OCEAN SHIPPING CONSULTANTS

PORT METRO VANCOUVER CONTAINER FORECASTS

#P120330-10

FINAL UPDATED REPORT

JULY 2013

Prepared for **Vancouver Fraser Port** Authority by:

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Terms and Abbreviations used in the Report

BC	British Columbia
bn	billion
C$	Canadian dollar
CAGR	compound annual growth rate
Deepsea	direct intercontinental container shipping
dwt	deadweight tonnes
FEU	forty foot equivalent units
GDP	gross domestic product
GT	gross tonnes
ha	hectares
IMF	International Monetary Fund
imp/exp	import/export
k	thousand
kg	kilogram
km	kilometre
kn	knots
LOA	length overall (of a ship)
m	metre (length) or million (quantity)
mt	million tonnes
mta	million tonnes per annum
nm	nautical miles
NPX	New Panamax (max 13000 TEU)
OECD	Organisation for Economic Co-operation and Development
Pacific Gateway (PG)	Ports of Vancouver and Prince Rupert
Pacific North West (PNW)	Ports of Metro Vancouver, Prince Rupert, Seattle, Tacoma, Portland
Pacific South West (PSW)	Ports of Long Beach, Los Angeles and Oakland
p.a.	per annum
QCC	quayside container crane
SPP	super-post-Panamax (crane outreach more than 18 rows)
sq.m	square metres
T	terminal
t	tonnes
TEU	twenty foot equivalent units
Transshipment	transfer of containers between vessels
ULCS	ultra large container ship (10,000TEU+)

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EXECUTIVE SUMMARY

Introduction

In June 2012 a series of container forecasts were completed for Port Metro Vancouver (PMV) to 2025 and also to 2050, as part of an in-depth study of the port's competitive position in relation to future capacity planning needs. In addition, the Report included an assessment of relevant macro-economic trends and container port demand, competitive developments at competing regional ports, the impact of trends in container shipping, the cost structure at Vancouver and intermodal developments.

An Initial Memorandum was delivered to PMV in May 2013, with specific emphasis on the revised container forecast for the Vancouver container terminals. This Executive Summary contains the key elements of the May 2013 Information Memorandum and other key areas relating to this Final Report delivered in July 2013 (following provision of a Draft Report dated June 2013).

The overall modelling process has been maintained for the revised container forecasts in order to ensure consistency with the previous report provided to PMV in June 2012. However, all factors influencing the container projections have been updated, including the following:

- Update of container throughput for 2012 at competing ports, including in the Pacific North West (PNW) region;
- Type of container (full, empty, inbound, outbound etc.) for the PNW region for 2012 and update to historic trends;
- Updated comparison of PNW throughout and Western Canada GDP development to include estimates for 2012;
- Indication of changes/updates to projected GDP drivers influencing PMV (and competing region) container forecasts;
- Regional GDP development for Canadian Provinces and key US regions with 2012 estimates;
- Estimates for 2012 for Vancouver's containerised imports/exports by source and North America destination;
- Revised PMV and regional container forecast to 2050.

Containerised cargo demand at the container terminals at PMV has expanded rapidly in the period since the early 2000s. The port has increased market share significantly on the basis of strong local demand and by extending its hinterland reach to eastern markets. The economic uncertainties noted since 2008 caused some disruption in this trend but market share has been sustained within the Pacific Northwest (PNW) market.

The development of container volumes at Vancouver will be determined by the overall scale of the local and broader North American container markets, the competitive position of Vancouver within these markets and the capacity available for container handling at the port.

This Executive Summary also outlines key conclusions with respect to:

- Competitive developments at regional ports, including PNW hinterlands;
- Trends in container shipping;
- The competitive cost structure at Vancouver, including additional analysis for serving Toronto;

- Intermodal developments;
- SWOT analysis;
- Forecast handling volumes for North America, the PNW region and Vancouver's container terminals.

Revised PMV Container Forecasts

Container demand for North America has seen consistent growth since 1990, with the total figure of 15.81 million TEUs increasing to 48.79 million TEUs by the end of 2012. For the PNW region, the total number of containers moving increased from 2.77 million TEUs to 7.56 million TEUs over the same assessment period.

Between 1990/2007 the total volumes of containers handled in North American ports increased by some 205 per cent to reach a peak total of 48.2 million TEUs. This equates to a CAGR of around 6.8 per cent. Demand then contracted sharply over 2008 and 2009, to a low of 40.2 million TEUs, although there has been some rebound since with 2010 generating almost 45.7 million TEUs and 2011 totalling over 46.2 million TEUs.

In fact, 2012 has marked a return to 2007 levels, with North American ports seeing a total of 48.8 million TEUs, just above the 2007 total of 48.2 million TEUs.

The share of PNW ports remained quite stable in the 1990s at between 16-18 per cent of total continental demand, but market share then declined marginally before stabilising since 2006, after which the region has generally accounted for approximately 15.5 per cent of total activity.

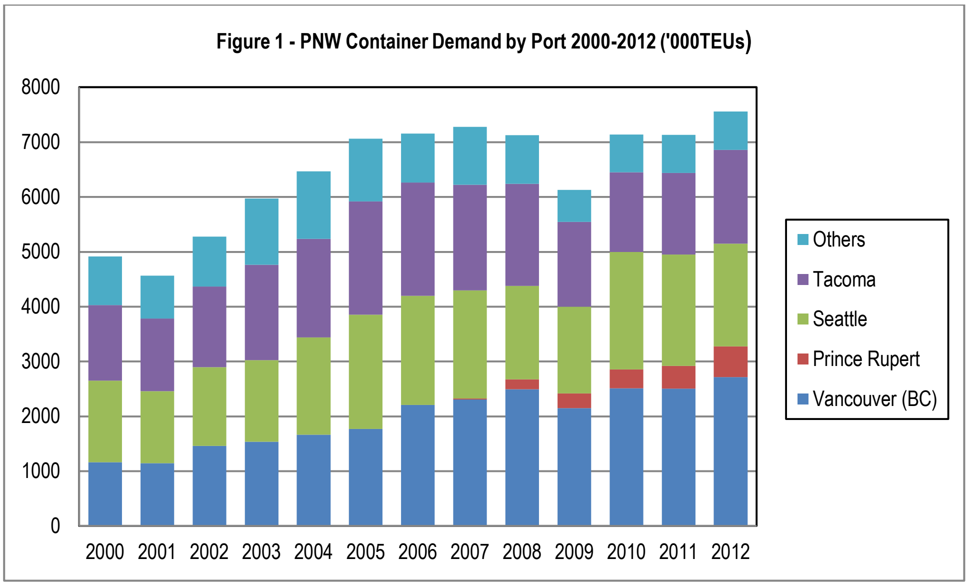
In 2012 ports located in the PNW region generated some 7.6 million TEUs (including US domestic containers). It is worth noting that this total represented an increase over the 7.1 million TEUs for 2011 and allowed the ports on a collective basis to surpass the 2007 pre-recessionary level of 7.3 million TEUs.

Only modest growth has been recorded at both Tacoma and Seattle over the assessment period and although volumes have increased, the share of regional traffic has declined. The position at Vancouver has been far more positive. Total volumes increased from just over 178,000 TEUs in 1990 to more than 2.71 million TEUs by the end of 2012, reflecting average annual growth of 10.6 per cent.

The continued growth of volumes at Vancouver has resulted in a strong rise in its share of regional port demand. In 1985, the Vancouver accounted for just 12 per cent of all containers being handled by PNW ports, compared to 55 per cent for Seattle and 33 per cent for Tacoma. However, by 2012, Vancouver was the largest port based on volumes, with a share of 36 per cent, followed by Seattle and Tacoma, with 25 per cent and 23 per cent, respectively.

As a consequence, Vancouver is now by far the most significant gateway in the PNW, though the emergence of Prince Rupert in establishing a regional share of 7 per cent in just five years since opening is noteworthy.

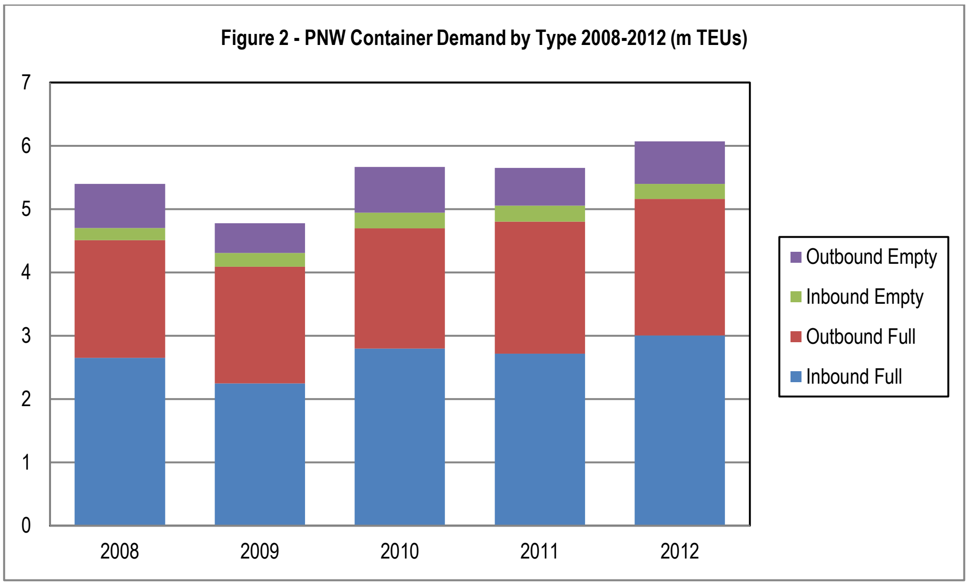
The increasing role played by Vancouver (BC) is further highlighted in Figure 1, which shows the growing share of the PNW container demand market compared to the other listed ports. The opening of Prince Rupert from 2008 onwards is also noticeable, as is the overall fall in total demand during 2009.



With respect to make-up of traffic in the PNW region, there has been relative stability in the type of container moving, when making an assessment in terms of full or empty, inbound or outbound, as Figure 2 identifies.

It is noticeable that the decline in traffic in 2009, followed by subsequent rebound and notable total volume levels in 2012 surpassing pre-economic crisis levels, the regional make-up at ports in the region has remained consistent with the growth or decline in overall terms.

As a consequence, the region can be regarded as being relatively stable, with future swings in type of container largely unexpected, with Asia the dominant source of the largest type of traffic, loaded inbound containers.



Economic Development and Container Port Demand

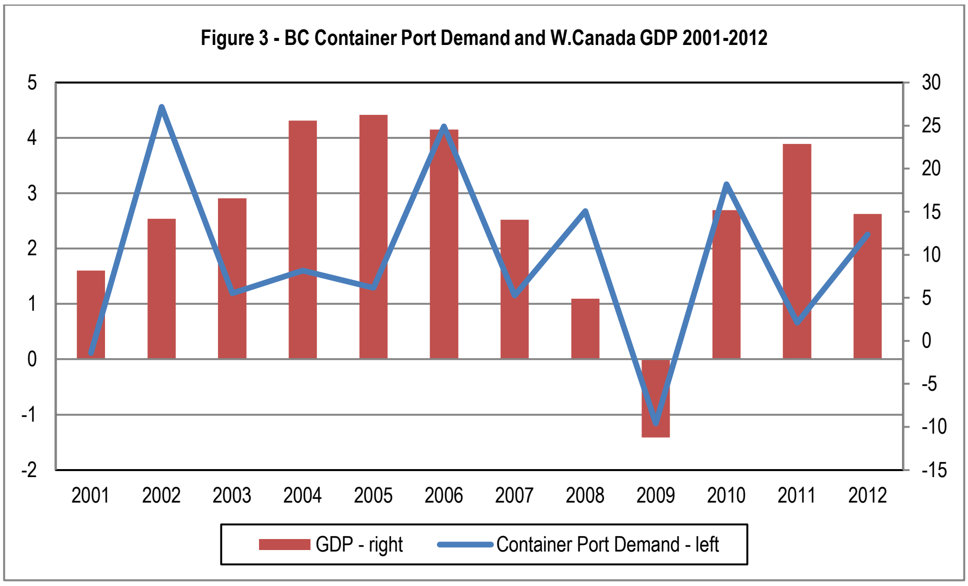
In the North American economies there is also found to be a close relation between the year-on-year development of GDP and the annual development of trade volumes. The more recent economic downturn represented the first real dislocation of the demand model noted since the 1980s. The US economy declined sharply by around 3.8 per cent between 2007 and 2009, but has since recovered this loss. The same general pattern was noted in Canada, but the decline was somewhat less severe, namely a decline of 2.1 per cent, as a result of strong commodity exports over the period.

In terms of regional developments, several trends were noted to be of direct relevance to the June 2012 Study and which remain applicable in this updated Report:

- The western states and provinces have progressively increased their share of the total economy over the period, with 2012 replicating the position in 2011;
- This has been at the expense of the more established economic regions of the Midwest and the Northeast which have seen their shares decline despite strong economic growth;
- In 2012 Canada's share of total North American GDP remained just under 8 per cent, with the US generating 92 per cent. There has generally been relatively little change in the contributing shares, further highlighting the general stability of each economy in terms of overall contribution to GDP.
- Despite the increasing importance of the immediate Pacific hinterland markets, it is also pertinent to note that the overall development of continental demand remains focused on the major central and eastern markets.

The relationship between the expansion of the North America economies and the level of trade is fundamental to the analysis of recent developments and future prospects. A close relation is found to exist between the development of regional GDP, total trade volumes and container port demand.

This position is also true for container port demand in British Colombia and GDP for the Western Canada region, as Figure 3 shows, with 2012 largely continuing the recent trends.



Competitive Developments at Regional Ports and PNW Port Hinterlands

The PNW port market has recorded significant expansion and development in the period since 1990. At the outset of the study period the immediate geographical hinterland (western Canada and Washington/Oregon) accounted for an estimated 25.9 per cent of regional port demand. The more distant western region generated a further 22.3 per cent of demand. The most significant development has been the extension of the hinterland into eastern Canadian and US markets.

The major central continental markets were already of some significance to PNW port demand in the early 1990s, although the role of Vancouver was far less important than that of the neighbouring US ports. This has now changed with the development of Vancouver's market role.

Although competition with Californian ports remains intense, it is apparent that the economics of using PMV's terminals has significantly improved in recent years. This underlines the potential for additional expansion at Vancouver. This conclusion was noted in the June 2012 Study and one that remains equally relevant to this June 2013 Update.

The development of demand at Vancouver will be determined by various factors, but the availability and type of competing capacity will be a key issue. Therefore it is prudent to understand the following:

- Current and planned container terminal capabilities.
- Anticipated development of container terminal capacity.
- Development of productivity in the regional ports.

The major ports in the Pacific Northwest range of ports are the US ports of Seattle and Tacoma that are in direct and proximate competition – but have jointly engaged on upgrading their intermodal capability – and Vancouver. Since 2007, the Canadian port of Prince Rupert began handling containers at a new container terminal.

There are no immediate container port investment projects planned for Seattle and current major infrastructure projects are aimed at improving the flow of traffic to/from the hinterland.

At Tacoma, the port's ten-year strategic plan, announced in 2012, includes redevelopment of its central peninsula to handle the largest vessels efficiently, including widening and deepening waterways as necessary. There are also plans to expand rail capability to handle 1.5-mile long trains and provide a second rail crossing over the Puyallup River. The plan is clearly directed at combining and optimising existing areas to make them more suitable for the larger carrier alliances and vessels of today's market.

In contrast, both Prince Rupert and Vancouver have significant plans to expand their container handling capacities to meet anticipated demand and this will allow the Pacific Gateway to significantly increase market share.

Trends in Container Shipping

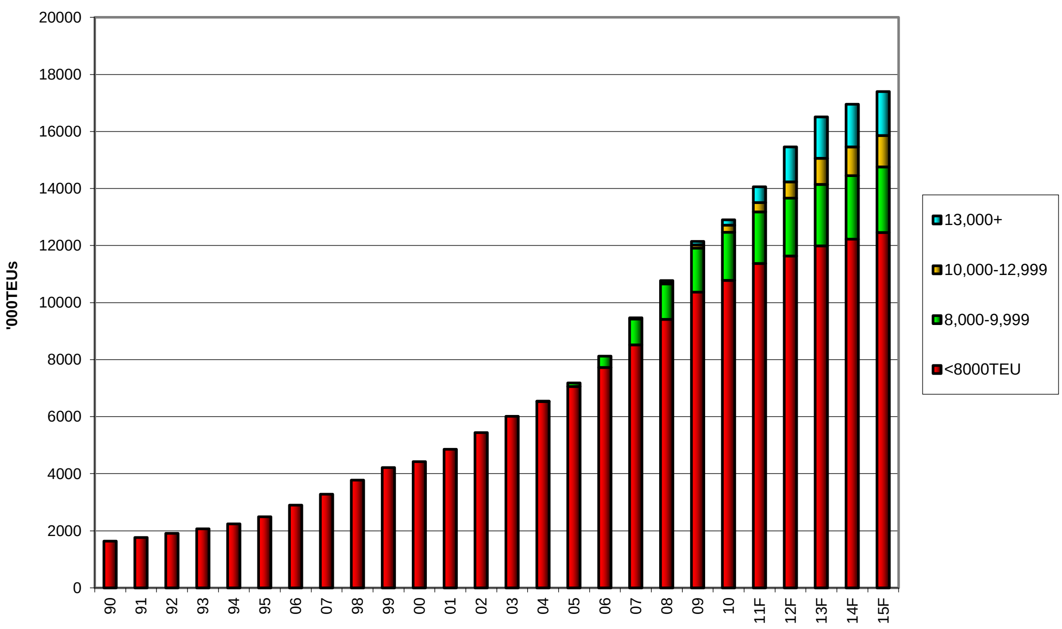
One of the major determinants in the development of container volumes at Vancouver will be the development of shipping demand and, specifically, the size and type of vessels that will be deployed on the key Transpacific trades. The trend has been towards the development of much larger vessels in recent years and Vancouver will be well placed to handle such container ships.

The shift to larger vessels has been the most significant feature for deepsea containerisation. The search for scale economies is at the heart of this drive. On a tonnage-mile basis, the savings from larger vessels are significant and also one of the few factors that are directly controlled by ship operators. Furthermore, as soon as one major operator advances to the next size echelon, the competitive nature of the shipping industry may force other operators to follow suit. The net effect is a rise in both average vessel size and the size of the largest vessels deployed.

The largest vessels that are planned will have a length (LOA) of 400m, a beam of 59m and a design draught of around 15.5m – although full draught will seldom be used. Berthing of these vessels should be possible with careful management at Vancouver and at Prince Rupert. The 18,000-20,000TEU vessels now on-order are likely to represent the largest container vessels that will be constructed.

The ULCS fleet (i.e. vessels of over 10,000TEU capacity) will account for 16.6 per cent of the total fleet in terms of TEU capacity by the end of 2015. Figure 4 outlines the increasing importance of large container ships in the global fleet. As a consequence of this trend there will be very great pressure to deploy much larger vessels at PNW ports. This represents a transformation of terminal requirements for the Asia-North America trades.

Figure 4 - The Increasing Importance of Large Vessels in the Container Fleet



Vancouver enjoys a significant ship size advantage in contrast to US ports and this is particularly the case with regard to Deltaport. This means that the largest vessels anticipated for the Transpacific will be accommodated at the port at real anticipated load factors, while other ports will be much more restricted.

Clear limits have been identified with regard to the draughts of ultra-large container vessels and this indicates that the deeper water that is available at Prince Rupert will seldom be required and that this difference between the port and Vancouver is not a significant competitive issue.

Since the earlier Study was completed in June 2012, the major development of interest to Vancouver is the further expansion of the fleets of the very largest vessel operators and the deployment of 12,000TEU+ units on the Transpacific by CMA CGM and Mediterranean Shipping Co (MSC) out of Long Beach.

These trends further underline the issue of increasing ship size and the advantages retained by PMV in being able to handle larger container ships at its facilities.

The June 2012 Study concluded that Vancouver has the potential to build on recent successes and consolidate and expand market share versus more restricted and limited alternative ports. However the continued trends in the Transpacific trades relating to the introduction of larger ships and the competitive advantage enjoyed by PMV in this respect, more strongly enforces this conclusion now.

Revised Forecast Container Demand at Vancouver

The development of overall demand and the role of the PNW within these markets – i.e. the *potential* markets for which Vancouver is competing – is forecast for the period to 2050 and reflects updates to the projections provided in the June 2012 Study, albeit that the same approach has been followed for this July 2013 updated report, namely:

- For the period to 2025 the basic structure of globalisation is forecast to continue, with strong import demand growth and also significant export growth driven by Chinese and other emerging Asian trade;

- Beyond 2025 a scenario-based approach has been developed. There are clearly different models for subsequent economic development and these are likely to have divergent impacts on both the volumes and directions of North American trade.

In addition to applying confirmed 2012 port throughput figures (included in Section 2.1) to the modelling process, more recent GDP projections have also been used in the OSC forecasts, based on the contents of Table 1 for the period to 2015.

Table 1
Latest IMF Real GDP % Data - April 2013

	2012	2013	2014	2015
USA	2.2	1.9	3.0	2.9
Canada	1.8	1.5	2.4	2.2

Source: IMF

As a consequence of applying revised 2012 port data and latest IMF GDP projections, it is apparent that Vancouver remains very well placed to benefit from the relatively strong demand anticipated for Canada and, specifically, for the western states that are dominant in its hinterland for import volumes. This will result in strong and sustained demand growth in the medium term.

In the period to 2025 three cases are developed (Low, Base and High) that are based upon a continuation of the current model of demand growth – i.e. demand is driven by economic expansion and the close link between GDP development and containerised goods flows. For the export market, demand is driven primarily by the level of economic expansion in the East Asian importing markets.

For the period from 2025 three scenarios are developed that reflect alternate macro-economic prospects:

- Continuing Free Trade – a continuation of recent trends in more limited form (the High Case);
- A Partially Protectionist World – where there are restrictions on trade (the Base Case);
- New Economic and Trade Paradigm – here production is localised and environmental pressures are dominant with container trade more restricted (the Low Case).

Asian trades will continue to dominate the overall structure of North American container flows and the location of PNW ports in relation to Asia and in terms of intermodal connectivity will continue to favour this port region. Figure 5 provides a summary of total North American port demand to 2050 in million TEUs, while Figure 6 provides an overview of the projected PNW volumes for each growth scenario to 2050.

Figure 5 - North American Container Port Demand to 2050 - million TEUs

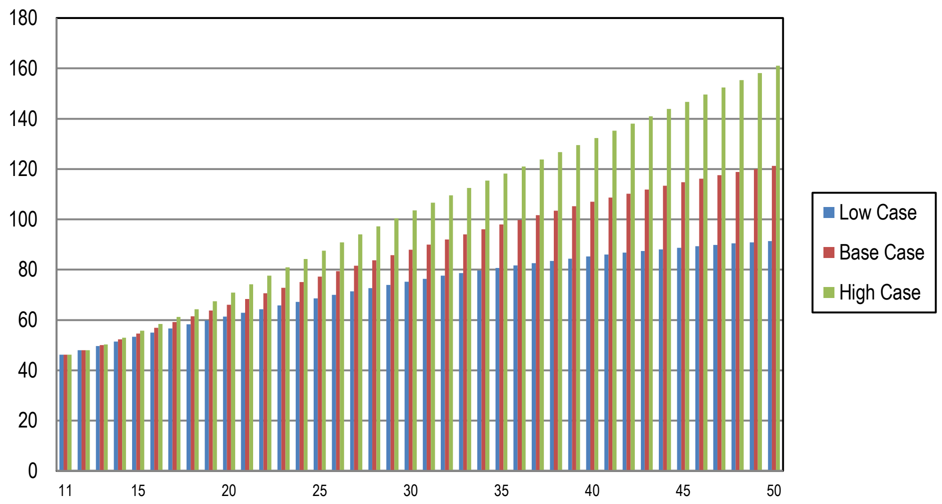
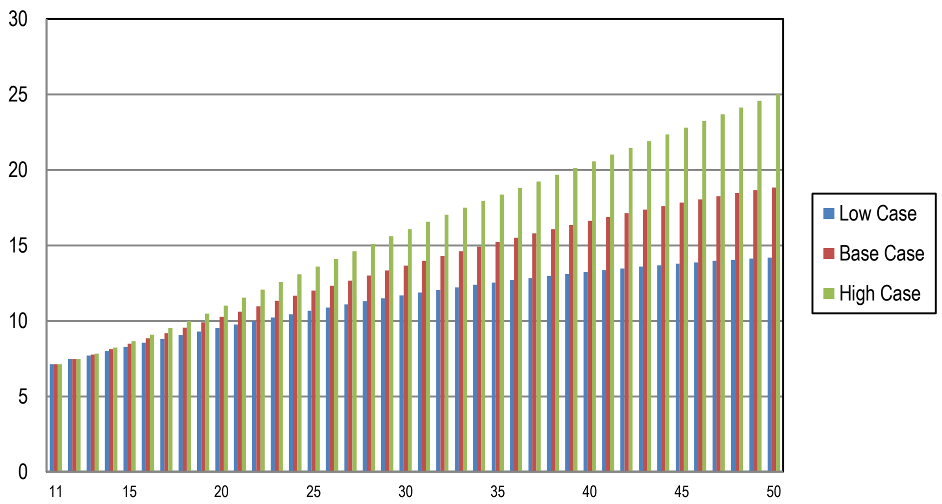


Figure 6 - PNW Container Port Demand to 2050 - million TEUs



The strong availability of export cargoes – particularly from BC – will underline the relative position of these ports versus competing terminals in California. As the overall balance of trade with Asia moves in the direction of equilibrium, these will be increasingly important considerations.

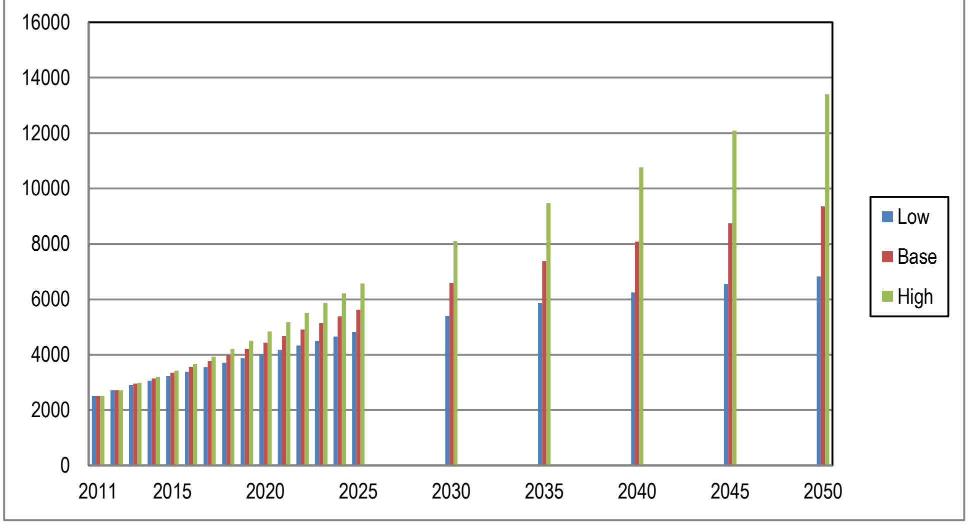
The development of the Panama Canal will have significant effects on the overall structure of Asia-North America container flows. It is anticipated that the role of All-Water services between Asia and the North American markets will increase in proportional share as much larger vessels are deployed on the trades. This will, however, be focused on the Californian ports. The importance of these terminals as access points for the broader North American markets will decline as All-Water trades increase market share. These ports will be squeezed between the PNW terminals (with their clear advantages) and shipments via Panama.

Overall potential import demand is driven not by the overall development of North American GDP but, rather, by the estimated development of Western Canadian GDP. This has been – and is forecast to continue to be – higher than that for the continent as a whole. This will have the effect of driving import demand at a faster pace for this region than is anticipated for the entire market.

The actual level of year-on-year demand growth will be driven by demand from the Asian markets – specifically China, and the current and stable link between GDP in these markets and overall demand growth is forecast to continue in the period to 2025. There will be strong and sustained demand growth in this sector, although these commodities will remain vulnerable to short term disruptions at the macro-economic level in East Asia.

As Figure 7 further outlines, the Low Case and High Case variants will see a range of between 4 million TEUs and 4.8 million TEUs in 2020, followed by 4.8-6.6 million TEUs by 2025 and 6.8-13.4 million TEUs in 2050.

Figure 7 - Forecast Potential Vancouver Volumes to 2050 ('000TEUs)



As Table 2 shows in more detail, it is anticipated that, under the Base Case, demand at Vancouver will increase to more than 4.4 million TEUS by 2020, before continuing increases in throughput to just over 5.6.million TEUs in 2025 and eventually rising to more than 9.3 million TEUs by the end of the assessment period in 2050.

Table 2
Forecast Potential Total Vancouver Volumes to 2050
- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Underlying Demand																				
High	2507.0	2713.2	2978.4	3179.9	3395.1	3621.8	3864.9	4125.7	4405.5	4705.8	5013.0	5325.7	5642.5	5961.8	6282.0	7746.7	9050.0	10285.5	11545.4	12806.3
Base	2507.0	2713.2	2956.9	3135.7	3325.2	3514.0	3707.9	3906.7	4109.9	4317.2	4526.8	4737.9	4950.0	5162.1	5373.6	6284.4	7046.5	7719.6	8352.5	8932.2
Low	2507.0	2713.2	2898.0	3046.8	3203.1	3348.6	3493.0	3635.6	3775.7	3912.5	4050.2	4188.6	4327.3	4466.3	4605.1	5164.9	5605.6	5964.3	6269.4	6519.1
Intermodal Addition																				
High	0.0	0.0	0.0	12.8	27.3	43.6	61.8	82.2	105.0	130.4	158.2	188.4	221.1	256.1	293.4	361.9	422.7	480.5	539.3	598.2
Base	0.0	0.0	0.0	12.7	26.8	42.3	59.3	77.8	97.9	119.6	142.8	167.6	194.0	221.8	251.0	293.6	329.2	360.6	390.2	417.2
Low	0.0	0.0	0.0	12.4	26.0	40.7	56.3	73.0	90.7	109.2	128.7	149.3	170.7	193.2	216.5	242.7	263.2	280.0	294.3	305.9
Total																				
High	2507.0	2713.2	2978.4	3192.8	3422.4	3665.4	3926.7	4207.8	4510.4	4836.1	5171.1	5514.1	5863.6	6218.0	6575.4	8108.5	9472.8	10766.0	12084.7	13404.5
Base	**2507.0**	**2713.2**	**2956.9**	**3148.3**	**3352.0**	**3556.3**	**3767.2**	**3984.5**	**4207.8**	**4436.8**	**4669.6**	**4905.6**	**5143.9**	**5383.9**	**5624.6**	**6577.9**	**7375.6**	**8080.2**	**8742.7**	**9349.5**
Low	2507.0	2713.2	2898.0	3059.2	3229.1	3389.2	3549.4	3708.7	3866.4	4021.7	4178.9	4337.8	4498.1	4659.4	4821.6	5407.6	5868.8	6244.3	6563.7	6825.1

Source: Ocean Shipping Consultants

Comparison of Forecast Container Demand Projections at Vancouver

A comparison of the Base Case forecasts completed in June 2012 and the current modelling exercise has been conducted. As shown in Table 3, additional containers are now anticipated for Vancouver in the revised May 2013 projections. Under the Base Case scenario the extra volumes amount to 142,800 TEUs in 2020, rising to almost 196,000 TEUs by 2025 and continuing thereafter throughout the longer-term forecast process until reaching 325,100 TEUs in 2050.

By way of comparison, the revised forecasts for Low Case and High Case scenarios will see an additional 227,000 – 260,000 TEUs in 2020, rising to 290,000 – 370,000 TEUs by 2025, before reaching 422,000 TEUs in 2050 for Low Case growth and 755,000 TEUs for High Case growth at the end of the forecast period.

The adjustments are relatively small when compared to the overall total number of containers that Vancouver can expect to handle at its container terminals. Indeed the extra containers still represent further demand for more capacity at the port that will need to be catered for moving forward beyond what was noted in the June 2012 forecasts, based on revised GDP data and known volumes for 2012.

Table 3
Vancouver Forecast Comparisons - June 2012 vs May 2013

	Base Case			Low Case			High Case		
	Jun-12	May-13	Difference	Jun-12	May-13	Difference	Jun-12	May-13	Difference
2011	2507.0	2507.0	0.0	2507.0	2507.0	0.0	2507.0	2507.0	0.0
2012	2697.5	2713.2	15.7	2697.5	2713.2	15.7	2697.5	2713.2	15.7
2013	2856.3	2956.9	100.6	2800.5	2898.0	97.5	2877.2	2978.4	101.2
2014	3014.2	3148.3	134.1	2928.1	3059.2	131.0	3057.0	3192.8	135.7
2015	3180.7	3352.0	171.3	3061.5	3229.1	167.6	3248.0	3422.4	174.4
2016	3372.5	3556.3	183.8	3210.0	3389.2	179.2	3476.5	3665.4	188.9
2017	3570.4	3767.2	196.8	3358.3	3549.4	191.0	3722.1	3926.7	204.6
2018	3774.1	3984.5	210.4	3505.8	3708.7	202.9	3986.3	4207.8	221.6
2019	3983.3	4207.8	224.5	3651.5	3866.4	214.8	4270.4	4510.4	240.0
2020	4197.7	4436.8	239.1	3794.9	4021.7	226.8	4576.2	4836.1	259.9
2021	4415.5	4669.6	254.1	3940.0	4178.9	238.9	4890.5	5171.1	280.7
2022	4636.1	4905.6	269.5	4086.5	4337.8	251.4	5211.9	5514.1	302.2
2023	4858.7	5143.9	285.3	4234.1	4498.1	264.0	5539.2	5863.6	324.3
2024	5082.6	5383.9	301.3	4382.6	4659.4	276.8	5870.8	6218.0	347.1
2025	5307.0	5624.6	317.6	4531.7	4821.6	289.9	6205.1	6575.4	370.4
2030	6206.5	6577.9	371.5	5079.1	5407.6	328.5	7651.8	8108.5	456.7
2035	6959.1	7375.6	416.5	5509.9	5868.8	358.9	8939.2	9472.8	533.6
2040	7623.9	8080.2	456.3	5860.7	6244.3	383.7	10159.5	10766.0	606.4
2045	8249.0	8742.7	493.7	6159.0	6563.7	404.7	11404.0	12084.7	680.7
2050	8821.5	9349.5	528.0	6403.1	6825.1	422.0	12649.5	13404.5	755.0

Source: Ocean Shipping Consultants

As a consequence of the revised forecasts, the total growth for Vancouver is going to increase, as Table 4 shows:

- The Base Case increase is from 112 per cent to 119 per cent;
- The High Case scenario will see total growth projected in the June 2012 Study of 148 per cent increasing to 157 per cent in this revised forecast process;
- The Low Case option also sees a similar improvement, of 8 per cent, from 81 per cent to 89 per cent overall.

Table 4
Comparison of Total Growth per Forecast

	Jun-12	May-13
Base	112%	119%
High	148%	157%
Low	81%	89%

Source: Ocean Shipping Consultants

Vancouver Supply/Demand Development to 2025

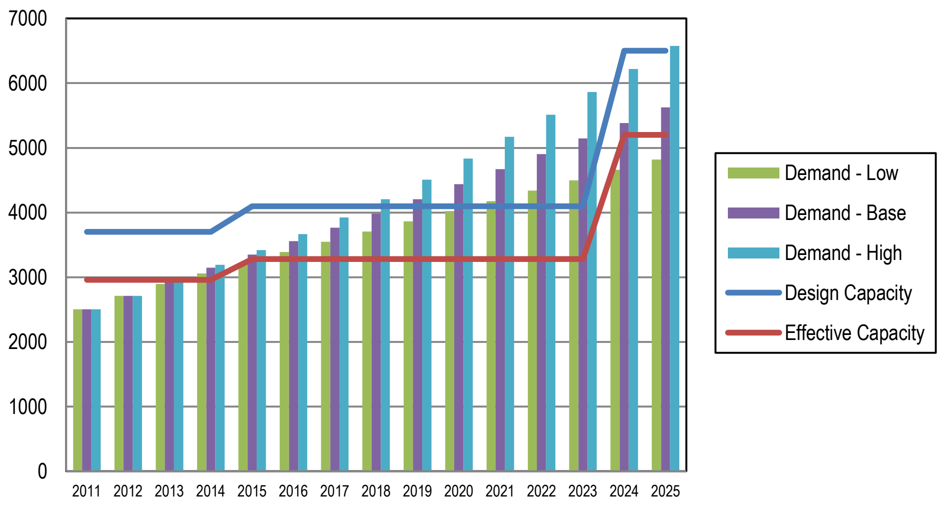
It is prudent to assess the container supply/demand balance at Vancouver's container facilities with the inclusion of the updated July 2013 revised forecasts.

The approach followed reflects the methodology used in the June 2012 Report in which a forecast of the balance of supply and demand is contrasted with the current and proposed development of capacity at Vancouver with identified *potential* demand growth. Taking this situation into account, the current maximum capacity of container facilities at Vancouver is confirmed by PMV to be 3.7 million TEUs per annum rising to 4.1 million TEUs in 2015 and, longer term, 6.5 million TEUs from 2024.

A difference between maximum (or "design") capacity and the actual effective capabilities and the actual effective capabilities of a terminal was applied. This is because in most operational situations with common-user facilities – as is the case in Vancouver – an effective utilisation rate of around 85 per cent of design capacity can be delivered without incurring inefficiencies elsewhere in the transport chain.

This information is replicated in Figure 8, which also provides the details of the Base, Low and High case container projections to 2025 against information obtained from page 4 of the Roberts Bank Terminal 2 Project Discussion Guide. The requirement for additional capacity is clearly evident in the near future, even if the Low Case growth scenario is applied.

Figure 8 - Vancouver Capacity & Demand Development to 2025 - '000TEUs



The Competitive Cost Structure at Vancouver

This updated Analysis has reaffirmed the existing highly competitive cost position for Vancouver terminals when serving the Midwest. This position is largely the same as presented in the June 2012 Study, with Toronto acting as the final destination further reflecting the same competitive issues.

The PNW in general is seen to be very well placed and, within this sector, Vancouver and Prince Rupert generate the lowest costs. This represents a major competitive advantage. These advantages are focused on the NE Asian trades but are also significant with regard to the SE Asian markets.

It is also concluded that this relatively strong competitive position will be further boosted by anticipated ship size developments in the main line container trades. The strong existing advantage will be considerably enhanced as larger vessels are introduced into the trades.

Although there will be increased competition from all-water services (especially from SE Asia via Suez in the largest classes of vessels) two factors will restrict this:

- The time involved in shipping via Suez is considerably greater than via the landbridge. If there are no intermodal delays, a difference of around 9 days is indicated in favour of the West Coast alternative. This will continue to be a relevant factor for higher value cargoes. For empty containers and lower value goods this will be of no real importance.

- A competitive response may be anticipated from the major railroads if Halifax is chosen to be the location of major deepsea developments.

Despite these factors, it is apparent that the Vancouver/Prince Rupert option offers a highly competitive overall transport alternative for the Midwest both within the West Coast market and also in contrast to the Panama and Suez alternatives. This advantage will increase in the next few years.

For the NE Asian trades the Vancouver/Prince Rupert option is the cheapest for serving Chicago by a considerable margin, whether the origin location is Singapore or Kobe.

This gateway is considerably cheaper than other PNW ports and also much lower than PSW alternatives. It should also be noted that the East Coast option becomes cheaper than the Californian routing for these trades with the New Panamax vessel. This will further squeeze demand at PSW ports.

Prince Rupert generates a slightly lower through cost than does Vancouver, but this is marginal and other considerations such as the greater availability of export cargo at Vancouver would offset this difference.

The outlook is further summarised in Figures 9 and 10.

Figure 9 - Current & Future Transport Costs Singapore-Chicago (2013U$/FEU)

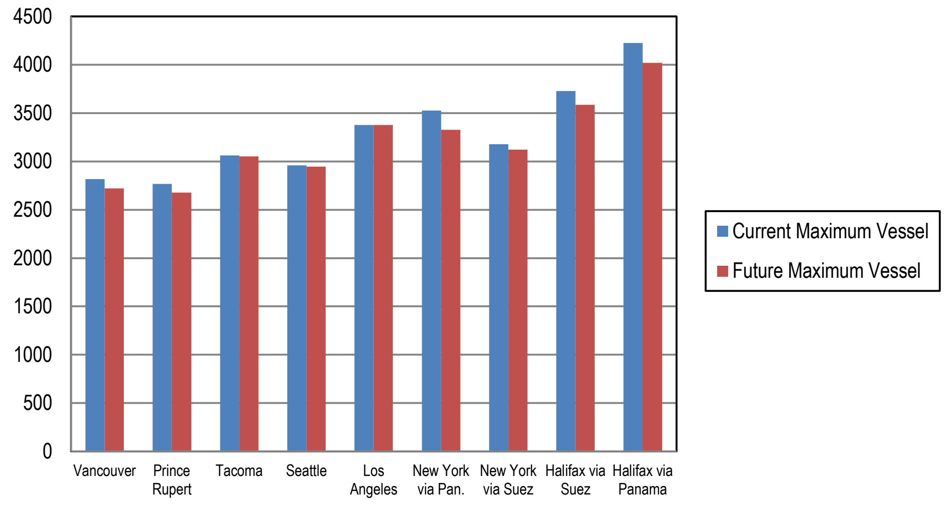
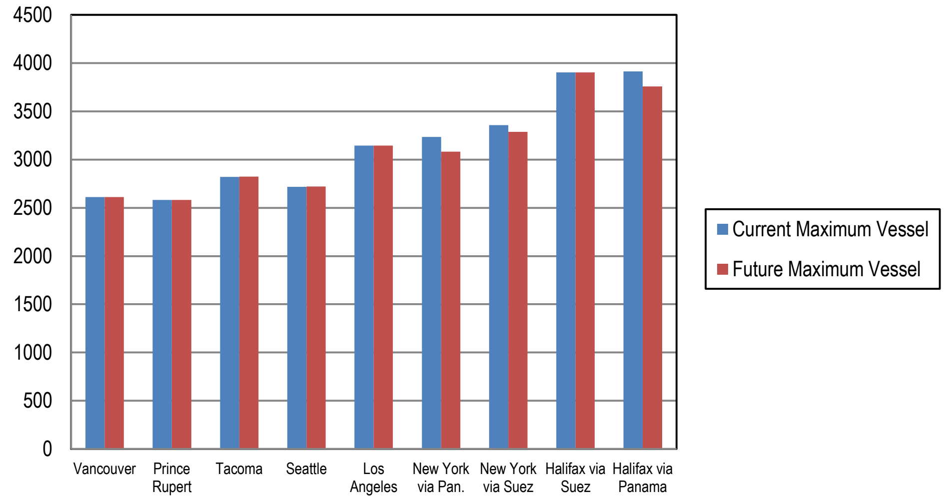
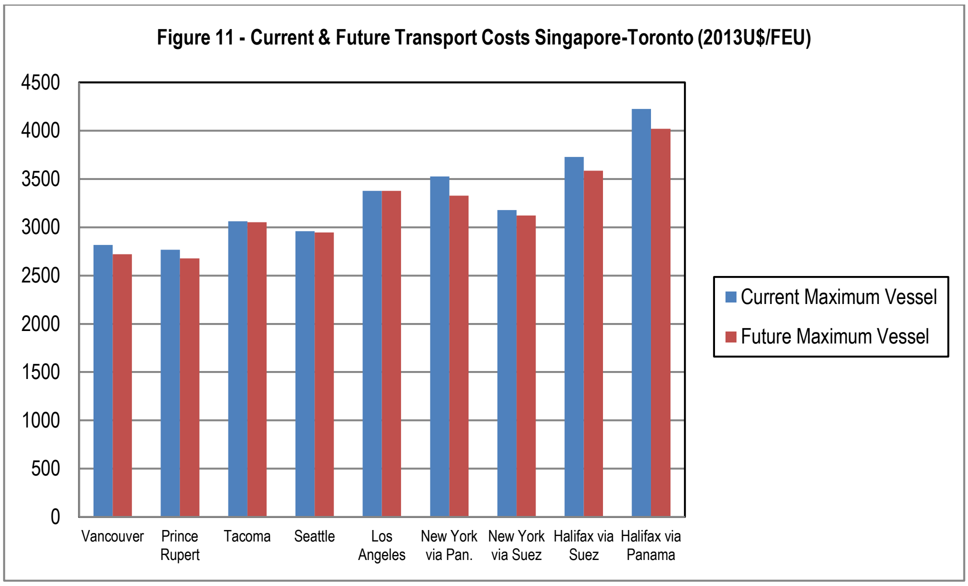


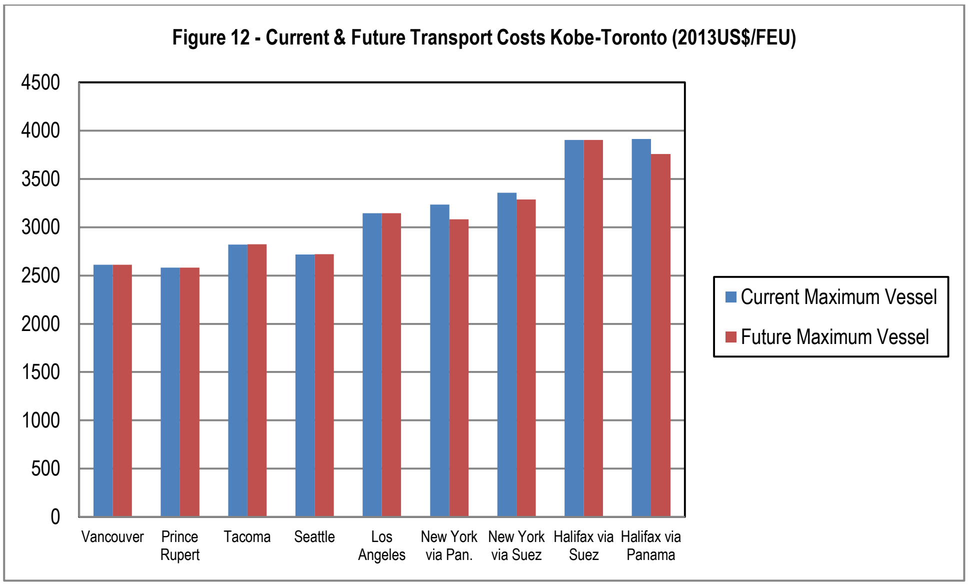
Figure 10 - Current & Future Transport Costs Kobe-Chicago (2013US$/FEU)



Conclusions on the current competitive position of Vancouver for Asian trades to Toronto
Similar calculations using the same ports of entry in Canada and the US have been used to draw some indicative comparisons for Singapore and Kobe serving Toronto.

Once again, the Vancouver and Prince Rupert options offered the most competitive cost options, favoured in part by the sailing distances and no requirement to use transit canals as impacts East Coast facilities. The information showing the competitive position by port is shown in Figures 11 and 12.





Intermodal Developments

There has been relatively little change to the intermodal network in the past year, since the June 2012 Report was provided.

It can still be concluded that the West Coast intermodal market is well served by rail facilities at the terminals and by inland facilities located on the major Midwest markets.

Moreover, the capacity of the rail links between US ports and the Midwest is also sufficient to meet anticipated demand growth with no difficulties. The same can be said of rail links between Vancouver (and Prince Rupert) and the eastern markets.

At present, there are no capacity constraints for the railroads and yard capacity can be added in line with demand and terminal expansion.

For Vancouver's container terminals, the only possible difficulty occurs if proposed oil exports from Alberta were to compete for rail space with coal and container trains. Clearly, the most appropriate mode for these exports will be by pipeline. This was the key concluding threat identified in June 2012 and the over-riding position remains the same in June 2013 as the only potential capacity constraint for increased container volumes via Vancouver.

Summary SWOT Analysis

The accompanying analysis (summarised in Table 7.1) presents an essentially subjective evaluation of the competitive position of Vancouver versus its immediate competitors in the PNW markets – Seattle, Tacoma and Prince Rupert.

Of course, not all of these factors are of equal weight and they will, in any case, vary from customer to customer. Nevertheless, this is exactly the type of evaluation that is undertaken by shipping lines (and the largest shippers) when evaluating port choice and terminal investment. OSC has confidence in the veracity of this approach.

Table 5
The Relative Competitive Position of Vancouver Versus Competing Terminals

	Vancouver	Prince Rupert	Seattle	Tacoma
Physical Capability of Terminals	*****	*****	****	****
Planned Capacity Development	*****	*****	**	**
Productivity of Terminals	****	*****	***	***
Cost of Transiting Terminals	*****	*****	****	****
Delivered costs to Midwest	****	*****	***	***
Intermodal Capacity	*****	*****	***	****
Import/Export Balance	*****	***	****	****
Local Demand	*****	**	*****	******
Location as a Regional Hub	*****	*	*****	*****
Existing Customer Base	*****	***	*****	*****
Total	**48**	**39**	**38**	**39**
- percentage	**96.0%**	**78.0%**	**76.0%**	**78.0%**

Source: Ocean Shipping Consultants

Based on these considerations, Vancouver occupies a highly competitive position. Of course, the relative importance of each of these considerations is not equal and it is not possible to provide a definitive quantification of such issues.

However, by ranking the position of Vancouver for each criteria, and comparing these scores with the other ports, a general view of the competitive position can be defined. It is apparent that the overall competitive position of the port is highly positive in relation to its immediate competitors.

SECTION 1 – MACRO-ECONOMIC TRENDS & CONTAINER PORT DEMAND

1.1 Introduction

The future development of container demand will be a function of the following factors:

- The overall scale of demand in the North American markets and specifically demand routed via the Pacific Northwest (PNW) port cluster.
- The competitive position of Vancouver's container terminals.
- The capacity of the terminals to handle containerised cargoes.

The approach taken in this Section is to identify broad developments in container port demand over the longer term and to identify the core driving forces that will determine container volumes at the regional levels in the coming period.

The analysis is structured as follows:

- The development of North American container port demand is detailed for the period since 1990. This is an important perspective as the relative shares of the major port ranges have developed significantly over the period. In the future, further shifts can be anticipated as a result of the Panama Canal development and other factors.
- The links between GDP, trade expansion and container port volumes over the historical study period are defined.
- The development of the West Coast markets – and Vancouver's role in this sector – is considered. General trends are identified.
- The importance of the Asian trades as the primary driver of West Coast demand is detailed. The future of trade volumes here will be a critical determinant of future demand over the longer run.
- The specific development of demand in the Pacific Gateway markets is then considered, with a specific focus on the regional economy and the development of demand in the export sector. The sustainability of recent expansion trends is considered.

This detailed analysis is used to firmly ground the demand forecasts at the overview level that are summarised in Section 2 of this study.

Table 1.1

North America: Container Throughput by Port Range, 1990-2012

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Million TEUs																							
Pacific North	2.77	2.90	3.18	3.24	3.67	3.82	3.88	4.10	4.28	4.62	4.92	4.57	5.28	5.97	6.47	7.07	7.15	7.28	7.13	6.13	7.14	7.13	7.56
US Pacific South	4.99	5.23	5.57	5.80	6.66	6.99	7.28	8.03	9.09	9.96	11.32	11.34	12.40	13.90	15.29	16.60	18.29	18.18	16.56	13.99	16.52	16.49	16.60
Mexican Pacific	0.09	0.12	0.15	0.15	0.16	0.17	0.22	0.30	0.32	0.37	0.48	0.51	0.70	0.77	0.93	1.10	1.56	1.83	2.08	1.85	2.05	2.10	3.24
Pacific	7.84	8.25	8.89	9.20	10.49	10.99	11.37	12.43	13.69	14.95	16.72	16.41	18.38	20.64	22.69	24.76	27.01	27.29	25.77	21.97	25.71	25.73	27.40
Altantic North	4.59	4.53	4.67	4.68	5.04	5.51	5.64	6.05	6.26	6.78	7.14	7.29	7.99	8.58	9.35	10.09	10.59	10.95	10.79	9.29	10.31	10.83	10.97
Atlantic South	2.33	2.58	2.59	2.89	3.25	3.77	4.01	4.42	4.61	4.90	5.19	5.21	5.49	5.85	6.27	6.95	7.20	7.39	7.25	6.36	7.03	6.95	7.51
US Gulf Coast	1.05	1.13	1.17	1.19	1.22	1.19	1.36	1.49	1.47	1.62	1.69	1.70	1.72	1.84	2.07	2.15	2.24	2.53	2.54	2.54	2.61	2.70	2.91
Atlantic/Gulf	7.96	8.24	8.43	8.76	9.51	10.47	11.01	11.96	12.34	13.30	14.02	14.21	15.19	16.27	17.70	19.19	20.03	20.87	20.59	18.19	19.95	20.48	21.39
Total	**15.81**	**16.49**	**17.32**	**17.96**	**20.00**	**21.45**	**22.39**	**24.39**	**26.03**	**28.25**	**30.74**	**30.62**	**33.57**	**36.91**	**40.39**	**43.95**	**47.03**	**48.16**	**46.36**	**40.16**	**45.66**	**46.21**	**48.79**
Per cent share																							
Pacific North	17.5%	17.6%	18.3%	18.1%	18.3%	17.8%	17.3%	16.8%	16.4%	16.4%	16.0%	14.9%	15.7%	16.2%	16.0%	16.1%	15.2%	15.1%	15.4%	15.3%	15.6%	15.4%	15.5%
US Pacific South	31.5%	31.7%	32.2%	32.3%	33.3%	32.6%	32.5%	32.9%	34.9%	35.3%	36.8%	37.0%	36.9%	37.7%	37.9%	37.8%	38.9%	37.7%	35.7%	34.8%	36.2%	35.7%	34.0%
Mexican Pacific	0.6%	0.7%	0.8%	0.8%	0.8%	0.8%	1.0%	1.2%	1.2%	1.3%	1.6%	1.7%	2.1%	2.1%	2.3%	2.5%	3.3%	3.8%	4.5%	4.6%	4.5%	4.5%	6.6%
Pacific	49.6%	50.0%	51.3%	51.2%	52.5%	51.2%	50.8%	51.0%	52.6%	52.9%	54.4%	53.6%	54.8%	55.9%	56.2%	56.3%	57.4%	56.7%	55.6%	54.7%	56.3%	55.7%	56.2%
Altantic North	29.0%	27.4%	26.9%	26.1%	25.2%	25.7%	25.2%	24.8%	24.0%	24.0%	23.2%	23.8%	23.8%	23.2%	23.2%	23.0%	22.5%	22.7%	23.3%	23.1%	22.6%	23.4%	22.5%
Atlantic South	14.7%	15.7%	14.9%	16.1%	16.2%	17.6%	17.9%	18.1%	17.7%	17.4%	16.9%	17.0%	16.3%	15.9%	15.5%	15.8%	15.3%	15.3%	15.6%	15.8%	15.4%	15.0%	15.4%
US Gulf Coast	6.6%	6.9%	6.8%	6.6%	6.1%	5.5%	6.1%	6.1%	5.6%	5.7%	5.5%	5.6%	5.1%	5.0%	5.1%	4.9%	4.8%	5.3%	5.5%	6.3%	5.7%	5.8%	6.0%
Atlantic/Gulf	50.4%	50.0%	48.7%	48.8%	47.5%	48.8%	49.2%	49.0%	47.4%	47.1%	45.6%	46.4%	45.2%	44.1%	43.8%	43.7%	42.6%	43.3%	44.4%	45.3%	43.7%	44.3%	43.8%
Total	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%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Ocean Shipping Consultants

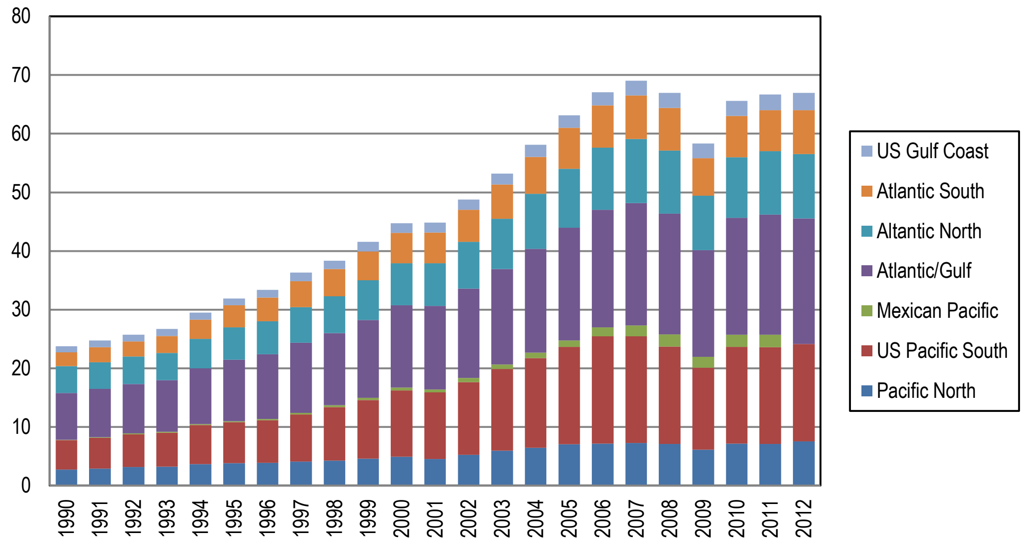
1.2 Overview: North American Container Port Demand Since 1990

Table 1.1 summarises overall demand development since 1990. The developments observed are the following:

- Between 1990/2007 the total volumes of containers handled in North American ports increased by some 205 per cent to reach a peak total of 48.2m TEUs. This equates to a CAGR of around 6.8 per cent;
- Demand then contracted sharply over 2008 and 2009 to a low of 40.2m TEUs. There has since been a recovery to 48.79m TEUs by the end of 2012, surpassing the pre-recessionary volume level of 48.16m TEUs;
- During the period to 2006 there was a steady increase in the market share of Pacific terminals, with this increasing from 49.6 per cent in 1990 to around 57.4 per cent in 2006. This reflected the strong economic position of post-Panamax vessels plus landbridge connections to the east via Pacific terminals.
- The share of PNW ports remained quite stable in the 1990s at between 16-18 per cent of total continental demand, but market share then declined marginally before stabilising since 2006. Recent developments are calling into question the structure of North American container trades. Not only are there clear uncertainties with regard to the future development of demand, the improvement of the Panama Canal will also shift the relative cost structures of serving the Midwest markets. These pressures will be felt most acutely in the Californian ports which will be squeezed between reinvigorated All-Water services and the lower transport costs of the PNW (especially Canadian ports).

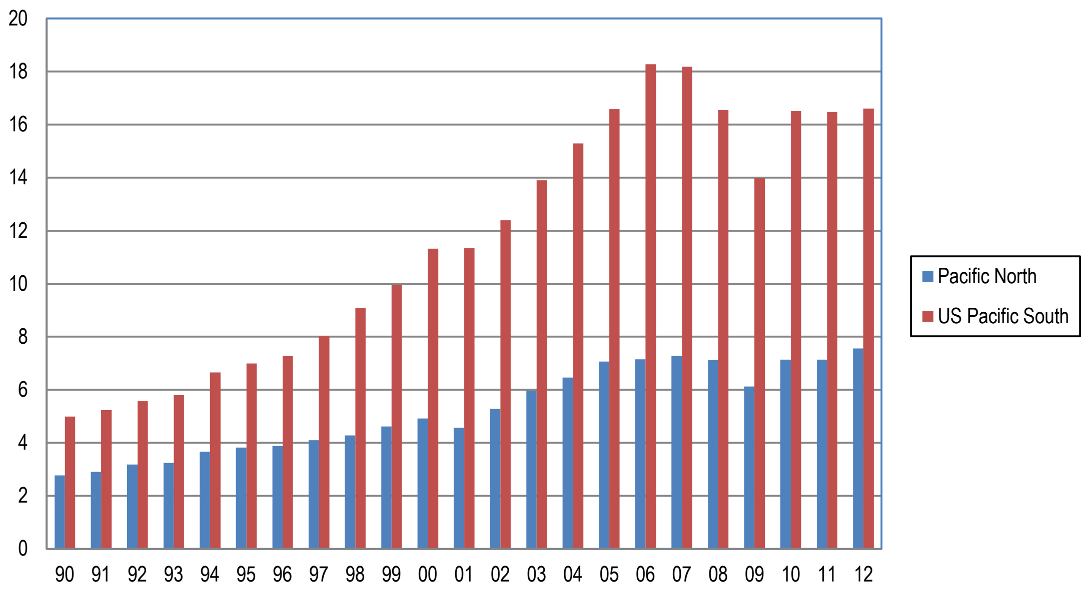
These developments are further detailed in Figure 1.1.

Figure 1.1 - N.American Container Port Demand by Region 1990-2012 - million TEUs



Distribution of container port demand between PNW and California has been fairly uniform. The development of container port demand in the PNW and Californian ports is further summarised in Figure 1.2. It is apparent that the distribution between the two port ranges has been fairly uniform over the period, with Pacific North terminals representing between 28 and 36 per cent of total N.America West Coast container port demand. However, the Californian ports were more severely impacted by the downturn and have yet to recover peak volumes, whereas the Pacific North region has seen more of an upturn to recover beyond pre-2007 recessionary levels.

Figure 1.2 - N.America West Coast Container Port Demand 1990-2012 - million TEUs



Developments at terminal level 2000-2012: shift of market share towards British Columbian ports.

Against this background a more detailed picture of the development of demand on the North American west coast has been derived on a port-specific basis for the period between 1985/2013 and this is summarised in Tables 1.2 and 1.3. This represents a more focused review of demand growth and only includes containers handled by the major continental ports between southern California and British Columbia. Container port demand in Hawaii and Alaska is excluded from the analysis – as these will clearly continue to constitute a separate aspect of the market and will only indirectly influence potential demand at Vancouver.

In 2012, it is estimated that the PNW ports handled some 7.56m TEUs (including domestic containers), of which Vancouver saw its share increase from 35 per cent to 36 per cent, though the continued development of Prince Rupert saw its share also rise, to seven per cent. This port has seen its regional share rise continuously since 2008.

Modest growth in Tacoma and Seattle: loss of market share at Seattle.

On a port-specific basis the position is more complex. After increasing in the early 2000s, demand at Seattle has been stagnant over much of the subsequent period. Volumes handled reached a level of 2.1m TEU in 2005 and have since then mirrored the overall development of the market, with a contraction followed by a recovery. This pattern has been reciprocated at Tacoma, where demand increased sharply in the early part of the period and has since contracted. There is a considerable degree of short term switching by shipping lines between terminals in these two ports.

Aggregated demand at the two ports saw a drop in share for 2012 compared to 2011. In 2011 the collective total was 50 per cent but this declined to 48 per cent by the end of 2012, largely due to Seattle seeing a loss of five per cent.

Strong growth in Vancouver: Double-digit share of regional market in past decade

The position at Vancouver has been far more positive. Total volumes increased from 1.165m TEUs in 2000 to 2.713m TEUs by the end of 2012 – reflecting a CAGR of 7.3 per cent per annum and an increase in regional share of the PNW market from 24 per cent to 36 per cent.

This was a continuation of the trend noted in the later 1990s and the port is now by far the most significant gateway in the PNW. However, the increase in volumes at Prince Rupert in a short period of time should be noted – the port has seen its volumes rise from just under 182,000 TEUs in 2008 to almost 565,000 TEUs by the end of 2012, reflecting a CAGR of 32.9 per cent during this short assessment period.

While the ability to generate this high CAGR was from a very low starting, this port has also a continued rise in its share of the regional PNW, with 2012 now reflective of seven per cent.

Table 1.2

North America Pacific North: Container Throughput by Port, 2000-2012

	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
'000 TEUs																
Seattle	845.0	1171.1	1479.1	1488.3	1315.1	1438.9	1486.5	1775.9	2087.9	1987.4	1973.5	1704.5	1584.6	2139.6	2033.5	1869.5
Tacoma	505.0	937.7	1092.1	1376.4	1320.3	1470.8	1738.1	1797.6	2066.4	2067.2	1924.9	1861.4	1545.9	1455.5	1488.8	1711.1
Vancouver (BC)	178.2	322.6	496.4	1163.2	1146.6	1458.2	1539.1	1664.9	1767.4	2207.7	2307.3	2492.1	2152.5	2514.3	2507.0	2713.2
Prince Rupert	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.7	181.9	265.2	343.4	410.5	564.9
Others	12.3	35.9	80.8	889.3	784.6	911.9	1206.2	1227.8	1144.3	892.0	1057.4	888.3	582.5	687.0	695.0	700.0
Pacific Northwest	**1540.5**	**2467.3**	**3148.4**	**4917.1**	**4566.6**	**5279.8**	**5969.8**	**6466.1**	**7066.0**	**7154.3**	**7279.8**	**7128.1**	**6130.6**	**7139.7**	**7134.8**	**7558.7**
Percentage																
Seattle	55%	47%	47%	30%	29%	27%	25%	27%	30%	28%	27%	24%	26%	30%	29%	25%
Tacoma	33%	38%	35%	28%	29%	28%	29%	28%	29%	29%	26%	26%	25%	20%	21%	23%
Vancouver (BC)	12%	13%	16%	24%	25%	28%	26%	26%	25%	31%	32%	35%	35%	35%	35%	36%
Prince Rupert	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	4%	5%	6%	7%
Others	1%	1%	3%	18%	17%	17%	20%	19%	16%	12%	15%	12%	10%	10%	10%	9%
Pacific Northwest	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

* includes Fraser Port from 2008

Source: Ocean Shipping Consultants

Table 1.3

North America Pacific South: Container Throughput by Port, 2000-2011

	1985	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
'000 TEUs																
Oakland	855.6	1124.1	1549.9	1776.9	1643.6	1707.8	1923.1	2047.5	2272.5	2391.6	2387.9	2236.2	2050.0	2330.2	2360.5	2344.4
San Francisco	107.2	140.4	45.0	50.1	34.6	23.7	20.6	32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern California	**962.8**	**1264.5**	**1594.9**	**1827.1**	**1678.2**	**1731.5**	**1943.7**	**2079.5**	**2272.5**	**2391.6**	**2387.9**	**2236.2**	**2050.0**	**2330.2**	**2360.5**	**2344.4**
Los Angeles	1103.7	2116.4	2555.2	4879.4	5183.5	6105.9	7178.9	7321.4	7484.6	8469.9	8355.0	7850.0	6749.0	7801.0	7820.5	8077.7
Long Beach	1171.5	1598.1	2843.5	4600.8	4463.0	4526.4	4658.1	5779.9	6709.8	7290.4	7312.5	6350.1	5067.6	6263.5	6313.6	6045.7
San Pedro Bay	**2275.2**	**3714.5**	**5398.7**	**9480.2**	**9646.5**	**10632.2**	**11837.1**	**13101.3**	**14194.4**	**15760.3**	**15667.5**	**14200.1**	**11816.6**	**14064.5**	**14134.1**	**14123.4**
Others	0.0	0.0	0.0	16.7	17.2	31.6	117.7	112.3	130.6	135.1	123.7	122.2	121.5	125.5	128.0	130.0
Mexico	25.0	65.0	88.0	477.1	505.5	705.0	774.7	929.4	1095.9	1564.2	1830.4	2078.8	1850.0	2050.0	2121.7	3239.9
Pacific Southwest	**3263.0**	**5044.0**	**7081.6**	**11801.1**	**11847.4**	**13100.3**	**14673.2**	**16222.5**	**17693.5**	**19851.2**	**20009.5**	**18637.3**	**15838.1**	**18570.2**	**18744.3**	**19837.7**
Percentage																
Oakland	26%	22%	22%	15%	14%	13%	13%	13%	13%	12%	12%	12%	13%	13%	13%	12%
San Francisco	3%	3%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Northern California	**30%**	**25%**	**23%**	**15%**	**14%**	**13%**	**13%**	**13%**	**13%**	**12%**	**12%**	**12%**	**13%**	**13%**	**13%**	**12%**
Los Angeles	34%	42%	36%	41%	44%	47%	49%	45%	42%	43%	42%	42%	43%	42%	42%	41%
Long Beach	36%	32%	40%	39%	38%	35%	32%	36%	38%	37%	37%	34%	32%	34%	34%	30%
San Pedro Bay	**70%**	**74%**	**76%**	**80%**	**81%**	**81%**	**81%**	**81%**	**80%**	**79%**	**78%**	**76%**	**75%**	**76%**	**75%**	**71%**
Others	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Mexico	1%	1%	1%	4%	4%	5%	5%	6%	6%	8%	9%	11%	12%	11%	11%	16%
Pacific Southwest	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Ocean Shipping Consultants

Figure 1.3 – Core West Coast Container Port Markets

1.3 North American Economic Development and Container Port Demand

Container trade volumes closely related to overall trade volume, especially manufactured goods. Container trade volumes (and port demand) are directly related to the overall volumes of traded goods – especially in the manufactured sector. This is particularly the case for cargoes imported into North America. In addition, in the case of Vancouver, the important containerised export sector is driven by the pace of demand for primary goods in the developing Far East markets.

In the North American economies there is also found to be a close relation between the year-on-year development of GDP and the annual development of trade volumes. Although short-term forecasting of the development of container trade volumes clearly requires an analysis of specific commodity sectors, the timescale of the current study is more appropriate to an aggregated approach to demand growth.

Economic development and trade: strong expansion of North American GDP between 1992-2007. Table 1.4 summarises the development of Canadian and US economies in the period since 1990. Following the recession of the early 1990s, a period of virtually unprecedented expansion of the economies was recorded in the period to 2007. Even the economic uncertainties of 2001 did not severely impact on the level of economic expansion. Between 1990 and 2007 the size of the US and Canadian economies increased by 66 and 55 per cent, respectively.

The more recent economic downturn represented the first real dislocation of the demand model noted since the 1980s. The US economy declined sharply by around 3.8 per cent between 2007 and 2009, but has since recovered this loss with the upturn continuing into 2012, albeit slowly. The same general pattern was noted in Canada, but the decline was somewhat less severe, namely a decline of 2.1 per cent, as a result of strong commodity exports over the period and growth in 2012 saw the overall improvement continue.

Table 1.4

North America: Overall GDP Development 1990-2012

- indexed development

	USA	Canada
1990	100.0	100.0
1991	99.1	98.1
1992	102.2	99.0
1993	104.9	101.3
1994	109.1	106.0
1995	112.1	109.0
1996	116.1	110.8
1997	121.0	115.3
1998	126.2	118.8
1999	131.5	123.8
2000	136.4	130.2
2001	137.5	132.6
2002	139.7	136.4
2003	143.1	139.0
2004	148.2	143.3
2005	152.8	147.6
2006	156.9	151.8
2007	159.9	155.1
2008	159.4	156.2
2009	153.8	151.8
2010	158.4	156.7
2011	161.1	160.6
2012	164.0	162.7

Source: OECD/IMF

Trade follows GDP developments: contraction of imports between 2007-2009.

The overall scale of total North American trade growth is detailed in Table 1.5. Once again, by basing development on 1990, the volume of trade (real values) is identified for the period[1]. In the US, imports expanded by around 227 per cent between 1990 and 2007 as a result of the process of manufacturing relocation to China and a strong consumer boom. The economic downturn was reflected in a contraction of imports of some 16 per cent between 2007-2009, with this directly reflecting the downturn in Transpacific container flows. This pattern was also noted with regard to Canada, and here the downturn was somewhat more restricted at around 12 per cent. The scale of the import boom has been less pronounced in Canada than it has been in the US.

[1] This run of data relates to the total real value of trade in goods and services. This is seen to be a useful indicator when considering the spectrum of containerised goods flows in the aggregate.

Rebalancing of divergence between imports and exports expected.
The other important trend has been the divergence between imports and exports, as shown in Table 1.5. The former have driven overall demand growth, but there has been a recent increase in the volume of exports, with this reflecting continuing strong demand from the Asian importers and also a limited rebalancing of relative costs. Over the longer term a further rebalancing can be anticipated, with this impacting on container logistics in the PNW and broader markets.

Table 1.5

North America: Trade Volume Development 1990-2012

- indexed development

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	208	2009	2010	2011	2012
USA																							
- Exports	100	106	113	117	127	140	152	171	174	185	208	207	213	224	249	270	294	318	330	292	332	356	378
- Imports	100	99	106	116	129	140	152	173	193	215	243	236	244	255	283	301	319	327	318	275	309	324	343
Canada																							
- Exports	100	102	110	122	138	151	160	173	187	207	234	229	237	248	276	294	314	325	321	280	315	332	352
- Imports	100	103	110	118	128	135	143	164	174	187	202	192	195	203	220	235	247	262	265	230	260	279	293

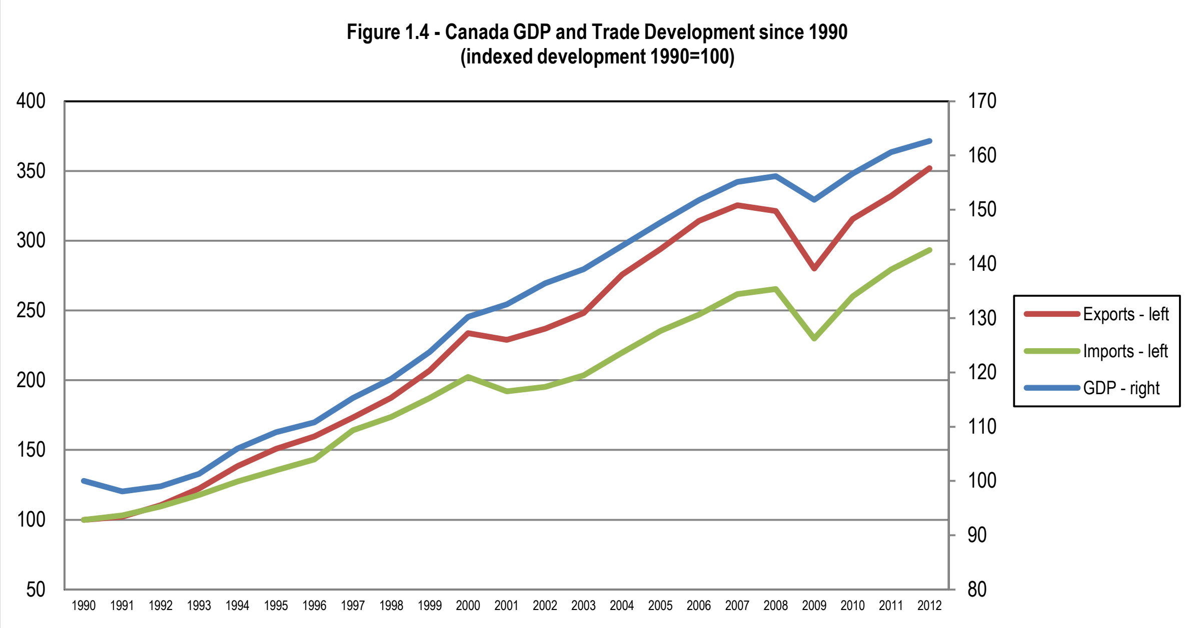
Source: OECD/Ocean Shipping Consultants

For containerisation the effects of these developments have been primarily:

- A very rapid increase in demand which has placed severe pressures on each stage of the distribution chain.
- In the US, a severe worsening of the balance of trade with this generating severe difficulties for the repositioning of empty containers.
- An assumption that demand will continue to expand at historic rates, with this leading to over-investment in shipping and terminal capacity.

The close relation between GDP and trade volumes in the Canadian economy is further underlined in graphic terms in Figures 1.4.

The development of trade is seen to be highly susceptible to macro-economic uncertainties. This was noted to a limited degree over 2000-2001 and in a much more far-reaching manner in the 2007-2009 period. The speed of recovery from such downturns is also apparent. The general upturn from 2010 onwards is also noteworthy, with 2012 levels surpassing pre-recessionary levels, reflected by container volume and trends over the same period of time.



Regional Economic Development: strong growth in western US and Canadian regional hinterland economies at the expense of the Northeast and Central regions.
There have been considerable differences recorded in the regional development of the US and Canadian economy and these are summarised in Table 1.6. This data collates returns from the US Bureau of Economic Analysis (BEA) and Statistics Canada that records the economic activity of each of the states and regions of the US. The collation of this data represents a major undertaking and the most recent comprehensive data is limited to 2010. Subsequent estimates have been made on the basis of overall economic expansion and reports from major individual states. Whilst this approach has its limitations, it is felt that this provides an effective means of analysis of GDP progress in the major existing and potential Vancouver hinterlands.

In order to make a true analysis feasible inflation has been excluded from the analysis and the data is quantified in terms of constant US dollars. It is not the absolute development of the economy that is of interest here but, rather, the contribution of each region and their changing importance.

The data has been assessed in terms of the regions/hinterlands that are of primary significance for PSW and PNW ports. Accordingly, local markets have been defined for California and Washington/Oregon and the category 'other west' includes all other demand from the US western region. Other regions utilise the broad definitions of the US BEA.

In terms of proportional developments, several trends are of direct relevance to the current study:

- The western states have progressively increased their share of the total US economy over the period. A similar pattern has been noted in the western provinces of Canada.
- This has been at the expense of the more established economic regions of the Midwest and the Northeast which have seen their shares decline despite strong economic growth.

Despite the increasing importance of the immediate Pacific hinterland markets, it is also important to note that the overall development of continental demand remains focused on the major central and eastern markets. Although local demand will remain very important for the foreseeable future, for the PNW it will be the economics of serving these distant markets (by landbridge) that remains of central importance in the overall development of potential demand.

Table 1.6

USA and Canada: Gross Domestic Product by Region (Current Prices), 1996-2012

	1996	1997*	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
US$bn (current)																	
British Columbia																	
Other West Canada~	197	205	194	205	235	231	233	284	332	392	408	421	427	419	432	455	481
East Canada	417	432	424	456	490	484	503	586	661	738	755	771	770	733	755	769	801
California & Hawaii	1011	1057	1123	1219	1327	1343	1384	1457	1569	1683	1787	1864	1911	1841	1896	1930	2014
Al'sk,/Org'n/Wshgt'n	279	300	320	343	361	363	378	392	424	450	484	513	532	539	555	565	592
Rockies plus Nevad	285	312	332	358	387	403	416	440	478	517	556	589	614	599	617	627	661
Great Lakes/Plains	1760	1910	2000	2084	2175	2214	2300	2402	2523	2602	2701	2815	2894	2798	2883	2918	3018
US Northeast	1911	2010	2111	2225	2358	2460	2526	2624	2796	2954	3134	3284	3391	3322	3422	3483	3625
US Southeast	1684	1798	1902	2023	2115	2203	2289	2410	2593	2782	2959	3069	3148	3068	3160	3216	3358
US Southwest	785	852	892	950	1026	1073	1105	1172	1273	1386	1508	1606	1699	1646	1696	1726	1819
Total USA	**7716**	**8238**	**8680**	**9201**	**9749**	**10058**	**10398**	**10896**	**11655**	**12339**	**13091**	**13716**	**14166**	**13797**	**14211**	**14452**	**15086**
Canada	**614**	**637**	**617**	**661**	**725**	**716**	**736**	**871**	**993**	**1130**	**1163**	**1192**	**1197**	**1167**	**1204**	**1235**	**1282**
USA & Canada	**8330**	**8875**	**9297**	**9862**	**10474**	**10774**	**11134**	**11767**	**12649**	**13533**	**14254**	**14908**	**15362**	**14964**	**15415**	**15687**	**16368**
Per Cent Share																	
West Canada~	2.4	2.3	2.1	2.1	2.2	2.1	2.1	2.4	2.6	2.9	2.9	2.8	2.8	2.8	2.8	2.9	2.9
East Canada	5.0	4.9	4.6	4.6	4.7	4.5	4.5	5.0	5.2	5.5	5.3	5.2	5.0	4.9	4.9	4.9	4.9
California & Hawaii	12.1	11.9	12.1	12.4	12.7	12.5	12.4	12.4	12.4	12.4	12.5	12.5	12.4	12.3	12.3	12.3	12.3
Al'sk,/Org'n/Wshgt'n	3.4	3.4	3.4	3.5	3.5	3.4	3.4	3.3	3.3	3.3	3.4	3.4	3.5	3.6	3.6	3.6	3.6
Rockies plus Nevad	3.4	3.5	3.6	3.6	3.7	3.7	3.7	3.7	3.8	3.8	3.9	3.9	4.0	4.0	4.0	4.0	4.0
Great Lakes/Plains	21.1	21.5	21.5	21.1	20.8	20.5	20.7	20.4	19.9	19.2	18.9	18.9	18.8	18.7	18.7	18.6	18.4
US Northeast	22.9	22.6	22.7	22.6	22.5	22.8	22.7	22.3	22.1	21.8	22.0	22.0	22.1	22.2	22.2	22.2	22.1
US Southeast	20.2	20.3	20.5	20.5	20.2	20.4	20.6	20.5	20.5	20.6	20.8	20.6	20.5	20.5	20.5	20.5	20.5
US Southwest	9.4	9.6	9.6	9.6	9.8	10.0	9.9	10.0	10.1	10.2	10.6	10.8	11.1	11.0	11.0	11.0	11.1
USA	92.6	92.8	93.4	93.3	93.1	93.4	93.4	92.6	92.1	91.2	91.8	92.0	92.2	92.2	92.2	92.1	92.2
Canada	7.4	7.2	6.6	6.7	6.9	6.6	6.6	7.4	7.9	8.4	8.2	8.0	7.8	7.8	7.8	7.9	7.8
USA & Canada	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	100.0

Figures may not sum exactly due to rounding, including estimates due to lack of full information available

* Discontinuity in US data in 1997, due to change from SIC industry definitions to NAICS industry definitions

~ British Columbia east to Manitoba, Yukon, NW Territories

Sources: US Bureau of Economic Analysis, Statistics Canada. Includes estimates

Macro-Economic Trends and Container Port Demand

The GDP trend functions as the main indicator for trade developments.
The relationship between the expansion of the North America economies and the level of trade is fundamental to the analysis of recent developments and future prospects. There are, obviously, limits to the ultimate expansion of container trade volumes, but it is unlikely that demand saturation will affect the North American markets over the timeframe of this study.

A close relation is found to exist between the development of regional GDP, total trade volumes and container port demand. In most regions and throughout the period under review, the variables have moved broadly in tandem and, indeed, the link was seen to be sustained during the recent contraction and subsequent recovery.

Given the timescale of the current analysis, it is also necessary to remark upon the penetration of containerisation into general cargo trade. Although by the late 1970s the role of containers was already firmly established on the major long-haul trades (Transatlantic and Transpacific), the overall penetration of containerisation remained limited on other secondary trades. At the outset of the study period, container trade volumes were being further boosted by the conversion of conventional liner trade to containers. This resulted in an additional layer of demand growth over and above that indicated by the progress of total trade. There is little scope for further conversion for import cargoes, but additional containerisation of local export commodities will further boost demand.

The indexed development of North American trade volumes and container port demand since 1990 is detailed in Figure 1.5. There is seen to have been a very close relation between these two variables over the period and this has remained highly robust even during periods of economic downturn.

Figure 1.5 - N.America Trade and Container Port Indices

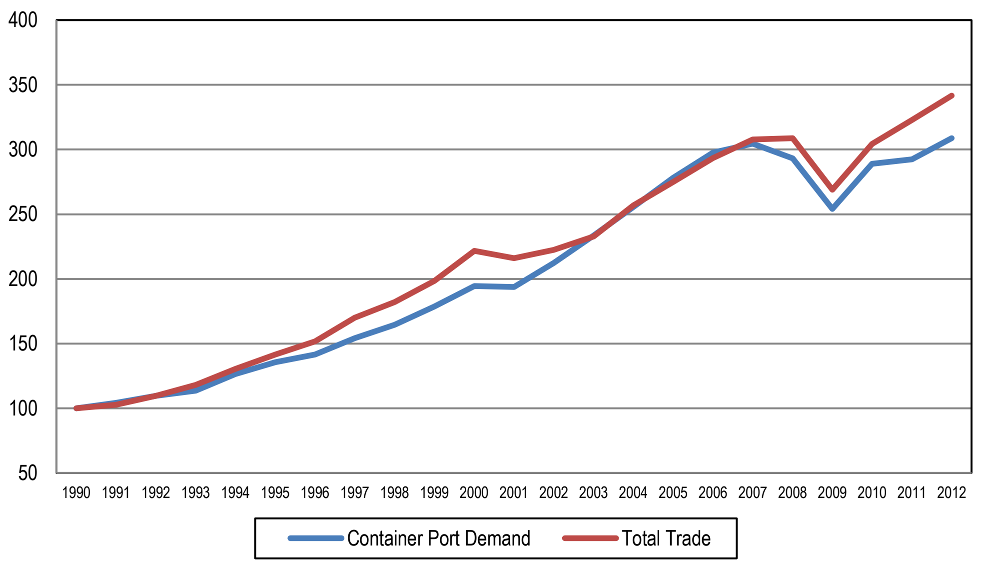


Table 1.7
North America: Real GDP Growth and Container Port Demand Growth , 1991-2012
- annual real % change

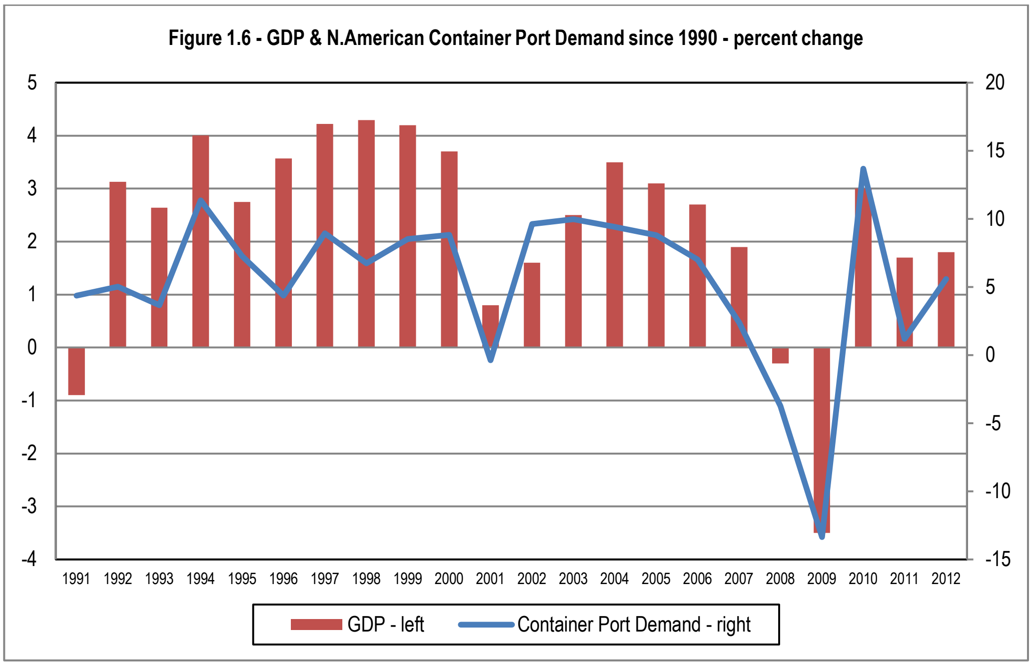
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
GDP - A	-0.9	3.1	2.6	4.0	2.7	3.6	4.2	4.3	4.2	3.7	0.8	1.6	2.5	3.5	3.1	2.7	1.9	-0.3	-3.5	3.0	1.7	2.0
Port demand - B	4.4	5.0	3.7	11.4	7.3	4.4	8.9	6.7	8.5	8.8	-0.4	9.6	10.0	9.4	8.8	7.0	2.4	-3.7	-13.4	13.7	1.2	5.6
Ratio (A/B)	-4.8	1.6	1.4	2.8	2.6	1.2	2.1	1.6	2.0	2.4	-0.5	6.0	4.0	2.7	2.8	2.6	1.3	12.5	3.8	4.6	0.7	2.8

Average Ratio 1991-2012 = 1 : 2.56
Average Ratio 2000-2012 = 1 : 3.80

Sources: IMF & derivation from IMF, US Bureau of Economic Analysis & Statistics Canada
Ocean Shipping Consultants

North American trade continues to respond to GDP changes in 2012.
Table 1.7 employs national economic statistics to contrast the growth of the combined GDPs of the USA and Canada with the growth in container port demand in those countries since 1991. These analyses help to show that container port demand has consistently replicated the overall GDP trends over the period, though it does also include periods of negative development, such as during 2008 and 2009.

In addition to direct, trade-related factors, container port demand has also been boosted by the continuing containerisation of general cargoes in developing markets and of backhaul bulk cargoes in developed markets, as well as by transshipment demand (although transshipment is of marginal importance in the North American markets). These factors, and others discussed below, mean that the relationship between output growth and container port demand growth is not clear-cut. However, as Figure 1.6 indicates, correlation has been evident and is expected to continue moving forward.



Forecasting trade growth in relation to the economy's structure and data limitations.
The economic relation between GDP growth and trade growth is very useful in forecasting the development of the containerised sector. However, this underlying relationship is not a sufficient explanation of the growth in container port demand. There are numerous other factors at work, and the limitations of economic data (which are often revised) and container handling statistics further complicate the picture.

Some other factors affecting the development of container port demand, and issues relating to the measurement and comparison of output growth and container port demand growth include:

- In addition to imports and exports, container throughput also includes empty containers, moving which is part of a port's business, but they do not represent cargo actually being traded. The proportion of empty containers within a port's throughput can vary significantly.

- Transshipment trebles the number of port moves per container (and hence the TEU count), but again it does not represent additional cargo.

- The increasing penetration of containerisation is a significant factor in developing markets, although less so in developed markets, where the containerisation of general cargoes is more or less at saturation level. However, an imbalance of loaded inbound and outbound containers (notably, between North America and the Far East) means that shippers continually search for more cargo to containerise on return legs of voyages. This has led to the increasing use of containers in cargo sectors that were not historically regarded as suitable for containerisation – for example forest products, iron and steel scrap, and waste paper.

- Containerisation itself generates trade, by making it easy to transport goods cheaply over considerable distances.

- Container throughput is quantified in volume terms and output is measured in value terms, so the two measures are not directly comparable. In recent years, the volume of containerised cargo has increased more rapidly than its real value, due to factors such as the fall in price of electronic goods.

- There are also significant economic relationships which modify the underlying link between economic growth and trade growth. These include fluctuations in the relative propensities to consume or save, to import or purchase domestically, to export or sell domestically, all mediated by relative movements in prices, incomes, exchange rates, tastes, confidence and other factors.

- In addition to the limitations of available economic data, there are lags in the economy between causes and their effects, so that it is not always clear which periods should be compared when different aspects of economic development (such as output and trade) are contrasted.

- OSC generally uses the container handling statistics published by ports themselves. Whilst every effort is made to employ comparable statistics, on inspection it is found that the methods of calculation can differ between ports and distort the data. Furthermore, ports may not distinguish clearly between different elements of throughput. Not all ports record transshipment (and few distinguish between hub-and-spoke and relay).

Despite the numerous factors – which need to be built into, or allowed for in the interpretation of, forecasts – the generation of trade through economic growth provides the most rational foundation for predicting the future direction and scale of import/export container handling demand.

Detailed analysis of the historical multiplier values provides the basis for the multiplier forecasts.

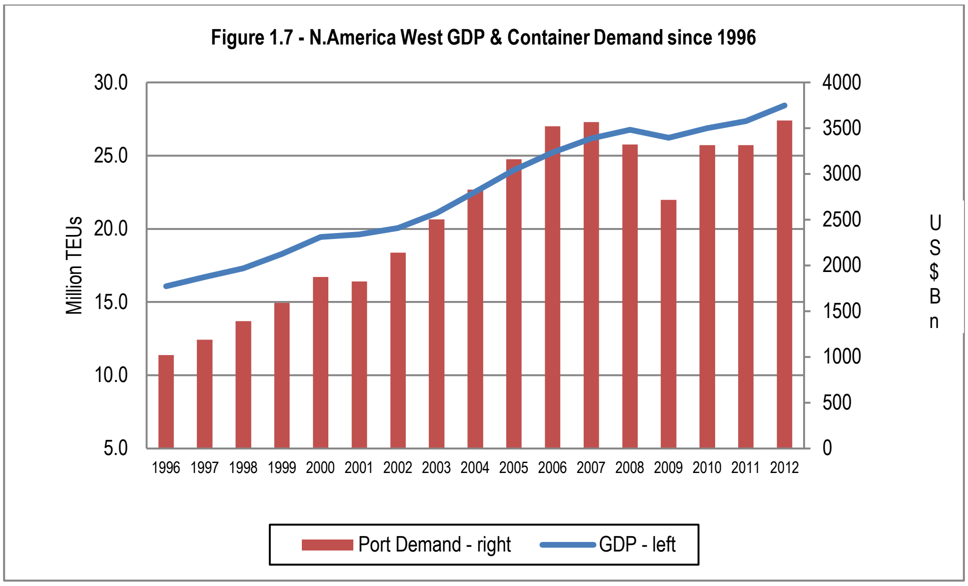
For the purposes of the medium term development of forecasts direct relation between GDP and container port volumes is of central importance. Throughout the period the relation between economic expansion and the level of containerised imports and exports is firmly grounded, although it is apparent that there has been some decline in the intensity of this relation for the reasons detailed.

The ratio between North American container port demand and GDP development on an annual basis for the period since 1985 has been calculated. These relations are of central importance in understanding the development of the overall port market and it is necessary to identify trends for the period. These may be summarised as follows:

- 1985-1990 1 : 1.98
- 1990-1995 1 : 2.73
- 1995-2000 1 : 1.96
- 2000-2005 1 : 3.04
- 2005-2012 1 : 1.90

With some exceptions, the trend has been one of a declining intensity. It is important to note that the period between 2000-2005 recorded a very intense relation. This was the result of strong economic expansion and the acceleration of the 'China Effect' with very strong demand growth. To some extent this is a one-off adjustment and a gradual decline in the intensity of the link is anticipated over the medium term.

In order to further illustrate this relation Figure 1.7 relates the development of container port demand in the West Coast of North America, with the overall development of container demand in the western region of the continent. This offers only a partial picture of the hinterlands of the Pacific ports, but once again, the nature of the relation is well illustrated.



Regional Hinterlands and Container Port Demand.

An analysis has been undertaken that helps to better define the development of North American hinterlands for each port region under review. This complex analysis has been defined on the basis of regional economic development as considered in this Section and also on the basis of partial inland distribution data maintained by the major container ports and terminals. Although the analysis requires a degree of estimation – and gathers data from a variety of (sometimes inconsistent) sources – this represents a useful analysis of demand growth and hinterland structures.

These analyses have been undertaken on a five-yearly basis for the period since 1995, with an indication for the position in 2012 in order to provide a degree of dynamic to the analyses. These analyses are detailed in Tables 1.8-1.12.

The data provides an important evaluation of the relative importance of various hinterlands within the overall North American container port market.

Table 1.8

Estimated Container Flows by Region and Port Range 1990

mTEUs

	Port Range				
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific North	Total
West Canada	0.00	0.00	0.00	0.32	0.32
East Canada	0.70	0.00	0.00	0.05	0.76
California	0.00	0.00	1.82	0.17	1.99
Washington/Oregon	0.00	0.00	0.07	0.38	0.44
Other West	0.00	0.00	0.13	0.09	0.22
Rocky Mountains	0.00	0.00	0.21	0.17	0.38
Plains/Great Lakes	0.27	0.17	1.64	1.17	3.25
Northeast	3.61	0.00	0.29	0.02	3.93
Southeast	0.00	2.32	0.58	0.22	3.12
Southwest	0.00	0.89	0.34	0.18	1.41
Total	4.59	3.38	5.08	2.77	15.82

Source: Ocean Shipping Consultants

Table 1.9
Estimated Container Flows by Region and Port Range 1995

mTEUs

	Port Range				
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific North	Total
West Canada	0.00	0.00	0.00	0.48	0.48
East Canada	0.72	0.00	0.00	0.12	0.84
California	0.00	0.00	2.23	0.16	2.39
Washington/Oregon	0.00	0.00	0.04	0.62	0.66
Other West	0.00	0.00	0.25	0.04	0.29
Rocky Mountains	0.00	0.00	0.41	0.16	0.57
Plains/Great Lakes	0.34	0.20	2.22	1.80	4.55
Northeast	4.45	0.00	0.63	0.04	5.12
Southeast	0.00	3.41	0.71	0.41	4.53
Southwest	0.00	1.35	0.67	0.00	2.03
Total	5.51	4.96	7.16	3.82	21.45

Source: Ocean Shipping Consultants

Table 1.10

Estimated Container Flows by Region and Port Range 2000

mTEUs

	Port Range				
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific North	Total
West Canada	0.00	0.00	0.00	0.51	0.51
East Canada	0.91	0.00	0.00	0.64	1.55
California	0.00	0.00	3.81	0.00	3.81
Washington/Oregon	0.00	0.00	0.14	0.83	0.97
Other West	0.00	0.00	0.36	0.07	0.43
Rocky Mountains	0.00	0.00	0.63	0.27	0.90
Plains/Great Lakes	0.67	0.36	3.72	1.78	6.53
Northeast	5.55	0.00	1.12	0.19	6.86
Southeast	0.00	4.63	0.98	0.58	6.19
Southwest	0.00	1.89	1.04	0.05	2.98
Total	7.14	6.88	11.80	4.92	30.74

Source: Ocean Shipping Consultants

Table 1.11
Estimated Container Flows by Region and Port Range 2005

mTEUs

	Port Range				
	North Atlantic	S.Atlantic/Gulf	Pacific South	Pacific North	Total
West Canada	0.00	0.00	0.00	0.74	0.74
East Canada	1.29	0.00	0.00	0.92	2.21
California	0.00	0.00	5.71	0.00	5.71
Washington/Oregon	0.00	0.00	0.21	1.19	1.40
Other West	0.00	0.00	0.54	0.10	0.64
Rocky Mountains	0.00	0.00	0.95	0.39	1.34
Plains/Great Lakes	0.95	0.48	5.58	2.55	9.56
Northeast	7.85	0.00	1.68	0.27	9.80
Southeast	0.00	6.12	1.47	0.84	8.43
Southwest	0.00	2.50	1.56	0.07	4.13
Total	10.09	9.10	17.70	7.07	43.96

Source: Ocean Shipping Consultants

Table 1.12

Estimated Container Flows by Region and Port Range 2012

mTEUs

	Port Range				
	North Atlantic	**S.Atlantic/Gulf**	**Pacific South**	**Pacific North**	**Total**
West Canada	0.00	0.00	0.00	0.77	0.77
East Canada	1.32	0.00	0.00	0.93	2.38
California	0.00	0.00	5.99	0.00	6.35
Washington/Oregon	0.00	0.00	0.22	1.20	1.51
Other West	0.00	0.00	0.56	0.10	0.71
Rocky Mountains	0.00	0.00	1.00	0.39	1.49
Plains/Great Lakes	0.97	0.51	5.85	2.58	10.51
Northeast	8.02	0.00	1.76	0.28	10.56
Southeast	0.00	6.49	1.54	0.85	9.32
Southwest	0.00	2.64	1.64	0.07	4.57
Total	10.31	9.64	18.57	7.14	48.17

Source: Ocean Shipping Consultants

PNW ports serve both the immediate hinterland as well as the more distant central hinterlands. In general terms, it is apparent that the PNW port market has recorded significant expansion and development in the period since 1990. At the outset of the study period the immediate geographical hinterland (western Canada and Washington/Oregon) accounted for an estimated 25.9 per cent of regional port demand. The more distant western region generated a further 22.3 per cent of demand. Some significant trends have since been noted in the period to 2012 in the distribution of the regional hinterlands:

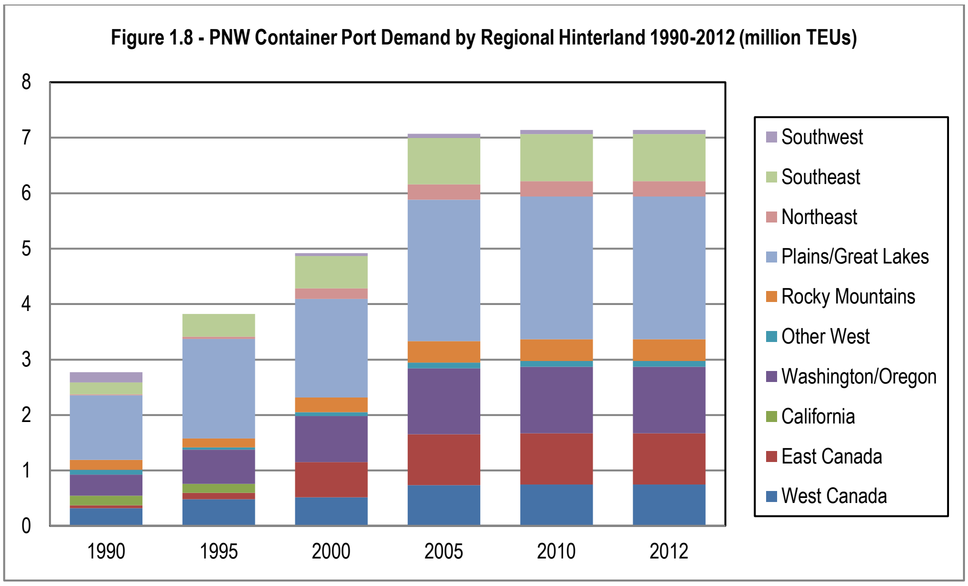
- The market share of the immediate market (western Canada and Washington/Oregon) has increased from a combined total of 2.14m TEUs in 2010 to 2.29m TEUs, with this reflecting the stronger economic development of this region and the declining importance of Californian ports in serving these markets as alternative shipping services have developed to PNW ports.

- The 'distant western' region rapidly declined in importance in the early 1990s, with this demand being increasingly met via PSW ports. In addition, these markets remain of limited overall magnitude.

The major central continental markets were already of some significance to PNW port demand in the early 1990s, although the role of Vancouver was far less important than that of the neighbouring US ports. These markets have increased in proportional terms and it can be concluded that terminals in the PNW region are increasingly serving the entire continental hinterland.

Therefore, over the study period the economic reach of the PNW ports has continued to be extended. Although competition with Californian ports remains intense, it is apparent that the economics of using these terminals has significantly improved in recent years. This underlines the potential for additional expansion at Vancouver.

The importance of various hinterland regions for the PNW is detailed in Figure 1.8.



1.4 The Asia-North America Container Trades

Decline in market share of Pacific South terminals for Asia-North America container trades (2001-2012) at the benefit of Atlantic and Gulf ports

Table 1.13 summarises the distribution of North American containerised imports from Asia among port ranges. The share of the Pacific South range declined from a high of 62.6 per cent in 2001 to 53.3 per cent in both 2009 and 2010. Some limited recovery was noted in 2011 when market share reached 56 per cent, which was replicated again in 2012. The decline was initially driven by a lack of port capacity and resulting congestion, but remedial measures have since been introduced. The decline also reflected the gradual erosion of the cost advantages of the West Coast option as intermodal and stevedoring charges have increased. The situation is somewhat obscured by the recent downturn, but it is apparent that in the medium term the level of competition between the major routings will further intensify.

The reduction in the share of this trade across the Pacific seaboard has been reciprocated by an increase in all-water transportation through both the Panama and Suez Canals, to the benefit of the Atlantic and Gulf port ranges. The share of containerised US imports from Asia handled at Atlantic and Gulf coast ports rose from 22 per cent in 2000 to a peak of 32.1 per cent in 2009 and 2010 and maintained thereafter.

Impact caused by increased West Coast stevedoring and intermodal costs, as well as improved facilities along US East and Gulf coasts

The attractiveness of the All-Water options to the US East and Gulf coasts has also been boosted by expansions in marine terminal capacity on these coasts and the establishment of distribution centres for retailers and importers. In addition, harbour deepening programmes to allow access to larger vessels and crucial improvements to the intermodal rail and barge infrastructure and services linking East and Gulf-coast ports with markets in the Midwest are also improving the position. The position at the Pacific Northwest has been one of a generally maintained market share in the past ten years at 14-15 per cent of total demand, as evident in 2012.

Pacific Northwest imports show an increasing importance of the Canadian terminals.

Total levels of recent containerised imports into the Pacific Northwest (US and Canadian ports) have fluctuated in line with market uncertainties, but the proportional importance of Canadian terminals has increased in line with strong demand from Vancouver and the developing position of Prince Rupert.

The Pacific Southwest (the range of ports from Oakland south to the major Mexican transit terminals) has also been highly volatile, with the role of Mexican ports increasing their share at the margin.

Table 1.13

Canada and US: Containerised Imports from Asia by Port Range, 1994-2012

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Million tonnes																			
Pacific North	5.86	5.92	5.08	5.29	6.53	6.96	6.95	6.20	7.16	8.13	9.59	10.96	12.26	12.40	11.46	10.13	11.40	11.96	12.44
US Pacific South	15.53	15.80	16.81	18.23	22.29	24.82	27.39	27.75	30.86	33.39	37.75	42.89	46.66	45.88	42.52	36.97	41.59	42.87	45.44
Pacific	**21.39**	**21.72**	**21.88**	**23.52**	**28.82**	**31.78**	**34.34**	**33.95**	**38.02**	**41.52**	**47.34**	**53.85**	**58.92**	**58.28**	**53.97**	**47.10**	**52.98**	**52.44**	**55.06**
US Atlantic South	2.29	2.50	2.51	3.10	3.95	4.30	4.64	4.83	6.31	7.53	8.62	9.93	11.47	11.96	11.18	9.75	10.97	10.25	11.17
Altantic North	3.25	3.39	3.06	3.52	4.04	4.52	4.77	5.04	6.57	7.16	9.13	10.50	12.16	12.71	12.05	10.76	12.11	13.66	14.89
US Gulf Coast	0.17	0.22	0.19	0.26	0.37	0.47	0.53	0.38	0.37	0.56	1.28	1.45	1.56	1.52	1.55	1.71	1.93	2.02	2.34
US Atlantic/Gulf	**5.71**	**6.11**	**5.76**	**6.88**	**8.36**	**9.28**	**9.94**	**10.26**	**13.25**	**15.24**	**19.04**	**21.87**	**25.19**	**26.19**	**24.78**	**22.23**	**25.00**	**24.15**	**26.32**
Total	**27.09**	**27.83**	**27.64**	**30.40**	**37.18**	**41.06**	**44.28**	**44.21**	**51.27**	**56.76**	**66.38**	**75.72**	**84.11**	**84.47**	**78.75**	**69.33**	**77.99**	**76.59**	**81.19**
Per cent share																			
US Pacific North	22%	21%	18%	17%	18%	17%	16%	14%	14%	14%	14%	14%	15%	15%	15%	15%	15%	16%	15%
US Pacific South	57%	57%	61%	60%	60%	60%	62%	63%	60%	59%	57%	57%	55%	54%	54%	53%	53%	56%	56%
US Pacific	**79%**	**78%**	**79%**	**77%**	**78%**	**77%**	**78%**	**77%**	**74%**	**73%**	**71%**	**71%**	**70%**	**69%**	**69%**	**68%**	**68%**	**68%**	**68%**
US Atlantic South	8%	9%	9%	10%	11%	10%	10%	11%	12%	13%	13%	13%	14%	14%	14%	14%	14%	13%	14%
US Altantic North	12%	12%	11%	12%	11%	11%	11%	11%	13%	13%	14%	14%	14%	15%	15%	16%	16%	18%	18%
US Gulf Coast	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	3%	3%
US Atlantic/Gulf	**21%**	**22%**	**21%**	**23%**	**22%**	**23%**	**22%**	**23%**	**26%**	**27%**	**29%**	**29%**	**30%**	**31%**	**31%**	**32%**	**32%**	**32%**	**32%**
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Sources: US Maritime Administration
Ocean Shipping Consultants

1.5 Economic Drivers – key Vancouver hinterlands

With increasing containerised cargoes shipped to/from eastern Canada and the US Midwest, demand at Vancouver has been declining from the regional economy. Attention is now directed towards the development of the economy in the region under review.

Canada overview: average annual GDP growth of 1.8 per cent (2000-2012).
In 2012, the Gross Domestic Product (GDP) of Canada was approximately $1,658 Billion in 2002 dollars, an increase of 1.8 per cent from 2011. From 2000 to 2012, the Canadian economy grew at an average annual growth rate of 1.9 per cent. While the economy steadily grew from 2000 to 2007, it contracted in 2008 and 2009 due to the global economic recession. However, in 2010 the national economy picked up again by 3.1 per cent, before growing by a further 2.6 per cent in 2011 and 1.8 per cent in 2012.

The development of the western Canadian economy since 2000 is detailed in Table 1.14.

Table 1.14
Western Canada GDP Development 2000-2012
constant 2002 million C$

	British Columbia		Alberta		Saskatchewan		Manitoba		Total	
	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change
2000	131355	0%	143252	0%	35160	0%	35476	0%	345243	0%
2001	133508	2%	147126	3%	34370	-2%	35778	1%	350782	2%
2002	138193	4%	150594	2%	34343	0%	36559	2%	359689	3%
2003	141312	2%	155670	3%	36074	5%	37090	2%	370146	3%
2004	146562	4%	163864	5%	37939	5%	37752	2%	386117	4%
2005	153195	5%	172202	5%	39179	3%	38603	2%	403179	4%
2006	159419	4%	182215	6%	38176	-3%	40103	4%	419913	4%
2007	164386	3%	185937	2%	39304	3%	40871	2%	430498	3%
2008	164543	0%	187819	1%	40866	4%	41975	3%	435203	1%
2009	162215	-1%	184017	-2%	40333	-1%	42485	1%	429050	-1%
2010	165792	2%	189940	3%	41424	3%	43453	2%	440609	3%
2011	170599	3%	199817	5%	43412	5%	43931	1%	457760	4%
2012	173499	2%	207610	4%	44367	2%	45117	3%	470593	3%

Source: Statistics Canada: Provinces and territories

Full year 2012 data for individual regions in Canada was not available at the time of writing this June 2013 Update report.

British Columbia represents 12.6 per cent of the Canadian economy with an average annual GDP growth of 2.4 per cent (2000-2011).
British Columbia is the fourth largest regional economy in Canada after Ontario, Quebec and Alberta with a GDP of $170,600 million in 2011 (in 2002 dollars), a 2.9 per cent increase in 2011, and accounting for 12.6 per cent of the total national economy. Over the last decade from 2000 to 2011, BC's economy grew at an average annual growth rate of 2.4 per cent.

Approximately 78 per cent of BC workers are employed in the service industries while the remainder are employed in the manufacturing, construction and resources. In the service sector, finance, insurance, real estate & leasing is the largest component, accounting for 31 per cent of the service sector GDP and 24 per cent of total GDP.

BC's economy includes manufacturing industries, construction sector and resource extraction sector.
BC's manufacturing industry is still dominated by processing natural resources harvested or extracted in the province such as canning salmon, processing fruits and berries, producing lumber and paper, and smelting and refining ores. However, a growing share of BC's manufacturing industry is dealing with many different types of activities, such as shipbuilding, building aircraft parts, manufacturing signs, or manufacturing plastics. BC firms also produce vitamins and health care products, computers and electronic products, and other types of goods.

Manufacturing accounts for a 40 per cent of all non-service sector GDP, followed by the construction sector which contributes 27 per cent. Resources and resource extraction are also major components of the BC economy. The largest component is the forestry industry, followed by mining. Approximately half of the softwood lumber produced in Canada comes from BC. Forestry industry products are also the province's most important export commodity. However, the forestry sector has faced many challenges in recent years such as the downturn in US housing, the mountain pine beetle epidemic and lower prices for forestry products.

Prairies represent 21.3 per cent of the Canadian economy with an average annual GDP growth of 2.2 per cent (2000-2011).
The Canadian prairies consist of Alberta, Saskatchewan and Manitoba. In 2011, Alberta was the third largest economy in Canada, contributing 14.8 per cent to the total national economy, reaching a GDP of $199.8bn (in 2002 dollars) as illustrated in Table 1.16. Saskatchewan and Manitoba reached a provincial GDP of $43.3bn and $43.9bn in 2011, respectively, thus representing 3.2 and 3.3 per cent of the national economy.

Prairies are natural resource based economies, including oil, gas, agriculture and forestry.
The economy in Alberta boomed from 2004 to 2006, accounting for annual GDP growth rates of more than 5 per cent and reaching almost 6 per cent in 2006. Over the last decade from 2000 to 2011, Alberta's economy grew at an average annual growth rate of 3.1 per cent. Due to the global economic recession, the economy contracted in 2009 by 2 per cent but picked up again in 2010 by 3.2 per cent. In 2011, GDP grew at 5.2 per cent which was the strongest economic performance among the all Canadian provinces and territories.

In Alberta, natural resources such as oil sands (for example in Fort McMurray) and other forms of oil production are major economic drivers. This also supports related industries such oil refinement and processing. Overall in 2010, the energy sector accounted for 26 per cent of total GDP in Alberta, followed by the finance and real estate sector with almost 15 per cent according to Statistics Canada and Alberta Treasury Board and Enterprise. Not surprisingly, Alberta's major exports were crude petroleum and gas (liquids) in 2010 (combined accounting for about two thirds of all exports in Alberta).

Saskatchewan's GDP grew at an average annual growth rate of 1.9 per cent from 2000 to 2011. In general, GDP growth rates over the last decade have been fluctuating. While the economy boomed in 2003 and 2004, reaching GDP growth rates of over 5 per cent, the economy contracted in 2001 and 2002 as well as in 2006 and 2009. In 2011, Saskatchewan's GDP rose by 4.8 per cent compared to 2010.

Saskatchewan's economy depends heavily on natural resources, especially agriculture. According to the government of Saskatchewan, approximately 95 per cent of all goods produced depend directly on the province's basic resources, i.e. grains, livestock, oil and gas, potash, uranium and wood, and their refined products.

In Manitoba, GDP grew by 2 per cent on average per year from 2000 to 2011. While most Canadian provincial economies contracted in 2009 due to the global recession, Manitoba's economy still grew at 1.2 per cent from 2008 to 2009, and real GDP advanced by 1.1 per cent compared to 2010.

Manitoba has a moderately strong economy which is also based largely on natural resources. This includes agriculture such as cattle farming and grains (mostly found in the southern half of the province), energy, oil, mining, and forestry play an important role in Manitoba. According to the University of Manitoba, the province is Canada's largest producer of sunflower seed and dry beans, as well as one of the leading sources for potatoes providing French Fries for major fast food chains.

Eastern Canada and the US Midwest

Vancouver continues to also serve the more remote eastern regions of Canada and the US Midwest and it remains an important region of trade for the port. It is necessary to present an overview of economic development in these regional markets. The development since 2007 is summarised in Table 1.15, with estimates included for 2012 as confirmed data is unavailable.

Ontario and Quebec represent approximately 60 per cent of the Canadian economy with an average annual GDP growth of 1.4 and 1.6 per cent respectively (2000-2011).

Ontario and Quebec are the largest economies within Canada in terms of GDP. Ontario contributed almost 40 per cent to the national GDP in 2010, while Quebec contributed 20 per cent. From 2000 to 2011, Ontario's GDP grew at an average annual growth rate of 1.4 per cent, contracting heavily in 2008 and 2009 when the global economic crisis hit but reaching its highest GDP growth rate over the last decade of 3.4 per cent in 2010. In 2011, Ontario's GDP reached $531,083,000,000, an increase of 2 per cent from the previous year.

Table 1.15

Eastern Canada / US Midwest GDP Development 2007-2012E

constant 2002 million C$

	Ontario		Quebec		Great Lakes		Illinois		Chicago		Total	
	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change	GDP	% Change
2007	530475	2%	264606	2%	1969826.25	0%	621110	0%	514966	0%	3900983	0%
2008	520023	-2%	267057	1%	1933161.3	-2%	615281	-1%	507503	-1%	3843025	-1%
2009	503501	-3%	265416	-1%	1862155.05	-4%	598807	-3%	490742	-3%	3720620	-3%
2010	520670	3%	271109	2%	1910179.95	3%	610322	2%	500268	2%	3812549	2%
2011	531083	2%	275718	2%	1938833	2%	620087	2%	508272	2%	3873993	2%
2012E	538519	1%	278475	1%	1967915.495	2%	630008	2%	516404	2%	3931322	1%

Source: U.S. Bureau of Economic Analysis, Statistics Canada

Ontario and Quebec have a mix of service and manufacturing industries.

Ontario's is primarily a service sector economy with strong manufacturing elements. The provincial capital, Toronto is the centre of Canada's financial services and banking industry. Manufacturing also plays an important role, especially the auto industry. Seven of the world's largest vehicle manufacturers operate 14 plants in Ontario. According to Statistics Canada, Ontario's main exports are motor vehicles parts and accessories, accounting for approximately 40 per cent of total exports. The province's leading trading partner is Michigan in the US.

In Quebec, the economy grew on average by 1.6 per cent over the last decade. Quebec's economy has been growing steadily at a moderate path recording growth rates between -0.6 per cent (due to the global economic crisis in 2009) and 2.7 per cent in 2004. In 2011, Quebec's GDP reached $275,718,000,000, an increase of 1.7 per cent from the previous year.

Quebec's economy is dominated by manufacturing and the service sectors. Quebec has more than 250 companies in the aerospace manufacturing sector, including Bombardier which is the third largest airplane manufacturer worldwide and is headquartered in Quebec. Within the service industry, the finance, insurance, real estate and leasing industry plays the most important role in Quebec.

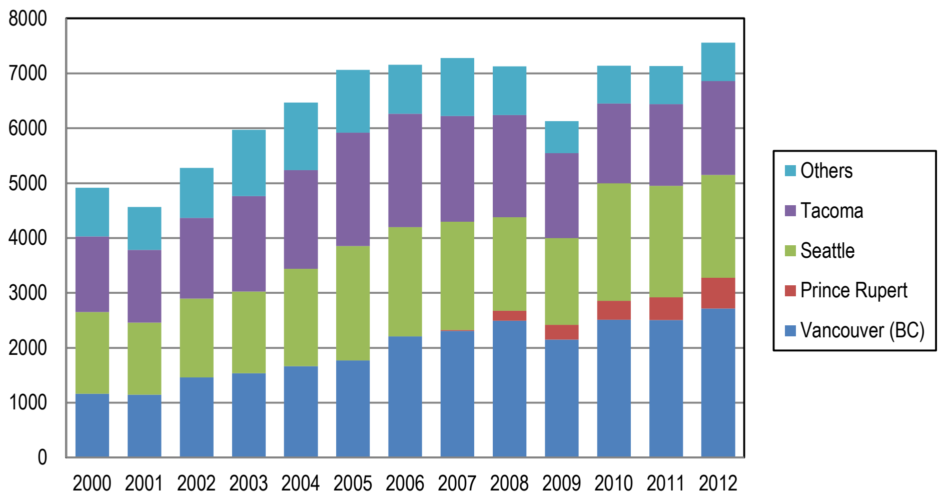
US Midwest is a logistical centre and has important services and manufacturing industries.
Within the US market, the Midwest (especially Chicago) is the centre for intermodal distribution and also a target market for West Coast ports. Chicago is the largest city in Illinois and the third largest city in the United States by population. The economy in Chicago itself as well as in its state Illinois and the greater area of Great Lakes contracted in 2008 and 2009 due to the global financial crisis. In all three cases the economy picked up again and GDP increased in 2010 by 2.6 per cent, 1.9 per cent, and 1.9 per cent for the Great Lake region, Illinois, and Chicago, respectively.

Chicago's economy is considered to have a balanced level of diversification. The Chicago metropolitan area is home to many large companies, such as McDonalds, Boeing and Motorola. The financial sector plays an important role in Chicago, as does the manufacturing sector, with leading manufacturing in chemical manufacturing, food manufacturing and machinery. The region is also the centre for intermodal distribution of containerised goods across much of the nation as a whole.

1.6 A Closer Analysis of Pacific Northwest Container Port Demand

Total demand in the PNW region increased by some 48 per cent between 2000 and 2007 to reach a peak of 7.28m TEU. Demand then contracted in line with the broader economic contraction with a decline of 15.8 per cent recorded between 2007 and 2009. Volumes have since recovered and in 2012 surpassed pre-recessionary levels. The development of demand is detailed in Figure 1.9.

Figure 1.9 - PNW Container Demand by Port 2000-2012 ('000TEUs)



Stagnant port demand since mid-2000, but an increase of market share for the Canadian ports
On a port-specific basis demand has been quite stagnant in most of these locations. The dynamic development in demand that was noted in the early 2000s has now been superseded by a more uncertain trade profile. The exception has been Canadian terminals, where the combined share of Vancouver and Prince Rupert has increased from 23.7 per cent to 40.9 per cent in 2011. This has been the most significant trend in the region. In contrast to the southerly ports, the balance of loaded containers is far more equitable in this region, with agricultural and other semi-manufactured goods providing significant backhaul opportunities on the Transpacific trades. The development of demand in terms of the type of containers handled at the regions ports is summarised for the period since 2008 in Table 1.18. Here, the analysis focuses on the development of demand in terms of container status (i.e.

loaded/empty and inbound/outbound). The US ports handle a significant volume of domestic container flows – i.e. containers shipped to/from Alaska and Hawaii and this complicates the overall picture. These volumes are largely a separate business using Jones Act vessels on specific trades. In total, these containers accounted for around 0.79m TEU in 2011 and volumes have directly tracked the level of the US economy over the period. Peak volumes recorded in 2008 (0.84m TEU) have yet to be re-approximated.

Table 1.16

Pacific NW Container Port Demand 2008-2012

- TEUs

		2008	2009	2010	2011	2012
Vancouver						
Int Full	Inbound	1,238,350	1,007,304	1,233,051	1,234,585	1,349,375
	Outbound	915,465	925,411	940,921	999,725	1,048,824
	Total	2,153,815	1,932,715	2,173,972	2,234,310	2,398,198
Int Empty	Inbound	55,958	115,546	63,894	86,026	101,934
	Outbound	282,334	104,201	276,443	186,697	213,028
	Total	338,292	219,747	340,337	272,722	314,962
TOTAL		2,492,107	2,152,462	2,514,309	2,507,032	2,713,160
Prince Rupert						
Int Full	Inbound	101,080	155,675	193,511	233,146	318,065
	Outbound	25,280	38,777	63,107	100,389	124,542
	Total	126,360	194,452	256,618	333,535	442,607
Int Empty	Inbound	2	126	0	1,596	3
	Outbound	55,515	70,645	86,748	75,339	122,247
	Total	55,517	70,771	86,748	76,935	122,250
TOTAL		181,877	265,223	343,366	410,470	564,857
Tacoma						
Int Full	Inbound	648,947	472,533	476,746	479,828	611,085
	Outbound	483,665	420,791	337,538	375,744	457,078
	Total	1,132,612	893,324	814,284	855,572	1,068,163
Int Empty	Inbound	0	0	0	0	0
	Outbound	215,363	182,322	162,461	166,385	196,739
	Total	215,363	182,322	162,461	166,385	196,739
Int	Total	1,347,975	1,075,646	976,745	1,021,957	1,264,902
Domestic	Total	513,377	470,209	478,762	466,838	446,231
TOTAL		1,861,352	1,545,855	1,455,507	1,488,795	1,711,133
Seattle						
Int Full	Inbound	664,472	612,236	897,224	768,964	728,557
	Outbound	434,546	459,557	558,237	612,450	525,913
	Total	1,099,018	1,071,793	1,455,461	1,381,414	1,254,470
Int Empty	Inbound	133,189	102,119	182,455	164,154	136,321
	Outbound	144,289	110,629	197,659	167,105	139,076
	Total	277,478	212,748	380,114	331,259	275,397
Int	Total	1,376,496	1,284,541	1,835,575	1,712,673	1,529,867
Domestic	Total	327,996	300,055	304,002	320,862	339,625
TOTAL		1704492	1584596	2139577	2033535	1,869,492
TOTAL PNW*						
Int Full	Inbound	2,652,849	2,247,748	2,800,532	2,716,523	3,007,082
	Outbound	1,858,956	1,844,536	1,899,803	2,088,308	2,156,357
	Total	4,511,805	4,092,284	4,700,335	4,804,831	5,163,438
Int Empty	Inbound	189,149	217,791	246,349	251,776	238,258
	Outbound	697,501	467,797	723,311	595,526	671,090
	Total	886,650	685,588	969,660	847,301	909,348
TOTAL		5,398,455	4,777,872	5,669,995	5,652,132	6,858,642

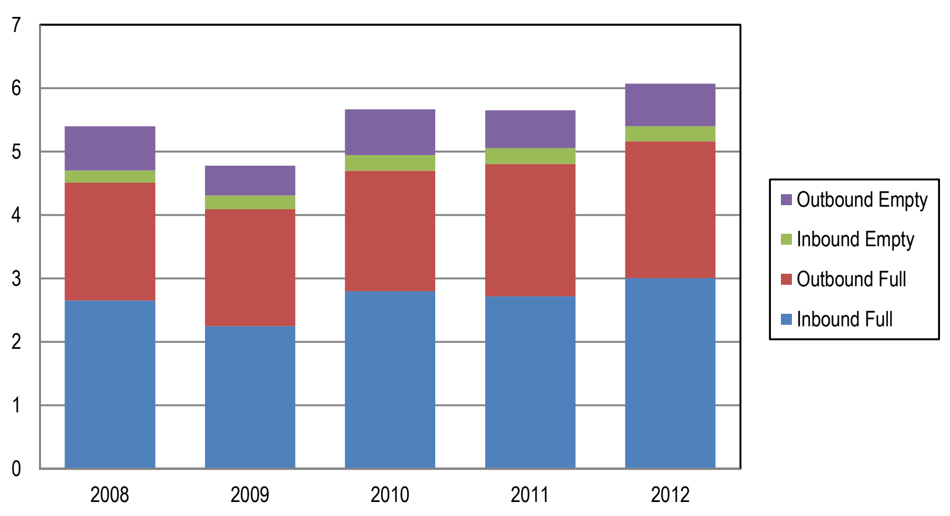
* - excludes domestic US containers

Source: Ocean Shipping Consultants

Within Pacific Northwest, the port of Vancouver shows by far the highest export component
It is the international business that is of primary significance and within these volumes it is apparent that there is a significant loaded export component based upon local produce. This is a feature of the region as a whole, but the volumes exported by Vancouver are seen to be by far the highest in the range. This is a significant aspect of local demand. In addition, it should be noted that loaded export containers are of far less proportional importance at Prince Rupert than at Vancouver.

The development of volumes at Vancouver by commodity type and vector is considered in greater detail later in this Section. The overall development of container volumes between 2008-2012 is further detailed in Figure 1.10.

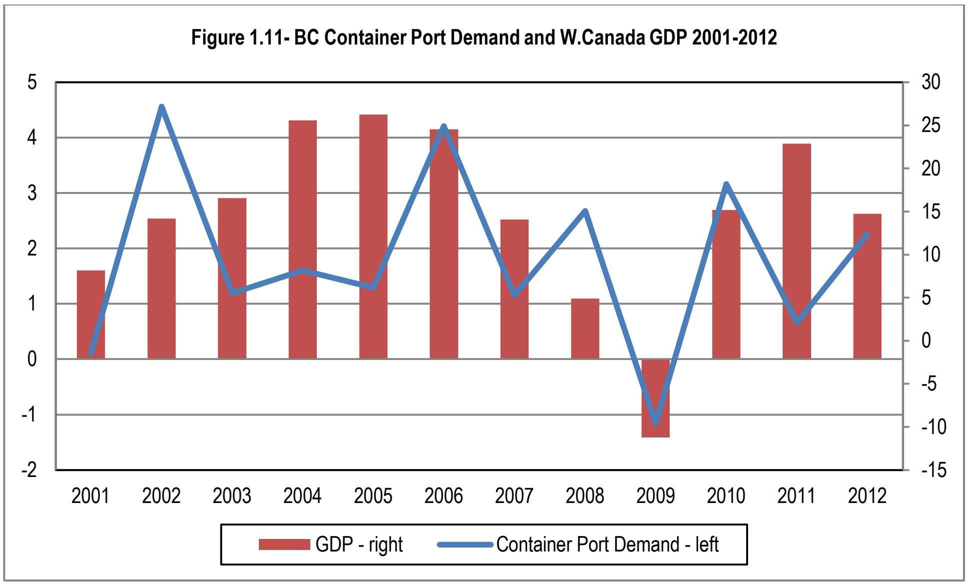
Figure 1.10 - PNW Container Demand by Type 2008-2012 (m TEUs)



Relationship between GDP trend and container port demand is more intense at BC level than at PNW or West Coast level, reflecting the increasing market share of the port
Before focusing on the development of demand volumes at Vancouver, attention is directed towards the relation between economic development in Western Canada (the primary Pacific Gateway hinterland) and the level of containers handled over the period.

Figure 1.11 summarises the nature of this link in the period since 2001 in terms of year-on-year real development of the two indicators. The broader link that has been noted at a higher level is clearly noted in this specific instance, with demand closely tracking GDP development in the hinterland. For the entire period since 2001, the average link between GDP and container port demand is placed at 1 : 2.83. It is important to note that this ratio has also been maintained for the period since 2007 – i.e. including the downturn and subsequent recovery.

This link is seen to be considerably more intense than is noted for either the PNW region or for the West Coast as a whole and reflects the increasing market share of BC ports.



1.7 The Structure of Vancouver Container Demand

The following analysis considers the development of Vancouver containerised cargo demand on the basis of the types of commodities that are handled in containerised mode (what is actually in the containers) and the direction of these cargo flows. The analyses, based on PMV data, look at the international origin and source of containerised cargoes and also at regions within the North American hinterland where demand is generated.

Table 1.17 presents a summary of the long term development of containerised imports in terms of major commodity groupings based on confirmed data for the period to 2011 and estimates for 2012:

- As is the case with West Coast as a whole, the driver of import demand is the broad spectrum of consumer and other household goods which are primarily originated in China. These commodities have continued to see good, double-digit volume growth over the assessment period, though the proportional importance of these commodities has declined from a peak of almost 41 per cent in 2003 to an estimated level of 33 per cent in 2012.

- This decline has been reciprocated by an increase in the role of construction materials in the containerised cargo base. This reflects both strong demand and the increasing containerisation of these commodities.

- The balance of demand has been remarkably stable, although it should be noted that there has been a strong growth in the role of Industrial components (including auto parts) in the container sector.

These developments are also summarised in Figure 1.12.

Broadly speaking, it can be anticipated that current market shares of Vancouver and Prince Rupert will be sustained over the forecast period (as is considered in Section 2), although it should be noted that the Pacific Gateway region as a whole is expected to gain some share of the North American market over the forecast period.

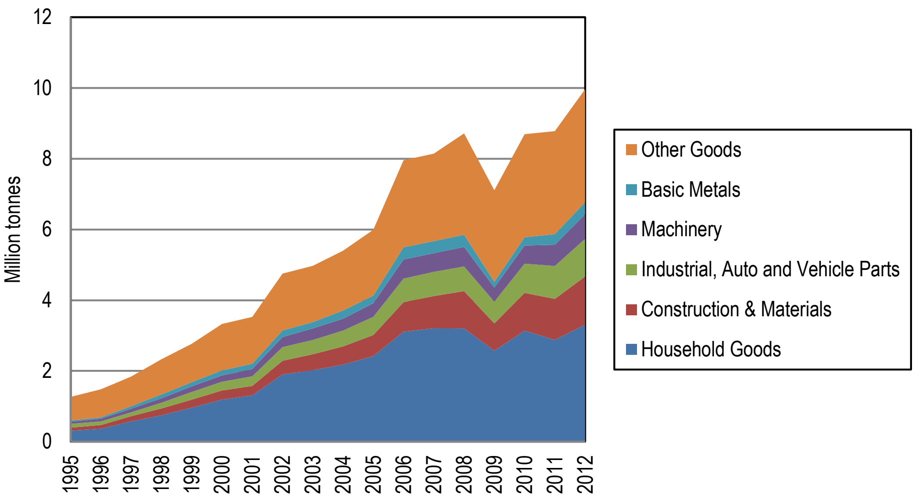
Table 1.17

Vancouver: Containerised Import Volumes 1995-2012

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012E
Million Tonnes														
Household Goo	0.31	1.19	1.31	1.90	2.02	2.18	2.42	3.11	3.21	3.20	2.57	3.14	2.88	3.31
Construction &	0.09	0.26	0.27	0.38	0.45	0.51	0.59	0.83	0.91	1.05	0.77	1.07	1.16	1.36
Industrial, Auto	0.11	0.25	0.27	0.39	0.40	0.45	0.51	0.67	0.68	0.70	0.61	0.83	0.93	1.06
Machinery	0.06	0.18	0.20	0.28	0.33	0.34	0.39	0.54	0.53	0.55	0.40	0.51	0.60	0.69
Basic Metals	0.03	0.14	0.15	0.19	0.18	0.23	0.22	0.34	0.34	0.34	0.17	0.24	0.30	0.34
Other Goods	0.67	1.31	1.33	1.61	1.59	1.69	1.86	2.46	2.47	2.87	2.59	2.91	2.91	3.20
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.97
Percentage														
Household Goo	24%	36%	37%	40%	41%	40%	40%	39%	39%	37%	36%	36%	33%	33%
Construction &	7%	8%	8%	8%	9%	10%	10%	10%	11%	12%	11%	12%	13%	14%
Industrial, Auto	9%	7%	8%	8%	8%	8%	9%	8%	8%	8%	9%	10%	11%	11%
Machinery	5%	5%	6%	6%	7%	6%	6%	7%	6%	6%	6%	6%	7%	7%
Basic Metals	3%	4%	4%	4%	4%	4%	4%	4%	4%	4%	2%	3%	3%	3%
Other Goods	53%	39%	38%	34%	32%	31%	31%	31%	30%	33%	36%	34%	33%	32%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Port Metro Vancouver

Figure 1.12 - Vancouver Containerised Imports by Commodity



A parallel analysis has been developed that summarises the important Vancouver containerised export cluster. Table 1.18 highlights the following significant points:

- The tonnage of containerised exports far exceeds the total tonnage of container imports. This is because the commodities exported are generally considerably heavier than the broad spectrum of containerised imports. This results in difficulties with regard to inventory – both ratios of 20' : 40' containers and also empty container availability.

- Lumber and wood pulp are by far the most significant cargo sectors in the local cargo base. The market share of these commodities has increased from 37 per cent in 2005 to an estimated 52.8 per cent in 2012. Chinese demand has been the primary driver of this trend, with containerisation being the primary mode for these rapidly developing volumes.

- Specialty crops have seen some increase in market share but this has slowed somewhat in 2012. This sector will continue to be directly driven by East Asian demand over the forecast period.

- The balance of demand has remained fairly stable over the period, with the increase in forest product market share reciprocated by a decline in the 'Other Goods' category.

These developments are also summarised in Figure 1.13.

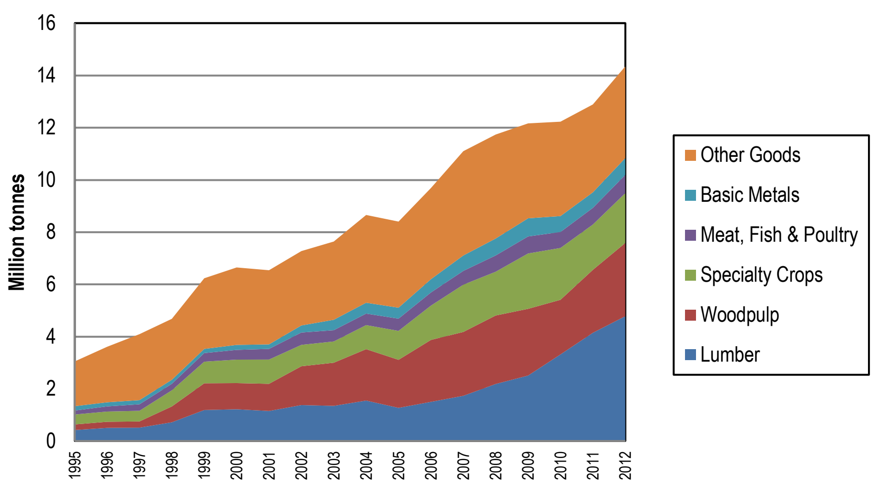
Table 1.18

Vancouver: Containerised Export Volumes 1995-2012E

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012E
Million Tonnes														
Lumber	0.42	1.22	1.15	1.38	1.35	1.55	1.27	1.50	1.73	2.19	2.51	3.32	4.15	4.78
Woodpulp	0.22	1.00	1.04	1.49	1.65	1.97	1.84	2.37	2.45	2.62	2.56	2.09	2.41	2.80
Specialty Crops	0.38	0.90	0.93	0.82	0.81	0.92	1.11	1.31	1.81	1.68	2.12	1.99	1.74	1.91
Meat, Fish & P	0.15	0.37	0.41	0.47	0.43	0.44	0.47	0.50	0.53	0.62	0.65	0.61	0.64	0.70
Basic Metals	0.17	0.19	0.17	0.27	0.40	0.42	0.42	0.51	0.59	0.65	0.69	0.61	0.59	0.64
Other Goods	1.71	2.97	2.84	2.85	3.00	3.36	3.30	3.49	3.99	3.98	3.64	3.62	3.37	3.51
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	14.35
Percentage														
Lumber	14%	18%	18%	19%	18%	18%	15%	16%	16%	19%	21%	27%	32%	33%
Woodpulp	7%	15%	16%	20%	22%	23%	22%	24%	22%	22%	21%	17%	19%	20%
Specialty Crops	12%	14%	14%	11%	11%	11%	13%	14%	16%	14%	17%	16%	13%	13%
Meat, Fish & P	5%	6%	6%	7%	6%	5%	6%	5%	5%	5%	5%	5%	5%	5%
Basic Metals	6%	3%	3%	4%	5%	5%	5%	5%	5%	6%	6%	5%	5%	4%
Other Goods	56%	45%	43%	39%	39%	39%	39%	36%	36%	34%	30%	30%	26%	24%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Port Metro Vancouver/Ocean Shipping Consultants

Figure 1.13 - Vancouver Containerised Exports by Commodity



Conversion of tonnes to TEUs based on historical data.

The development of container cargo volumes and weights are summarised in Table 1.19. This is an important perspective in the current context not just with respect to the container inventory issues already mentioned but also because container cargo statistics are maintained in tonnage terms and it will be necessary to translate these volumes into TEU numbers for the forecasting exercise.

Table 1.19 summarises the development of container weights over the period since 2008, with estimated data applied for 2012. It is calculated that the average cargo weight for an export TEU via Vancouver is currently around 12.92t, the corresponding figure for imports is much lower at 7.14t per TEU.

Table 1.19

Vancouver Containerised Export Volumes 2008-2012

- million tonnes

	2008	2009	2010	2011	2012e
Exports					
Million Tonnes	11.741	12.167	12.232	12.892	13.300
Million TEUs	0.915	0.925	0.941	1.000	1.030
Tonnes/TEU	12.825	13.147	13.000	12.896	12.919
Imports					
Million Tonnes	8.718	7.112	8.696	8.783	8.804
Million TEUs	1.238	1.007	1.233	1.235	1.233
Tonnes/TEU	7.040	7.060	7.052	7.114	7.139

Source: Port Metro Vancouver/Ocean Shipping Consultants

Asia is the most important trade partner for Vancouver, both for imports and exports.
The importance of the Asian markets in driving containerised cargo flows through the region (and via Vancouver) has already been considered. Tables 1.20 and 1.21 confirm this and summarise the development of containerised cargo flows for the period since 1995 in terms of trading partners, with estimates included for 2012.

Table 1.20

Vancouver: Containerised Imports by Source 1995-2012E

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012E
Million Tonnes														
China	0.17	0.96	1.17	1.83	2.33	2.77	3.38	4.94	5.20	5.35	4.05	5.15	5.09	5.92
Hong Kong	0.27	0.64	0.60	0.76	0.62	0.55	0.47	0.53	0.52	0.53	0.45	0.56	0.52	0.55
South Korea	0.06	0.31	0.32	0.41	0.36	0.39	0.37	0.61	0.58	0.64	0.65	0.72	0.83	0.98
Taiwan	0.13	0.32	0.32	0.36	0.35	0.35	0.35	0.37	0.37	0.37	0.30	0.38	0.42	0.46
Thailand	0.11	0.23	0.27	0.34	0.34	0.35	0.34	0.39	0.38	0.36	0.36	0.39	0.37	0.40
Others	0.53	0.87	0.85	1.04	0.97	0.99	1.07	1.11	1.10	1.47	1.30	1.50	1.54	1.65
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.96
Percentage														
China	13%	29%	33%	38%	47%	51%	56%	62%	64%	61%	57%	59%	58%	59%
Hong Kong	22%	19%	17%	16%	13%	10%	8%	7%	6%	6%	6%	6%	6%	5%
South Korea	4%	9%	9%	9%	7%	7%	6%	8%	7%	7%	9%	8%	9%	10%
Taiwan	10%	10%	9%	8%	7%	6%	6%	5%	5%	4%	4%	4%	5%	5%
Thailand	9%	7%	8%	7%	7%	7%	6%	5%	5%	4%	5%	4%	4%	4%
Others	42%	26%	24%	22%	19%	18%	18%	14%	13%	17%	18%	17%	18%	17%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Port Metro Vancouver/Ocean Shipping Consultants

Table 1.21

Vancouver: Containerised Exports by Destination 1995-2012E

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012E
Million Tonnes														
China	0.17	1.06	1.22	1.74	2.21	2.62	2.80	3.49	3.75	4.07	5.17	4.84	5.68	7.06
Japan	1.21	2.59	2.52	2.46	2.21	2.55	2.18	2.37	2.48	2.58	2.23	2.51	2.47	2.59
Taiwan	0.50	0.79	0.69	0.75	0.79	0.86	0.77	0.84	0.98	0.89	0.69	0.79	0.81	0.83
South Korea	0.15	0.43	0.44	0.53	0.55	0.56	0.55	0.68	0.88	0.91	0.75	0.62	0.59	0.65
Hong Kong	0.30	0.50	0.40	0.43	0.39	0.40	0.36	0.44	0.44	0.54	0.44	0.46	0.43	0.44
Others	0.73	1.29	1.27	1.37	1.50	1.66	1.75	1.88	2.58	2.75	2.90	3.02	2.91	3.17
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	14.74
Percentage														
China	6%	16%	19%	24%	29%	30%	33%	36%	34%	35%	42%	40%	44%	48%
Japan	40%	39%	38%	34%	29%	29%	26%	24%	22%	22%	18%	20%	19%	18%
Taiwan	16%	12%	11%	10%	10%	10%	9%	9%	9%	8%	6%	6%	6%	6%
South Korea	5%	6%	7%	7%	7%	6%	7%	7%	8%	8%	6%	5%	5%	4%
Hong Kong	10%	8%	6%	6%	5%	5%	4%	4%	4%	5%	4%	4%	3%	3%
Others	24%	19%	19%	19%	20%	19%	21%	19%	23%	23%	24%	25%	23%	22%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Port Metro Vancouver/Ocean Shipping Consultants

The most significant trend has been the rapid emergence and consolidation of imports from China within the cargo base. China's market share has increased from 29 per cent in 2000 to a peak of 59 per cent in 2010. There was a very minor decline in 2011, but it is anticipated that 2012 will have seen a return to pre-recessionary levels, in keeping with overall port demand for the region. These increases have been reciprocated by declines in market share for all other major trading partners with the exception of South Korea that accounted for almost 10 per cent of demand in 2012.

The top five Asian import sources have increased market share from 74 per cent in 2000 to an estimated 84 per cent in 2012. Vancouver's market development has been almost entirely driven by the Transpacific trades over the period.

The same broad pattern is noted with regard to exports. The combined market share of the major Asian markets has fallen marginally, from almost 81 per cent in 2000 to an estimated 795 per cent for 2012, but the dependence of the port on exports to East Asia will remain central to overall demand. Within this, the biggest change has been the increase in demand from China.

Key destinations of imports via Vancouver: Eastern and Central Canada (42 per cent), BC (27 per cent) and USA (20 per cent)

In considering the development of Vancouver demand it is also necessary to define the importance of various North American hinterlands in driving containerised cargo volumes. Table 1.22 details the long term development of import demand in terms ultimate destination. The following is apparent:

Throughout the 1990s Vancouver was primarily a port serving local containerised import demand, with BC accounting for around 53.1 per cent of demand in 1995. The importance of local markets declined sharply in the period to 2000 and then fell further in the first years of the 2000s. This has now stabilised at around 30 per cent of total demand. This represents a significant cargo base for shipping lines calling at the port.

The strong economic growth in Alberta and the Prairies has also increased market share with these markets accounting for an estimated 11 per cent in 2012, largely consistent with the 2011 total. The role of the port as a gateway for eastern and central Canada has shown some decline over the period and has fallen from 56 per cent in 2005 to around 42 per cent for 2012. This does not reflect a particular weakness at Vancouver as the 2011 and 2012 figures suggest stabilisation in shares but, rather, is a manifestation of the broader trend in favour of all-water services and Atlantic ports.
The other important trend has been the increase in the US as a market for Vancouver. This has fluctuated significantly over the period but accounted for an estimated 20 per cent of volumes in 2012, reflective of a trend since 2005 which has seen the figure continue to increase. Hence there is some scope for further consideration of Vancouver's position as a gateway for US imports.

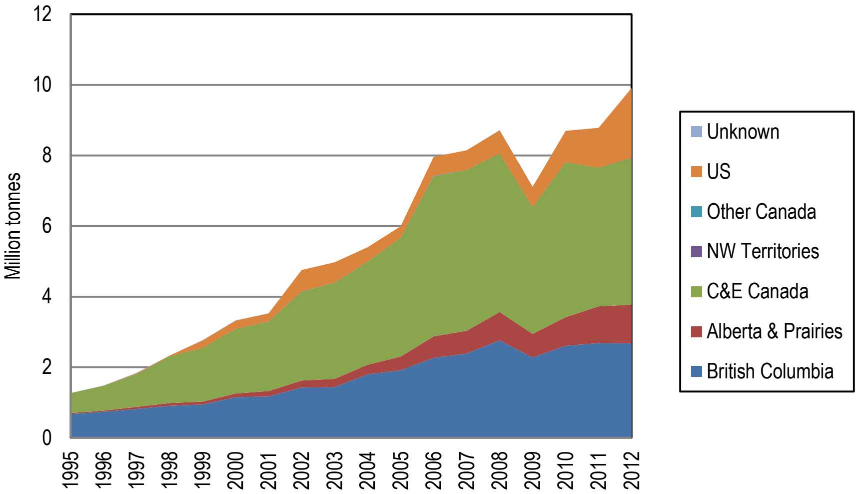
These developments are further summarised in Figure 1.14.

Table 1.22
Vancouver: Containerised Imports by N. American Destination 1995-2012E

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012E
Million Tonnes														
British Columbi	0.67	1.15	1.17	1.43	1.43	1.80	1.91	2.26	2.39	2.76	2.28	2.61	2.68	2.69
Alberta & Prairi	0.03	0.10	0.16	0.20	0.24	0.27	0.39	0.61	0.64	0.80	0.67	0.81	1.04	1.10
C&E Canada	0.56	1.83	1.96	2.52	2.72	2.92	3.36	4.53	4.56	4.49	3.59	4.39	3.93	4.18
NW Territories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Canada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
US	0.00	0.23	0.23	0.61	0.58	0.41	0.33	0.54	0.56	0.65	0.58	0.89	1.13	1.99
Unknown	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Total	1.27	3.33	3.53	4.75	4.97	5.40	5.99	7.96	8.15	8.72	7.11	8.70	8.78	9.96
Percentage														
British Columbi	53%	35%	33%	30%	29%	33%	32%	28%	29%	32%	32%	30%	31%	27%
Alberta & Prairi	2%	3%	4%	4%	5%	5%	6%	8%	8%	9%	9%	9%	12%	11%
C&E Canada	44%	55%	56%	53%	55%	54%	56%	57%	56%	52%	50%	51%	45%	42%
NW Territories	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other Canada	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
US	0%	7%	7%	13%	12%	8%	5%	7%	7%	8%	8%	10%	13%	20%
Unknown	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Port Metro Vancouver/Ocean Shipping Consultants

Figure 1.14 -Vancouver Containerised Imports by N.American Destination



Origins of exports via Vancouver: BC (77 per cent), Eastern and Central Canada (11.5 per cent), Canadian Prairies (7.1 per cent) and USA (4.1 per cent) in 2012.
The position with regard to export cargoes is different. The role of locally-sourced BC cargoes is more significant, with these volumes increasing from 58 per cent of all demand in 2000 to an estimated peak level of 77per cent in 2012. This underlines the degree to which the local export cluster has become a driving force for the port which provides a relative advantage versus other PNW alternatives.

Other regions have seen reciprocal decline in proportional importance, but it should be noted that Vancouver's role as an export point for US goods increased sharply in the first half of the 2000s and has since maintained market share.

These developments are detailed in Table 1.23 and Figure 1.16.

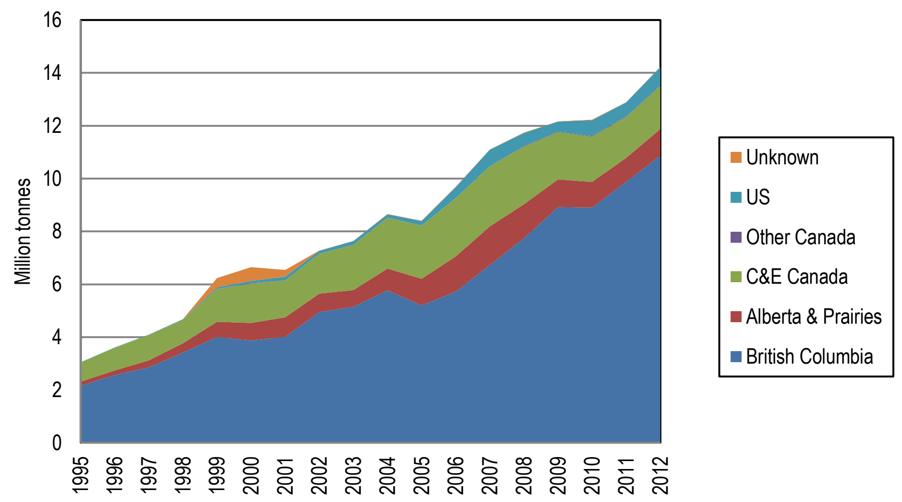
Table 1.23

Vancouver: Containerised Exports by N. American Origin 1995-2012E

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012E
Million Tonnes														
British Columbi	2.16	3.87	4.01	4.95	5.15	5.77	5.20	5.72	6.73	7.74	8.92	8.90	9.88	10.87
Alberta & Prairi	0.15	0.67	0.74	0.70	0.63	0.82	1.00	1.34	1.46	1.28	1.05	0.97	0.90	1.01
C&E Canada	0.73	1.49	1.39	1.51	1.72	1.93	2.02	2.21	2.28	2.18	1.79	1.72	1.55	1.63
NW Territories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Canada	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.02	0.02	0.02
US	0.01	0.08	0.14	0.11	0.14	0.13	0.17	0.41	0.63	0.50	0.39	0.60	0.53	0.70
Unknown	0.00	0.52	0.26	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01
Total	3.05	6.65	6.54	7.28	7.64	8.66	8.41	9.69	11.10	11.74	12.17	12.23	12.89	14.23
Percentage														
British Columbi	71%	58%	61%	68%	67%	67%	62%	59%	61%	66%	73%	73%	77%	76%
Alberta & Prairi	5%	10%	11%	10%	8%	10%	12%	14%	13%	11%	9%	8%	7%	7%
C&E Canada	24%	22%	21%	21%	22%	22%	24%	23%	20%	19%	15%	14%	12%	11%
NW Territories	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Other Canada	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
US	0%	1%	2%	1%	2%	1%	2%	4%	6%	4%	3%	5%	4%	5%
Unknown	0%	8%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Port Metro Vancouver

Figure 1.15- Vancouver Containerised Exports by N.American Origin



SECTION 2 – MACRO-ECONOMIC TRENDS & FORECAST CONTAINER PORT DEMAND TO 2050

2.1 Introduction

Against the background of a detailed review of the structure of regional and Vancouver demand, attention is now directed towards the overall development of demand where the port will be competing. This Section develops a series of forecasts covering these developments.

A discontinuity is noted in the approach to forecasting. The model which has driven demand in the period since the mid-1990s has been based on globalisation. That is to say, the migration of manufacturing from North America to East Asia (particularly China) and the resulting scale of containerised imports into North America has been the driving force of Transpacific demand. More recently, the pace of economic development in East Asia has simulated the level of containerised exports, with this particularly focusing demand on Vancouver.

Given the long term perspective on demand that is the subject of this study, it is apparent that a simple (if modified) extrapolation of these trends will not provide an adequate picture of future demand levels. On this basis a twin-track approach has been developed:

- For the period to 2025 the basic structure of globalisation is forecast to continue, with strong import demand growth and also significant export growth driven by Chinese and other emerging Asian trade.

- Beyond 2025 a scenario-based approach has been developed. There are clearly different models for subsequent economic development and these are likely to have divergent impacts on both the volumes and directions of North American trade.

This Section develops the analyses from these two perspectives.

2.2 Demand Development to 2025

It is necessary to present a picture of the future development of demand on the basis of a ‘top-down’ macro-economic analysis and projection. This Section develops such a review for the North American markets as a whole before focusing on the PNW market. The actual development of container volumes at Vancouver will be a function of the overall scale of demand, the competitive position of the port terminal and the availability of capacity to meet demand.

Recent globalisation boosted the economies and intensified the relationship between GDP and trade.

In recent decades, as economies have expanded, trade has also increased to meet the demands of industry for raw materials and intermediate goods, and the demands of consumers for competitive products. Trade in manufactured goods and intermediate goods – the prime constituents of containerisation – has been at the centre of this global economic expansion.

During this period, the fundamental structure of the world economy has altered. The ability to source finished or partially manufactured goods in areas of low costs has been at the centre of the 'globalisation' of industries. Not only has this boosted world output, but it has also intensified the relation between economic output and trade. In the longer run, it will be the sustainability of this pattern of growth that will define the outlook for containerisation.

Availability of low-cost container trade stimulated globalisation and is being boosted by it as well.
The container system has been both a catalyst and a beneficiary of these developments. The availability of low-cost transport effectively eliminates freight charges as a significant consideration in the cost of most higher-value commodities. This allows complex global sourcing patterns to be developed. With the continued availability of low-cost labour in China and other developing regions, the migration of manufacturing to these locations seems certain to continue.

Although the period since 2008 has delivered a considerable shock to the world trading system, the resilience of the container sector has been clearly noted, with much of the business lost between the second half of 2008 and early 2010 now recovered. However, looking forward from the current perspective, it is clear that considerable uncertainty is still noted at the macro-economic level.

Analysis of GDP outlook scenarios as input parameters for the trade forecasting.
Given the strong link between GDP and container demand, the starting point for regional demand projections must be a summary of the development trends for the economies under review. This process has been retained in this June 2013 update to ensure consistency with the previous report provided in 2012.

A review has been undertaken of published forecasts covering national and provincial GDP developments from a variety of sources. The following sections provide a brief economic outlook, especially a GDP outlook, for Canada and the U.S., as well as provincial outlooks for British Columbia, the Prairies, and Eastern Canadian provinces.

National Outlooks
The position for Canada is summarised in Tables 2.1. The outlook is for sustained economic development over 2012, with an average growth rate of 2.2 per cent noted for 2012 and then some further recovery to 2.4 per cent in 2014. Of course, this national figure covers a wide range of regional developments and these are considered below.

Table 2.1
Canada - GDP Forecasts
Real % change

Year	BMO Prov. Econ. Outlook	Scotia Global Forecast	TD Prov. Econ. Update	RBC Prov. Outlook	CIBC Prov. Forecast	Global Insight	IMF	Average
2012	2.0%	2.0%	2.2%	2.6%	2.1%	2.1%	2.1%	**2.2%**
2013	2.5%	2.2%	2.4%	2.6%	2.1%	2.6%	2.2%	**2.4%**
2014			2.2%			2.7%	2.5%	**2.5%**
2015			2.1%			2.7%	2.4%	**2.4%**
2016						2.2%	2.2%	**2.2%**
2016-41						2.2%		**2.2%**

Source: Collated by OSC

The situation for the US is detailed in Table 2.2. The US economy is growing at a modest pace, on average predicted to grow at 2.2 per cent in 2012 and 2.4 per cent in 2013. Over the medium term, average predictions reach growth rates of 3.1 per cent for 2014 and 3.2 per cent in 2015 and 2016. Over the long term, it is expected that the overall U.S. economy grows at an average annual growth rate of 2.9 per cent from 2016 onwards.

Table 2.2
USA - GDP Forecasts
Real % change

Year	BMO Prov. Econ. Outlook	Scotia Global Forecast	TD Prov. Econ. Update	RBC Prov. Outlook	CIBC Prov. Forecast	Global Insight	IMF	Average
2012	2.3%	2.2%	2.6%	2.5%	2.3%	1.9%	2.1%	**2.3%**
2013	2.4%	2.4%	2.6%	1.9%	2.7%	2.2%	2.4%	**2.4%**
2014		3.1%			3.1%	3.2%	3.1%	**3.1%**
2015		3.0%			3.0%	3.4%	3.4%	**3.2%**
2016						2.9%	3.4%	**3.2%**
2016-41						2.9%		**2.9%**

Source: Collated by OSC

However, it is important to note that revised GDP forecasts have been applied to the forecasting process. In order for complete clarity, Table 2.3 offers the over-riding GDP data utilised, based on the most recent IMF information available at the time of the preparation of the revised forecasting process.

Table 2.3
Latest IMF Real GDP Per Cent Data - April 2013

	2012	2013	2014	2015
USA	2.2	1.9	3.0	2.9
Canada	1.8	1.5	2.4	2.2

Source: IMF

It is apparent that Vancouver is very well placed to benefit from the relatively strong demand anticipated for Canada and, specifically, for the western states that is dominant in its hinterland for import volumes. This will result in strong and sustained demand growth in the medium term.

Given the importance of containerised exports within the Vancouver cargo base, it is also necessary to summarise the economic development of the key importing regions in East Asia. It has been strong levels of economic expansion that have driven demand for containerised commodities shipped via the port. There have been wide variations in the year-on-year development of this relation, but in the period since 2000 this has begun to stabilise and this provides a useful tool for the forecasting of demand in these sectors.

Medium Term Macro-Economic Outlook

It is clearly necessary to consider how the regional economy will expand over the forecast period – indeed, this will be one of the primary determinants of container port demand in the Vancouver markets. Given the uncertainties that are currently noted, it is unclear at what rate the world economy will recover from current difficulties and whether the current recovery is sustainable. Therefore, three cases have been developed to cope with the range of possible outcomes.

The inter-dependencies within the world's economy and foreign trade mean that it is necessary to consider the global and regional economic scenarios that are likely to underpin economic growth, trade and hence port demand both within the region and in the broader relay context. Three cases have been developed:

- **The Base Case** – which represents a consensus view of short term difficulties in 2012, with the fallout from these difficulties restricting growth through to 2015. There will then be some recovery to trend growth. From the current perspective this remains the likely outcome.

- **The High Case** – this assumes a more rapid upturn, with some more positive developments in 2013 and then a return to a somewhat higher rate of economic expansion.

- **The Low Case** – anticipates some further uncertainties at the macro-economic level in 2012 and 2013, with the chance of some chance of renewed stagnation. Beyond 2013 a more restrained pace of subsequent expansion as the cost of the downturn is worked through the economy.

It will be developments at this macro-economic level that are critical in determining the position for the regional economies. There remain significant risks for the world economy and these will play directly through into the region.

Table 2.4
Core Macro-Economic Forecasts to 2025
Real % change

	2012	2013	2014-2015	2016-2020	2021-2025
High Case					
West Canada	3.24%	3.71%	3.66%	3.59%	3.59%
Canada	1.80%	1.73%	2.65%	2.88%	2.88%
USA	2.20%	2.19%	3.34%	2.76%	2.76%
Base Case					
West Canada	3.24%	3.27%	3.25%	3.13%	3.13%
Canada	1.80%	1.50%	2.30%	2.50%	2.50%
USA	2.20%	1.90%	2.90%	2.40%	2.40%
Low Case					
West Canada	3.24%	2.68%	2.70%	2.50%	2.50%
Canada	1.80%	1.20%	1.76%	2.00%	2.00%
USA	2.20%	1.52%	2.32%	1.92%	1.92%

Source: Various, incl. Ocean Shipping Consultants

The essential conditions for the three cases on which long-term economic growth forecasts in this study are based are as follows:

Base Case

- Economic fall-out of global financial crisis has settled and limited uncertainty will be noted in 2012;
- Credit availability improves during 2012;
- Return to long-term growth of US economy, accompanied by free-trade policies;
- Euro Zone pressures continue to restrain growth;
- Economic growth and free trade policies in the EU;
- More flexible economic management within Euro Zone;
- Economic and currency stability in East Asia;
- Renewed attempts to deregulation and restructure Japanese economy;
- Political stability, economic expansion and continuing structural reforms in China;
- Oil price stable at relatively high levels;
- Stable trade framework and continued foreign direct investment in emerging and developing economies.

The High Case

- Economic fall-out now contained and more rapid expansion from 2012;
- Credit availability improves during 2012 and approaches pre-crisis levels;
- Earlier return to long-term growth of US economy, stimulating earlier expansion in trade and eased credit conditions;
- Economic growth and free trade policies in the EU;
- Euro Zone pressures are successfully managed;
- Japanese economy recovers more strongly than in the Base Case;
- Return to economic and currency stability in East Asia but at an accelerated rate;
- Political stability, economic expansion and accelerated structural reforms in China;
- Oil price stable at relatively high levels;

- Stable trade framework and continued foreign direct investment in emerging and developing economies.

Low Case

- Renewed uncertainty and periods of short term contraction in established economies;
- More uncertainty in the US, leading directly to slower world growth;
- Slower growth in the EU economies – especially in the south;
- Renewed inflexibility of economic management and irreconcilable policy objectives within Euro Zone;
- More prolonged stagnation of the Japanese economy, with inadequate structural adjustment;
- Economic uncertainty in China and lower growth;
- Uncertain and volatile development of oil prices;
- More uncertain trade and foreign investment climate in emerging and developing economies.

It remains unclear which development will actually occur, but this captures the range of possibilities that can be reasonably anticipated. The core GDP forecasts that are used in structuring the regional import/export demand forecasts for North America are summarised in Table 2.4.

Under the Base Case the current recovery accelerates in both the US and Canada and the increasing importance of the West Canada region continues over the forecast period. The development of these underlying economic factors will be the primary determinant of demand development for import volumes.

The High and the Low Cases represent a range of possible developments around the Base Case which, with changes in the assumed container port multiplier, will determine the overall development of demand at the continental and regional level.

North American and Vancouver trades largely determined by trade with Asia
For North America as a whole, imports remain the dominant category. That is to say there are far more loaded boxes imported into the markets than are exported and focusing on this link as the primary driver is clearly appropriate. However, in the case of Vancouver, the importance of the export sector necessitates analysis of some additional macro-economic drivers. As has been noted, the destination of containerised exports is primarily Developing Asia (and especially China). The level of future demand development over the horizon to 2025 will be driven by the pace of continuing expansion in these markets.

Table 2.5 presents a summary of the overall economic development of the top five Vancouver containerised cargo markets for the period since 2004 and includes the latest IMF forecasts to 2013. The sheer dynamism of the region is apparent, with China leading the way and the regional NICs (Taiwan, South Korea and Hong Kong) all recording sustained growth. The exception is Japan, where much more restricted growth is noted in-line with other Developed economies.

Table 2.5
Key East Asian Markets - GDP Development 2004-2013
Real % change

	2004	2005	2006	2007	2008	2009	2010	2011	2012F	2013F
China	10.1	11.3	12.7	14.2	9.6	9.2	10.4	9.2	8.2	8.8
Japan	2.4	1.3	1.7	2.2	-1.0	-5.5	4.4	-0.7	2.0	1.7
Taiwan	6.2	4.7	5.4	6.0	0.7	-1.8	10.7	4.0	3.6	4.7
South Korea	4.6	4.0	5.2	5.1	2.3	0.3	6.3	3.6	3.5	4.0
Hong Kong	8.5	7.1	7.0	6.4	2.3	-2.6	7.0	5.0	2.6	4.2
Developing Asia	**8.5**	**9.5**	**10.3**	**11.4**	**7.8**	**7.1**	**9.7**	**7.8**	**7.1**	**7.3**

Source: IMF

China is the dominant force, but other markets are also emerging such as Vietnam and Indonesia. In order to capture these developments, IMF average data concerning the Developing Asia (including China) has also been included in this series. Strong and sustained growth has been noted and it is anticipated that there will be further expansion.

The overall development of the regional economies over the period is further detailed in Figure 2.1.

Figure 2.1 - Key Asian GDP Development 2004-2013 (percent change)

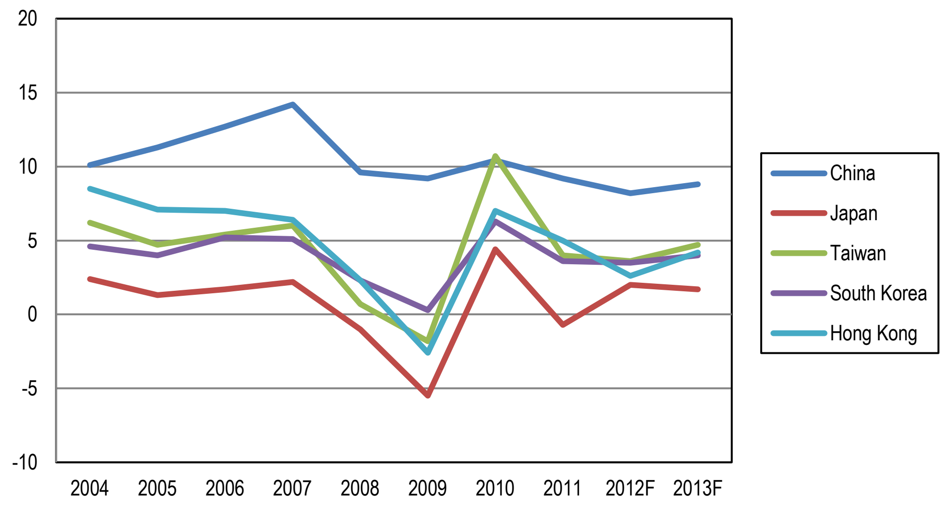


Table 2.6
Developing Asia - Key Indicators 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012F	2013F
GDP - %	8.5	9.5	10.3	11.4	7.8	7.1	9.7	7.8	7.1	7.3
CPI - %	4.1	3.7	4.2	5.4	7.4	3.0	5.7	6.5	5.0	4.6
Trade Balance - % ca	2.6	3.4	5.6	6.6	5.5	3.8	3.2	1.8	1.2	1.4
Exports - %	27.7	23.7	23.0	21.4	17.8	-15.9	30.5	19.9	8.0	10.0
Imports - %	31.3	19.5	17.6	19.0	22.2	-14.7	35.3	22.7	11.8	11.0

Source: IMF

Table 2.6 presents some further key data for the region. It should be noted that:

- There are some worsening inflationary pressures noted in the region – with this being noted specifically for China. This may have the effect of somewhat slowing the overall expansion of demand.

- The trade balance for the region as a whole has narrowed in recent years. Over most of the period one of the primary drivers of demand was the rapid increase in manufactured goods exports. Growth remains strong, but the process of economic balancing is underway.

- This has been particularly noted for period since the economic downturn and recovery, with the pace of (overall) import volumes being considerably higher than that for imports – the previous primary driver of demand.

Significant link between Asian economic development and containers exported via Vancouver. A significant link is noted between the development Asian economies and the level of containerised exports shipped via Vancouver. This was particularly noted in the late 1990s and the first years of the 2000s, when very strong year on year expansion was recorded. The link is detailed in Table 2.7.

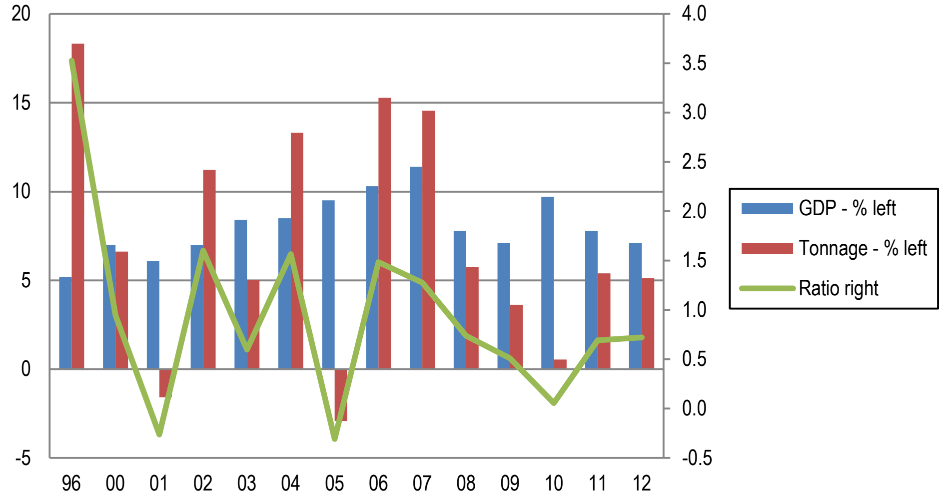
On average the intensity of this link has declined, but a fairly stable relation has been noted in the 2000s as a whole, with a percentage increase in Developing Asia corresponding to an increase of around 0.65 per cent in containerised export tonnages shipped via Vancouver. The link is further detailed in Figure 2.2.

Table 2.7
Developing Asia GDP and Vancouver Containerised Exports 1996-2011

	96	00	01	02	03	04	05	06	07	08	09	10	11	12
GDP - %	5.2	7.0	6.1	7.0	8.4	8.5	9.5	10.3	11.4	7.8	7.1	9.7	7.8	7.1
Tonnage - %	18.3	6.6	-1.6	11.2	5.0	13.3	-2.9	15.3	14.6	5.7	3.6	0.5	5.4	5.1
Ratio	**3.5**	**0.9**	**-0.3**	**1.6**	**0.6**	**1.6**	**-0.3**	**1.5**	**1.3**	**0.7**	**0.5**	**0.1**	**0.7**	**0.7**

Source: IMF/PMV/Ocean Shipping Consultants

Figure 2.2 - Developing Asian GDP & Vancouver Containerised Exports since 1996



Detailed analysis of Asian economic development to assess possible future trade developments
Given the importance of Asian economic development in determining future export volumes shipped via Vancouver, it is necessary to summarise the range of possible developments over the period to 2025. Short term IMF forecasts for China and the region have been collated together with longer term ranges of possible economic developments and the results are summarised in Table 2.8.

Table 2.8
Core Asian Macro-Economic Forecasts to 2025
Real % change

	2012	2013	2014-2015	2016-2020	2021-2025
High Case					
China	8.20%	10.12%	9.78%	8.63%	6.90%
Developing Asia	6.60%	8.29%	8.18%	8.05%	6.90%
Base Case					
China	8.20%	8.80%	8.50%	7.50%	6.00%
Developing Asia	6.60%	7.10%	7.50%	7.00%	6.00%
Low Case					
China	8.20%	7.48%	6.80%	6.00%	4.80%
Developing Asia	6.60%	5.92%	6.60%	5.60%	4.80%

Source: IMF/Ocean Shipping Consultants

With regard to developments over the period to 2025, the main uncertainty is attached to the sustainability of recovery from the downturn and the danger of renewed economic contraction. It is clear that there is scope for a rapid recovery in GDP (and container port demand) on the same basis that has been noted in earlier – less severe – contractions. However, the outlook is unclear and a range of developments from 2012 has been defined which go on to determine the pace of growth between 2013-2015. A range of developments around recorded trend levels has been assumed for the balance of the forecast period.

Containerisation of general and bulk cargoes represents an aggregate demand. That is to say, a variety of individual commodities and finished and semi-finished goods are transported by container. In addition, the imbalance of the Transpacific trades (in total), has seen very low value cargoes increasingly containerised for the eastbound leg where cargo availability is limited. This has resulted in commodities such as steel scrap, waste paper and other low value goods also entering into inter-continental trade.

The approach taken in this study is to relate the development of GDP directly to container port demand in the import/export market, and to use this as a basic driver of demand growth. This allows factors such as increased penetration of the container system into new commodity groups and the imbalance of container port demand (i.e. the requirement to handle empty containers) to be adequately captured.

In summary, the approach is as follows:

- **Step 1 –** The relation between regional GDP and the port range hinterland's GDP is identified. The degree to which this co-efficient has changed over time is defined, with this generally reflecting a declining intensity. As economic development is noted, the trend is that trade as a percentage of the economy begins to stabilise to a mature level. This process is anticipated to continue over the forecast period.

- **Step 2 –** The distribution of demand by seaboard is considered on the basis of underlying distribution costs at the continental level and on the basis of the relative costs of all-water and intermodal services. This is based upon a review of the relative competitive position of the port ranges' container handling facilities in contrast to competing ports. This identifies port capabilities, transit costs, intermodal links, etc. This defines the role of PNW ports in the market.

- **Step 3 –** This allows a series of continental and regional demand forecasts to be calculated on the basis of overall demand expansion and relative underlying cost structures.

- **Step 4 –** Specific estimates are developed that identify the range of possible demand growth for the Pacific Gateway in each of the markets under consideration. This is based upon the general macro trends that are assessed over the period to 2025.

The actual degree to which Vancouver will capture a share of these markets is the subject of the specific competition analyses developed in this study.

Overview of co-efficients applied

In developing estimations of the link between GDP development and overall North American container port demand, the following co-efficients have been utilized within the container forecasts generated:

Overall North American GDP Container Port Demand Multipliers

	Base	High	Low
2012-2015	1.75	1.75	1.75
To 2020	1.50	1.80	1.30
To 2025	1.20	1.40	1.10

That is to say, for example, for each percentage increase in GDP noted in the Base Case for the period between 2012-2015 an increase in port demand (container moves across the quay) of 1.75 per cent will be generated. The development and reduction in this co-efficient is a major aspect of demand projections.

With regard to the co-efficients linking containerised exports with Developing Asian GDP the following historic relations have been noted:

Developing Asia GDP and Vancouver Containerised Exports:

1996-2011	1 : 1.29
2000-2005	1 : 0.68
2005-2012	1 : 0.66

In the forecast market to 2025 it is estimated that a link of 1 : 0.66 will be a sustainable driver in this container trades.

2.3 Demand Development 2025-2050

Given the timeframe associated with this study, the maximum *potential* of the market must be a factor in determining the level of forecast demand. Clearly, there must be some limit to the pace of expansion in the developed container markets. In the OECD in general (and North America in particular), the relative maturity of the container sector makes the identification of growth limits of some importance.

At the centre of concerns about the scope for long-term demand growth is the degree to which import markets for container goods will reach saturation and the political implications of ever greater import-dependency. That is to say, the consumption of certain commodity groupings is thought to be limited, and the pace of growth ultimately constrained. This is, in some instances, obviously the case. For example, the *per capita* consumption of meat and other food products cannot continue to expand without limit in the North American markets. The scope for import growth must thus be limited. Furthermore, the development of the world economy beyond 2025 could proceed along one of several different courses, each of which will have different implications for the level of expansion and the direction of trade. Clearly, this will have direct implications for the future level of containerised demand at Vancouver.

It has also been suggested that the robust development of container demand has been attributable to a 'one-off' period of 'globalisation' in world manufacturing and consumption. Accordingly, the period since 1990 is held to represent a special case and a period of structural adjustment. It is clear that this process of globalisation still has further to run and this is reflected in the approach taken to demand projection for the period to 2025.

The only coherent approach to these uncertainties over the longer term is to adopt a scenario-based approach to forecasting. Essentially, the economy could develop in a series of divergent directions. Three scenarios have been defined that will have differing implications for Vancouver's container demand.

Core issues that will further impact the world economy over the post-2025 period include:

- The ability of the world economies to expand further in light of major issues such as population growth, climate change and energy availability.

- The linked issue of political stability and the degree to which free trade policies will continue will be a major issue. For example, a shift to protectionism would directly impact the volume and direction of containerised trade.

- The location of production and consumption will continue to mature with, for example, increased export volumes directed towards East Asia as living standards continue to improve in these markets.

- There may also be technological changes that have unforeseen effects on the development of trade volumes and modalities – although the dominant position of containerisation is not forecast to change significantly.

- Of course, the overall competitive position of Vancouver in these markets – in terms of capacity, intermodal connectivity and efficiency – will also influence demand within each of the identified scenarios.

Macro-economic scenarios for the North American markets.
The following scenarios have been used in the development of post-2025 forecasts for the region:

Continuing Free Trade
In the projections developed for the period to 2025 a range of developments has been defined that entail a broad continuation of the forces that have driven the global economy in the period since the early 1990s. That is to say, the globalisation of production will continue and new, cheaper, sources of imported goods will join China in driving containerised goods flows. It has been this model that has been the primary driver of deepsea container trades in the period since the late 1990s, with recent export demand increases reinforcing these developments.

It is possible that this process will continue over the longer term period to 2050 – albeit at a slower and less intense pace. This would result in a restructuring of the relative economic importance of world regions and have far-reaching economic and political implications.

In qualitative terms, the outlook would have the following characteristics:

- The basic structure of demand would remain focused on increased trade from China (and other Asian markets) serving the North American markets.

- Strong demand in Asian markets would sustain commodity prices, with this particularly benefiting the western Canadian economy.

- Under these conditions further GDP expansion will be noted, although the long-term sustainable level of expansion would be lower than in the period to 2025 under the Base Case for North America.

- There would be continuing further economic expansion in East Asia – albeit at a gradually slower pace – with this sustaining the level of export demand growth from western Canada.

- There would be some further reduction in the intensity of the relation between GDP development and container port demand, with this reflecting trends already in place. It is likely that parity between trade growth and container port demand will be reached from the 2030s.

- Strong demand growth will continue on the Transpacific trades and there will be a progressive move towards a more balanced trade structure as demand from east Asia continues to stimulate import growth.

- It is likely that commodity prices will remain unstable over the period and conflicts over resources will become more common. This will add instability, but the western Canadian economy will benefit from sustained higher energy prices.

The overall outlook will be one of a continued evolution of trade on the basis of developments noted in the past twenty years, with this resulting in continued (but somewhat slower) North American and PNW demand. The role of Vancouver will be determined by the ability to offer a competitive container handling product and by availability of capacity.

This scenario would essentially represent a continuation of the High Case to 2025 demand projection.

A Partially Protectionist World

Recent years have seen worsening trade pressures. The sustainability of the Base Case has been called into question with the major importing regions – both North America and Europe – increasingly questioning the desirability of the wholesale transferring of production capacity to China. In addition, the ability of these regions to continue to pay for ever-larger volumes of imports is questionable. Whilst these pressures are likely to become more significant in the short term the real impact (if they intensify) will be after 2025. A political shift to redirect growth within trading blocs would be the outcome of such a position.

In qualitative terms, the outlook would have the following characteristics:

- It is likely that any such protectionist scenario would see the development of 'Fortress North America' with a commonality of interests between Canada and the US – and (probably) the broader NAFTA grouping. Investment would be increasingly directed inwards for these economies.

- Restrictions on trade would typically result in lower than potential trade growth. Interference in the allocation of resources would see lower economic growth.

- In the short term, however, a *stimulus* would likely be recorded in the level of North American growth. This would follow from increased investment in domestic industry and the result stimulus to demand growth.

- This pattern would see both smaller trade volumes and also a reorientation of demand to within the North American continent. The development of demand would be slower for container ports that have focused on serving the Transpacific trades – such as Vancouver. This would increase competitive pressures between PNW and West Coast ports for markets which will grow considerably more slowly.

- These conditions would reduce the level of world demand for commodities and energy and also re-orientate trade in these goods within the continent. This would reduce the relative economic advantage anticipated for the western Canadian region.

From the current perspective some version of this scenario is seen as a likely outcome given the limitations inherent in a continuation of the current model. This will represent a continuation of the Base Case projections.

New Economic and Trade Paradigm

Over the timeframe of this study, it is a possibility that the world economy could move forward on a different basis. The environmental pressures that were dominating policy choice – at least until the economic downturn – were driven by concerns over matters such as Climate Change and Sustainability. It is possible that these issues will once again achieve their dominance at the global level. Once again, however, these issues are likely to be focused on the post-2025 development of the market.

It is difficult to identify the likely impact of these changes, but in qualitative terms the following matters will emerge:

- There will be policy encouragement (or compulsion) to re-orientate economic activity on a localised basis. This would see considerable slower economic growth, with the emphasis on recycling and other such policies. This would see absolute demand increase more slowly.
- Under these conditions economic growth would be much more limited in North America and the pace of expansion in the Developing Asian markets would be correspondingly slower. The degree to which Developing Asian markets would be able to expand at a pace ahead of demographic pressures would be called into question.
- Container trade between Asia and North America could stagnate under these conditions as the energy costs of delivering goods from Asia to America will come under increasing policy challenges (particularly with regard to carbon emissions).
- Indeed, the introduction of a putative global carbon tax would directly impact on goods flows in containers and also commodity demand. This will adversely impact on the relative economic advantages of the western Canadian provinces.

This represents a complete paradigm shift and the degree to which this could be realised is likely to be problematic. However, these issues will become increasingly important over the forecast period and do represent a possible (if unlikely) outcome. This scenario would generate the slowest growth for Vancouver and represent a continuation of the Low Case from 2025. Container demand will be heavily constrained should this scenario be realised.

Table 2.9

Continuing Free Trade Scenario 2026-2050 - main container demand drivers

	2026-2035	2036-2050
GDP		
Canada	Declines to 2.2% pa	Declines to 1.8% pa
West Canada	Declines to 2.5% pa	Declines to 2.0% pa
USA	Declines to 2.2% pa	Declines to 1.8% pa
Developing Asia	Declines to 6.0% pa	Declines to 4.5% pa
Multiplier		
North America - imports	Declines to 1.1	Declines to 1.0
Asia - exports to	Remains at 0.6	Remains at 0.6
Market Share PNW - imports	Remains at 15.5%	Remains at 15.5%
Regional Distribution - within N.America		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained
Proportional Importance of Asia - % of total port demand		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained

Source: Ocean Shipping Consultants

In contrast to the projections developed for the period to 2025, the actual impact of these developments on container port demand can only be viewed in a subjective light. The general structure of these scenarios will be reflected in the volume and direction of container port demand but there will be wide variations in each case.

he approach taken to assessing the impact of these developments on regional container port demand is to provide a general estimation of the impact of these changes on the forces driving trade demand. These general indicators are summarised in Tables 2.9-2.11 which summarise the key drivers over the period.

Table 2.10

Partially Protectionist Trade Scenario 2026-2050 - main container demand drivers

	2026-2035	2036-2050
GDP		
Canada	Increases to 2.5% pa	Declines to 1.2% pa
West Canada	Declines to 2.5% pa	Declines to 1.8% pa
USA	Increases to 2.5% pa	Declines to 1.4% pa
Developing Asia	Declines to 5.0% pa	Declines to 4.0% pa
Multiplier		
North America - imports	Declines to 0.8	Declines to 0.7
Asia - exports to	Remains at 0.6	Remains at 0.6
Market Share PNW - imports	Remains at 15.5%	Remains at 15.5%
Regional Distribution - within N.America		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained
Proportional Importance of Asia - % of total port demand		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained

Source: Ocean Shipping Consultants

Table 2.11

New Paradigm Trade Scenario 2026-2050 - main container demand drivers

	2026-2035	2036-2050
GDP		
Canada	Declines to 1.8% pa	Declines to 1.0% pa
West Canada	Declines to 2.0% pa	Declines to 1.4% pa
USA	Declines to 1.8% pa	Declines to 1.0% pa
Developing Asia	Declines to 4.0% pa	Declines to 3.0% pa
Multiplier		
North America - imports	Declines to 0.7	Declines to 0.5
Asia - exports to	Remains at 0.6	Remains at 0.6
Market Share PNW - imports	Remains at 15.5%	Remains at 15.5%
Regional Distribution - within N.America		
Imports	BC share increases to 45%	BC share increases to 60%
Exports	Current distribution maintained	Current distribution maintained
Proportional Importance of Asia - % of total port demand		
Imports	Current distribution maintained	Current distribution maintained
Exports	Current distribution maintained	Current distribution maintained

Source: Ocean Shipping Consultants

The following points should be noted:

- Under the Continuing Free Trade scenario the broader trends noted in the period to 2025 will continue. However, there will be a general slowdown in regional economic growth as full maturity is approximated and there will also be a slowdown in the intensity of the link between GDP and container port demand. This will approach unity by the end of the period. That is to say, trade volumes will move in direct proportion to underlying economic expansion.

  In this scenario the distribution of trade in terms of broad trading regions – will remain stable and the current distribution of containers within North America will also be held stable. Indeed, this is a feature of each scenario, with the overall volume of trade being the primary difference under each case.

- Under the 'Partially Protectionist' scenario the major difference will be a stimulation in local demand in the first years of the period – i.e. between 2026-2036 as local production increases and some is relocated back from Asia. However, the defensive nature of this scenario will see lower overall growth in the balance of the forecast period. The smaller role of Transpacific trade in the North American economy will also see a more rapid contraction in the intensity of the multiplier link. This will fall to lower than parity over the period as growth and trade is partially re-orientated within North America.

  The overall distribution of a smaller container trade profile will remain similar to that anticipated for other cases, with the focus being on lower demand growth.

- The 'New Paradigm' situation is difficult to assess, but the key change will be lower overall expansion and trade – with multipliers to growth being lower than in the protectionist case. In addition, there will be further re-orientation in favour of local markets. This will, for example, result in the share of BC within the PNW hinterland increasing to a larger proportion. Essentially, this scenario will have a negative impact on the pace of container trade development.

The development of container demand has been forecast for the period to 2050 under these conditions.

2.4 Regional Container Port Demand Forecasts

Having considered the forces that will shape continental and regional demand growth, attention is now directed towards the overall range of possible demand growth under these conditions. The approach taken is as detailed above. That is to say, the overall development of North American container port demand under these trade conditions is defined. The role of the PNW ports within these forecasts is defined and then attention is directed towards the development of demand at the Pacific Gateway ports (i.e. Vancouver and Prince Rupert). It is this general framework that will shape demand growth at Vancouver over the study period, but the actual core forecasts for the port are developed following consideration of specific competition issues. The perspective of the current analysis is a general overview of the magnitude of demand.

Outlook for the long term North American container port demand
Table 2.12 summarises the anticipated development of North American container port demand over the forecast period to 2025, with further estimations of the level of demand under each of the longer term scenarios to 2050.

Under the Base Case (regarded as the most likely outcome from the current perspective), total North American container port demand is forecast to increase from the 2012 level of 48.8m TEUs to 78.6m

TEUs in 2025. This represents a CAGR of 3.7 per cent based on the 2012 starting point. The continuation of this case over the balance of the study period generates a possible level of container port demand at some 123.4m TEU in 2050. The overall CAGR for the entire period, of 2012 to 2050 based on the revised forecasts now equates to 2.5 per cent.

There is a significant divergence in demand in the different cases and scenarios modeled in this analysis. The range of demand identified at 2025 is placed at between 69.8—89.1m TEUs per annum and a progressive divergence is noted in the subsequent development of demand.

In general the development of demand will be driven by the pace of economic expansion and the overall structure of trade – i.e. the degree to which globalisation and inter-regional containerised goods flows will be maintained. There will be a slowdown in the pace of demand growth reflecting the maturity of the relation and of the Transpacific container trades under each of the scenarios. The general outlook is further detailed in Figure 2.3.

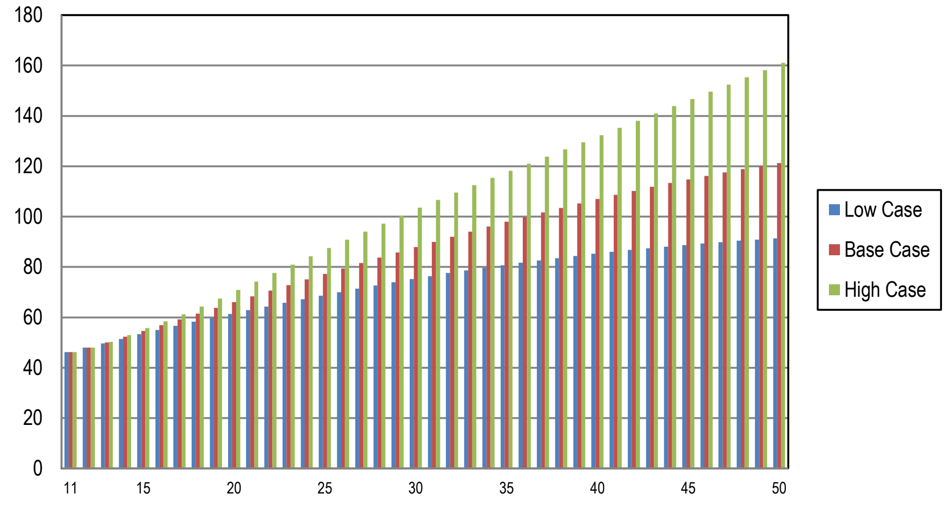
Table 2.12
Forecast Overall North American Container Port Demand to 2050
- million TEUs

	11	12	13	14	15	16	17	18	19	20	25	30	35	40	45	50
Low Case*	46.21	48.79	50.07	52.14	54.21	55.95	57.64	59.28	60.87	62.39	69.81	76.52	82.13	86.68	90.27	92.94
Base Case**	46.21	48.79	50.39	52.99	55.63	57.91	60.21	62.53	64.86	67.20	78.58	89.47	99.67	108.85	116.82	123.35
High Case***	46.21	48.79	50.62	53.63	56.71	59.47	62.38	65.46	68.70	72.13	89.11	105.36	120.30	134.72	149.33	163.89

* Low Case + 'New Paradigm' from 2025
** Base Case + 'Partially Protectionist' from 2025
*** High Case + 'Continuing Free Trade' from 2025

Source: Ocean Shipping Consultants

Figure 2.3 - North American Container Port Demand to 2050 - million TEUs



Outlook for the long term Pacific Northwest container port demand within the North American market.

The next stage of the forecasting exercise focuses attention on the role of the PNW within the overall North American market. In assessing these developments the following important points should be noted:

- Asian trades will continue to dominate the overall structure of North American container flows and the location of PNW ports in relation to Asia and in terms of intermodal connectivity will continue to favour this port region.

- The strong availability of export cargoes – particularly from BC – will underline the relative position of these ports versus competing terminals in California. As the overall balance of trade with Asian moves in the direction of equilibrium, these will be increasingly important considerations.

- The development of the Panama Canal will have significant effects on the overall structure of Asia-North America container flows. It is anticipated that the role of All-Water services between Asia and the North American markets will increase in proportional share as much larger vessels are deployed on the trades. This will, however, be focused on the Californian ports. The importance of these terminals as access points for the broader North American markets will decline as All-Water trades increase market share. These ports will be squeezed between the PNW terminals (with their clear advantages) and shipments via Panama.

In order to develop a cautious view of potential demand growth it is assumed that the PNW share of the North American markets will remain constant over the forecast period. It may be that there is scope to increase share, but this would represent an upside to core demand developments.

Table 2.13
Forecast Pacific Northwest Container Port Demand to 2050
- million TEUs

	11	12	13	14	15	16	17	18	19	20	25	30	35	40	45	50
Low Case*	7.13	7.56	7.77	8.09	8.42	8.68	8.95	9.20	9.45	9.69	10.84	11.88	12.75	13.46	14.01	14.43
Base Case**	7.13	7.56	7.82	8.23	8.64	8.99	9.35	9.71	10.07	10.43	12.20	13.89	15.47	16.90	18.13	19.15
High Case***	7.13	7.56	7.86	8.33	8.80	9.23	9.68	10.16	10.67	11.20	13.83	16.36	18.68	20.91	23.18	25.44

* Low Case + 'New Paradigm' from 2025
** Base Case + 'Partially Protectionist' from 2025
*** High Case + 'Continuing Free Trade' from 2025

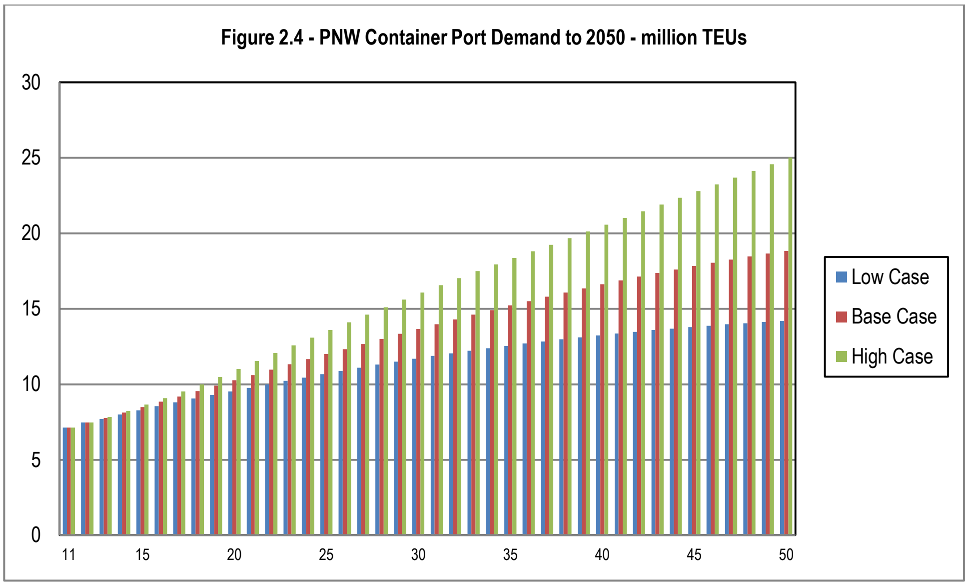
Source: Ocean Shipping Consultants

On this basis, the development of demand for PNW ports as a whole has been defined and the results are summarised in Table 2.13 and in Figure 2.4.

It is forecast that total demand shipped via these ports will increase from just under 7.6m TEUs in 2012 to 10.4m TEUs in 2020 and then reaching 12.2m TEUs by 2025. The longer term Base Case projections indicated a potential demand level of almost 19.2m TEUs at the end of the long term period. Once again, a considerable range of demand is noted, with demand running at between10.8 and 13.8m

TEU in 2025. As follows from the earlier analyses, there is also a wide range of potential developments over the balance of the study period.

In 2050 the range of potential demand for PNW terminals is forecast to be between 14.4-25.4m TEU, with this being determined by the different scenarios defined in this study.



Outlook for the long term Pacific Gateway container port demand within the PNW port range. The future development of combined demand at the Pacific Gateway terminals (i.e. Vancouver plus Prince Rupert) is also considered as this comprises container traffic for these two ports.

Here a different methodology is utilized. Overall import demand is driven not by the overall development of North American GDP but, rather, by the estimated development of Western Canadian GDP. This has been – and is forecast to continue to be – higher than that for the continent as a whole. This will have the effect of driving import demand at a faster pace for this region than is anticipated for the entire market.

The development of demand by region and by commodity group is summarised in Table 2.14 for the period to 2030. The following should be noted:

- The current distribution of containers imported via Pacific Gateway terminals into different North American regions is forecast to remain fairly stable. The strong development forecast for the western Canadian economy will secure volumes in these markets, but there may be renewed and increased competition from the All-Water eastern ports, although this will be marginal for eastern and central Canada. There may be scope for PG ports to further increase their transit flows to US markets, but improved intermodal links from US PNW ports will limit the scope for these adjustments. In general, it has been assumed that distribution will remain stable, but there is seen to be some upside for PG terminals to further extend their market penetration.

- It is unlikely that the current split of containerised imports by commodity grouping will be significantly modified over the period to 2025 (although in the longer term structural changes may influence these issues). On this basis, it is assumed that the current emphasis on household goods, components and construction materials will be sustained. The imbalance in goods will broadly continue, thus generating a flow of imported empties.

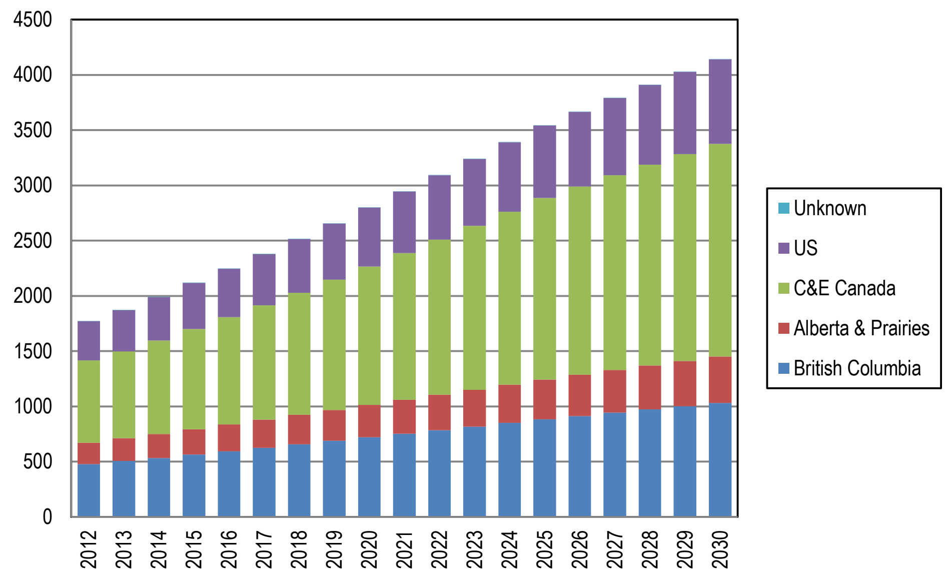
The outlook for the PG region where Vancouver is located is further summarised to 2030 in Figure 2.5.

Table 2.14
Pacific Gateway - Base Case Import Container Port Demand to 2030
- '000TEUs

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Destination																			
British Columbia	477.7	505.1	533.8	564.2	594.2	624.9	656.2	688.0	720.3	752.8	785.3	817.7	850.0	881.9	913.3	944.0	974.0	1003.1	1031.4
Alberta & Prairies	194.6	205.8	217.5	229.8	242.1	254.6	267.3	280.3	293.5	306.7	319.9	333.1	346.3	359.3	372.1	384.6	396.8	408.7	420.2
C&E Canada	743.1	785.7	844.2	906.8	970.5	1036.8	1105.7	1177.2	1251.2	1327.1	1404.8	1484.0	1564.6	1646.2	1704.8	1762.1	1818.1	1872.5	1925.2
US	353.9	374.1	395.4	417.9	440.1	462.9	486.0	509.6	533.5	557.6	581.7	605.7	629.6	653.2	676.5	699.2	721.5	743.1	764.0
Unknown	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total including empties	**1769.4**	**1870.6**	**1990.9**	**2118.7**	**2246.9**	**2379.1**	**2515.3**	**2655.1**	**2798.5**	**2944.1**	**3091.6**	**3240.6**	**3390.4**	**3540.6**	**3666.6**	**3789.9**	**3910.3**	**4027.3**	**4140.7**
By Commodity																			
Household Goods	547.6	574.3	611.3	650.7	690.1	730.6	772.4	815.4	859.4	904.1	949.4	995.2	1041.2	1087.2	1126.0	1163.9	1200.8	1236.7	1271.6
Construction & Materials	229.1	240.3	255.7	272.2	288.6	305.6	323.1	341.1	359.5	378.2	397.1	416.3	435.5	454.8	471.0	486.8	502.3	517.3	531.9
Industrial, Auto and Vehicle	179.1	187.8	199.9	212.7	225.6	238.9	252.5	266.6	281.0	295.6	310.4	325.4	340.4	355.5	368.1	380.5	392.6	404.3	415.7
Machinery	116.4	122.1	130.0	138.3	146.7	155.3	164.2	173.3	182.7	192.2	201.8	211.6	221.3	231.1	239.4	247.4	255.3	262.9	270.3
Basic Metals	57.7	60.6	64.4	68.6	72.7	77.0	81.4	86.0	90.6	95.3	100.1	104.9	109.8	114.6	118.7	122.7	126.6	130.4	134.0
Other Goods	537.5	563.7	600.0	638.5	677.1	717.0	758.0	800.1	843.3	887.2	931.7	976.6	1021.7	1067.0	1104.9	1142.1	1178.4	1213.7	1247.8
Empties	101.9	121.8	129.7	138.0	146.4	155.0	163.8	172.9	182.3	191.8	201.4	211.1	220.8	230.6	238.8	246.9	254.7	262.3	269.7
Total including empties	**1769.4**	**1870.7**	**1991.0**	**2118.9**	**2247.1**	**2379.3**	**2515.5**	**2655.4**	**2798.8**	**2944.4**	**3091.8**	**3240.9**	**3390.7**	**3540.8**	**3666.9**	**3790.3**	**3910.6**	**4027.7**	**4141.1**

Source: Ocean Shipping Consultants

Figure 2.5 - Pacific Gateway Container Imports by Destination ('000TEUs)



A parallel forecast has been developed that focuses on the development of exports handled by PG ports. Here, the emphasis is clearly on the commodities grown and manufactured in BC and it is apparent that the location of these clusters favours Vancouver in contrast to Prince Rupert. There is some scope to increase penetration of the eastern markets for export commodities but the overall balance is forecast to continue to be dominated by current commodities sources on the same pattern as noted at present.

The progressive penetration of containerisation into these trades is now largely complete and it is not anticipated that demand will be further influenced by these considerations. This means that lumber/wood pulp and specialty crops will remain the key drivers of demand in terms of commodities. The actual level of year-on-year demand growth will be driven by demand from the Asian markets – specifically China, and the current and stable link between GDP in these markets and overall demand growth is forecast to continue in the period to 2030 and beyond.

There will be strong and sustained demand growth in this sector, although these commodities will remain vulnerable to short term disruptions at the macro-economic level in East Asia.

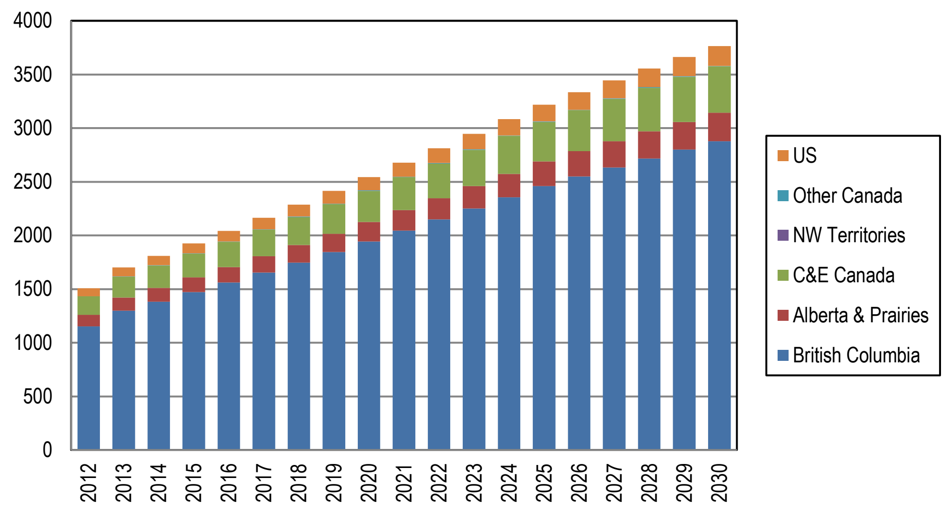
Base Case export demand forecasts for the PG region are summarised in Table 2.15 and in Figure 2.6.

Table 2.15
Pacific Gateway - Base Case Export Container Port Demand to 2030
- '000TEUs

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
By Origin																			
British Columbia	1152.5	1300.1	1383.7	1472.6	1561.6	1653.5	1748.2	1845.4	1945.0	2046.2	2148.7	2252.3	2356.4	2460.8	2548.3	2634.1	2717.7	2799.1	2877.9
Alberta & Prairies	106.8	120.5	128.2	136.5	144.7	153.2	162.0	171.0	180.2	189.6	199.1	208.7	218.4	228.0	236.2	244.1	251.9	259.4	266.7
C&E Canada	172.7	194.8	207.3	220.6	233.9	247.7	261.9	276.4	291.4	306.5	321.9	337.4	353.0	368.6	381.7	394.6	407.1	419.3	431.1
NW Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Canada	2.1	2.4	2.5	2.7	2.9	3.0	3.2	3.4	3.6	3.8	4.0	4.1	4.3	4.5	4.7	4.8	5.0	5.2	5.3
US	73.9	83.3	88.7	94.4	100.1	106.0	112.1	118.3	124.7	131.2	137.8	144.4	151.1	157.8	163.4	168.9	174.2	179.4	184.5
Total including empties	**1508.6**	**1701.9**	**1811.2**	**1927.6**	**2044.1**	**2164.4**	**2288.3**	**2415.6**	**2546.0**	**2678.5**	**2812.7**	**2948.2**	**3084.5**	**3221.1**	**3335.7**	**3448.0**	**3557.5**	**3664.0**	**3767.1**
By Commodity																			
Lumber	381.6	393.5	410.7	429.7	447.8	466.6	486.2	506.6	527.9	546.9	566.5	586.9	608.1	630.0	652.3	675.0	698.0	721.5	745.3
Woodpulp	229.3	228.8	238.8	249.8	260.3	271.3	282.7	294.5	306.9	318.0	329.4	341.3	353.6	366.3	379.2	392.4	405.9	419.5	433.3
Specialty Crops	156.1	164.7	171.9	179.8	187.4	195.3	203.5	212.0	220.9	228.9	237.1	245.6	254.5	263.7	273.0	282.5	292.1	302.0	311.9
Meat, Fish & Poultry	57.1	60.5	63.2	66.1	68.8	71.7	74.8	77.9	81.2	84.1	87.1	90.3	93.5	96.9	100.3	103.8	107.3	110.9	114.6
Basic Metals	52.6	56.4	58.9	61.6	64.2	66.9	69.7	72.6	75.7	78.4	81.2	84.1	87.2	90.3	93.5	96.8	100.1	103.4	106.8
Other Goods	287.2	319.5	333.4	348.8	363.5	378.8	394.7	411.3	428.5	444.0	459.9	476.5	493.6	511.4	529.5	547.9	566.7	585.7	605.1
Empties	335.3	478.5	534.3	591.6	652.1	713.9	776.9	840.7	904.9	978.3	1051.3	1123.4	1194.1	1262.7	1307.9	1349.6	1387.3	1420.9	1450.0
Total	**1499.1**	**1701.9**	**1811.2**	**1927.6**	**2044.1**	**2164.4**	**2288.3**	**2415.6**	**2546.0**	**2678.5**	**2812.7**	**2948.2**	**3084.5**	**3221.1**	**3335.7**	**3448.0**	**3557.5**	**3664.0**	**3767.1**

Source: Ocean Shipping Consultants

Figure 2.6 - Pacific Gateway Containers Exports by Origin ('000TEUs)



Results for long term outlook for the Pacific Gateway container port demand.
The longer term development of PG demand obviously becomes increasingly speculative, but estimates have been derived on the basis of longer term economic development under each scenario and on the basis of the key assumptions detailed earlier in the Section. It is forecast that total Pacific Gateway container port demand to be handled by ports in this region could increase to between 8.2-16.1m TEUs at the end of the study period, although the core Base Case forecasts estimate almost 11.1m TEUs TEU at that time.

Under the Base Case and starting from 2012 a CAGR of 5.7 per cent is forecast for the period to 2025, with this slowing to 3.3 per cent between 2025-2050. This also means that the CAGR for the period between 2012 and to 2030 will be 5.0 per cent.

These developments are summarised in Table 2.16 and in Figure 2.7.

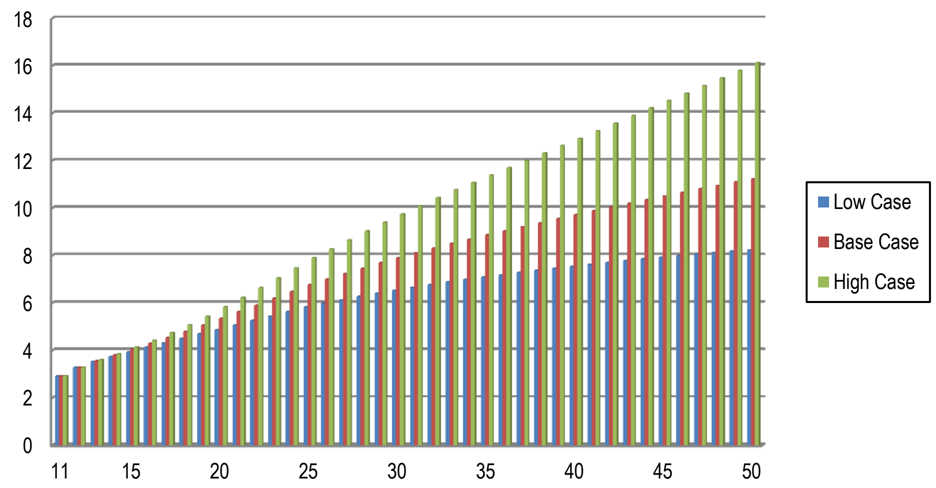
Table 2.16
Forecast Pacific Gateway - Vancouver + Prince Rupert - Container Port Demand to 2050
- million TEUs

	11	12	13	14	15	16	17	18	19	20	25	30	35	40	45	50
Low Case*	2.92	3.28	3.54	3.73	3.93	4.13	4.32	4.51	4.70	4.88	5.83	6.54	7.09	7.54	7.93	8.24
Base Case**	2.92	3.28	3.57	3.80	4.05	4.29	4.54	4.80	5.07	5.34	6.76	7.91	8.87	9.71	10.51	11.24
High Case***	2.92	3.28	3.60	3.86	4.13	4.42	4.74	5.07	5.44	5.83	7.90	9.75	11.39	12.94	14.53	16.11

* Low Case + 'New Paradigm' from 2025
** Base Case + 'Partially Protectionist' from 2025
*** High Case + 'Continuing Free Trade' from 2025

Source: Ocean Shipping Consultants

Figure 2.7 - Pacific Gateway Container Port Demand to 2050 - million TEUs



Various factors determine the degree of realization of this potential demand.
The degree to which this potential demand will be realised (and the role of Vancouver within the Pacific Gateway market place) will be determined by the following factors:

- The overall capacity available at Vancouver to meet potential demand.
- Shifts in the development of deepsea containerisation – vessel sizes and market issues.
- The competitive position of these facilities in terms of marine accessibility.
- The relative costs and capacity of intermodal links to/from the broader hinterland in contrast to other port options.

In order to develop specific forecasts for Vancouver within this profile these issues are considered to define a SWOT analysis of the position of the port. This is then used to refine the specific forecasts for the port.

SECTION 3 – COMPETITIVE DEVELOPMENTS AT REGIONAL PORTS

3.1 Introduction

The development of demand at Vancouver will be determined by various factors, but the availability and type of competing capacity will be a key issue. This Section provides a detailed analysis of the structure and capabilities of container terminals on the North American west coast and assesses how these will develop over the forecast period. The following matters are addressed, taking into account any developments since the June 2012 report was provided:

- Current and planned container terminal capabilities.
- Anticipated development of container terminal capacity.
- Development of productivity in the regional ports.

3.2 Existing and Forecast Capabilities of Regional Container Terminals

This subsection provides an analysis of the container terminal industry on North America's Pacific coast, covering container ports in the Pacific Northwest (Portland, Tacoma, Seattle, Port Metro Vancouver and Prince Rupert) and the Pacific Southwest (Long Beach, Los Angeles and Oakland). It details the development of each of these gateway ports, with an overview of their capabilities in tabular form.

Table 3.1 provides a summary of the development of container handling facilities on this seaboard between 1995 and to the end of 2012. Three indicators of aggregate capability are employed:

- Terminal area – the land area devoted to container operations.
- Quayage – length of quays dedicated to container handling and typically equipped with container gantry cranes.
- Number of quayside container gantry cranes.

Expansion in capability observed, but PNW ports show a more limited expansion than PSW ports

The total area of Pacific Coast container terminals reached some 2255 hectares in 2012, having increased by 58 per cent since 2000. Growth slowed significantly between 2005 and 2012. Although some terminal expansion and new terminal building took place during this period, ports also invested consolidating their existing capabilities in larger terminals with deeper water to handle increasingly large container ships.

Consequently, the berthage dedicated to container handling increased by 27 per cent over 2000-11, but by only five per cent over 2005-12, to 38.3km.

The number of container gantry cranes rose by 32 per cent over 2000-12, to 267. Over this period, average crane size has also increased, as terminals invested in super post-Panamax models to handle the largest vessels.

Clearly, demand has increased much more rapidly, and there has been a significant improvement in container terminal productivity in the region over the period.

The share of Pacific Northwest ports within the North America West Coast ports has developed as follows since 2000:

- *Container terminal area* – from 36 per cent in 2000 to 31 per cent in 2012. Overriding the healthy performance of Canadian container ports, this trend essentially reflects stronger investment arising from more rapid demand development of the southern US ports, relative to that of the northern US ports on the Pacific seaboard.
- *Length or container quayage* – from 39 per cent in 2000 to 34 per cent in 2012.
- *Number of quayside container gantry cranes* – from 39-35 per cent over 2000-12.

These relative developments will be of considerable importance in determining the competitive position of Vancouver in the forecast period.

Table 3.1
North America West Coast Containerport Development, 1995-2012

	Area - hectares	Quayage - metres	Quay gantry cranes
Pacific Northwest			
1995	457	10130	61
2000	509	11633	79
2005	628	11407	79
2012	709	13007	94
Pacific Southwest*			
1995	782	17846	115
2000	922	18545	124
2005	1488	25099	172
2012	1546	25311	173
Total			
1995	1239	27976	176
2000	1431	30178	203
2005	2116	36506	251
2012	2255	38318	267

* excludes Hawaiian ports

Source: Ocean Shipping Consultants

3.3 Pacific Northwest Terminals

The major ports in the Pacific Northwest range of ports are the US ports of Seattle and Tacoma that are in direct and proximate competition – but have jointly engaged on upgrading their intermodal capability – and Port Metro Vancouver. In addition, the port of Portland also handles some containers, and can be regarded as a niche operation that operates in a somewhat different sector of the market. Finally, in 2007, the Canadian port of Prince Rupert began handling containers at a new container terminal. An overview of each port is provided below, based on facilities available at the start of 2013 to include notable developments since the June 2012 Report was provided.

Seattle

Following the amalgamation of Terminals 25 and 30 in 2009, there are four container terminals in Seattle, occupying some 213 hectares and providing 3.3km of container quays. Berth depth is fairly competitive with other regional ports, with most berths offering 15.2m. The status of the port's container handling facilities are summarised in Table 3.2.

Two terminals have on-dock rail provision:

- APL's 70h Global Gateway North facility at Terminal 5, operated by Eagle Marine, has 884m of berths with depths ranging between 13.7-15.2m. It incorporates a 12h intermodal yard with six tracks, where two trains with 27 five-platform double stack railcars each can be assembled for direct access to the Union Pacific Railroad (UPRR) and BNSF railway, and a further two trains with the same capacity can be parked on sidings.
- Occupying 79h, Terminal 18, managed by Stevedoring Services of America (SSA), has 1353m of berths for container handling (and a 136m breakbulk berth), with 15.2m depth. The terminal has similar on-dock capacity as Terminal 5. A total of six super post-Panamax cranes with 64m outreaches were installed during late 2011 and 2012, taking the complement of quay gantry cranes to ten.

Table 3.2
Seattle: Container Handling Facilities, Start 2013

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail rail	Major customers
Terminal 5 Global Gateway North (APL)	69.6	884	13.7-15.2	6	Yes	APL, MOL, Hyundai, Hamburg Sud, Westwood
Terminal 18 SSA Inc.	79	1220	15.2	10	Yes	CMA CGM, ANL-US Lines, Maersk, Safmarine, Matson
Terminal 30 SSA Marine/China Shipping	28.3	823	15.2	6	near-dock	China Shipping
Terminal 46 Total Terminals International	35.2	701	15.2	5	near-dock	Hanjin, MSC, K Line, Yangming, COSCO
Total	**212.1**	**3628**		**27**		
-2005	198.7	3171		20		
-2000	na	4053		25		

Source: Ocean Shipping Consultants

The former Terminal 30 was converted from a container terminal to a cruise terminal in 2003, and then returned to container handling in 2009, when it was amalgamated with Terminal 25, to create a new terminal for China Shipping. It is also operated by SSA. Although the terminal is only 28h in size, the near-dock BNSF/UPRR intermodal facility lies conveniently behind it. There are 823m of quay with 15.2m depth alongside.

Hanjin'sT46 facility has 700m of berths with 15.2m depth. There is scope to add a third berth. Since 2002, six panama container gantry cranes have been replaced by five post-Panamax units, three of which are super-post Panama cranes with 22-row outreaches. The terminal does not have a direct rail link, being dependent on the near-dock BNSF/UPRR facility alongside the adjacent Terminal 30.

Outlook for Seattle: focus on improvement of hinterland connections.
There are no immediate container port investment projects in the offing, though there are delayed plans to add berths at Terminal 5 (213m), Terminal 18 (500m) and Terminal 46, which, it is reasonable to expect, would be triggered by increasing demand.

Current major infrastructural projects are aimed at improving the flow of traffic to/from the hinterland and include the East Marginal Way grade separation and the Alaskan Way viaduct.

With the expansion of the Panama Canal locks to take larger vessels from 2014, the longer-term future of Seattle will, more than ever, continue to be dominated by the efficacy of its intermodal connections.

Table 3.3
Tacoma: Container Handling Facilities, Start 2013

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
Olympic Container Terminal (Yangming)	22	335	15.5	4	Yes	Yangming, K Line, Hanjin, Cosco
Husky Terminal ITS (K Line)	37.6	823	15.5	4	Yes	K-Line, COSCO, Hanjin Mitsui-OSK, Yangming
Washington United (Hyundai Merchant Marine)	42.5	792	15.5	6	Yes	HMM, MOL, APL, Grand Alliance
APM Terminal	54.8	671	15.5	5	near-dock	Horizon
Pierce CountyTerminal Ports America (Evergreen)	57.1	689	15.5	7	Yes	Evergreen
Total	**214**	**3310**		**26**		
-2005	194.9	2880		22		
-2000	na	2270		23		

Source: Ocean Shipping Consultants

Tacoma
The port of Tacoma currently operates five container terminals, with a total area of 214 hectares and a berthage of 3.3km. Berth depth has been uniformly increased to 15.5m.

Hyundai Merchant Marine's Washington United and Evergreen's Pierce County terminals have their own intermodal yards, with capacity for 52 and 78 double stack container railcars respectively. The Washington United Terminal quay was extended by 183m in 2011 to accommodate longer vessels. In mid-2012, the Grand Alliance joined HMM's existing alliance partners at the terminal. The other terminals are served by two near-dock intermodal yards, used by both BNSF and UPRR. On-dock rail connections have been extended to all but one terminal (APM's):

- ITS (K Line)'s Husky Terminal and Yangming's Olympic Terminal have on-dock access to the North Intermodal Yard, which can handle 76 double stack container railcars.
- The APM Terminal is served by the adjacent South Intermodal Yard, which can accommodate 30 doublestack container railcars on ramp tracks and 37 on interchange tracks. In 2009, Maersk stopped calling Tacoma in favour of joint services with CMA CGM out of Seattle. However, in 2010, the lease on its Tacoma terminal was extended for six years, for continued use by cabotage operator, Horizon Lines. NYK planned to move to the facility in 2012 but instead used the Washington United Terminal along with its partners. (In 2009, the carrier cancelled plans for a new East Blair Terminal.)

An overpass was opened in 2011 to separate trains and vehicular traffic at Lincoln Avenue.

Outlook for Tacoma: optimising existing areas to attract the larger carrier alliances and vessels. The port's ten-year strategic plan, announced in 2012, includes redevelopment of its central peninsula to handle the largest vessels efficiently, including widening and deepening waterways as necessary. There are also plans to expand rail capability to handle 1.5-mile long trains and provide a second rail crossing over the Puyallup River.

Though details have yet to be released, the overall plan is clearly directed at combining and optimising existing areas to make them more suitable for the larger carrier alliances and vessels of today's market. The only new terminal included in the strategic plan is a bulk facility. Although there are significant possibilities for expansion of container handling, which could be activated if warranted by demand, given 2012 throughput still nearly 0.4m TEU below the 2.1m TEU peaks achieved in 2005-06, and existing capacity to handle 3.4m TEU/year, few are likely to happen in the immediate future:

- Phase II of the Washington United Terminal is intended to add 66 acres (26.7h) to the terminal area (53 acres for container handling and 13 acres to expand the rail capability), providing an additional 0.36m TEU/year of container handling capacity.
- There is scope to expand Yangming's Olympic Terminal from 21.6-30.75 hectares.
- The acquisition of the former Kaiser Aluminium site supplied 83 acres for possible development into a cargo terminal, not necessarily for containers, though originally conceived as such.
- SSA and the native American Puyallup tribe have a longstanding agreement to develop a two-berth container terminal on 180 acres of land. Until and unless a container-line customer is found, however, development seems unlikely.

Table 3.4
Portland: Container Handling Facilities, Start 2013

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
Terminal 2 (multipurpose)	20.2	611	12.2	2	Yes	CHKY Alliance
SSA						Hapag Lloyd
Terminal 6	31.6	869	13.1	9	Yes	CHKY Alliance
ICTSI						Hamburg Sud
Total	**51.8**	**1480**		**11**		
-2005	49.9	1567		9		
-2000	49.9	1567		9		

Source: Ocean Shipping Consultants

Portland

Located on the Columbia River, Portland is some distance from the sea and is also restricted with regard to vessel sizes. Over 2010-11, the navigation channel was deepened from 12.2-13.1m. The port enjoys a particular export role, based on the agricultural output of the region and linked to barge services on the Columbia/Snake River systems. Given the vessel size restrictions, the port's role will continue to rely on development of the existing customer base. And it will remain of peripheral significance to the broader PNW market.

There are two container terminals at Portland. Terminal 2 is operated by SSA. In 2011, Manila-based ICTSI took over management of Terminal 6 under a 25-year lease.

Outlook for Portland: ample scope to expand, so no terminal expansion envisaged.
There is ample scope to expand container volumes within existing capacity, so there is little requirement for terminal expansion. The current status of facilities is detailed in Table 3.4.

Port Metro Vancouver

The port of Vancouver merged with Fraserport in 2007, forming Port Metro Vancouver. Container terminal capabilities are summarised in Table 3.5. All terminals have on-dock rail provision and water depth at the Vancouver terminals is 15.5-15.9m.

The 1997 development of container handling at a new site at Robert's Bank, deep water, good intermodal provision and competitive handling rates enabled Vancouver to recapture Canadian cargoes from other PNW ports and extend its hinterland into eastern Canada and the US. This helped sustain strong growth in container volumes until 2007, when the port faced competition from a new deep-sea container terminal at Prince Rupert port. With a dip in 2009, volumes at Port Metro Vancouver have leveled out in the period to 2012.

Current facilities are detailed in Table 3.5 and planned facilities in Table 3.6.

Table 3.5
Port Metro Vancouver: Container Handling Facilities, Start 2013

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
Delta Port TSI	85	1100	15.9	10	Yes	CKYH, CMA CGM, China Shipping, Evergreen, Grand Alliance, Maersk, MSC, PIL Zim, New World Alliance
Vanterm TSI	31	619	15.5	6	Yes	CKYH, CMA CGM, China Shipping, Evergreen, Grand Alliance, Maersk, MSC, PIL Zim, New World Alliance
Centerm DPW	31.3	644	15.5	6	Yes	China Shipping,Hanjin WSL, Zim
Fraser Surrey Docks Macquarie	28.1	701	11.7	4	Yes	CCNI, CSAV, Evergreen HMM, Maersk, Hamburg Sud, Hapag-Lloyd
Total	**175.4**	**3074**		**26**		
- 2005 (including Fraserport)	152.4	2634		23		
- 2000 (including Fraserport)	na	2862		18		

Source: Ocean Shipping Consultants

Outlook for Port Metro Vancouver: expansion in capacity by reconfiguration and construction of new terminal

Future plans centre on intermodal improvements to boost capacity at Deltaport and development of a second container terminal on reclaimed land at Robert's Bank.

PMV has publicly-stated plans to increase the capacity at Deltaport through the development of T2, with operations due to commence in 2024, as the following confirms:

- By reconfiguring the intermodal yard, road access and rail tracks, the port authority plans to boost capacity at the existing Deltaport Terminal by 0.6m TEU/year to 2.4m TEU/year.
- The planned second terminal would also have three berths and capacity to handle 2.4m TEU/year when fully built up.

Table 3.6
Port Metro Vancouver: Planned Container Handling Facilities

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Year
Deltaport capacity expansion						
+0.6m TEU/year capacity					Yes	2015
Roberts Bank Terminal 2						
- Phases to 2030, +2.4m TEU/y	+81	+3 berths		+10	Yes	2024

Source: Ocean Shipping Consultants

Prince Rupert

The Fairview Container Terminal at Prince Rupert opened in 2007 with capacity to handle 0.5-0.6m TEU/year, with an increase gained during 2012 that enabled its operating capacity to be raised to 0.75m TEU/year).

Container throughput on the 360m container quay reached 0.40m TEU in 2011 and 0.56m in 2012, so it is probable that the proposed two stages of further capacity development will continue on the following basis:

- Stage 1 – an increase of 0.5m TEU/year by 2015, which will take the total to an estimated 1.25m TEU/year capacity;
- Stage 2 – an increase of 0.75m TEU/year in 2020.

These two staged increase will expand the terminal by 32 hectares and extend the quay to 800m in 2014.

The current facilities at the start of 2013 are detailed in Table 3.7 and "planned" facilities in Table 3.8.

Table 3.7
Prince Rupert: Container Handling Facilities, Start 2013

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
Fairview Container Terminal	24	360	18.7	3	Yes	Cosco, K-Line,
Maher Terminals						Hanjin, Yangming
Total	**24**	**360**		**3**		

Source: Ocean Shipping Consultants

Table 3.8
Prince Rupert: Planned Container Handling Facilities

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Year
Fairview Container Terminal	32	440	18	3	Yes	2015
- Capacity build-up to 2m				-2		2020

Source: Ocean Shipping Consultants

3.4 Pacific Northwest Container Handling Capacity Development

Table 3.9 summarises the foregoing container port investment plans for the Pacific Northwest region, along with associated capacity additions, based on available information in June 2013.

Scheduling becomes increasingly less certain over time; the timing of later stages of development will largely depend on the pace of demand growth. Hence, in this study, investment and capacity are forecast to 2020.

Table 3.9
PNW: Recent, Committed and Planned Container Port Investment

Port	Project	Quay length (metres)	Annual Capacity (m TEUs/year)	Year
Port Metro Vancouver	Roberts Bank: Deltaport reconfiguration		0.60	2015
	Roberts Bank: Terminal II	3 berths		
	Build-out		2.40	2024
Prince Rupert	Container terminal expansion	440	0.50	2015
	equipment build-up		0.70	2020
Seattle	TTI Terminal: 6th container gantry crane removed		-0.05	2011
	Terminal 18 (SSA): 3 super-post Panamax cranes delivered		0.45	2012
Anchorage	Completion of new two-berth container terminal		0.15	2014

Source: Ocean Shipping Consultants

Container handling capacity in PNW anticipated to expand by 16 per cent over 2012-2020. It is anticipated that container handling capacity (see Section 3.7 below) for the entire range will increase by some 16 per cent between 2012-20, based on terminal expansions, with developments at Vancouver being at the centre of this expansion. The outlook is summarised by port in Table 3.10.

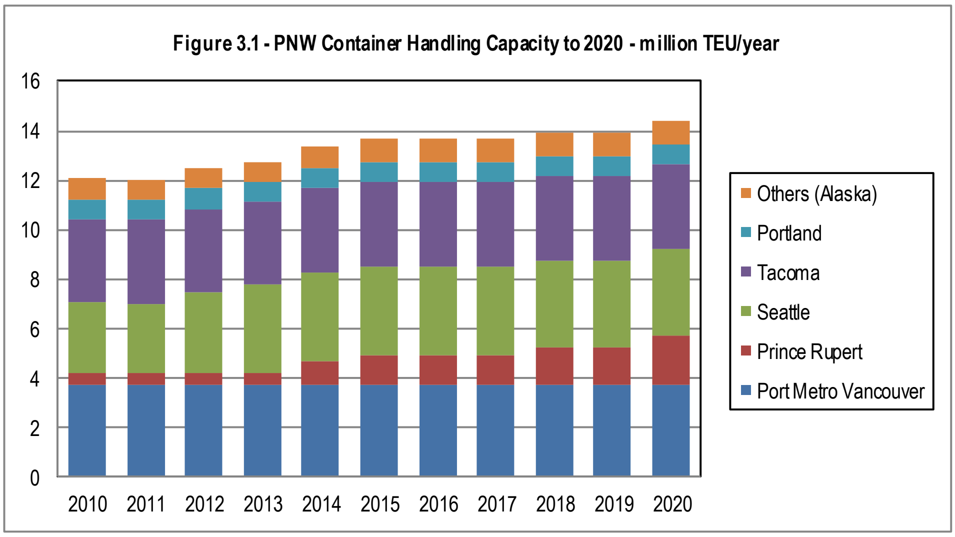
Total capacity in the PNW range at end-2012 amounted to some 12.5m TEU/year, with Port Metro Vancouver offering some 3.7m TEU – 30 per cent of the total, or 34 per cent if Portland and Alaskan ports are excluded.

The capacity outlook is illustrated graphically in Figure 3.1, though it should be noted that the T2 development at PMV is excluded, based on the publicly-confirmed starting date for operations of 2024.

Table 3.10
North America Pacific Northwest: Container Handling Capacity to 2020

m TEU/year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Port Metro Vancouver	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70
Prince Rupert	0.50	0.50	0.50	0.50	1.00	1.25	1.25	1.25	1.50	1.50	2.00
Seattle	2.85	2.80	3.25	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55
Tacoma	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
Subtotal	**10.45**	**10.40**	**10.85**	**11.15**	**11.65**	**11.90**	**11.90**	**11.90**	**12.15**	**12.15**	**12.65**
Portland	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Others (Alaska)	0.80	0.80	0.80	0.80	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Total	**12.05**	**12.00**	**12.45**	**12.75**	**13.40**	**13.65**	**13.65**	**13.65**	**13.90**	**13.90**	**14.40**

Source: Ocean Shipping Consultants



3.5 Container Port Productivity

As presented in Table 3.11, terminal productivity is considered from the following perspectives:

- Throughput per unit of berth – TEUs per berth metre per annum;
- Throughput per unit of terminal area – TEUs per terminal hectare per annum;
- Throughput per quayside gantry crane – TEUs per gantry crane per annum.

The current results indicate that:

- Productivity at Metro Vancouver is significantly higher than that at the US ports in the range, and this applies to all three measures used. This is despite the inclusion of the multipurpose facilities at Fraser Port in the aggregate, which can be expected to have lower productivity than the dedicated deep-sea facilities at Vancouver.
- Productivity at Prince Rupert's single container berth has climbed sharply since the port opened its container terminal. Levels have reached a point indicating the terminal is close to capacity limits, and further investment will be needed to sustain demand growth.

Table 3.11
North America Pacific Northwest: Container Handling Productivity, 2007-12

	2007	2008	2009	2010	2011	2012
TEUs per hectare of terminal area						
Port Metro Vancouver	16375	16352	12471	14567	14525	15468
Prince Rupert	696	7578	11051	14307	17103	23536
Seattle	9933	8579	7446	10054	9555	8891
Tacoma	9524	9209	7312	6884	6982	7996
Portland	5217	4923	3494	3632	3666	3537
Range average	***10638***	***10342***	***8532***	***9891***	***9819***	***10421***
TEUs per metre of container berth						
Port Metro Vancouver	947	946	817	811	809	883
Prince Rupert	46	505	737	954	1140	1569
Seattle	622	538	437	590	561	520
Tacoma	616	596	495	466	447	517
Portland	176	166	118	122	133	124
Range average	***619***	***602***	***510***	***567***	***558***	***596***
TEUs per container gantry crane						
Port Metro Vancouver	113433	108352	93585	96704	96424	104352
Prince Rupert	5568	60626	88408	114455	136823	188286
Seattle	75904	65557	63384	85583	84731	78570
Tacoma	80206	77556	59456	55980	56775	65813
Portland	26013	22314	15837	16464	17950	16655
Range average	***78480***	***74544***	***65027***	***72899***	***73607***	***78423***

Source: Ocean Shipping Consultants

3.5 Pacific Southwest Terminals

The focus of competition for Vancouver will be other terminals in the PNW. Despite this, it is also necessary to consider the broader West Coast region. This region (and indeed the whole Pacific range) is dominated by the twin ports of Long Beach and Los Angeles – which serve the entire North American hinterland via intermodal shipment as well as the local Californian market. Further volumes are shipped through Oakland, whose significance is primarily local to the San Francisco area.

With overcapacity prevailing on the Europe-Far East trades, March 2012 saw the cascading of the first 12500 TEU vessels to the Pacific and US west coast, spearheaded by calls at Long Beach and Oakland by the *MSC Fabiola*, with other sized-ships following/planning to follow thereafter in recent months.

Long Beach

Key specifications of container terminals at Long Beach are summarised in Table 3.12. There are six container terminals, all being dedicated to one or more lines or consortia.

Table 3.12
Long Beach: Container Handling Facilities, Start 2013

Terminal	Berths	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
Pier A SSA/MSC	A88-A96	80.9	1097	15.2	10	Yes	MSC, Zim
Pier C SSA (Matson)	C60-C62	28.3	549	12.8	3	No	Matson
Pier F: Long Beach CT OOCL*	F6-F10	41.3	838	15.2	7	Yes	OOCL & alliance partners
Pier G ITS (K Line)	G226-G236	99.6	1945	11-12.8	17	Yes	K Line & alliance partners
Pier J: Pacific CT. SSA/COSCO/CMA CGM	J243- J247 +J266-J270	103.6	1799	12.8-15.2	15	Yes	COSCO & alliance partners; CMA CGM, MSC
Pier T TTI (Hanjin)	T132-T140	155.8	1524	16.8	14	Yes	Hanjin & alliance partners, CMA CGM, MSC
Total		**509.5**	**7752**		**66**		
- 2005		515.9	8392		70		
- 2000		339.4	6390		44		

* lease ended end-2011; will be redeveloped as part of Middle Harbour project – see Table 3.13

Source: Ocean Shipping Consultants

The total land area being used for container handling at these terminals at the start of 2013 extends to around 510 hectares. There are 7.75km of container quays, served by 66 container gantry cranes. (This excludes Pier E – formerly 38.3 hectares and 640m of quay – on which works are in process, as part of the Middle Harbour redevelopment – see below).

The main access channel is dredged to 23.1m. Berth depth is up to 15.2-16.8m for terminals A, F J and T, except Pier C & G – the former is used for Matson's cabotage services. All terminals, except Pier C, have on-dock rail access.

Outlook for Long Beach: investments on terminal expansion, new on-dock infrastructure, bridge replacement and 'greening'.

Long Beach plans investment totalling US$4.5bn over the coming decade:

- The US$1.2bn redevelopment of the Middle Harbour, which will combine Piers D, E and F into a single, larger terminal, is the port's major container terminal investment project at present. Work on the first phase – upgrading Piers D/E – commenced in spring 2011.

  Phase II is targeted for completion in 2019. When fully built up, the 123h new terminal will have capacity to handle 3.3m TEU/year (some 2.2m TEU/year more than offered by the individual terminals prior to amalgamation). In April 2012, the port signed a 40-year lease agreement for the new terminal with OOCL, whose lease on its existing Pier F facility expired in 2011.

- The port is also seeking approval for a $650m plan to convert the site of a former oilfield into a 64.7h container terminal with 1000m of quays. This will become Pier S and is expected to take some five years to realise.

- Continuing modernisation and "greening" of K Line's Pier G, in a programme which started in 2000. A new on-dock rail yard has been completed (in 2012), nearly doubling the terminal's on-dock rail capacity. The programme also aims to provide additional shore power facilities and container yard space, and is due to be finished in 2020.

Other projects will include the US$1bn replacement of the Gerald Desmond Bridge (which is insufficiently high for the largest transpacific containerships to pass beneath), rail network improvement and the provision of shore power (cold ironing) to Piers A, G, J and T, following its recent installation at Pier C. Shore power will also be included in the Middle Harbour development.

At Pier T, TTI (Hanjin) has plans to use a vacant ten-acre area of land to install a grain transloading facility to ship grain in otherwise empty containers. MSC have recently acquired a share of TTI, giving them access to deepwater terminals that are not constrained by the air draught limitations of the inner terminals – thus allowing the deployment of larger vessels for the line.

At Pier T, MSC purchased a stake in the terminal in early 2013. Also in November 2012 CMA CGM purchased a 25% stake of Pier J which has been operated as a joint venture between SSA and Cosco.

Table 3.13
Long Beach: Planned Container Handling Facilities

Terminal	Area - h	Berthage - m	Depth - m	Quay gantry cranes	On-dock rail	Year
Middle Harbour Redevelopment - reconfigure Piers D, E & F *(OOCL)*						
- Phase I: Pier D/E upgrade net 0.8m TEU/year capacity		c450			Yes	2014
- Completion to 3.3m TEU/year cap (net 2.2m TEU/year)	123	->3 berths for 13000 TEU vessels		22-row outreaches	Yes	2017->
Pier S (oilfield redevelopment) +1.2m TEU/year	64.7	1000	na	na		2018->

Source: Ocean Shipping Consultants

Los Angeles

In the Pacific Southwest range, container handling capabilities at the port of Los Angeles have been expanded most vigorously over the past decade.

- The land area devoted to container handling has increased from 386 to 688 hectares and container quayage from 6.5 to 10.2km.
- The number of container gantry cranes has risen from 47 to 75 over the period.

There are nine container terminals, including a vacant Port of Los Angeles facility. On-dock rail access is available on all tenanted terminals apart from MOL's Trans-Pacific Terminal.

The deepest berths at each terminal range between 13.7m (Yangming's West Basin CT, Evergreen and NYK's Yusen Terminals) to 16.8m for the APM's Pier 400 facility. At least one berth at the other terminals, except APL's, has been deepened to 16.2m in a dredging programme which commenced in 2006.

In late 2010, California United Terminals moved from Long Beach to Los Angeles, taking a sublease at APM's terminal.

Key specifications and major customers of container terminals at Los Angeles are presented in Table 3.14.

Table 3.14
Los Angeles: Container Handling Facilities, Start 2013

Terminal	Berths	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Major customers
West Basin CT (China Shipping)	100-102	36.8	648	16.2	8	Yes	China Shipping, K-Line, Yang Ming, Cosco, Hanjin, Evergreen, Zim
West Basin CT (Yangming)	121-131	75.3	1067	10.7-13.7	8	Yes	Yangming, K-Line, China Shipping, Cosco, Hanjin, Evergreen, Zim
Trans Pacific Terminal (Mitsui-OSK)	135-139	70	1234	10.7-16.2	11	No	Mitsui-OSK, CMA-CGM, APL, HMM, CSAV
Port of Los Angeles CT	206-209	34.8	665	12.2-13.7	4	No	vacant
Yusen Terminal (NYK Line)	212-225	74.9	1768	10.7-13.7	10	Yes	NYK, OOCL Hapag-Lloyd,
Evergreen Terminal	226-236	83.0	1433	11.6-13.7	8	Yes	Evergreen, China Shipping, Zim
APL Terminal (Global Gateway South)	302-305	118.2	1219	15.2	12	Yes	APL, MOL Hapag-Lloyd, Evergreen
Pier 400 APM Terminals	401-404	159	1582	16.8	10	Yes	Maersk, Safmarine, OOCL Horizon, Hapag Lloyd, MSC, CMA-CGM, NYK, US Lines
California United Terminals (Pier 400 sublease: HMM)	405-406	36.8	610	16.8	4	Yes	Hyundai, APL, MOL
Total		**688**	**10226**		**75**		
- 2005		630.0	9734		65		
- 2000		385.7	6472		47		

Source: Ocean Shipping Consultants

Outlook for Los Angeles.
The port's ten-year plan to 2020 contains investment totalling US$3bn, which is intended to:

- Complete the channel/berth deepening programme to 16.2m.
- Expand handling capacity.
- Expand on-dock and near-dock rail capacity.
- Improve traffic flow, with road and bridge improvements within the port.

Container terminal expansion projects in the period to 2020 are summarised in Table 3.15 and comprise:

- A third berth at the China Shipping's West Basin Container Terminal (the second was commissioned in 2011).
- Phase 1 of a continuing programme at MOL's Trapac Terminal, which saw a berth extension completed in spring 2011, and is set to add 57 acres of land and an on-dock rail capability in 2014, with berth and channel deepening to 16.1m in 2015. In addition, the terminal operator plans to install the first automated straddle carriers in the US.
- Redevelopment of APL's Global Gateway South Terminal with the addition of 22.7h (56 acres) and 380m of quay. With work starting in 2014, the project is expected to boost capacity to 3.2m TEU/year by 2027.

Beyond 2020, a second phase of development at Trapac will add another ten acres of land.

The major project, however, will be the construction of Pier 500, to provide a new 200-acre container terminal. This is expected to take about ten years to actualise.

Table 3.15
Los Angeles: Planned Container Handling Facilities

Terminal	Berths	Area - h	Berthage - m	Depth - m	Quay gantry cranes - no.	On-dock rail	Year
California United Terminal sublease					+4	existing	2011-12
+0.60m TEU/year capacity							
West Basin CT expansion		+20.7	+114	16.2	+2	existing	2014
(China Shipping) +0.4m TEU/y capacity							
Trapac Terminal expansion							
I: +0.5m TEU/y capacity		+23		16.2	+5	Yes	2015
II: +0.1m TEU/y capacity		+4					2025
APL Terminal expansion							
+1.55m TEU/year capacity	306	+22.7	+381	16.8	+12	existing	->2027
Pier 500 terminal		81					2021->

Source: Ocean Shipping Consultants

Oakland
Key container terminal specifications at Oakland are presented in Table 3.16.

Although offering extensive container handling capabilities – with a total area of 310 hectares and some 7.0km of container berths – the port of Oakland plays a secondary role on the west coast and is highly dependent upon the greater San Francisco markets. There is no on-dock rail capacity to facilitate intermodal movements, with rail connections supplied by two near-dock facilities.

However, the consolidation of terminals has provided seven larger facilities, all but two (the cabotage terminals) offering 15.2m depth alongside. Access channel depth was increased from 14m to 15.2m from late-2009 and, in April 2012, the port received the first 12500 TEU containership to call on the west coast, the *MSC Fabiola*, highlighting the desire for bigger vessels to call in the region.

Outlook for Oakland: no immediate terminal expansion plans.
With throughput yet to surpass the 2006-07 peaks, there are no immediate terminal expansion plans, though there are longstanding plans to redevelop the inner harbour.

Table 3.16
Oakland: Container Handling Facilities, Start 2013

Terminal	Berths	Area - h	Berthage - m	Depth - m	Quay gantry cranes -no.	On-dock rail	Major customers
Outer Harbour Terminal Ports America	20-26	84.9	1714	12.8-15.2	10	No	Maersk, Horizon, CCNI Hapag Lloyd, Hamburg Sud K Line, YML, Hanjin, Cosco, MOL, HMM, APL, US Lines Polynesia Line
TransPacific Terminal. (MOL)	30-32	26.6	662	15.2	4	No	Mitsui-OSK APL, Hyundai MM
Vacant.	33-34	13.2	433	15.2	0	No	vacant
Ben E. Nutter CT STS/Evergreen	35-38	23.5	931	15.2	4	No	Evergreen
Total Terminals (Hanjin)	55-56	48.6	731.5	15.2	4	No	Hanjin & partners
Oakland International CT SSA Marine	57-59	60.6	1091	15.2	6	No	CMA CGM, Coscon, CSCL, Hamburg Sud, Hapag-Lloyd, MSC, NYK, OOCL, Zim
APL Terminal Eagle Marine Serv.	60-63	32.1	836	12.8	4	No	APL, Evergreen, HMM, MOL
Charles P Howard CT SSA Terminals Inc.	67-68	20.4	593	12.8	4	No	Matson Line
Total		**309.9**	**6992**		**36**		
- 2005		303.4	6631		37		
- 2000		na	4860		29		

Source: Ocean Shipping Consultants

Table 3.17
North America Pacific Southwest*: Container Handling Capacity to 2020

m TEU/year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Long Beach	7.90	7.60	7.60	7.60	8.40	8.40	8.40	8.70	9.10	9.10	9.10
Los Angeles	9.65	10.60	10.90	10.90	11.30	11.80	11.80	12.32	12.32	12.32	12.32
Oakland	3.27	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72
Total	**20.82**	**21.92**	**22.22**	**22.22**	**23.42**	**23.92**	**23.92**	**24.74**	**25.14**	**25.14**	**25.14**

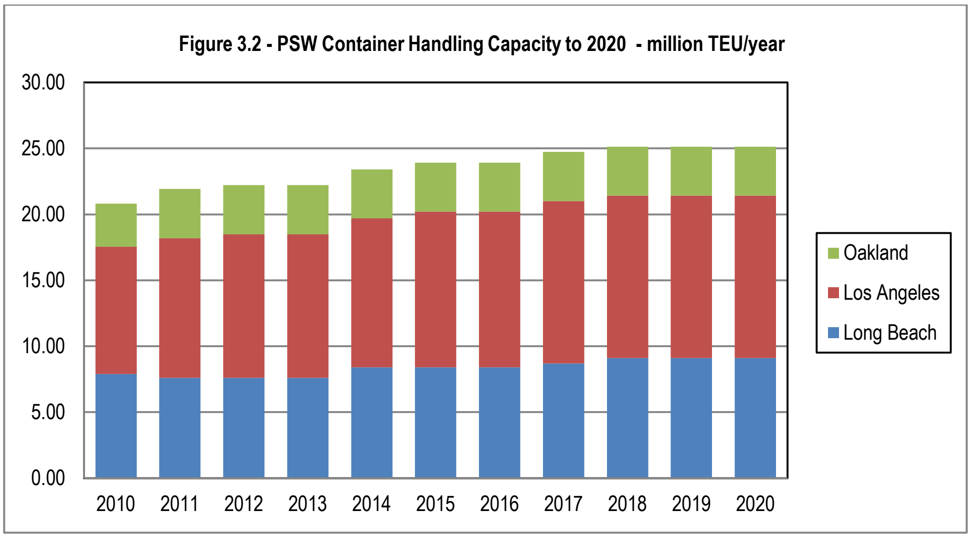
* excludes Hawaii

Source: Ocean Shipping Consultants

Pacific Southwest Container Handling Capacity Development
Aggregating the container port investment plans in the Pacific Southwest, Table 3.17 presents the anticipated container handling capacity in this range of ports to 2020.

Over 2012-20, container handling capacity is set to increase by 13 per cent to 25.1m TEU/year.

The outlook is also charted in Figure 3.2.



3.6 'Design' and 'Effective' Capacity

Container terminal capacity is invariably quantified in terms of the numbers of containers that can be handled by the facilities under consideration in a given period. This represents the maximum capacity of the terminal and is the metric that has been used in the current analysis. Providing there is a general balance between berth length and terminal area, this tends to represent the maximum that the terminal can handle across the quay in a given period.

In reality, of course, the position is more complex. It is not possible to aim for full berth utilisation and the capacity of a particular terminal will be dependent upon the specific market in which the terminal is operating. For example, there is a considerable difference noted between common-user and line-owned/operated terminals. In the latter case, the line can maximize the capacity of the terminal by controlling the arrival and departure of vessels. For common-user terminals, there is a greater need to meet short term customer requirements and a less certain vessel arrival profile is noted.

Typically, it has been found that for a common-user terminal, like those operated in Vancouver, once demand reaches in excess of around 80 per cent of 'design' capacity difficulties at other stages of the transport chain begin to emerge. For example, vessels may be queuing for berths or there can be landside congestion.

Calculation of these issues can never be definitive given the importance of local and often temporary market issues. However, in this study it is estimated that utilisation rates of around 85 per cent represent a maximum efficient (or 'effective') use of a container terminal. This is an important consideration when defining when new capacity will be required as a period of 100 per cent utilisation would likely represent an inefficient terminal that would be in danger of losing market share. The choice of 85 per cent may be seen as conservative – with congestion difficulties frequently encountered at lower utilisation levels.

3.7 Conclusion

It is apparent from the analysis conducted that only limited expansion is anticipated in West Coast terminals as a whole. This position was first identified in June 2012, and it remains very similar in June 2013.

Recently, demand increases have been accommodated by improved productivity but there is very little scope to further improve capacity by this means – particularly within Canadian ports.

It is also apparent that there has been a programme of depth improvements in the major Californian ports and in the PNW and this has allowed larger vessels to enter the trade.

As is considered in Section 4 of this Updated report, the water depth available at Vancouver will be sufficient to handle the largest anticipated vessels in the Transpacific trades at the load states anticipated over the forecast period.

SECTION 4 – TRENDS IN CONTAINER SHIPPING

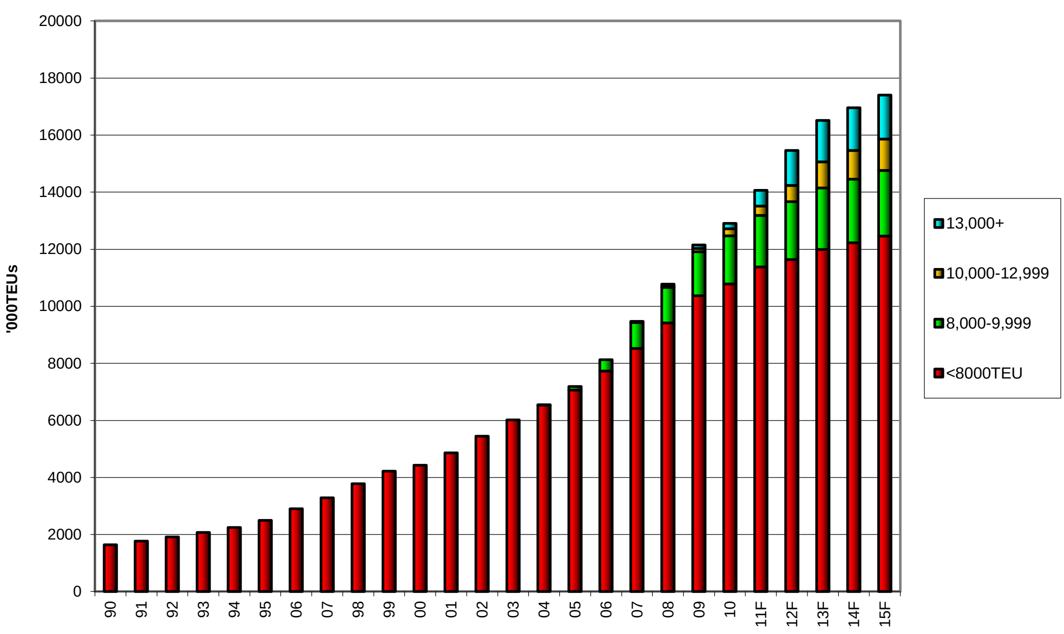
4.1 Introduction

One of the major determinants in the development of container volumes at Vancouver will be the development of shipping demand and, specifically, the size and type of vessels that will be deployed on the key Transpacific trades. The trend has been towards the development of much larger vessels in recent years and Vancouver will be well placed to handle such container ships.

This Section looks at:

- The development of container vessels for the largest deepsea trades;
- The specific situation on the Transpacific trades.

Figure 4.1 - The Increasing Importance of Large Vessels in the Container Fleet



4.2 Container Vessel Sizes and Fleet Development

One of the major determinants in the development of container volumes at Vancouver will be the development of shipping demand and, specifically, the size and type of vessels that will be deployed on the key Transpacific trades. The trend has been towards the development of much larger vessels in recent years and Vancouver will be well placed to handle such container ships.

The shift to larger vessels has been the most significant feature for deepsea containerisation. The search for scale economies is at the heart of this drive. On a tonnage-mile basis, the savings from larger vessels are significant and also one of the few factors that are directly controlled by ship operators. Furthermore, as soon as one major operator advances to the next size echelon, the competitive nature of the shipping industry may force other operators to follow suit. The net effect is a rise in both average vessel size and the size of the largest vessels deployed.

The largest vessels that are planned will have a length (LOA) of 400m, a beam of 59m and a design draught of around 15.5m – although full draught will seldom be used. Berthing of these vessels should be possible with careful management at Vancouver and at Prince Rupert. The 18,000-20,000TEU vessels now on-order are likely to represent the largest container vessels that will be constructed.

The trend in favour of larger vessels is well established and has accelerated since 2004. The share of 8,000 TEU+ vessels increased from 0.2 per cent of the containership fleet at the beginning of 2004 to 25 per cent at the beginning of 2012. The very largest vessels are typically deployed on trades between East Asia and Europe. To date, the emphasis in these trades has been on the 8,000-11,000 TEU size range, but vessels of over 13,000 TEU are now being deployed and are set to increase their share in this market. The oversupply of these largest classes of vessels is now resulting in pressure to re-deploy these vessels on other trades and the Transpacific will be a primary candidate for these developments. There is likely to be pressure to deploy further larger vessels on these trades, where water depth and other considerations permit such operations.

The development of the world fleet is summarised in Figure 4.1.

Unfortunately for the shipping lines, many of them began receiving significant new tonnage just at the time when the major world economies went into recession. This resulted in a more rapid transfer of vessels previously deployed on Asia-Europe services to transpacific and transatlantic trades, and the process of 'cascading' of larger vessels to secondary deep-sea trades also accelerated.

Launched in 2006, the Emma Maersk was the first in a series of containerships, which remain the largest operational today. The 156,907dwt vessels have 398m loa, 56.4m beam and maximum draught of 15.5m.

Figure 4.2 – Emma Maersk

Maersk have since ordered larger vessels – the 18,000TEU 'EEE' Class – and CMA CGM have decided to increase the size of their most recent orders to around 16,500TEU. There are also evaluations of moves to further expand the scope of the EEE Class to around 20,000TEU.

Container vessel size development driven by search for economies of scale.
The shift to larger vessels has been the most significant feature for deepsea containerisation. The search for scale economies is at the heart of this drive. On a tonnage-mile basis, the savings from larger vessels are significant and also one of the few factors that are directly controlled by ship operators. Furthermore, as soon as one major operator advances to the next size echelon, the competitive nature of the shipping industry may force other operators to follow suit. The net effect is a rise in both average vessel size and the size of the largest vessels deployed.

The generational development of deepsea container vessel designs is summarised in Table 4.1.

Table 4.1

Design Development of Large Containerships

	TEUs	Length overall (m)	Beam (m)	Maximum draught* (m)	Required th depth (m)*
First generation: 1968	1,100				
Second generation: 1970-80	2-3,000	213	27.4	10.8	12.0
Panamax: 1980-90	3-4,500	294	32.0	12.2	12.8-13.0
Post-panamax: 1988-95	4-5,000	280-305	41.1	12.7	13.5-14.0
Fifth generation: 1996-2005	6,400-8,000	300-347	42.9	14.0-14.5	14.8-15.3
Super post-panamax: 1997->	8,000-11,400	320-380	43-47	14.5-15.0	15.3-15.8
Ultra large container ships: 2006->	14,500	380-400	56.4	15.5	16.3
New-panamax: 2010	12,500	366	49.0	15.2	16.0
Maersk EEE Class: 2014	18,000	400	59.0	15.5	16.3

* Maximum draught is rarely realised, even when vessels are fully laden, so required berth depth is less in practice. Maximum draught refers to the depth of the vessel below water when at scantling draught, required depth refers to the water depth necessary to accommodate vessels at maximum draught.

Source: Ocean Shipping Consultants

Current expansion of the Panama Canal will boost ship size developments as well.
Currently, there is a further, one-off boost motivating ship size development in some trades, namely the expansion of the Panama Canal, which will permit larger vessels to cross between the Pacific and Atlantic Oceans from late 2014. The maximum dimensions for vessels that will be allowed through the new locks will be 369m loa x 49m beam x 15.2m maximum draught. This implies considerable margins relative to the actual dimensions of the locks, and it may be that new-Panamax (NPX) vessel dimensions will be progressively enhanced, as has been the case for Panamax dimensions.

Factors defining the upper limits of the size of container vessels.
It is apparent that the size of container vessels is now approaching a peak. Factors which define upper limits are:

- Scale of demand: This is the most obvious determining factor. The market does not require 1mt of crude oil in one package, still less 1mt of reefer cargoes or 1m passengers on one voyage. Attempts to increase ship size beyond that called for by market demand result in half-empty vessels, trading with the costs, but not the benefits of scale. This explains why, for example, the largest general cargo vessels are much smaller than the largest tankers or dry bulk carriers. Similar considerations apply to container ships. Filling the largest container ships used for transshipment requires networks of feeders and/or interlining mainline services to concentrate demand.

- At-sea versus in-port costs, long versus short hauls, and number of port calls: economies of scale are reaped whilst vessels are at sea, since it costs less per cargo ton to ship a large cargo than a small cargo. However, the per-ton costs of loading and unloading do not decline similarly with increasing cargo size, as it is difficult significantly to speed up per-ton or per-container handling speeds, so larger vessels benefit from only limited economies, if any, whilst in port. Scale economies are therefore at their greatest when the sea-time/port-time ratio is maximised. Large vessels are thus less attractive for short hauls, or itineraries with a large number of port calls.

- The new locks being built in the Panama Canal will make longer hauls, incorporating a Panama-Canal transit, possible for larger vessels. This will have far-reaching implications for the container trades. The economics of the transpacific 'All-Water' option between Asia and the North American east coast will improve significantly. 'Pendulum' and 'round-the-world' (RTW) services – linking two or three of the major east-west trades (transatlantic, transpacific and Europe-Asia) – will also become much more economic, and there will be much larger vessels trading in the Atlantic. Transshipment will be central to raising load factors on such services, but due to the cost of feedering in protected-flag vessels, this is not currently realistic in the US trades.

- Limits to scale economies and diminishing returns: There are diminishing returns from increasing vessel size beyond certain limits – to obtain the same percentage increases in economies of scale it is necessary to expand vessel size by increasingly large margins. This issue is explored in depth for container ships below.

- Available ports: The largest vessels can only be accommodated at very few ports, and possibly only when partially loaded, thus negating the theoretical benefits to be gained by scale economies, but not the higher costs of the vessels. The opportunities for utilising such vessels are therefore limited.

- Terminal and hinterland transport infrastructure:

  As well as the necessary access parameters, terminals have to install the requisite cargo-handling technology, such as larger quayside cranes for containers. To cope with the increasing overall and consignment volumes being moved across the quay, yard systems have had to evolve also, to keep up the flow between quay and yard.

  Except in the case of transshipment, it is not only necessary to have the requisite terminal development, but the hinterland transport infrastructure also has to be capable of handling terminal throughput – and particularly peak demand.

Limits to Scale Economies for Container Ships: Physical infrastructure in the port will limit the economies of scale; draught is not expected to be an issue.
In the search for scale economies, the container ship fleet has undergone repeated vessel size revolutions. A few years ago, the transformation focused on 8,000 TEU+ vessels. Now, attention has shifted to vessels over 12,500 TEU, whilst Maersk, MSC, CMA CGM, China Shipping, Cosco and others have all invested in container ships with capacities around 13,500 TEU or significantly larger.

In the current market, the largest container ships fall into two main categories:

- The Ultra Large Container Ship (ULCS) offers a capacity of around 14,500 TEU, with a length of around 380m, and is typified by the Emma Maersk. This class of vessel will be too large to enter the expanded Panama Canal locks – and is dubbed 'post new-Panamax'.

- The 12,500 TEU 'new-Panamax' design represents the largest vessel that will be able to pass through the Panama Canal, when expansion works are completed in 2014, and it has been the focus of much newbuilding attention. The design combines the maximum scale economies achievable, consistent with the flexibility to trade between the Atlantic and Pacific.

With LOAs up to nearly 400m and maximum draught up to 15.5m, these vessels place challenges on ports to provide the requisite access, sufficient berth length and depth, and the necessary equipment and yard organisation to ensure rapid turnaround times, even with very large consignment sizes.

Moreover, even larger vessels are on-order, with 18,000TEU units on-order and larger vessels under consideration. In OSC's view, there will be limited scope, economically, to develop containerships much in excess of these limits. Typically container cargoes are light with vessels on the Transpacific either full of light cargoes (eastbound) or heavy cargoes plus a high proportion of empties (westbound). When combined with high fuel costs and low speed, this means that draughts are not an issue. The 18,000TEU design is no deeper than smaller vessels. Other issues such as vessel length become increasingly significant for these vessels.

Figure 4.3 – Maersk 'EEE' Class

The progressive decrease in unit transport costs to be gained with increasing vessel size has been the major driving force in the strategies of container ship operators. However, the potential savings decline as vessel sizes increase. There are significant scale economies, as ship sizes are increased to around 14,500 TEU. Although additional gains can be made beyond this stage, very large increases in capacity have to be incorporated in order to make worthwhile further savings. When issues relating to the cost of engine power (see below) are included in the analysis, the potential savings become marginal. It is unlikely that the limited further economies to be obtained will be sufficient to offset the lack of flexibility and the operational difficulties of trading and handling much larger vessels.

Detailed analysis of optimization the vessel size and trading costs

In order to find the optimal vessel size to minimize trading costs, all costs related to the trade have to be considered. Direct trading costs comprise:

- Capital costs – the cost of financing the vessel;
- Operating costs – the various cost sectors involved with operating and manning the vessel;
- Fuel costs – the fuel consumption in-port and at-sea, with this varying in line with fuel price, speed and consumption.

Tables 4.2 and 4.3 summarise the daily trading costs for large deepsea vessels in terms of vessel capacity in the current market, updated based on current confirmed data and estimates at the time of writing in May/June 2013.

All of these costs are related to the size of the vessel, with significant scale economies noted for each sector as the size increases. Indeed, this has been the driving force associated with the introduction of larger vessels over the past twenty years.

Table 4.2
Deep-Sea Containership Capital and Operating Costs 2013

	4800TEU	6800TEU	8500TEU	13000TEU	14500TEU	18000TEU*
Capacity - TEUs	4800	6800	8500	13000	14500	18000
Capital Costs						
New build Price - mUS$	45.0	67.5	82.0	105.0	132.0	145.0
Daily Capital Charge - $	**18,552**	**27,828**	**33,806**	**43,288**	**54,420**	**59,779**
$/TEU	**3.87**	**4.09**	**3.98**	**3.33**	**3.75**	**3.32**
Operating Costs						
Manning - US$/day	3,833	3,833	3,833	3,833	3,833	3,833
Repair & Maintenance - US$/day	1,734	2,456	2,903	3,573	3,863	3,950
Insurance - US$/day	1,035	1,466	1,733	2,133	2,306	2,510
Admin/Other Charges** - US$/day	1,200	1,200	1,200	1,300	1,300	1,300
Total	**7,801**	**8,955**	**9,669**	**10,838**	**11,302**	**11,593**
$/TEU	**1.63**	**1.32**	**1.14**	**0.83**	**0.78**	**0.64**

* - estimates for twin engine Maersk design

Source: Ocean Shipping Consultants

Table 4.2 presents a summary of current capital and operating costs for the different specified vessels. The following should be noted:

- *Capital costs* can be calculated in various different ways, with each specific newbuilding deal invariably unique. However, a common calculation has been made that converts original purchase price into a daily capital charge. Of course, this will fluctuate in line with market conditions prevailing in the shipbuilding sector when a particular vessel was ordered. However, representative prices have here been adopted to allow some direct comparisons. The surge in ordering for ULCSs that was noted in 2007-2008 resulted in firm pricing for these vessels, with typical contracts placed at between $160-173m per unit. Prices have since fallen back and it is reported that Maersk were able to secure their EEE Class vessels at a unit price of some $190m, though OSC is aware that in mid-2013 known orders by the likes of UASC/China Shipping are putting this size of vessel much nearer $150m.

  The scale economies are apparent. Capital charges per TEU of vessel capacity fall from around $4.09 per day for 6800TEU vessels to just $3.32 for the EEE Class.

  It must be stressed that the returns available in pushing vessel capacity decline as vessel sizes increase. There will be little motivation to move beyond 18,000TEU even for a line that has the market presence to justify such vessels.

- *Operating costs* have been derived from the OSC database. This comprises actual costs for operating a vessel (excluding liner management and agency costs) and covers manning, repair and maintenance (converted to a daily rate to include periodic special survey), insurance (both hull and machinery and protection and indemnity) and other various miscellaneous charges.

  Detailed consideration of these costs is outside the scope of the current paper, but it is clear that manning costs do not escalate significantly in relation to vessel size. Repair and maintenance are linked to original capital value – all of the vessels in the fleet sector are relatively young, so no information has become available concerning any special difficulties as the vessels age. Insurance is linked to vessel and cargo values and, therefore, increases in fairly close relation to vessel size. The balance of costs is relatively minor and does not move rapidly upwards as size increases.

  The net effect is, once again seen to be considerable scale economies, but it must be noted that these costs are low in comparison to capital charges and certainly in relation to fuel costs. Nevertheless, these savings transfer directly to the owner's bottom line and have been a significant driver of vessel size increases.

- *Fuel charges* are seen to be highly dependent upon speed of trading and also the prevailing costs of fuel. Table 4.3 presents a picture of fuel charges for vessels trading at the speeds recorded – i.e. before the move to slow steaming that was precipitated by oversupply in the market, though updated fuel costs have been included compared to the Study provided in 2012. For comparison purposes fuel costs have been estimated for the 18,000TEU design trading more slowly at 19 knots. Current fuel prices for IFO and MDO have been used in the calculations.

Table 4.3
Sample Fuel Consumption Levels and Bunker Bills - 2013

	4800TEU	6800TEU	8500TEU	13000TEU	14500TEU	18000TEU*
Vessel Capacity	4800	6800	8500	13000	14500	18000
Fuel Costs						
IFO - US$/tonne	669	669	669	669	669	669
MDO - US$/tonne	981	981	981	981	981	981
Speed - knots	**23 knots**	**23 knots**	**23 knots**	**23 knots**	**23 knots**	**19 knots**
Consumption At Sea						
IFO - tonnes/day	84.2	119.3	149.5	203.7	229.0	160.2
MDO - tonnes/day	2.5	2.8	2.8	3	3	3
Consumption In Port						
IFO - tonnes/day	0	0	0	0	0	0
MDO - tonnes/day	2.8	2.8	2.8	3	3	3
Fuel Costs At Sea - US$/day	**58,774**	**82,535**	**102,733**	**139,178**	**156,107**	**110,086**
Fuel Costs In Port - US$/day	**2,453**	**2,748**	**2,748**	**2,944**	**2,944**	**2,944**

* - twin engine Maersk design

Source: Ocean Shipping Consultants

It is apparent that the daily fuel costs for an 18,000TEU vessel trading at 19 knots are around 20 per cent cheaper than an NPX (12500-13,000TEU) vessel trading at 23 knots. This is a significant saving when converted into per TEU daily charges.

Of course, the slower vessel will not be offering the same annualised container handling capacity as the same vessel trading at a faster speed and these trade-offs need to be calculated, but the overall importance of fuel costs is apparent.

Table 4.4 presents a summary of vessel costs for a typical Transpacific voyage and underlines the overall costs per container for different sizes of vessels. The pressure to introduce larger vessels (where possible) is apparent from this review of direct costs.

Table 4.4
Sample Calculation - Annualised Asia to Europe Vessel Costs Per Slot
- 3 East Asian ports and 3 North American ports

	4800TEU	6800TEU	8500TEU	13000TEU	14500TEU	18000TEU
Capacity - TEU	4800	6800	8500	13000	14500	18000
No. containers - round trip	8640	12240	15300	23400	26100	32400
Port time - handling (days)	2.40	3.40	3.54	4.43	4.53	5.19
Port time - access (days)	3.00	3.00	3.00	3.00	3.00	3.00
Canal Time	0.00	0.00	0.00	0.00	0.00	0.00
Total Port Time (days)	5.40	6.40	6.54	7.43	7.53	8.19
Sea Time						
Round trip - nautical miles	15800	15800	15800	15800	15800	15800
Speed - knots	21	21	21	21	21	21
N. miles per day	504	504	504	504	504	504
Sea Time (days)	31.35	31.35	31.35	31.35	31.35	31.35
Contingency (+ 5 per cent)	32.92	32.92	32.92	32.92	32.92	32.92
Voyage Time	38.32	39.32	39.46	40.35	40.45	41.11
Voyages per annum	9.13	8.90	8.87	8.67	8.65	8.51
Slots per annum - TEUs	87690	121068	150792	225535	250940	306502
Vessel costs at sea - US$/day	86157	104307	128621	167768	192958	233630
Vessel costs in port - US$/day	36264	43580	52511	69655	76386	88969
Vessel sea costs - US$	2,700,960	3,269,946	4,032,156	5,259,390	6,049,084	7,324,117
Vessel port costs - US$	195,827	278,914	343,512	517,663	575,284	728,858
Canal charges	275,850	275,850	275,850	275,850	275,850	275,850
Voyage Costs - US$	3,172,637	3,824,710	4,651,518	6,052,903	6,900,218	8,328,825
Annual Service Costs - US$	28,980,155	34,047,864	41,259,505	52,505,465	59,708,302	70,911,254
Annualised Costs per slot - US$	***330.5***	***281.2***	***273.6***	***232.8***	***237.9***	***231.4***

Source: Ocean Shipping Consultants

Trade-off between additional engine capital costs and speed: ultimate size of container vessels is likely to be between 18,000-20,000TEU.

The technical issues relating to powering containerships are complex and lie outside the scope of this study. However, significant work has been undertaken by Lloyd's Register on this subject, in which OSC has been involved, and some of the findings are summarised here. There is a non-linear relation between energy requirement and speed, in which the energy requirement (and therefore fuel bills) increases with the cube of speed – the so-called 'cube rule'. This means that there is a much more severe penalty for increasing the speed of a vessel from 24 to 25 knots, for example, than there is from 19 to 20 knots. This creates additional sensitivity to fuel price rises, with sharp increases in bunker prices leading immediately to pressure to cut vessel trading speed.

Although it is possible to increase an engine's power by adding cylinders or boosting the capacity of each cylinder, further issues relating to propeller size also have to be addressed. The diameter of the propeller must be increased significantly, if power is to be converted to drive, which creates problems for casting and, more importantly, there are cavitation issues for such massive units. This makes a twin-propeller design necessary, if the required speeds are to be achieved.

Energy consumption by vessel speed and size has been considered at some length for vessels that are currently operational, and the results are summarised in Table 4.5.

Table 4.5

Power Requirements for Large Containerships by Vessel Size and Speed

MCR Ps (MW)

	Vessel Size				
Knots	**6,800 TEU**	**8,800 TEU**	**10,800 TEU**	**12,500 TEU**	**14,500 TEU**
21	41.4	45.9	53.1	56.7	59.9
22	47.6	52.8	61.1	65.1	68.9
23	54.4	60.3	69.8	74.4	78.7
24	61.8	68.6	79.3	84.6	89.4
25	69.9	77.5	89.6	95.6	101.1
26	78.6	87.2	100.8	107.5	113.7

Sources: Lloyds Register
Ocean Shipping Consultants

From this is can be seen that:

- There is a very steep increase in energy consumption for larger vessels – even 14,500 TEU vessels are not always able to trade at 25 knots.
- Any requirement for powering above 100MW creates a requirement for two engines and resulting twin-skeg design. This significantly alters the scale economy calculations.

It is apparent from this that vessels larger than 18,000 TEU do not offer significant additional savings. The requirement either to increase available power to provide a competitive trading speed or to reduce capital and hence transport costs by slowing down the vessel means that only limited additional gains can be secured. This confirms that the ultimate size of container vessels is likely to be between 18,000-20,000TEU. The ability to berth these vessels will be an important feature of Vancouver's competitive position over the forecast period.

Slow steaming and super slow steaming is not anticipated to become the new norm.
A fairly widespread response by carriers to the recent severe overcapacity in the container shipping sector, combined with prevailing high fuel prices, has been for carriers to make use of idle vessels by deploying up to three additional vessels on service strings and slowing down vessel trading speeds. This has the multiple benefits for the carrier of reducing fuel costs, turning costly idle vessels into performing assets and, by managing overcapacity, boosting freight rates and turning operator losses into profits.

By reducing speed from a typical 24 knots before the recession to as low as 14 knots in 2009, carriers were able to limit the number of idle vessels and reduce overcapacity significantly. Several hundred thousand TEUs of capacity was absorbed in this way. The continuance of slow speeding in 2010 served to reduce the number of laid-up vessels to a small rump, thus dramatically limit the impact of underlying overcapacity – indeed create a shortage on some routes – and boost freight rates sufficiently to return operators to profitability.

A question being asked currently, is whether slow steaming and super slow steaming are here to stay. Further, since slow steaming reduces the power required for ship propulsion, if it were maintained as a permanent feature, this would raise the ship-size threshold at which a second engine would be needed, so could this facilitate a further increase in vessel sizes?

To answer these questions, it is necessary to consider the reasons for which slow steaming was introduced.

The current focus on slow steaming occurred because carriers built too many ships – not because this is the least costly way to proceed. The additional capital cost of adding more vessels is minimal when the vessels already exist and they would otherwise be idle (indeed costs of idling vessels are offset). However, whilst slow steaming may make economic sense when there are spare vessels available to add to a string, this is not the norm when there is no supply/demand imbalance. Slow steaming can also impose costs on customers, who may be forced to finance additional loads in the supply pipeline, in order to meet their requirements. Indeed the current slow steaming trend has generated a slew of complaints from customers.

It is OSC's view that it would be dangerous to adopt a policy based on particular steaming speeds at any one time. Whilst carriers may keep slow speeding in their armory as a way to manage mega-overcapacity and low freight rates, they will find reasons to speed vessels up when demand catches up with capacity, and their attention reverts from repairing their balance sheets and bottom lines to maintaining their market shares.

Table 4.6
Forecast ULCS* Fleet Development to 2016

	No. Of ULCS vessels	ULCS (>10,000) 000TEU capacity	Total fleet 000TEU capacity	ULCS share TEU capacity
Existing fleet				
2011 October	96	1209.8	14895.0	8.1%
Orderbook (scheduled delivery)				
2011	19	241.5	490.7	49.2%
2012	60	776.3	1488.9	52.1%
2013	35	481.2	1367.7	35.2%
2014	31	424.8	609.9	69.7%
2015	10	156.0	180.0	86.7%
2016	12	210.0	275.0	76.4%
Forecast fleet (start)				
2012	115	1451.3	15385.7	9.4%
2013	175	2227.6	16874.6	13.2%
2014	210	2708.8	18242.3	14.8%
2015	241	3133.6	18852.2	16.6%

* - Ultra Large Container Vessels are all those with a capacity of over 10,000TEU

Source: Ocean Shipping Consultants/Clarksons

The development of the ULCS fleet is further summarised in Table 4.6, which includes confirmed data (as available in May/June 2013) relating to the position in 2016. At the start of 2013 the ULCS share of the component accounted for 13.2 per cent of the total fleet in terms of TEU capacity, up from 8.1 per cent as at October 2011. This significant increase is due to the high level of ULCS tonnage scheduled for delivery in 2013 and 2014, whereby 35 per cent and 70 per cent of new capacity ordered in these two years will be in these size ranges. This represents a transformation of terminal requirements for the Asia-North America trades.

4.3 The Transpacific Trades

Within this overall framework, the specific development of shipping deployments on the Transpacific trades will be of immediate relevance to Vancouver's demand development. The berthing of the largest vessels will be a critical issue for the port's competitive position.

Table 4.7 summarises the average loading conditions of large deepsea vessels deployed on the Transpacific trades based on the position during 2012. These are figures calculated for the entire trades and do not differentiate specific details of the PNW aspect of the trades.

Table 4.7
Transpacific Container Trades: Key Features

	Asia-N.America	N.America-Asia
Container Weights and Size Ratios 2012		
20' : 40' Ratio (TEUs)	1 : 4.50	1 : 3.95
20' : 40' Ratio (containers)	1 : 2.25	1 : 1.98
Empty : Loaded Ratio (TEUs)	1 :250.0	1 : 3.25
Empty : Loaded Ratio (FEUs)	1 : 105.0	1 : 2.99
40'+ containers - %	6.25%	7.10%
Loaded Container Weights (gross) TEU - t	15.11	20.21
Loaded Container Weights (gross) FEU - t	15.25	22.00
Empty Container Weights TEU - t	2.00	2.00
Empty Container Weights FEU - t	3.60	3.60
Average load factor	97.50%	84.30%
Indicated Typical Cargo Weights - including container tares		
4500TEU	39186	38253
6800TEU	59215	58212
8500TEU	74019	72766
13000TEU	113206	111290
14500TEU	126268	124130
18000TEU	156747	154093
Indicated Actual Vessel Draught		
4500TEU - max draught 13.38m	11.52	11.48
6800TEU - max draught 13.55m	12.25	12.16
8500TEU - max draught 14.47m	13.24	13.15
13000TEU - max draught 15.56m	14.68	14.57
14500TEU - max draught 15.88m	14.92	14.81
18000TEU - max draught 15.50m	15.68	15.57

Source: Ocean Shipping Consultants

The following points should be noted from this review:

- 40’ containers are dominant for the Transpacific trades with this being a legacy of the emphasis on these sizes of containers by major US operators since the early 1980s. This means that there will be a shortage of smaller units which will be loaded by weight rather than volume and will be in demand for Vancouver exports.

- There is a severe net imbalance favouring eastbound containers on these trades – i.e. there are many westbound empty movements. Once again the position in Vancouver is structurally different.

- On average loaded containers are much heavier westbound than eastbound, but this effect is masked by the number of westbound empties.

Estimation of actual draught is essential to assess the port’s competitive position.

As is presented in Table 4.7, an estimation of cargo weights can be derived for each vessel class and, from this, estimations of the effect on actual (rather than maximum or 'design') draught can be defined. This is very important when determining the competitive water depth at the ports under review. It should be noted that there is very little change compared to the position outlined in the June 2012 Study, with all key conclusions still relevant.

It is apparent that the deepest average draught for eastbound Transpacific vessels will be around 15m for 14,500TEU vessels with the westbound figure being some 14.81m – this is considerably less than design draught. For larger vessels in the 18,000TEU range, cargoes will be limited not by the water depth at the terminals but by the weight of containerised cargoes.

Table 4.8
Summary: Current and Future Position on Transpacific Container Trades

	Trade Growth* 2000-2012 %	Imbalance	Port Restrictions	No.Calls per voyage	Typical Vessel TEU	Average TEU Consignment	Maximum Vessel TEU
Current Position	87.6	Severe	Limited	5.2	8500	3269	11500
To 2016	35.4	Severe	Limited	5.2	10000	3846	14500
To 2021	32.9	Severe	None	5.0	12500	5000	18000

* Current position 2000-2011, Base Case forecasts

Source: Ocean Shipping Consultants

Table 4.8 presents a summary of the anticipated sizes of vessels that will be deployed on the Transpacific trades, which is primarily the same as outlined in the June 2012 Study.
It is apparent that although very large vessels will be deployed, with 14,500TEU vessels anticipated by 2016 and the occasional deployment of 18,000TEU vessels by 2021, the average size of vessels on these trades will be significantly smaller as a result of general port limitations and the use of multi-port itineraries.

4.4 Implications for Vancouver

Vancouver enjoys a ship size advantage in contrast to US ports with slightly deeper water at Deltaport. This means that the largest vessels anticipated for the Transpacific can be accommodated at the port at real anticipated load factors while other ports will be a little more restricted. Deltaport also has more Super Post Panamax cranes too.

Clear limits have been identified with regard to the draughts of ultra-large container vessels and this firmly indicates that the deeper water that is available at Prince Rupert will seldom be required. Consequently this difference between Prince Rupert and Vancouver is not a

significant competitive issue and will not prove sufficient on its own to heavily influence a decision to switch liner services away from the Vancouver container terminals and use Prince Rupert instead.

Of course, alternative fleet developments and water depth needs represents sensitivities to this conclusion and are further tested in this study.

4.5 Transpacific Container Services

Table 4.9 summarises the capacity of the top 10 container shipping lines in 2005 and contrasts how their TEU capacities have changed with the existing 2013 position. This highlights the concentration in shipping capacity in the major lines that has been noted in recent years and also defines the key port customers at the global level. It will be actions of these lines that determine the market share of major terminals in the forecast period.

Container Lines Transpacific Services

The approach taken to reviewing the lines is to consider their individual fleet development strategy and then to present a review of the lines' Transpacific services. The individual line's business strategy is then examined, before developing an overall opinion concerning the relative outlook for the line and how it is likely to affect its particular position on the Transpacific Trade. The following parts of this Section review each of the major shipping lines and consortia in this manner.

Increased co-operation between shipping lines since 2008, to ensure the vessels would be filled

Since 2008, as a result of the beginning of the world economic slowdown, coupled with the start of the introduction of new, larger tonnage, major shipping lines decided to reorganise their services. As far as the Transpacific services were concerned, this meant a major change in the way that the top three shipping lines (on the basis of slots deployed) decided to do business. Despite hitherto being intensely competitive towards one another on all services, the introduction of larger tonnage and the need for individual lines to be able to fill them meant that Maersk Line, MSC and CMA CGM decided to embark upon an unheard of level of co-operation.

Table 4.9

Top 10 Container Liner Companies* - Fleet Capacity 2005-2013

	Owned 000 TEUs	Chartered-in 000 TEUs	Total 000 TEUs	Rank
2005				
Maersk Line	924.9	740.4	1665.3	1
MSC	538.0	409.4	947.4	2
CMA CGM*	174.9	233.2	408.1	3
Evergreen	376.6	159.0	535.6	4
NOL/APL	158.6	178.7	337.3	5
Hapag-Lloyd	251.2	194.4	446.6	6
Cosco	250.8	211.0	384.6	7
China Shipping	170.7	211.0	381.7	8
Hanjin	104.5	249.2	353.7	9
NYK Line	142.3	177.4	319.7	10
2013				
Maersk Line	1308.2	1275.3	2583.5	1
MSC	910.6	1322.5	2233.1	2
CMA CGM*	548.4	837.0	1385.4	3
Evergreen	388.6	334.8	723.4	4
NOL/APL	251.2	325.0	576.2	7
Hapag-Lloyd	354.0	278.0	632.0	6
Cosco	418.5	298.4	716.9	5
China Shipping	408.8	140.4	549.2	9
Hanjin	319.0	256.0	575.0	8
NYK Line	297.5	102.6	400.1	10

* = includes subsidiaries

Mitsui OSK, OOCL and Hamburg Sud operate more TEUs than NYK Line in 2013

Source: Clarksons Research Studies/Ocean Shipping Consultants

Table 4.10
Summary of Trans-Pacific Services For Each Major Line/Consortia

Consortia/Line	Service	TEU Size	Frequency
Maersk Line	TP1	6,500	Weekly
	TP3/TP9	8,000	Weekly
	TP5	4,000	Weekly
	TP6	9,000	Weekly
	TP7	4,000	Weekly
MSC	TP2/Eagle	8,000	Weekly
	APX	5,000	Weekly
	PSX	6,500	Weekly
CMA CGM	TP8/Bohai Rim	8,000	Weekly
	Fuji Japan	5,000	Weekly
	Pearl River	9,000	Weekly
Evergreen	UAM	5,500	Weekly
	JAS	4,500	Weekly
	PCE	2,700	Weekly
	CPS2	4,500	Weekly
	TPS	5,500	Weekly
	HTW	8,000	Weekly
Grand Alliance	NWX	8,500	Weekly
	PAX	5,000	Weekly
	SSX	8,000	Weekly
	CCX	5,500	Weekly
	PNX	7,500	Weekly
New World Alliance	APX	5,000	Weekly
	PCE	4,500	Weekly
	PS1	5,000	Weekly
	PS2	5,500	Weekly
	SAX	6,500	Weekly
CKYH Alliance	PSW1/CALCO-C	4,500	Weekly
	PSW2/CALCO-Y	5,550	Weekly
	PSW3/CALCO-A	5,000	Weekly
	PSW4/CALCO-M	5,550	Weekly
	CO CEN/CALCO-O	5,500	Weekly
	HJ PSX/CALCO-H	7,500	Weekly
	HJ-SJX/CALCO-J	4,500	Weekly
	COS-CLX	4,500	Weekly
	COS-SEA	6,000	Weekly
	HJ-CAX	5,500	Weekly
	K-PNW (NOWCO-A)	5,500	Weekly
	PNW North (NOWCO-1)	5,500	Weekly
	PNW South (NOWCO-2)	7,500	Weekly

Source: Ocean Shipping Consultants

Similar Vessel Share Agreements (VSAs) and slot swap agreements were also struck between Grand Alliance and New World Alliance members as well as members of the CKYH Alliance and what used to be regarded as 'outsider' shipping lines, such as Evergreen and Zim. All shipping lines had the common aim of ensuring that their new larger vessels would be filled. In this way, they could justify the order of the new, bigger tonnage by taking the maximum possible advantage of the economies of scale, albeit at the expense of a slight loss of individual identity when it came to any service differentiation.

As a result of the various VSAs and slot swap deals, it has become increasingly problematic to determine exactly which services each line actually operates, since each of the lines involved obviously markets the service as its own. However, unless otherwise stated, the services mentioned in each of the shipping line reviews are operated by that specific line and details of any partnerships and/or slot charter arrangements are noted separately.

Table 4.10 provides a summary of the services offered by major lines and consortia and Table 4.11 provides the detail of the Transpacific services currently in operation. Based on the deployment of all the major shipping lines and consortia, there is approximately 220,000TEU available on the Transpacific Services in each direction on a weekly basis.

It is apparent that the Transpacific trades are increasingly being dominated by the major shipping lines and that there are pressures to deploy ever larger vessels. This position has not altered since the June 2012 Report was delivered.

This situation means that long term relationships with the major liner operators will be a key determinant of volumes for all ports competing to attract traffic. Only by offering required facilities with regard to vessel size, efficiency and hinterland links will potential demand be successfully realised.

In this respect Vancouver has the potential to build on recent successes and consolidate and expand market share versus more restricted and limited alternative ports, including Prince Rupert (which cannot replicate the advantages offered at Vancouver. This subject is addressed in more detail in Section 7, which outlines a SWOT analysis of relevant competitive regional ports).

Table 4.11
Trans-Pacific Shipping services ex Asia to WCNA - 2012

Operator/service	Regions	Partnership	TEU size	Ports	Frequency	Slot-Charterer
APL Ltd/APX	EA/NEA/CAM/ECNA/ NEUR/WCNA	HMM/MOL	4553-4900	Chiwan/HK/Kaohsiung/Busan/Kobe/Tokyo/Balboa/Puerto Manzanillo/Miami/ Savannah/Charleston/New York/Rotterdam/Bremerhaven/Felixstowe/Norfolk/ Los Angeles/Oakland	Weekly	Evergreen/Maersk
PCE	EA/NEA/WCNA		4600-4730	Dalian/Tianjin/Qingdao/Yokohama/Los Angeles/Oakland/HK/Chiwan	Weekly	Evergreen
PS1	WCNA/NEA/EA/SEA	HMM/MOL	4553-5928	Seattle/Vancouver/Yokohama/Kobe/Kaohsiung/Chiwan/Laem Chabang/ Singapore/Port Klang/Vung Tau/Yantian/HK/Yangshan	Weekly	
PS2	EA/WCNA/CAM	HMM/MOL	5506-5888	Xiamen/Chiwan/HK/Yantian/Kaohsiung/Oakland/Los Angeles/Lazaro Cardenas/ Manzanillo	Weekly	Hapag-Lloyd
SAX	SEA/EA/WCNA	HMM	6506-7000	Singapore/HK/Chiwan/Los Angeles/Kaohsiung/Yantian	Weekly	
CSCL/AAC(CPS)	EA/NEA/WCNA	Evergreen	8530	Guangzhou/HK/Yantian/Shanghai/Ningbo/Busan/Los Angeles/Oakland	Weekly	Zim
AAC2(CPS2)	EA/NEA/WCNA	Evergreen	4051-4250	Qingdao/Shanghai/Ningbo/Oakland/Los Angeles	Weekly	
ANW1	EA/NEA/WCNA		2504-4250	Guangzhou/HK/Yantian/Shanghai/Ningbo/Busan/Seattle/Vancouver	Weekly	
CMA CGM/Bohai Rim (New Orient Exp)	WCNA/EA	MSC	8189-8238	Long Beach/Oakland/Dalian/Xingang/Shanghai/Ningbo	Weekly	Maersk
Columbus	NEA/EA/SEA/ECNA/WCNA	Maersk	5624-8465	Yokohama/Shanghai/Ningbo/HK/Yantian/Tanjung Pelepas/New York/Norfolk/ Savannah/Busan/Seattle/Vancouver	Weekly	HMM/USL
Pearl River	EA/WCNA	MSC	8238	Xiamen/Chiwan/HK/Yantian/Long Beach/Oakland	Weekly	ANL
CSAV/ASIAM(NAAA)	INDSUB/SEA/EA/WCNA/ NEA		2672-3586	Jawaharlal Nehru/Mundra/Karachi/Port Klang/Ho Chi Minh/Yantian/Shanghai/ Ningbo/Long Beach/Busan/Chiwan/Colombo	Weekly	
Andex 1	EA/NEA/CAM/WCSA/ WCNA		3987-4380	HK/Chiwan/Ningbo/Shanghai/Busan/Manzanillo/Lazaro Cardenas/Callao/ Iquique/Antofagasta/San Antonio/San Vicente/Long Beach/Yokohama/Keelung	Weekly	
Andex 2	NEA/EA/CAM/WCSA/ WCNA		2672-3586	Busan/Xingang/Shanghai/Ningbo/Xiamen/HK/Chiwan/Manzanillo/Lazaro Cardenas/Puerto Quetzal/Acajutla/Caldera/Guayaquil/Buenaventura/Long Beach	Weekly	
The Containership Company AS/ Great Dragon	WCNA/EA		2890-3017	Los Angeles/Taicang/Ningbo/Qingdao	n/a	
Cosco/CEN	EA/WCNA/NEA	COSCON/Hanjin/ K Line/NYK/YML	7455-8495	Dalian/Xingang/Qingdao/Shanghai/Ningbo/Prince Rupert/Long Beach/Oakland/ Yokohama	Weekly	
S PNW	EA/NEA/WCNA	COSCON/Hanjin/ K Line/YML	5446-5816	HK/Yantian/Yokohama/Prince Rupert/Vancouver/Seattle	Weekly	
N PNW	EA/NEA/WCNA	COSCON/Hanjin/ K Line/YML	5446	Shanghai/Ningbo/Busan/Seattle/Portland/Vancouver/Gwangyang	Weekly	
SEA	EA/WCNA	COSCON/Hanjin/ K Line/YML	5446-7455	Fuzhou/Guangzhou/HK/Yantian/Xiamen/Long Beach/Oakland	Weekly	

Evergreen/UAM	WCNA/NEA/EA/SEA/ISC/ EMED/WMED/ISC/SEA/EA/WCNA		5364-5652	Tacoma/Vancouver/Tokyo/Osaka/Qingdao/Shanghai/Ningbo/Kaohsiung/Hong Kong/Yantian/Tanjung Pelepas/Colombo/Ashdod/El Dekheila/Taranto/Genoa/ Barcelona/Valencia/Taranto/Colombo/Tanjung Pelepas/Kaohsiung/Hong Kong/ Yantian/Shanghai/Tacoma	Weekly	CMA CGM, MOL
NUE	EA/NEA/WCNA/CAM/ECNA/NE/ ECNA/CAM/WCNA/NEA/EA		4229	Ningbo/Shanghai/Qindao/Busan/LA/Colon/Charleston/Norfolk/New York/Antwerp/ Bremerhaven/Thamesport/Rotterdam/Le Havre/Nwe York/Norfolk/Charleston/ Colon/LA/Oakland/Tokyo/Ningbo	Weekly	
CPN	EA/NEA/WCNA/EA		2728	Qingdao/Ningbo/Shanghai/Busan/Tacoma/Vancouver/Qingdao	Weekly	
CPS2 (AAC2)	EA/NEA/WCNA/EA	CSCL	4211-4334	Qingdao/Shanghai/Ningbo/Oakland/Los Angeles/Qingdao	Weekly	
TPS	EA/WCNA/EA		5652-6332	Hong Kong/Kaohsiung/LA/Oakland/Tacoma/Taipei/Kaohsiung/Yantian/Hong Kong	Weekly	
HTW (AAS)	EA/WCNA/EA		7024-8084	Kaohsiung/Xiamen/Hong Kong/Yantian/LA/Oakland/Kaohsiung	Weekly	CSCL, Zim
Hainan PO Shipping/CAE	EA/WCNA/EA	TSL	2800-3500	Hong Kong/Yantian/Ningbo/Shanghai/Long Beach/Hong Kong	Weekly	
Hanjin Shipping Co/ S PNW	EA/NEA/WCNA/NEA/EA	COSCON/Hanjin/ K Line/YML	5300-5600	Hong Kong/Yantian/Yokohama/Prince Rupert/Vancouver/Seattle/Yokohama/ Hong Kong	Weekly	
N PNW	EA/NEA/WCNA/NEA/EA	COSCON/Hanjin/ K Line/YML	5300-5600	Shanghai/Ningbo/Busan/Seattle/Portland/Vancouver/Busan/Gwangyang/Shanghai	Weekly	
PSX	EA/NEA/WCNA/NEA/EA		7455-8600	Yantian/Kaohsiung/Shanghai/Gwangyang/Busan/Long Beach/Oakland/Busan/Yantian	Weekly	
SJX	SEA/EA/NEA/WCNA/NEA/EA/SEA	Wan Hai	4024-4389	Port Klang/Singapore/Cai Mep/Hong Kong/Yantian/Osaka/Tokyo/Osaka/Hong Kong/ Port Klang	Weekly	Coscon, K-Line
CAX	EA/NEA/WCNA/NEA/EA		5302-5750	Shanghai/Gwangyang/Busan/Long Beach/Busan/Shanghai		Coscon, YML
Hapag Lloyd/NWX	EA/NEA/WCNA/NEA/EA	NYK/OOCL	8750	Ningbo/Yangshan/Qingdao/Busan/Vancouver/Seattle/Vancouver/Tokyo/Nagoya/ Kobe/Busan/Qingdao/Yangshan/Ningbo	Weekly	
PAX	EA/NEA/WCNA/CAM/ECNA/NE/ ECNA/CAM/WCNA/NEA/EA		4612-4890	Kaohsiung/Yantian/Hong Kong/Da Chan Bay/Kobe/Nagoya/Tokyo/Seattle/Oakland/ Puerto Manzanillo/Savannah/Norfolk/New York/Halifax/Thamesport/Antwerp/ Bremerhaven/Rotterdam/Halifax/New York/Norfolk/Savannah/Puerto Manzanillo/ Long Beach/Oakland/Yokohama	Weekly	ACL
Horizon Lines/ TP1	EA/WCNA/NPAC/EA		2824	Yantian/Xiamen/Kaohsiung/LA/Oakland/Honolulu/Apra/Yantian	Weekly	Maersk, MSC, Safmarine
Hyundai Merchant Marine Co/ PCX	EA/NEA/WCNA/NEA/EA	APL/MOL	6800	Ningbo/Shanghai/Gwangyang//Busan/Long Beach/Oakland/Busan/Gwangyang	Weekly	
PNW	EA/NEA/WCNA/NEA/EA	APL/MOL	6479	Kaohsiung/Hong Kong/Yantian/Shanghai/Busan/Tacoma/Seattle/Vancouver/Busan/ Gwangyang/Kaohsiung	Weekly	Evergreen
PSW	NEA/EA/NEA/WCNA/NEA	APL/MOL	4651	Busan/Kaohsoiung/Xiamen/Hong Kong/Yantian/Busan/Long Beach/Oakland/Busan	Weekly	

K-Line/ PSW1	EA/WCNA/NEA/EA	COSCON/Hanjin/ PIL/Wan Hai/YML	4014-4500	Xiamen/Hong Kong/Yantian/Shanghai/Long Beach/Oakland/Yokohama/Ningbo/ Shanghai/Xiamen	Weekly	
PSW3	NEA/WCNA/NEA	COSCON/Hanjin/ YML	4578-4900	Kobe/Nagoya/Shimizu/Tokyo/Long Beach/Oakland/Tokyo/Kobe	Weekly	
NOWCO-A	EA/NEA/WCNA/NEA/EA	COSCON/Hanjin/ YML	5576-5896	Kaohsiung/Xiamen/Hong Kong/Yantian/Shanghai/Nagoya/Tokyo/Tacoma/Vancouver/ Tokyo/Nagoya/Kobe/Kaohsiung	Weekly	
Maersk Line / TP5	WCNA/NEA/EA/NEA/WCNA		4360	Long Beach/Oakland/Dutch Harbour/Yokohama/Gwangyang/Busan/Qingdao/ Nagoya/Yokohama/Long Beach	Weekly	MSC
TP6	WCNA/NEA/EA/SEA/RS/WMED/ NAF/SEA/EA		9038-9200	LA/Yokohama/Nagoya/Shanghai/Ningbo/Xiamen/Hong Kong/Yantian/Tanjung Pelepas/Jeddah/Barcelona/Valencia/Algeciras/Tangier/Tanjung Pelepas/Vung Tau/ Yantian/Hong Kong/LA	Weekly	
TP7/TA3	EA/NEA/CAM/ECNA/NE/ECNA/ CAM/WCNA/EA		4437-5085	Kaohsiung/Da Chan Bay/Yantian/Hong Kong/Busan/Yokohama/Balboa/Miami/ Savannah/Charleston/Port Newark/Miami/Bremerhaven/Felixstowe/Rotterdam/ Le Havre/Halifax/Port Newark/Savannah/Miami/Balboa/LA/Oakland/Kaohsiung	Weekly	
Matson Navigation Co. / CLX	WCNA/NPAC/EA/WCNA		1970-2524	Long Beach/Honolulu/Apra/Xiamen/Ningbo/Shanghai/Long Beach	Weekly	
CLX2	WCNA/EA/WCNA		3456-3538	Long Beach/Hong Kong/Shenzhen/Shanghai/Long Beach	Weekly	
MSC / Eagle - Yang Tse - TP2	EA/WCNA/EA	CMA CGM/Maersk	6700-8400	Kaohsiung/Hong Kong/Xiamen/Shanghai/Qingdao/Long Beach/Kaohsiung	Weekly	
New Orient Express - Bohai	WCNA-EA/WCNA	CMA CGM/Maersk	8034	Long Beach/Oakland/Dalian/Xingang/Shanghai/Ningbo/Long Beach	Weekly	
Pearl River	EA/WCNA/EA	CMA CGM/Maersk	7943-8400	Xiamen/Chiwan/Hong Kong/Yantian/Long Beach/Oakland/Xiamen	Weekly	
MOL / APX	EA/NEA/CAM/ECNA/NE/ECNA/ CAM/WCNA/NEA/EA	APL/HMM	4578-4900	Chiwan/Hong Kong/Kaohsiung/Busan/Kobe/Tokyo/Balboa/Puerto Manzanillo/Miami/ Savannah/Charleston/New York/Rotterdam/Bremerhaven/Felixstowe/Norfolk/ Charleston/Puerto Manzanillo/LA/Oakland/Tokyo/Kobe/Chiwan	Weekly	Evergreen/Maersk
PSX	SEA/EA/WCNA/NEA/EA/SEA	APL/HMM	5896-6400	Laem Chabang/Cai Mep/Hong Kong/Yantian/LA/Oakland/Tokyo/Xiamen/Hong Kong/ Da Chan Bay/Laem Chabang	Weekly	
NYK Line / CCX	EA/NEA/WCNA/NEA/EA	HL/OOCL	6160-6422	Qingdao/Ningbo/Shanghai/Yangshan/Busan/LA/Oakland/Busan/Qingdao	Weekly	
NWX	EA/NEA/WCNA/NEA/EA	HL/OOCL	6160	Ningbo/Yangshan/Qingdao/Busan/Vancouver/Seattle/Vancouver/Tokyo/Nagoya/ Kobe/Busan/Qingdao/Yangshan/Ningbo	Weekly	
PAX	EA/NEA/WCNA/CAM/ECNA/NE/ ECNA/CAM/WCNA/NEA	HL/OOCL	4900	Kaohsiung/Yantian/Hong Kong/Da Chan Bay/Kobe/Nagoya/Tokyo/Seattle/Oakland/ Puerto Manzanillo/Savannah/Norfolk/New York/Halifax/Thamesport/Antwerp/ Bremerhaven/Rotterdam/Halifax/New York/Norfolk/Savannah/Puerto Manzanillo/ Long Beach/Oakland/Yokohama	Weekly	
OOCL / SSX	EA/WCNA/EA	HL/NYK	8063	Shekou/Hong Kong/Kaohsiung/Long Beach/Kaohsiung/Xiamen/Hong Kong/Yantian	Weekly	
CCX	EA/NEA/WCNA/NEA/EA	HL/NYK	5344-5888	Qingdao/Ningbo/Shanghai/Yangshen/Busan/LA/Oakland/Busan/Qingdao	Weekly	
PNX	SEA/EA/WCNA/NEA/EA/SEA	HL/NYK/Zim	7506	Singapore/Laem Chabang/Shekou/Hong Kong/Kaohsiung/Vancouver/Seattle/Busan/ Kaohsiung/Hong Kong/Shekou/Singapore	Weekly	

PIL / CTP	EA/WCNA/EA		1550-1740	Hong Kong/Shekou/Ningbo/Shanghai/Long Beach/Hong Kong	Weekly	
Westwood Shipping / Korea 1	WCNA/NEA/WCNA		2046	Vancouver/Seattle/Hitachinaka/Shimizu/Tokyo/Busan/Vancouver	14	
Korea 2	WCNA/NEA/WCNA		1819-2000	Vancouver/Seattle/Tomakoma/Hakata/Busan/Osaka/Nagoya/Vancouver	14	
Yang Ming / PSW2	EA/WCNA/EA	COSCON/Hanjin/ K Line	3725-5551	Hong Kong/Yantian/Kaohsiung/Keelung/LA/Oakland/Keelung/Kaohsiung/Hong Kong	Weekly	
PSW4	EA/NEA/WCNA/NEA/EA	COSCON/Hanjin/ K Line	5512-5551	Shanghai/Ningbo/Busan/Tacoma/LA/Oakland/Busan/Gwangyang/Shanghai	Weekly	
Zim Line / ZCS	EMED/WMED/ECNA/CAR/WCNA/ EA/NEA/CAM/CAR/ECNA/WMED/ EMED		4860-8200	Haifa/Piraeus/Leghorn/Genoa/Tarragona/Halifax/New York/Savannah/Kingston/ LA/Oakland/Da Chan Bay/Hong Kong/Ningbo/Shanghai/Busan/Balboa/Kingston/ Savannah/New York/Halifax/Tarragona/Haifa	Weekly	COSCON, CSCL, HL

Source: Ocean Shipping Consultants

SECTION 5 – THE COMPETITIVE COST STRUCTURE AT VANCOUVER

5.1 Introduction and Methodology

In addition to questions of terminal capacity and hinterland links, the market position of Vancouver in the trades under review will be a function of the costs of using the port's terminals in contrast to other possible facilities. These charges will comprise not simply the stevedoring costs associated with using a particular terminal but also the overall costs entailed in delivering containers to/from major markets. From this perspective, the competitive position will be determined by the total of shipping costs, stevedoring costs and intermodal and truck delivery charges.

This Section provides an analysis of the current and future development of costs in these sectors and is thus of central importance to informing Vancouver projections.

Included in this analysis additional to the June 2012 Study is an assessment of cost comparisons for container cargo routed to Toronto via different port gateways in Canada and the US. This routing is provided together with a cost update of the various options for serving Chicago via the same comparable gateway options in contrast to the container terminals at Vancouver.

5.2 Container Stevedoring Charges

Attention is initially turned to the current and potential future development of container handling charges at Vancouver. The analysis is developed as follows:

- The levels of container stevedoring charges on the West Coast are contrasted with other major port markets.
- A more focused analysis of the total costs of transiting major West Coast terminals and the competitive position of Vancouver is presented.
- The effect of US/Canadian dollar exchange rates on container handling costs is then considered.
- The potential level of transshipment container handling pricing is identified.
- The future development of the Vancouver container handling charges to 2020 is projected.

Generally speaking, container handling charges at Vancouver are seen to be competitive in relation to those charges at competing PNW and PSW ports. This varies in-line with the exchange rate with the US dollar but is also attributable to generally lower cost structures in the port.

West Coast Container Handling Charges Since 2008

The level of container handling charges is seen to be dynamic. Cost levels are determined by the inter-relation between central and local administrative policies and the actual supply and demand of container handling capacity. There are therefore very strong regional pressures in the container handling markets.

The identification of container handling charges is an extremely complex undertaking. Whilst some terminals publish a tariff for container handling, this provides only the most general guide to the level of charges that are actually levied. Invariably, discounts are available for volume customers and often further flexibility is made available in the light of major marketing initiatives.

In addition, the various activities included in container handling charges are also found to vary between ports and, indeed, often in different terminals within the same port. However, this complexity must be negotiated if the competitive position of Vancouver in the broader world and regional market is to be identified.

Assessment of container handling charges based on three different types of sources.

The methodology here utilised reflects the complexity of the issues involved and, accordingly, provides typical cost estimates on the basis of:

- Published tariffs;
- Data provided by container terminals;
- Data provided and confirmed by major shipping lines.

By assuming this wide-ranging approach a sophisticated analysis of the current (and anticipated) developments of costs can be derived.

In this Section, analysis is presented for the broader regional market for import/export markets. Although Vancouver has the potential to develop a significant regional transshipment role, the regions' ports have not yet developed a competitive tariff structure for this part of the market. As such, transshipment charges are not considered in this analysis.

Evaluation of cost structures must be grounded on a homogeneous basis of handling activities.

Prior to evaluating cost structures, some further remarks are necessary with regard to the methodology utilised in determining typical cost levels. In order to develop costs that are comparable it is necessary to develop data as follows:

- Ensure that similar consignments are utilised;
- Make clear that all parallel handling activity is included.

There are numerous differences between the actual handling activities that are included in a particular tariff. Sometimes prices include all extra operations that may become necessary, whilst on other occasions these costs relate simply to the movement of the container from the vessel to the yard during regular working hours, with other costs such as hatch opening, lashing, overtime payments constituting further billings. It is essential that these costs must all be included as they can exert a great influence over total outgoings. Our method has been to identify costs as follows:

- Basic handling charge, and
- Other handling charges.

Basic Handling Charge includes all handling costs between the ship and the yard in either direction. Other Handling Charges include the diverse activities that are sometimes billed to the shipowner. These include:

- Hatch opening and closing
- Cargo plan preparation
- Overtime costs
- Lashing/unlashing
- Extra yard moves
- Weighing
- Stand-by on vessel account

The distribution between different categories varies for each port but this approach allows direct comparisons to be developed.

This approach allows a review of handling charges to be developed and compared between ports. A synthetic analysis has been developed that identifies charges on a homogeneous basis among different ports.

It is also necessary to consider the average (or typical) customer for a particular port and this will obviously vary greatly. In order to allow direct comparison we have assumed the following criteria:

- 90,000 units per annum,
- around 100 calls per annum,
- typically 900 containers per port call, and
- average vessel size 8500TEU

These synthetic conditions are adequately reflected in the regional ports that are under consideration, although some differences will be noted in smaller volume terminals.

It is also necessary to estimate the mix of ISO containers utilised and we have assumed 21 per cent 20 ft and the remainder as 40 ft ISO boxes. This broadly reflects the reported position in Vancouver in 2011. Further, it is assumed that 80 per cent are loaded and 20 per cent are empty. This latter approach allows typical costs to be synthesised between ports which quote different tariffs for empty and full containers and with those that offer a uniform rate.

Table 5.1
North American Container Stevedoring Charges in the World Context
- end-year US dollars per import/export container*

	2008	2009	2010	2011
Vancouver - C$	***240***	***235***	***250***	***255***
Vancouver - US$	***242***	***193***	***238***	***255***
Prince Rupert - C$	***N/A***	***N/A***	***230***	***235***
Seattle/Tacoma	265	245	272	265
Oakland	310	285	325	350
Long Beach/Los Angeles	335	335	355	345
Top 5 Japanese Ports	279	336	339	390
Kaohsiung	86	85	80	79
Pusan	155	145	160	162
Hong Kong	325	315	335	340
Singapore	185	185	177	190
Antwerp - Scheldt	158	147	145	135
Rotterdam - Delta	201	185	184	170

* - Vancouver TEU : FEU ratio utilised
Prevailing exchange rate. Prince Rupert 2008/2009 subject to new port price instability, hence unknown

Source: Ocean Shipping Consultants

World Container Handling Charges
In order to offer a degree of comparison with other major regional ports an analysis has been undertaken of the development of container handling prices at Vancouver and other major world port ranges for the period since 2008. This reflects the period of market downturn and subsequent recovery. The results are summarised for import/export containers in Table 5.1.

This run of data contrasts similar activities in major North American West Coast ports with those in Asian and North European hub ports. Although differences are noted, it is clear that West Coast terminal handling rates are – generally speaking – cheaper than those at the major Asian hub ports and significantly more expensive than in northern Europe. This reflects the balance of the market in each region. For example, the container handling market in northern Europe is highly competitive, with an over-capacity situation noted. This results in strong downward pressure on prices. In some Asian gateways – especially Hong Kong – the balance of the market has favoured the stevedore, with the next effect being very high stevedoring charges.

In other situations – most notably in Japan – the strict regulation of the port market has seen stevedoring rates at very high levels, with this being manifested in an uncertain development for these terminals.

Regional market balance determines the container handling pricing levels.
It must be stressed, therefore, that the regional balance of a market is critical in determining pricing levels. Although the level of pricing in a different world region is of some interest, it remains the case that the regional balance of supply and demand and the structure of the immediate market remains of fundamental importance in determining prices.

Table 5.2
March 2012 - West Coast Container Handling and Other Charges
- US$ per import/export container

	to Stevedore	to Port Authority	Total
Vancouver	255.00	20.85	275.85
Prince Rupert	235.00	18.50	253.50
Seattle/Tacoma	265.00	19.95	284.95
Oakland	350.00	22.50	372.50
Long Beach/Los Angeles	345.00	24.75	369.75

Note - the mechanism for port dues/wharfage collection varies in each port. Includes estimates.

Source: Ocean Shipping Consultants

Regional Container Handling Charges

Table 5.2 summarises those revenues that are directed towards the stevedoring company from the shipping lines for the service of container handling (other charges such as port dues are a separate sector) on the North American West Coast. The development of prices has been collated on an annual basis since the early 2000s on the basis of representative services as defined above. In the past two years there has been a recovery in the level of charges per container in the region under review in general.

Trend on the West Coast: limited increases in pricing levels in US ports.

In recent years, the general trend in container handling prices on the West Coast has been characterised by a limited contraction in line with the downturn in demand noted since 2007, but the recovery has been reflected in firmer pricing levels. Indeed, the tight control of the waterfront and high labour costs limited the level of price weakening during the downturn. Stevedoring charges at Los Angeles/Long Beach increased by some 6 per cent between 2008-2010 and have since recorded a marginal downturn to reach a level of around US$345 at the end of last year. This pattern of increase has also been noted at Oakland, although – in absolute terms – prices remain somewhat lower at this location.

This trend of limited increases in prices has also been noted in the US PNW region, although the absolute scope for price increases is seen to have been considerably more restricted. For example, typical stevedore charges for transiting Seattle/Tacoma terminals have increased by some 2.6 per cent between 2008-2010 to reach a level of US$272 per container. This reflects the weaker balance of supply and demand in the PNW and the strong level of competition from the major PSW gateways.

The Effect of Exchange Rate Movements on Container Handling Charges

The development of stevedoring prices at Vancouver has shown a different development pattern over the period. Since 1995 the role of the port has been transformed from a medium volume local terminal to a major alternative gateway for the PNW and the broader US hinterland. There has been little development in handling prices in terms of Canadian dollars over the period.

It is certainly the case that the competitive position of Vancouver has been influenced by the developing value of the Canadian dollar over the period since the early-2000s. It is invariably the case that shipping costs are primarily billed in terms of US dollars and in the period to 2003, the relatively weak position of the Canadian dollar versus its US counterpart resulted in lower handling rates at Vancouver.

In the subsequent period the Canadian dollar has strengthened sharply, with this negating the earlier exchange rate advantage.

Figure 5.1 - Canadian $ per US$ (end year)

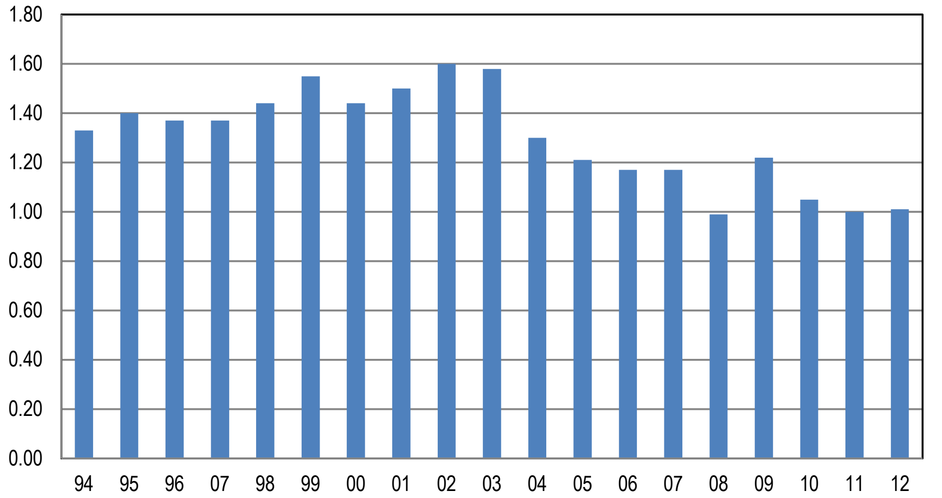


Figure 5.1 charts the development of end-year exchange rates between the two currencies together with current data for April 2012, which is largely consistent with the position in June 2013. It is apparent from this data that the general trend has been a strengthening of the Canadian dollar since 2003 and this trend has been maintained during the recent period of economic uncertainty. It is clear that Vancouver has succeeded in increasing its market share in the region, despite the relative increase in stevedore costs at the port when considered in terms of US dollars since 2009.

Table 5.3 summarises the effect of shifts in the exchange rate on current stevedoring and port revenues considered in terms of US dollars. It is apparent that although the Canadian dollar has strengthened considerably (to rates not recorded since before 1994) over the period, this has not adversely impacted on competitive position.

In 1995, the port was already somewhat cheaper than the neighbouring US ports and this position has improved further. In 2011 Vancouver enjoyed a price advantage of around 3.8 per cent over Seattle and an advantage of around 26 per cent over Californian ports. There is an underlying difference in pricing but the year-on-year position has been obscured by changes in the exchange rate and this is relevant for the position in mid-2013.

Vancouver's competitive position has been noted throughout this period of uncertainty, with relative exchange rates seen to exert only a limited influence on competitive position of the port and is expected to continue in the short-term future, at least.

Table 5.3
The Effect of Currency Fluctuations on Vancouver Container Revenue
- US$ charges per container

	to Stevedore	to Port Authority	Total
at US$ = C$0.90	283.33	23.17	306.50
at US$ = C$1.00	**255.00**	**20.85**	**275.85**
at US$ = C$1.10	231.82	18.95	250.77
at US$ = C$1.20	212.50	17.38	229.88
at US$ = C$1.30	196.15	16.04	212.19
at US$ = C$1.40	182.14	14.89	197.04
at US$ = C$1.50	170.00	13.90	183.90
at US$ = C$1.60	159.38	13.03	172.41

Source: Ocean Shipping Consultants

Total Built-Up Transit Costs

In addition to revenues retained by the stevedoring companies, further charges are levied that are directed towards the Port Authorities. These 'port charges' are associated with vessels calling at regional ports and represent revenues for the development of the port. There are wide differences noted in the mechanisms utilised for the collection of these charges, with stevedores sometimes responsible (as at Vancouver) and in other cases direct billing.

Port dues form a limited part of the total built-up transit costs.

There are usually published tariffs for every key element of port charges – port dues on ship, port dues on cargo, pilotage, towage, etc. – but in the current regional market there is a high degree of flexibility in these charges – especially for new customers. It is certain that Maersk does not pay port dues in direct conformity with the published tariffs, for example. This flexibility is most notable in the establishment of major new terminal contracts, and the overall package of prices is often related to stevedore charges in order to deliver a competitive overall cost. This is a highly sensitive area and a matter of strict secrecy.

The current position with regard to charges for representative vessels and customers has been estimated from a variety of sources and the results are detailed in Table 5.2. This is based not simply on published tariffs, but actual reports from shipping lines and agents utilising these ports. Clearly, there is a mixture of fixed and cargo volume-related charges, which are thus closely influenced by consignment size.

Port charges at Vancouver are currently marginally higher than in US PNW ports.

Charges to the Port Authority are currently estimated at some US$20.85 at Vancouver, with this being marginally higher than in US PNW ports and significantly cheaper than the position at Long Beach/Los Angeles and this position is assumed to be relevant during 2013 as it was for 2012.

This cost sector represents a significant potential for revenue generation for terminal development at Vancouver, but it must be stressed that this is a highly competitive area, and ports are quite prepared to offer significant additional discounts to secure important customers.

Short-term volatility in stevedoring charges and port dues has a limited effect on the overall competitive position.

It should also be stressed that these charges are only a single element of through-transport costs. With competitive shipping and intermodal charges, short-term volatility in the stevedoring charge and port dues would have only a very limited effect on the overall competitive position – especially if productivity and efficiency can be sustained at higher levels in Vancouver.

5.3 The Outlook for Vancouver Container Handling Charges

In order to consider the development of the competitive position of Vancouver over the forecast period, it is necessary to consider how terminal handling charges are likely to develop. This market is seen to be highly dynamic with strong demand growth, and regional moves towards introduction of more private capital into container handling, suggesting significant changes in average costs.

Handling charges primarily determined by the local balance of supply and demand for capacity.
In considering the future development of handling charges in the regional market, the most significant factor determining demand will be the future balance of supply and demand for container handling capacity. The free market will determine pricing against this background.

The primary determinant of market prices will be the local balance of supply and demand in Vancouver modified by the broader balance of the market of which Vancouver is a part (i.e. the PNW market). It is the resulting capacity-utilisation rate that will offer the best indicator of the direction of the market over the forecast period. There are of course limitations encountered in relying on this methodology.

The future development of capacity becomes increasingly problematic to specify beyond the medium term, with further capacity additions predicated upon actual demand growth in the medium term. However, given the timescale associated with port investment, it is felt that a supply/demand-based approach is meaningful through to 2020.

Tables 5.4 summarise the development of supply and demand for the PNW market for the forecast period and includes the most recent PMV-supplied data relating to planned capacity, together with any other changes at regional ports. At present overall utilisation rates are running at some 68.3 per cent, but this obscures considerable differences between smaller and larger terminals, with deep water remaining at a premium in the range.

It is anticipated that the balance of the market will remain broadly stable in the period to 2014 and then strengthen, so the position in the June 2012 Report is regarded as being relevant for this June 2013 Update. The gradient of this improvement will be determined by the level of demand, with limited changes anticipated for the capacity side of the equation.

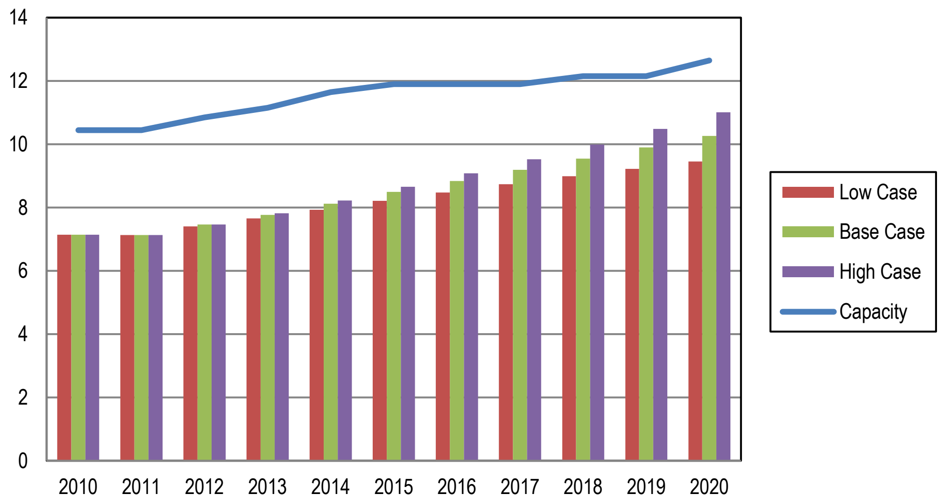
This phased development is typical of port utilisation rates with capacity being provided in large packages and demand increasing incrementally. The position is further summarised in Figure 5.2.

Table 5.4
Forecast Pacific North West Container Port Supply/Demand Balance to 2020
- million TEU/annum and percentage

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Capacity	10.45	10.45	10.85	11.15	11.65	11.90	11.90	11.90	12.15	12.15	12.65
Total Demand											
Low Case	7.14	7.14	7.41	7.66	7.93	8.22	8.48	8.74	8.99	9.23	9.46
Base Case	7.14	7.14	7.46	7.77	8.13	8.50	8.84	9.19	9.55	9.90	10.26
High Case	7.14	7.14	7.46	7.82	8.23	8.66	9.08	9.53	9.99	10.49	11.01
Capacity Utilisation - %											
Low Case	68.3%	68.3%	68.3%	68.7%	68.1%	69.1%	71.3%	73.4%	74.0%	76.0%	74.8%
Base Case	68.3%	68.3%	68.8%	69.7%	69.8%	71.4%	74.3%	77.3%	78.6%	81.5%	81.1%
High Case	68.3%	68.3%	68.8%	70.1%	70.6%	72.7%	76.3%	80.0%	82.3%	86.3%	87.1%

Source: Ocean Shipping Consultants

Figure 5.2 - Forecast PNW Container Port Capacity and Demand to 2020 (mTEU/annum)



There is no deterministic relation between the development of capacity-utilisation rates and stevedoring prices. However, an evaluation of this indicator provides by far the best assessment of the general anticipated level of stevedoring prices. This is especially appropriate in North America where the free market can operate uninfluenced by other regulatory factors.

On the basis of these forecast supply/demand shifts, a projection of forecast import/export stevedore rates at Vancouver – in terms of real Canadian dollars – has been developed and summarised in Table 5.5 and in Figure 5.3.

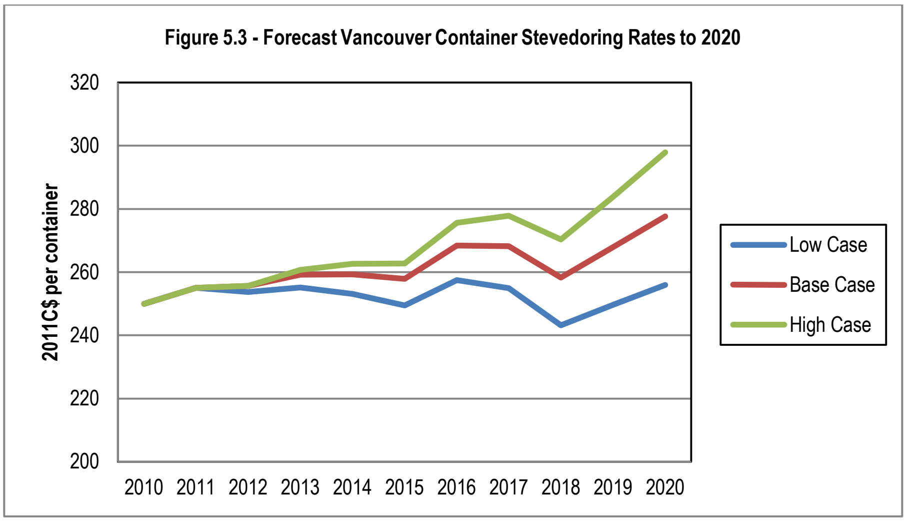
A strengthening in prices is forecast in the short term, and then a cyclical pattern is anticipated that will reflect the balance of supply and demand over the rest of the period. It is forecast that rates will be significantly higher in real terms in 2020 than is currently the case. This represents a positive outlook for the market.

Table 5.5
Forecast Vancouver Stevedoring Rates to 2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PNW Capacity Utilisation - %											
Low Case	68.3%	68.3%	68.3%	68.7%	68.1%	69.1%	71.3%	73.4%	74.0%	76.0%	74.8%
Base Case	68.3%	68.3%	68.8%	69.7%	69.8%	71.4%	74.3%	77.3%	78.6%	81.5%	81.1%
High Case	68.3%	68.3%	68.8%	70.1%	70.6%	72.7%	76.3%	80.0%	82.3%	86.3%	87.1%
2011 C$ per import/export container											
Low Case	250	255	255	256	254	258	266	274	276	284	279
Base Case	250	255	257	260	260	267	277	288	293	304	303
High Case	250	255	257	262	264	272	285	299	307	322	325

* vessel - terminal departure

Source: Ocean Shipping Consultants



The outlook for container handling prices at Vancouver under anticipated local and regional supply/demand balances is generally positive. There is little danger that prices will show any sustained weakness and the competitive position of the port versus other US locations will be sustained.

5.4 Relative Cost Structures and Potential Vancouver Demand

The future share of Vancouver in the total Asian markets will be further influenced by the competitive cost structures associated with intermodal services to the Midwest. The competitive pressures will be between:

- Other West Coast ports, and
- Alternative all-water services.

The current analysis defines the relative level of costs involved and assesses how these will develop in the future. The analysis concludes with a forecast of the likely impact of highly competitive transport cost structures on Vancouver demand projections.

This current analysis provides a summary of the comparative costs for delivering a standard 40' freight container from two Asian source ports to the Chicago region of the US. In order to provide a range of analyses, two Asian ports have been selected – Yokohama and Singapore – as they represent the geographical range of trades under review. Volumes shipped from the major Chinese ports (e.g. Shanghai) will record transport costs between these limits.

In the current and future market there are three options for these movements, with these being:

- Via US West Coast ports and then by landbridge intermodal link to Chicago – four port alternatives have here been used to cover the direct competition with Vancouver (Los Angeles, Seattle/Tacoma, Vancouver and Prince Rupert).
- Via the Panama Canal and various north-east coast North American ports (Halifax, and New York), with onward rail movement to Chicago. The economics of this alternative will be radically revised when larger vessels can transit the Canal from late 2014.
- As above, except with shipment via the Suez Canal.

In defining these competitive cost structures, it is necessary to identify the following cost areas:

- *Voyage Costs*. These comprise built-up vessel trading costs – capital charges (ship mortgage), operating costs and bunker charges – and, where appropriate, canal dues.
- *Stevedoring Costs*. These have been defined for the range of ports under review, on the basis of high volume typical movements of 40' containers.
- *Inland Distribution Costs*. These are based upon quoted intermodal rail rates for delivery of 40' containers from the discharge port to the Chicago area. Once again, rates for high volume shipments of 40' containers have been utilised.

It is also necessary to adopt a dynamic approach to these cost estimations. The water depth advantage of both Vancouver and Halifax have been significant in the development of Asia to US container flows, but recent years have seen an improvement of water depth at some terminals on the West Coast and at New York and there are plans to improve some of the other East Coast ports – although the timing of these latter developments remains unclear. At present, a number of the East Coast US ports are restricted with regard to water depth. It is currently not possible to berth the very largest container vessels in service globally on a fully loaded basis anywhere on the East Coast (if required). Indeed, even with the current dredging programme at New York, for example, finalised, there remain limitations for the largest vessels and other air draught restrictions. Virginia remains the benchmark in the region, with water depth of 15.2m.

Given these developments, costs have been considered from three perspectives:

- The maximum vessel size currently possible for each trade;
- The forecast position from around 2015-2016.

Key Assumptions

Table 5.6 presents a summary of the dimensions and berthing requirements for vessels which are currently dominant and are anticipated for these trades. This information was prepared for the June 2012 Report but is still relevant for this June 2013 Study update.

The typical dimensions of each of the vessel types are detailed and the implications for port and canal accessibility are defined. Required water depth has been calculated on the basis of current operational practices and load states of the vessels. As is detailed in Section 4, these units are seldom fully-loaded by weight, but their operators are stressing these requirements.

The known specifications of the 18,000TEU EEE Class vessels are also included. It should be noted that there are various publicly-available figures for the likely water depth requirement that this class of ship will need, ranging from 14.5m to 16.5m. At the time of writing the first vessel loaded with cargo has not sailed, so the exact figure for a fully-laden ship is not known, but will definitely be between the range indicated. Table 5.6 estimates the typical likely design draught and required water depth when in port.

Based on what information is generally known, the current largest and anticipated largest vessels have been selected on the basis port and canal developments over the period to 2015-2016. It is anticipated that no significant further increases will be noted for the container sector.

Table 5.6
Current and Forecast Container Vessel Particulars

	4500TEU Panamax	8500TEU	12500TEU New Panamax	14500TEU	18000TEU
Dimensions					
Draught (design) - m	12.2	14.5	15.2	15.5	15.5
Required depth - m	12.8	15.0	15.6	15.9	15.9
LOA - m	294	320.0	366.0	380.0	400.0
Beam	32	45.5	49.0	56.4	59.0
Suez Transit - $	315000	424000	517000	548000	615000
Panama Transit - $	312750	475000	665000	na	na
Accessibility in 2012					
Vancouver	Y	Y	Y	Y	Y
Prince Rupert	Y	Y	Y	Y	Y
Singapore	Y	Y	Y	Y	Y
Kobe	Y	Y	Y	N	N
Seattle/Tacoma	Y	Y	N	N	N
Los Angeles	Y	Y	Y	N	N
Long Beach	Y	Y	Y	N	N
Panama	Y	N	N	N	N
Halifax	Y	Y	Y	Y	N
New York	Y	Y	N	N	N
Suez	Y	Y	Y	Y	Y
Accessibility in 2016					
Vancouver	Y	Y	Y	Y	Y
Prince Rupert	Y	Y	Y	Y	Y
Singapore	Y	Y	Y	Y	Y
Kobe	Y	Y	Y	N	N
Seattle/Tacoma	Y	Y	Y	N	N
Los Angeles	Y	Y	Y	Y	N
Long Beach	Y	Y	Y	Y	N
Panama	Y	Y	Y	N	N
Halifax	Y	Y	Y	Y	N
New York	Y	Y	N	N	N
Suez	Y	Y	Y	Y	Y

From end-2014

Source: Ocean Shipping Consultants

The costs of transiting the Panama and Suez Canals are of relevance to this study. The summarised data is based on net canal tonnage for these vessels and calculates transit charges on the basis of current tariffs. Estimates have been made of transit costs for the expanded Panama Canal and for the use of vessels yet to be delivered at Suez. The daily at-sea and in-port trading costs of these vessels have already been considered in the context of scale economy evaluation in Section 4.

Table 5.7 details the haul lengths involved in terms of nautical miles for the various trade permutations under consideration in this study. It is important to note the wide divergence in haul lengths between Singapore and Kobe, with the westerly option via Suez clearly favoured for south-east Asian cargoes (in distance terms). The range of selected origins provides a useful indicator the overall range of costs on Asia-Chicago trades.

Table 5.7
Asia to North America Haul Lengths
- nautical miles

	Singapore	Kobe
Vancouver	*7078*	*4550*
Prince Rupert	6667	4386
Tacoma	7082	4554
Seattle	7062	4534
Los Angeles	7669	5137
Long Beach	7669	5137
Halifax via Panama	12881	10029
New York via Panama	12511	9659
Halifax via Suez	9554	12509
New York via Suez	10046	12983

Source: Ocean Shipping Consultants

Table 5.8
Typical Container Handling Charges
- US$ per 40' container

Terminal	Handling Charge
Singapore	190.00
Kobe	390.00
Prince Rupert	235.00
Vancouver	255.00
Tacoma	265.00
Seattle	265.00
Los Angeles	345.00
Long Beach	345.00
Halifax	300.00
New York	325.00

- all charges between gate and vessel

Source: Ocean Shipping Consultants

Table 5.8 provides a summary of container handling charges at the various ports under review. There is believed to be little difference between the figures between June 2012 and June 2013.

These price levels relate to high volume and regular consignments, and are representative of the entire charge for transiting container terminals with 40' (loaded) containers. Charges are seen to be very high in Kobe, with this reflecting the highly regulated situation in Japan. On the US West Coast, charges are also at high levels for the reasons considered earlier in this review. Charges on the East Coast are somewhat lower, with New York currently estimated at around $325 per 40' container. It is further estimated that Halifax is considerably cheaper at around $300 – with this partially reflecting difficult trading conditions of late at this location.

Table 5.9
Indication of Typical Intermodal Rail Costs, 2013 to Chicago & Toronto
- US$ per 40' container

To Chicago	Typical	To Toronto	Typical
Vancouver	**1597**	**Vancouver**	**1570**
Prince Rupert	**1587**	**Prince Rupert**	**1587**
Seattle	*1700*	Seattle	*2093*
Tacoma	*1803*	Tacoma	2212
Los Angeles	*2009*	Los Angeles	2511
Halifax	*2215*	Halifax	2215
New York	*1521*	New York	1345

Rates are subject to current fuel surcharge; percentage .is 13%.
Rates do not apply on hazardous or restricted commodities.
Maximum cargo weights for these rates: 38,000 lbs per 20' and 44,000 lbs per 20'

Source: Ocean Shipping Consultants/Local Rail Companies

The development of intermodal rail rates for the North American market is summarised in Table 5.9, which details ***typical*** likely costs for rail movements of high volumes of 40' loaded containers on a regular service basis.

It should be noted that this market sector is seen to be highly competitive, especially where several railroads are offering a service. Also, the level of rates is seen to be highly negotiable, and the specific rates from a terminal are the subject of intense short-term volatility.

The data here summarised are based on a range of the highest and lowest rates that have been identified by OSC during the late 2011/early 2012 period and then updated for early/mid 2013 to include estimates and increases in key items such as fuel.

It is important to note that these rates are regarded as indicative only and do not take into account specially negotiated arrangements with railroads that are not available in the public domain. Moreover, rail rates are not specifically just a component of distance and cost therein, with market forces playing an important role in the figures applicable.

For example, a container moving to an inland destination such as Toronto from the port of Halifax is not necessarily going to be cheaper than if it moves from Vancouver just because Halifax is a closer distance.

There are various reasons for this including, but not limited to:

- Overall volume demand;
- Empty equipment imbalances – if the laden container is moving to a location where there is no backhaul cargo, then the empty cost of returning the unit to a location where it is required will be taken into account;
- Commodity specific commercial sensitivities – if the cargo is required at a certain location at a particular time, then it will impact price, i.e. car parts at an automotive manufacturing plant.

Therefore given the volatility and competitive nature of this market, it has been necessary to identify a ***typical*** rate. This has been defined from data extracted from numerous sources, and should be noted as merely representative of the current market. These rates have been confirmed as reasonably representative by several operators who are active on these trades, thereby ensuring it is prudent to use the identified rail costs in the following cost comparisons.

5.5 Cost Calculations

These input costs have been utilised in defining the built-up charge associated with the various existing and future transport options that are relevant for North American hinterland distribution. In developing these costs several further key assumptions have been utilised:

- It has been assumed that a load factor of 90 per cent will be achieved;
- An average trading speed of 22 knots has been utilized (except for the planned 18,000TEU vessels (where a trading speed of 19 knots is anticipated);
- Container handling has been estimated at a speed of 120 container per hour 'through-the-ship';
- A simplified port itinerary has been utilised;
- Canal charges have been calculated on the basis of current tariffs – without rebates.

Tables 5.10-5.13 provide a further insight into the calculation methodologies utilised in this study. The first two tables summarise cost calculations for Singapore to Chicago under current vessel sizes and the next table reconsiders these costs on the basis of the anticipated vessel size position in 2015-2016. As the focus of the analysis is the relative position and the importance of changes in the shipping sector, all other costs are held constant in real terms. Table 5.12 and 5.13 provide a parallel set of analyses for shipments from Kobe.

After these, a series of similar calculations offered with respect to Toronto as the final destination instead of Chicago. This information is contained within Table 5.14 to Table 5.17

It is important to note that there are numerous assumptions made in these analyses and only a general picture can be offered. For example, the US-applied Harbor Maintenance Fees (HMF) have not been included because this charge (of 0.125 per cent of the value of the goods) is based solely on the value of the cargo being shipped, which is information not readily to hand and, therefore, too specific for the purposes of this indicative assessment. Nevertheless, it should be noted that the application of this additional charge will have some minor bearing on the costs for using US ports, perhaps adding an approximate US$100 to a laden unit's total cost – these ports are already more expensive than Vancouver (and Prince Rupert), so this additional cost will only further widen the differential. Nevertheless, following the outputs still provide a highly useful assessment of the ***relative*** position for both final destinations and a range of entry ports in both Canada and the US from both East and West coasts.

Table 5.10
Sample Calculation I - Singapore to Chicago with Largest Current Vessels
- US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	14500	14500	8500	8500	12500	4500	14500	4500	8500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	7078	6667	7082	7062	7669	12881	9554	12511	10046
Sea Days @ 22 knots	14.04	13.23	14.05	14.01	15.22	25.56	18.96	24.82	19.93
Port (and Canal) Days	9.10	9.10	5.33	5.33	7.84	2.82	9.10	2.82	5.33
Cargo size - boxes	7733	7733	4533	4533	6667	2400	7733	2400	4533
Sea Costs per day	229550	229550	152497	152497	205890	92585	229550	92585	152497
Port Costs per day	76386	76386	52511	52511	76386	36265	76386	36265	52511
Sea Costs	3223719	3036526	2142823	2136771	3132879	2366243	4351429	2298273	3039650
Port Costs	694966	694966	280060	280060	599109	102394	694966	102394	280060
Canal Charges	0	0	0	0	0	312750	564440	312750	436720
Voyage Cost	3918685	3731493	2422883	2416831	3731988	2781387	5610835	2713418	3756430
No. FEU	6525	6525	3825	3825	5625	2025	6525	2025	3825
Cost per FEU	***600.56***	***571.88***	***633.43***	***631.85***	***663.46***	***1373.52***	***859.90***	***1339.96***	***982.07***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
Total per FEU	***1045.56***	***996.88***	***1088.43***	***1086.85***	***1198.46***	***1863.52***	***1349.90***	***1854.96***	***1497.07***
Inland to Chicago	***1596.50***	***1586.72***	***1802.50***	***1699.50***	***2008.50***	***2214.50***	***2214.50***	***1521.31***	***1521.31***
Total	***2642.06***	***2583.60***	***2890.93***	***2786.35***	***3206.96***	***4078.02***	***3564.40***	***3376.27***	***3018.38***

Source: Ocean Shipping Consultants

Table 5.11
Sample Calculation II - Singapore to Chicago with Largest Future Vessels
- 2013 US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	18000	18000	12500	12500	12500	12500	18000	12500	12500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	7078	6667	7082	7062	7669	12881	9554	12511	10046
Sea Days @ 22 knots (1	15.52	14.62	14.05	14.01	15.22	25.56	20.95	24.82	19.93
Port (and Canal) Days	11.29	11.29	7.84	7.84	7.84	7.84	11.29	7.84	7.84
Cargo size - boxes	9600	9600	6667	6667	6667	6667	9600	6667	6667
Sea Costs per day	196110	196110	205890	205890	205890	205890	196110	205890	205890
Port Costs per day	88968	88968	76386	76386	76386	76386	88968	76386	76386
Sea Costs	3044004	2867248	2893082	2884912	3132879	5262044	4108847	5110894	4103912
Port Costs	1004817	1004451	599109	599109	599109	599109	1004817	599109	599109
Canal Charges	0	0	0	0	0	665000	633450	665000	489250
Voyage Cost	4048821	3871698	3492191	3484021	3731988	6526153	5747114	6375003	5192271
No. FEU	8100	8100	5625	5625	5625	5625	8100	5625	5625
Cost per FEU	***499.85***	***477.99***	***620.83***	***619.38***	***663.46***	***1160.20***	***709.52***	***1133.33***	***923.07***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
Total per FEU	***944.85***	***902.99***	***1075.83***	***1074.38***	***1198.46***	***1650.20***	***1199.52***	***1648.33***	***1438.07***
Inland to Chicago	***1596.50***	***1586.72***	***1802.50***	***1699.50***	***2008.50***	***2214.50***	***2214.50***	***1521.31***	***1521.31***
Total	***2541.35***	***2489.71***	***2878.33***	***2773.88***	***3206.96***	***3864.70***	***3414.02***	***3169.64***	***2959.38***

Source: Ocean Shipping Consultants

Table 5.12

Sample Calculation III - Kobe to Chicago with Largest Current Vessels

- US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	12500	12500	8500	8500	12500	4500	12500	4500	8500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	4550	4386	4554	4534	5137	10029	12509	9659	12983
Sea Days @ 22 knots	9.03	8.70	9.04	9.00	10.19	19.90	24.82	19.16	25.76
Port (and Canal) Days	7.84	7.84	5.33	5.33	7.84	2.82	7.84	2.82	5.33
Cargo size - boxes	6667	6667	4533	4533	6667	2400	6667	2400	4533
Sea Costs per day	205890	205890	152497	152497	205890	92585	205890	92585	152497
Port Costs per day	76386	76386	52511	52511	76386	36265	76386	36265	52511
Sea Costs	1858730	1791734	1377918	1371867	2098526	1842329	5110077	1774360	3928307
Port Costs	599109	599109	280060	280060	599109	102394	599109	102394	280060
Canal Charges	0	0	0	0	0	312750	532510	312750	436720
Voyage Cost	2457839	2390843	1657978	1651927	2697635	2257474	6241696	2189505	4645087
No. FEU	5625	5625	3825	3825	5625	2025	5625	2025	3825
Cost per FEU	***436.95***	***425.04***	***433.46***	***431.88***	***479.58***	***1114.80***	***1109.63***	***1081.24***	***1214.40***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00
Total per FEU	***1081.95***	***1050.04***	***1088.46***	***1086.88***	***1214.58***	***1804.80***	***1799.63***	***1796.24***	***1929.40***
Inland to Chicago	***1596.50***	***1586.72***	***1802.50***	***1699.50***	***2008.50***	***2214.50***	***2214.50***	***1521.31***	***1521.31***
Total	***2678.45***	***2636.76***	***2890.96***	***2786.38***	***3223.08***	***4019.30***	***4014.13***	***3317.55***	***3450.71***

Source: Ocean Shipping Consultants

Table 5.13

Sample Calculation IV - Kobe to Chicago with Largest Future Vessels

- US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	12500	12500	12500	12500	12500	12500	12500	12500	12500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	4550	4386	4554	4534	5137	10029	12509	9659	12983
Sea Days @ 22 knots	9.03	8.70	9.04	9.00	10.19	19.90	24.82	19.16	25.76
Port (and Canal) Days	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84
Cargo size - boxes	6667	6667	6667	6667	6667	6667	6667	6667	6667
Sea Costs per day	205890	205890	205890	205890	205890	205890	205890	205890	205890
Port Costs per day	76386	76386	76386	76386	76386	76386	76386	76386	76386
Sea Costs	1858730	1791734	1860364	1852194	2098526	4096967	5110077	3945818	5303712
Port Costs	599109	599109	599109	599109	599109	599109	599109	599109	599109
Canal Charges	0	0	0	0	0	665000	532510	665000	532510
Voyage Cost	2457839	2390843	2459473	2451302	2697635	5361076	6241696	5209927	6435331
No. FEU	5625	5625	5625	5625	5625	5625	5625	5625	5625
Cost per FEU	***436.95***	***425.04***	***437.24***	***435.79***	***479.58***	***953.08***	***1109.63***	***926.21***	***1144.06***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00
Total per FEU	***1081.95***	***1050.04***	***1092.24***	***1090.79***	***1214.58***	***1643.08***	***1799.63***	***1641.21***	***1859.06***
Inland to Chicago	***1596.50***	***1586.72***	***1802.50***	***1699.50***	***2008.50***	***2214.50***	***2214.50***	***1521.31***	***1521.31***
Total	***2678.45***	***2636.76***	***2894.74***	***2790.29***	***3223.08***	***3857.58***	***4014.13***	***3162.52***	***3380.37***

Source: Ocean Shipping Consultants

Table 5.14
Sample Calculation I - Singapore to Toronto with Largest Current Vessels
- US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	14500	14500	8500	8500	12500	4500	14500	4500	8500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	7078	6667	7082	7062	7669	12881	9554	12511	10046
Sea Days @ 22 knots	14.04	13.23	14.05	14.01	15.22	25.56	18.96	24.82	19.93
Port (and Canal) Days	9.10	9.10	5.33	5.33	7.84	2.82	9.10	2.82	5.33
Cargo size - boxes	7733	7733	4533	4533	6667	2400	7733	2400	4533
Sea Costs per day	229550	229550	152497	152497	205890	92585	229550	92585	152497
Port Costs per day	76386	76386	52511	52511	76386	36265	76386	36265	52511
Sea Costs	3223719	3036526	2142823	2136771	3132879	2366243	4351429	2298273	3039650
Port Costs	694966	694966	280060	280060	599109	102394	694966	102394	280060
Canal Charges	0	0	0	0	0	312750	564440	312750	436720
Voyage Cost	3918685	3731493	2422883	2416831	3731988	2781387	5610835	2713418	3756430
No. FEU	6525	6525	3825	3825	5625	2025	6525	2025	3825
Cost per FEU	***600.56***	***571.88***	***633.43***	***631.85***	***663.46***	***1373.52***	***859.90***	***1339.96***	***982.07***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
Total per FEU	***1045.56***	***996.88***	***1088.43***	***1086.85***	***1198.46***	***1863.52***	***1349.90***	***1854.96***	***1497.07***
Inland to Toronto	***1570.17***	***1586.72***	***2211.73***	***2092.82***	***2511.12***	***2214.50***	***2214.50***	***1344.96***	***1344.96***
Total	***2615.73***	***2583.60***	***3300.16***	***3179.67***	***3709.58***	***4078.02***	***3564.40***	***3199.92***	***2842.03***

Source: Ocean Shipping Consultants

Table 5.15
Sample Calculation II - Singapore to Toronto with Largest Future Vessels
- 2013 US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	18000	18000	12500	12500	12500	12500	18000	12500	12500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	7078	6667	7082	7062	7669	12881	9554	12511	10046
Sea Days @ 22 knots (1	15.52	14.62	14.05	14.01	15.22	25.56	20.95	24.82	19.93
Port (and Canal) Days	11.29	11.29	7.84	7.84	7.84	7.84	11.29	7.84	7.84
Cargo size - boxes	9600	9600	6667	6667	6667	6667	9600	6667	6667
Sea Costs per day	196110	196110	205890	205890	205890	205890	196110	205890	205890
Port Costs per day	88968	76386	76386	76386	76386	88968	76386	76386	0
Sea Costs	3044004	2867248	2893082	2884912	3132879	5262044	4108847	5110894	4103912
Port Costs	1004817	862402	599109	599109	599109	697790	862717	599109	0
Canal Charges	0	0	0	0	0	665000	633450	665000	489250
Voyage Cost	4048821	3729650	3492191	3484021	3731988	6624833	5605014	6375003	4593162
No. FEU	8100	8100	5625	5625	5625	5625	8100	5625	5625
Cost per FEU	***499.85***	***460.45***	***620.83***	***619.38***	***663.46***	***1177.75***	***691.98***	***1133.33***	***816.56***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00	190.00
Total per FEU	***944.85***	***885.45***	***1075.83***	***1074.38***	***1198.46***	***1667.75***	***1181.98***	***1648.33***	***1331.56***
Inland to Toronto	***1570.17***	***1586.72***	***2211.73***	***2092.82***	***2511.12***	***2214.50***	***2214.50***	***1344.96***	***1344.96***
Total	***2515.02***	***2472.17***	***3287.56***	***3167.20***	***3709.58***	***3882.25***	***3396.48***	***2993.29***	***2676.52***

Source: Ocean Shipping Consultants

Table 5.16

Sample Calculation III - Kobe to Toronto with Largest Current Vessels

- US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	12500	12500	8500	8500	12500	4500	12500	4500	8500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	4550	4386	4554	4534	5137	10029	12509	9659	12983
Sea Days @ 22 knots	9.03	8.70	9.04	9.00	10.19	19.90	24.82	19.16	25.76
Port (and Canal) Days	7.84	7.84	5.33	5.33	7.84	2.82	7.84	2.82	5.33
Cargo size - boxes	6667	6667	4533	4533	6667	2400	6667	2400	4533
Sea Costs per day	205890	205890	152497	152497	205890	92585	205890	92585	152497
Port Costs per day	76386	76386	52511	52511	76386	36265	76386	36265	52511
Sea Costs	1858730	1791734	1377918	1371867	2098526	1842329	5110077	1774360	3928307
Port Costs	599109	599109	280060	280060	599109	102394	599109	102394	280060
Canal Charges	0	0	0	0	0	312750	532510	312750	436720
Voyage Cost	2457839	2390843	1657978	1651927	2697635	2257474	6241696	2189505	4645087
No. FEU	5625	5625	3825	3825	5625	2025	5625	2025	3825
Cost per FEU	***436.95***	***425.04***	***433.46***	***431.88***	***479.58***	***1114.80***	***1109.63***	***1081.24***	***1214.40***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00
Total per FEU	***1081.95***	***1050.04***	***1088.46***	***1086.88***	***1214.58***	***1804.80***	***1799.63***	***1796.24***	***1929.40***
Inland to Toronto	***1570.17***	***1586.72***	***2211.73***	***2092.82***	***2511.12***	***2214.50***	***2214.50***	***1344.96***	***1344.96***
Total	***2652.12***	***2636.76***	***3300.19***	***3179.70***	***3725.70***	***4019.30***	***4014.13***	***3141.20***	***3274.36***

Source: Ocean Shipping Consultants

Table 5.17

Sample Calculation IV - Kobe to Toronto with Largest Future Vessels

- US dollars per 40' container

Routing	Vancouver	Prince Rupert	Tacoma	Seattle	Los Angeles	Halifax via Panama	Halifax via Suez	New York via Panama	New York via Suez
Vessel TEU	12500	12500	12500	12500	12500	12500	12500	12500	12500
Load factor - %	90	90	90	90	90	90	90	90	90
Ocean Haul Length	4550	4386	4554	4534	5137	10029	12509	9659	12983
Sea Days @ 22 knots	9.03	8.70	9.04	9.00	10.19	19.90	24.82	19.16	25.76
Port (and Canal) Days	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84
Cargo size - boxes	6667	6667	6667	6667	6667	6667	6667	6667	6667
Sea Costs per day	205890	205890	205890	205890	205890	205890	205890	205890	205890
Port Costs per day	76386	76386	76386	76386	76386	76386	76386	76386	76386
Sea Costs	1858730	1791734	1860364	1852194	2098526	4096967	5110077	3945818	5303712
Port Costs	599109	599109	599109	599109	599109	599109	599109	599109	599109
Canal Charges	0	0	0	0	0	665000	532510	665000	532510
Voyage Cost	2457839	2390843	2459473	2451302	2697635	5361076	6241696	5209927	6435331
No. FEU	5625	5625	5625	5625	5625	5625	5625	5625	5625
Cost per FEU	***436.95***	***425.04***	***437.24***	***435.79***	***479.58***	***953.08***	***1109.63***	***926.21***	***1144.06***
Discharge cost	255.00	235.00	265.00	265.00	345.00	300.00	300.00	325.00	325.00
Load cost	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00	390.00
Total per FEU	***1081.95***	***1050.04***	***1092.24***	***1090.79***	***1214.58***	***1643.08***	***1799.63***	***1641.21***	***1859.06***
Inland to Toronto	***1570.17***	***1586.72***	***2211.73***	***2092.82***	***2511.12***	***2214.50***	***2214.50***	***1344.96***	***1344.96***
Total	***2652.12***	***2636.76***	***3303.97***	***3183.61***	***3725.70***	***3857.58***	***4014.13***	***2986.17***	***3204.02***

Source: Ocean Shipping Consultants

Cost Levels for Transport Alternatives

Table 5.18 to Table 5.21 provides a summary of the total transport costs under each alternative with current largest vessels deployed (limited by port and canal constraints) and for when larger vessels are introduced as port and canal improvements materialize for the period from around 2015. Both Chicago and Toronto are included.

It should be noted that all other costs are held constant, with the exception of sea costs incurred with the introduction of larger vessels where this is possible. In addition, it has been further assumed that the accessibility of other West Coast ports is also improved over the period.

Representative shipments costs are derived from Kobe and Singapore are also kept as constants because these ports constitute the geographical range of demand growth.

Table 5.18

Asia to Chicago Container Distribution Costs - Current Direct Comparison*

-US$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Kobe to Chicago				
via Vancouver	436.95	445.00	1596.50	2478.45
via Prince Rupert	425.04	425.00	1586.72	2436.76
via Tacoma	433.46	455.00	1802.50	2690.96
via Seattle	431.88	455.00	1699.50	2586.38
via Los Angeles	479.58	535.00	2008.50	3023.08
via Halifax and Panama	1114.80	490.00	2214.50	3819.30
via Halifax and Suez	1109.63	490.00	2214.50	3814.13
via New York and Panama	1081.24	515.00	1521.31	3117.55
via New York and Suez	1214.40	515.00	1521.31	3250.71
Singapore to Chicago				
via Vancouver	600.56	445.00	1596.50	2769.70
via Prince Rupert	571.88	425.00	1586.72	2722.25
via Tacoma	633.43	455.00	1802.50	3011.16
via Seattle	631.85	455.00	1699.50	2909.64
via Los Angeles	663.46	535.00	2008.50	3319.89
via Halifax and Panama	1373.52	490.00	2214.50	4161.03
via Halifax and Suez	859.90	490.00	2214.50	3664.07
via New York and Panama	1339.96	515.00	1521.31	3480.91
via New York and Suez	982.07	515.00	1521.31	3133.37

* - current largest possible capacity vessels deployed on each alternative

** - load and discharge costs

Source: Ocean Shipping Consultants

Table 5.19
Asia to Chicago Container Distribution Costs - Forecast Direct Comparison*
- 2012US$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Kobe to Chicago				
via Vancouver	436.95	445.00	1596.50	2478.45
via Prince Rupert	425.04	425.00	1586.72	2436.76
via Tacoma	437.24	455.00	1802.50	2694.74
via Seattle	435.79	455.00	1699.50	2590.29
via Los Angeles	479.58	535.00	2008.50	3023.08
via Halifax and Panama	953.08	490.00	2214.50	3657.58
via Halifax and Suez	1109.63	490.00	2214.50	3814.13
via New York and Panama	926.21	515.00	1521.31	2962.52
via New York and Suez	1144.06	515.00	1521.31	3180.37
Singapore to Chicago				
via Vancouver	499.85	445.00	1596.50	2541.35
via Prince Rupert	477.99	425.00	1586.72	2489.71
via Tacoma	620.83	455.00	1802.50	2878.33
via Seattle	619.38	455.00	1699.50	2773.88
via Los Angeles	663.46	535.00	2008.50	3206.96
via Halifax and Panama	1160.20	490.00	2214.50	3864.70
via Halifax and Suez	709.52	490.00	2214.50	3414.02
via New York and Panama	1133.33	515.00	1521.31	3169.64
via New York and Suez	923.07	515.00	1521.31	2959.38

* - forecast largest possible capacity vessels deployed on each alternative (2015-2016 onwards)
** - load and discharge costs

Source: Ocean Shipping Consultants

Table 5.20
Asia to Toronto Container Distribution Costs - Current Direct Comparison*
-US$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Kobe to Toronto				
via Vancouver	436.95	445.00	1570.17	2452.12
via Prince Rupert	425.04	425.00	1586.72	2436.76
via Tacoma	433.46	455.00	2211.73	3100.19
via Seattle	431.88	455.00	2092.82	2979.70
via Los Angeles	479.58	535.00	2511.12	3525.70
via Halifax and Panama	1114.80	490.00	2214.50	3819.30
via Halifax and Suez	1109.63	490.00	2214.50	3814.13
via New York and Panama	1081.24	515.00	1344.96	2941.20
via New York and Suez	1214.40	515.00	1344.96	3074.36
Singapore to Toronto				
via Vancouver	600.56	445.00	1570.17	2769.70
via Prince Rupert	571.88	425.00	1586.72	2722.25
via Tacoma	633.43	455.00	2211.73	3011.16
via Seattle	631.85	455.00	2092.82	2909.64
via Los Angeles	663.46	535.00	2511.12	3319.89
via Halifax and Panama	1373.52	490.00	2214.50	4161.03
via Halifax and Suez	859.90	490.00	2214.50	3664.07
via New York and Panama	1339.96	515.00	1344.96	3480.91
via New York and Suez	982.07	515.00	1344.96	3133.37

* - current largest possible capacity vessels deployed on each alternative
** - load and discharge costs

Source: Ocean Shipping Consultants

Table 5.21
Asia to Toronto Container Distribution Costs - Forecast Direct Comparison*
- 2012US$ per 40' container

	Sea Costs	Stevedoring Costs**	Inland Rail Costs	Total
Kobe to Chicago				
via Vancouver	436.95	445.00	1570.17	2452.12
via Prince Rupert	425.04	425.00	1586.72	2436.76
via Tacoma	437.24	455.00	2211.73	3103.97
via Seattle	435.79	455.00	2092.82	2983.61
via Los Angeles	479.58	535.00	2511.12	3525.70
via Halifax and Panama	953.08	490.00	2214.50	3657.58
via Halifax and Suez	1109.63	490.00	2214.50	3814.13
via New York and Panama	926.21	515.00	1344.96	2786.17
via New York and Suez	1144.06	515.00	1344.96	3004.02
Singapore to Chicago				
via Vancouver	499.85	445.00	1570.17	2515.02
via Prince Rupert	460.45	425.00	1586.72	2472.17
via Tacoma	620.83	455.00	2211.73	3287.56
via Seattle	619.38	455.00	2092.82	3167.20
via Los Angeles	663.46	535.00	2511.12	3709.58
via Halifax and Panama	1177.75	490.00	2214.50	3882.25
via Halifax and Suez	691.98	490.00	2214.50	3396.48
via New York and Panama	1133.33	515.00	1344.96	2993.29
via New York and Suez	816.56	515.00	1344.96	2676.52

* - forecast largest possible capacity vessels deployed on each alternative (2015-2016 onwards)
** - load and discharge costs

Source: Ocean Shipping Consultants

Conclusions on the current competitive position of Vancouver for Asian trades to Chicago
For the NE Asian trades the Vancouver/Prince Rupert option is the cheapest for serving Chicago by a considerable margin, whether the origin location is Singapore or Kobe.

This gateway is considerably cheaper than other PNW ports and also much lower than PSW alternatives. It should also be noted that the East Coast option becomes cheaper than the Californian routing for these trades with the New Panamax vessel. This will further squeeze demand at PSW ports.

Prince Rupert generates a slightly lower through cost than does Vancouver, but this is marginal and other considerations such as the greater availability of export cargo at Vancouver would offset this difference.

All-water options remain more expensive as a result of the distances involved in the case of NE Asia and the size limitations of the Panama Canal for SE Asian suppliers.

The *relative* advantage of Vancouver is sustained for shipments from Singapore (and the ASEAN market in general). Once again, it must be stressed that timings will continue to favour the West Coast and this will sustain overall demand. Within this, the costs of Vancouver are seen to be highly favourable.

The outlook is further summarised in Figures 5.4 and 5.5.

Figure 5.4 - Current & Future Transport Costs Singapore-Chicago (2013U$/FEU)

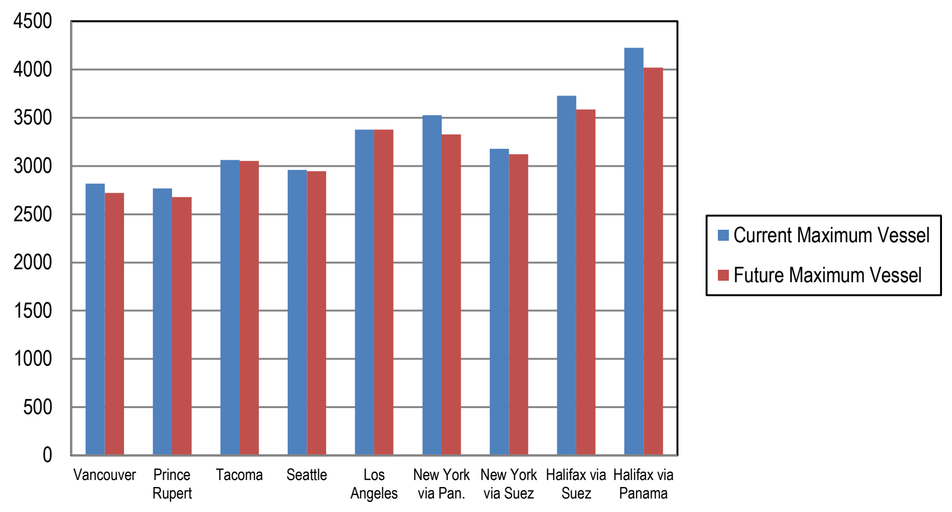
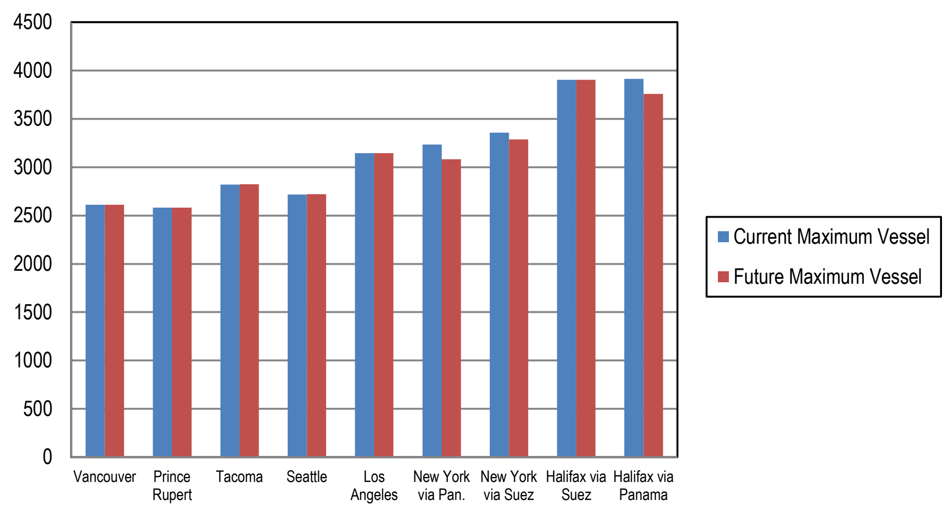


Figure 5.5 - Current & Future Transport Costs Kobe-Chicago (2013US$/FEU)



Conclusions on the current competitive position of Vancouver for Asian trades to Toronto
Similar calculations using the same ports of entry in Canada and the US have been used to draw some indicative comparisons for Singapore and Kobe serving Toronto.

Once again, the Vancouver and Prince Rupert options offered the most competitive cost options, favoured in part by the sailing distances and no requirement to use transit canals as impacts East Coast facilities, as shown in Figures 5.6 and 5.7.

The PSW ports are deemed to be more expensive than the PNW alternative, with volume and local cargo issues influencing the structure of Californian demand.

Figure 5.6 - Current & Future Transport Costs Singapore-Toronto (2013U$/FEU)

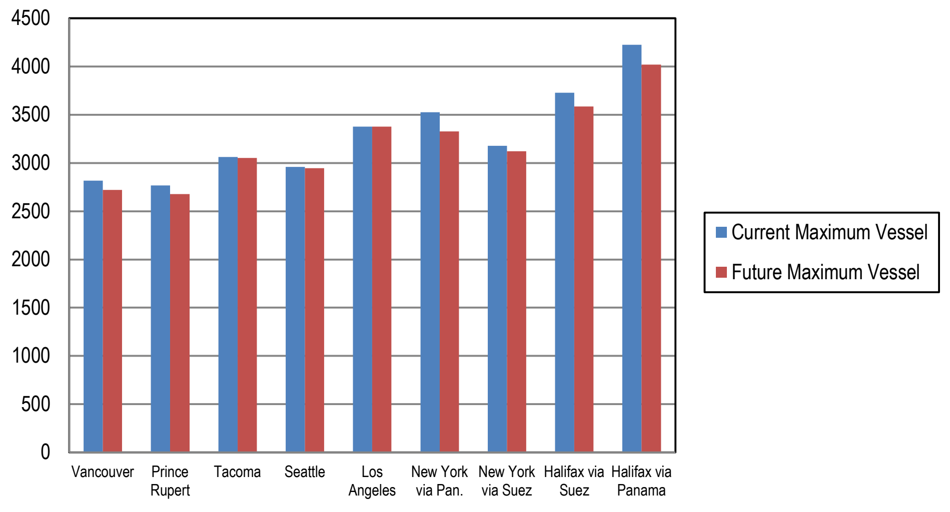
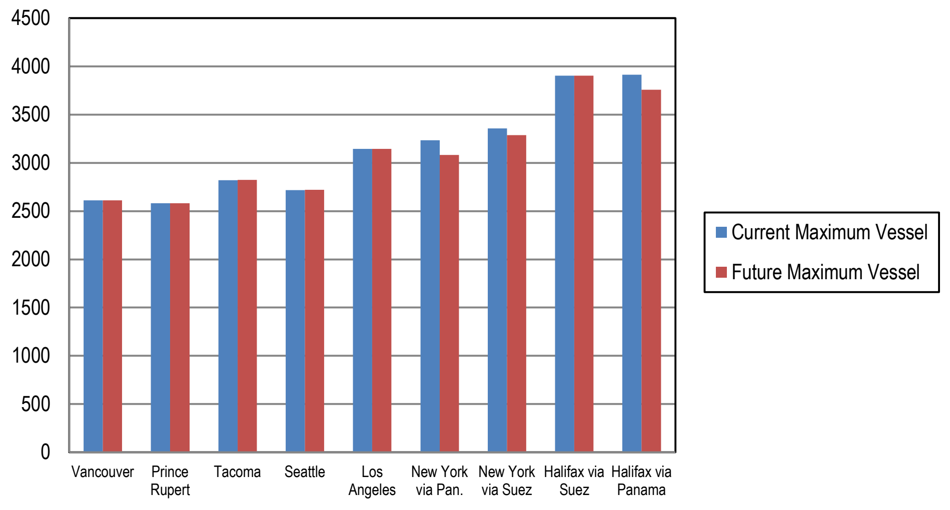


Figure 5.7 - Current & Future Transport Costs Kobe-Toronto (2013US$/FEU)



The Empty Container Issue

The Asia-North America container trades are severely distorted by the imbalance in goods flows in favour of eastbound containers. This generates a requirement for large volumes of empty container repositioning back to Asia. This is seen to be only indirectly relevant to the current analysis but the following points may be made:

- The relative balance of Vancouver flows minimises disruptions due to these considerations. Given identified competitive cost structures this further supports the Vancouver option.
- There is no time pressure for repositioning empties. As such, the slower transit time via the East Coast will not be a penalty for this trade.
- The North Atlantic trade is in far better balance eastbound and westbound and, as such, there is a more limited pool of empty containers on the East Coast. Possibilities for reloading are therefore higher.

- The introduction of the Pendulum service offers greater opportunities for global integration of hardware, with the North American, European and Asian markets interlinked by transshipment over wayports.

Although the competitive position of the Suez all-water option is clearly improving, these should be more than offset by the advantages at Vancouver. This will be far less true of other PNW ports and be scarcely the case with the Californian terminals.

There are no specific negative factors impacting on the position of Vancouver with regard to the empty container repositioning issue. Indeed, the main impact of the Vancouver market position has been a *lack* of empty containers to handle the increasing level of export volumes.

Conclusion

This analysis has summarised the existing highly competitive cost position for Vancouver terminals when serving the Midwest. This position is largely the same as presented in the June 2012 Study, with Toronto acting as the final destination further reflecting the same competitive issues.

The PNW in general is seen to be very well placed and, within this sector, Vancouver and Prince Rupert generate the lowest costs. This represents a major competitive advantage. These advantages are focused on the NE Asian trades but are also significant with regard to the SE Asian markets.

It is also concluded that this relatively strong competitive position will be further boosted by anticipated ship size developments in the main line container trades. The strong existing advantage will be considerably enhanced as larger vessels are introduced into the trades.

Although there will be increased competition from all-water services (especially from SE Asia via Suez in the largest classes of vessels) two factors will restrict this:

- The time involved in shipping via Suez is considerably greater than via the landbridge. If there are no intermodal delays, a difference of around 9 days is indicated in favour of the West Coast alternative. This will continue to be a relevant factor for higher value cargoes. For empty containers and lower value goods this will be of no real importance.

- A competitive response may be anticipated from the major railroads if Halifax is chosen to be the location of major deepsea developments.

Despite these factors, it is apparent that the Vancouver/Prince Rupert option offers a highly competitive overall transport alternative for the Midwest both within the West Coast market and also in contrast to the Panama and Suez alternatives. This advantage will increase in the next few years.

SECTION 6 – INTERMODAL DEVELOPMENTS

6.1 Introduction

The development of intermodal links between west-coast gateway ports and the rest of North America has been one of the most significant factors shaping the North American market for container handling. Double-stack technology has stretched the hinterland of west-coast ports to the entire North American market, with service costs and – perhaps more importantly – through-transit time being highly competitive with that of all-water services from the Far East. Latterly, 'pendulum' services via Suez have added to the initial competition via Panama. The expansion of Panama Canal locks, which is due to be completed in 2014, will allow vessels of around 12,800 TEU to pass through the canal between the Pacific and Atlantic Oceans, thereby boosting the competitiveness of the All-Water option. It is this benchmark that intermodal services will be competing with in the future.

The continued use of West Coast ports to move cargoes between the Far East and Midwest or eastern states will be substantially determined by the capacity, efficiency and cost-competitiveness of the inland intermodal structure – comprising port, railroad and receiving facilities. Increasing demand until the mid-2000s was met by investment in both port and hinterland capabilities, notably completion of the Alameda Corridor through Los Angeles in 2002 and on-going improvements of the Fast Corridor through Seattle and Tacoma since 1998. These have contributed significantly to maintaining the capability of the system to connect the ports with the rail network efficiently. In western Canada, investments in intermodal yards are closely linked to the developing marine terminals, and there are no real constraints in despatching containers.

With the expansion of the Panama Canal locks to take larger vessels from 2014, the efficacy of intermodal connections will continue to be central to maintaining the competitiveness of intermodal routings via West Coast ports.

This Section provides the following, which includes any notable updates or changes that have occurred since the June 2012 Report was provided:

- A summary of intermodal market development;
- A review of current and planned investments in intermodal capacity;
- An estimate of the adequacy of intermodal capacity to meet demand.

6.2 Development Synopsis

The capabilities and capacities of North America's intermodal system for carrying international containers are determined by the following major considerations:

- The capacity of on-dock and near-dock container terminals;
- The adequacy of access between the terminals and intercontinental service network;
- The physical capacity of the relevant rail network;
- The capacity of major Midwest and eastern intermodal terminals.

The following analyses the capabilities in each sector. It is clear that considerable investment has been made (and is continuing) in the provision of on-dock intermodal systems at all the major West Coast container ports apart from Oakland. New terminal investments invariably feature on-dock rail facilities.

Intermodal Container Traffic

International intermodal container flows on North American railroads increased steadily during the first part of the 2000s, to 8.51m containers in 2006. This was followed by a 28 per cent decline over 2006-09, to 6.11m containers. Since, then volumes have picked up again, reaching 7.58m containers in 2012, representing a 59 per cent increase over 1999-2012.

As a proportion of total intermodal movements on North American railroads, which also includes domestic containers and trailers, international (ISO) container traffic increased in share from 48.5 per cent in 1999 to 59.2 per cent in 2007, but has dropped back since to 52 per cent in 2012. Being driven essentially by demand for consumer products, international traffic was more severely affected than domestic traffic during the recession, and its share has remained relatively depressed compared to domestic volumes since then.

The development of international container traffic is presented in Table 6.1.

Table 6.1
North America: International Intermodal Container Traffic, 1999-2012

'000 ISO containers (20', 40' and 45')	Number	Per Cent of Total
1999	4774.6	48.5
2000	5326.5	51.5
2001	5416.1	52.4
2002	5870.9	53.7
2005	7915.3	58.0
2006	8508.6	59.8
2007	8335.5	59.2
2008	7749.8	56.7
2009	6105.3	52.3
2010	7250.4	54.1
2011	7451.6	53.0
2012	7580.5	51.8

Sources: Intermodal Association of North America
Ocean Shipping Consultants

International Intermodal Container Train Capacity and Rail Operators

The double-stack rail system is central to the strategies of the major shipping lines in serving America's vast hinterland. American President Lines (APL) was at the forefront of the establishment of dedicated double-stack services from Seattle, Portland and Los Angeles, and Sea-Land from Tacoma and Oakland. Such were the manifest economic advantages of these services, that other major Pacific operators were forced to follow suit. In subsequent consolidation of the container shipping industry, APL's stack-train operations were sold to Pacer Stacktrain, following APL's takeover by Neptune Orient Lines, whilst Sea-Land's remained with CSX, when Sea-Land's marine operations were acquired by Maersk.

Virtually all major transpacific lines offer landbridge services, either through direct contracts with the railroads or through third-party wholesalers like Pacer Stacktrain. The long-term development of double-stack container train capacity from the major west-coast ports is presented in Table 6.2.

Table 6.2
North American West Coast: International Container Train Capacity, 1986-2013
000 TEUs

	Pacific North	Pacific South	Total
Midwest			
1986	116.5	276.6	393.1
1991	305.8	218.4	524.2
1995	563.3	1111.1	1674.4
2003	1276.3	993.6	2269.9
2013	1499.7	838.9	2338.5
Northeast			
1986	87.4	58.2	145.6
1991	291.7	145.6	437.3
1995	396.9	367.5	764.4
2003	1814.4	722.4	2536.8
2013	1405.0	873.5	2278.5
Central/Southeast/Gulf			
1986	87.4	58.2	145.6
1991	87.4	145.6	233.0
1995	110.9	741.9	852.8
2003	617.8	2694.1	3311.9
2013	968.2	3482.4	4450.7
Total			
1986	291.3	393.0	684.3
1991	684.9	509.6	1194.5
1995	1071.1	2220.5	3291.6
2003	3708.4	4410.1	8118.6
2013	3873.0	5194.8	9067.8

Source: Ocean Shipping Consultants

Given that domestic and international containers and trailers are routinely carried on the same trains, that trains may be split and re-assembled and that hinterland regions overlap, only an estimation of capacity is possible. In 1986 – ahead of the real development of the double-stack revolution – total capacity on these routes amounted to some 0.68m TEU per annum. By far the greatest part was deployed on routes between the Pacific South ports and the Midwest. Development continued rapidly through the 1990s and, by 2003, total deployed capacity was running at around 8.12m TEU per annum.

Slower demand growth at US West Coast ports during the first decade of the 2000s culminating in recession toward the end of the decade, subsequently reduced the need for additional capacity and, at 9.07m TEU/year in 2013, international intermodal capacity was only moderately higher than in 2003. 49 per cent of this was on routes to/from central and southeast parts of the US, reflecting the shifting demography of the country's population and consumer demand toward the south.

By the turn of the millennium, Vancouver's increasing role in the intermodal market was already boosting the position of PNW ports, and this trend continued through the first decade of the 2000s with the addition of Prince Rupert as a container terminal. The share of Pacific North ports climbed from 33 per cent in 1995 to 46 per cent in 2003 then fall back to 43 per cent in 2013, with Canadian ports offsetting the decline at US northwest ports.

Whilst the Canadian ports have increased their penetration of services for the east coast and Midwest, the Pacific South ports – particularly the San Pedro Bay ports – have seen a dramatic growth in services to the southeast, central and Gulf regions.

Figure 6.1 - West Coast Ports: International Rail Capacity 1986-2013 ('000TEUs)

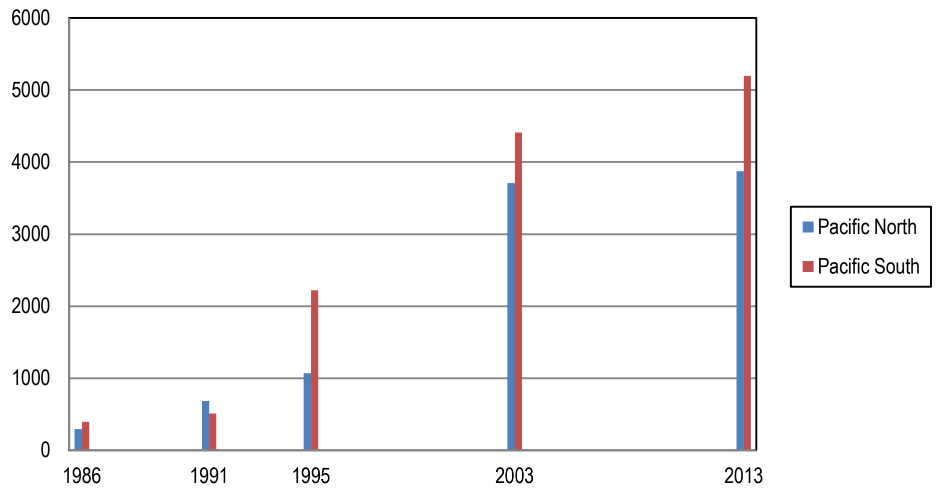
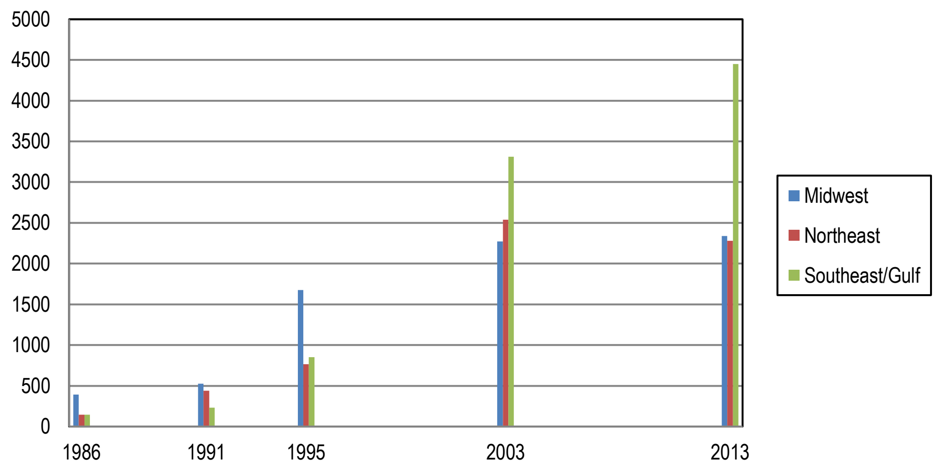


Figure 6.2 - West Coast Ports: International Rail Capacity by Hinterland 1986-2013 ('000TEUs)



The development of west-coast double-stack container services is shown in Figures 6.1 and 6.2. The numbers of trains per week carrying international containers in/out of west-coast ports during May 2013 are summarised in Table 6.3, with the estimated distribution of capacity to regions included to give an indication of likely demand patterns (the figures are not reflective of actual cargo flows by region).

Table 6.3

North American West-Coast Ports: Number of International Container Trains, May 2013)

	Port	Per Week	Regions Served (estimated distribution)
CN	Vancouver south shore & Roberts Bank	28 out	10% central Canada, 30% Midwest, 50% NE, 10% SE
	Vancouver south shore & Roberts Bank	28 in	10% central Canada, 30% Midwest, 50% NE, 10% SE
	Prince Rupert	7 out	10% central Canada, 30% Midwest, 50% NE, 10% SE
	Prince Rupert	7 in	10% central Canada, 30% Midwest, 50% NE, 10% SE
		70	
CP Rail	Vancouver south shore & Roberts Bank	14 outbound	10% central Canada, 30% US Midwest, 60% northeast
	Vancouver south shore & Roberts Bank	14 inbound	10% central Canada, 30% US Midwest, 60% northeast
		28	
BNSF	Los Angeles/Long Beach on-dock	14 outbound	Chicago (50% Midwest, 50% transfer to northeast lines)
	Los Angeles/Long Beach on-dock	19 inbound	Chicago (50% Midwest, 50% transfer from northeast)
	Los Angeles/Long Beach on-dock	23 outbound	Central & Southeast
	Los Angeles/Long Beach on-dock	21inbound	Central & Southeast
	Los Angeles	11 outbound	Chicago & points east (20% Midwest, 80% NE)
	Los Angeles	9 inbound	Chicago (50% Midwest, 50% NE)
	Los Angeles	26 outbound	Central & Southeast including transfers
	Los Angeles	28 inbound	Central & Southeast including transfers
	Oakland	3 outbound	Chicago (30% Midwest, 70% northeast)
	Oakland	7 inbound	Chicago (50% Midwest, 50% northeast)
	Oakland	6 outbound	Southeast
	Oakland	8 inbound	Southeast
	Seattle	7 outbound	Chicago (50% Midwest, 50% northeast)
	Seattle	15 inbound	Chicago (50% Midwest, 50% northeast)
	Seattle	3 outbound	Central and Southeast
	Seattle	2 inbound	Southeast
	Tacoma	6 outbound	Chicago & north (60% Midwest,40% northeast)
	Tacoma	15 inbound	Chicago & north (60% Midwest,40% northeast)
	Tacoma	2 outbound	Central
	Tacoma	2 inbound	Southeast
	Portland	6 outbound	Chicago & north (60% Midwest, 40% northeast)
	Portland	13 inbound	Chicago & north (60% Midwest, 40% northeast)
		246	
Union Pacific	Los Angeles/Long Beach on-dock	10 outbound	Chicago (70% Midwest, 30% northeast)
	Los Angeles/Long Beach on-dock	5 inbound	Chicago (70% Midwest, 30% northeast)
	Los Angeles/Long Beach on-dock	19 outbound	Central and southeast
	Los Angeles/Long Beach on-dock	18 inbound	Central and southeast
	Los Angeles	6 outbound	Central
	Los Angeles	6 inbound	Central
	Oakland	5 outbound	Chicago (50% Midwest, 50% northeast)
	Oakland	6 inbound	Chicago (50% Midwest, 50% northeast)
	Oakland	12 outbound	Central and southeast
	Oakland	8 inbound	Central and southeast
	Seattle	4 outbound	Chicago (60% Midwest, 40% northeast)
	Seattle	7 inbound	Chicago (70% Midwest, 30% northeast)
	Seattle	7 outbound	Central and Southeast
	Seattle	10 inbound	Central and Southeast
	Portland	6 outbound	Chicago (50% Midwest, 50% northeast)
	Portland	7 inbound	Chicago (50% Midwest, 50% northeast)
		136	

Sources: Port Metro Vancouver, Rail Companies, Ocean Shipping Consultants

Following a series of mergers and acquisitions, intermodal railroad capacity serving the west-coast US market is dominated by Burlington Northern Santa Fe and Union Pacific. In Canada, CP Rail and CN are, of course, dominant and they have also extended their reach into the eastern US by means of acquisitions. In addition, CN's acquisition of additional rail capacity has widened its coverage to the US southeast.

Table 6.4
North American West-Coast Ports: Major Rail Operators

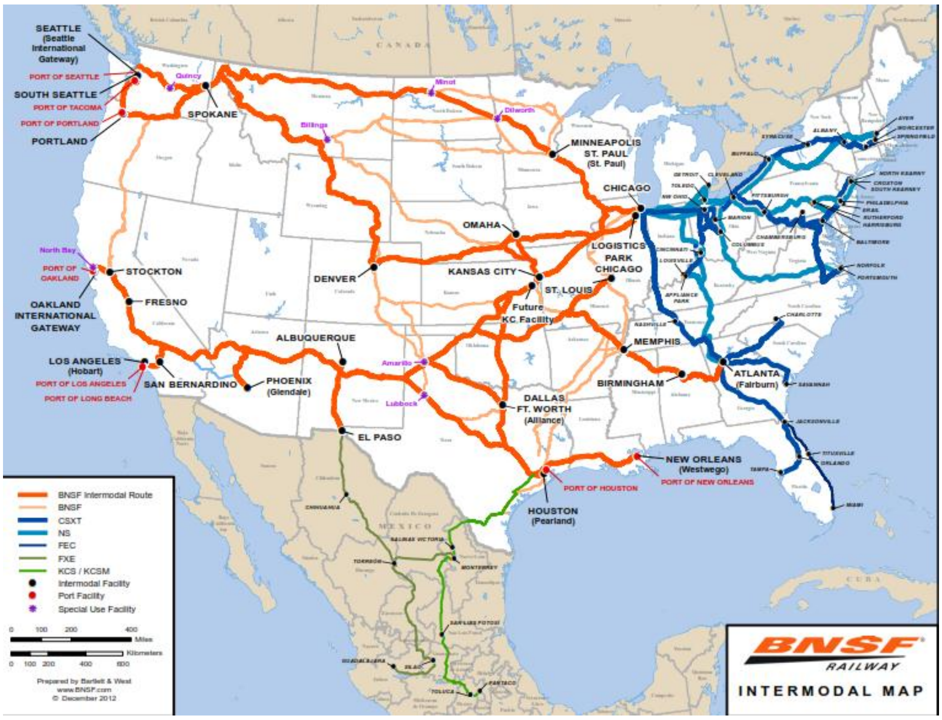
Port	Railroads
Vancouver	Canadian Pacific Railway, Canadian National
Prince Rupert	Canadian National
Tacoma	Burlington Northern Santa Fe (BNSF), Union Pacific Railroad (UPRR)
Seattle	BNSF, UPRR
Portland	BNSF, UPRR
Long Beach	BNSF, UPRR
Los Angeles	BNSF, UPRR
Oakland	BNSF, UPRR

Sources: Ports
Rail companies
Ocean Shipping Consultants

The rail companies serving each west-coast port are listed in Table 6.4 and their geographical coverage is illustrated in the accompanying maps.

Canadian National

Canadian Pacific



Burlington Northern Santa Fe

Union Pacific

6.3 Major Intermodal Facilities and Planned Investments

The development of the North American intermodal system and network has required very heavy investment in the various stages of the intermodal chain. In general, the capacity of the main lines linking the western ports with the eastern hinterland has not been significantly constrained and, where difficulties have occurred, the necessary investment to boost capacity has been forthcoming from the railroads.

The main constraints to the ability of the ports to maximise intermodal volumes have focused on:

- The availability of on-dock container handling capability;
- Links between port rail facilities and the major east-west rail lines.

Heavy investment has been directed at both sectors to boost capacity significantly in the forecast period.

The development of on-dock rail capacity at the major west-coast ports has followed an uncertain path since demand growth accelerated in the early 1990s. Initially, the big operators were highly reluctant to allow organised port labour to take a major role in intermodal container handling. This factor was responsible for the emphasis on 'near-dock' container yards, which became the principal means of linking marine terminals with the rail system. This applied at both Los Angeles and Long Beach, where the emphasis near-dock construction resulted in the Intermodal Container Transfer Facility (ICTF).

However, the costs associated with trucking containers from terminals to rail yards were obviously highly uncompetitive. Hence, there has been a switch in favour of on-dock rail facilities, and all new container terminals on the west coast either incorporate such a facility or provide on-dock access to an adjacent rail yard. The level of investment in these facilities has been very high and has provided capacity to handle current and anticipated intermodal volumes.

Of course, the quality of any transportation system is determined by its weakest link, and these investments placed greater pressure on the connections between the ports and the main transcontinental rail lines. The focus of investment thus shifted to providing dedicated "rail corridors" – the Alameda Corridor serving Los Angeles/Long Beach and the Fast Corridor serving Seattle/Tacoma. These programmes were central to the development of intermodal volumes to/from these locations.

Port Rail Facilities

A summary of the on-dock rail facilities available in each major terminal on the west coast is presented in Table 6.5, based on available information in June 2013.

At ***Vancouver***, all three container terminals offer on-dock rail facilities:

- At *Deltaport*, the rail yard has eight tracks of 1067m each.
- *Vanterm* has six 305m and three 366m rail tracks.
- *Centerm* has three rail tracks totalling 840m.

Similarly, the recently opened Fairview Terminal at the port of ***Prince Rupert***, was also built with an on-dock rail capability. The total length of available rail at the port is placed at around 6100m, with 7 working tracks and 6 storage tracks of 5182m train capacity.

The port of ***Tacoma*** has a significant role in the regional intermodal market, and has added a considerable length of rail track in recent years, but, along with Seattle, faced increasing landside congestion, due to constraints on port access. These are being addressed by the Fast Corridor project, which is similar to the Alameda Corridor project – albeit on a considerably smaller scale – and the problem has been less significant in recent years due to declining demand.

The two most recently built container terminals – Evergreen's Pierce County and Hyundai Marine's Washington United facilities – are the only ones with on-dock rail yards. The lack of such a capability at the other container terminals has been ameliorated by provision of on-dock rail access to the two near-dock intermodal yards, whilst APM Terminals has its own near-dock rail facility.

The *North Intermodal Yard* is located on the port's main peninsula. It has eight 980m railtracks, with capacity for 76 double-stack cars. Container handling is by means of straddle carriers. The *South Intermodal Yard* has 5.9km of track, with capacity for 67 double-stack cars. Handling is by means of top loaders.

At ***Seattle***, on-dock rail facilities are available at two of the port's four container terminals – APL's Terminal 5 and SSA's Terminal 18. SSA's Terminal 30 has the near-dock BNSF/UPRR intermodal facility located behind it, and Hanjin'sT46 facility is alongside Terminal 30.

The ***Fast*** (Freight Action Strategy for Seattle-Tacoma) ***Corridor*** comprises a collection of 24 projects aimed at improving the flow of rail (and road) traffic between Tacoma and Everett by means of grade separations, bridges and passing tracks. 19 projects have been carried out since 1998, leaving five to complete.

The investment will allow more trains to be handled, and at speeds of up to 50 miles/hour. It will also double the capacity for intermodal trains to around 36 per day. This should be more than adequate to eliminate current difficulties and accommodate anticipated demand growth over the forecast period.

The ***San Pedro Bay ports*** are the most significant West Coast gateways for intermodal shipments to the rest of North America.

At ***Los Angeles***, dedicated or shared on-dock rail yards exist on all container terminals except MOL's Transpacific Terminal. As part of an on-going investment programme, it too is set to have an on-dock rail capability by 2014. At ***Long Beach***, all terminals except that for the cabotage line, Matson, have on-dock rail yards, with railcar capacity ranging between 28 and 174.

In addition, railed containers are handled at the International Container Transfer Facility (ICTF) shared between Los Angeles and Long Beach. Operated by UPRR, this is located some five miles from the ports and was opened in 1986 as a multi-user facility for numerous shipping lines. Since its construction, the facility has expanded its role for transcontinental rail services, as well as the relay of containers to/from the ports and major rail yards in downtown Los Angeles. The 101h facility can accommodate a weekly total of around 70 double-stack container trains in each direction (westbound and eastbound). There are six loading lines, varying in length from 1158m to 1524m, with the capacity to handle 95 double-stack cars, and an adjacent storage yard for 100 more railcars. There is the possibility to double the capacity of this facility, but this will be dependent upon market demand.

Given the high investment in on-dock and near-dock intermodal terminals at Los Angeles and Long Beach, this aspect of intermodal capacity is not anticipated to be a constraint on the development of port demand.

Opened in 2002, the Alameda Corridor provides a 20-mile expressway between these intermodal terminals and the major Union Pacific and BNSF marshalling yards in downtown Los Angeles, which in turn link to the transcontinental rail network. Costing US$2.4bn, this dedicated route for port traffic allows the Burlington Northern Santa Fe and Union Pacific railroads to carry up to 12.7m containers/year (87 stack trains daily) on its double tracks (compared with 3.7m in 1999 on pre-existing tracks). As such, the capacity will be sufficient to meet anticipated demand growth. There is also scope for more intensive operation, if demand progresses beyond this level.

Despite a high intermodal throughput, the port of ***Oakland*** does not offer an on-dock capability at any of the marine container terminals. Instead, there are two adjacent near-dock intermodal terminals operated jointly by BNSF and UPRR respectively. The port's container business is largely focused on the immediate hinterland.

Figure 6.3 illustrates the sharp rise in intermodal yard capacity at west-coast ports since 2000.

Figure 6.3 - West Coast: Intermodal Rail Yard Capacity, 2000-13 (Doublestack railcars)

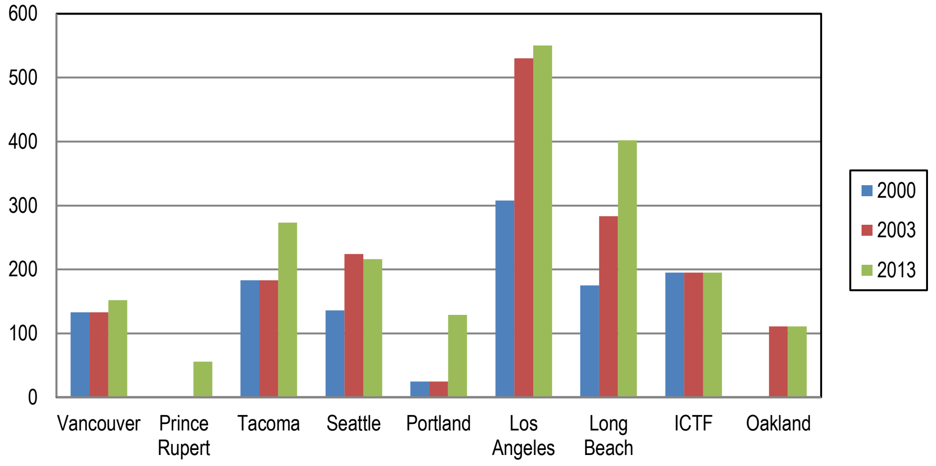


Table 6.5
North American West-Coast Ports: Intermodal Facilities, 2013

Port/Terminal	On-dock/near-dock rail provision	Yard Capacity (double-stack cars)
Vancouver		
Delta	on-dock	93
Vanterm	on-dock	32
Centerm	on-dock	27
Prince Rupert		
Fairview Container Terminal	on-dock	56
Tacoma		
Olympic Container Terminal: Yangming	On-dock access to near-dock facility	0
Husky Terminal: ITS (K Line)	On-dock access to near-dock facility	0
Washington United Terminal: HMM	on-dock	52
APM Terminal	near-dock	0
Pierce County Terminal: Evergreen	on-dock	78
North Intermodal Yard		76
South Intermodal Yard		67
Seattle		
Terminal 5: Global Gateway North (APL)	on-dock	108
Terminal 18: SSA	on-dock	108
Terminal 30: SSA/China Shipping	near-dock	0
Terminal 46: Total Terminals (Hanjin)	near-dock	0
BNSF/UPRR near-dock facility		***
Portland		
Terminal 2: SSA	on-dock	45
Terminal 6: ICTSI	on-dock	84
Los Angeles		
West Basin Container Terminal: China Shipping	shares Yangming/China Shipping on-dock facility	81
West Basin Container Terminal: Yangming	shares Yangming/China Shipping on-dock facility	see above
Transpacific Terminal (MOL)	No	0
Yusen Terminal (NYK)	shares on-dock Terminal Island Container Transfer Facility	119
Evergreen Terminal	shares on-dock Terminal Island Container Transfer Facility	see above
Pier 300: Global Gateway South: Eagle Marine (APL)	on-dock	128
Pier 400: APM Terminal	on-dock	222
California United Terminals: HMM	subleases APM Terminal	
Long Beach		
Pier A: SSA/MSC	on-dock	63
Pier C: SSA (Matson)	No	0
Pier F: Long Beach Container Terminal (OOCL)	on-dock	28
Pier G: International Transportation Service (K Line)	on-dock	54
Pier J: Pacific Container Terminal: SSA/Cosco	on-dock	83
Pier T: TTI (Hanjin)	on-dock	174
Oakland		
Joint intermodal terminal	Near-dock	111

Source: Ports and terminal operators
Ocean Shipping Consultants

Table 6.6 summarises the existing and forecast medium-term capacity of on-dock and near-dock intermodal facilities at west-coast ports. It is also clear that the relative importance of on-dock will continue to increase.

Table 6.6
North American West-Coast Ports: Intermodal Yard Capacity, 2013-2020
double-stack railcars

	2013				2020			
	On-dock	Near-dock	Total	%	On-dock	Near-dock	Total	%
Vancouver	152	0	152	7.3%	203	0	203	9.1%
Prince Rupert	56	0	56	2.7%	143	0	143	6.4%
Tacoma	130	143	273	13.1%	130	143	273	12.3%
Seattle	216	na	216	10.4%	216	na	216	9.7%
Portland	129	0	129	6.2%	129	0	129	5.8%
Oakland	0	111	111	5.3%	0	111	111	5.0%
Long Beach	402	0	402	19.3%	402	0	402	18.1%
Los Angeles	550	0	550	26.4%	550	0	550	24.8%
LA: ICTF	0	195	195	9.4%	0	195	195	8.8%
Total	**1635**	**449**	**2084**	**100.0%**	**1773**	**449**	**2222**	**100.0%**

Source: Ocean Shipping Consultants

The scale of demand growth during the late 1990s caused significant constraints to build up in the operation of intermodal links in both the Pacific South and Pacific North markets. However, organisational efficiencies, the completion of the Alameda Corridor, progress on the Fast Corridor and a slower pace of demand growth over the past decade have changed the situation. In Vancouver, investments in intermodal yards and rail capacity are closely linked to the development of marine terminals, and there are no real constraints in despatching containers.

The physical capacities of the major east-west rail lines do not represent any long-term constraint to the volume of intermodal containers to be handled. Each major operator has a rolling investment programme, and investment will continue to be made available as required. For major rail operators, intermodal traffic is one sector of the total rail business, and will benefit from broader development programmes.

Inland Rail Facilities

The final part of the intermodal chain is the provision of inland intermodal terminal capacity. This sector has experienced periodic congestion. However, significant shares of limited capital budgets were targeted at this sector, underlining a continued commitment to the handling of international container volumes.

With double-stack capacity firmly established on corridors to/from west-coast ports, the focus has shifted somewhat to improving intermodal capabilities for east-coast ports. With demand also growing less rapidly, the pace of investment in the intermodal transport chain serving west-coast ports has eased off.

The recent major investments of note:

Union Pacific has formally opened its new US$370m Joliet International Terminal (JIT) close to west Chicago and Interstates 55 and 58. The terminal significantly increases UP’s capacity and flexibility for international intermodal services. JIT has a capacity of 0.5m containers (and/or trailers) per annum. Phase I with an area of some 220 ha was commissioned in 2010 and there is scope for a further expansion of around 95 ha. By capacity, JIT is the second largest of UP’s intermodal facilities, being somewhat smaller than the ICTF yard at Long Beach.

On Columbus' west side, CSC Corp.'s intermodal cargo facility (Buckeye Yard) doubled its capacity. The project, as part of the National Gateway initiative, was completed in early 2013, increasing the yard's annual capacity from 0.18m to 0.36m containers (or trailers). The project added 24 acre of land (totalling 36 acre now) and a second access track, redesigned the yard by introducing RMG systems, and expanded the track from 9,000 feet to 15,000 feet as well as the gate.

A new terminal under construction at Union Pacific is the new Santa Teresa in New Mexico. This new intermodal terminal will be integrated along the Sunset Route (whereas a second main track is being built) and is scheduled to open in early 2014 with an annual capacity of 0.25m containers (and/or trailers).

Aside from these major capacity additions, only limited additional investment is planned for the inland sector. Sufficient capacity is seen to exist to handle current and medium term demand but, if required, further capacity can be added with minimum difficulty.

6.4 Conclusions

The West Coast intermodal market is well served by rail facilities at the terminals and by inland facilities located on the major Midwest markets. The capacity of the rail links between US ports and the Midwest is also sufficient to meet anticipated demand growth with no difficulties. The same can be said of rail links between Vancouver (and Prince Rupert) and the eastern markets. At present, there are no capacity constraints for the railroads and yard capacity can be added in line with demand and terminal expansion.

For Vancouver, the only possible difficulty occurs if proposed oil exports from Alberta were to compete for rail space with coal and container trains. Clearly, the correct mode for these exports will be by pipeline. This is the only potential capacity constraint for increased container volumes via Vancouver.

SECTION 7 – SWOT ANALYSIS FOR VANCOUVER CONTAINER PORT

7.1 Introduction

This Updated Study has updated a series of detailed analyses first developed in the June 2012 Report that focused on the competitive position of Vancouver as a container port for the various hinterlands of the port. It has been clearly established once again that considerable potential exists for the further development of the port as a major regional load-centre and transit point for the broader North American markets. The port will continue to enjoy a highly diversified cargo base. As such, this represents a continuation of the expanding role of the port that has been noted in recent years. In order to handle this demand it will be necessary to significantly increase handling capacity.

This Section provides an essentially subjective review of the relative competitive position of the port versus other locations in the PNW for both existing and developing sectors of the market, taking into account the relevant 2013 updates. The competitive position versus Prince Rupert, in particular, as well as both Tacoma and Seattle is considered. In addition, a summary is presented of the strengths and weaknesses of the port in each of the major identified market sectors, namely:

- Vancouver and British Columbia;
- The broader Pacific Northwest;
- The Prairie provinces;
- Eastern Canada and the US Midwest.

In each case, the general competitive position of Vancouver is seen to be positive once again.

7.2 The Competitive Position of Vancouver

This study has identified a series of criteria that will determine the existing and forecast competitive position of Vancouver in the developing markets. These criteria may be summarised as follows:

- The physical capability of the terminals;
- The planned development of capacity;
- The productivity of the terminals;
- The costs of transiting the terminals;
- Delivered costs to eastern Canada and the Midwest;
- Intermodal capacity;
- Import/export balances;
- Suitability as a regional hub location;
- Existing customer base;

The accompanying analysis (summarised in Table 7.1) presents an essentially subjective evaluation of the competitive position of Vancouver versus its immediate competitors in the PNW markets – Seattle and Vancouver. Of course, not all of these factors are of equal weight and they will, in any case, vary from customer to customer. Nevertheless, this is exactly the type of evaluation that is undertaken by shipping lines (and the largest shippers) when evaluating port choice and terminal investment. OSC have confidence in the veracity of this approach.

The following points must be stressed in this analysis:

Table 7.1
The Relative Competitive Position of Vancouver Versus Competing Terminals

	Vancouver	Prince Rupert	Seattle	Tacoma
Physical Capability of Terminals	*****	*****	****	****
Planned Capacity Development	*****	*****	**	**
Productivity of Terminals	****	*****	***	***
Cost of Transiting Terminals	*****	*****	****	****
Delivered costs to Midwest	****	*****	***	***
Intermodal Capacity	*****	*****	***	****
Import/Export Balance	*****	***	****	****
Local Demand	*****	**	*****	******
Location as a Regional Hub	*****	*	*****	*****
Existing Customer Base	*****	***	*****	*****
Total	**48**	**39**	**38**	**39**
- percentage	**96.0%**	**78.0%**	**76.0%**	**78.0%**

Source: Ocean Shipping Consultants

Physical Capability

The Vancouver facilities offer considerable advantages with regard to ship size accessibility and available capacity – particularly at Deltaport. The facilities at Prince Rupert (although offering a much lower capacity) are seen to be equally well suited to current and future demand. The position in both Seattle and Tacoma is less competitive, with generally less deepwater capacity and a more fractured terminal structure. There is very little planned investment at these locations. Vancouver enjoys an existing advantage and (providing planned developments are expedited) this competitive position should be maintained.

Planned Capacity Development
Vancouver has a comprehensive plan to increase container handling capacity. This will allow it to expand its market share and further extend its hinterland. Expansion is also planned at Prince Rupert. The US PNW ports do not have significant expansion plans.

Terminal Productivity
In terms of land use and crane utilisation rates, productivity at Vancouver is significantly higher than is noted on average in the competing US terminals. Productivity levels at Prince Rupert are comparable with Vancouver. Both Seattle and Tacoma are under pressure to increase utilisation rates and it will be essential for Vancouver to continue its process of productivity improvement if this relative advantage is to be maintained.

Cost Levels
Vancouver and Prince Rupert both enjoy a significant advantage with regard to stevedoring costs in contrast to both Seattle and Tacoma. This has been partially attributable to favourable exchange rates, but underlying cost structures are also generally lower.

Delivered Costs to Midwest and Eastern Canada
The PNW in general enjoys a highly competitive cost structure on these hauls in contrast to Californian and east coast ports. Vancouver and Prince Rupert have a lower cost structure than do either Seattle or Tacoma and are thus the most competitive alternative. The addition of Toronto as the final destination region further outlines the strong position retained by Vancouver previously identified in the 2012 report for serving the Chicago region.

Intermodal Capacity
Both Tacoma and Seattle have been hampered by a lack of available on-dock rail capacity and – more importantly – by congestion linking the ports with the transcontinental mainlines. These difficulties have declined in recent years as investment has been stepped-up. Vancouver does not suffer from such restrictions and has available capacity. In contrast to Prince Rupert, Vancouver is served by two transcontinental lines – thus offering improved flexibility and security.

Import/Export Balances
In contrast to the Californian ports, the balance between imports and exports in the PNW is considerably more positive – with this generally easing the problems associated with repositioning empty containers. Vancouver does, however, enjoy a relative advantage in contrast to both Seattle and Tacoma with a much more balanced profile within the PNW context. There are major existing and expanding containerised export opportunities for Vancouver and this will be a more important driver than will be the case for competing ports.

Local Demand
Each of the major ports in the region has a very strong local market – with the exception of Prince Rupert which is isolated from local demand. The combined local demand of Seattle and Tacoma is greater than that for Vancouver, but the overall structure of demand and deeper hinterland reach of Vancouver offset this relative deficiency.

Suitability as a Regional Hub
As pressures to reduce port calls intensify as larger vessels are deployed, Vancouver will be well placed to play a dominant PNW role. The difficulties associated with cross-border movements into the US will be offset by the other advantages of the port. It is likely that Vancouver and either Tacoma *or* Seattle will be called at by most major lines.

Existing Customer Base
In contrast to Seattle, the diversity of the existing customer base (that is the number of major lines calling at the port) is somewhat more limited at Vancouver, but the difference has narrowed in recent years. In relation to Tacoma there is little relative difference, however. As the competitive position of the port is consolidated, it is anticipated that this relative disadvantage will decline.

It should be apparent from these considerations that Vancouver occupies a highly competitive position. Of course, the relative importance of each of these considerations is not equal and it is not possible to provide a definitive quantification of such issues.

However, by ranking the position of Vancouver for each criteria, and comparing these scores with the other ports, a general view of the competitive position can be defined. It is apparent that the overall competitive position of the port is highly positive in relation to its immediate competitors.

7.3 Vancouver SWOT Analysis

These considerations are further detailed in Table 7.2 which summarises the relative strengths and weaknesses of Vancouver in the competitive market place for each of the identified market sector. In addition, the analysis seeks to summarise the opportunities for further development and to detail the potential threats to development.

Table 7.2
Summary SWOT Analysis for Vancouver Container Terminals by Market Sector

Market Sector	Strengths	Weaknesses	Opportunities	Threats
Local Demand - Vancouver & British Columbia	Central location No cross border costs Competitive handling rate Capacity available and planned More lines offering first/last call Strong export demand Relatively high productivity	US ports may offer first/last calls Exchange rate volatility v US ports	Scope for local market to grow above trend	Failure to deliver required port capacity Adverse currency moves could lower relative advantage Could lose share to (cheaper) Prince Rupert
The Broader Pacific Northwest	Competitive handling rates v US ports Competitive productivity Stonger local market for exports Available intermodal capacity Deeper water than US ports More lines offering first/last call Capacity available and planned Relatively high productivity	US ports may offer first/last calls Exchange rate volatility v US ports Vancouver local market is smaller than Seattle/Tacoma	PNW market to expand at continental rate - could increase share Lower costs and port consolidation could favour Vancouver	Failure to deliver required port capacity Could lose share to (cheaper) Prince Rupert Could lose share to (deeper) Prince Rupert
Prairies	Ideal location No cross border costs Effective intermodal links Competitive handling rate Capacity available and planned Lowest intermodal costs Strong local demand	Costs slightly higher than Prince Rupert	Local economy to expand faster than total Canada	Failure to deliver required port capacity Could lose share to (cheaper) Prince Rupert Could lose share to (deeper) Prince Rupert All-water services could lift market share

The Eastern Canadian and US Intermodal Markets	Competitive handling costs Deeper water than US ports Effective intermodal links Capacity available and planned Lowest intermodal costs Relatively high productivity Through-costs are low	Costs slightly higher than Prince Rupert Lack of westbound cargo PNW volumes smaller than PSW may favour Californian ports Exposure to C$ rate for US cargoes US ports may offer first/last calls	Can increase market share in both US and Canadian markets Concentration of port calls in PNW will favour Vancouver	Failure to deliver required port capacity Could lose share to (cheaper) Prince Rupert Could lose share to (deeper) Prince Rupert All-water services could lift market share Potential border costs for US cargoes

Source: Ocean Shipping Consultants

SECTION 8 – FORECAST CONTAINER HANDLING VOLUMES AT VANCOUVER

8.1 Introduction

On the basis of the analyses developed in this June 2013 Updated Study, the following summarises the overall anticipated development of Vancouver container port demand. The approach taken is as follows:

- A base load demand is established that is driven by the overall development of the North American market, the role of the PNW and Pacific Gateway in these markets and then Vancouver's share of this demand. This summarises underlying demand forecasts for the period.
- In addition to this base load demand growth, it is anticipated that the market share of Vancouver in the eastern markets will increase, given the relative intermodal costs that have been identified in this study. This results in the addition of a premium to underlying demand at Vancouver. The actual quantification of this adjustment is problematic, but it is reasonable to assume that the volumes of containers shipped to Central and Eastern Canada could be around 20 per cent higher than in the underlying demand case by 2020.

  This would essentially be a one-off development, with this higher market share maintained over the balance of the study period.

The development of this updated demand is summarised in Table 8.1 and in Figure 8.1. The balance of imports and exports under the Base Case is detailed in Figure 8.2.

The development of import demand (after this adjustment has been made) is then defined in terms of the following categories:

- Volumes by destination within North America – identifying changes in the proportional significance of different markets on the basis of underlying transport costs and the competitive position.
- The commodities within this import demand profile are also considered, with the basic distribution between commodity groupings held constant over the forecast period.
- The origin of these imports is also considered, with the role of Asian demand within the overall import profile seen to be held at high levels over the period. In absolute terms, volumes will differ in line with the longer term scenario adopted.

For exports a parallel analysis has been developed, with this focusing on:

- Exports by origin within North America – underlining the continuing importance of local (BC) originated cargoes.
- The commodity splits for these exports – with overall demand driven by the main growth sectors that have been responsible for recent developments.
- The destination of these exports, with demand driven by economic growth in the East Asian markets (especially China) and, particularly, raw material and food imports into these markets.

Clearly there is a discontinuity in the forecasts developed to 2025 with the longer term projections. For the period between 2025 and 2050 a scenario-based approach has been adopted and this can only really offer a snapshot of potential demand in each of the periods under review. The range of possible developments clearly broadens significantly in the second half of the forecast period.

Figure 8.1 - Forecast Potential Vancouver Volumes to 2050 ('000TEUs)

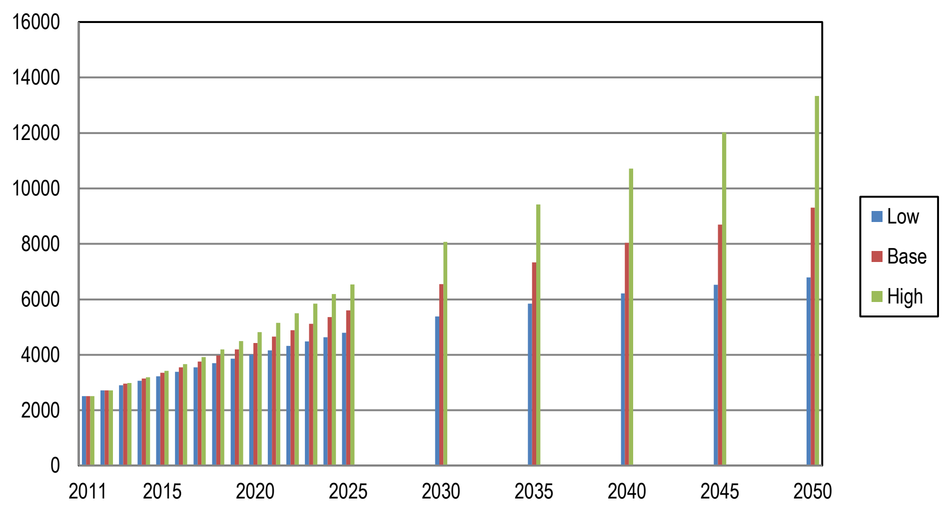


Figure 8.2 - Potential Vancouver Base Case Imports & Exports to 2050 - '000TEUs

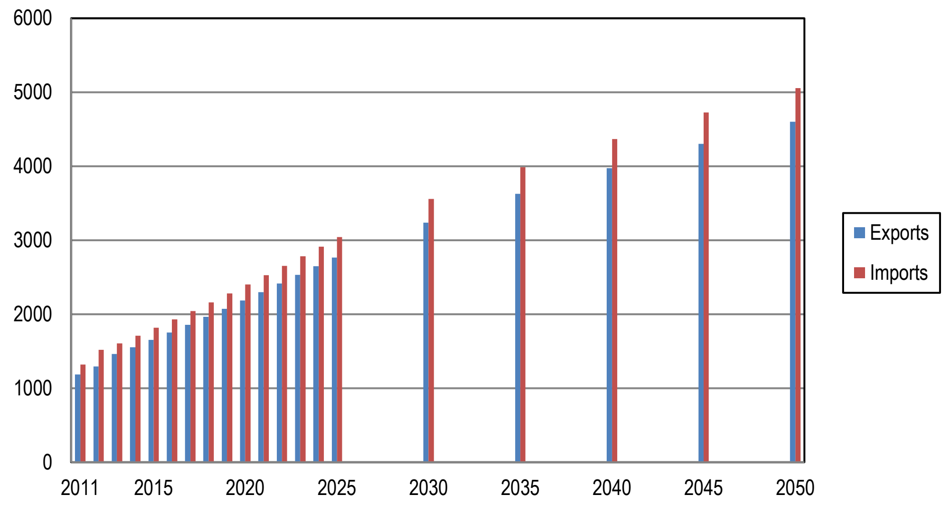


Table 8.1

Forecast Potential Total Vancouver Volumes to 2050

- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Underlying Demand																				
High	2507.0	2713.2	2978.4	3179.7	3394.6	3621.1	3863.9	4124.3	4403.7	4703.6	5010.4	5322.6	5638.9	5957.6	6277.2	7740.7	9043.1	10277.6	11536.6	12796.5
Base	2507.0	2713.2	2956.9	3135.4	3324.8	3513.3	3706.9	3905.4	4108.3	4315.2	4524.4	4735.2	4946.8	5158.5	5369.4	6279.5	7041.1	7713.6	8346.1	8925.4
Low	2507.0	2713.2	2898.0	3046.5	3202.6	3347.9	3492.1	3634.4	3774.2	3910.7	4048.1	4186.1	4324.5	4463.1	4601.5	5160.9	5601.3	5959.7	6264.6	6514.1
Intermodal Addition																				
High	0.0	0.0	0.0	11.6	24.7	39.4	55.9	74.3	94.9	117.9	143.1	170.5	200.0	231.7	265.5	327.3	382.4	434.6	487.9	541.2
Base	0.0	0.0	0.0	11.5	24.2	38.2	53.6	70.4	88.6	108.2	129.2	151.6	175.5	200.6	227.1	265.6	297.8	326.2	353.0	377.4
Low	0.0	0.0	0.0	11.2	23.5	36.8	51.0	66.1	82.0	98.8	116.5	135.0	154.4	174.7	195.9	219.5	238.1	253.3	266.2	276.7
Total																				
High	2507.0	2713.2	2978.4	3191.3	3419.3	3660.5	3919.8	4198.7	4498.7	4821.6	5153.4	5493.0	5838.9	6189.3	6542.6	8068.0	9425.5	10712.2	12024.4	13337.6
Base	**2507.0**	**2713.2**	**2956.9**	**3146.9**	**3349.0**	**3551.5**	**3760.6**	**3975.8**	**4196.9**	**4423.4**	**4653.6**	**4886.8**	**5122.2**	**5359.1**	**5596.5**	**6545.1**	**7338.8**	**8039.9**	**8699.0**	**9302.8**
Low	2507.0	2713.2	2898.0	3057.8	3226.2	3384.7	3543.1	3700.5	3856.2	4009.5	4164.5	4321.1	4479.0	4637.8	4797.4	5380.4	5839.4	6213.0	6530.8	6790.8

Source: Ocean Shipping Consultants

Table 8.2

Forecast Potential Vancouver Base Case Import Volumes to 2050 by Destination

- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
British Columbia	393.1	395.4	418.0	444.9	473.5	502.1	531.6	562.1	593.3	625.3	657.9	690.9	724.1	757.6	791.2	925.3	1037.5	1136.6	1229.8	1315.2
Alberta & Prairies	152.8	161.1	170.3	181.2	192.9	204.6	216.6	229.0	241.7	254.8	268.0	281.5	295.0	308.7	322.3	377.0	422.7	463.1	501.0	535.8
C&E Canada	575.4	615.0	650.2	692.0	736.5	781.0	827.0	874.3	922.9	972.7	1023.4	1074.7	1126.4	1178.5	1230.7	1439.3	1613.9	1768.0	1913.0	2045.8
NW Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
US	166.0	292.9	309.6	329.5	350.7	371.9	393.8	416.3	439.5	463.2	487.3	511.7	536.4	561.2	586.1	685.4	768.5	841.9	910.9	974.2
Total	**1320.6**	**1464.5**	**1548.3**	**1647.8**	**1753.6**	**1859.7**	**1969.1**	**2081.8**	**2197.6**	**2316.2**	**2436.7**	**2558.8**	**2682.1**	**2806.1**	**2930.5**	**3427.1**	**3842.8**	**4209.8**	**4555.0**	**4871.2**

Source: Ocean Shipping Consultants

Table 8.3

Forecast Potential Vancouver Base Case Import Volumes to 2050 by Commodity

- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Household Goods	398.0	458.3	480.6	511.5	544.4	577.3	611.3	646.3	682.2	719.0	756.5	794.4	832.6	871.1	909.7	1063.9	1192.9	1306.9	1414.1	1512.2
Construction & Materials	160.5	188.6	197.8	210.5	224.0	237.6	251.5	265.9	280.7	295.9	311.3	326.9	342.6	358.5	374.4	437.8	490.9	537.8	581.9	622.3
Industrial, Auto and Vehicle	128.7	147.4	154.6	164.5	175.1	185.7	196.6	207.9	219.4	231.3	243.3	255.5	267.8	280.2	292.6	342.2	383.7	420.4	454.8	486.4
Machinery	83.0	95.8	100.5	107.0	113.9	120.7	127.9	135.2	142.7	150.4	158.2	166.1	174.1	182.2	190.3	222.5	249.5	273.3	295.7	316.3
Basic Metals	41.5	47.5	49.8	53.1	56.5	59.9	63.4	67.0	70.8	74.6	78.5	82.4	86.4	90.3	94.3	110.3	123.7	135.5	146.6	156.8
Other Goods	403.0	442.4	464.0	493.8	525.6	557.3	590.2	623.9	658.6	694.2	730.3	766.9	803.8	841.0	878.3	1027.1	1151.7	1261.7	1365.1	1459.9
Empties	72.5	84.4	100.8	107.3	114.2	121.1	128.3	135.6	143.1	150.9	158.7	166.7	174.7	182.8	190.9	223.2	250.3	274.2	296.7	317.3
Total	**1320.6**	**1464.5**	**1548.3**	**1647.8**	**1753.6**	**1859.7**	**1969.1**	**2081.8**	**2197.6**	**2316.2**	**2436.7**	**2558.8**	**2682.1**	**2806.1**	**2930.5**	**3427.1**	**3842.8**	**4209.8**	**4555.0**	**4871.2**

Source: Ocean Shipping Consultants

Table 8.4

Forecast Potential Vancouver Base Case Import Volumes to 2050 by Origin

- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
China	785.3	870.8	920.7	979.8	1042.7	1105.8	1170.9	1237.9	1306.7	1377.3	1449.0	1521.6	1594.9	1668.6	1742.5	2037.9	2285.0	2503.3	2708.5	2896.5
Hong Kong	72.4	80.3	84.9	90.4	96.2	102.0	108.0	114.2	120.5	127.0	133.7	140.4	147.1	153.9	160.7	188.0	210.8	230.9	249.8	267.2
South Korea	130.6	144.8	153.1	162.9	173.4	183.8	194.7	205.8	217.2	229.0	240.9	253.0	265.1	277.4	289.7	338.8	379.9	416.2	450.3	481.5
Taiwan	60.6	67.2	71.1	75.7	80.5	85.4	90.4	95.6	100.9	106.4	111.9	117.5	123.2	128.9	134.6	157.4	176.5	193.3	209.2	223.7
Thailand	52.9	58.6	62.0	65.9	70.2	74.4	78.8	83.3	87.9	92.7	97.5	102.4	107.3	112.3	117.3	137.2	153.8	168.5	182.3	194.9
Others	218.9	242.7	256.6	273.1	290.6	308.2	326.3	345.0	364.2	383.8	403.8	424.1	444.5	465.0	485.6	568.0	636.8	697.7	754.9	807.3
Total	**1320.6**	**1464.5**	**1548.3**	**1647.8**	**1753.6**	**1859.7**	**1969.1**	**2081.8**	**2197.6**	**2316.2**	**2436.7**	**2558.8**	**2682.1**	**2806.1**	**2930.5**	**3427.1**	**3842.8**	**4209.8**	**4555.0**	**4871.2**

Source: Ocean Shipping Consultants

Table 8.5

Forecast Potential Vancouver Base Case Exports to 2050 by Origin

- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
British Columbia	906.4	953.9	1076.1	1145.2	1218.8	1292.5	1368.6	1446.9	1527.4	1609.8	1693.6	1778.5	1864.1	1950.3	2036.7	2381.9	2670.8	2925.9	3165.8	3385.6
Alberta & Prairies	84.0	88.4	99.7	106.1	112.9	119.8	126.8	134.1	141.5	149.2	156.9	164.8	172.7	180.7	188.7	220.7	247.5	271.1	293.4	313.7
C&E Canada	135.8	142.9	161.2	171.6	182.6	193.6	205.0	216.8	228.8	241.2	253.7	266.4	279.3	292.2	305.1	356.8	400.1	438.3	474.3	507.2
NW Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Canada	1.7	1.8	2.0	2.1	2.2	2.4	2.5	2.7	2.8	3.0	3.1	3.3	3.4	3.6	3.7	4.4	4.9	5.4	5.8	6.2
US	58.1	61.2	69.0	73.4	78.1	82.9	87.7	92.8	97.9	103.2	108.6	114.0	119.5	125.0	130.6	152.7	171.2	187.6	203.0	217.0
Total	**1186.4**	**1248.7**	**1408.6**	**1499.1**	**1595.4**	**1691.9**	**1791.5**	**1894.0**	**1999.3**	**2107.2**	**2216.9**	**2328.0**	**2440.1**	**2553.0**	**2666.1**	**3117.9**	**3496.1**	**3830.0**	**4144.0**	**4431.7**

Source: Ocean Shipping Consultants

Table 8.6
Forecast Potential Vancouver Base Case Export Volumes to 2050 by Commodity
- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Lumber	315.9	323.7	325.7	340.0	355.7	370.6	386.2	402.4	419.3	436.9	452.6	468.9	485.8	503.3	521.4	616.9	719.3	829.0	946.2	1069.5
Woodpulp	183.7	189.8	189.4	197.7	206.8	215.5	224.5	234.0	243.8	254.0	263.2	272.6	282.5	292.6	303.2	358.7	418.2	482.0	550.2	621.9
Speciality Crops	132.2	129.2	136.3	142.3	148.9	155.1	161.6	168.4	175.5	182.8	189.4	196.3	203.3	210.6	218.2	258.2	301.0	347.0	396.0	447.6
Meat, Fish & Poultry	48.6	47.3	50.1	52.3	54.7	57.0	59.4	61.9	64.5	67.2	69.6	72.1	74.7	77.4	80.2	94.9	110.6	127.5	145.5	164.5
Basic Metals	45.3	43.5	46.7	48.7	51.0	53.1	55.4	57.7	60.1	62.6	64.9	67.2	69.6	72.1	74.7	88.4	103.1	118.8	135.6	153.3
Other Goods	256.4	237.7	264.4	276.0	288.7	300.9	313.5	326.7	340.4	354.7	367.4	380.7	394.4	408.6	423.3	500.8	583.9	673.0	768.2	868.3
Empties	882.2	277.5	396.0	442.2	489.7	539.7	590.9	643.0	695.8	749.0	809.7	870.2	929.8	988.3	1045.1	1200.1	1259.8	1252.7	1202.3	1106.6
Total	**1186.4**	**1248.7**	**1408.6**	**1499.1**	**1595.4**	**1691.9**	**1791.5**	**1894.0**	**1999.3**	**2107.2**	**2216.9**	**2328.0**	**2440.1**	**2553.0**	**2666.1**	**3117.9**	**3496.1**	**3830.0**	**4144.0**	**4431.7**

Source: Ocean Shipping Consultants

Table 8.7

Forecast Potential Vancouver Base Case Export Volumes to 2050 by Destination

- '000TEUs

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
China	496.4	598.0	674.6	718.0	764.1	810.3	858.0	907.1	957.5	1009.2	1061.7	1114.9	1168.6	1222.7	1276.8	1493.2	1674.3	1834.3	1984.7	2122.4
Hong Kong	216.3	219.2	247.3	263.1	280.0	297.0	314.5	332.5	350.9	369.9	389.1	408.6	428.3	448.1	468.0	547.3	613.7	672.3	727.4	777.9
South Korea	70.5	70.4	79.4	84.5	89.9	95.3	100.9	106.7	112.7	118.7	124.9	131.2	137.5	143.8	150.2	175.7	197.0	215.8	233.5	249.7
Taiwan	51.9	54.8	61.9	65.8	70.1	74.3	78.7	83.2	87.8	92.6	97.4	102.2	107.2	112.1	117.1	136.9	153.6	168.2	182.0	194.6
Thailand	37.9	37.6	42.4	45.1	48.0	50.9	53.9	57.0	60.1	63.4	66.7	70.0	73.4	76.8	80.2	93.8	105.1	115.2	124.6	133.3
Others	254.4	268.7	303.1	322.6	343.3	364.1	385.5	407.6	430.3	453.5	477.1	501.0	525.1	549.4	573.7	671.0	752.4	824.2	891.8	953.7
Total	**1186.4**	**1248.7**	**1408.6**	**1499.1**	**1595.4**	**1691.9**	**1791.5**	**1894.0**	**1999.3**	**2107.2**	**2216.9**	**2328.0**	**2440.1**	**2553.0**	**2666.1**	**3117.9**	**3496.1**	**3830.0**	**4144.0**	**4431.7**

Source: Ocean Shipping Consultants

8.2 Comparison of Vancouver Container Forecasts – June 2012 Study vs. June 2013 Update Report

A comparison of the Base Case forecasts completed in June 2012 and the current modeling exercise has been conducted.

As shown in Table 8.8, additional containers are now anticipated for Vancouver in the revised June 2013 projections. Under the Base Case scenario the extra volumes amount to 142,800 TEUs in 2020, rising to almost 196,000 TEUs by 2025 and continuing thereafter throughout the longer-term forecast process until reaching 325,100 TEUs in 2050.

By way of comparison, the revised forecasts for Low Case and High Case scenarios will see an additional 138,000 – 155,700 TEUs in 2020, rising to 183,600 – 228,700 TEUs by 2025, before reaching 271, 800 TEUs in 2050 for Low Case growth and 466,200 TEUs for High Case growth at the end of the forecast period.

The adjustments are relatively small when compared to the overall total number of containers that Vancouver can expect to handle at its container terminals.

Indeed the extra containers still represent further demand for more capacity at the port that will need to be catered for moving forward beyond what was noted in the June 2012 forecasts, based on revised GDP data and known volumes for 2012.

Table 8.8

Vancouver Forecast Comparisons - June 2012 vs May 2013

	Base Case			Low Case			High Case		
	Jun-12	May-13	Difference	Jun-12	May-13	Difference	Jun-12	May-13	Difference
2011	2507.0	2507.0	0.0	2507.0	2507.0	0.0	2507.0	2507.0	0.0
2012	2697.5	2713.2	15.7	2697.5	2713.2	15.7	2697.5	2713.2	15.7
2013	2856.3	2956.9	100.6	2800.5	2898.0	97.5	2877.2	2978.4	101.2
2014	3014.2	3146.9	132.7	2928.1	3057.8	129.7	3057.0	3191.3	134.3
2015	3180.7	3349.0	168.3	3061.5	3226.2	164.7	3248.0	3419.4	171.4
2016	3372.5	3551.6	179.1	3210.0	3384.7	174.7	3476.5	3660.5	184.0
2017	3570.4	3760.6	190.2	3358.3	3543.1	184.7	3722.1	3919.8	197.7
2018	3774.1	3975.8	201.7	3505.8	3700.5	194.7	3986.3	4198.7	212.4
2019	3983.3	4196.9	213.5	3651.5	3856.2	204.7	4270.4	4498.7	228.2
2020	4197.7	4423.4	225.7	3794.9	4009.5	214.6	4576.2	4821.6	245.3
2021	4415.5	4653.7	238.2	3940.0	4164.5	224.6	4890.5	5153.5	263.0
2022	4636.1	4886.8	250.8	4086.5	4321.1	234.7	5211.9	5493.0	281.1
2023	4858.7	5122.3	263.6	4234.1	4479.0	244.9	5539.2	5838.9	299.6
2024	5082.6	5359.1	276.6	4382.6	4637.8	255.3	5870.8	6189.3	318.5
2025	5307.0	5596.5	289.6	4531.7	4797.4	265.7	6205.1	6542.7	337.6
2030	6206.5	6545.1	338.7	5079.1	5380.5	301.4	7651.8	8068.1	416.3
2035	6959.1	7338.9	379.7	5509.9	5839.4	329.5	8939.2	9425.5	486.4
2040	7623.9	8039.9	416.0	5860.7	6213.0	352.4	10159.5	10712.3	552.8
2045	8249.0	8699.1	450.1	6159.0	6530.8	371.8	11404.0	12024.5	620.5
2050	8821.5	9302.9	481.4	6403.1	6790.9	387.8	12649.5	13337.7	688.2

Source: Ocean Shipping Consultants

8.3 Vancouver Supply/Demand Development to 2025

The final analysis of this Section considers the development of the supply/demand balance at Vancouver's container facilities on the basis of demand volumes here defined and the core assessment of capacity development at the port as detailed in Section 3. Vancouver's future capacity assessment is based on information obtained from page 4 of the Roberts Bank Terminal 2 Project Discussion Guide.

It is apparent that container terminal utilisation rates will steadily increase over the forecast period, although there is already a pressing need for additional capacity to be developed at Vancouver.

It should be noted that an effective utilisation rate of around 80 per cent of the maximum or 'design' of terminal capacity usually indicates less than optimal terminal use and the first signs of congestion either with regard to vessel arrival or for hinterland linkages. Based on confirmed throughout for 2012 and short-term projections for 2013 onwards, it is clear that Vancouver is already surpassing this utilization figure.

It can be concluded that there is already a pressing need for investment at Vancouver if potential demand is not to be missed.

These developments are further summarised in Figure 8.3 and in Table 8.9.

Figure 8.3 - Vancouver Capacity & Demand Development to 2025 - '000TEUs

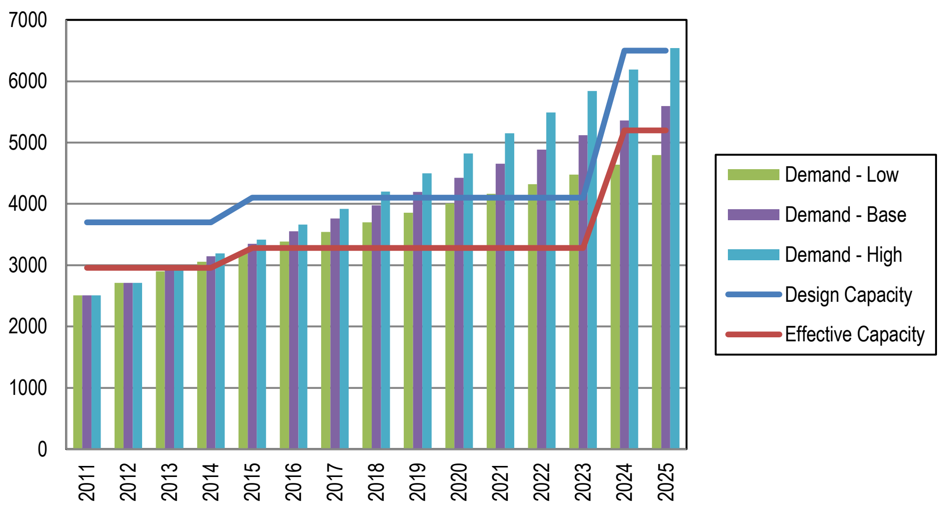


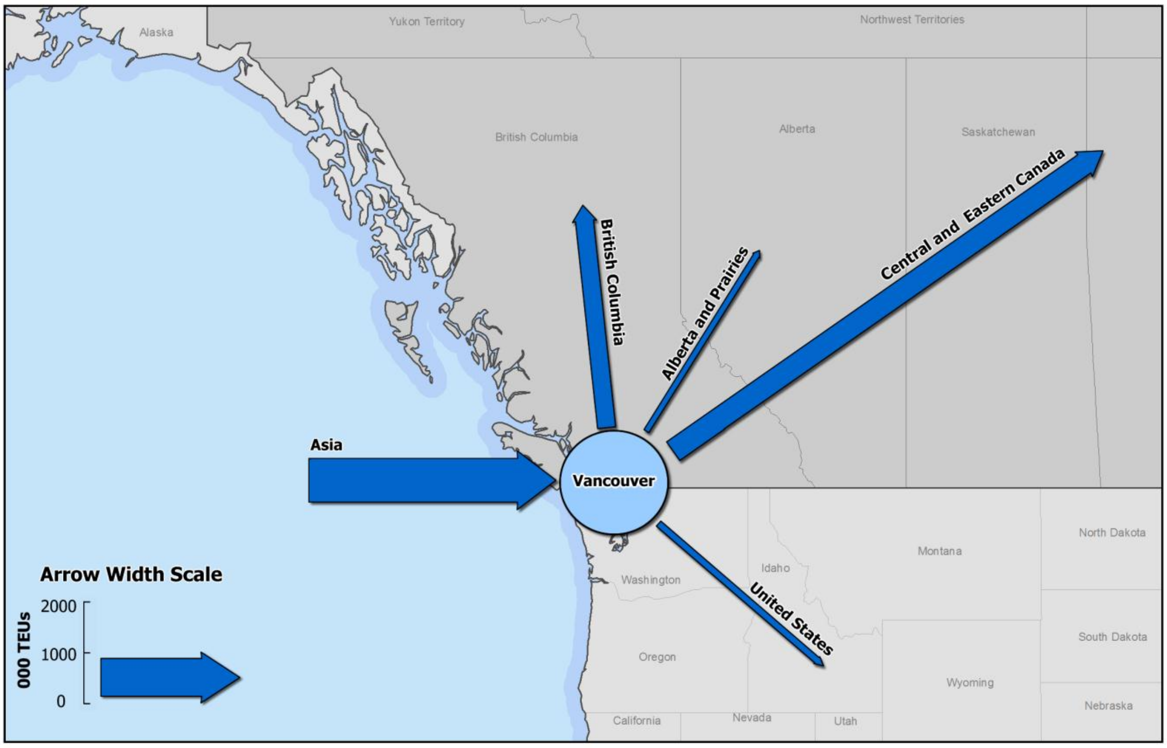
Table 8.9
Vancouver Container Supply/Demand Balance to 2025

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capacity - '000TEUs															
Maximum	3700	3700	3700	3700	4100	4100	4100	4100	4100	4100	4100	4100	4100	6500	6500
Effective	2960	2960	2960	2960	3280	3280	3280	3280	3280	3280	3280	3280	3280	5200	5200
Demand - '000TEUs															
High	2507	2713	2978	3191	3419	3660	3920	4199	4499	4822	5153	5493	5839	6189	6543
Base	2507	2713	2957	3147	3349	3552	3761	3976	4197	4423	4654	4887	5122	5359	5597
Low	2507	2713	2898	3058	3226	3385	3543	3700	3856	4010	4165	4321	4479	4638	4797
Utilisation - %															
High	84.7%	91.7%	100.6%	107.8%	104.2%	111.6%	119.5%	128.0%	137.2%	147.0%	157.1%	167.5%	178.0%	119.0%	125.8%
Base	84.7%	91.7%	99.9%	106.3%	102.1%	108.3%	114.7%	121.2%	128.0%	134.9%	141.9%	149.0%	156.2%	103.1%	107.6%
Low	84.7%	91.7%	97.9%	103.3%	98.4%	103.2%	108.0%	112.8%	117.6%	122.2%	127.0%	131.7%	136.6%	89.2%	92.3%

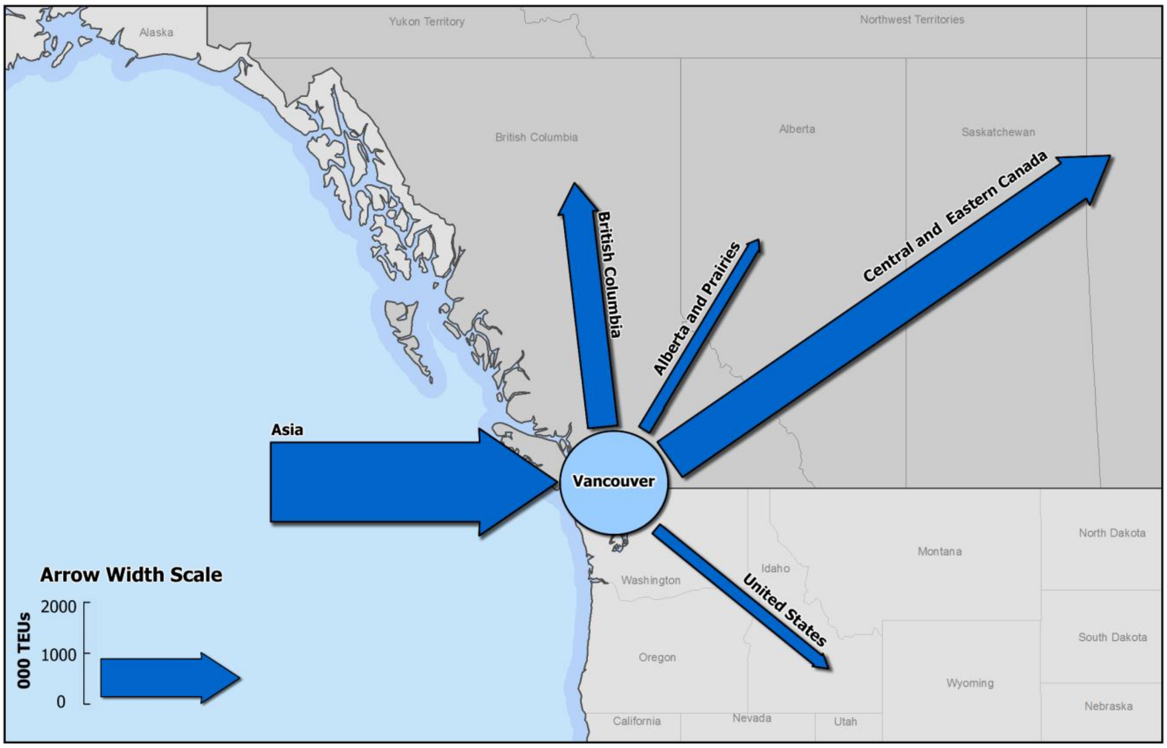
Source: Ocean Shipping Consultants

The following images below reflect the various forecasts.

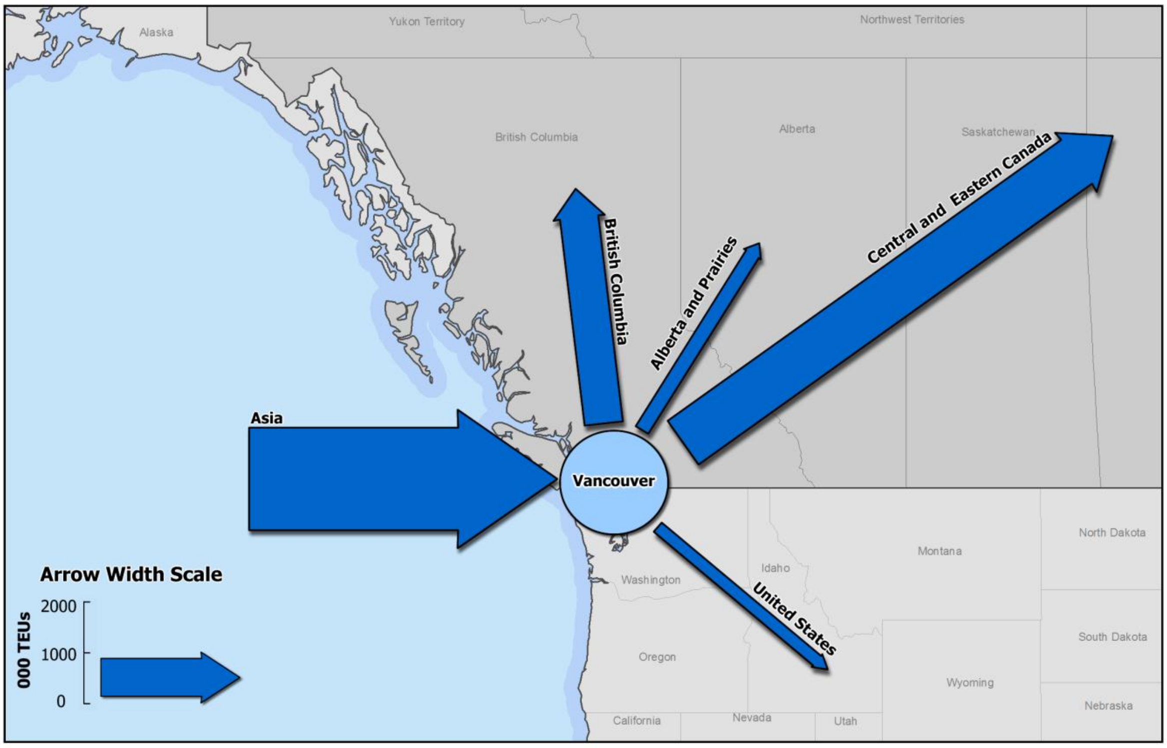
Vancouver: Containerised Imports by Destination (000 TEUs) 2012



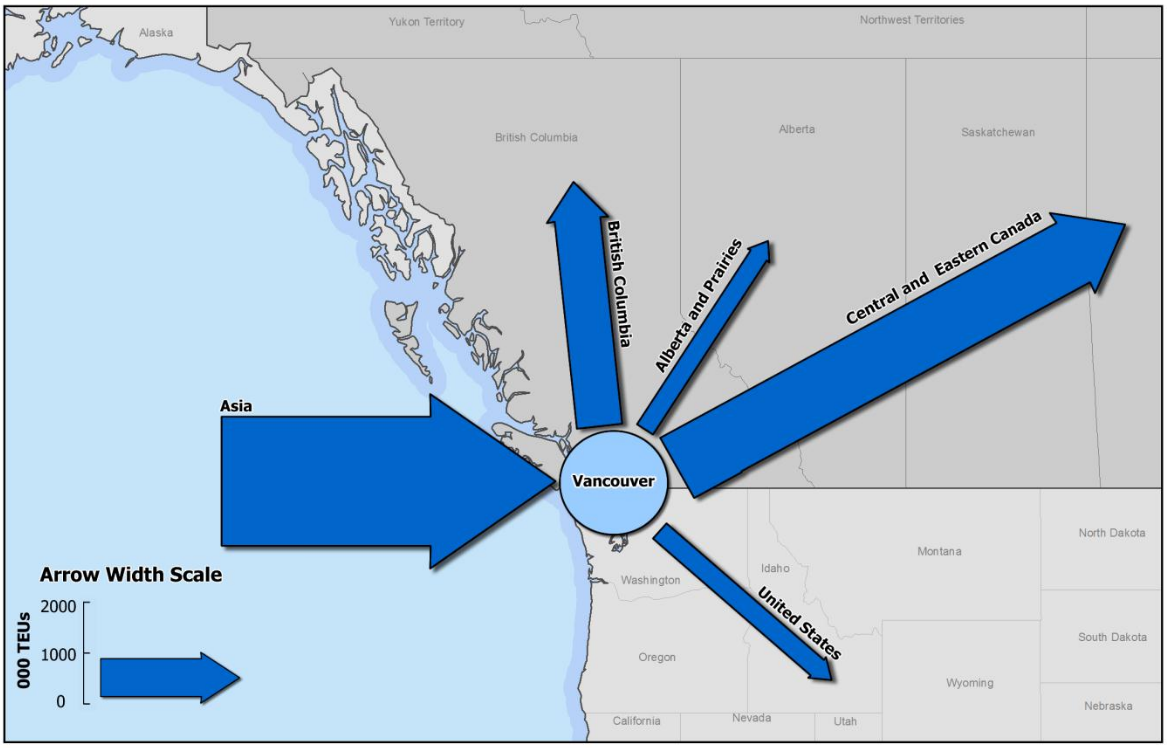
Vancouver: Containerised Imports by Destination (000 TEUs) 2025



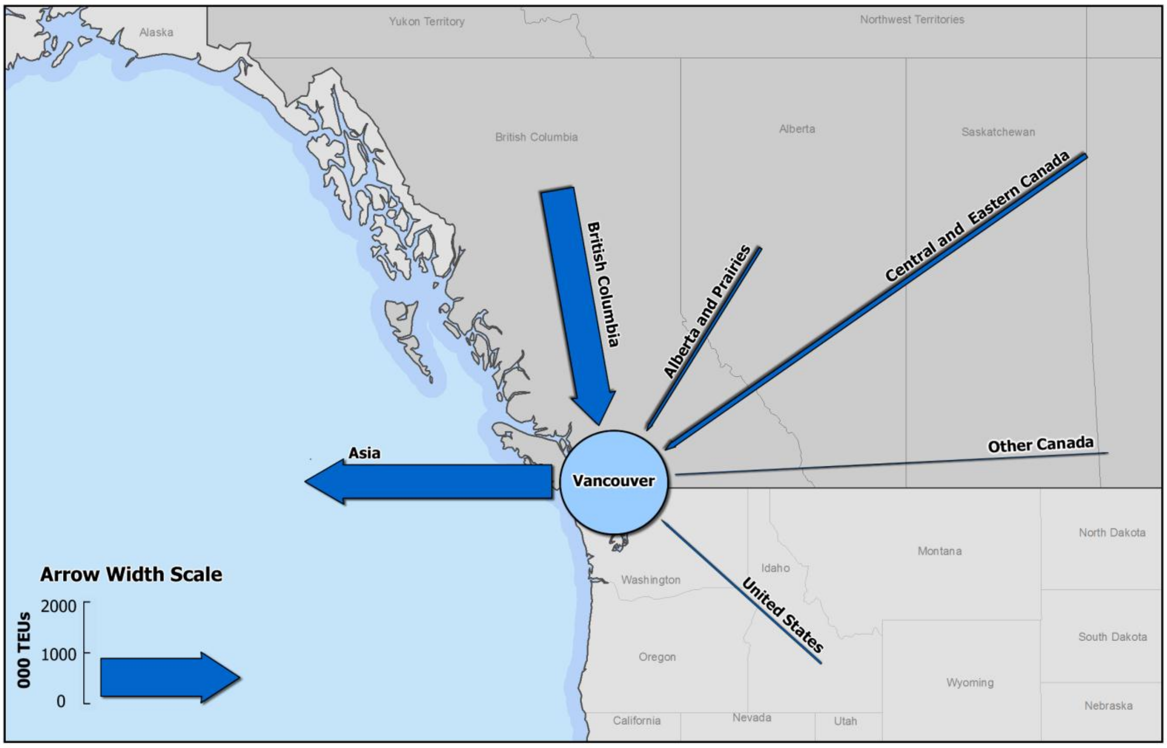
Vancouver: Containerised Imports by Destination (000 TEUs) 2035



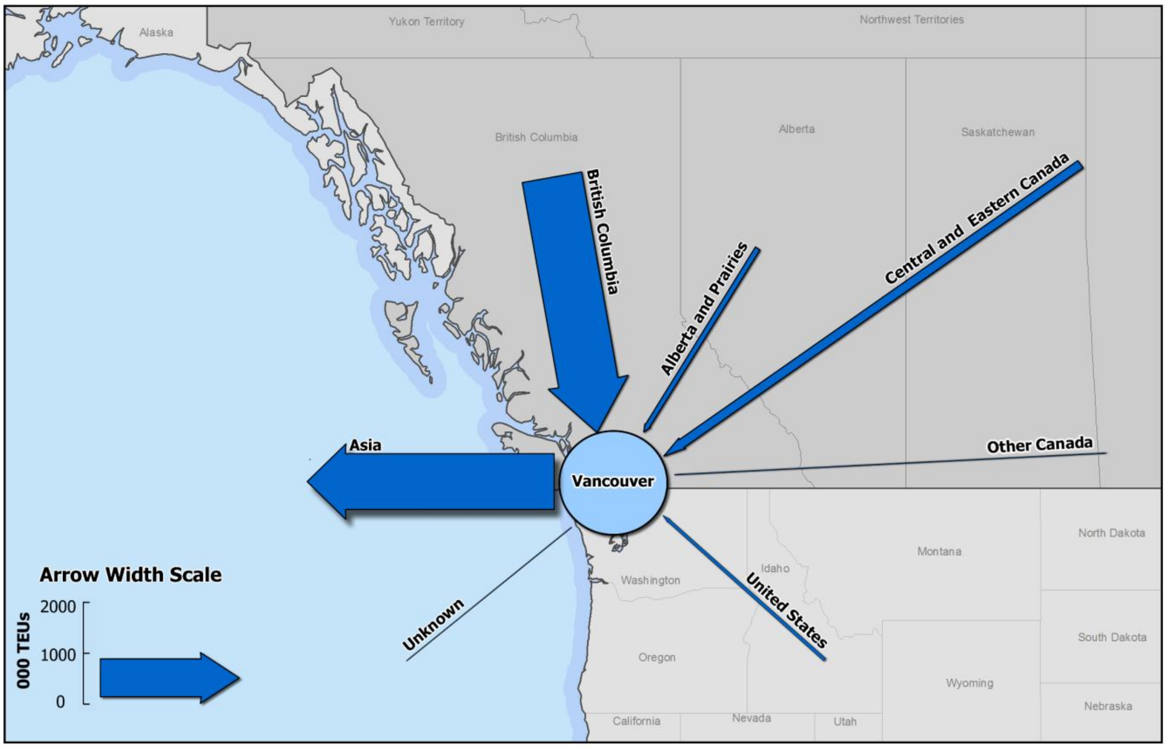
Vancouver: Containerised Imports by Destination (000 TEUs) 2050



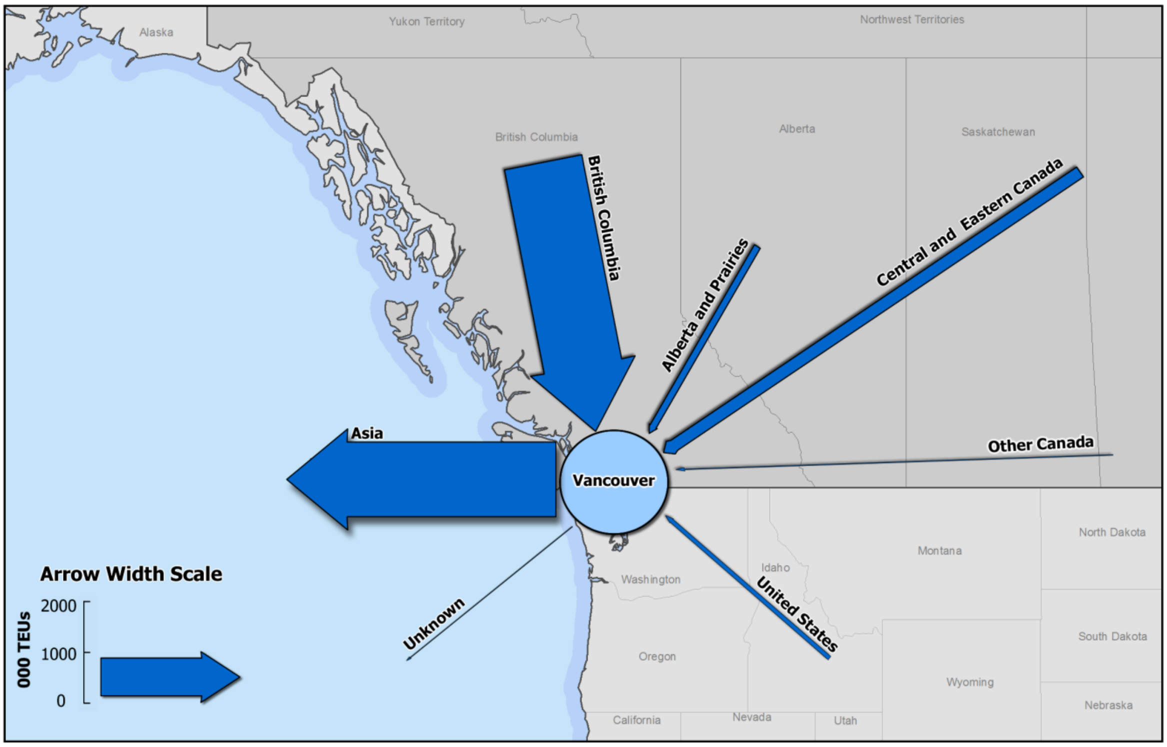
Vancouver: Containerised Exports by Destination (000 TEUs) 2012



Vancouver: Containerised Exports by Destination (000 TEUs) 2025



Vancouver: Containerised Exports by Destination (000 TEUs)
2035



Vancouver: Containerised Exports by Destination (000 TEUs)
2050