5	11.6	11.7					
2025	Peru	San Nicolas	East Coast USA	Baltimore	82.5	35.0	28.1	25.2	22.8	18.6	15.9	13.0	10.9	10.7	9.9	10.1	9.6	9.3	8.3	7.9	7.7
2025	Chile	Antofagasta	East Coast USA	Baltimore	79.7	35.8	29.3	26.6	24.3	20.6	18.1	14.9	12.5	12.3	11.3	11.4	11.2	10.8	9.9	8.0	9.2
2025	South America West	Matarani	North America East	Philadelphia	80.5	34.7	28.3	25.9	23.9	19.6	17.0	14.0	11.8	11.5	10.6	10.7					
2025	South America West	Callao	North America East	Philadelphia	82.5	35.5	28.9	26.5	24.4	20.0	17.4	14.3	12.0	11.7	10.8	10.9					
2025	South America West	San Nicolas	North America Gulf	Mobile	83.9	35.5	28.5	25.5	23.2	19.1	16.3	13.4	11.2	11.0	10.1	10.2	9.8	9.5	8.5	8.1	7.9
2025	South America West	Matarani	North America Gulf	South Louisiana	83.5	36.2	29.5	27.4	25.4	20.8	17.9	14.8	12.6	12.3	11.4	11.5					
2025	South America West	Callao	North America Gulf	South Louisiana	85.5	37.0	30.1	28.0	25.9	21.2	18.3	15.1	12.8	12.6	11.6	11.7					
2025	South America West	Callao	Central America (incl. N	Tampico	78.2	34.7	28.8	26.8	25.1	20.6	17.5	14.4	12.0	11.8	10.8	10.9					
2025	South America West	Callao	South America East	Puerto La Cruz	73.3	32.6	26.9	24.8	23.2	19.2	16.4	13.4	11.2	10.9	10.0	10.1					
2025	Chile	Antofagasta	Caribbean Basin	Point Lisas	59.8	28.4	23.4	21.4	19.8	17.1	14.9	12.2	10.2	10.0	9.2	9.2	9.2	8.9	8.1	6.6	7.6

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	Peru	San Nicolas	Caribbean Basin	Point Lisas	62.6	27.6	22.2	20.0	18.3	15.0	12.7	10.4	8.6	8.5	7.8	7.9	7.6	7.3	6.6	6.2	6.1
2025	South America West	Callao	Caribbean Basin	San Juan	67.6	32.0	27.0	26.0	24.9	21.3	18.2	15.1	12.7	12.6	11.8	12.1					
2025	Peru	Matarani	Europe	Rotterdam	76.2	33.1	27.4	25.2	23.5	19.2	16.5	13.6	11.5	11.3	10.4	10.5					
2025	Chile	Antofagasta	Europe	Rotterdam	75.5	34.2	28.4	25.8	23.9	20.2	17.7	14.5	12.3	12.1	11.1	11.1	10.9	10.5	9.5	9.0	8.8
2025	South America West	Callao	Europe	Rotterdam	79.4	34.4	28.5	26.1	24.4	19.9	17.1	14.1	11.9	11.7	10.7	10.8					
2025	South America West	Callao	Africa	Safi	69.3	30.6	25.3	23.4	21.9	18.2	15.7	13.1	11.0	11.0	10.1	10.2					
2025	South America West	Matarani	Middle East	Aqaba (El Akaba)	84.6	37.0	30.4	27.9	25.9	21.4	18.4	15.2	12.8	12.7	11.7	11.8					
2025	Oceania	Newcastle	North America East	Baltimore	109.1	45.6	36.8	32.8	29.5	24.1	20.5	16.9	14.1	13.8	12.7	12.9	12.2	11.7	9.6	9.1	8.9
2025	Oceania	Bunbury	North America East	Philadelphia	98.2	41.0	33.1	29.5	26.5	21.6	18.8	15.5	13.0	12.7	11.7	11.8					
2025	Oceania	Newcastle	North America Gulf	Mobile	110.6	46.2	37.3	33.1	30.0	24.6	20.9	17.3	14.4	14.0	13.0	13.1	12.3	11.9	9.8	9.3	9.1
2025	Oceania	Bunbury	North America Gulf	South Louisiana	102.0	42.8	34.6	31.3	28.2	23.0	19.8	16.4	13.9	13.6	12.6	12.7					
2025	Oceania	Newcastle	Central America (incl.	Tampico	104.0	44.4	36.3	32.7	29.8	24.3	20.6	16.9	14.1	13.7	12.7	12.7	12.0	11.5	9.3	8.7	8.5
2025	Oceania	Bunbury	Central America (incl.	Tampico	94.8	40.5	33.2	30.1	27.4	22.4	19.1	15.7	13.2	12.8	11.8	11.9					
2025	Oceania	Bunbury	Caribbean Basin	San Juan	83.1	37.4	31.1	29.0	26.9	22.9	19.6	16.2	13.7	13.5	12.7	12.9					
2025	Oceania	Bunbury	Middle East	Aqaba (El Akaba)	52.9	22.7	18.6	16.8	15.3	12.9	11.3	9.5	8.1	8.1	7.5	7.5					
2025	China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Korea	Guangzhou	East Coast USA	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Far East	Guangzhou	East Coast Canada	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Taiwan	Guangzhou	East Coast USA	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Japan	Kobe	East Coast USA	Philadelphia	117.1	50.9	41.3	37.1	33.4	27.8	24.3	20.4	17.3	17.3	16.3	17.0					
2025	Far East	Guangzhou	North America East	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Far East	Guangzhou	North America East	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Far East	Guangzhou	North America East	Philadelphia	106.7	46.3	37.4	33.3	29.9	24.3	21.0	17.2	14.4	14.1	13.1	13.2					
2025	Far East	Guangzhou	North America Gulf	South Louisiana	114.9	48.1	38.8	35.0	31.6	25.6	22.0	18.1	15.3	15.0	13.9	14.0					
2025	Far East	Guangzhou	North America Gulf	South Louisiana	114.9	48.1	38.8	35.0	31.6	25.6	22.0	18.1	15.3	15.0	13.9	14.0					
2025	Far East	Guangzhou	North America Gulf	New Orleans	114.9	48.1	38.8	35.0	31.6	25.6	22.0	18.1	15.3	15.0	13.9	14.0					
2025	Far East	Guangzhou	North America Gulf	South Louisiana	114.9	48.1	38.8	35.0	31.6	25.6	22.0	18.1	15.3	15.0	13.9	14.0					
2025	Far East	Guangzhou	Central America (incl.	Tampico	107.7	45.8	37.5	33.8	30.7	25.0	21.2	17.4	14.5	14.2	13.2	13.2					
2025	Far East	Guangzhou	South America East	Puerto La Cruz	102.5	43.5	35.4	31.7	28.8	23.5	20.1	16.4	13.6	13.3	12.3	12.4					
2025	Far East	Guangzhou	Caribbean Basin	San Juan	96.4	42.9	35.5	32.9	30.4	25.6	21.8	18.0	15.1	15.0	14.0	14.3					
2025	South East Asia	Manado	North America East	Philadelphia	104.7	46.2	38.3	35.5	33.2	28.3	26.4	21.5	18.0	17.7	16.4	16.6					
2025	South East Asia	Bangkok	North America Gulf	New Orleans	106.5	44.7	36.2	33.0	30.0	24.6	21.3	17.7	15.1	15.0	13.8	14.0					

Table C-5. Ocean Freight Rates Excluding Panama Canal Tolls for Expanded Canal, Least Cost Alternative and By Pass routes, by Vessel Size, Selected Years 2000-2025, (2002$)

					Vessel Size Range (000 dwt)																
Year	Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
2025	South East Asia	Manado	North America Gulf	New Orleans	109.0	48.0	39.7	37.1	34.8	29.6	27.3	22.4	18.9	18.6	17.2	17.4					
2025	South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	71.9	30.1	24.0	21.8	20.2	17.3	15.6	13.0	10.9	10.8	10.0	10.0					

Source: Richardson Lawrie Associates

Table C-6. Least Cost Alternative Routes Expanded Canal - 2010

				Vessel Size Range (000 dwt)																
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
North America East	New York	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America East	New York	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America East	New York	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
East Coast Canada	Sept Iles (Seven Is.)	Oceania	Whyalla	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America East	New York	Oceania	Brisbane	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
East Coast USA	Norfolk	Taiwan	Kaohsiung	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast USA	Norfolk	Korea	Kwangyang	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast USA	Norfolk	Japan	Mizushima	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast Canada	Sept Iles (Seven Is.)	Korea	Kwangyang	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast Canada	Sept Iles (Seven Is.)	Japan	Mizushima	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
East Coast Canada	Sept Iles (Seven Is.)	China & Hong Kong	Shanghai	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America East	New York	Far East	Guangzhou	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
North America East	New York	Far East	Guangzhou	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
North America Gulf	Tampa	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Tampa	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Tampa	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Tampa	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Tampa	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Tampa	Oceania	Auckland	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Tampa	Oceania	Auckland	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America Gulf	Mobile	Far East	Osaka	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America Gulf	Tampa	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
North America Gulf	Tampa	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
North America Gulf	Tampa	South East Asia	Bangkok	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Central America East	Puerto Limon	North America West	Los Angeles	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Central America East	Puerto Limon	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America East	Puerto Limon	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America East	Puerto Limon	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Central America East	Puerto Limon	South East Asia	Jakarta	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South America East	Santos	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Other South America East	Buenos Aires	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Venezuela	Puerto Ordaz	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America East	Buenos Aires	West Coast Canada	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					

Table C-6. Least Cost Alternative Routes Expanded Canal - 2010

				Vessel Size Range (000 dwt)																
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
Brazil	Santos	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America East	Ponta da Madeira	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America East	Puerto La Cruz	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America East	Puerto Bolivar	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America East	Puerto Bolivar	South America West	Huasco	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America East	Puerto La Cruz	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America East	Santos	Oceania	Brisbane	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Venezuela	Puerto Ordaz	Taiwan	Kaohsiung	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	China & Hong Kong	Shanghai	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	Korea	Kwangyang	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	Japan	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Ponta da Madeira	Korea	Kwangyang	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Ponta da Madeira	Japan	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North Brazil	Ponta da Madeira	China & Hong Kong	Shanghai	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Venezuela	Puerto Ordaz	Japan	Shimizu	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
North Brazil	Saã Luiz	Japan	Shimizu	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South Brazil	Sepetiba, Bahia de	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
North Brazil	Saã Luiz	China & Hong Kong	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Venezuela	Puerto Ordaz	China & Hong Kong	Qinhuangdao	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Argentina	Puerto Madryn	China & Hong Kong	Guangzhou	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Colombia	Puerto Bolivar	Japan	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Brazil	Saã Luiz	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South America East	Ponta da Madeira	Far East	Mizushima	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
Caribbean Basin	Kingston	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Caribbean Basin	Kingston	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Caribbean Basin	Kingston	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Caribbean Basin	Kingston	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Caribbean Basin	Kingston	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Caribbean Basin	Kingston	Far East	Guangzhou	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Europe	Rotterdam	West Coast Canada	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Europe	Rotterdam	West Coast USA	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Europe	Rotterdam	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Europe	Rotterdam	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					

Table C-6. Least Cost Alternative Routes Expanded Canal - 2010

Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 dwt)																
				0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
Europe	Rotterdam	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Africa	Durban	North America West	Los Angeles	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Africa	Safi	Central America West	Lazaro Cardenas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Africa	Safi	Oceania	Auckland	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Middle East	Damman	Central America West	Lazaro Cardenas	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Middle East	Damman	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Middle East	Damman	South America West	Matarani	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America West	Vancouver	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America West	Vancouver	North America Gulf	New Orleans	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America West	Vancouver	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
West Coast Canada	Vancouver	South America East	Sepetiba, Bahia de	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	South America East	Sepetiba, Bahia de	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	Caribbean Basin	San Juan	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
West Coast USA	Los Angeles	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
West Coast Canada	Vancouver	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
North America West	Vancouver	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
West Coast Canada	Vancouver	North Africa	Alexandria	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
West Coast Canada	Vancouver	South Africa	Durban	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH
North America West	Vancouver	Africa	Safi	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
North America West	Vancouver	Middle East	Aqaba (El Akaba)	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Central America West	Puerto Quetzal	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	North America Gulf	South Louisiana	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	North America Gulf	New Orleans	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	South America East	Sepetiba, Bahia de	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	Caribbean Basin	San Juan	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Central America West	Puerto Quetzal	Africa	Safi	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Peru	San Nicolas	East Coast USA	Baltimore	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Chile	Antofagasta	East Coast USA	Baltimore	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Matarani	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America West	Callao	North America East	Philadelphia	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					

Table C-6. Least Cost Alternative Routes Expanded Canal - 2010

Origin Region	Origin Port	Destination Region	Destination Port	Vessel Size Range (000 dwt) 0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
South America West	San Nicolas	North America Gulf	Mobile	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Matarani	North America Gulf	South Louisiana	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America West	Callao	North America Gulf	South Louisiana	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America West	Callao	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America West	Callao	South America East	Puerto La Cruz	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Chile	Antofagasta	Caribbean Basin	Point Lisas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Peru	San Nicolas	Caribbean Basin	Point Lisas	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	Caribbean Basin	San Juan	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Peru	Matarani	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
Chile	Antofagasta	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
South America West	Callao	Europe	Rotterdam	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America West	Callao	Africa	Safi	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH					
South America West	Matarani	Middle East	Aqaba (El Akaba)	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Oceania	Newcastle	North America East	Baltimore	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Oceania	Bunbury	North America East	Philadelphia	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Oceania	Newcastle	North America Gulf	Mobile	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Oceania	Bunbury	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Oceania	Newcastle	Central America East	Tampico	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH
Oceania	Bunbury	Central America East	Tampico	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Oceania	Bunbury	Caribbean Basin	San Juan	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Oceania	Bunbury	Middle East	Aqaba (El Akaba)	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
China & Hong Kong	Guangzhou	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Korea	Guangzhou	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	East Coast Canada	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Taiwan	Guangzhou	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Japan	Kobe	East Coast USA	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America Gulf	New Orleans	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	North America Gulf	South Louisiana	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					

Table C-6. Least Cost Alternative Routes Expanded Canal - 2010

				Vessel Size Range (000 dwt)																	
Origin Region	Origin Port	Destination Region	Destination Port	0 to 10k	10 to 15k	15 to 20k	20 to 25k	25 to 30k	30 to 40k	40 to 50k	50 to 60k	60 to 70k	70 to 80k	80 to 90k	90 to 100k	100 to 110k	110 to 120k	120 to 150k	150 to 170k	170 to 200k
Far East	Guangzhou	Central America East	Tampico	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	South America East	Puerto La Cruz	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
Far East	Guangzhou	Caribbean Basin	San Juan	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South East Asia	Manado	North America East	Philadelphia	S	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South East Asia	Bangkok	North America Gulf	New Orleans	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South East Asia	Manado	North America Gulf	New Orleans	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					
South East Asia	PT Kaltim Prima Port	South America East	Sepetiba, Bahia de	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH	CGH					

Source: Richardson Lawrie Associates

Appendix D

PANAMA CANAL TOLL PRICING ANALYSIS FOR EXISTING AND EXPANDED CANAL

Table D-1. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2000

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090	2,090
Potential Panama Canal Cargo (ton 000s)	65,988	65,988	65,988	65,988	65,988	65,988	65,988	65,988	65,988	65,988	65,988	65,988	65,988
Forecast Panama Canal Transits (no.)	1,862	1,850	1,850	1,828	1,792	1,632	1,538	1,374	1,249	1,216	1,643	1,632	1,632
Percent of Potential Transits	89.1%	88.5%	88.5%	87.5%	85.7%	78.1%	73.6%	65.8%	59.7%	58.2%	78.6%	78.1%	78.1%
Forecast Panama Canal Cargo (ton 000s)	58,271	57,914	57,914	57,223	55,603	49,249	45,797	39,141	35,482	34,244	49,631	49,249	49,249
Percent of Potential Cargo	88.3%	87.8%	87.8%	86.7%	84.3%	74.6%	69.4%	59.3%	53.8%	51.9%	75.2%	74.6%	74.6%
Economic Value of Canal for Potential Transits ($000s)	397,027	397,027	397,027	397,027	397,027	397,027	397,027	397,027	397,027	397,027	397,027	397,027	397,027
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,366	4,023	4,023	5,506	9,624	28,821	41,190	67,184	83,905	89,743	27,555	28,821	28,821
Forecast Panama Canal Toll Revenues ($000s)	98,309	105,832	110,975	137,013	160,023	165,874	176,697	171,544	165,686	166,702	163,266	162,682	163,330
Average Toll Revenue per Forecasted Transit ($000)	53	57	60	75	89	102	115	125	133	137	99	100	100
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.92	2.39	2.88	3.37	3.86	4.38	4.67	4.87	3.29	3.30	3.32
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-2. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2001

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055	2,055
Potential Panama Canal Cargo (ton 000s)	65,019	65,019	65,019	65,019	65,019	65,019	65,019	65,019	65,019	65,019	65,019	65,019	65,019
Forecast Panama Canal Transits (no.)	1,816	1,805	1,796	1,742	1,595	1,456	1,229	1,116	1,046	966	1,534	1,516	1,503
Percent of Potential Transits	88.4%	87.9%	87.4%	84.8%	77.6%	70.8%	59.8%	54.3%	50.9%	47.0%	74.6%	73.8%	73.1%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	57,053	56,671	56,442	54,015	48,231	42,513	34,819	30,704	28,695	24,895	46,075	45,575	44,935
Percent of Potential Cargo	87.7%	87.2%	86.8%	83.1%	74.2%	65.4%	53.6%	47.2%	44.1%	38.3%	70.9%	70.1%	69.1%
Economic Value of Canal for Potential Transits ($000s)	325,907	325,907	325,907	325,907	325,907	325,907	325,907	325,907	325,907	325,907	325,907	325,907	325,907
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,420	4,069	4,537	9,722	24,566	41,351	68,689	85,083	94,391	111,264	31,095	32,693	34,679
Forecast Panama Canal Toll Revenues ($000S)	96,153	103,468	108,008	129,427	139,110	144,133	135,482	135,011	134,438	122,724	151,591	150,557	149,057
Average Toll Revenue per Forecasted Transit ($000)	53	57	60	74	87	99	110	121	128	127	99	99	99
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.40	2.88	3.39	3.89	4.40	4.69	4.93	3.29	3.30	3.32
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-3. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2002

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,029	2,029	2,029	2,029	2,029	2,029	2,029	2,029	2,029	2,029	2,029	2,029	2,029
Potential Panama Canal Cargo (ton 000s)	64,674	64,674	64,674	64,674	64,674	64,674	64,674	64,674	64,674	64,674	64,674	64,674	64,674
Forecast Panama Canal Transits (no.)	1,782	1,771	1,771	1,691	1,540	1,370	1,169	1,066	1,004	906	1,475	1,474	1,460
Percent of Potential Transits	87.8%	87.3%	87.3%	83.3%	75.9%	67.5%	57.6%	52.5%	49.5%	44.7%	72.7%	72.6%	72.0%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	56,478	56,203	56,179	52,859	47,125	40,160	33,472	29,865	27,912	23,830	44,713	44,660	44,000
Percent of Potential Cargo	87.3%	86.9%	86.9%	81.7%	72.9%	62.1%	51.8%	46.2%	43.2%	36.8%	69.1%	69.1%	68.0%
Economic Value of Canal for Potential Transits ($000s)	314,181	314,181	314,181	314,181	314,181	314,181	314,181	314,181	314,181	314,181	314,181	314,181	314,181
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,852	4,378	4,422	11,627	26,357	47,323	70,758	85,275	93,859	112,056	33,498	33,674	35,686
Forecast Panama Canal Toll Revenues ($000S)	95,038	102,413	107,338	126,435	135,643	135,797	130,036	130,803	130,563	117,244	147,069	147,401	145,822
Average Toll Revenue per Forecasted Transit ($000)	53	58	61	75	88	99	111	123	130	129	100	100	100
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.68	4.92	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-4. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2003

Canal Scenario and Item	Panama Canal Toll Pricing Option												
	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,031	2,031	2,031	2,031	2,031	2,031	2,031	2,031	2,031	2,031	2,031	2,031	2,031
Potential Panama Canal Cargo (ton 000s)	64,836	64,836	64,836	64,836	64,836	64,836	64,836	64,836	64,836	64,836	64,836	64,836	64,836
Forecast Panama Canal Transits (no.)	1,793	1,778	1,774	1,715	1,556	1,413	1,166	1,062	964	922	1,487	1,466	1,452
Percent of Potential Transits	88.3%	87.5%	87.3%	84.4%	76.6%	69.5%	57.4%	52.3%	47.5%	45.4%	73.2%	72.2%	71.5%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	57,001	56,562	56,425	53,798	47,625	41,672	33,443	29,706	25,472	24,320	44,988	44,405	43,722
Percent of Potential Cargo	87.9%	87.2%	87.0%	83.0%	73.5%	64.3%	51.6%	45.8%	39.3%	37.5%	69.4%	68.5%	67.4%
Economic Value of Canal for Potential Transits ($000s)	321,173	321,173	321,173	321,173	321,173	321,173	321,173	321,173	321,173	321,173	321,173	321,173	321,173
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,412	4,194	4,455	9,994	25,841	43,274	72,641	87,735	106,289	111,873	33,712	35,598	37,676
Forecast Panama Canal Toll Revenues ($000S)	95,875	103,027	107,752	128,646	137,057	140,990	129,845	130,169	120,046	119,363	147,735	146,422	144,780
Average Toll Revenue per Forecasted Transit ($000)	53	58	61	75	88	100	111	123	124	129	99	100	100
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.71	4.91	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-5. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2004

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,054	2,054	2,054	· 2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054
Potential Panama Canal Cargo (ton 000s)	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655	65,655
Forecast Panama Canal Transits (no.)	1,807	1,797	1,795	1,733	1,569	1,421	1,165	1,060	962	924	1,498	1,475	1,461
Percent of Potential Transits	88.0%	87.5%	87.4%	84.4%	76.4%	69.2%	56.7%	51.6%	46.8%	45.0%	72.9%	71.8%	71.1%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	57,540	57,318	57,238	54,460	48,091	41,926	33,328	29,709	25,515	24,465	45,385	44,727	44,018
Percent of Potential Cargo	87.6%	87.3%	87.2%	82.9%	73.2%	63.9%	50.8%	45.2%	38.9%	37.3%	69.1%	68.1%	67.0%
Economic Value of Canal for Potential Transits ($000s)	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245	323,245
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,876	4,294	4,452	10,279	26,557	44,570	75,135	89,828	108,137	113,214	34,608	36,738	38,885
Forecast Panama Canal Toll Revenues ($000S)	96,769	104,391	109,287	130,215	138,389	141,841	129,433	130,123	120,160	119,987	148,922	147,401	145,711
Average Toll Revenue per Forecasted Transit ($000)	54	58	61	75	88	100	111	123	125	130	99	100	100
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.71	4.90	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-6 Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2005

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127	2,127
Potential Panama Canal Cargo (ton 000s)	68,237	68,237	68,237	68,237	68,237	68,237	68,237	68,237	68,237	68,237	68,237	68,237	68,237
Forecast Panama Canal Transits (no.)	1,884	1,864	1,859	1,789	1,617	1,464	1,200	1,086	989	955	1,547	1,521	1,506
Percent of Potential Transits	88.6%	87.6%	87.4%	84.1%	76.0%	68.8%	56.4%	51.1%	46.5%	44.9%	72.7%	71.5%	70.8%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	60,233	59,641	59,491	56,417	49,768	43,399	34,571	30,708	26,551	25,531	47,081	46,282	45,536
Percent of Potential Cargo	88.3%	87.4%	87.2%	82.7%	72.9%	63.6%	50.7%	45.0%	38.9%	37.4%	69.0%	67.8%	66.7%
Economic Value of Canal for Potential Transits ($000s)	339,762	339,762	339,762	339,762	339,762	339,762	339,762	339,762	339,762	339,762	339,762	339,762	339,762
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,554	4,602	4,887	11,387	28,499	47,283	78,888	94,678	112,936	117,826	36,536	39,160	41,438
Forecast Panama Canal Toll Revenues ($000S)	101,386	108,706	113,674	135,008	143,336	146,925	134,304	134,524	125,006	125,243	154,540	152,630	150,890
Average Toll Revenue per Forecasted Transit ($000)	54	58	61	75	89	100	112	124	126	131	100	100	100
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.39	3.88	4.38	4.71	4.91	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

▭ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-7. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2006

Canal Scenario and Item	Panama Canal Toll Pricing Option												
	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,098	2,098	2,098	2,098	2,098	2,098	2,098	2,098	2,098	2,098	2,098	2,098	2,098
Potential Panama Canal Cargo (ton 000s)	67,802	67,802	67,802	67,802	67,802	67,802	67,802	67,802	67,802	67,802	67,802	67,802	67,802
Forecast Panama Canal Transits (no.)	1,860	1,839	1,834	1,764	1,593	1,440	1,179	1,063	966	931	1,522	1,497	1,482
Percent of Potential Transits	88.6%	87.6%	87.4%	84.1%	75.9%	68.6%	56.2%	50.6%	46.1%	44.4%	72.6%	71.3%	70.6%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	59,788	59,192	59,037	55,955	49,328	42,965	34,142	30,246	26,139	25,068	46,637	45,859	45,115
Percent of Potential Cargo	88.2%	87.3%	87.1%	82.5%	72.8%	63.4%	50.4%	44.6%	38.6%	37.0%	68.8%	67.6%	66.5%
Economic Value of Canal for Potential Transits ($000s)	335,139	335,139	335,139	335,139	335,139	335,139	335,139	335,139	335,139	335,139	335,139	335,139	335,139
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,648	4,706	5,002	11,527	28,602	47,387	78,951	94,880	112,960	118,110	36,663	39,223	41,498
Forecast Panama Canal Toll Revenues ($000S)	100,608	107,850	112,761	133,847	142,000	145,392	132,617	132,466	123,013	122,911	152,957	151,109	149,374
Average Toll Revenue per Forecasted Transit ($000)	54	59	61	76	89	101	112	125	127	132	100	101	101
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.71	4.90	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-8. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2007

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002- June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
<u>Existing Canal</u>													
Potential Panama Canal Transits (no.)	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104	2,104
Potential Panama Canal Cargo (ton 000s)	68,417	68,417	68,417	68,417	68,417	68,417	68,417	68,417	68,417	68,417	68,417	68,417	68,417
Forecast Panama Canal Transits (no.)	1,866	1,845	1,839	1,781	1,601	1,445	1,235	1,084	1,025	950	1,526	1,502	1,487
Percent of Potential Transits	88.7%	87.7%	87.4%	84.6%	76.1%	68.7%	58.7%	51.5%	48.7%	45.1%	72.5%	71.4%	70.7%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	60,281	59,672	59,507	56,797	49,800	43,345	36,261	30,874	29,256	25,849	47,009	46,261	45,513
Percent of Potential Cargo	88.1%	87.2%	87.0%	83.0%	72.8%	63.4%	53.0%	45.1%	42.8%	37.8%	68.7%	67.6%	66.5%
Economic Value of Canal for Potential Transits ($000s)	338,238	338,238	338,238	338,238	338,238	338,238	338,238	338,238	338,238	338,238	338,238	338,238	338,238
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,774	4,859	5,175	10,737	28,768	47,897	72,903	94,247	101,786	116,603	37,168	39,642	41,937
Forecast Panama Canal Toll Revenues ($000S)	101,452	108,734	113,662	135,941	143,374	146,677	140,715	135,338	136,532	126,856	154,216	152,453	150,700
Average Toll Revenue per Forecasted Transit ($000)	54	59	62	76	90	102	114	125	133	134	101	102	101
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.91	3.28	3.30	3.31
<u>Expanded Canal</u>													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-9. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2008

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116
Potential Panama Canal Cargo (ton 000s)	69,252	69,252	69,252	69,252	69,252	69,252	69,252	69,252	69,252	69,252	69,252	69,252	69,252
Forecast Panama Canal Transits (no.)	1,874	1,852	1,846	1,786	1,606	1,454	1,242	1,088	1,031	955	1,532	1,509	1,496
Percent of Potential Transits	88.5%	87.5%	87.2%	84.4%	75.9%	68.7%	58.7%	51.4%	48.7%	45.1%	72.4%	71.3%	70.7%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	60,914	60,287	60,111	57,311	50,293	43,917	36,701	31,189	29,634	26,211	47,487	46,769	46,105
Percent of Potential Cargo	88.0%	87.1%	86.8%	82.8%	72.6%	63.4%	53.0%	45.0%	42.8%	37.8%	68.6%	67.5%	66.6%
Economic Value of Canal for Potential Transits ($000s)	342,184	342,184	342,184	342,184	342,184	342,184	342,184	342,184	342,184	342,184	342,184	342,184	342,184
Economic Value of Traffic Diverted Due to Tolls ($000s)	3,917	5,040	5,380	11,152	29,301	48,240	73,757	95,668	102,959	117,915	37,785	40,169	42,203
Forecast Panama Canal Toll Revenues ($000S)	102,532	109,865	114,818	137,179	144,794	148,605	142,442	136,752	138,312	128,630	155,833	154,160	152,672
Average Toll Revenue per Forecasted Transit ($000)	55	59	62	77	90	102	115	126	134	135	102	102	102
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.91	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-10. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing Canal, Most Probable Case 2009

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131	2,131
Potential Panama Canal Cargo (ton 000s)	70,316	70,316	70,316	70,316	70,316	70,316	70,316	70,316	70,316	70,316	70,316	70,316	70,316
Forecast Panama Canal Transits (no.)	1,882	1,860	1,854	1,792	1,612	1,461	1,247	1,097	1,035	961	1,540	1,517	1,504
Percent of Potential Transits	88.3%	87.3%	87.0%	84.1%	75.6%	68.6%	58.5%	51.4%	48.5%	45.1%	72.2%	71.2%	70.6%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	61,674	61,050	60,861	57,968	50,902	44,595	37,225	31,774	30,011	26,692	48,171	47,476	46,804
Percent of Potential Cargo	87.7%	86.8%	86.6%	82.4%	72.4%	63.4%	52.9%	45.2%	42.7%	38.0%	68.5%	67.5%	66.6%
Economic Value of Canal for Potential Transits ($000s)	346,435	346,435	346,435	346,435	346,435	346,435	346,435	346,435	346,435	346,435	346,435	346,435	346,435
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,126	5,249	5,616	11,601	29,920	48,719	74,778	96,442	104,639	119,179	38,218	40,540	42,606
Forecast Panama Canal Toll Revenues ($000S)	103,837	111,274	116,261	138,765	146,558	150,862	144,489	139,312	140,102	130,966	158,115	156,500	154,979
Average Toll Revenue per Forecasted Transit ($000)	55	60	63	77	91	103	116	127	135	136	103	103	103
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.91	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)													
Potential Panama Canal Cargo (ton 000s)													
Forecast Panama Canal Transits (no.)													
Percent of Potential Transits													
Forecast Panama Canal Cargo (ton 000s)													
Percent of Potential Cargo													
Economic Value of Canal for Potential Transits ($000s)													
Economic Value of Traffic Diverted Due to Tolls ($000s)													
Forecast Panama Canal Toll Revenues ($000s)													
Average Toll Revenue per Forecasted Transit ($000)													
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)													

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-11. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2010

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173
Potential Panama Canal Cargo (ton 000s)	72,015	72,015	72,015	72,015	72,015	72,015	72,015	72,015	72,015	72,015	72,015	72,015	72,015
Forecast Panama Canal Transits (no.)	1,905	1,884	1,877	1,812	1,630	1,485	1,271	1,114	1,051	978	1,562	1,549	1,528
Percent of Potential Transits	87.7%	86.7%	86.3%	83.4%	75.0%	68.3%	58.5%	51.3%	48.4%	45.0%	71.9%	71.3%	70.3%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,747	62,134	61,927	58,918	51,760	45,504	38,148	32,466	30,662	27,400	49,074	48,638	47,740
Percent of Potential Cargo	87.1%	86.3%	86.0%	81.8%	71.9%	63.2%	53.0%	45.1%	42.6%	38.0%	68.1%	67.5%	66.3%
Economic Value of Canal for Potential Transits ($000s)	353,360	353,360	353,360	353,360	353,360	353,360	353,360	353,360	353,360	353,360	353,360	353,360	353,360
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,451	5,561	5,963	12,212	30,824	49,458	75,493	98,154	106,570	120,915	38,956	40,441	43,248
Forecast Panama Canal Toll Revenues ($000S)	105,670	113,271	118,312	141,060	149,044	154,001	148,135	142,395	143,191	134,442	161,221	160,442	158,186
Average Toll Revenue per Forecasted Transit ($000)	55	60	63	78	91	104	117	128	136	137	103	104	104
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.39	4.67	4.91	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173	2,173
Potential Panama Canal Cargo (ton 000s)	75,685	75,685	75,685	75,685	75,685	75,685	75,685	75,685	75,685	75,685	75,685	75,685	75,685
Forecast Panama Canal Transits (no.)	1,905	1,865	1,858	1,793	1,630	1,485	1,271	1,129	1,051	978	1,570	1,558	1,536
Percent of Potential Transits	87.7%	85.8%	85.5%	82.5%	75.0%	68.3%	58.5%	52.0%	48.4%	45.0%	72.3%	71.7%	70.7%
Forecast Panama Canal Cargo (ton 000s)	65,827	64,140	63,933	60,564	54,216	47,440	39,883	34,846	32,182	28,523	51,805	51,369	50,371
Percent of Potential Cargo	87.0%	84.7%	84.5%	80.0%	71.6%	62.7%	52.7%	46.0%	42.5%	37.7%	68.4%	67.9%	66.6%
Economic Value of Canal for Potential Transits ($000s)	355,099	355,099	355,099	355,099	355,099	355,099	355,099	355,099	355,099	355,099	355,099	355,099	355,099
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,542	7,259	7,661	13,966	30,351	49,142	75,344	95,087	106,607	121,021	37,278	38,763	41,602
Forecast Panama Canal Toll Revenues ($000s)	105,670	111,653	116,621	138,945	149,045	154,002	148,137	145,428	143,193	134,443	162,466	161,687	159,431
Average Toll Revenue per Forecasted Transit ($000)	55	60	63	77	91	104	117	129	136	137	103	104	104
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.61	1.74	1.82	2.29	2.75	3.25	3.71	4.17	4.45	4.71	3.14	3.15	3.17

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-12. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2011

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163
Potential Panama Canal Cargo (ton 000s)	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775	71,775
Forecast Panama Canal Transits (no.)	1,894	1,873	1,865	1,803	1,623	1,480	1,271	1,112	1,051	977	1,578	1,578	1,543
Percent of Potential Transits	87.6%	86.6%	86.2%	83.3%	75.0%	68.4%	58.8%	51.4%	48.6%	45.2%	72.9%	72.9%	71.3%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,433	61,818	61,602	58,681	51,624	45,481	38,249	32,458	30,687	27,414	50,016	50,016	48,670
Percent of Potential Cargo	87.0%	86.1%	85.8%	81.8%	71.9%	63.4%	53.3%	45.2%	42.8%	38.2%	69.7%	69.7%	67.8%
Economic Value of Canal for Potential Transits ($000s)	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793	352,793
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,491	5,608	6,030	12,132	30,535	48,916	74,540	97,693	105,973	120,436	35,633	35,633	39,984
Forecast Panama Canal Toll Revenues ($000S)	105,115	112,667	117,659	140,436	148,593	153,828	148,460	142,299	143,251	134,436	163,852	164,558	160,771
Average Toll Revenue per Forecasted Transit ($000)	55	60	63	78	92	104	117	128	136	138	104	104	104
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.90	3.28	3.29	3.30
Expanded Canal													
Potential Panama Canal Transits (no.)	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147
Potential Panama Canal Cargo (ton 000s)	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297	79,297
Forecast Panama Canal Transits (no.)	1,884	1,859	1,839	1,783	1,618	1,471	1,244	1,093	1,019	955	1,547	1,547	1,524
Percent of Potential Transits	87.7%	86.6%	85.7%	83.0%	75.4%	68.5%	58.0%	50.9%	47.5%	44.5%	72.1%	72.1%	71.0%
Forecast Panama Canal Cargo (ton 000s)	69,577	68,774	67,795	64,728	57,698	48,814	39,094	32,959	30,495	27,391	52,603	52,588	51,790
Percent of Potential Cargo	87.7%	86.7%	85.5%	81.6%	72.8%	61.6%	49.3%	41.6%	38.5%	34.5%	66.3%	66.3%	65.3%
Economic Value of Canal for Potential Transits ($000s)	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415	360,415
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,706	6,108	7,665	13,426	29,280	45,235	77,347	100,526	111,329	123,671	34,937	34,976	37,589
Forecast Panama Canal Toll Revenues ($000s)	110,124	117,731	121,713	145,929	156,034	157,125	145,406	138,705	136,808	129,956	164,101	164,749	162,711
Average Toll Revenue per Forecasted Transit ($000)	58	63	66	82	96	107	117	127	134	136	106	106	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.80	2.25	2.70	3.22	3.72	4.21	4.49	4.74	3.12	3.13	3.14

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-13. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2012

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164	2,164
Potential Panama Canal Cargo (ton 000s)	71,883	71,883	71,883	71,883	71,883	71,883	71,883	71,883	71,883	71,883	71,883	71,883	71,883
Forecast Panama Canal Transits (no.)	1,891	1,875	1,862	1,800	1,623	1,482	1,285	1,121	1,054	981	1,584	1,584	1,549
Percent of Potential Transits	87.4%	86.7%	86.1%	83.2%	75.0%	68.5%	59.4%	51.8%	48.7%	45.3%	73.2%	73.2%	71.6%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,386	61,869	61,546	58,685	51,699	45,638	38,719	32,807	30,853	27,604	50,269	50,269	48,911
Percent of Potential Cargo	86.8%	86.1%	85.6%	81.6%	71.9%	63.5%	53.9%	45.6%	42.9%	38.4%	69.9%	69.9%	68.0%
Economic Value of Canal for Potential Transits ($000s)	354,292	354,292	354,292	354,292	354,292	354,292	354,292	354,292	354,292	354,292	354,292	354,292	354,292
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,544	5,450	6,105	12,118	30,392	48,613	73,068	96,713	105,810	120,218	34,954	34,954	39,362
Forecast Panama Canal Toll Revenues ($000S)	105,027	112,784	117,539	140,414	148,772	154,291	150,268	143,778	143,988	135,315	164,705	165,409	161,578
Average Toll Revenue per Forecasted Transit ($000)	56	60	63	78	92	104	117	128	137	138	104	104	104
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.90	3.28	3.29	3.30
Expanded Canal													
Potential Panama Canal Transits (no.)	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147	2,147
Potential Panama Canal Cargo (ton 000s)	79,517	79,517	79,517	79,517	79,517	79,517	79,517	79,517	79,517	79,517	79,517	79,517	79,517
Forecast Panama Canal Transits (no.)	1,880	1,861	1,835	1,779	1,616	1,473	1,257	1,100	1,021	959	1,552	1,551	1,530
Percent of Potential Transits	87.6%	86.7%	85.5%	82.9%	75.3%	68.6%	58.6%	51.2%	47.6%	44.7%	72.3%	72.3%	71.3%
Forecast Panama Canal Cargo (ton 000s)	69,618	68,926	67,804	64,794	57,706	49,040	39,549	33,262	30,620	27,612	52,773	52,756	52,074
Percent of Potential Cargo	87.6%	86.7%	85.3%	81.5%	72.6%	61.7%	49.7%	41.8%	38.5%	34.7%	66.4%	66.3%	65.5%
Economic Value of Canal for Potential Transits ($000s)	361,987	361,987	361,987	361,987	361,987	361,987	361,987	361,987	361,987	361,987	361,987	361,987	361,987
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,788	5,958	7,808	13,499	29,187	44,678	75,875	99,645	111,256	123,255	34,402	34,445	36,756
Forecast Panama Canal Toll Revenues ($000s)	110,161	118,004	121,696	146,007	156,062	157,750	147,134	139,993	137,357	130,920	164,738	165,380	163,647
Average Toll Revenue per Forecasted Transit ($000)	59	63	66	82	97	107	117	127	134	136	106	107	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.79	2.25	2.70	3.22	3.72	4.21	4.49	4.74	3.12	3.13	3.14

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-14. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2013

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168	2,168
Potential Panama Canal Cargo (ton 000s)	72,112	72,112	72,112	72,112	72,112	72,112	72,112	72,112	72,112	72,112	72,112	72,112	72,112
Forecast Panama Canal Transits (no.)	1,891	1,875	1,861	1,801	1,624	1,500	1,292	1,127	1,061	986	1,600	1,600	1,565
Percent of Potential Transits	87.2%	86.5%	85.9%	83.1%	74.9%	69.2%	59.6%	52.0%	49.0%	45.5%	73.8%	73.8%	72.2%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,445	61,932	61,596	58,808	51,843	46,474	38,982	33,023	31,111	27,827	51,011	51,011	49,641
Percent of Potential Cargo	86.6%	85.9%	85.4%	81.6%	71.9%	64.4%	54.1%	45.8%	43.1%	38.6%	70.7%	70.7%	68.8%
Economic Value of Canal for Potential Transits ($000s)	356,403	356,403	356,403	356,403	356,403	356,403	356,403	356,403	356,403	356,403	356,403	356,403	356,403
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,606	5,510	6,193	12,083	30,350	46,480	72,774	96,669	105,602	120,240	33,036	33,036	37,505
Forecast Panama Canal Toll Revenues ($000S)	105,121	112,891	117,623	140,676	149,158	156,922	151,257	144,709	145,171	136,364	167,130	167,832	163,951
Average Toll Revenue per Forecasted Transit ($000)	56	60	63	78	92	105	117	128	137	138	104	105	105
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.90	3.28	3.29	3.30
Expanded Canal													
Potential Panama Canal Transits (no.)	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150	2,150
Potential Panama Canal Cargo (ton 000s)	79,881	79,881	79,881	79,881	79,881	79,881	79,881	79,881	79,881	79,881	79,881	79,881	79,881
Forecast Panama Canal Transits (no.)	1,879	1,861	1,833	1,779	1,617	1,487	1,262	1,109	1,027	964	1,563	1,563	1,541
Percent of Potential Transits	87.4%	86.5%	85.3%	82.7%	75.2%	69.2%	58.7%	51.6%	47.8%	44.8%	72.7%	72.7%	71.7%
Forecast Panama Canal Cargo (ton 000s)	69,784	69,108	67,938	64,998	57,812	49,754	39,793	33,749	30,835	27,832	53,359	53,341	52,645
Percent of Potential Cargo	87.4%	86.5%	85.0%	81.4%	72.4%	62.3%	49.8%	42.2%	38.6%	34.8%	66.8%	66.8%	65.9%
Economic Value of Canal for Potential Transits ($000s)	364,181	364,181	364,181	364,181	364,181	364,181	364,181	364,181	364,181	364,181	364,181	364,181	364,181
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,884	6,033	7,967	13,554	29,124	42,993	75,577	98,581	111,139	123,206	33,005	33,052	35,419
Forecast Panama Canal Toll Revenues ($000s)	110,401	118,285	121,907	146,399	156,359	159,827	148,036	141,835	138,337	131,910	166,557	167,193	165,408
Average Toll Revenue per Forecasted Transit ($000)	59	64	66	82	97	107	117	128	135	137	107	107	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.79	2.25	2.70	3.21	3.72	4.20	4.49	4.74	3.12	3.13	3.14

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option ⬚ Alternative Canal toll pricing option

Table D-15. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2014

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175	2,175
Potential Panama Canal Cargo (ton 000s)	72,460	72,460	72,460	72,460	72,460	72,460	72,460	72,460	72,460	72,460	72,460	72,460	72,460
Forecast Panama Canal Transits (no.)	1,894	1,878	1,864	1,804	1,628	1,505	1,331	1,143	1,083	993	1,603	1,603	1,568
Percent of Potential Transits	87.1%	86.3%	85.7%	82.9%	74.9%	69.2%	61.2%	52.5%	49.8%	45.7%	73.7%	73.7%	72.1%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,608	62,099	61,749	58,997	52,056	46,741	39,993	33,693	31,906	28,087	51,194	51,194	49,810
Percent of Potential Cargo	86.4%	85.7%	85.2%	81.4%	71.8%	64.5%	55.2%	46.5%	44.0%	38.8%	70.7%	70.7%	68.7%
Economic Value of Canal for Potential Transits ($000s)	359,091	359,091	359,091	359,091	359,091	359,091	359,091	359,091	359,091	359,091	359,091	359,091	359,091
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,679	5,578	6,292	12,141	30,399	46,453	69,789	95,084	103,131	120,469	33,192	33,192	37,731
Forecast Panama Canal Toll Revenues ($000S)	105,390	113,190	117,905	141,103	149,748	157,766	155,278	147,548	148,997	137,598	167,796	168,496	164,560
Average Toll Revenue per Forecasted Transit ($000)	56	60	63	78	92	105	117	129	138	139	105	105	105
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.88	4.38	4.67	4.90	3.28	3.29	3.30
Expanded Canal													
Potential Panama Canal Transits (no.)	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157	2,157
Potential Panama Canal Cargo (ton 000s)	80,389	80,389	80,389	80,389	80,389	80,389	80,389	80,389	80,389	80,389	80,389	80,389	80,389
Forecast Panama Canal Transits (no.)	1,881	1,866	1,835	1,782	1,618	1,490	1,301	1,118	1,048	970	1,563	1,563	1,541
Percent of Potential Transits	87.2%	86.5%	85.1%	82.6%	75.0%	69.1%	60.3%	51.8%	48.6%	45.0%	72.5%	72.5%	71.4%
Forecast Panama Canal Cargo (ton 000s)	70,074	69,565	68,198	65,376	57,948	49,937	40,800	34,064	31,598	28,088	53,421	53,401	52,691
Percent of Potential Cargo	87.2%	86.5%	84.8%	81.3%	72.1%	62.1%	50.8%	42.4%	39.3%	34.9%	66.5%	66.4%	65.5%
Economic Value of Canal for Potential Transits ($000s)	366,964	366,964	366,964	366,964	366,964	366,964	366,964	366,964	366,964	366,964	366,964	366,964	366,964
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,997	5,894	8,141	13,538	29,242	43,121	72,521	98,314	108,679	123,350	33,404	33,454	35,881
Forecast Panama Canal Toll Revenues ($000s)	110,839	119,011	122,344	147,158	156,762	160,403	152,021	143,234	142,022	133,078	166,891	167,520	165,678
Average Toll Revenue per Forecasted Transit ($000)	59	64	67	83	97	108	117	128	136	137	107	107	108
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.79	2.25	2.71	3.21	3.73	4.20	4.49	4.74	3.12	3.14	3.14

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-16. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2015

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200
Potential Panama Canal Cargo (ton 000s)	73,320	73,320	73,320	73,320	73,320	73,320	73,320	73,320	73,320	73,320	73,320	73,320	73,320
Forecast Panama Canal Transits (no.)	1,913	1,899	1,884	1,823	1,648	1,547	1,353	1,165	1,098	1,009	1,629	1,629	1,607
Percent of Potential Transits	87.0%	86.3%	85.6%	82.9%	74.9%	70.3%	61.5%	53.0%	49.9%	45.9%	74.0%	74.0%	73.0%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	63,250	62,758	62,387	59,635	52,687	48,362	40,660	34,338	32,406	28,622	52,054	52,054	51,335
Percent of Potential Cargo	86.3%	85.6%	85.1%	81.3%	71.9%	66.0%	55.5%	46.8%	44.2%	39.0%	71.0%	71.0%	70.0%
Economic Value of Canal for Potential Transits ($000s)	365,352	365,352	365,352	365,352	365,352	365,352	365,352	365,352	365,352	365,352	365,352	365,352	365,352
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,778	5,648	6,408	12,293	30,628	43,533	70,038	95,479	104,284	121,528	32,591	32,591	35,063
Forecast Panama Canal Toll Revenues ($000S)	106,524	114,449	119,180	142,685	151,636	163,184	157,950	150,477	151,351	140,214	170,909	171,605	169,744
Average Toll Revenue per Forecasted Transit ($000)	56	60	63	78	92	105	117	129	138	139	105	105	106
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.37	3.88	4.38	4.67	4.90	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180	2,180
Potential Panama Canal Cargo (ton 000s)	81,438	81,438	81,438	81,438	81,438	81,438	81,438	81,438	81,438	81,438	81,438	81,438	81,438
Forecast Panama Canal Transits (no.)	1,900	1,885	1,853	1,813	1,635	1,518	1,321	1,138	1,061	984	1,589	1,589	1,567
Percent of Potential Transits	87.1%	86.4%	85.0%	83.1%	75.0%	69.6%	60.6%	52.2%	48.6%	45.1%	72.9%	72.9%	71.9%
Forecast Panama Canal Cargo (ton 000s)	70,871	70,379	68,972	66,948	58,507	51,034	41,444	34,645	32,051	28,618	54,398	54,377	53,654
Percent of Potential Cargo	87.0%	86.4%	84.7%	82.2%	71.8%	62.7%	50.9%	42.5%	39.4%	35.1%	66.8%	66.8%	65.9%
Economic Value of Canal for Potential Transits ($000s)	373,286	373,286	373,286	373,286	373,286	373,286	373,286	373,286	373,286	373,286	373,286	373,286	373,286
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,138	6,007	8,333	12,224	29,517	41,818	72,746	98,833	109,894	124,302	32,378	32,432	34,916
Forecast Panama Canal Toll Revenues ($000s)	112,147	120,455	123,780	150,472	158,437	164,040	154,549	145,851	144,115	135,579	170,287	170,907	169,008
Average Toll Revenue per Forecasted Transit ($000)	59	64	67	83	97	108	117	128	136	138	107	108	108
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.79	2.25	2.71	3.21	3.73	4.21	4.50	4.74	3.13	3.14	3.15

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-17. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2016

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158	2,158
Potential Panama Canal Cargo (ton 000s)	72,567	72,567	72,567	72,567	72,567	72,567	72,567	72,567	72,567	72,567	72,567	72,567	72,567
Forecast Panama Canal Transits (no.)	1,869	1,856	1,841	1,779	1,601	1,501	1,308	1,125	1,058	980	1,581	1,581	1,560
Percent of Potential Transits	86.6%	86.0%	85.3%	82.4%	74.2%	69.5%	60.6%	52.1%	49.0%	45.4%	73.3%	73.3%	72.3%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,408	61,948	61,572	58,772	51,706	47,397	39,717	33,696	31,622	28,149	51,050	51,050	50,325
Percent of Potential Cargo	86.0%	85.4%	84.8%	81.0%	71.3%	65.3%	54.7%	46.4%	43.6%	38.8%	70.3%	70.3%	69.4%
Economic Value of Canal for Potential Transits ($000s)	359,802	359,802	359,802	359,802	359,802	359,802	359,802	359,802	359,802	359,802	359,802	359,802	359,802
Economic Value of Traffic Diverted Due to Tolls ($000s)	4,896	5,709	6,484	12,500	31,220	44,139	70,657	94,978	104,306	120,173	33,262	33,262	35,766
Forecast Panama Canal Toll Revenues ($000S)	105,137	113,000	117,640	140,645	148,852	159,973	154,363	147,646	147,760	137,889	167,613	168,303	166,410
Average Toll Revenue per Forecasted Transit ($000)	56	61	64	79	93	107	118	131	140	141	106	106	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.89	4.38	4.67	4.90	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,134	2,134	2,134	2,134	2,134	2,134	2,134	2,134	2,134	2,134	2,134	2,134	2,134
Potential Panama Canal Cargo (ton 000s)	80,351	80,351	80,351	80,351	80,351	80,351	80,351	80,351	80,351	80,351	80,351	80,351	80,351
Forecast Panama Canal Transits (no.)	1,850	1,837	1,805	1,766	1,586	1,470	1,274	1,089	1,019	990	1,539	1,539	1,517
Percent of Potential Transits	86.7%	86.1%	84.6%	82.8%	74.3%	68.9%	59.7%	51.0%	47.7%	46.4%	72.1%	72.1%	71.1%
Forecast Panama Canal Cargo (ton 000s)	69,660	69,201	67,766	65,838	57,431	50,025	40,478	33,587	31,215	30,266	53,303	53,281	52,553
Percent of Potential Cargo	86.7%	86.1%	84.3%	81.9%	71.5%	62.3%	50.4%	41.8%	38.8%	37.7%	66.3%	66.3%	65.4%
Economic Value of Canal for Potential Transits ($000s)	366,896	366,896	366,896	366,896	366,896	366,896	366,896	366,896	366,896	366,896	366,896	366,896	366,896
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,304	6,116	8,496	12,218	30,177	42,429	73,329	99,852	109,978	114,555	33,174	33,230	35,745
Forecast Panama Canal Toll Revenues ($000s)	110,273	118,481	121,657	147,989	155,435	160,697	150,868	141,358	140,313	141,441	166,757	167,366	165,436
Average Toll Revenue per Forecasted Transit ($000)	60	64	67	84	98	109	118	130	138	143	108	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.80	2.25	2.71	3.21	3.73	4.21	4.50	4.67	3.13	3.14	3.15

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-18. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2017

Canal Scenario and Item	Panama Canal Toll Pricing Option												
	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161	2,161
Potential Panama Canal Cargo (ton 000s)	72,920	72,920	72,920	72,920	72,920	72,920	72,920	72,920	72,920	72,920	72,920	72,920	72,920
Forecast Panama Canal Transits (no.)	1,868	1,855	1,839	1,776	1,595	1,495	1,316	1,129	1,050	1,022	1,575	1,575	1,553
Percent of Potential Transits	86.4%	85.8%	85.1%	82.2%	73.8%	69.2%	60.9%	52.2%	48.6%	47.3%	72.9%	72.9%	71.9%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,607	62,161	61,773	58,905	51,717	47,398	40,180	34,106	31,509	30,603	51,034	51,034	50,301
Percent of Potential Cargo	85.9%	85.2%	84.7%	80.8%	70.9%	65.0%	55.1%	46.8%	43.2%	42.0%	70.0%	70.0%	69.0%
Economic Value of Canal for Potential Transits ($000s)	361,130	361,130	361,130	361,130	361,130	361,130	361,130	361,130	361,130	361,130	361,130	361,130	361,130
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,098	5,888	6,691	12,883	31,996	45,003	69,685	94,327	105,836	110,250	34,133	34,133	36,676
Forecast Panama Canal Toll Revenues ($000S)	105,488	113,402	118,033	140,970	148,900	159,989	156,301	149,328	147,274	148,876	167,607	168,290	166,358
Average Toll Revenue per Forecasted Transit ($000)	56	61	64	79	93	107	119	132	140	146	106	107	107
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.68	1.82	1.91	2.39	2.88	3.38	3.89	4.38	4.67	4.86	3.28	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,132	2,132	2,132	2,132	2,132	2,132	2,132	2,132	2,132	2,132	2,132	2,132	2,132
Potential Panama Canal Cargo (ton 000s)	80,423	80,423	80,423	80,423	80,423	80,423	80,423	80,423	80,423	80,423	80,423	80,423	80,423
Forecast Panama Canal Transits (no.)	1,845	1,831	1,798	1,758	1,581	1,462	1,283	1,085	1,009	980	1,531	1,529	1,507
Percent of Potential Transits	86.5%	85.9%	84.4%	82.5%	74.2%	68.6%	60.2%	50.9%	47.3%	46.0%	71.8%	71.7%	70.7%
Forecast Panama Canal Cargo (ton 000s)	69,583	69,097	67,628	65,638	57,650	49,981	41,027	33,684	31,051	30,086	53,297	53,169	52,434
Percent of Potential Cargo	86.5%	85.9%	84.1%	81.6%	71.7%	62.1%	51.0%	41.9%	38.6%	37.4%	66.3%	66.1%	65.2%
Economic Value of Canal for Potential Transits ($000s)	367,434	367,434	367,434	367,434	367,434	367,434	367,434	367,434	367,434	367,434	367,434	367,434	367,434
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,498	6,345	8,794	12,657	30,297	43,287	71,923	100,403	111,546	116,219	33,898	34,229	36,781
Forecast Panama Canal Toll Revenues ($000s)	110,247	118,414	121,523	147,677	155,963	160,562	153,078	141,671	139,608	140,626	166,758	167,084	165,116
Average Toll Revenue per Forecasted Transit ($000)	60	65	68	84	99	110	119	131	138	144	109	109	110
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.58	1.71	1.80	2.25	2.71	3.21	3.73	4.21	4.50	4.67	3.13	3.14	3.15

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

☐ Alternative Canal toll pricing option

Table D-19. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2018

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,171	2,171	2,171	2,171	2,171	2,171	2,171	2,171	2,171	2,171	2,171	2,171	2,171
Potential Panama Canal Cargo (ton 000s)	73,477	73,477	73,477	73,477	73,477	73,477	73,477	73,477	73,477	73,477	73,477	73,477	73,477
Forecast Panama Canal Transits (no.)	1,872	1,860	1,853	1,779	1,596	1,494	1,314	1,133	1,047	1,019	1,573	1,573	1,551
Percent of Potential Transits	86.2%	85.7%	85.3%	81.9%	73.5%	68.8%	60.5%	52.2%	48.2%	46.9%	72.5%	72.5%	71.5%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	62,963	62,541	62,397	59,193	51,932	47,539	40,251	34,281	31,534	30,618	51,161	51,161	50,418
Percent of Potential Cargo	85.7%	85.1%	84.9%	80.6%	70.7%	64.7%	54.8%	46.7%	42.9%	41.7%	69.6%	69.6%	68.6%
Economic Value of Canal for Potential Transits ($000s)	363,861	363,861	363,861	363,861	363,861	363,861	363,861	363,861	363,861	363,861	363,861	363,861	363,861
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,357	6,106	6,410	13,333	32,691	45,989	71,006	95,263	107,505	111,990	35,110	35,110	37,704
Forecast Panama Canal Toll Revenues ($000S)	106,112	114,119	119,280	141,678	149,558	160,486	156,613	150,169	147,445	148,997	168,099	168,774	166,791
Average Toll Revenue per Forecasted Transit ($000)	57	61	64	80	94	107	119	133	141	146	107	107	108
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.82	1.91	2.39	2.88	3.38	3.89	4.38	4.68	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,137	2,137	2,137	2,137	2,137	2,137	2,137	2,137	2,137	2,137	2,137	2,137	2,137
Potential Panama Canal Cargo (ton 000s)	80,743	80,743	80,743	80,743	80,743	80,743	80,743	80,743	80,743	80,743	80,743	80,743	80,743
Forecast Panama Canal Transits (no.)	1,844	1,831	1,806	1,756	1,580	1,460	1,279	1,087	1,004	975	1,526	1,524	1,502
Percent of Potential Transits	86.3%	85.7%	84.5%	82.2%	73.9%	68.3%	59.9%	50.8%	47.0%	45.6%	71.4%	71.3%	70.3%
Forecast Panama Canal Cargo (ton 000s)	69,666	69,201	67,953	65,636	57,806	50,075	41,087	33,786	31,033	30,040	53,339	53,197	52,452
Percent of Potential Cargo	86.3%	85.7%	84.2%	81.3%	71.6%	62.0%	50.9%	41.8%	38.4%	37.2%	66.1%	65.9%	65.0%
Economic Value of Canal for Potential Transits ($000s)	369,422	369,422	369,422	369,422	369,422	369,422	369,422	369,422	369,422	369,422	369,422	369,422	369,422
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,809	6,618	8,613	13,165	30,964	44,266	73,137	101,457	113,210	118,022	34,974	35,345	37,944
Forecast Panama Canal Toll Revenues ($000s)	110,488	118,713	122,297	147,819	156,464	160,900	153,323	142,217	139,588	140,479	167,002	167,281	165,263
Average Toll Revenue per Forecasted Transit ($000)	60	65	68	84	99	110	120	131	139	144	109	110	110
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.72	1.80	2.25	2.71	3.21	3.73	4.21	4.50	4.68	3.13	3.14	3.15

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-20. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2019

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,186	2,186	2,186	2,186	2,186	2,186	2,186	2,186	2,186	2,186	2,186	2,186	2,186
Potential Panama Canal Cargo (ton 000s)	74,203	74,203	74,203	74,203	74,203	74,203	74,203	74,203	74,203	74,203	74,203	74,203	74,203
Forecast Panama Canal Transits (no.)	1,879	1,869	1,862	1,808	1,599	1,496	1,314	1,139	1,048	1,020	1,574	1,574	1,552
Percent of Potential Transits	85.9%	85.5%	85.2%	82.7%	73.2%	68.4%	60.1%	52.1%	47.9%	46.6%	72.0%	72.0%	71.0%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	63,425	63,048	62,904	60,789	52,204	47,734	40,370	34,551	31,653	30,726	51,348	51,348	50,589
Percent of Potential Cargo	85.5%	85.0%	84.8%	81.9%	70.4%	64.3%	54.4%	46.6%	42.7%	41.4%	69.2%	69.2%	68.2%
Economic Value of Canal for Potential Transits ($000s)	367,662	367,662	367,662	367,662	367,662	367,662	367,662	367,662	367,662	367,662	367,662	367,662	367,662
Economic Value of Traffic Diverted Due to Tolls ($000s)	5,697	6,366	6,672	11,175	33,632	47,255	72,632	96,362	109,299	113,857	36,352	36,352	39,011
Forecast Panama Canal Toll Revenues ($000S)	106,929	115,083	120,286	145,356	150,397	161,185	157,133	151,407	148,085	149,608	168,808	169,475	167,426
Average Toll Revenue per Forecasted Transit ($000)	57	62	65	80	94	108	120	133	141	147	107	108	108
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.89	4.38	4.68	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,148	2,148	2,148	2,148	2,148	2,148	2,148	2,148	2,148	2,148	2,148	2,148	2,148
Potential Panama Canal Cargo (ton 000s)	81,268	81,268	81,268	81,268	81,268	81,268	81,268	81,268	81,268	81,268	81,268	81,268	81,268
Forecast Panama Canal Transits (no.)	1,847	1,836	1,812	1,757	1,581	1,458	1,277	1,092	1,003	973	1,524	1,521	1,499
Percent of Potential Transits	86.0%	85.5%	84.4%	81.8%	73.6%	67.9%	59.5%	50.8%	46.7%	45.3%	70.9%	70.8%	69.8%
Forecast Panama Canal Cargo (ton 000s)	69,901	69,461	68,359	65,776	58,075	50,216	41,192	34,057	31,091	30,079	53,426	53,266	52,507
Percent of Potential Cargo	86.0%	85.5%	84.1%	80.9%	71.5%	61.8%	50.7%	41.9%	38.3%	37.0%	65.7%	65.5%	64.6%
Economic Value of Canal for Potential Transits ($000s)	372,493	372,493	372,493	372,493	372,493	372,493	372,493	372,493	372,493	372,493	372,493	372,493	372,493
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,189	6,945	8,708	13,760	31,739	45,532	74,646	102,403	115,052	119,968	36,345	36,762	39,423
Forecast Panama Canal Toll Revenues ($000s)	110,983	119,301	123,148	148,302	157,279	161,422	153,768	143,414	139,967	140,786	167,427	167,651	165,568
Average Toll Revenue per Forecasted Transit ($000)	60	65	68	84	99	111	120	131	140	145	110	110	110
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.72	1.80	2.25	2.71	3.21	3.73	4.21	4.50	4.68	3.13	3.15	3.15

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-21. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2020

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,219	2,219	2,219	2,219	2,219	2,219	2,219	2,219	2,219	2,219	2,219	2,219	2,219
Potential Panama Canal Cargo (ton 000s)	75,401	75,401	75,401	75,401	75,401	75,401	75,401	75,401	75,401	75,401	75,401	75,401	75,401
Forecast Panama Canal Transits (no.)	1,892	1,883	1,877	1,820	1,688	1,500	1,317	1,147	1,055	1,028	1,579	1,579	1,557
Percent of Potential Transits	85.3%	84.9%	84.6%	82.1%	76.1%	67.6%	59.4%	51.7%	47.5%	46.3%	71.2%	71.2%	70.2%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	64,096	63,755	63,636	61,415	55,651	48,078	40,634	34,981	31,990	31,108	51,721	51,721	50,932
Percent of Potential Cargo	85.0%	84.6%	84.4%	81.5%	73.8%	63.8%	53.9%	46.4%	42.4%	41.3%	68.6%	68.6%	67.5%
Economic Value of Canal for Potential Transits ($000s)	372,784	372,784	372,784	372,784	372,784	372,784	372,784	372,784	372,784	372,784	372,784	372,784	372,784
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,076	6,682	6,940	11,680	26,111	48,767	74,515	97,665	111,023	115,393	37,714	37,714	40,495
Forecast Panama Canal Toll Revenues ($000S)	108,104	116,416	121,725	146,898	160,338	162,383	158,218	153,332	149,743	151,532	170,134	170,796	168,629
Average Toll Revenue per Forecasted Transit ($000)	57	62	65	81	95	108	120	134	142	147	108	108	108
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.89	4.38	4.68	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,206	2,206	2,206	2,206	2,206	2,206	2,206	2,206	2,206	2,206	2,206	2,206	2,206
Potential Panama Canal Cargo (ton 000s)	86,962	86,962	86,962	86,962	86,962	86,962	86,962	86,962	86,962	86,962	86,962	86,962	86,962
Forecast Panama Canal Transits (no.)	1,855	1,844	1,822	1,758	1,643	1,448	1,273	1,095	1,008	979	1,513	1,510	1,487
Percent of Potential Transits	84.1%	83.6%	82.6%	79.7%	74.5%	65.6%	57.7%	49.6%	45.7%	44.4%	68.6%	68.5%	67.4%
Forecast Panama Canal Cargo (ton 000s)	70,441	69,871	68,800	65,345	58,061	48,602	40,607	34,279	31,361	30,382	51,789	51,610	50,821
Percent of Potential Cargo	81.0%	80.3%	79.1%	75.1%	66.8%	55.9%	46.7%	39.4%	36.1%	34.9%	59.6%	59.3%	58.4%
Economic Value of Canal for Potential Transits ($000s)	377,882	377,882	377,882	377,882	377,882	377,882	377,882	377,882	377,882	377,882	377,882	377,882	377,882
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,440	7,352	9,061	14,036	27,331	49,912	75,873	101,281	113,782	118,568	40,718	41,186	43,966
Forecast Panama Canal Toll Revenues ($000s)	111,969	120,194	124,137	147,897	159,595	157,525	152,461	144,535	141,364	142,382	163,539	163,707	161,506
Average Toll Revenue per Forecasted Transit ($000)	60	65	68	84	97	109	120	132	140	145	108	108	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.72	1.80	2.26	2.75	3.24	3.75	4.22	4.51	4.69	3.16	3.17	3.18

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-22. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2021

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222	2,222
Potential Panama Canal Cargo (ton 000s)	75,509	75,509	75,509	75,509	75,509	75,509	75,509	75,509	75,509	75,509	75,509	75,509	75,509
Forecast Panama Canal Transits (no.)	1,896	1,887	1,881	1,823	1,690	1,500	1,315	1,146	1,062	1,029	1,580	1,580	1,556
Percent of Potential Transits	85.3%	84.9%	84.6%	82.0%	76.0%	67.5%	59.2%	51.5%	47.8%	46.3%	71.1%	71.1%	70.0%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	64,232	63,888	63,771	61,507	55,684	48,036	40,512	34,885	32,210	31,074	51,721	51,721	50,915
Percent of Potential Cargo	85.1%	84.6%	84.5%	81.5%	73.7%	63.6%	53.7%	46.2%	42.7%	41.2%	68.5%	68.5%	67.4%
Economic Value of Canal for Potential Transits ($000s)	375,303	375,303	375,303	375,303	375,303	375,303	375,303	375,303	375,303	375,303	375,303	375,303	375,303
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,138	6,752	7,006	11,862	26,496	49,465	75,588	98,729	110,585	116,213	38,234	38,234	41,085
Forecast Panama Canal Toll Revenues ($000S)	108,322	116,645	121,969	147,097	160,422	162,239	157,771	152,941	150,879	151,416	170,146	170,803	168,569
Average Toll Revenue per Forecasted Transit ($000)	57	62	65	81	95	108	120	134	142	147	108	108	108
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.89	4.38	4.68	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,262	2,262	2,262	2,262	2,262	2,262	2,262	2,262	2,262	2,262	2,262	2,262	2,262
Potential Panama Canal Cargo (ton 000s)	88,966	88,966	88,966	88,966	88,966	88,966	88,966	88,966	88,966	88,966	88,966	88,966	88,966
Forecast Panama Canal Transits (no.)	1,855	1,843	1,822	1,761	1,642	1,445	1,269	1,090	1,013	978	1,510	1,507	1,483
Percent of Potential Transits	82.0%	81.5%	80.6%	77.9%	72.6%	63.9%	56.1%	48.2%	44.8%	43.3%	66.8%	66.6%	65.6%
Forecast Panama Canal Cargo (ton 000s)	70,440	69,863	68,813	65,892	58,069	48,520	40,479	34,062	31,506	30,259	51,684	51,512	50,680
Percent of Potential Cargo	79.2%	78.5%	77.3%	74.1%	65.3%	54.5%	45.5%	38.3%	35.4%	34.0%	58.1%	57.9%	57.0%
Economic Value of Canal for Potential Transits ($000s)	379,965	379,965	379,965	379,965	379,965	379,965	379,965	379,965	379,965	379,965	379,965	379,965	379,965
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,578	7,503	9,184	14,336	27,648	50,606	76,821	102,639	113,463	119,566	41,413	41,865	44,785
Forecast Panama Canal Toll Revenues ($000s)	112,039	120,256	124,232	148,950	159,679	157,324	152,058	143,772	142,276	141,973	163,345	163,524	161,184
Average Toll Revenue per Forecasted Transit ($000)	60	65	68	85	97	109	120	132	140	145	108	108	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.72	1.81	2.26	2.75	3.24	3.76	4.22	4.52	4.69	3.16	3.17	3.18

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-23. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2022

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,225	2,225	2,225	2,225	2,225	2,225	2,225	2,225	2,225	2,225	2,225	2,225	2,225
Potential Panama Canal Cargo (ton 000s)	75,667	75,667	75,667	75,667	75,667	75,667	75,667	75,667	75,667	75,667	75,667	75,667	75,667
Forecast Panama Canal Transits (no.)	1,898	1,888	1,883	1,824	1,695	1,498	1,312	1,142	1,062	1,026	1,578	1,578	1,554
Percent of Potential Transits	85.3%	84.9%	84.6%	82.0%	76.2%	67.3%	59.0%	51.3%	47.7%	46.1%	70.9%	70.9%	69.9%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	64,409	64,062	63,947	61,656	56,076	48,079	40,504	34,839	32,234	31,033	51,773	51,773	50,948
Percent of Potential Cargo	85.1%	84.7%	84.5%	81.5%	74.1%	63.5%	53.5%	46.0%	42.6%	41.0%	68.4%	68.4%	67.3%
Economic Value of Canal for Potential Transits ($000s)	377,596	377,596	377,596	377,596	377,596	377,596	377,596	377,596	377,596	377,596	377,596	377,596	377,596
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,179	6,802	7,052	11,994	26,024	50,051	76,467	99,849	111,416	117,385	38,735	38,735	41,663
Forecast Panama Canal Toll Revenues ($000S)	108,617	116,956	122,298	147,440	161,488	162,366	157,725	152,739	151,004	151,215	170,325	170,976	168,672
Average Toll Revenue per Forecasted Transit ($000)	57	62	65	81	95	108	120	134	142	147	108	108	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.89	4.38	4.68	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255
Potential Panama Canal Cargo (ton 000s)	88,825	88,825	88,825	88,825	88,825	88,825	88,825	88,825	88,825	88,825	88,825	88,825	88,825
Forecast Panama Canal Transits (no.)	1,855	1,841	1,820	1,758	1,640	1,441	1,286	1,094	1,018	973	1,505	1,502	1,478
Percent of Potential Transits	82.3%	81.6%	80.7%	78.0%	72.7%	63.9%	57.0%	48.5%	45.2%	43.1%	66.7%	66.6%	65.5%
Forecast Panama Canal Cargo (ton 000s)	70,851	69,891	68,867	65,888	58,123	48,519	41,827	34,634	31,933	30,181	51,631	51,439	50,587
Percent of Potential Cargo	79.8%	78.7%	77.5%	74.2%	65.4%	54.6%	47.1%	39.0%	36.0%	34.0%	58.1%	57.9%	57.0%
Economic Value of Canal for Potential Transits ($000s)	381,844	381,844	381,844	381,844	381,844	381,844	381,844	381,844	381,844	381,844	381,844	381,844	381,844
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,706	7,645	9,290	14,595	27,949	51,206	73,540	101,348	112,662	120,738	42,091	42,599	45,598
Forecast Panama Canal Toll Revenues ($000s)	112,647	120,413	124,437	149,068	159,940	157,412	156,116	145,933	143,957	141,694	163,350	163,471	161,055
Average Toll Revenue per Forecasted Transit ($000)	61	65	68	85	98	109	121	133	141	146	109	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.72	1.81	2.26	2.75	3.24	3.73	4.21	4.51	4.69	3.16	3.18	3.18

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-24. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2023

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,231	2,231	2,231	2,231	2,231	2,231	2,231	2,231	2,231	2,231	2,231	2,231	2,231
Potential Panama Canal Cargo (ton 000s)	75,933	75,933	75,933	75,933	75,933	75,933	75,933	75,933	75,933	75,933	75,933	75,933	75,933
Forecast Panama Canal Transits (no.)	1,902	1,893	1,892	1,828	1,698	1,506	1,328	1,141	1,060	1,025	1,586	1,586	1,562
Percent of Potential Transits	85.3%	84.8%	84.8%	81.9%	76.1%	67.5%	59.5%	51.1%	47.5%	45.9%	71.1%	71.1%	70.0%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	64,669	64,318	64,292	61,885	56,263	48,431	40,937	34,878	32,258	31,060	52,135	52,135	51,291
Percent of Potential Cargo	85.2%	84.7%	84.7%	81.5%	74.1%	63.8%	53.9%	45.9%	42.5%	40.9%	68.7%	68.7%	67.5%
Economic Value of Canal for Potential Transits ($000s)	380,601	380,601	380,601	380,601	380,601	380,601	380,601	380,601	380,601	380,601	380,601	380,601	380,601
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,227	6,860	6,907	12,139	26,332	49,829	75,876	100,962	112,650	118,626	38,417	38,417	41,425
Forecast Panama Canal Toll Revenues ($000S)	109,052	117,419	122,985	147,977	162,020	163,587	159,473	152,906	151,108	151,342	171,604	172,251	169,873
Average Toll Revenue per Forecasted Transit ($000)	57	62	65	81	95	109	120	134	143	148	108	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.90	4.38	4.68	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,253	2,253	2,253	2,253	2,253	2,253	2,253	2,253	2,253	2,253	2,253	2,253	2,253
Potential Panama Canal Cargo (ton 000s)	88,813	88,813	88,813	88,813	88,813	88,813	88,813	88,813	88,813	88,813	88,813	88,813	88,813
Forecast Panama Canal Transits (no.)	1,855	1,841	1,826	1,758	1,646	1,446	1,301	1,091	1,014	969	1,510	1,507	1,482
Percent of Potential Transits	82.4%	81.7%	81.0%	78.0%	73.1%	64.2%	57.8%	48.4%	45.0%	43.0%	67.0%	66.9%	65.8%
Forecast Panama Canal Cargo (ton 000s)	70,963	69,996	69,089	65,961	59,151	48,827	42,241	34,620	31,838	30,114	51,884	51,671	50,799
Percent of Potential Cargo	79.9%	78.8%	77.8%	74.3%	66.6%	55.0%	47.6%	39.0%	35.8%	33.9%	58.4%	58.2%	57.2%
Economic Value of Canal for Potential Transits ($000s)	384,412	384,412	384,412	384,412	384,412	384,412	384,412	384,412	384,412	384,412	384,412	384,412	384,412
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,851	7,805	9,207	14,875	28,278	50,995	72,840	102,502	114,186	122,185	41,962	42,528	45,610
Forecast Panama Canal Toll Revenues ($000s)	112,942	120,718	125,002	149,376	162,355	158,595	157,907	146,002	143,690	141,530	164,448	164,508	162,013
Average Toll Revenue per Forecasted Transit ($000)	61	66	68	85	99	110	121	134	142	146	109	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.72	1.81	2.26	2.74	3.25	3.74	4.22	4.51	4.70	3.17	3.18	3.19

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-25. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2024

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242	2,242
Potential Panama Canal Cargo (ton 000s)	76,300	76,300	76,300	76,300	76,300	76,300	76,300	76,300	76,300	76,300	76,300	76,300	76,300
Forecast Panama Canal Transits (no.)	1,910	1,900	1,899	1,835	1,704	1,509	1,330	1,143	1,090	1,026	1,590	1,590	1,565
Percent of Potential Transits	85.2%	84.8%	84.7%	81.8%	76.0%	67.3%	59.3%	51.0%	48.6%	45.8%	70.9%	70.9%	69.8%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	65,002	64,646	64,620	62,184	56,517	48,599	41,057	34,957	32,936	31,144	52,318	52,318	51,453
Percent of Potential Cargo	85.2%	84.7%	84.7%	81.5%	74.1%	63.7%	53.8%	45.8%	43.2%	40.8%	68.6%	68.6%	67.4%
Economic Value of Canal for Potential Transits ($000s)	384,414	384,414	384,414	384,414	384,414	384,414	384,414	384,414	384,414	384,414	384,414	384,414	384,414
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,283	6,926	6,973	12,299	26,666	50,529	76,862	102,215	111,019	119,941	39,012	39,012	42,105
Forecast Panama Canal Toll Revenues ($000S)	109,613	118,017	123,612	148,686	162,750	164,144	159,933	153,260	154,417	151,754	172,227	172,871	170,417
Average Toll Revenue per Forecasted Transit ($000)	57	62	65	81	95	109	120	134	142	148	108	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.90	4.38	4.69	4.87	3.29	3.30	3.31
Expanded Canal													
Potential Panama Canal Transits (no.)	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255	2,255
Potential Panama Canal Cargo (ton 000s)	88,922	88,922	88,922	88,922	88,922	88,922	88,922	88,922	88,922	88,922	88,922	88,922	88,922
Forecast Panama Canal Transits (no.)	1,866	1,844	1,829	1,760	1,649	1,447	1,302	1,091	1,041	968	1,510	1,506	1,481
Percent of Potential Transits	82.8%	81.8%	81.1%	78.1%	73.1%	64.2%	57.8%	48.4%	46.2%	42.9%	67.0%	66.8%	65.7%
Forecast Panama Canal Cargo (ton 000s)	71,696	70,169	69,296	66,102	59,323	48,948	42,372	34,645	32,422	30,102	51,950	51,716	50,822
Percent of Potential Cargo	80.6%	78.9%	77.9%	74.3%	66.7%	55.0%	47.7%	39.0%	36.5%	33.9%	58.4%	58.2%	57.2%
Economic Value of Canal for Potential Transits ($000s)	387,762	387,762	387,762	387,762	387,762	387,762	387,762	387,762	387,762	387,762	387,762	387,762	387,762
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,207	7,984	9,338	15,176	28,637	51,711	73,632	103,800	112,755	123,715	42,761	43,388	46,559
Forecast Panama Canal Toll Revenues ($000s)	114,162	121,153	125,508	149,855	162,987	159,109	158,489	146,250	146,715	141,638	164,875	164,872	162,295
Average Toll Revenue per Forecasted Transit ($000)	61	66	69	85	99	110	122	134	141	146	109	109	110
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.73	1.81	2.27	2.75	3.25	3.74	4.22	4.53	4.71	3.17	3.19	3.19

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

⬚ Alternative Canal toll pricing option

Table D-26. Dry Bulk Market Segment: Summary of Panama Canal Toll Pricing Options, Existing and Expanded Canal, Most Probable Case 2025

	Panama Canal Toll Pricing Option												
Canal Scenario and Item	ACP tolls prior to Oct 2002	ACP tolls Oct 2002-June 2003	ACP tolls from July 2003	PCUMS Option 1 (25% increase)	PCUMS Option 2 (50% increase)	PCUMS Option 3 (75% increase)	PCUMS Option 4 (100% increase)	PCUMS Option 5 (125% increase)	PCUMS Option 6 (140 increase)	PCUMS Option 7 (150% increase)	Commodity Option 1 & PCUMS (75% increase)	Commodity Option 2 & PCUMS (75% increase)	Commodity Option 3 & PCUMS (75% increase)
											Phosphate 10% *Cement 10%* *Met coke 10%* *Copper conc 10%*	*Phosphate 10%* *Cement 10%* *Met coke 5%* *Copper conc 5%*	*Phosphate 10%* *Cement 10%*
Existing Canal													
Potential Panama Canal Transits (no.)	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251	2,251
Potential Panama Canal Cargo (ton 000s)	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699	76,699
Forecast Panama Canal Transits (no.)	1,915	1,905	1,905	1,840	1,708	1,546	1,331	1,144	1,089	1,043	1,592	1,592	1,592
Percent of Potential Transits	85.1%	84.6%	84.6%	81.7%	75.9%	68.7%	59.1%	50.8%	48.4%	46.3%	70.7%	70.7%	70.7%
Forecast Panama Canal Cargo (ton 000s)(ton 000s)	65,346	64,985	64,959	62,539	56,798	50,107	41,230	35,137	33,044	31,863	52,513	52,513	52,513
Percent of Potential Cargo	85.2%	84.7%	84.7%	81.5%	74.1%	65.3%	53.8%	45.8%	43.1%	41.5%	68.5%	68.5%	68.5%
Economic Value of Canal for Potential Transits ($000s)	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935	387,935
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,329	6,986	7,031	12,354	26,959	46,681	77,732	103,155	112,307	118,128	39,612	39,612	39,612
Forecast Panama Canal Toll Revenues ($000S)	110,193	118,635	124,258	149,521	163,554	169,285	160,576	154,012	154,890	155,374	172,887	173,527	174,167
Average Toll Revenue per Forecasted Transit ($000)	58	62	65	81	96	110	121	135	142	149	109	109	109
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.69	1.83	1.91	2.39	2.88	3.38	3.89	4.38	4.69	4.88	3.29	3.30	3.32
Expanded Canal													
Potential Panama Canal Transits (no.)	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221	2,221
Potential Panama Canal Cargo (ton 000s)	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771	87,771
Forecast Panama Canal Transits (no.)	1,868	1,845	1,843	1,764	1,650	1,494	1,300	1,090	1,037	984	1,508	1,505	1,504
Percent of Potential Transits	84.1%	83.1%	83.0%	79.4%	74.3%	67.3%	58.6%	49.1%	46.7%	44.3%	67.9%	67.7%	67.7%
Forecast Panama Canal Cargo (ton 000s)	71,959	70,350	70,276	66,420	59,524	51,222	42,449	34,770	32,405	30,760	52,039	51,784	51,753
Percent of Potential Cargo	82.0%	80.2%	80.1%	75.7%	67.8%	58.4%	48.4%	39.6%	36.9%	35.0%	59.3%	59.0%	59.0%
Economic Value of Canal for Potential Transits ($000s)	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849	390,849
Economic Value of Traffic Diverted Due to Tolls ($000s)	6,256	8,161	8,284	15,151	28,959	45,774	74,654	104,803	114,377	121,960	43,545	44,232	44,313
Forecast Panama Canal Toll Revenues ($000s)	114,711	121,613	127,221	150,696	163,706	166,326	158,929	146,901	146,796	145,138	165,378	165,315	165,826
Average Toll Revenue per Forecasted Transit ($000)	61	66	69	85	99	111	122	135	142	148	110	110	110
Average Toll Revenue per Ton of Forecasted Cargo ($/ton)	1.59	1.73	1.81	2.27	2.75	3.25	3.74	4.22	4.53	4.72	3.18	3.19	3.20

Source: Prepared by Nathan Associates Inc.

☐ Preferred Canal tolll pricing option

☐ Alternative Canal toll pricing option