

EXECUTIVE SUMMARY

Project Introduction

Vancouver Fraser Port Authority commissioned Ocean Shipping Consultants (OSC) to provide a Container Forecast Study in 2014. This Report follows previous work completed by OSC since 2011.

This new 2016 market Report is a stand-alone document that provides container traffic projections to 2050 and is designed to be used by Vancouver Fraser Port Authority as it continues to evaluate its container expansion projects. It is also understood that the container forecasts will also be used as inputs into the environmental and other approval agencies for the permitting process for expansion and the development of new capacity.

This Executive Summary document provides the following information:

- Part 1 – an introduction to OSC and the members of the team who have provided the December 2015 Market Report to Vancouver Fraser Port Authority.
- Part 2 – a brief synopsis of the container forecasts to 2050 for Vancouver Fraser Port Authority for market regions served by the port and a supply-demand analysis to 2025.

Part 1 - Introduction to Ocean Shipping Consultants

The Ocean Shipping Consultants Team

OSC is the shipping and port economics division of Royal HaskoningDHV of the Netherlands. OSC was acquired by Royal Haskoning in early 2011 and the management remain in place. Royal Haskoning and DHV recently merged to form a large international engineering and project consultancy firm with a global staff of some 8000 people.

Since 1985 OSC has successfully completed more than 275 individual projects in more than 60 countries for in excess of 200 different clients.

The OSC study team is led by Andrew Penfold, OSC Project Director, with assistance from Dean Davison, Principal Consultant and Johan-Paul Verschuure, Port & Transport Economist. The following represents a synopsis of the OSC team and skills brought to this project:

- **Andrew Penfold:**
Andrew has over 30 years of direct experience as a shipping economist and provider of cargo forecasts. He jointly founded OSC in 1985 and developed a leading independent firm of market analysts with extensive expertise in shipping, port economics and development projects.

At the global level his clients include PSA Corporation, Hutchison Ports and the Ports of Rotterdam, Antwerp, Genoa and Felixstowe. Considerable expertise has also been developed relating to container shipping operations and leading clients include Lloyd's Register of Shipping, Maersk Line and other major container liner operators.

Andrew has worked with Vancouver Fraser Port Authority since 2001 and has provided a number of forecast and market studies supporting the port's continued growth. He led and oversaw all components of the Container Traffic Forecast Study in 2014 and has successfully completed the same for this 2016 project.

▪ **Dean Davison:**

Dean offers more than 25 years of port and consulting experience. He joined the Port of Tilbury, UK, in 1990 and worked as a container stevedore and operative on conventional/ro-ro terminals before switching to commercial activities. In 1998 Dean moved to Containerisation International magazine as North American writer before joining Drewry Shipping Consultants at the end of 2000 where he successfully completed a wide-range of port, shipping and intermodal projects on a global basis.

In 2005 Dean helped established Moffatt & Nichol's European presence in London before relocating to New York in 2007 where he spent almost six years working on projects for a wide range of North American ports including New York/New Jersey, Savannah, Virginia, Montreal, Oakland, Los Angeles, Wilmington (NC), Houston and Mobile.

Dean joined OSC in late 2012 to further enhance the company's consulting capabilities and worked on the Port of Vancouver Forecast Update Study in 2013 and again in 2014. He is responsible for writing and editing the Container Traffic Forecast Study in 2016.

▪ **Johan-Paul Verschuure:**

Johan-Paul has over six years of experience in financial and economic feasibility studies and market studies. In his role as a Port & Transport Economist he combines his technical background as a Port Engineer with Financial Economic expertise.

He has a Masters Degree in Civil Engineering with a focus on port development and a Masters Degree in Financial Economics. With this combination he continues to assist on projects for business cases for various types of terminals including container terminals and bulk facilities. Johan-Paul supported the Port of Vancouver Forecast Update Study in 2013 and 2014 is responsible for generating the updated 2016 forecast model.

Forecasting Approach by Ocean Shipping Consultants

Led by Andrew Penfold, OSC has substantial experience of successfully completing a high number of cargo forecasts on a global basis. This includes previously completing container projections for Port of Vancouver in 2012, 2013 and 2014.

The 2016 forecast approach to this modelling process utilises the following fully updated and robust methodology:

The schematic shown in Figure ES1 provides a visual summary of this robust methodology used to determine the container forecasts for Port of Vancouver, with a synopsis noted as follows:

1. The market study model forecasts the future container demand for the following levels of aggregation:
 - Total for all North American container ports, broken down to Pacific Coast and Atlantic Gulf coasts.
 - Pacific West Coast container demand.
 - Pacific Northwest region, defined as including Vancouver and Prince Rupert and the US PNW facilities of Seattle, Tacoma and Portland.
 - Pacific Gateway facilities of Port of Vancouver and Prince Rupert.
 - Port of Vancouver container demand forecasts.
2. The scenarios underlying the forecasts, as developed in Section I, are:
 - High, medium and low GDP growth scenarios for North America, China and other major Asia areas, Other Canada and West Canada.
 - High, medium and low GDP growth: Demand growth Multipliers for North America and both China and the other major Asia region of key economies.
 - Application of four specific risk/opportunity factors (covering US side capacity development in Pacific Northwest, intermodal transportation from Port of Vancouver increases, application of intermodal transportation costs/charges and market share of Port of Vancouver based on mainly ship size and draught developments).
3. The overall container demand outlook is formulated in Section I.11 for North America and subsequently for the Pacific Northwest region by forecasting a market share for this area on the following basis:
 - North American container demand consists of the container volumes handled on the Pacific West Coast, Atlantic Coast and Gulf Coasts. Trade is split by global regions (i.e. NE Asia, SE Asia, Australasia, South America, Middle East/India, Africa and Europe). The total container demand is generated using the North American outlook for GDP and multipliers.
 - The Pacific West Coast container demand is generated based on market share of total North American market versus share of East Coast for each growth scenario.
 - The market share which ports in the Pacific Northwest region are able to attract from the total Pacific West Coast demand is subsequently determined.
4. The outlook for the Pacific Gateway area comprises the container volumes for Port of Vancouver and Prince Rupert. The forecasts for import and export containers are developed separately and the approach for each consists of the following.

- The forecast of underlying import demand is based on 2015F¹ import volumes of both ports (excluding empty containers). This volume of full imports in 2015F is split to their destinations. The volumes for each destination are then combined with corresponding GDP outlook for West Canada, Other Canada and US and the North American multipliers outlook.
- The additional potential of the Pacific Gateway for increased penetration in the US and Canadian hinterland is captured by an additional market growth factor for intermodal transport penetration and intermodal cost outlook (see risk/opportunity factors under point 2 above).
- The combined forecast for the Pacific Gateway of the underlying import demand plus the continued penetration of more distant regions is then split by origin and commodity type.

The outlook for the export volumes for the Pacific Gateway follows a similar approach:

- The forecast for full exports is based on the actual full exports in 2014 and the projections for 2015F which use January to October year-to-date data. The full exports are split in two container flows based on 2015 actual destination shares. These two container exports flows are then projected using China or other major Asia GDP scenarios and the Asian multiplier scenarios.
- The total export container forecast is then split by origin and commodity type, based on the known position for 2014, for both China and other major Asia areas.

The outlook for empty containers has been carried out as a separate set of steps.

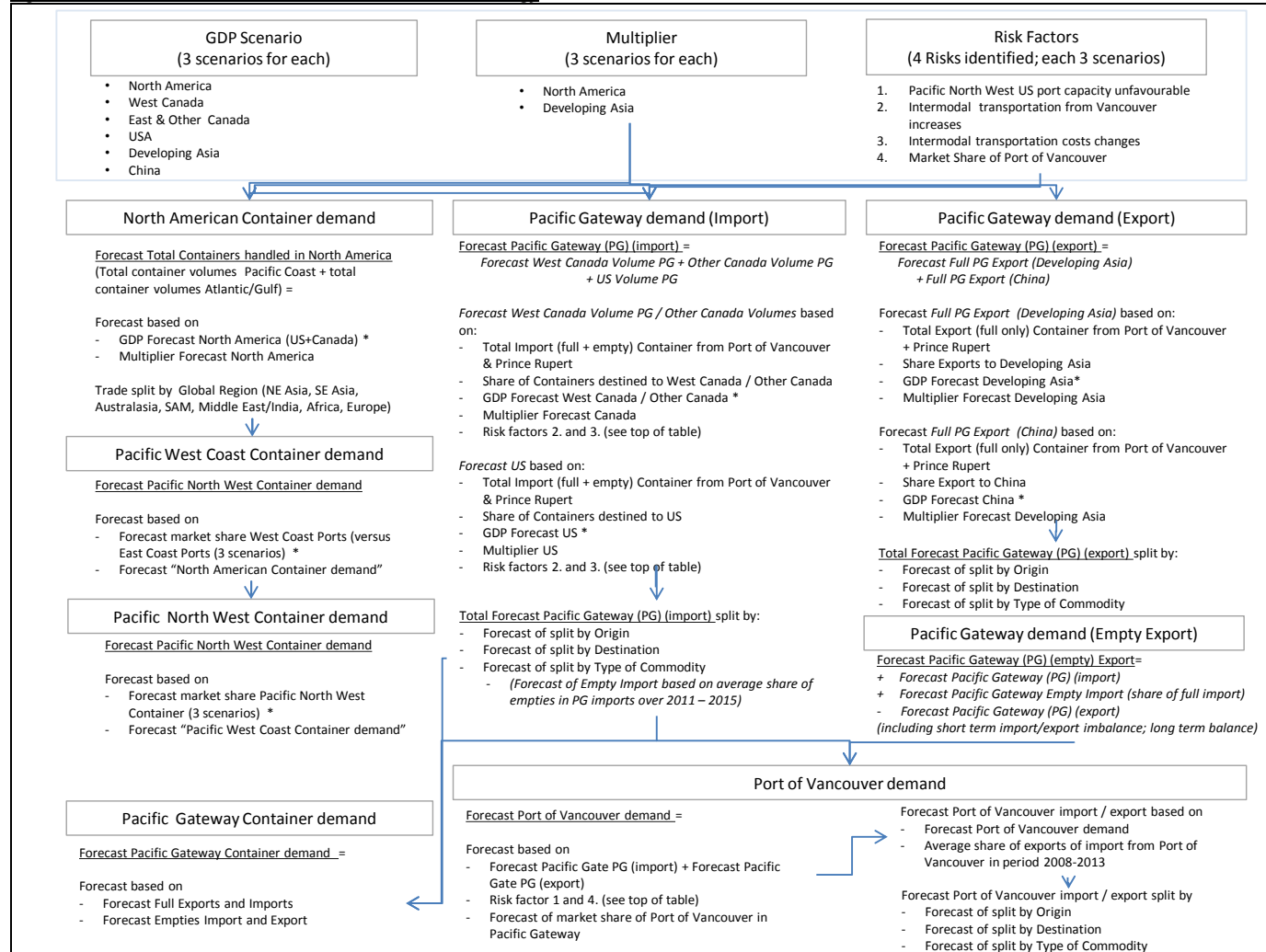
- The empty import containers have been forecast based on their average historic share of full imports and subsequently applying a declining trend.
- The empty export containers are determined as the balance between the full and empty imports minus the full exports. In the near future this balance is set such that the (full and empty) imports make up for roughly 54 per cent as is currently witnessed. However, the forecast assumes that the balance between total imports and exports will move towards a 50-50 per cent split from around 2022 onwards.

5. The volumes for Port of Vancouver are determined by the market share which Port of Vancouver is anticipated to capture from the Pacific Gateway volumes. The first (US side capacity development Pacific Northwest) and fourth risk factor (increased ship sizes and draught) are applied to this forecast.

As with the Pacific Gateway forecast, the Port of Vancouver forecasts are split into a set of detailed forecasts to identify the origin, destination and commodity type of the container flows. The import : export ratio is kept the same as that of the total Pacific Gateway to calculate Port of Vancouver imports and exports from the total traffic forecast.

¹ 2015F represents estimated total for 2015, based on year-to-date information available, mostly consisting of January-to-September or October 2014 details.

Figure ES1: Port of Vancouver Forecast Demand Model Methodology



Source: Ocean Shipping Consultants

Part 2 – Port of Vancouver Container Forecasts to 2050

Introduction

The following is a list of key components that make-up the container forecasts for Port of Vancouver:

- Key Recent Trends.
- North American Container Port Demand.
- Macro-Economic trends in North America.
- Economic Drivers – Key Port of Vancouver Hinterlands, including Commodity Demand.
- Drivers of Demand to 2025.
- Demand Development 2025-2050.
- Container Port Demand Forecasts to 2025 and 2050.
- Supply-Demand Analysis at Port of Vancouver.

Key Recent Trends

The following represents a summary of the key macro-economic and market factors of relevance:

- ***The outlook for the Chinese economy*** is considerably more uncertain than was noted in earlier forecasts. It is apparent that economic expansion is slowing as a result of the shifting of demand in favour of domestic consumption. This is unlikely to significantly impact on the structure of trade between to/from North America in the medium term and may well in actually stimulate export volumes via Vancouver as the Chinese economy is rebalanced.
- The cost differential between Chinese manufacturing and local conditions in North America has also reduced, although the advantages of Chinese output remain significant. This has seen increased interest in '***near-sourcing***' of production to, for example, Mexico and the '***reshoring***' of some production into the US itself. To date, the overall impact has been limited and confined to energy intensive primary industry and it should also be noted that the beneficiaries of this have included cheaper sources of production in, for example, Vietnam and Indonesia. For the medium term, the model of increased reliance on Chinese and other East Asian manufacturing is unlikely to be significantly modified as major cost differences will be maintained.
- ***The collapse in commodity prices*** (especially oil) that has been noted since mid-2014 is a major trend that will influence the structure of trade in the short to medium term. This has a complex impact on the Canadian position. On the one hand, this is exerting a negative impact on the economies of the major oil and commodity producing Provinces (including BC) but, conversely, this has acted as a major stimulus to demand in the US and in central Canada, where consumption of imported manufactured goods has benefitted. This has also resulted in a decline in the value of the Canadian dollar versus its US equivalent and this has further boosted the competitive position of the Vancouver alternative. While the impact of weak commodity prices has been generally negative for the Canadian economy the results have been broadly positive for Vancouver as a container gateway.
- There has been considerable progress on the ***Trans-Pacific Partnership Agreement (TPP)*** with a full text made public in early November 2015. The primary aim of this agreement will be to further reduce trade tariffs between the signatories. This will provide a further stimulus to trade between the members – all of the major Pacific Rim economies apart from China – and the US and Canada and will provide some further upside on transpacific containerised trade. The speed of progress on this arrangement was faster than had been anticipated in 2014.
- The potential railroad merger of Canadian Pacific and Norfolk Southern could bring additional upsides for the Port of Vancouver, such as improved access to Chicago and better geographic access to the eastern regions of the US, if it is successful. Canadian Pacific will need to

overcome potential surface transportation authority objections and a sense of US nationalism towards foreign ownerships. It is already clear that the cost advantage enjoyed by Canadian railroads over US counterparts will continue and there is not seen to be any price changes implemented by US railroads that will alter this position.

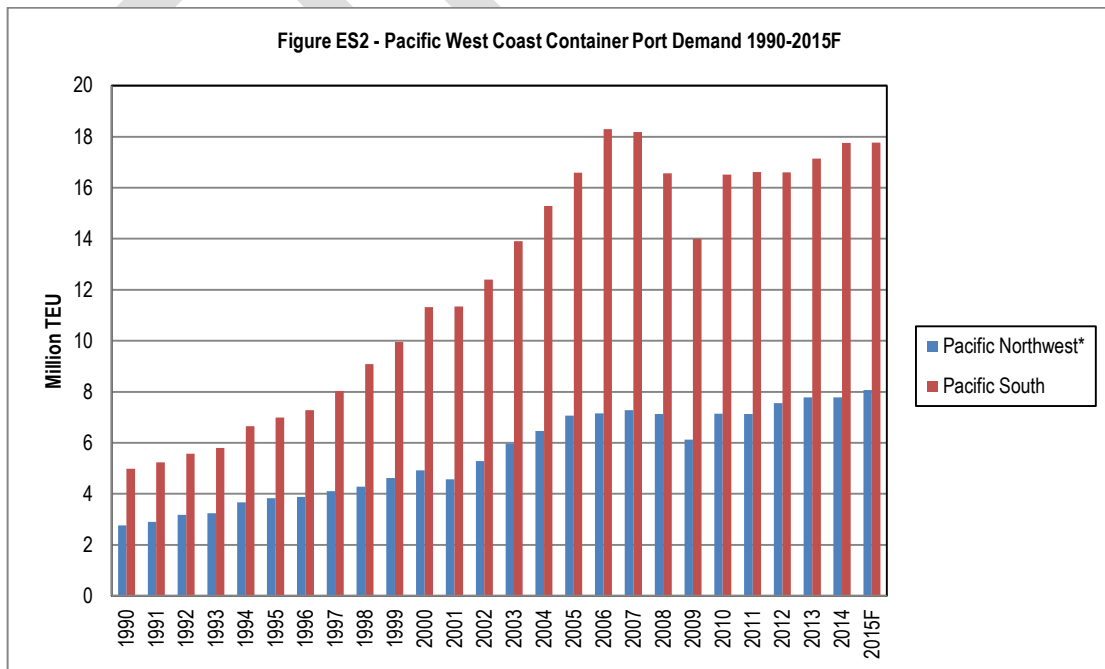
- Container shipping merger and acquisition activity will occur during 2016. CMA CGM is acquiring NOL/APL, with Cosco and China Shipping merging. Some of the major alliances, notably the G6 Alliance and Ocean Three will see changes. However, for the Port of Vancouver these developments will have little impact because the need for major shipping lines/alliances to use the port to meet demand will continue, regardless of the operators.

North American Container Port Demand

Between 1990 and 2007, total North American container port demand increased by 216 per cent to reach just under 50 million TEU, growing at 6.8 per cent per annum. The Global Financial Crisis saw the total fall to 40.2 million TEU for 2009, but a strong recovery saw the total rise to almost 55.8 million TEU for the projected total at the end of 2015.

The distribution of volumes between the Pacific Northwest region where the Port of Vancouver is located and the Pacific South ports in California has remained largely consistent, although the Californian ports were more severely impacted by the downturn and are yet to reach pre-recessionary levels, as Figure ES2 shows.

For 2015F, the Pacific Northwest region ports are projected to handle almost 8.07 million TEU, of which the Port of Vancouver’s share accounted for 37.8 per cent, a rise from 31.5 per cent in 2011. Prince Rupert’s share is currently 9.6 per cent, as the Pacific Gateway facilities continue to grow faster than the US Pacific Northwest ports of Seattle-Tacoma and Portland. Since 2000, the Port of Vancouver has seen container growth of 6.7 per cent per annum, above the Pacific Northwest regional average of 3.4 per cent.



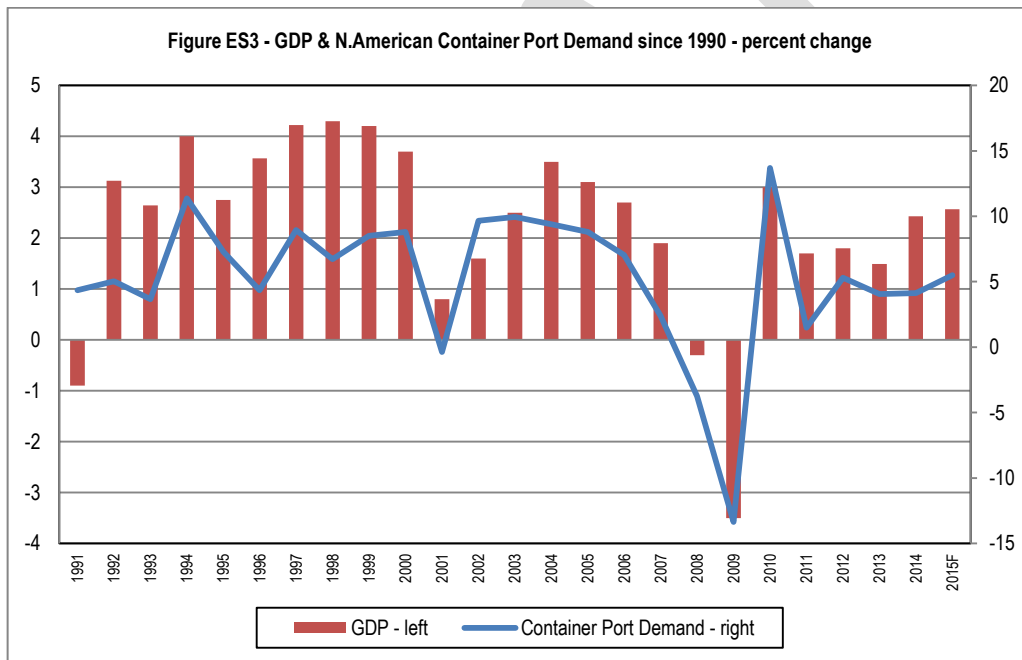
* = Pacific Northwest region classification consists of all major ports, including Port of Vancouver, Prince Rupert, Seattle, Tacoma and Portland.

Macro-Economic Trends in North America

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

The economic relation between GDP growth and trade growth (port demand) is noted in Figure ES3, which is of central importance, but is not the only driver of growth for containers. Other drivers include:

- Containerisation of general cargoes is more or less at saturation level as North America is a developed market.
- An imbalance of loaded inbound and outbound containers between North America and the Far East means shippers are continually searching for more cargoes on return legs to Asia – hence increasing use of container in sectors not historically regarded as suitable for containerisation, such as forest products, iron and steel scrap and waste papers. This is an important consideration for Port of Vancouver export demand.

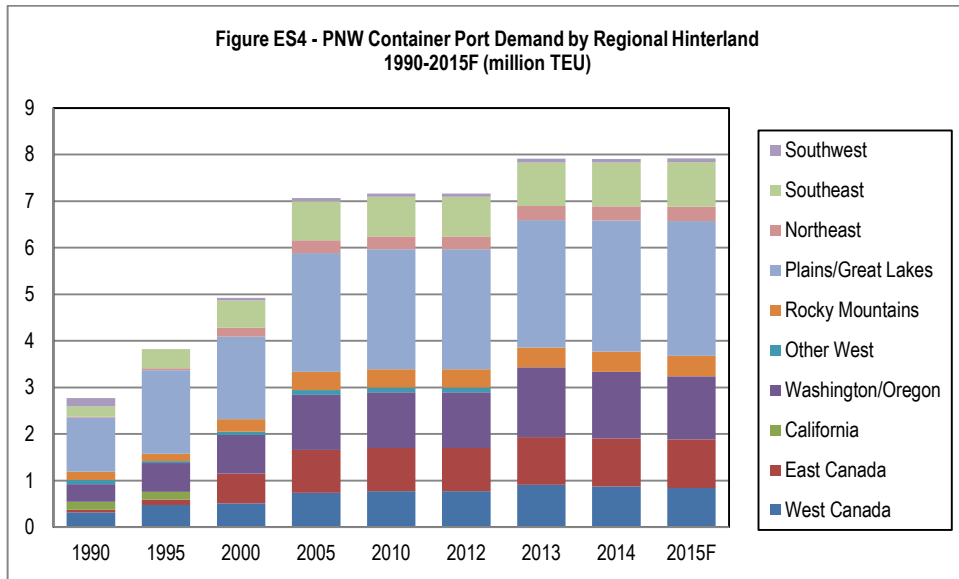


Key Port of Vancouver Hinterlands & Economic Drivers, including Commodity Demand

The development of markets served by the Pacific Northwest region is shown in Figure ES4. The overall growth of volumes handled is shown, along with the economic reach of the region’s ports extending. Other key trends include:

- Immediate markets (western Canada and Washington/Oregon) have grown, reflecting stronger economic development of region and declining importance of Californian ports serving these markets.
- Central continental markets have increased in importance and terminals in the Pacific Northwest region are serving more distant areas.

- Competition with Californian ports (and US East Coast ports) for more distant hinterlands remains intense, but economics of using Pacific Northwest ports has improved.
- Considering ports in British Columbia and the US Pacific Northwest area as competitors is justifiable.



In 2014 the Gross Domestic Product (GDP) of Canada was approximately \$1,975 billion according to IMF data and is projected to be C\$1,985 billion by the end of 2015. From 2000 to 2015F, the Canadian economy will have grown by an average annual rate of 4.0 per cent using this data set. The full effects of the Global Financial Crisis have been fully eradicated with year-on-year expansion in the 2010 to 2014 period ranging between 3.3-6.1 per cent. Other key economic points include:

- British Columbia is the fourth largest regional economy in Canada after Ontario, Quebec and Alberta with a GDP of \$186,472 million estimated for 2015F (in 2002 dollars), reflecting a 2.4 per cent increase over 2014, itself a 2.9 per cent rise on the 2014 total. Since 2000 to 2012 the economy of British Columbia has grown at an average annual rate of 2.4 per cent.
- The Canadian prairies consist of Alberta, Saskatchewan and Manitoba and remain the third largest economy in Canada, contributing around 44.2 per cent to the total of Western Canada.
- Ontario and Quebec collectively represent approximately 60 per cent of the Canadian economy with an average annual GDP growth of 0.9 and 1.1 per cent respectively between 2007 and 2015F. These two provinces are the largest economies within Canada in terms of GDP.
- The Great Lakes region is a bi-national Canadian-American area that includes parts of eight US states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin), plus the province of Ontario. Collectively this means a population of up to 85 million people and remains a key area served by the Pacific Northwest region.
- Within the US market, the Chicago area is a key interchange point for intermodal distribution to/from the US Midwest, along with more localised demand (Chicago is the largest city in Illinois and the third largest city in the US by population). These two factors have long made Chicago a key target of the US West Coast ports, along with Port of Vancouver and Prince

Rupert. In addition, the major ports on the East Coast of North America from Halifax to Savannah, continue to actively target these same areas too and are all regarded as competitors.

The key drivers of import demand for ports on the Pacific West Coast (of North America) are household and other consumer goods which originate in China. As Table ES1 shows, the total traffic for these commodities is currently just over four million tonnes, a rise on the three million tonnes seen in 2013. However, as a share of total imports these commodities have fallen - from 41 per cent in 2003 to just under 36 per cent by 2015F.

Table ES1
Port of Vancouver: Containerised Import Volumes 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
Million Tonnes																	
Household Goods	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	2.89	3.03	3.72	4.06
Construction & Materials	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	1.28	1.17	1.46	1.40
Industrial, Auto and Vehicle Parts	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	1.07	1.17	1.34	1.46
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	0.77	0.77	0.80	0.80
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	0.40	0.33	0.40	0.41
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	3.22	3.68	3.15	3.18
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	9.63	10.39	10.87	11.32
Percentage																	
Household Goods	24.2%	35.8%	37.1%	40.0%	40.7%	40.4%	40.4%	39.1%	39.4%	36.7%	36.2%	36.1%	32.8%	30.0%	29.2%	34.2%	35.9%
Construction & Materials	7.1%	7.7%	7.5%	8.1%	9.0%	9.5%	9.9%	10.5%	11.2%	12.1%	10.9%	12.3%	13.2%	13.3%	13.6%	13.4%	12.4%
Industrial, Auto and Vehicle Parts	8.5%	7.4%	7.7%	8.1%	8.1%	8.3%	8.6%	8.4%	8.4%	8.0%	8.6%	9.5%	10.6%	11.1%	11.3%	12.3%	13.0%
Machinery	4.8%	5.4%	5.8%	6.0%	6.6%	6.2%	6.4%	6.8%	6.5%	6.3%	5.6%	5.9%	6.8%	8.0%	7.4%	7.4%	7.0%
Basic Metals	2.7%	4.2%	4.3%	3.9%	3.6%	4.3%	3.6%	4.3%	4.2%	3.9%	2.3%	2.7%	3.4%	4.2%	3.2%	3.7%	3.6%
Other Goods	52.6%	39.4%	37.5%	33.8%	32.0%	31.3%	31.1%	30.9%	30.4%	32.9%	36.4%	33.5%	33.2%	33.4%	35.4%	29.0%	28.1%
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%

Source: Port of Vancouver data

In terms of exports, a summary is shown in Table ES2. Export tonnages exceed import volumes, with common commodities much denser. Lumber and woodpulp remain the most significant types of cargo, with these two commodities accounting for almost 50 per cent. Chinese demand remains the primary driver of this demand, with containerisation being the primary transport mode.

Table ES2
Port of Vancouver: Containerised Export Volumes 1995-2015F

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015F
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	4.26	4.50	3.91	3.93
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	2.33	2.46	2.03	2.12
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	2.51	2.67	2.52
Meat, Fish & Poultry	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	0.55	0.54	0.52	0.54
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	0.57	0.45	0.41	0.42
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	3.77	4.36	4.25	4.28
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	13.39	14.82	13.79	13.81
Percentage																	
Lumber	13.9%	18.3%	17.6%	19.0%	17.7%	17.9%	15.1%	15.5%	15.6%	18.6%	20.6%	27.1%	32.2%	31.8%	30.4%	28.4%	28.5%
Woodpulp	7.0%	15.1%	15.9%	20.4%	21.6%	22.7%	21.9%	24.5%	22.0%	22.3%	21.0%	17.1%	18.7%	17.4%	16.6%	14.7%	15.4%
Specialty Crops	12.5%	13.5%	14.2%	11.2%	10.6%	10.6%	13.2%	13.6%	16.3%	14.3%	17.4%	16.2%	13.5%	14.3%	16.9%	19.4%	18.2%
Meat, Fish & Poultry	4.9%	5.6%	6.2%	6.5%	5.7%	5.1%	5.6%	5.2%	4.8%	5.3%	5.4%	5.0%	4.9%	4.1%	3.6%	3.8%	3.9%
Basic Metals	5.5%	2.9%	2.7%	3.7%	5.2%	4.8%	5.0%	5.2%	5.3%	5.5%	5.7%	5.0%	4.6%	4.3%	3.0%	3.0%	3.0%
Other Goods	56.2%	44.6%	43.4%	39.1%	39.2%	38.8%	39.2%	36.0%	36.0%	33.9%	29.9%	29.6%	26.1%	28.2%	29.4%	30.8%	31.0%
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%

Source: Port of Vancouver data

The importance of Asian markets continues for Port of Vancouver, for both import and export containerised cargo, most notably the Chinese markets:

- Chinese imports have increased from a share of 13.2 per cent in 1995 to an estimated 60.0 per cent for 2015F, reflecting of 6.79 million tonnes. The second largest source in 2015F is South Korea, with just 10.6 per cent.
- China is also the largest destination for exports, rising from just 5.7 per cent in 1995 to 4.34 million tonnes anticipated in 2015F, generating 5.99 million tonnes. Japan remains the second largest export location with an estimated 2015F share of 17.6 per cent, or 2.43 million tonnes.

Drivers of Demand to 2025

Globalisation has boosted economic growth and intensified the link between GDP and trade, with the availability of low-cost transportation via containerisation a beneficiary of developments.

There is now renewed confidence in the outlook for the world economy, but the position remains fragile. The shorter-term outlook for Canada and the US is for sustained economic development, as shown in Table ES3.

Table ES3

Core Macro-Economic Forecasts to 2025

Real % change

	2014	2015	2016	2017	2018	2019	2020	2021-2025
High Case								
West Canada	4.26%	0.35%	1.38%	2.53%	2.53%	2.53%	2.53%	2.53%
Canada	2.81%	1.20%	1.91%	2.77%	2.68%	2.46%	2.31%	2.30%
USA	2.79%	2.96%	3.27%	3.22%	3.08%	2.53%	2.30%	2.30%
Base Case								
West Canada	3.70%	0.30%	1.20%	2.20%	2.20%	2.20%	2.20%	2.20%
Canada	2.44%	1.04%	1.66%	2.41%	2.33%	2.14%	2.01%	2.00%
USA	2.43%	2.57%	2.84%	2.80%	2.68%	2.20%	2.00%	2.00%
Low Case								
West Canada	2.07%	0.24%	0.96%	1.76%	1.76%	1.76%	1.76%	1.76%
Canada	2.07%	0.88%	1.41%	1.93%	1.86%	1.71%	1.61%	1.60%
USA	2.07%	2.18%	2.41%	2.24%	2.14%	1.76%	1.60%	1.60%

Source: Various, incl. Ocean Shipping Consultants

Three drivers of demand have been considered to 2025 and form the basis of the container import traffic forecasts in this Study:

- The Base Case** – a consensus view of the position through to 2017, with a continued recovery towards trend growth. From the current perspective this remains the likely outcome.
- The High Case** – this takes into account positive developments in 2014, followed by a further strong increase and then a return to a somewhat higher rate of economic expansion.
- The Low Case** – anticipates further uncertainties at the macro-economic level, such as seen in 2014 and 2015, with the chance of some renewed stagnation. Beyond 2017 a more restrained pace of expansion as the cost of the downturn is worked through the economy.

Developments at this macro-economic level are critical in determining the position for the regional economies. Significant risks for the world economy remain and play directly through into the region.

For export demand from the Port of Vancouver a strong link remains with Asian economic development. Table ES4 collates short-term IMF forecasts with longer-term ranges used in the export forecasting process.

Table ES4

Core Asian Macro-Economic Forecasts to 2025

Real % change

	2014	2015	2016	2017	2018	2019	2020	2021-2025
High Case								
China	8.40%	7.83%	7.25%	6.90%	7.02%	7.28%	7.28%	7.48%
Other Major Asia	1.55%	1.75%	2.27%	2.16%	2.37%	2.58%	2.47%	3.10-3.60%
Base Case								
China	7.30%	6.81%	6.30%	6.00%	6.10%	6.33%	6.33%	6.50%
Other Major Asia	1.50%	1.70%	2.20%	2.10%	2.30%	2.50%	2.40%	3.00-3.50%
Low Case								
China	5.84%	5.45%	5.04%	4.80%	4.88%	5.06%	5.06%	5.20%
Other Major Asia	1.47%	1.67%	2.16%	2.06%	2.25%	2.45%	2.35%	2.90-3.40%

Source: IMF/Ocean Shipping Consultants

The approach taken is to relate the development of GDP to container port demand in the import/export markets and use this as a basic driver of growth, as follows:

- Step 1 – identify relationship between GDP and port ranges.
- Step 2 – distribute demand by port ranges, using distribution costs and intermodal services – include the competitive position of the ports.
- Step 3 – generate continental and regional demand forecasts.
- Step 4 – apply general macro trends over the period to 2025.

Demand Development 2025-2050

Longer-term container projections have to adopt a scenario-based approach to overcome uncertainties associated with forecasts so far into the future. These scenarios include:

- Continuing Free Trade – globalisation will continue, further GDP expansion and Port of Vancouver's market remains focused on China and key Asian markets. (Continuation of High Case).
- Partially Protectionist World – development of commonality of interests between Canada and the US and (most likely) the broader NAFTA grouping. (Continuation of Base Case).
- New Economic & Trade Paradigm – policy encouragement to re-orientate economic activity on a localised basis, with more limited economic growth in North America and container trade with Asia stagnating. (Continuation of Low Case).

The development of overall container demand has been forecast to the period to 2050 under these conditions to provide a general estimation of likely container traffic over such a long-term basis.

Container Port Demand Forecasts to 2025 and 2050

Container traffic forecasts are summarised for four deliverables:

- North American demand – derived from North American GDP forecasts and North American TEU growth/GDP growth multipliers.
- Pacific Northwest regional demand – covering both British Columbia ports and US ports, estimated as a fixed share of North American traffic.
- Pacific Gateway (Vancouver and Prince Rupert) – derived from Western and Other Canada GDP and North American multipliers.
- Port of Vancouver demand – a fixed percentage of Pacific Gateway demand and key competitive conclusions established in this Report.

Total North American Demand

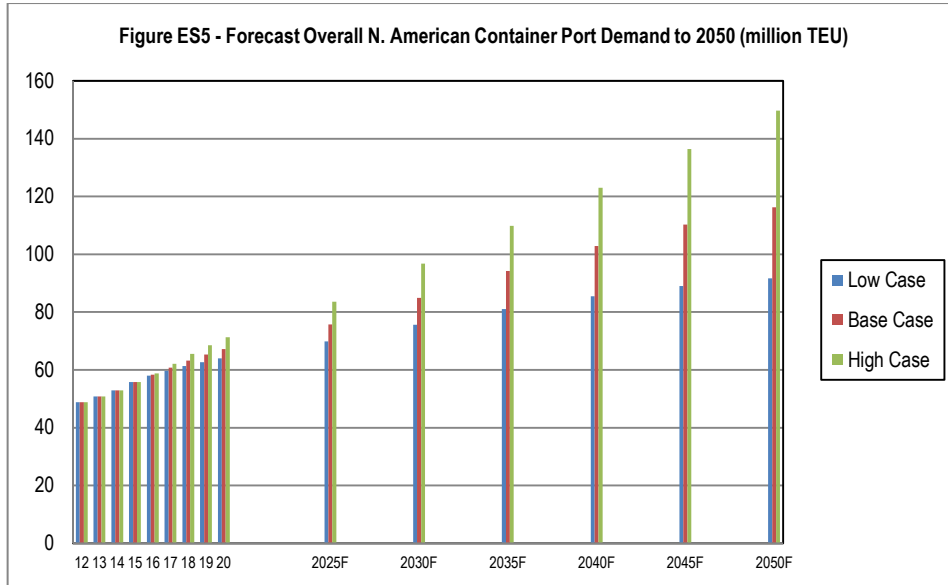
Table ES5 summarises the anticipated development of North American container port demand to 2025, with further estimations of the level of demand under each longer term scenarios to 2050. The Base Case growth option will see annual growth of 3.1 per cent per annum from 2015 to 2025 as traffic increases from 55.8 million TEU to 75.7 million TEU. By 2050 volumes could rise to 116.3 million TEU.

Table ES5
Forecast Overall North American Container Port Demand to 2050
 - million TEU

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	45.7	46.3	48.8	50.8	52.9	55.8	58.0	59.6	61.3	62.7	64.0	69.8	75.7	81.0	85.5	89.0	91.7
Base Case	45.7	46.3	48.8	50.8	52.9	55.8	58.4	60.8	63.2	65.3	67.2	75.7	84.9	94.2	102.8	110.3	116.3
High Case	45.7	46.3	48.8	50.8	52.9	55.8	58.7	62.1	65.5	68.5	71.3	83.6	96.8	109.9	123.0	136.4	149.7

Source: Ocean Shipping Consultants

The general outlook is further shown in Figure ES5, with the range of demand in 2025 placed at 69.9 million TEU to 83.6 million TEU. A slowdown in the pace of demand growth reflects the maturity of the Transpacific trades, in particular.



Pacific Northwest Region Market

The Pacific Northwest share of total North American container traffic is shown in Table ES6. Under the Base Case scenario total demand via ports in the region will increase from 8.1 million TEU estimated for 2015 to 12.0 million TEU by 2025 and 18.4 million TEU by 2050. Growth will be influenced by:

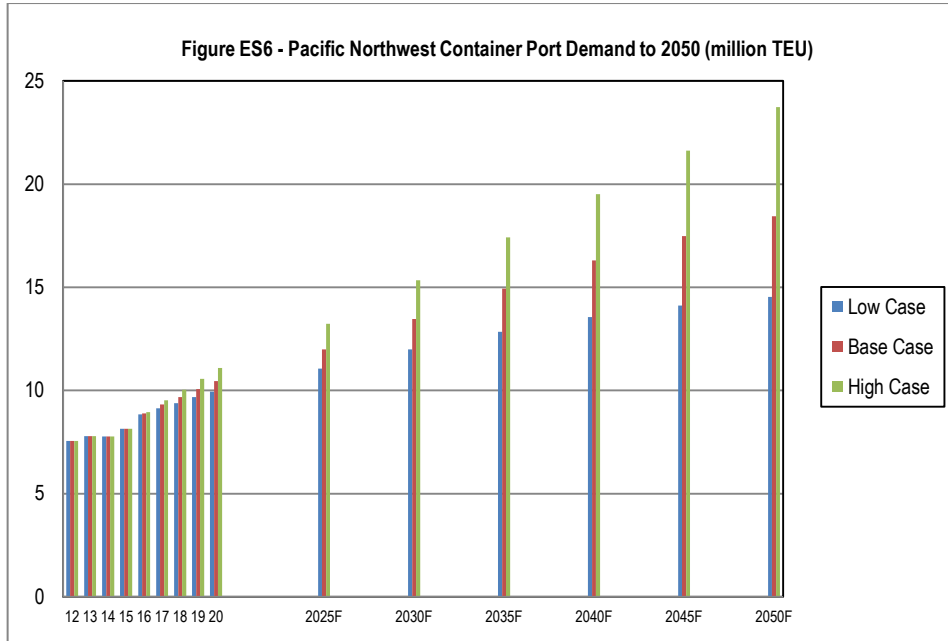
- Asian trades will continue to dominate container demand.
- Availability of export cargoes, particularly from British Columbia.
- All-Water services and the larger Panama Canal will impact ports in California more than the Pacific Northwest region.
- Ability to keep pace with demand growth in terms of terminal capacity and rail intermodal services.

Table ES6
Forecast Pacific Northwest Container Port Demand to 2050
 - million TEU

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	7.1	7.1	7.6	7.8	7.8	8.1	8.8	9.1	9.4	9.7	9.9	11.1	12.0	12.8	13.6	14.1	14.5
Base Case	7.1	7.1	7.6	7.8	7.8	8.1	8.9	9.3	9.7	10.1	10.4	12.0	13.5	14.9	16.3	17.5	18.4
High Case	7.1	7.1	7.6	7.8	7.8	8.1	9.0	9.5	10.0	10.6	11.1	13.2	15.3	17.4	19.5	21.6	23.7

Source: Ocean Shipping Consultants

Figure ES6 highlights the considerable range of demand for the Pacific Northwest region of 11.1 million TEU to 13.2 million TEU in 2025 and between 14.5 million TEU and 23.7 million TEU by 2050, depending on the economic growth scenario.



Pacific Gateway Market

The Pacific Gateway market comprises the Port of Vancouver and Prince Rupert. Import demand is driven by the development of Western Canada, Other (Central) Canada and the US GDP, with the latter responsible for the intermodal market and projections to 2050 are shown in Table ES7, with the following key points of note:

- Current container import distribution to different North American regions will remain stable.
- There may be scope for Pacific Gateway ports to further increase transit flows to US markets.
- The current split of containerised imports by commodity grouping will largely remain – i.e. emphasis on household goods, components and construction materials.
- Exported goods will continue to focus on commodities grown and manufactured in (primarily) British Columbia. The diversity of container shipping services and many export transloading facilities favour the Port of Vancouver over Prince Rupert.
- Ability to keep pace with demand growth in terms of terminal capacity and rail intermodal services.

Table ES7

Forecast Pacific Gateway - Vancouver + Prince Rupert - Container Port Demand to 2050

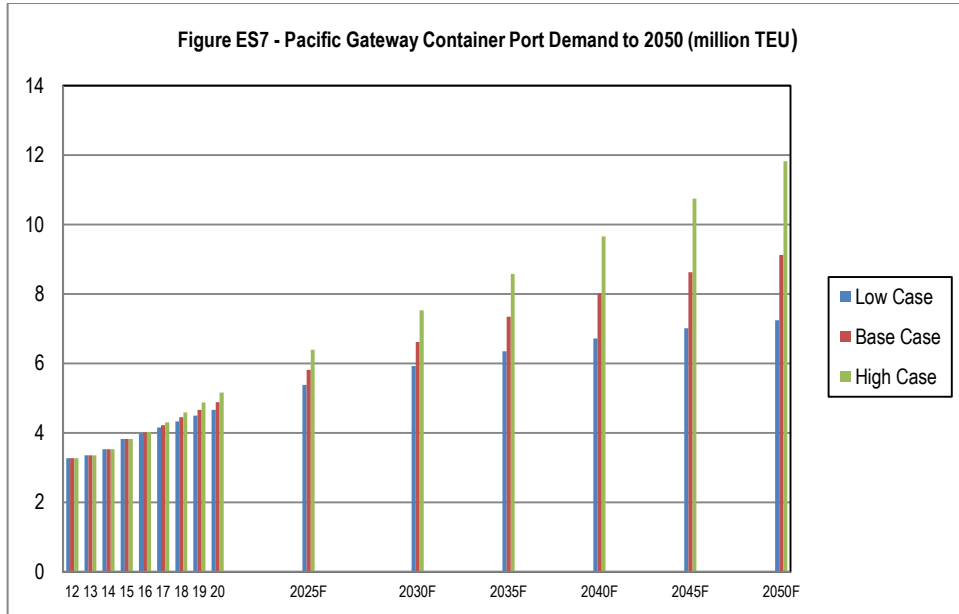
- million TEU

	2010A	2011A	2012A	2013A	2014A	2015F	2016F	2017F	2018F	2019F	2020F	2025F	2030F	2035F	2040F	2045F	2050F
Low Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.2	4.3	4.5	4.7	5.4	5.9	6.4	6.7	7.0	7.2
Base Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.2	4.4	4.7	4.9	5.8	6.6	7.3	8.0	8.6	9.1
High Case	2.9	2.9	3.3	3.4	3.5	3.8	4.0	4.3	4.6	4.9	5.2	6.4	7.5	8.6	9.7	10.7	11.8

Includes empties

Source: Ocean Shipping Consultants

Under the Base Case growth option, annual growth of 4.8 per cent is projected for the Pacific Gateway region to 2025 from the estimated total for 2015 as container volumes of almost 3.8 million TEU increase to 5.8 million TEU by 2025 and then 9.1 million TEU by 2050. Figure ES7 shows the range of potential growth in more detail over this assessment period.



Forecast Container Handling Volumes at Port of Vancouver

Potential container demand for the Port of Vancouver is determined by the following factors:

- Overall capacity available at the port’s terminals to meet potential demand.
- Trends and developments in deepsea containerisation – i.e. vessels sizes and market issues.
- Competitive position of the Port of Vancouver’s container terminals in terms of marine accessibility.
- Relative costs and capacity of intermodal links to/from the broader hinterland compared to other port options.

The relative competitive position of the Port of Vancouver and its container terminals is summarised in Table ES8. The Port of Vancouver is very competitive in all areas of qualitative assessment, supported by key quantitative factors as infrastructure and transportation costs to key markets.

However, it is crucial that the competitiveness of the port’s facilities and levels of service are maintained moving forward.

Table ES8
The Relative Competitive Position of the Port of Vancouver Versus Competing Ports

	Vancouver	Prince Rupert	Sea-Tac	San Pedro
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	46	37	35	44
- percentage	92.0%	74.0%	70.0%	88.0%

Source: Ocean Shipping Consultants

The potential container volumes for the Port of Vancouver to 2050 are shown in Table ES9 and also Figure ES8. The underlying demand is estimated as varying market shares of the Pacific Gateway forecast, including further penetration of the Central and Eastern Canada market and the continued ability to serve key US areas.

Total Base Case traffic is projected to increase from the estimated 2015 figure of just over 3.0 million TEU to over 4.8 million TEU by 2025 and almost 7.6 million TEU by 2050.

The range in 2025 will be between almost 4.5 million TEU and nearly 5.3 million TEU and by 2050 will be almost 6.0 million TEU to almost 9.8 million TEU, depending on economic growth scenario.

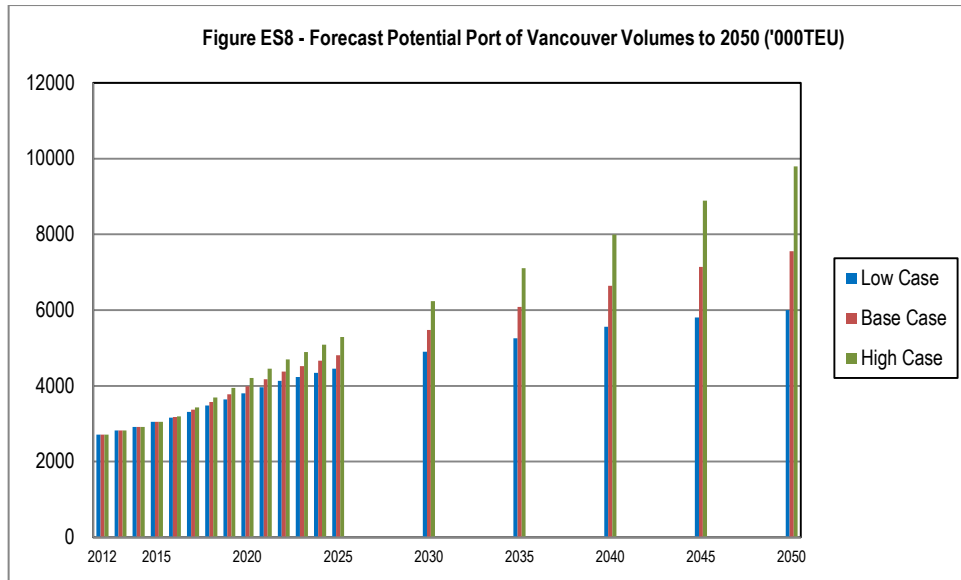
Table ES9
Forecast Potential Total Vancouver Volumes to 2050

- '000 TEU

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Total																					
Low Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3161.1	3317.4	3481.6	3643.7	3807.7	3966.0	4131.0	4236.1	4343.7	4453.7	4904.7	5259.9	5563.8	5809.8	5998.7
Medium Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3177.1	3371.9	3577.4	3780.5	3986.7	4178.8	4380.2	4520.2	4664.3	4812.6	5479.4	6082.5	6645.3	7139.8	7552.7
High Case	2514.3	2507.0	2713.2	2825.5	2912.9	3054.5	3192.8	3435.4	3693.7	3950.1	4212.1	4450.7	4702.9	4892.3	5089.0	5293.2	6233.7	7108.0	7994.7	8894.8	9793.3

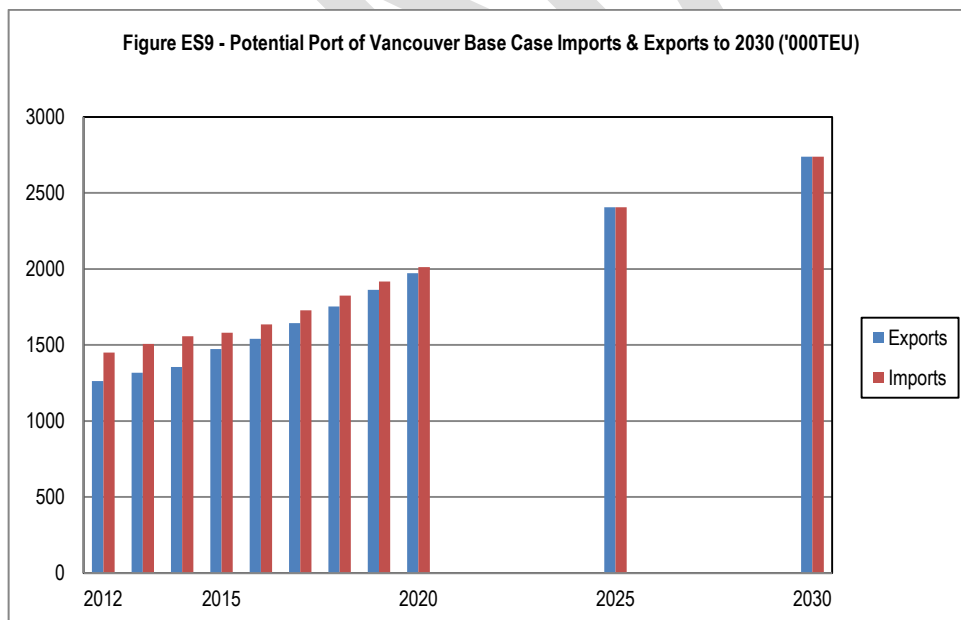
Includes empties

Source: Ocean Shipping Consultants



A summary breakdown of imports and exports under the Base Case demand is also shown in Figure ES9.

It is important to note that there is some discontinuity in the forecasts developed to 2025 and the much longer-term projections. The period 2025 to 2050 adopts a scenario-based approach and is to be regarded as a snapshot of potential demand only.



Comparison of Forecasts by CAGR

Table ES10 compares the annual growth rates (CAGR) for the following regions and time periods, with assumptions and conclusions added:

- North America, Pacific Northwest Region and the Port of Vancouver are listed. The Pacific Gateway region (Vancouver and Prince Rupert) is excluded because historic data is unavailable for Prince Rupert as the facility only opened during 2007.
- The Port of Vancouver has matched the North American growth for the period 2000 to 2015 but surpassed the demand generated by the Pacific Northwest region.
- Between 2016 and 2025, and also for the 2025 to 2050 period, the Port of Vancouver will continue to see its total container demand growth surpass projections for North America and the Pacific Northwest region.
- North America, the Pacific Northwest region and the Port of Vancouver are all mature markets, which is reflected in the lower growth in overall terms (if compared to emerging or developing economies).

Table ES10
Comparison of Annual Growth Rates of Total TEU - Historic Container Demand and Projected Volumes

North America			Pacific North West Region			Port of Vancouver		
Time Period	Scenario	Average Annual Growth Rate	Time Perio Scenario	Average Annual Growth Rate	Time Period Scenario	Average Annual Growth Rate		
2010-2014	Historic	3.7%	2010-2014 Historic	2.2%	2010-2014 Historic	3.7%		
2015		5.5%	2015	4.6%	2015	4.9%		
2016-2025	High Scenario	4.1%	2016-2025 High Scenario	5.0%	2016-2025 High Scenario	5.7%		
	Base Scenario	3.1%		Base Scenario		3.9%	Base Scenario	4.7%
	Low Scenario	2.3%		Low Scenario		3.1%	Low Scenario	3.8%
2026-2050	High Scenario	2.4%	2026-2050 High Scenario	2.4%	2026-2050 High Scenario	2.5%		
	Base Scenario	1.7%		Base Scenario		1.7%	Base Scenario	1.8%
	Low Scenario	1.1%		Low Scenario		1.1%	Low Scenario	1.2%

Source: Ocean Shipping Consultants

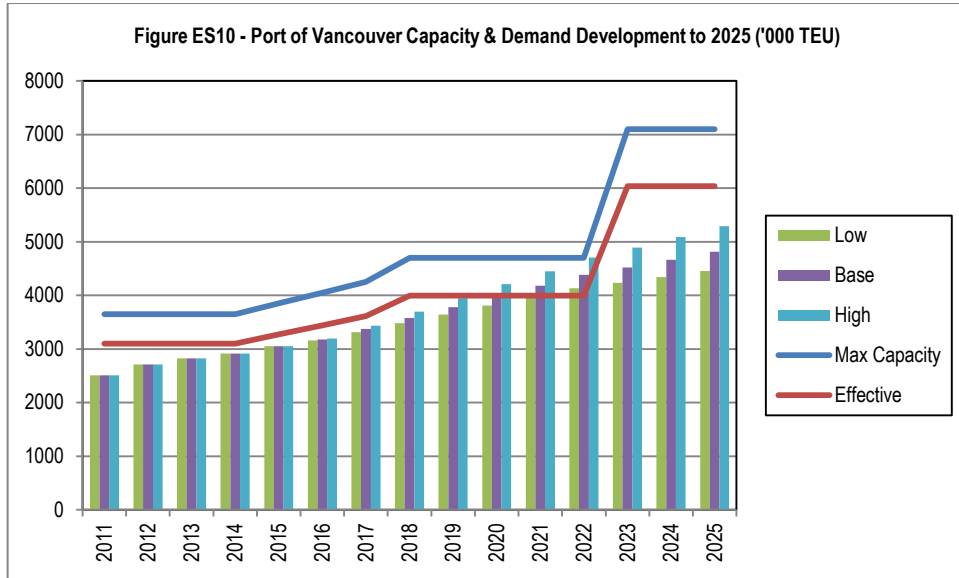
Supply-Demand Analysis at the Port of Vancouver

The scope of this Report is not to conduct a detailed capacity analysis of the Port of Vancouver container terminals. However, it is still very useful to offer a summary of the projected supply-demand position to 2025.

Figure ES10 compares the Port of Vancouver container forecasts with known capacity at the port to 2025.

An effective utilisation rate of around 85 per cent of the maximum or “design” of terminal capacity typically indicates less than optimal use and the first signs of congestion and is shown.

It should be noted that there is already a pressing need for further investment in capacity at container terminals in Vancouver if potential demand is not to be lost.



Key Conclusions for the Port of Vancouver

- The Port of Vancouver remains a highly-competitive option for import and export container volumes moving forward.
- By 2025, the port’s terminals are projected to be handling over 4.8 million TEU per annum in total (under the Base Case growth scenario), compared to the 2015 confirmed total of just over 3.0 million TEU.
- Continued growth of Asian imports moving to local markets but also to more distant US and Canadian discretionary areas will continue to grow through the port’s competitive intermodal and transportation costs, supported by exports from British Columbia.
- The Port of Vancouver enjoys a highly competitive cost structure for serving eastern Canada and the US Midwest based upon ability to berth the largest vessels, competitive handling charges and relatively low cost intermodal links to the east.
- However, the Port of Vancouver will need intermodal rail capacity to continue to serve these important locations and it must be concluded that there is already a pressing need for container terminal investment if further potential demand is not to be missed.