

Container Shipping Growth and Industrial Real Estate Demand in Greater Vancouver: 2005-2020

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Synopsis: Avison Young researched the potential impact that the planned container shipping expansion in Greater Vancouver will have on demand for industrial land and warehouse space. Presented as a range of possible outcomes, our findings suggest that extra warehouse demand between 2005 and 2020 could increase annual absorption by 10% to 50%. This range is large, as it depends upon several variables -- explained in the report -- that are difficult to forecast including whether the ultimate goal of tripling present container traffic is reached, the extent of efficiency increases to warehouse operations and the percentage of future container traffic processed in local warehouses.



E. & O.E.: The estimates and analysis contained herein are based on sources deemed reliable, but are not guaranteed by Avison Young. This report offers a perspective on how pending container traffic increases could impact demand for industrial land.





Background

Global economic integration combined with expanding Asian economies has contributed to a rapid growth in world trade. Container shipping has emerged over the past 20 years as a principal means through which goods move around the world.

Greater Vancouver has been perfectly placed to benefit from increased global container shipping, serving as a hub for trade between Asia and North America. The Asian economies need the raw resources and commodities that Canada offers while Canadians and Americans have developed insatiable appetites for all variety of Asian manufactured goods from shoes to semi conductors. All of these trade through Vancouver area ports. These trade trends are expected to accelerate in the coming years and Vancouver can expect steadily increasing container shipping traffic.

Indeed the Vancouver area ports and terminal operators, along with the BC government, have plans underway to triple container traffic throughput by 2020.¹ This would give the region yet another economic boost and has broader implications.

Container traffic expansion will impact the Lower Mainland's industrial real estate market. Some ports and terminals will require additional waterfront land to operate cranes, load and unload containers and provide facilities for lease to shipping companies. Shippers will need additional industrial lands to pack containers or process and store them, preferably on or near port facilities. More importantly, expanded container shipping implies that Greater Vancouver will convince more companies to establish warehouse - distribution facilities in the Lower Mainland, which will generate additional demand for industrial space.

In this report, we present estimates as to how much additional land and warehouse space will be required if Greater Vancouver area ports succeed in growing container traffic volumes from the present 1.9 Million TEUs (Twenty-foot Equivalent Units)² to between 5 and 7 million TEUs.

¹British Columbia Ministry of Small Business and Economic Development & Ministry of Transportation, *British Columbia Ports Strategy* (Victoria: 2005).

²TEU = Twenty-foot Equivalent Unit. A box 20' long, 8' wide and 8.5' tall. Most containers in use today are 40' long and therefore the equivalent of 2 TEUs.

Research, Challenges, and Methodology

Exactly how much land and the number and sizes of warehouses that will be required is difficult to anticipate. No comparable studies could be found on the amount of land required as container traffic expands in a given port city. Nor do any studies appear to examine the impact of the rise in container shipping over the past 20 years on industrial real estate markets (beyond discussion of warehouse design or logistics changes).

The lack of studies is partially owing to the high number of variables involved within and across different ports, cities and countries. Container related land and warehouse requirements is affected by different information technology utilization, road and rail configurations, operating hours, labour contracts, worker culture, crane sizes, and the sizes of ships served.

After considerable research and thought, we developed a workable way to estimate present and future container related demand. Because using comparable studies from other jurisdictions did not appear practical (even if it were possible) we developed a method based on local factors.³ In addition to reading any related reports we could find, we interviewed port and terminal executives and operators as well as warehouse distribution specialists in the Vancouver area.⁴ This gave us knowledge of local shipping patterns and warehouse characteristics which we used to approximate present-day container-traffic-driven demand for industrial real estate. We next researched changes underway in container shipping, warehousing, and world trade patterns in order to anticipate the likely characteristics of future container traffic through Vancouver.

Because most variables could only be estimated, we decided to offer our findings as a range of possibilities – explaining our reasoning – rather than as one definitive number. Although our findings can only be considered rough estimates, this report is designed to help those in the real estate industry as well as in the broader planning, development and business communities to consider the impact of container traffic expansion and land requirements. We explain our assumptions, calculations and analyses. And we invite feedback, suggestions or information that might allow us to refine our impact assessment.

³One valuable resource based on other jurisdictions was a telephone conversation with Michael McGowan formerly a real estate analyst with RREEF Research, now with Kensington Investment Group. He offered some useful ideas and information based on his experience analyzing California port cities.

⁴Numerous people also took time to answer our questions about ports, terminals, shipping and warehouses. We would like to thank: (in alphabetical order) Tom Corsie, Bill Corson, Christina DeMarco, Mark Griggs, Trevor Heaver, Tom Hutton, Alix Li, Darcy Scott, Barrie Sime, Tsur Sommerville, Morley Strachan, Bill Waters, Simon Weller.

Estimating associated warehouse / distribution space demand in 2005

Container Traffic in 2005

Containers arrive at approximately eight berths in four terminals in Greater Vancouver: Vanterm and Centerm in Burrard Inlet (adjacent to downtown Vancouver), Deltaport and the Fraser Surrey Docks. Table A below provides a snap shot of these different facilities.

TABLE A – PRESENT DAY CONTAINER TRAFFIC

Port	Present size (acres)	# of Berths	TEUs 2004	Container egress (road % versus rail)
Deltaport	160	2	910,000	55% rail 45% truck
Vanterm	76 acres	2	400,000	43% rail 57% truck
Centerm	72 acres	2	350,000	43% rail 57% truck
Fraser Surrey Docks	130	Approx 2 (several berths serve container as well as other cargo types)	250,000	Approximately: 40% rail, 60% truck
Total	438	8	1,900,000	50% truck – 50% rail

Industrial real estate in 2005

The Lower Mainland has approximately 155 Million square feet of industrial buildings (2005). Because it's impractical to survey every industrial site for warehouses and inquire whether the goods arrived or will depart by container, we developed a model for estimating the relationship between warehouse usage and container imports.

Our Model Explained

Step One:

Approximately 950,000 TEUs worth of containers annually are transported to or from Greater Vancouver's terminals by truck – half of the total annual container traffic. Industry analysts state that truck-hauled containers have destinations or origins within BC, the vast majority within the Lower Mainland. Long distance transport typically happens by rail. For our model, we assume that 90% of these truck-hauled TEUs (or 855,000 TEUs) are processed in Greater Vancouver. If we further assume that the goods involved all either start or end in warehouses, then we can devise a series of formulas to estimate warehouse space required.

Step Two:

To estimate the total amount of warehouse space required, we calculated the cubic feet of goods hauled in containers annually by multiplying the total TEUs (that we assume are reaching or leaving warehouses) by the cubic feet of a TEU container (which is 20 feet long, 8 feet wide and 8 ½ feet high). We also accounted for the fact that not all containers will be completely stuffed by assuming 90% space usage per container.⁵

$$855,000 \text{ TEUs} \times 20' \times 8' \times 8.5' = 1,162,800,000 \text{ cubic feet}$$

$$\times 90\% = 1,046,520,000 \text{ cubic feet}$$

Step Three:

To convert cubic feet into square footage of warehouse space requires establishing additional assumptions about warehouses and inventory, which we have separated into three steps:

Part A. Determine warehouse utilization or efficiency: We needed to know how much of the floor space in a typical warehouse is filled with product, and how much is aisles, loading areas, office space, etc. The consensus among industry analysts and warehouse operators with whom we spoke was that product fills approximately 25% of a warehouse. The remaining 75% is used for loading docks, aisles, offices, machinery, etc. Therefore we multiplied the cubic space required by 4.

$$1,046,520,000 \times 4 = 4,186,080,000 \text{ cubic feet}$$

Part B: Divide by Ceiling Height: In order to convert cubic feet of product into square feet of warehouse, we needed to determine an average ceiling height and account for space occupied by shelving or empty maneuvering room. Because most warehouses today have 30' ceilings, but some older ones are lower – and because most warehouses also will use shelves to stack or organize product -- we assumed 26' of space is used to store actual product coming from or going to containers.

$$\text{Total warehouse space required annually*}$$

$$= 4,186,080,000 / 26 = 149,502,857 \text{ sq. ft.}$$

*but not all at the same time.

Part C: Divide by annual inventory turn over: Warehouses turn over inventory multiple times per year. This number varies significantly depending upon the industry, product, warehouse operator, customer base, etc. In addition, owing to new warehouse

⁵Although inbound containers are likely stuffed, outbound containers may well be under-filled because of the lower demand and lower prices for containers heading from North America to Asia.

technologies and customer demands, this is constantly changing. Warehouse operators reported turn overs ranging from 4.3 times per year to 37 times per year, with most in the 10-14 range. We were unable to determine with confidence an average inventory turn over rate for Lower Mainland warehouses. Therefore, we decided to use a range of possibilities from 8 to 25 times per year for 2005. We then divided the total annual square feet calculated in step three by the turn over to reach an estimate of actual warehouse square footage required:

i.e.: $149,502,857 \text{ s.f.} / 8 \text{ turn overs annually} = 18,687,857 \text{ square feet}$ of warehouse occupancy related to container shipping in 2005.

Step Four: Convert warehouse space into acres: We assumed an average 45% site coverage.

i.e. $18,697,857 / 0.45 / 43560 = 953 \text{ acres}$

TABLE B – ESTIMATES OF SQUARE FOOTAGE REQUIRED BASED ON DIFFERENT INVENTORY TURN OVER RATES:

Annual inventory turn over	Warehouse square footage required	Acres
8	18,687,857	953
12	12,458,571	636
25	7,475,143	381

Estimate of warehouse space used 2005:
7.4 million – 18.7 million square feet (380 – 950 acres)

Adding Port-based Land Usage (Acres)

In addition to the warehouse space used by container shipping, the ports themselves require land for operations. As mentioned in Table A above, 438 acres are under use for container shipping.

Estimate of acres used 2005:
819 – 1391

Note: This excludes land used for rail yards and railway rights-of-way, and excludes any road rights-of-way that service warehouse or port facilities exclusively or almost exclusively.

The Next 15 Years

Greater Vancouver Land Use Trends

Because Greater Vancouver is land constrained some assumptions can be made about future port-related industrial expansion. First, developers and residents will continue to pressure for access to waterfront lands. Second, land prices throughout the region will continue to rise, pushing up industrial rental rates. Because of higher land costs and rental prices in Greater Vancouver, it's likely that future container traffic growth will be based on a higher percentage of containers being transloaded onto railcars for shipment to other jurisdictions with lower land costs for warehousing. Nevertheless, warehouse space demand in Greater Vancouver will still increase because of population growth, economic expansion, and container traffic increases.

Shipping Changes and Greater Vancouver

Because container ships are increasing in size Vancouver area ports and terminals will also want to expand their berth areas whenever possible. At inner city ports like Vanterm and Centerm, this may not be possible. However, expansions are planned at Deltaport.

Warehouse – Distribution Trends

New technology and new scientific approaches to logistics are changing the warehouse-distribution business. This will impact the amount of industrial real estate required by these businesses.

First, using Radio-Frequency Identification (RFID) allows warehouse operators to know the exact location of every item in the warehouse.

Second, automated conveyor belts can be used in conjunction with RFID to retrieve items from shelving. This can remove the need for extra wide aisles that accommodate forklifts, allowing for more efficient space utilization than 25% being used for actual product assumed today. Automation of this type may have the largest impact on reducing future warehouse distribution space requirements.

Third, improved just-in-time delivery approaches that use information technology to track supplies are reducing the amount of inventory required at any given warehouse at any one time, thus reducing real estate requirements. It should be noted that the needs of a company to provide good customer service often conflict with just-in-time delivery theories that aim to reduce the amount of goods on hand. As one electronics retailer noted, they need extra stock to handle sudden increased customer demand otherwise customers will buy the same product from competitors. For them, it does not make good business sense to be too frugal on stock storage. We believe this experience will be widespread and therefore expect just-in-time delivery to have only a modest impact on warehouse space demand.

Modeling Future Warehouse Demand

The Vancouver Port Authority estimates that 40% of all traffic by 2020 will depart or arrive at the docks by truck, down from approximately 50% today. This implies that the Port predicts future growth will be 65% in favour of immediate rail departure and 35% of growth will require some industrial land in the Lower Mainland.

We believe that 35% of future growth arriving or departing as local traffic from local warehouses to be a maximum that Greater Vancouver can expect, given land constraints and pricing. We therefore also modeled a scenario that assumes 25% of future growth will require industrial land in the Lower Mainland (with 75% of future containers departing or arriving immediately from elsewhere). Because much of the rail based growth would have to be based on US customers in places like Chicago, which involves cross-border trans shipment issues, we also do not anticipate more than 75% of future container traffic arriving or departing immediately by rail.

Therefore a reasonable estimate is that 25% to 35% of container traffic growth to 2020 will pass through Lower Mainland warehouses.

We also assumed that warehouse utilization will be higher by 2020 owing to the developments discussed above, increasing from approximately 25% to 33% by 2020. Inventory turn over rates are also expected to increase slightly and we have used 12-25 times per year as our assumption range.

TABLE C – ASSUMING 35% OF FUTURE CONTAINER TRAFFIC REACHES LOWER MAINLAND WAREHOUSES

Additional traffic in 2020 (TEUs)	TEUs using warehouse space	Total Cubic Feet	Turn over	Warehouse Space utilization ratio	Total warehouse cubic feet required	Ceiling Height	Total warehouse sq. ft. required	Acres
5,200,000	1,638,000	2,004,912,000	12	33%	501,228,000	26'	19,279,000	983.5
3,200,000	1,008,000	1,233,792,000	12	33%	308,488,000	26'	11,863,385	605.2
5,200,000	1,638,000	2,004,912,000	25	33%	240,589,440	26'	9,253,440	472.1
3,200,000	1,008,000	1,233,792,000	25	33%	148,055,040	26'	5,694,425	290.5

TABLE D – ASSUMING 25% OF FUTURE CONTAINER TRAFFIC REACHES LOWER MAINLAND WAREHOUSES

Additional traffic in 2020 (TEUs)	TEUs using warehouse space	Total Cubic Feet	Turn over	Warehouse Space utilization ratio	Total warehouse cubic feet required	Ceiling Height	Total warehouse sq. ft. required	Acres
5,200,000	1,170,000	1,432,080,000	12	33%	358,020,000	26'	13,770,000	702.5
3,200,000	720,000	881,280,000	12	33%	220,320,000	26'	8,473,846	432.3
5,200,000	1,170,000	1,432,080,000	25	33%	171,849,600	26'	6,609,600	337.2
3,200,000	720,000	881,280,000	25	33%	105,753,600	26'	4,067,446	207.5

Estimate of additional warehouse space needed by 2020:

4.0 million – 19.3 million sq. ft. (207 – 983 acres)

Estimate of total warehouse space required by 2020 for container-related use (existing from p. 5 plus future warehouse space):

11.5 Million – 38 Million sq. ft.

Additional Land Requirements for Ports:

Tripling container traffic will require more container berths, and therefore more industrial land dedicated to container berths. This is in addition to the 8 ports detailed in Table A. Table F outlines likely terminal growth.

TABLE F - VANCOUVER AREA PORTS EXPECT THE FOLLOWING GROWTH:

Port	Acres of expansion anticipated	Additional Berths expected
Lynnterm	0 (reallocating existing land)	2
Roberts Bank Phase II	200	2 or 3
Delta Port Terminal 3	50	1
Richmond Fraser Docks	200	2 or 3
Totals	450	7-9

Total additional acres required between 2005 & 2020 (port lands plus warehouse space):

650 – 1350

Total acres directly related to container shipping by 2020 (existing plus growth to 2020):

1450 – 2750.

Conclusions:

The majority of future container-traffic related growth in demand for industrial land and warehouses will occur in addition to “organic expansion” in industrial real estate requirements that will happen in Greater Vancouver as a result of expected population and economic growth.

Over the past ten years Greater Vancouver’s industrial real estate market has absorbed an average of 2,500,000 square feet annually. Given that vacancy rates have held steady in Vancouver, this absorption roughly equates to new supply.

Our findings here suggest that container expansion could generate the need for an additional 260,000 and 1,200,000 square feet of warehouse space annually.

Significant increase in warehouse demand ahead?

If the lower-end of our estimates proves to be correct, it would represent a modest increase in warehouse development of 10%. However, if future container-related warehouse demands are near the higher ends of our estimates, or 1.2 million square feet per year, this could generate a 50% increase in demand for new warehouse facilities over a typical year, in each year from 2005 to 2020.

Impact on existing industrial space users:

Given present shortages of labour and materials – as well as land -- this could further drive up construction costs and therefore lease costs for new facilities. As a result, rental rates on existing facilities should also edge upwards.

Implications of new demands for geographically constrained region:

Greater Vancouver is land constrained. Already this region has the lowest industrial real estate vacancy rate in North America at 2.2%. Future potential industrial land is under pressure for residential, park and other uses. With the region's population expected to reach approximately 3 million by 2020, demand for land for a variety of uses –retail, office, industrial, residential, park, roadway, etc. -- will increase, putting pressure on planners, city and provincial officials to provide enough industrial land to meet the needs of container expansion.

For more information, additional copies, or to provide feedback, please contact:

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