
# The Use of Containers in Canada

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# Executive Summary

This report is the first phase of a two-phase study that describes container usage in Canada. As such, it describes the flow and use of containers and was commissioned to identify state of play, major issues and recommended areas for further study. Phase II will examine recommended solutions.

This report addresses the existing context, and provides a thorough understanding and description of container movements and logistics in Western Canada, in particular, as well as in Central Canada and the Atlantic Region. The study also provides several illustrations of best practices in similar situations in Canada and around the globe.

## Background

The background of the study relates to a need determine the volume of empty marine containers in Canada, and causal issues which are viewed by some as a significant lost transportation opportunity in terms of serving certain export markets. Exports from these regions tend to be of lower value and voluminous commodity-based products, and are currently generally moving in bulk, rather than container, mode.

Canadian ports were at the forefront of containerization, when it was first developed in the late 1960s and early 1970s. Today, largely because of the globalization of production made possible by the container, the Canadian market is comparatively small, relative to North America and the world, and is estimated at 4.6 million TEUs (including Canadian cargo moving through US ports), or just 1.5% of the global market of 323 million TEUs.

Since the beginning of the container era there has been an ongoing move towards larger and larger vessels. As of October 2006, there were 250 post Panamax vessels on order and due to be delivered by 2008. They are expected to be placed on the Europe–Far East and transpacific routes before finding their way onto secondary routes like the transatlantic or Suez express services. In September 2006, Maersk Line took delivery of the *Emma Maersk*, "officially" rated at 11,400 TEUs. Others have followed suit with vessels in the 10,000 TEU range.

These vessels will add substantial new capacity to the world's trade lanes and have an impacton rates, service patterns and, especially, ports. They will have gargantuan appetites for cargo, but import containers will continue to move by rail to distribution centres located near large consumer markets or transload facilities located close to ports. Railway companies will increase the amount of cargo moving in block trains. The availability of containers will largely be driven by the local consumer market and the presence of lucrative export cargoes.

# Twenty foot equivalent unit

[1] Peter Hunter, *The Magic Box: A History of Containerization*, ICHCA Canada, 1983.

## Container Flows

Much of North America's trade with Asia and Europe is heavily imbalanced in favour of high value imports moving east- and westbound, respectively. In general terms for every three loaded import containers arriving in Central/Eastern Canada from Vancouver, there is only one export marine container returning westbound loaded with exports. Of the other two empty containers available for loading, one container moves empty directly to Vancouver, while the other empty container is used for moving domestic product, most of which is Alberta- or Vancouver-bound. The repositioning of these marine containers for domestic traffic (DRP) is permitted under cabotage rules as long as the containers are used for one incidental move enroute to the port of exit. This is an efficient way to ship domestic goods moving to Western Canada from the east, although restricting the use to one domestic move may limit some transportation opportunities.

Stated more accurately, in 2005 30% of railed containers moved empty across Western Canada to Vancouver as shown below.

**CN&CP Units** **Rail Profile Central/Eastern to W Canada (Marine Containers)**

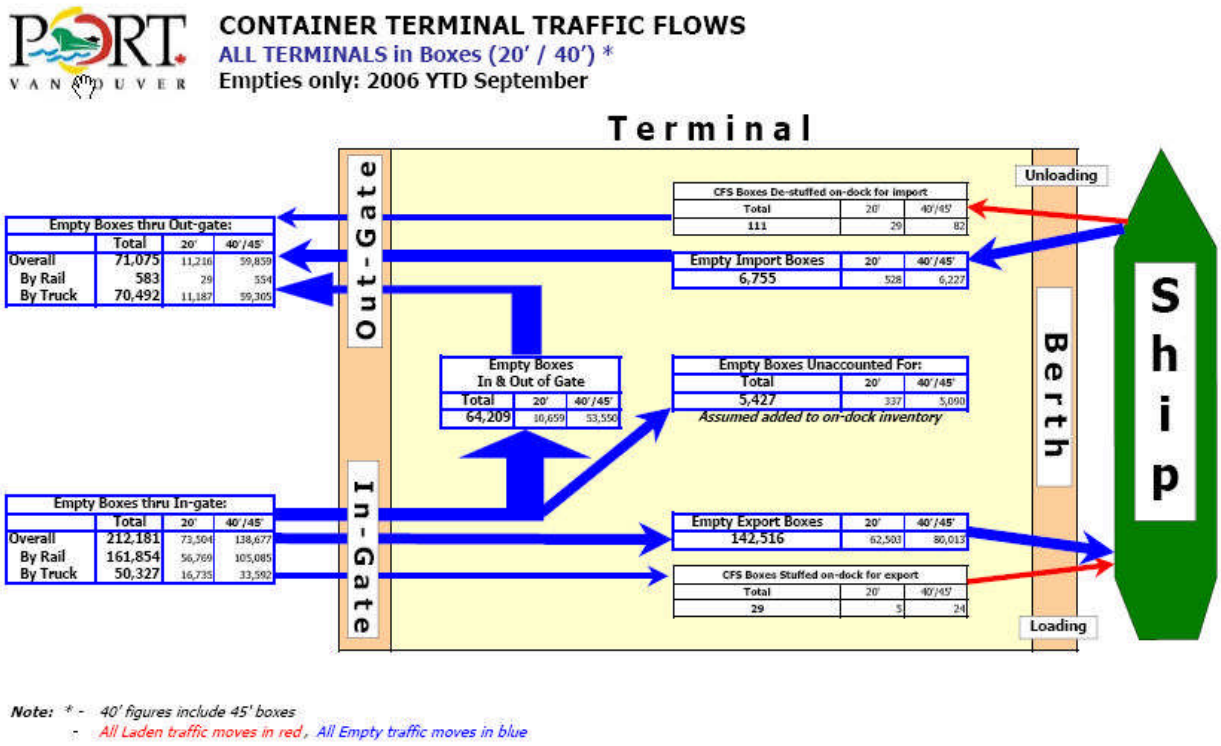
| Destination | | Export Loads | Empties | DRP Use | |
|---|---|---|---|---|---|
| BC | 20 | 42,526 | 30,665 | 3,910 | |
| | other | 74,023 | 54,408 | 21,425 | |
| BC Total | | 116,549 | 85,073 | 25,335 | 25% |
| AB | 20 | 5,044 | 1,641 | 7,379 | |
| | other | 5,813 | 4,550 | 47,848 | |
| AB Total | | 10,857 | 6,191 | 55,227 | 55% |
| SK | 20 | 973 | 4,238 | 1,553 | |
| | other | 620 | 1,082 | 5,152 | |
| SK Total | | 1,593 | 5,320 | 6,705 | 7% |
| MB | 20 | 1,345 | 1,260 | 2,811 | |
| | other | 1,240 | 1,154 | 10,319 | |
| MB Total | | 2,585 | 2,414 | 13,130 | 13% |
| TOTAL | | 131,584 | 98,998 | 100,397 | 330,979 |
| | | 40% | 30% | 30% | |

**Source:** CP & CN 2005 data

Of the roughly 99,000 empty container units shown above moving central/east to west, it should be noted that approximately 85,100 of these are moving directly to Vancouver. Only about 6,200 are Alberta-bound, just over 5,300 are Saskatchewan-destined, and approximately 2,400 are headed for Manitoba. Over 80% of loaded marine containers that are moving to Alberta/Saskatchewan and Manitoba are in (DRP) use.

Domestic cargoes move in a balanced way across most of Western Canada due in large part to the surplus of empty marine containers available. Domestic container fleets and their associated railway movements do not play a significant role in source load or transload alternatives for Western Canada.

The "empty container" situation is quite apparent in Vancouver. As the figure below illustrates, as of September 2006, Vancouver had evacuated over 142,000 TEUs of empty containers.




Source: Vancouver Port Authority

Of 1.2 million TEUs handled in Montreal in 2005, about 124,000 were empty. Theoretically, some of these boxes could be repositioned to the Prairies and loaded out with exports or they could be repositioned to the Maritimes for the same purpose, if the right economic and market situations existed.

Halifax has another perspective. Of 550,000 TEUs handled in 2005, some 80,000 were empties. But Halifax *needs* empties, mainly for reefer cargoes and some dry moves. Thus, many of its lines have to reposition empties from the Caribbean, Europe, Central Canada and even as far away as California.

## Shippers and Shipping Line Perspective

Feedback from shipping lines in Central Canada indicated that for most lines (and because it is the biggest consumer market in the country), Toronto is the largest source of empties. One line brings imports through Vancouver and keeps sending them eastward, where they exit the country through Montreal. Another sends them all the way to Halifax. Most are repositioned back to Vancouver (and occasionally Calgary or Edmonton). They rely on the railways' domestic repositioning programs for most of these moves.

The issue of shipping grain from the Prairies is problematic for some lines. As one shipping line told us:

> We are not interested in shipping grain from the Prairies. We pay about US $2.80 per 20 foot and US $4.00 per 40 per day for our containers. We need at least US $800 a box to make up for delays and make up empty rail rates to make it interesting to us. High volumes of exports from Asia make it tough to add more cycle time in a tight supply. We average US $3,000-$3,800 and up for a loaded import box depending upon origin and destination. If there is a surplus, it may be worth it; supply is tight—very tight. Containers flow much easier to the larger terminals. The other issue is there is not a great supply of 20 foot, which is what the grain shippers like. They cost us at least $100 per box to inspect and make sure the container is okay for food. So this is another problem. Also storage rates at the railway terminals mean we can lose our shirt on any delay and we need to move the containers out of the terminal right away, no matter if the shipper is ready to load. So this can cost more money.

Only two retailers spoke to the study team for this assignment. However, they were extremely representative of the prevailing situation with respect to port usage, transloads, use of 53 foot containers and domestic repositioning. For one retailer, out of a total of over 50,000 TEUs per annum, fewer than 1,500 are shipped empty from Calgary to Vancouver. The rest are shipped full, with either domestic cargo or exports.

Nor is cabotage, or the 30 day import rule, seen as a constraint on the creative use of import marine containers. As one shipping line executive told us:

> The existence of the 30 day rule has no apparent bearing on the supply of containers for grain exports. The attraction of export cargo is a function of low cost positioning to the point of loading, a compensatory freight rate and a destination in Asia which is a source of cargo. In the absence of these elements it is more cost effective for the marine carrier to send the container as an empty directly to the place in Asia where it can be used to generate the next high value revenue move.

## Opportunities

There are many economic and logistical impediments to shipping more bulk products in empty containers, such as the weight of product, container size and condition, market conditions, logistical issues and container supply. Nevertheless there could be opportunities to address the concerns of Prairie shippers in particular. Those that could be the subject of further study include:

### *Source load versus port load*

The cost differential between source load (which seems most desired on the part of Prairie shippers) and port loading, which seems the preferred option for shipping lines, needs to be examined. One study suggests the difference is especially acute in Saskatchewan, whereas it is about 6% in Alberta. It points out that special crops are not conducive to whole unit train movement and car allocation is an issue. There are several options in this regard:

#### Transload facilities development further inland

The current CN model of utilizing inland transload terminals (e.g. the new terminal in Edmonton) to ship product previously handled in carload, provides many advantages.

Product now flows in carload and is reloaded to containers for furtherance to ports for loading to a ship. This method of operation provides the opportunity for the steamship lines and railways to better utilize container capacity. A large proportion of the Canadian domestic reposition of marine containers flows into Alberta from Central Canada. From Alberta, those same loaded containers are made empty and forwarded to the Port of Vancouver. Rather than shipping empty containers to Vancouver, shipping lines could potentially send containers by truck to the transload point to load commodities originating from the Prairies.

#### Satellite terminals

CN and CP are moving away from the handling of empty marine containers at their largest intermodal terminals unless the empties are booked for immediate evacuation for account of the shipping line. Similarly, both railways are moving toward tightening the disciplines in the shipping of containers—through punitive storage rates, narrow receiving windows and truck reservation systems—so that laden containers have minimum dwell time either before being loaded on to a train, or after unloading. Positioning of these containers directly to satellite terminals closer to source load activities might provide a better supply of empties, assuming market conditions and economics are favourable.

#### Inland terminals

Another variation on both the transload and satellite terminal option would be to combine them with an existing inland terminal or create a new intermodal facility. The latter would require a) sufficient import volume to generate empty containers, or b) sufficient export volume to attract empty containers, as well as c) sufficient volume to pay terminal capital and operating costs as well as additional rail costs.

### *Shippers association, pools and co-ops*

The Midwest Shippers Association was created to assist smaller operators/growers located in the Midwest to market their identity preserved (IP) products to international markets and provide logistic and educational services to members.

A co-operative effort could be undertaken to reduce logistics costs for Prairie container shippers. The economic structures already exist on the Prairies for pooling or co-operative arrangements amongst shippers to reduce their overall logistics costs. These solutions could include a seasonal inland terminal for empty/laden storage/despatch, and other services.

#### Ownership of containers

Further to market influence, is the problem of a lack of suitable 20 foot containers, which is the preferred size for bulk loading. A fleet of these could be purchased and contract with the shipping lines to carry them. At US $1,850 per container, they are not costly. In this way, the backhaul would become the headhaul for the Prairie shipper and they could earn revenue by leasing the container to the shipping line for the return move, although this would only be minimal. The biggest issue would relate to equipment control in foreign countries including return of the containers.

# 1.0 Introduction

## 1.1 This Report

MariNova Consulting, along with our partners, Jonathan Seymour & Associates Inc (JS&A), CPCS Transcom, UMA Engineering and Logistic Marketing Services, undertook to examine the "Use of Containers in Canada." It is intended to examine all aspects of container usage on a national basis, with special concentration on the issue of empty containers access, empty repositioning, and empty evacuation to points overseas.

The study takes place in two phases; this report is Phase I and examines the current context of container movements within Canada, and identifies key issues to be examined more thoroughly in Phase II. Phase II, if it proceeds, will examine those key issues identified in Phase I, as well as potential opportunities and business models that can be pursued going forward.

This report addresses the existing context, and provides a thorough understanding and description of container movements and logistics in Western Canada, in particular, as well as both Central Canada and the Atlantic Region. The study also provides several illustrations of best practices in similar situations in Canada and around the globe.

Specifically, this phase is intended to:

- Describe the flow of international marine containers within Canada, focusing on empty container movements and repositioning, by region and province;
- Identify "nodes" of container-based logistical activity, including volumes;
- Provide a statistical analysis of inbound and outbound loaded and empty containers, including:
  - Inbound destination of containers by origin and outbound by country and province;
  - Source loading versus port loading;
  - Dry versus reefer;
  - Volumes by container size (20 foot versus other);
  - Port of entry and exit; and
  - Truck versus rail on-carriage movements;
- Identify key issues relating to the efficient use of empty containers and factors that limit full container backhaul movements, including cabotage and tariff restrictions; and
- Identify best practices as they exist in the US and Europe.

At the end of Phase I, Transport Canada will determine whether to proceed with Phase II, based on the findings and satisfactory conclusion of the first phase.

## 1.2 Stakeholder Consultations

As per the RFP and our proposal, we extensively consulted with various stakeholders. Most interviews were conducted in-person. These interviews are listed in Appendix A.

## 1.3 Structure of the Report

The remainder of this report is structured as follows:

- Section 2 provides some of the background to the study.
- Section 3 contains an introduction to the container industry, its history and genesis over the past 40 years, some of the global context in which steamship lines serving the Canadian market operate, as well as likely future growth scenarios. It also provides some context about the development of containerization in Canada.
- Section 4 deals with the State of Play amongst ports and terminals, in the Vancouver region, Montreal, Halifax, Saint John, and ports in Newfoundland. It provides data on cargo flows from an international perspective.
- Section 5 examines the State of Play for railways and intermodal trucking and provides an extensive container flow analysis.
- Section 6 looks at containerization from a regional perspective, specifically the West Coast, Prairies, Central Canada and the Atlantic Region.
- Section 7 examines key issues that have been identified in the course of the study.
- Section 8 suggests some possible business opportunities to pursue.

There are also four Appendices that include a list of those interviewed during Phase I, a literature review, an examination of best practices, and trade data.

# 2.0 Background

The genesis of the study relates to the movement of empty marine containers in Canada, which is viewed as less than optimal in terms of serving certain markets. The view amongst some observers was that 20-40% of marine containers are moved empty through Canadian ports to be repositioned back to markets such as the Far East and Europe, which are sending high value imports back to North America. (The percentage through the Port of Vancouver is currently around 14.5% in 2006 and Halifax was 13.0% in 2005). The movement of empty containers on Canada's road and rail networks is considered to be an inefficient use of intermodal capacity. The cost of storing empty containers at port and inland intermodal terminals also leads to inefficiencies. The railways have implemented a domestic repositioning program (DRP) that addresses some of these issues.

Much of North America's trade with Asia and Europe is heavily imbalanced in favour of high value imports moving east- and westbound, respectively. Exports to those regions tend to be of lower value and, in the case of the US, lower volume as well. Canada's exports tend to be more voluminous, but also lower in value, as they tend to be commodity-based. Thus, shipping lines will analyze whether it is more cost effective to quickly expedite the movement of an empty container back to Asia versus waiting to load a full container of a lower value commodity. In the US, many container lines would rather ship an empty container than risk damaging the container with a poor paying load of waste or scrap. In Canada, the situation is somewhat different because of the country's resource-based economy, but these commodities do not pay as well as import cargoes. Another factor relating to the feasibility and incentive to ship Canadian exports in containers is the low value of the product, of which the value of transportation constitutes a much higher proportion of the final price. At this time, the proliferation of final manufacturing in Asia and India is taking place at a staggering pace, which has led to a surge of import cargo from that region—the so-called "China Effect." This phenomenon will only moderate when the cost of labour and fixed assets escalates in those regions and/or demand in developed countries stabilizes or shrinks and/or trade restrictions impede any further development of trade.

The imbalance of full versus empty containers is exacerbated by the size of Canada and the fact that many exporters are located outside the main consuming regions. We therefore see the movement of empties from Toronto and Montreal, to the Prairies and Maritimes, to load out with export cargoes. One response has been the establishment of transload facilities near the Port of Vancouver. Importers send their marine containers to a transload facility, discharging up to five 40 foot containers into three trailers (or domestic 53 foot containers), for haulage either directly to a store or a regional distribution centre. The empty marine container is therefore immediately available to be loaded with export cargo or sent back overseas to load more imports. Likewise, an inland terminal, Coast 2000, located equidistant between the three main container terminals in the Port of Vancouver, brings empty import cargoes, from across the street at HBC Logistics, into its facility and then loads the container with export forest products. On the East Coast, even though Halifax's imports and exports are well balanced, the containers required for export are quite often repositioned empty or as a domestic intermodal move from Toronto and Montreal. This situation is beginning to change with the establishment of transload facilities in Halifax as well.

The establishment of transload facilities in Vancouver does not, however, fully address the needs of Western shippers, particularly those on the Prairies where there is a need for equipment to export specialty crops and forest products. In addition, many of these products have historically moved in 20 foot containers, rather than 40 foot and 45 foot units that carry most imports, and which have become more prevalent in world trade. At the Port of Vancouver, 79% of its traffic is 40 foot units.

The potential use of international containers may be restricted by Canadian tariffs, which allow marine containers to stay in the country for 30 days, with one incidental move for domestic carriage. Steamship lines have also begun to institute a demurrage charge after 14 days. This will serve as a revenue source much the same way it does for the railways rolling stock. This may be the beginning of a trend with marine container demurrage. Some observers argue that these restrictions promote the inefficient movement of empty containers at considerable cost. Others might argue that it imposes some discipline on the trade and Canada avoids accumulating the mountains of containers that can be found at some US ports because that country allows duty-free entry for up to one year.

In some respects, the current situation—vis-à-vis imports and exports and empty container movements—is very ironic. With container vessels getting ever larger and volumes of cargo growing at more than double world GDP, container carriers have made inroads into commodities and trades that were once the exclusive domain of specialty carriers catering to forest products and refrigerated cargoes. Their economies of scale and thirst for backhaul cargoes have driven rates down to levels that are very attractive to Canadian exporters of cargoes that would otherwise move in bulk. This trend is likely to continue, as more post-Panamax tonnage is ordered, and what some observers have called the Asian cargo tsunami continues to produce massive volumes of imports. However, as the import/export ratio stabilizes, the export box's price may increase simply due to the increased demand versus supply of the container.

# 3.0 Containerization

The invention of containerization is usually credited to a US trucker named Malcolm McLean, who first introduced it on a service from New York to Puerto Rico, and Matson Line, which operated from the US mainland to Hawaii. The concept of containerization may have actually been invented in Canada, when in 1953, the *William Carson*, built for Canadian National Railways, was outfitted to carry 3' x 2'6" containers on their service between North Sydney, Nova Scotia and Port aux Basques, Newfoundland. Five additional prototypes of 10' x 6'4" x 8'4" were built the same year. The Port of Vancouver claims the Canadian company, White Pass & Yukon, introduced the first purpose-built container ship on its route from North Vancouver to Skagway, BC in November 1955, carrying commercial 8' x 8' x 7' containers, each with a capacity of five tonnes.[1]

Like all revolutionary ideas, containerization had its doubters and sceptics, and as a result, the "revolution" did not take hold until the mid-1960s and early 1970s, even though it was considered "the most important development in international transport service since the change-over from sail to steam."[2] One of the reasons for the delay was the huge capital costs that ports and shipping companies had to incur to enter this new business.

## 3.1 The Global Container Industry

The container industry now spans the globe and about 90% of the world's general cargo is now carried in containers. The other 10% of general cargo (as distinct from bulk) is carried in forest products carriers, refrigerated vessels and car carriers. Of course, bulk carriers transport most of the world's bulk products, such as petroleum, sulphur, gypsum, coal, and indeed, grain.

The largest container ports in the world are Singapore at 23.2 million TEUs (20 foot equivalent units),[3] Hong Kong at 22.4 million, and Shanghai at 18.0 million (which is poised to break through 20 million by this year). The top 30 container ports in the world, as of 2005, are shown in Table 3.1, as follows.

[2] Ibid, p. 1.

[3] Twenty-foot equivalent units.

**Table 3.1: Top Container Ports, 2005**

| Port | TEUs (millions) | Port | TEUs (millions) |
|---|---|---|---|
| Singapore | 23.2 | Tianjin | 4.8 |
| Hong Kong | 22.4 | New York/New Jersey | 4.8 |
| Shanghai | 18.0 | Guanghou | 4.7 |
| Schenzen | 16.2 | Tanjung Pelapas | 4.1 |
| Busan | 11.8 | Laem Chebang | 3.8 |
| Kaohsiung | 9.5 | Tokyo | 3.7 |
| Rotterdam | 9.3 | Bremen/Bremerhaven | 3.7 |
| Hamburg | 8.0 | Xiamen | 3.3 |
| Dubai | 7.6 | Tanjung Priok | 3.3 |
| Los Angeles | 7.4 | Gioia Tauro | 3.1 |
| Long Beach | 6.7 | Algeciras | 3.1 |
| Antwerp | 6.4 | Yokohama | 2.9 |
| Quindao | 6.3 | Jeddah | 2.8 |
| Port Klang | 5.5 | Felixstowe | 2.7 |
| Ningbo | 5.2 | Dalian | 2.6 |

**Source:** *Containerisation International*

It is important to note that very few North American ports are on the list above and that the Canadian market is relatively small.

The container industry is still relatively new; even though it began in 1956, it only took root in the 1970s. It has gone through a number of metamorphoses since then, related to both the "business" side and in terms of its impact on world trade. It is a very dynamic and capital intensive business, both on the land side in terms of port investment, and the maritime side, in terms of fleet development. While intensely competitive with many players serving a myriad of markets, it does appear that the industry is in a period of consolidation as smaller companies are being swallowed up by ever larger ones. The two most notable developments of the past 12 months were the Danish-owned Maersk Line's absorption of the joint English-Dutch owned P&O Nedlloyd and the German-owned Hapag-Lloyd's purchase of CP Ships.

As of late 2005, before the mergers of Maersk/P&O and Hapag-Lloyd/CP Ships, the top 20 container lines in the world were:

**Table 3.2: Top Container Lines, 2005**

| Container Line | Ship slot capacity | Ships |
|---|---|---|
| Maersk Line | 1,005,554 | 399 |
| MSC | 713,808 | 264 |
| P&O Nedlloyd | 490,435 | 165 |
| Evergreen | 450,927 | 150 |
| CMA/CGM | 426,994 | 192 |
| APL | 322,520 | 106 |
| China Shipping | 304,788 | 108 |
| COSCO | 299,961 | 116 |
| Hanjin Group | 296,938 | 77 |
| NYK | 287,137 | 107 |
| OOCL | 236,018 | 68 |
| CSAV | 231,419 | 88 |
| MOL | 226,105 | 72 |
| K Line | 219,560 | 74 |
| Hapag-Lloyd | 215,694 | 57 |
| Zim | 210,407 | 90 |
| Hamburg Sud | 191,333 | 86 |
| Yang Ming | 189,939 | 68 |
| CP Ships | 179,209 | 76 |
| Hyundai | 142,257 | 37 |

**Source:** *Containerisation International*, November 2005

Based on 2005 data, Maersk Line, after its purchase of P&O Nedlloyd, now controls almost 1.5 million TEUs of ship slot capacity and either owns or charters 564 ships, placing it well ahead of second-place Mediterranean Shipping Company (MSC). After purchasing CP Ships, Hapag-Lloyd now has almost 400,000 TEUs of capacity and 133 ships and has vaulted to fifth place.

An interesting development of the past 10-15 years was the emergence of vessel sharing or slot-charter agreements amongst hitherto arch-competitors. Within these alliances, the various shipping lines still compete on price, but also on customer service, and, in some cases, their overall logistical packages. With container ships now costing more than US $100 million per new post-Panamax unit, and with a minimum of five ships usually required to start a new "string"[4] across the Pacific (for instance), the main benefit of these alliances has been the sharing of risk and capital cost, as well as the ability of alliance members to cover the globe with their service networks.

[4] A "string' is a series of ships required to maintain a weekly schedule on a given route. A route connecting north Asia with the Pacific North West (PNW) will require a "string" of five ships.

The container industry has also developed hand-in-hand with globalization.[5] Instead of having to fill a 5,000-10,000 tonne vessel, small shippers or producers only needed worry about filling a 20 foot or 40 foot container. However, as globalization has taken hold, and with the relocation of much of the world's manufacturing capacity to China and Southeast Asia, large shippers such as Wal-Mart have become dominant. This results in smaller shippers either being squeezed out or needing to combine forces and work with freight forwarders or third party logistics providers (3PLs).The largest shippers have enormous buying power and clout with shipping lines, railways and other parts of the supply chain. An estimated 70% of Vancouver's imports and a large proportion of its exports are controlled by third party logistics (3PL) providers. The largest US importer, Wal-Mart, shipped over 575,000 TEUs of cargo in 2004, or over 11,000 TEUs per week.

As of 2005, the world container fleet had surpassed the 21 million TEU mark, of which 20.1 million are maritime units.[6] There were also another 892,000 of so-called "regional' containers in use around the globe, of which 137,000 units or 342,000 TEUs were in North America. Of this total, an estimated 6,000 units are owned and operated by Canadian railway and trucking firms and a further 5,000 or more units are operated by Canadian retailers.[7]

Of the total 21 million containers in use, about 6.2 million are 20 foot units, or 47.2% of the fleet, and 50.5% of the fleet are 40 foot units. The rest is made up of 45 foot units and "others." The share of maritime 20 foot units has been declining and can probably be expected to continue to decline. Likewise, the use of 40 foot high cubes (9'6") is also increasing and accounted for 38.2% of all maritime containers in 2005.

There are many different types of containers, including dry containers, reefer containers, open tops, flats, and tank containers. Dry containers can be 8'6" or 9'6" high cubes, as can reefers. Within these types of containers are many permutations and combinations, from 20 foot standard to 40 foot high cubes. Especially important to certain regions of Canada, dry freight equipment makes up 93% of the global fleet, while refrigerated containers account for just 6% of TEU capacity and 5% of units, with 708,000 units in service world-wide. The price of a new 40 foot high cube reefer is currently US $17,500 compared with US $3,150 for a typical high cube dry 40 foot box. Twenty foot dry units are US $1,850.[8]

At the time the World Container Census was taken, the total number of marine (as opposed to domestic intermodal and swapbodies, etc.) containers amounted to 19.8 million TEUs. Total ship board slots amounted to 9.42 million TEUs, for a ratio of 2.1:1.

On the domestic side, there are 45 foot, 48 foot and 53 foot units (which are also 8'6" wide) in use in North America, as follows:

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[5] Frank Broeze, "The Globalisation of the Oceans: Containerisation from the 1950s to the Present," *Research in Maritime History*, No. 23, 2002.

[6] *Containerisation International*, World Container Census, 2006, Market Analysis.

[7] Email from Andrew Foxcroft, *Containerisation International*, to James Frost, 25 October 2006, augmented by e-mail correspondence from major Canadian retailer.

[8] *Containerisation International*, September 2006, p. 39.

**Table 3.3: Number and Percentage Share of Units, by Length**

| Length | Units | Share by Unit |
|---|---|---|
| 45 foot | 7,596 | 5.5% |
| 48 foot | 58,880 | 42.8% |
| 53 foot | 67,520 | 49.1% |
| Other | 3,508 | 2.6% |
| **Total** | **137,504** | **100.0%** |

**Source**: *Containerisation International*, World Container Census, p. 7.

The North American *domestic* fleet is rapidly switching from 48 foot to 53 foot units. As of 2005, 53 foot units comprised roughly 49% of the domestic fleet, compared with almost 43% for 48 foot units. Thus, about 8% of the fleet is 45 foot units and "other".

Most of the North American domestic fleet is owned by railroads and "combined transport operators" such as Oceanex on the East Coast. Truckers such as Yanke, Clarke, Armour, Maritime-Ontario, and retailers such as Canadian Tire also own these units, the latter of which has a fleet of about 3,000 units. HBC Logistics used to own its own fleet of 53 foot units but has sold them to CP Rail.

## 3.2 Future Developments

There are several trends impacting container shipping in 2006. They include:

a) *A trend towards larger and larger vessels*. As of October 2006, there were 250 post-Panamax vessels on order and due to be delivered by 2008. To put this in perspective, assuming eight ships in a Far East-Europe rotation and a five-ship transpacific rotation, they would fill 15 new loops. They are expected to be placed on these two routes before finding their way onto secondary routes like the transatlantic or Suez express services. The vessels they replace, which are first generation post-Panamax units, may find their way onto those routes.

   In September, 2006, Maersk Line took delivery of the *Emma Maersk*, "officially" rated at 11,400 TEUs and the first of 12 such units to be built at their own shipyard in Odense, Denmark. It is by far the largest container ship ever built, at 397.71 m length overall, 56.40 m beam, 15.5 m draft and deadweight 156,907 tonnes, capable of 25.5 knots. Many observers speculate that the "real" capacity is closer to 14,500 TEUs.[9] CMA/CGM also has eight 11,400 TEU units on order, Hanjin has five 10,000 TEU ships on order, and COSCO has eight 10,000 TEU units ordered. Zim has broken from its Panamax tradition and placed an order for four 10,000 TEU ships and another four 8,200 TEU vessels. Most of the major lines have similar orderbooks.

[9] *Scandinavian Shipping Gazette*, September 1, 2005.


**Source:** Wikipedia

**Figure 1: *Emma Maersk*, launched, October 2006**

These vessels will add substantial new capacity to the world's trade lanes and have an impact on rates, service patterns and, especially, ports. They will first appear on Asia-Europe, then the trans-Pacific, then perhaps the trans-Atlantic. Their presence will have a cascading effect on other trades, as smaller tonnage finds its way onto routes that have hitherto been served by feeders.

b) *The China Effect*: The so-called "China effect" has had an enormous impact on world trade and container shipping. Shipping lines generally have healthier balance sheets than at anytime in the past ten years. Volumes on the two biggest trade lanes have risen substantially, driven by the trade with China. The Economist Intelligence Unit is forecasting China leading the way in terms of global growth, at 10.5% in 2006, falling to 9.3% in 2007. China's industrial output helped fuel an average container increase of over 10% at the top 100 container ports world-wide in 2005. Most of the largest ports in the world, in fact, had much larger increases in the 20-30% range. It is now a well-established fact that world trade outpaces global GDP growth, and that container shipping outpaces world trade.

According to Drewry Shipping Consultants, most of China's exports are finished goods, which are shipped to North America and Western Europe in containers.[10] The latest wave of Foreign Direct Investment (FDI) in China has been in the electronics sector. The next wave will be driven by the relocation of another industry to China. The question is: which one? Many observers are speculating it will be autos.

The growth in Chinese trade has resulted in massive increases in container throughput at its own ports. Over the past decade, the number of containers handled at China's ports has increased 1,360%, from 3.1 million to over 45 million. From 0.2% of world container throughput in 1980, it now accounts for 14.4%. Shanghai handled 1.5 million TEUs in 1995, 5.6 million TEUs in 2000, and 18.0 million TEUs

[10] "Global Shipping Insight—Forward Thinking on the China Factor," Drewry Shipping Consultants, July 2004.

in 2005. The country has a massive share of container cargo moving in the major east/west trades, including Asia/US (52%), US/Asia (33%), Asia/North Europe (45%), North Europe/Asia (43%), Asia/Mediterranean (48%), and Mediterranean/Asia (27%).

c) *The revival of all water services to the US East Coast:* Congestion on the West Coast has led many carriers to re-introduce all water services from the Far East to the US East Coast. These services typically transit the Panama Canal and turn around at New York. Shippers appear willing to sacrifice faster transit times for slower, more reliable service.

d) *Mergers and Acquisitions*: Maersk's purchase of P&O Nedlloyd signalled another round of merger activity. At the very least, it shook up the existing alliance structure, as P&O Nedlloyd was a member of the Grand Alliance, which calls at Vancouver and Halifax. Maersk was reported to be as much interested in PONL's vessel orderbook as its trade routes and cargo volumes. Another company, CP Ships, that was seen as an acquisitor in 2004, was itself acquired by Hapag-Lloyd in late 2005. There are other large and strong shipping lines which may see the need to get larger to thwart Maersk's dominant market share, which went from 13% to 22% world-wide.

e) *Terminal Operators and Global Capital Markets*: Container terminal operators are attracting the attention of global capital markets. P&O Ports was sold to Dubai Ports World earlier in 2006, and Goldman Sachs purchased the assets of Associated British Ports. The North American terminal assets of Orient Overseas International Limited (OOIL), including TSI in Vancouver and Global Terminals in New York, are currently for sale and Halifax's Halterm terminal was purchased by Macquarie ports for almost CAD $180 million. SSA of Seattle, which operates over 30 terminals world-wide, was for sale earlier in the year but was taken off the market.

f) *Suez Services:* The development of so-called Suez services may take the pressure off West Coast ports and provide alternative gateways for Asian imports from, and Canadian exports to, this region. The cut-off point seems to be the Hong Kong/Pearl River Delta region for ships to begin sailing west as opposed to being east-bound. As of June 2006, there were approximately 26 all water services from the Far East to the East Coast of North America and only three Suez services, including those operated by the Grand Alliance, Maersk Line, and China Shipping. In recent weeks, new direct services have been announced from the Indian sub-continent to the East Coast of North America.

g) *The Expansion of the Panama Canal*: Voters in Panama have voted to expand the Panama Canal by 2015 at a cost of $5.25 billion. The expansion of the Canal, which is operating at about 85% capacity, will create a new Panamax container vessel of 12,000 TEUs.

## 3.3 The Canadian Context

As mentioned above, Canadian ports were at the forefront of the container revolution.[11] Montreal had the first terminal in the country in 1968 and Halifax built the first common user facility a year later. Vancouver followed in May 1970. Montreal specialized in the North Atlantic and served the Quebec, Ontario and US Midwest markets, while Halifax served a number of trade routes, including the North Atlantic, as well as the Mediterranean, Caribbean, Far East and Australia/New Zealand. Vancouver primarily served the Far East, but also had services to North Europe via the Panama Canal.

Other ports were also in the container "game." Saint John, New Brunswick, which was served by CP Rail, specialized in Far East and Australia/New Zealand carriers, as well as the Mediterranean. For most of the 1970s and 1980s, it handled about half as much container cargo as Halifax. Quebec City was CP's container port in the St. Lawrence until it decided to shift to Montreal in 1978. St. John's, Newfoundland, entered the container business in the 1960s when various companies began using containers from Montreal and Halifax. The Newfoundland railway closed and was replaced by Terra Transport's domestic container service via North Sydney and Port aux Basques in 1981. The Fraser River Harbour Commission built a container terminal, capable of being expanded to 104 acres in 1973.

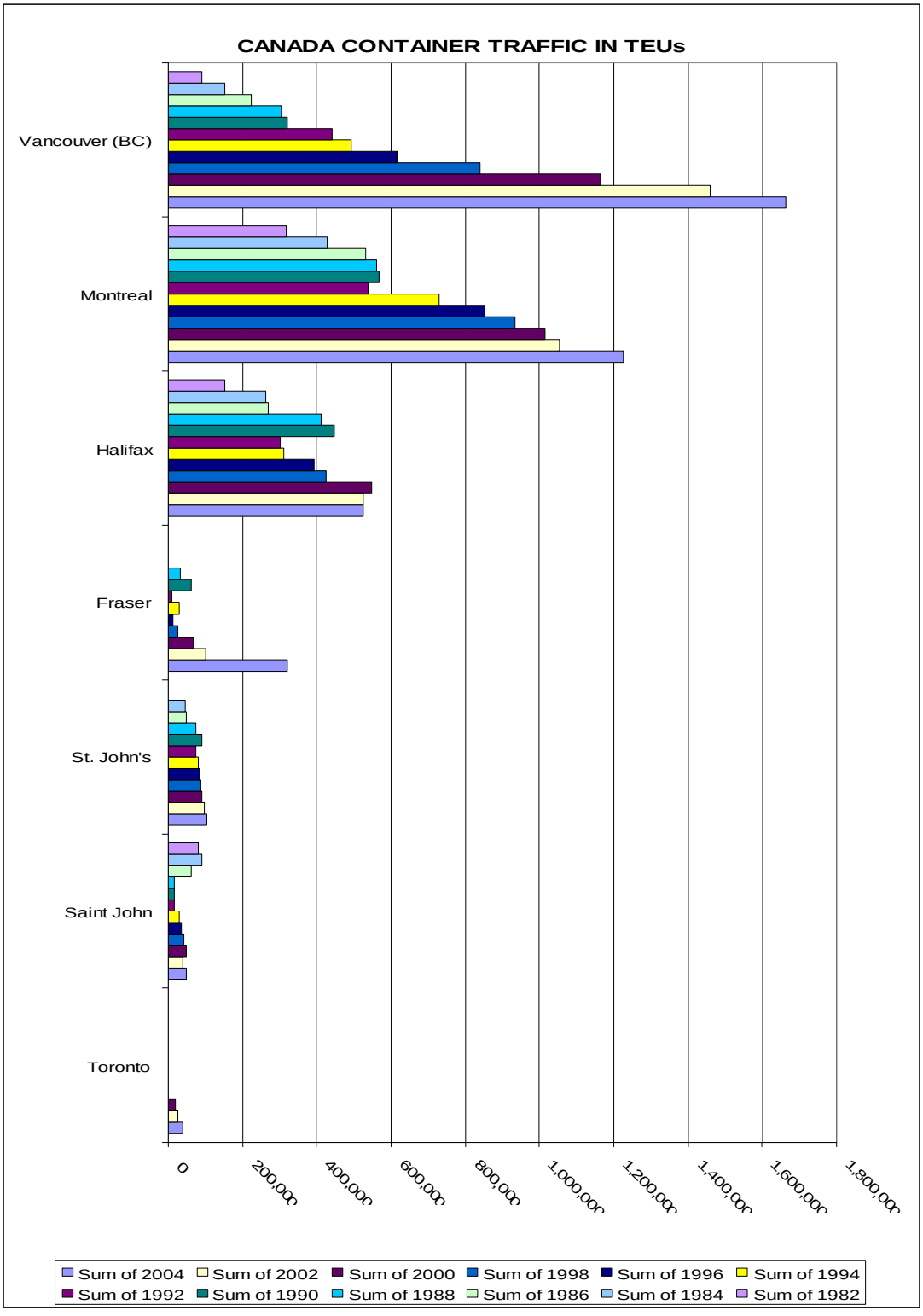
Montreal was Canada's dominant container port until the late 1990s, although Halifax threatened its hegemony in the late 1980s, when it came to within 50,000 TEUs in 1989. Vancouver was a distant third in Canadian port rankings until 1992, when the so-called "container clause" was removed from longshore labour's contract, and the Vancouver Port Authority (VPA) introduced incentives for vessels which called at the port on a first-in/last-out basis. After this, and combined with the rise in Asian imports, Vancouver surged ahead and was the first Canadian port to break the one million TEU barrier in 1999.[12]

Figure 2 illustrates Canadian container traffic since 1982. Figure 3 shows all Canadian container traffic over a 23-year period, from 1981-2004.

Canada-wide, 7.92% of all exports (by weight) were shipped in containers in 2003 and 11.32% of all imports (by weight) were containerized in 2003. The important thing to remember in this context is the value of containerized cargo versus bulk cargo.

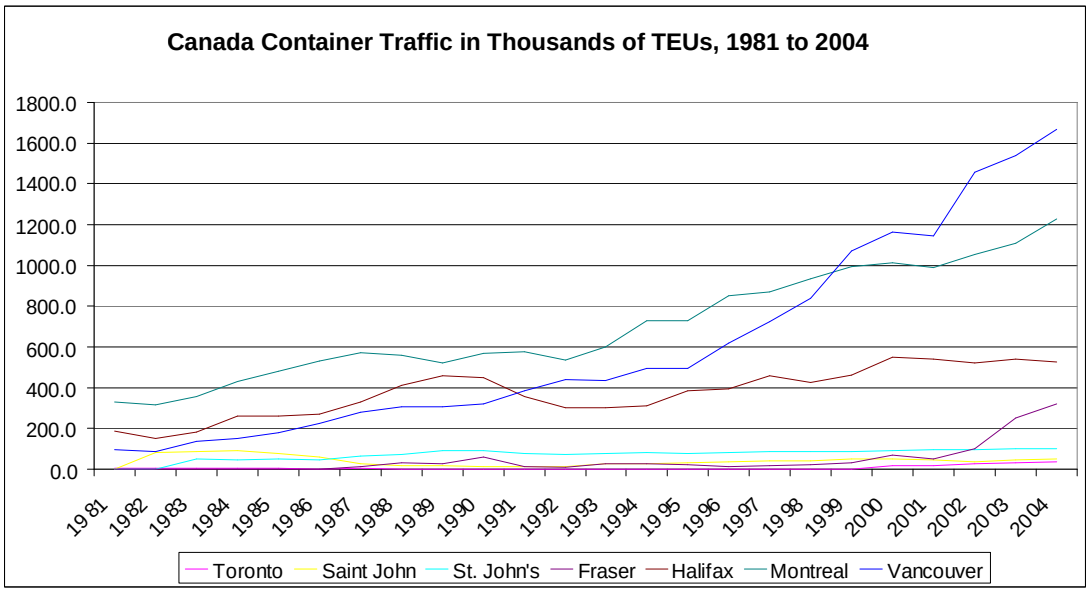
[11] Peter Hunter, *The Magic Box: A History of Containerization*.

[12] *Containerisation International* Yearbook, 1999.




**Source:** *Containerisation International* Yearbook, 2004

**Figure 2: Canada Container Traffic in TEUs**




**Source:** *Containerisation International* Yearbook, 2004

**Figure 3: Canada-Wide Traffic in Containers, 1981-2004**

The largest world-wide container trade volume is carried on the Asia-Europe route, followed by the trans-Pacific, but the biggest volumes on the latter route move through Los Angeles and Long Beach which, together, handled over 15 million TEUs in 2005. The total Canadian market is estimated at 4.6 million TEUs (including Canadian cargo moving through US ports), or 1.5% of the global market of 323 million TEUs.[13]

**Table 3.4: Canadian Container Ports and World Rankings, 2005**

| Port | TEUs | Rank |
|---|---|---|
| Vancouver | 1,767,379 | 51 |
| Montreal | 1,254,560 | 66 |
| Halifax | 550,462 | 109 |
| Fraser River | 372,844 | 126 |
| St. John's | 110,995 | 196 |
| Saint John | 49,950 | 237 |
| Via US ports | 500,000 est. | |
| **Total** | **4,606,190** | |

**Source:** *Containerisation International*

The Canadian market is comparatively small, relative to North America and the world. As the table above shows, Canadian ports were ranked as follows: Vancouver (51), Montreal (66) and Halifax (109), and handled some four million TEUs. By comparison, US ports handled 36.7 million TEUs in 2005.

[13] CI Online, Container Traffic, 2005.

As heavily regulated as the domestic shipping industry is in Canada, with duty, ownership, crewing, safety and Canadian flag requirements, the international industry operates in a virtual free market situation.[14] Indeed, it is difficult to imagine a more free market environment, with upwards of 26 shipping lines offering service from the West Coast to Asia as of October 2006. Having said that, it does operate with legalized cartels (conferences) and within alliances, but there are usually more lines operating outside the conference system than inside, so this tends to minimize the impact of any monopolistic tendencies. The marketplace, and the trend towards ever-larger and more numerous vessels, also tends to keep pressure on rates. This trend is likely to continue. As of October 2006, there are 643 new container vessels on order, of which at least 250 are post-Panamax units of 8,000 TEU or greater, including 12 x 11,400 units ordered by Maersk Line at US $125 million each.[15]

Unlike other industries and businesses, shipping rates have actually *declined* over time, both in real terms and on an adjusted basis. Industry veterans recall when a refrigerated container of scallops would be sent from the East Coast for US $7,500 15 years ago, but only fetch US $4,000 in 2006. For most items imported from Asia, the cost of ocean transportation is a minuscule portion of the overall cost of the product. For instance, a shipment of 6,000 pairs of sneakers will cost about US $3,000, or $0.50 per pair, which will then retail for $50-$100. While still comparatively cheap, especially since it is largely priced as backhaul, the cost for many Canadian products is proportionately higher because of the lower value of the products. A container full of 1,500 tires manufactured in Nova Scotia can be shipped for about US $2,500, or $1.65 each.

## The basics of shipping by container

Cargo moves to Canada from a variety of origins around the world, representing at least 15 different trade routes. Upwards of 25 container shipping participate in the Canadian trade. These lines are represented either through shipping agents or through their own offices located in port cities or major markets across the country.

Typically, a container will be loaded in Shanghai, with a shipment of sneakers to Toronto, for which the shipper has paid around US $3,500. The vessel sails, and arrives in Vancouver 13 days later. Once in Vancouver, the container is discharged, along with 500-1,500 others and is either moved directly to rail, or placed in a stack on the pier awaiting an empty rail car which has to arrive from Toronto or Montreal. When a rail car is available, the container is loaded and a train sets off for Toronto, where it arrives at either a CN or CP intermodal terminal approximately seven days later. In Toronto, the consignee arranges for a trucking company to pick up the container and deliver it either to a distribution centre, warehouse or directly to a store. The consignee's paperwork is handled by a shipping agent, customs broker, freight forwarder, or its own staff, depending upon how large an operation it is. From door-door, the whole operation can take as few as 3-4 weeks.

[14] J.R.F. Hodgson and Mary R. Brooks, "Canada's Maritime Cabotage Policy, 2004 and "Recent Developments in International Shipping Policy," 2003.

[15] PR News Service, Newbuilding Reports, October 30, 2006.

To get the container back to the Far East, the shipping line has several choices. It can seek a load in central Canada, find one on the Prairies, or send the container back to Vancouver, to either be loaded with cargo or sent back empty. For a load picked up in central Canada, in the most efficient operation, the container would be picked up immediately after having dropped off the import load (this is called triangulation). More likely, the container will go to a depot and then be moved when an export load is found. A trucker will pick up the container, take it to the shipper, have it filled with cargo and then take it to a railway intermodal yard. From there, the container will be sent back to Vancouver, where it will be discharged at the container terminal, where it will have a reservation on a particular ship.

Increasingly, containers are discharged from a ship, loaded onto a truck and drayed across Vancouver to a transload facility where the cargo is transferred into a 53 foot domestic container. In some respects, this does not seem as efficient as the operation described above. However, the shipper can achieve better productivity from a 53 foot unit than a 40 foot one. An added benefit, on both coasts, is having the marine container available for an export load where it is needed.

# 4.0 State of Play—Ports and Terminals

In this section, we will discuss the state of play in the Canadian container shipping industry as of Autumn 2006. It may be useful, however, to discuss some industry background. In section 3.0 above, we provided some background regarding the Canadian context. This section will describe the current state of play in Canadian ports as of the past 12 months.

Basically, there are three main players and several smaller ports that handle containers in Canada. The three main players are Vancouver, Montreal, and Halifax. Until the Hapag-Lloyd takeover of CP Ships in 2005, Fraser Ports was also emerging as a significant container port, but that cargo has been consolidated at Vancouver in 2006.

## 4.1 Vancouver

### 4.1.1 Port of Vancouver

Vancouver is Canada's largest container port, handling 1.7 million TEUs in 2005. It has three container terminals—two operated by TSI and one by Dubai Ports World. Both Vanterm and Centerm have recently been expanded and the environmental review process is underway to expand DeltaPort. The port is served by three Class 1 railways: CN, CP, and BNSF.

Vancouver primarily serves the Asian market as far as India. An estimated 26 carriers provide service between Vancouver and Asian markets, in the following consortia or vessel sharing agreements.

**VPA TERMINALS**
**CONTAINER LINES - WEEKLY CALLS**

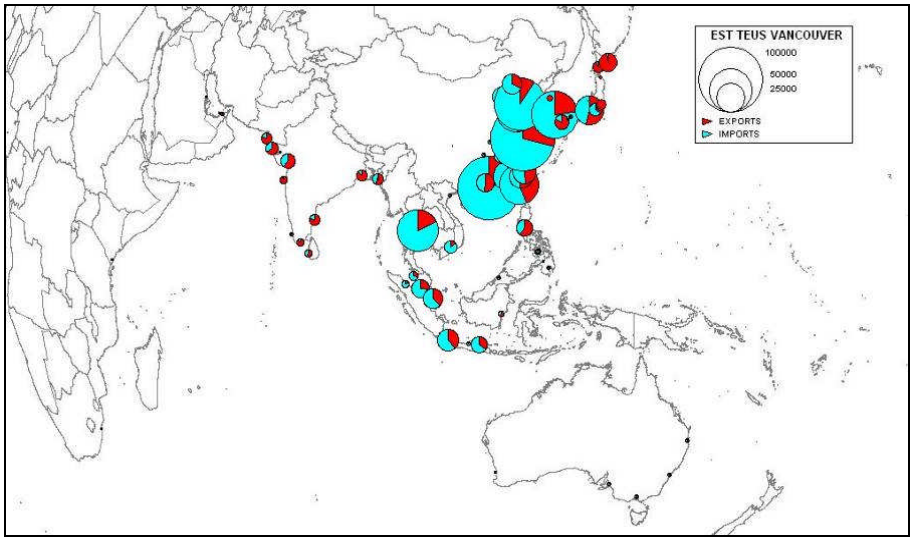
| CENTERM | VANTERM | DELTAPORT |
|---|---|---|
| **New World Alliance**<br>**PS1**<br>APL, MOL, Hyundai | **K-Line**<br>**KPNW**<br>K-Line, Yang Ming, Hanjin | **Evergreen**<br>**CPN +WAE**<br>Evergreen, Lloyd Triestino, Hatsu, CMA-CGM |
| **New World Alliance**<br>**WPNW**<br>APL, MOL, Hyundai | **New Grand Alliance**<br>**NWX**<br>OOCL, NYK, Hapag Lloyd, PIL | **Zim**<br>**AMP/FPOC**<br>Zim, CSAV Norasia, China Shipping |
| **New World Alliance**<br>**PS3**<br>APL, MOL, Hyundai | **Hanjin**<br>**PN-N**<br>Hanjin, COSCO, Yang Ming | **New Grand Alliance**<br>**PNX**<br>OOCL, NYK, Hapag Lloyd, PIL |
| **Westwood I + 2**<br>(alternate weeks) | **COSCO**<br>**PN-S**<br>Hanjin, COSCO, Yang Ming | **China Shipping**<br>**ANW**<br>China Shipping, CMA-CGM, Zim |
| | | **Maersk**<br>**TP3**<br>Maersk Sealand |

note: for string/schedule details, see container lines' websites

JS/TC MTs/lines1
October 28, 2006

**Figure 4: Vancouver Consortia and Vessel Sharing Agreements**

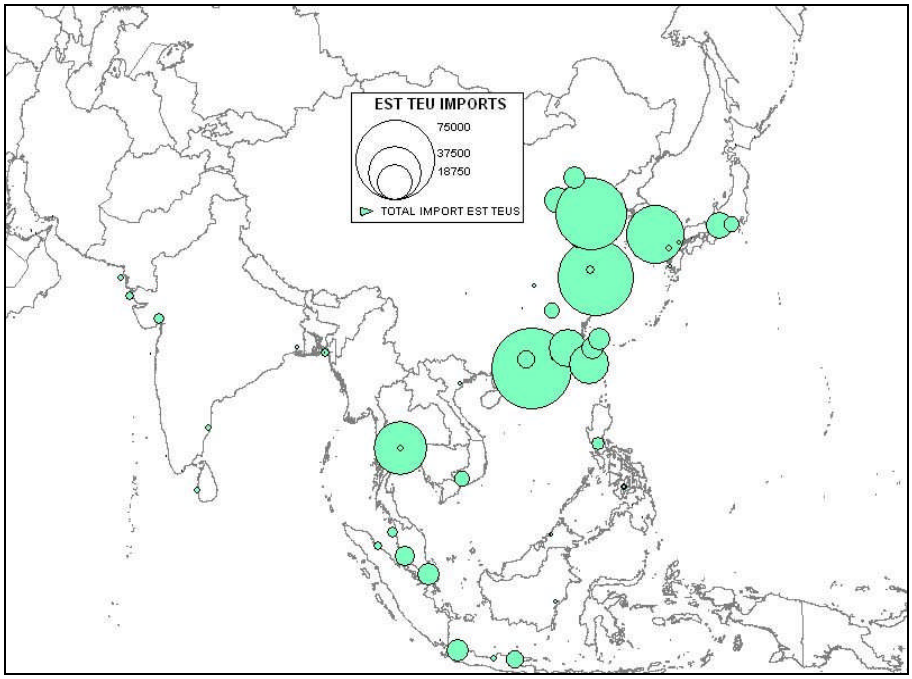
Figure 5 illustrates Vancouver's trade with various countries. The dominance of imported TEUs (light blue) to Vancouver as compared to exported products (red) shows the imbalance of imported goods entering North America through Vancouver.




**Source:** Transport Canada 2003

**Figure 5: Vancouver TEUs Export and Imports**

Vancouver's imports are spread across a relatively small geographic area, relative to Halifax, for instance. It is Canada's Asian gateway (see Figure 6).




**Source:** Transport Canada 2003

**Figure 6: Vancouver Total Imports TEU**

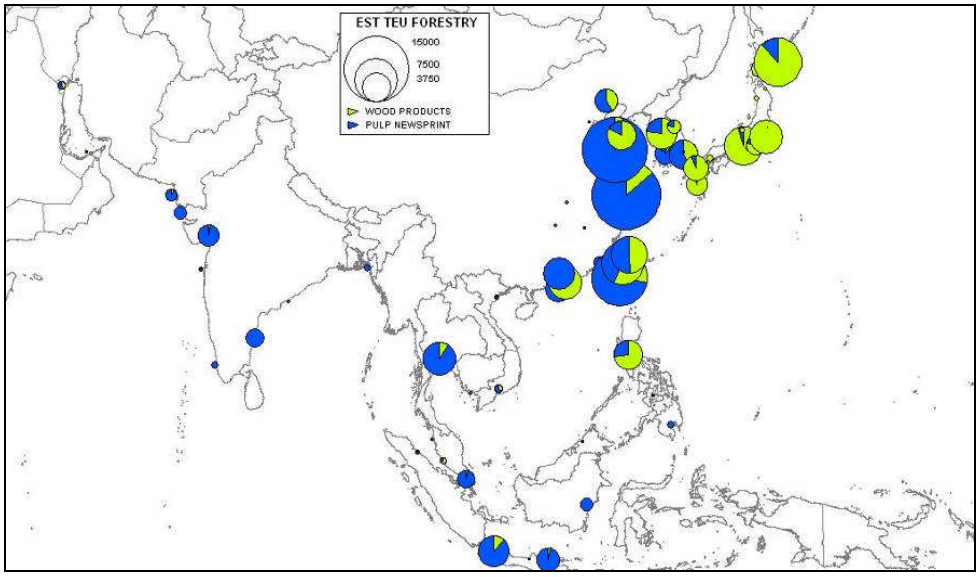
As most observers of Canada's port industry are aware, Vancouver is Canada's leading gateway for Asian cargo imported and exported into Canada. Figure 7 provides a glimpse at its importance to Canadian trade:

| | ALL DIRECTIONS | | | IMPORT DESTINATION | | | EXPORT ORIGIN | | |
|---|---|---|---|---|---|---|---|---|---|
| *IN METRIC TONNES* | 2005 YTD Dec | 2004 YTD Dec | %age Change | 2005 YTD Dec | 2004 YTD Dec | %age Change | 2005 YTD Dec | 2004 YTD Dec | %age Change |
| ***TOTAL - ALL REGIONS*** | **14,399,195** | **14,059,980** | **2.4%** | **5,992,462** | **5,400,201** | **11.0%** | **8,406,733** | **8,659,779** | **-2.9%** |
| ***TOTAL CANADA*** | **13,888,275** | **13,516,387** | **2.8%** | **5,663,716** | **4,991,541** | **13.5%** | **8,224,560** | **8,524,846** | **-3.5%** |
| *BC* | 7,117,467 | 7,568,127 | -6.0% | 1,914,184 | 1,796,502 | 6.6% | 5,203,283 | 5,771,625 | -9.9% |
| *ALBERTA* | 1,059,353 | 802,059 | 32.1% | 310,911 | 212,489 | 46.3% | 748,442 | 589,570 | 27.0% |
| *SASKATCHEWAN* | 121,213 | 99,648 | 21.6% | 13,989 | 9,861 | 41.9% | 107,224 | 89,787 | 19.4% |
| *MANITOBA* | 210,057 | 193,894 | 8.3% | 62,171 | 50,094 | 24.1% | 147,886 | 143,800 | 2.8% |
| *ONTARIO* | 3,307,021 | 2,920,953 | 13.2% | 2,101,371 | 1,839,380 | 14.2% | 1,205,650 | 1,081,572 | 11.5% |
| *QUEBEC* | 2,065,161 | 1,919,318 | 7.6% | 1,255,178 | 1,079,433 | 16.3% | 809,984 | 839,886 | -3.6% |
| *MARITIMES* | 6,912 | 7,755 | -10.9% | 5,627 | 3,540 | 58.9% | 1,285 | 4,215 | -69.5% |
| *OTHER CANADA* | 1,091 | 4,632 | -76.4% | 286 | 241 | 18.7% | 805 | 4,391 | -81.7% |
| ***TOTAL US*** | **496,671** | **533,076** | **-6.8%** | **328,602** | **408,057** | **-19.5%** | **168,069** | **125,019** | **34.4%** |
| *US WEST COAST* | 41,961 | 31,856 | 31.7% | 4,815 | 5,802 | -17.0% | 37,145 | 26,053 | 42.6% |
| *US MOUNTAIN* | 476 | 834 | -42.9% | 0 | 611 | -100.0% | 476 | 223 | 113.6% |
| *US MIDWEST* | 398,032 | 378,265 | 5.2% | 292,939 | 346,857 | -15.5% | 105,093 | 31,408 | 234.6% |
| *US NORTHEAST* | 39,669 | 79,299 | -50.0% | 30,041 | 29,280 | 2.6% | 9,628 | 50,018 | -80.8% |
| *US SOUTH* | 4,101 | 27,846 | -85.3% | 277 | 24,960 | -98.9% | 3,824 | 2,885 | 32.5% |
| *US OTHER* | 12,433 | 14,977 | -17.0% | 530 | 546 | -3.0% | 11,903 | 14,431 | -17.5% |
| ***MISCELLANEOUS*** | **14,248** | **10,517** | **35.5%** | **144** | **603** | **-76.0%** | **14,104** | **9,914** | **42.3%** |

**Source:** VPA

**Figure 7: Vancouver Gateway National Origin/Destination**

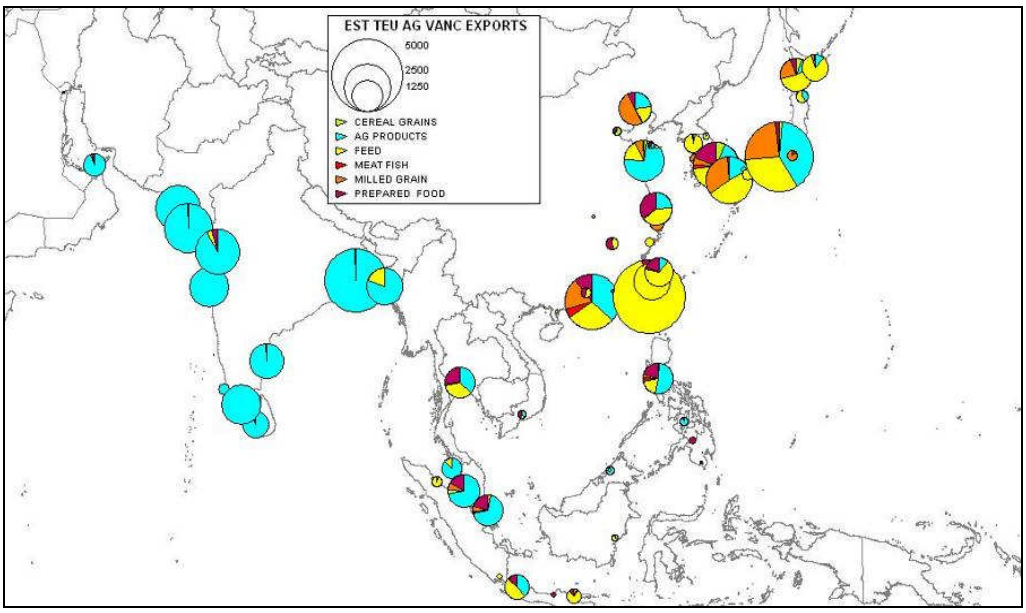
Forestry is the largest segment using containers. Figure 8 shows exports of forestry using containers comparing Wood (green) and Pulp (blue). Pulp shipments are the greatest to mainland Asia and Wood products to Japan.




**Source:** Transport Canada, 2003

**Figure 8: Vancouver Export Forestry Products TEU**

Figure 9 shows agricultural exports such as pulse, which are shown as light blue, feed (hay) shown in yellow, milled grains in orange, and prepared foods in purple.

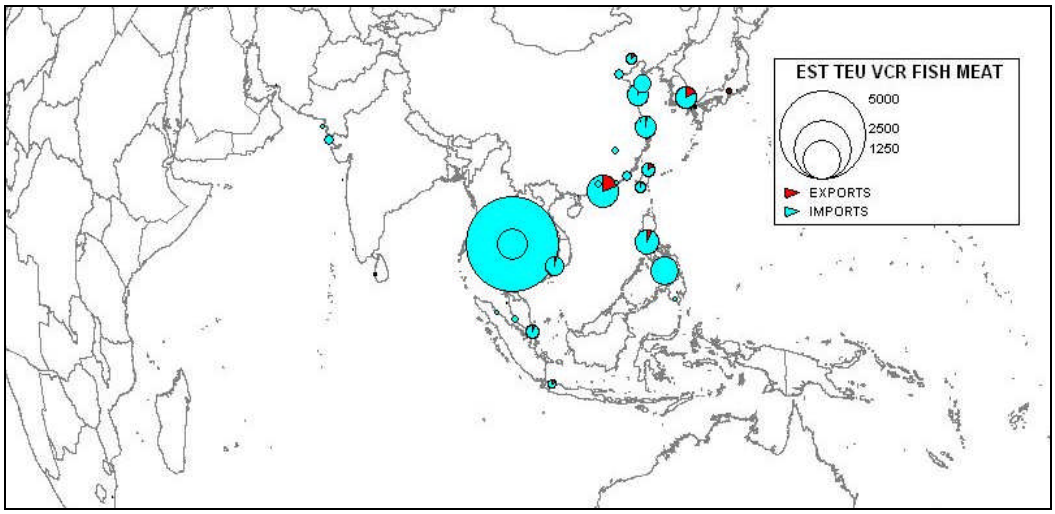



**Source:** Transport Canada, 2003

**Figure 9: Vancouver Agricultural Products Exported TEU**

This sector shows the diversity of agricultural exports to Japan as compared to pulses to India and other Southeast Asian countries. Also, feed is dominant to Taiwan.

Figure 10 indicates imported containers of fish products from Thailand. It also shows the imbalance as compared to exports of meat products to Asia.




**Source:** Transport Canada, 2003

**Figure 10: Vancouver Refrigerated Cargo**

There is some seasonality with respect to Vancouver's container shipments as well, as Figure 11 on the following page clearly indicates. Likewise, there is some seasonality in the movement of dry containers, as shown in Figure 12.

### 4.1.2 Terminals

The Greater Vancouver Gateway's primary deep-sea container terminals are Centerm, Vanterm and Deltaport. Extensive upgrades to both Centerm and Vanterm have increased the capacity of these two terminals to 720,000 TEU and 650,000 TEU, respectively. The ability to further extend either terminal is limited by site size, commitments to breakbulk operations, and surface access issues. Deltaport has a current capacity of 900,000 TEU. The planned third-berth expansion will increase throughput to 1.3 million TEU when complete in 2008. Roberts Bank is also the proposed location for the VPA's fourth container terminal.

| | ALL DIRECTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL | | | | LADEN | | | | EMPTY | | | |
| In TEUs | TOTAL | 20FT | 40FT | 45FT | TOTAL | 20FT | 40FT | 45FT | TOTAL | 20FT | 40FT | 45FT |
| **2004** | **69,673** | **1,549** | **68,074** | **50** | **69,641** | **1,549** | **68,042** | **50** | **32** | **-** | **32** | **-** |
| January | 5,272 | 105 | 5,160 | 7 | 5,272 | 105 | 5,160 | 7 | - | - | - | - |
| February | 4,945 | 103 | 4,842 | - | 4,945 | 103 | 4,842 | - | - | - | - | - |
| March | 6,017 | 133 | 5,884 | - | 6,017 | 133 | 5,884 | - | - | - | - | - |
| April | 5,315 | 189 | 5,124 | 2 | 5,315 | 189 | 5,124 | 2 | - | - | - | - |
| May | 5,620 | 178 | 5,442 | - | 5,620 | 178 | 5,442 | - | - | - | - | - |
| June | 5,636 | 170 | 5,466 | - | 5,636 | 170 | 5,466 | - | - | - | - | - |
| July | 5,114 | 120 | 4,994 | - | 5,114 | 120 | 4,994 | - | - | - | - | - |
| August | 5,526 | 121 | 5,364 | 41 | 5,526 | 121 | 5,364 | 41 | - | - | - | - |
| September | 5,379 | 103 | 5,276 | - | 5,379 | 103 | 5,276 | - | - | - | - | - |
| October | 6,569 | 93 | 6,476 | - | 6,549 | 93 | 6,456 | - | 20 | - | 20 | - |
| November | 7,725 | 105 | 7,620 | - | 7,713 | 105 | 7,608 | - | 12 | - | 12 | - |
| December | 6,555 | 129 | 6,426 | - | 6,555 | 129 | 6,426 | - | - | - | - | - |

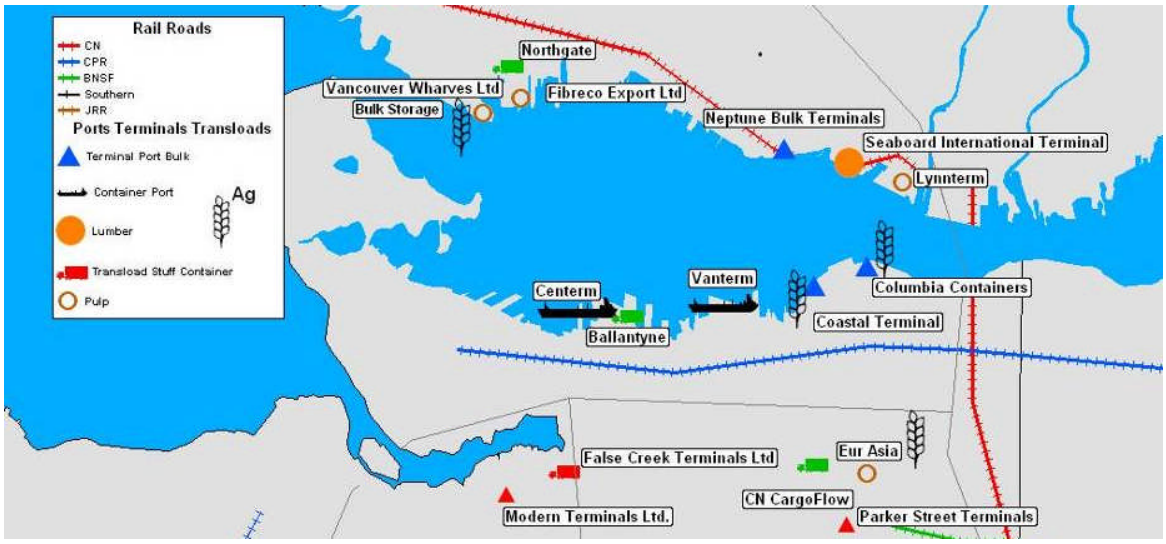
**Source:** VPA

**Figure 11: Vancouver Reefer Container Shipments, 2004**

| | ALL DIRECTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OVERALL | | | | LADEN | | | | EMPTY | | | |
| In TEUs | TOTAL | 20FT | 40FT | 45FT | TOTAL | 20FT | 40FT | 45FT | TOTAL | 20FT | 40FT | 45FT |
| **2004** | **1,595,234** | **257,469** | **1,260,628** | **77,137** | **1,407,821** | **219,736** | **1,131,956** | **56,129** | **187,413** | **37,733** | **128,672** | **21,008** |
| January | 119,187 | 19,437 | 94,636 | 5,114 | 106,973 | 16,593 | 86,418 | 3,962 | 12,214 | 2,844 | 8,218 | 1,152 |
| February | 116,950 | 17,990 | 93,434 | 5,526 | 104,823 | 16,430 | 84,152 | 4,241 | 12,127 | 1,560 | 9,282 | 1,285 |
| March | 135,222 | 20,239 | 108,714 | 6,269 | 119,831 | 18,043 | 96,676 | 5,112 | 15,391 | 2,196 | 12,038 | 1,157 |
| April | 119,038 | 18,415 | 94,678 | 5,945 | 106,804 | 16,648 | 85,516 | 4,640 | 12,234 | 1,767 | 9,162 | 1,305 |
| May | 145,138 | 24,084 | 113,658 | 7,396 | 131,826 | 21,199 | 105,132 | 5,495 | 13,312 | 2,885 | 8,526 | 1,901 |
| June | 141,114 | 23,888 | 110,048 | 7,178 | 120,739 | 19,336 | 96,286 | 5,117 | 20,375 | 4,552 | 13,762 | 2,061 |
| July | 135,600 | 22,449 | 106,162 | 6,989 | 116,615 | 17,773 | 93,532 | 5,310 | 18,985 | 4,676 | 12,630 | 1,679 |
| August | 146,188 | 23,415 | 115,332 | 7,441 | 125,242 | 18,525 | 101,702 | 5,015 | 20,946 | 4,890 | 13,630 | 2,426 |
| September | 129,955 | 20,928 | 102,250 | 6,777 | 114,037 | 16,619 | 92,884 | 4,534 | 15,918 | 4,309 | 9,366 | 2,243 |
| October | 139,226 | 21,917 | 110,028 | 7,281 | 120,494 | 17,964 | 97,508 | 5,022 | 18,732 | 3,953 | 12,520 | 2,259 |
| November | 133,746 | 21,780 | 106,318 | 5,648 | 120,454 | 19,997 | 96,704 | 3,753 | 13,292 | 1,783 | 9,614 | 1,895 |
| December | 133,873 | 22,927 | 105,370 | 5,576 | 119,984 | 20,609 | 95,446 | 3,929 | 13,889 | 2,318 | 9,924 | 1,647 |

**Source:** VPA

**Figure 12: Vancouver Dry Container Moves, 2004**




**Source:** LMS Marketing Services

**Figure 13: Burrard Inlet Terminals**

Contractual commitments between specific terminals and groups of shipping lines can result in instances where one terminal may be operating above capacity while another is operating below. The constituent strings provide frequent direct service between Vancouver and all major ports in China, Japan, Korea, Taiwan, etc., plus trans-shipment to all other Asian ports (and beyond).

The combined capacity of the three terminals in Vancouver is 2.25 million TEU, following recently completed upgrades. Actual throughput across the dock has grown from 1.15 million TEU in 2001 to 1.76 million in 2006. It is expected that the Vancouver terminals will collect at least a further 300,000 TEU annually from the Fraser-Surrey service realignment. In September 2006, it is understood more than 200,000 TEU were handled—which exceeds the design capacity, thus resulting in congestion and infrastructure issues which are being addressed by the Pacific Gateway Strategy, the Vancouver Port Authority, and terminal operators.

### 4.1.3 Rail intermodal terminals

Canadian Pacific Railway (CP) and CN each operate a Vancouver Intermodal Terminal, in Pitt Meadows and Surrey, north and south of the Fraser River, respectively. Rated lift capacity is 264,000 for CP and 120,000 for CN. It should be noted that these terminals handle both domestic and international container traffic.

Although direct rail service is offered between the three container terminals and the primary population centres, including Toronto, Montreal and Chicago, it is understood that system optimization may result in domestic and international blocs of intermodal cars being handled on a single train. The flows look like the diagram on the following page.

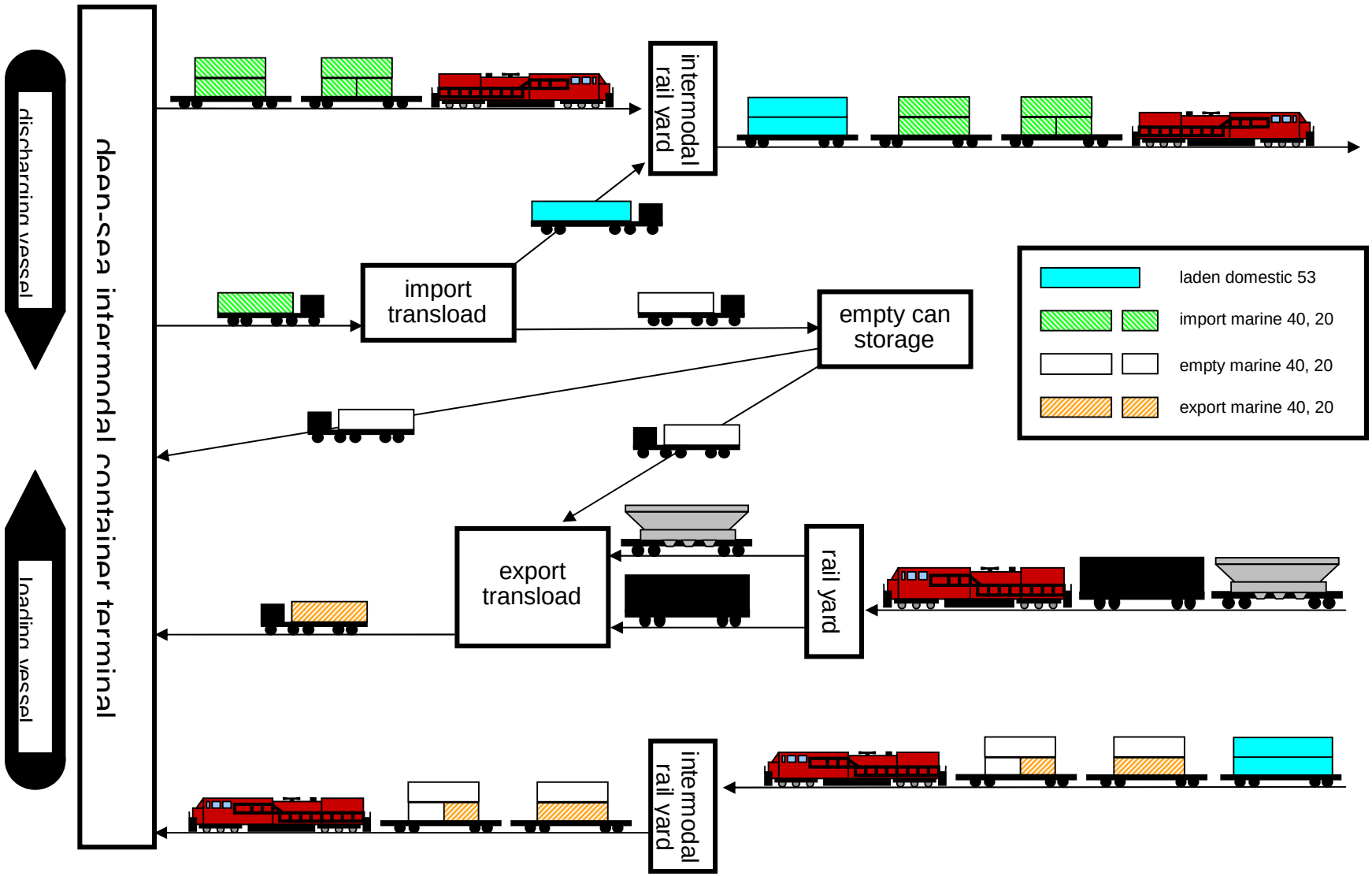



**Figure 14: Representative Intermodal Container Flows and Primary Nodes, Port Area (Vancouver Gateway)**

## 4.2 Fraser River

### 4.2.1 Fraser-Surrey

Fraser-Surrey is located opposite New Westminster on the main arm of the Fraser River. Access to the facility is constrained by the available draft over the Dees highway tunnel and by the extent of dredging undertaken to remove the deposited silt. In practice, the maximum draft is limited to 11.5m, which restricts scheduled calls to services deploying smaller ships.

The terminal's major customer for the last few years was CP Ships. Consequent to the sale of the line, this container traffic has shifted to Hapag-Lloyd's larger vessels—calling at Deltaport and Vanterm. Fraser-Surrey's container throughput, which had grown from 50,000 TEU in 2001 to 372,000 in 2005, dropped to 22,000 TEU in the second quarter of 2006. Current services include some of Hamburg Sud's Central/South American services, plus scheduled services to Australia and the Mediterranean. Historically, Fraser-Surrey's container role has been the servicing of niche players and feeder services.

### 4.2.2 Coast 2000

Coast 2000 was initially a joint venture of Fraser River Terminals, a forest products transload facility, and the VPA (engaged on a catalyst basis). The business model involved the development of a significant brownfield land base, and the co-location of a number of transloaders (import and export) around a container yard. The entire facility was being serviced by good highway, rail and marine (barge) links. The site selected was 90 acres on the Fraser River at the Fraser River Port Authority's Fraser Richmond site. The object was to permit a marine container to be stripped at one facility, and then stuffed at another, without an outside dray or distant empty storage requirement.

The site now houses Coast 2000, Western Canada Express (a 3rd party domestic repositioner), and Westrans (Canfor lumber), with a major importer expected to be in operation by end-2007. Only 12 acres remains uncommitted, and the project is some four years ahead of forecast. HBC Logistics is close by, but connected by a public road. A barge service between the deep-sea terminals and Coast 2000 is under active consideration. In keeping with the interpretation of its mandate, the VPA has sold its 50% stake in Coast 2000 to Western Stevedoring. Subsequently, Western Stevedoring was purchased by Stevedoring Services of America (SSA).

### 4.2.3 Prince Rupert

The Fairview container terminal is expected to open for business in late 2007. The Prince Rupert Port Authority expects to ramp up from 200,000 TEU total throughput to its Phase 1 capacity of 500,000 TEU over five years. Phase 2, if built, would see an increase to 1.5 million TEU in 2011. The small footprint of the terminal, combined with the local population base, has resulted in predictions that 80% of import containers will move to the US, with the balance moving to Toronto and Montreal. Exports, and the need for associated inland

terminals (if any), will depend on the port rotation of the shipping line(s) involved. At present, no line has committed publicly.

CN has tasked employees to develop export potential for Fairview. The new grain transload facility in Edmonton is part of this approach; it will have an initial capacity of 6,000 containers and could equally serve Vancouver or Prince Rupert. A forest products transload facility in Prince George is also under consideration.

## 4.3 Montreal

### 4.3.1 Port of Montreal

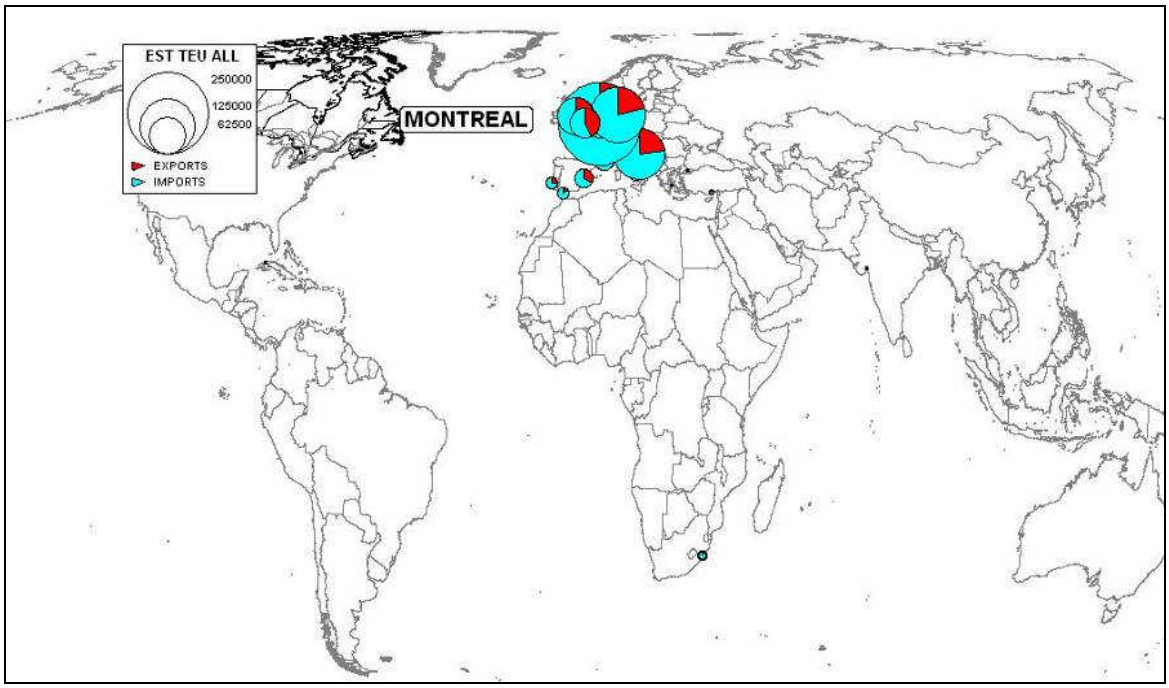
In 2005, the Port of Montreal handled 1,130,623 full TEUs and 123,937 empties. The port has four main container terminals: Cast, Racine, Termont, and Bikerdike. The Cast and Racine Terminals are operated by Montreal Gateway Terminals (now owned by Hapag-Lloyd) and handled the vast majority of the international container cargo in 2005, while Empire Stevedoring handled the majority of the domestic traffic on/off Oceanex vessels at the Bikerdike complex. Termont, a joint venture between Cerescorp and Logistec, had no regular lines calling in 2005 but has since acquired two MSC services, as well as acquired MSC as a partner.

In addition to these four container terminals, the port also owns two multipurpose terminals, a grain terminal with a storage capacity of 260,000 tonnes, 15 transit sheds for non-containerized general cargo and dry bulk, and a terminal at Contrecoeur, some 40 km away. The Port of Montreal also operates its own short-line railway with more than 100 km of track. They provide switching services to the terminals within the port and interchange with CN and CP.

Over 95% of the international traffic in 2005 was to/from ports in North Europe and the Mediterranean. Direct services are scheduled to the following ports in Europe:

- Antwerp (Belgium);
- Felixstowe, Liverpool and Thamesport (United Kingdom);
- Rotterdam (Netherlands);
- Hamburg and Bremerhaven (Germany);
- Le Havre and Marseilles-Fos (France);
- Cadiz and Valencia (Spain);
- Genoa, Livorno, Naples and Gioia Tauro (Italy); and
- Lisbon (Portugal).

The map below shows the overwhelming dominance of Europe in Montreal's trade.




**Source:** Transport Canada, 2003

**Figure 15: Total Montreal TEU**

Since 2006, MSC has offered a regular service to/from Freeport Bahamas that serves as their hub for Caribbean and South American cargo.

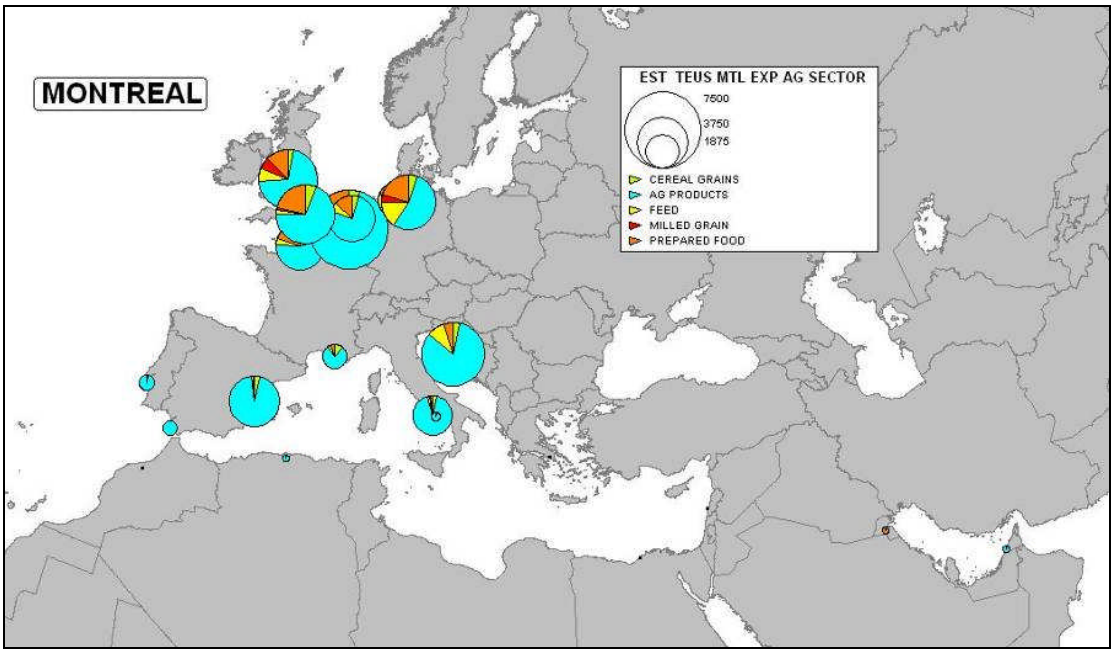
The commodity distribution for the containerized cargo in 2004 is shown in the following table. It shows among other things that grain products represented 8% of the total exports for the year.

**Table 4.1: 2004 Commodities by Tonnage**

| Commodity | Inbound | Outbound | Total | % of Total |
|---|---|---|---|---|
| Foodstuffs | 635,526 | 770,120 | 1,405,646 | 13% |
| Forest products | 392,409 | 982,114 | 1,374,523 | 13% |
| Various metal products | 723,886 | 496,422 | 1,220,308 | 11% |
| Chemical products | 436,858 | 271,572 | 708,430 | 7% |
| Iron and steel products | 454,478 | 212,135 | 666,613 | 6% |
| Construction materials | 474,374 | 112,821 | 587,195 | 5% |
| Vehicles and accessories | 277,754 | 237,528 | 515,282 | 5% |
| Grain | 34,777 | 406,472 | 441,249 | 4% |
| Textile products | 96,813 | 166,008 | 262,821 | 2% |
| Metal and non-metal ores | 90,212 | 135.168 | 225,380 | 2% |
| Miscellaneous | 2,134,195 | 1,309,863 | 3,444,058 | 32% |
| **Total** | **5,751,282** | **5,100,223** | **10,851,505** | **100%** |

**Source:** Port of Montreal website

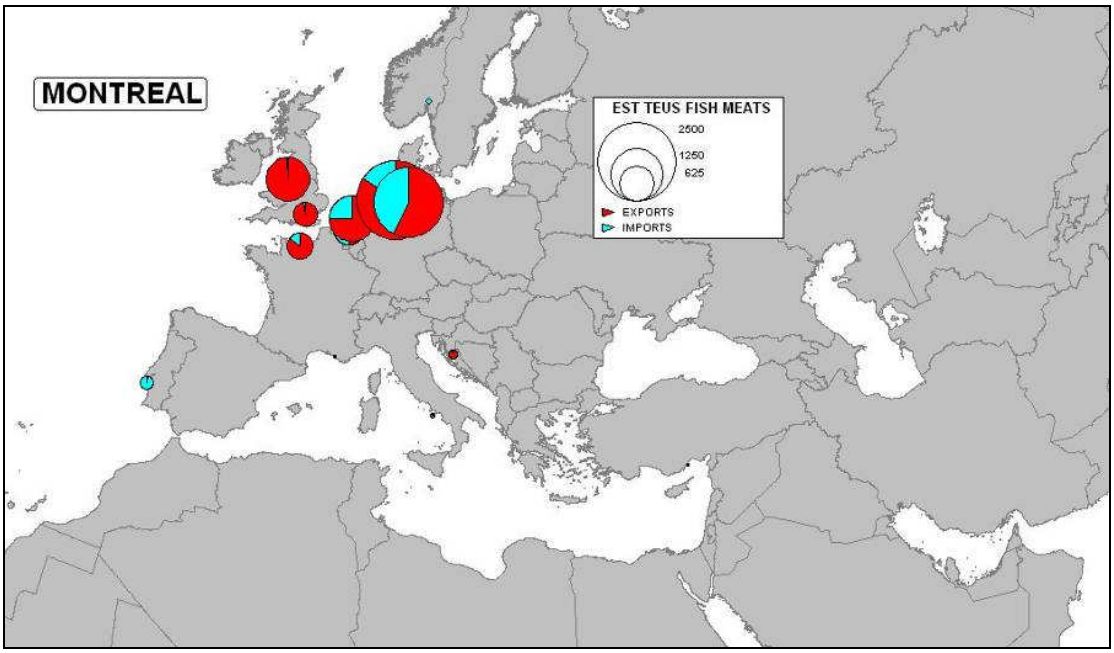
Montreal handles a large amount of agricultural products to a wide variety of countries, as shown below.




**Source:** Transport Canada , 2003

**Figure 16: Montreal Exports Agricultural Products**

It also handles refrigerated products to and from the markets shown below.




**Source:** Transport Canada, 2003

**Figure 17: Montreal Reefer TEU**

Approximately 55% of the containerized traffic moving through the Port of Montreal is carried inland by rail, mostly to and from markets in Ontario and the US Midwest. Some 45 trains per week are scheduled to/from the Port of Montreal.

Of the cargo trucked to/from Montreal, 246,000 TEU are destined/from the North Eastern US as follows:

| | |
|---|---|
| • Massachusetts | 127,500 TEU |
| • Vermont | 37,000 TEU |
| • Maine | 26,000 TEU |
| • Connecticut | 26,000 TEU |
| • New Hampshire | 18,000 TEU |
| • Rhode Island | 11,500 TEU |
| **Total** | 246,000 TEU |

The port is considered well balanced with about 10% of the total container traffic shipped empty even though the domestic traffic on Oceanex (78,000 TEU in 2005) is heavily imbalanced. The proportion of empty TEU is even lower for 20 foot equipment at 9.4%.

Montreal offers the shortest inland distances to the Canadian and US Midwest markets. Since icebreaking has enabled year-round navigation up the St. Lawrence River, it has been the favourite destination for European cargo into these markets and has enjoyed higher than average growth rates for the trades in which it participates. Despite draft limitations, maximum ship size has grown to 4,000 TEU with new purpose-built ship designs.

### 4.3.2 Montreal terminals

Since the acquisition of the Cast Group by CP Ships, both the Racine and Cast Terminals have been jointly managed by Montreal Gateway Terminals. Recently Hapag-Lloyd acquired CP Ships and now owns Montreal Gateway Terminals.

Cast Terminal's footprint is 62 acres and the terminal has four ship-to-shore gantry cranes. The terminal has on-dock rail with a capacity of some 130 double stacked railcars. It is located on berths 77 to 80 near the Louis Hippolyte Lafontaine tunnel exit and is at the east end of the port rail system.

Racine Terminal, originally the CP Ships' terminal in Montreal, occupies 68 acres and is equipped with five ship-to-shore gantry cranes. It can also accommodate 130 double stacked railcars; but on four tracks as the terminal shape is more elongated than the Cast Terminal. It is located on berths 57 to 64.

Both terminals use a combination of rubber tire gantries (RTGs) and front end loaders for stacking and handling on the terminal. In 2005, these two terminals handled nearly all the international containers for the Port of Montreal and had a record year at nearly 1.2 million TEUs. In 2005, these two terminals handled approximately 40,000 empty containers onto ships for repositioning back to Europe and the Mediterranean.

Empties are generally received from Toronto and Chicago with a small amount from Montreal. The terminal stores empties as required but has reduced empties' storage to less than 2000 TEUs and prices empty storage to discourage their storage on the terminals. Neither terminal operates a transload facility; this work is generally performed in off-dock facilities.

The Montreal Gateway Terminal's ratio of TEUs per lift is 1.6 and their average tonnage per loaded TEU was 10 tonnes.

Empire Stevedoring operates the Bikerdike complex and handles the containers for Oceanex, a domestic short sea service to Newfoundland with two sailings per week from Montreal. The terminal has two ship-to-shore gantry cranes and four RTGs. It is situated in an older part of the port on Berths 7 and 8. Their participation in international container traffic is small.

The Termont Terminal is situated at Maisonneuve Terminal, on Berths 66 to 70, between the Cast and Racine Terminals. It is now owned jointly by Logistec, Ceres and MSC. In 2005, the terminal had no business but expected to handle some 160,000 TEUs annually with the two MSC services that now call at the terminal. Their traffic is balanced with minimal repositioning of empties. As most terminals, they discourage the storage of empties on the terminal and no longer transload. The terminal's estimated capacity is 250,000 lifts.

## 4.4 Halifax

### 4.4.1 Port of Halifax

In 2005, Halifax handled 550,542 TEUs. The port has two major terminals, operated by Halterm and CeresGlobal, which handle over 90% of the port's container volume.

There is also as a container/breakbulk terminal operated by Logistec, which primarily serves the forest products and tire manufacturing industry and two shipping lines. Halifax Intermodal Terminal (HIT), owned by CN, is a domestic intermodal terminal.

While its overall volume is modest compared to Vancouver and Montreal (and most of its US competitors), Halifax serves a broad hinterland, as shown below.

**Table 4.2: Markets Served by Halifax**

| Market | Volume (TEUs) |
|---|---|
| Atlantic Region | 90,000 |
| Quebec | 110,000 |
| Ontario | 130,000 |
| US Midwest | 95,000 |
| Newfoundland | 40,000 |
| New England | 15,000 |

**Source:** MariNova estimate

The port's cargo moves by a variety of modes:

**Table 4.3: Mode of Transport**

| Mode | Percentage |
|---|---|
| Rail | 67% |
| Road | 22% |
| Short sea | 11% |

**Source:** Halifax Port Authority

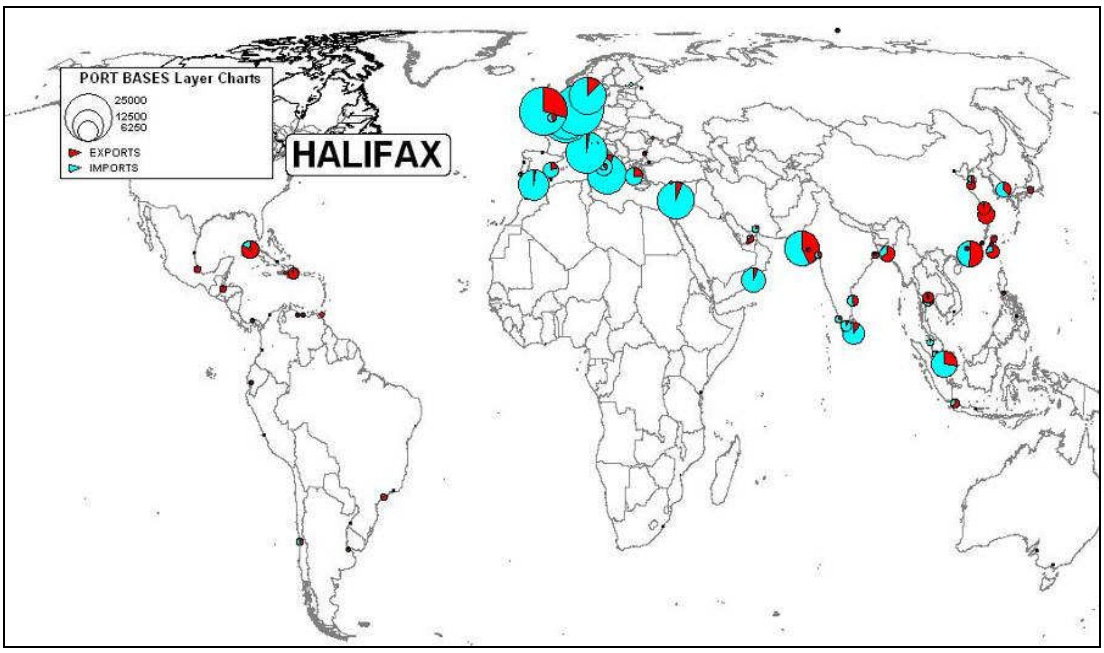
Halifax has a very wide range of services. It has direct links to all markets except South America, Africa, and Australia/New Zealand, although these markets are served on a transshipment basis. It has services either within alliance structures or individual lines, to the following regions:

**Table 4.4: Routes Served through Halifax**

| Trade Route | Service |
|---|---|
| North Atlantic | ACL, Hapag-Lloyd, OOCL, NYK, EWL |
| Scandinavia | ACL, Eimskip |
| Mediterranean | Zim, Costa, Hapag-Lloyd, OOCL, NYK, Melfi, CSCL |
| Middle East | Zim, Hapag-Lloyd, OOCL, NYK, NSCSA, Maersk |
| Indian sub-continent | Maersk, Hapag-Lloyd, OOCL, NYK, Indotrans |
| Far East | Zim, Hapag-Lloyd, OOCL, NYK, Indotrans, NSCSA, Maersk, CSCL |
| Caribbean | Zim, Melfi, Costa |
| South America | Zim, Maersk |

**Source:** Port of Halifax website

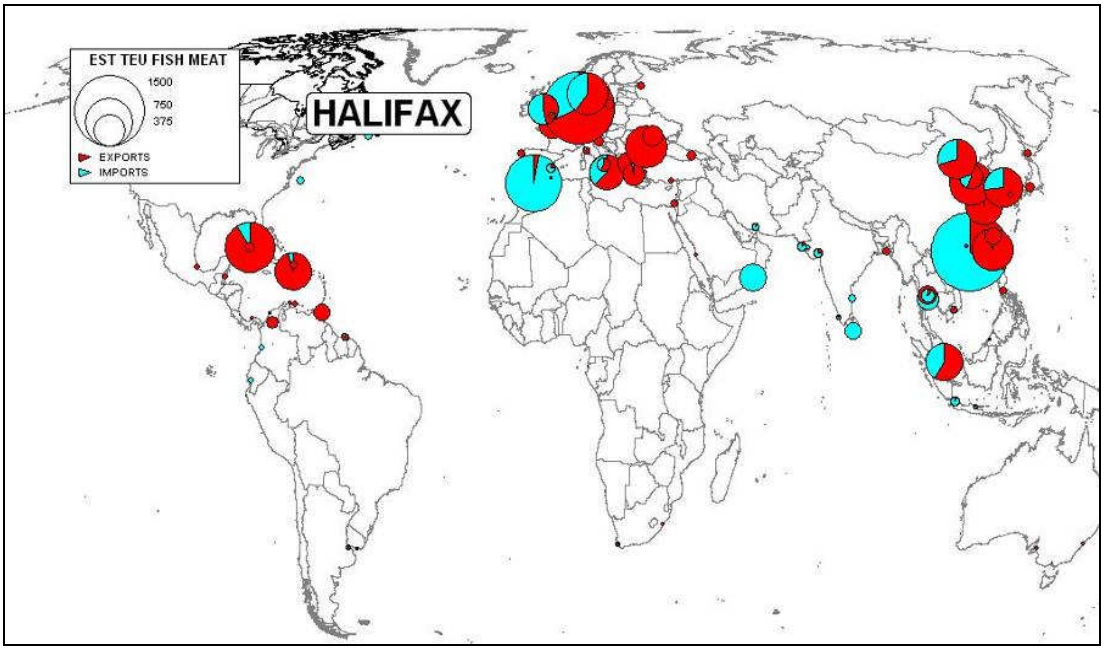
Figure 18 summarizes import and export data from the Port at Halifax. Flows of TEU for imports in the figure below (shown as light blue) are greater into Halifax than exports (shown as red). Major trade flows are between Europe, the Mediterranean, Middle East, Indian sub-continent and Southeast Asia.




**Source:** Transport Canada, 2003

**Figure 18: Total Halifax TEU Exports and Imports**

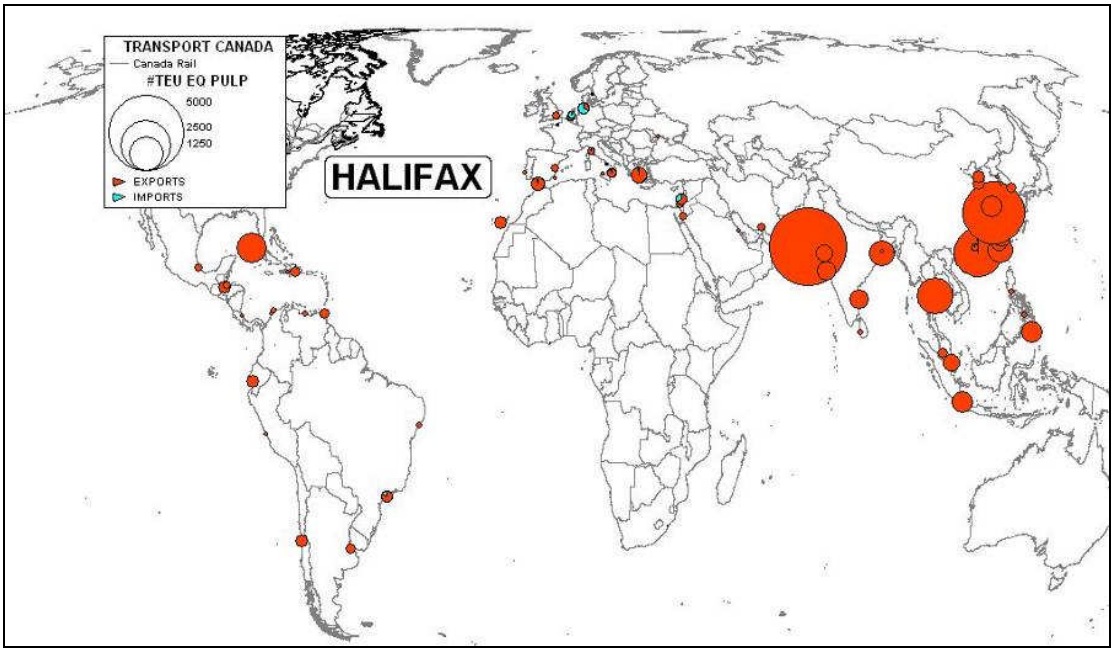
In terms of commodities, the port's greatest strength is its reefer market, which accounts for about 15% of overall volume. Export reefer commodities include seafood, French fries, Christmas trees, and frozen blueberries. These markets are shown below.




**Source:** Transport Canada, 2003

**Figure 19: Halifax Refrigerated Cargo Markets**

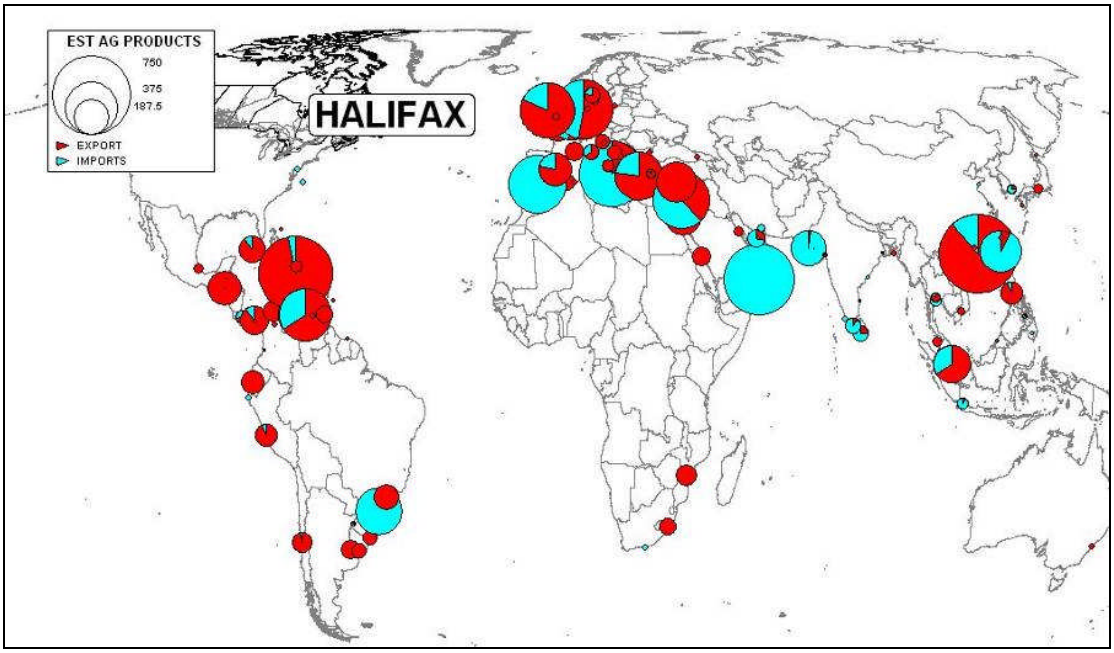
The port's forest markets are mainly to India and the Far East, as shown below:




**Source:** Transport Canada, 2003

**Figure 20: Halifax Forest Products Markets**

The port also has a large market spread for cereal and agricultural products.




**Source:** Transport Canada, 2003

**Figure 21: Halifax Cereal and Agricultural Products Market**

Halifax's trade is virtually balanced between imports and exports; some carriers actually handle more export than import volume. It has been emphasizing the fact that it is operating at about 50-60% capacity and is able to accommodate additional volumes without significant capital expenditures. One terminal has been deepened to 17m and the other will be deepened to 16m within 12 months, enabling the port to accommodate large post-Panamax vessels.

In the past 18 months, Halifax has attracted two transload operations to the region. One is operated on behalf of the Canadian Retail Shippers Association (CRSA) by Armour Transportation Group; the other is the initial phase of a transload operation to be operated by Consolidated Fastfrate. A new 90,000 sf building will be completed within 12 months with potential expansion to 150,000 sf. The first customer is Canadian Tire. These two facilities have helped the port attract new Asian services operated by China Shipping and Maersk. They also enable the inbound container to remain in Halifax to be loaded out with export cargo.

Halifax is pinning its future growth expectations on both the Chinese and Indian markets. The latter initiative may have some relevance to the present study.

### 4.4.2 Halifax terminals

Halterm was Canada's first common user (as opposed to carrier-owned) container terminal, built in 1969. It is owned by the Halterm Income Fund (Macquarie Ports has made a $180 million offer to purchase as of November 6, 2006) and encompasses about 75 acres at the south end of the Halifax peninsula. The terminal is equipped with six cranes, of which two are super post-Panamax units. Its clients include Zim, Maersk, China Shipping, Oceanex, Costa, Melfi and Eimskip.

Empties are not a significant amount of Halterm's business, comprising about 15% of volume. There are "no mountains" of empties on their terminal, perhaps because they charge for empty storage and there is a significant "motivator" to clean them out. Halterm does store empties for some clients as part of their overall service package, but this tends to apply to reefers. They have empty storage areas on the terminal, with allocations per shipping line.

Halterm does not handle domestic containers as this all goes to Halifax Intermodal Terminal at Pier 9 in the north-end. A few local truckers such as Conrad's, Clarke, Yeoman's, and CTS (for Seaco and other leasing companies) maintain some inventory for some lines, and CN maintains a yard in Moncton for international lines.

Transload is becoming a factor, and that will have its own challenges, particularly as it relates to container terminal access and the issue of downtown traffic. Halterm's terminal used to be an 80:20 rail-to-truck split, and is moving to 70:30 with 65:35 on export. However, transload has more scope and is good for local cargo.

In terms of their overall container splits, they are as follows:

| Unit | Percentage of Units |
|---|---|
| 20 foot | 40% |
| 40 foot | 60% |
| 45 foot | minuscule |

The Ceres Terminal in Fairview Cove was built in 1981. It is a 72 acre terminal equipped with four cranes, including one post-Panamax unit. The terminal has ordered two new post-Panamax cranes for delivery in 2007. Its customers include the Grand Alliance (Hapag-Lloyd, NYK and OOCL) with two services east- and westbound (i.e. four ship calls) per week as well as Atlantic Container Line (ACL), which also calls weekly both east- and westbound. Feeder cargo for New England has also been handled at this terminal. With Maersk Line's purchase of P&O Nedlloyd in 2005, it lost P&O's volume from the Grand Alliance. This terminal is also equipped with a large number of reefer plugs.

A big issue for customers at this terminal has been truck access. This is in the process of being resolved with the construction of a new state-of-the-art marshalling area and gate facility, to be completed in 2007.

Halifax also has a domestic intermodal terminal (HIT) operated by CN. It handles about 25,000 containers per annum for a variety of customers including CN Intermodal, Armour Transportation, Clarke Transport, Canadian Tire, and others. It also handles international marine containers in "domestic" programs. Two transload operations have opened in the past 12-18 months in Dartmouth, across the harbour from the two main container terminals. These are operated by Armour and Consolidated Fastfrate and are both in their infancy. The Fastfrate facility, expected to be completed in 2007, will initially be 90,000 sf, growing to 150,000 sf. Armour is working out of three smaller facilities and has plans to expand.

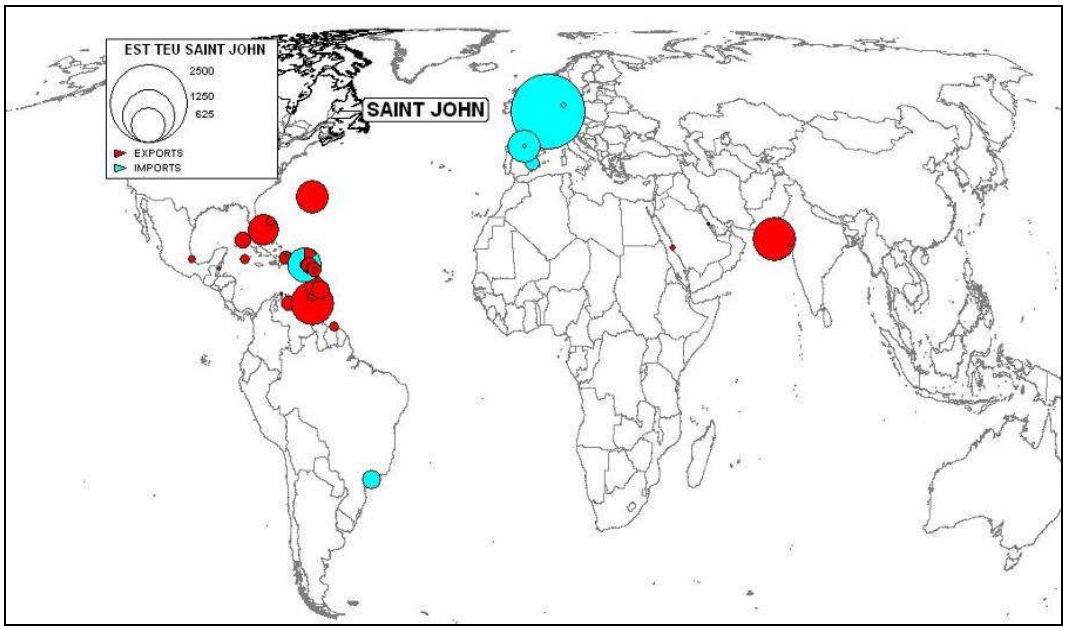
## 4.5 Saint John

### 4.5.1 Port of Saint John

The Port of Saint John built its container terminal in the early 1970s. In the late mid-late 1980s, Saint John lost many of its container services when several were consolidated with Halifax lines, in the case of OOCL, NOL and K-Line, which began a 63 day eastbound round-the-world service with vessels too large for Saint John and requiring a deviation that favoured Halifax, as well as ACT/PACE which rationalized its port calls with Columbus Line.

Saint John now has one container service operated by Tropical Shipping of West Palm Beach, Florida. In 2000, Tropical purchased Kent Line from the Irving Group and has provided service to the Caribbean since then. The port presently handles about 40,000 TEUs, mostly between Saint John and the Caribbean.

Saint John serves the following markets:

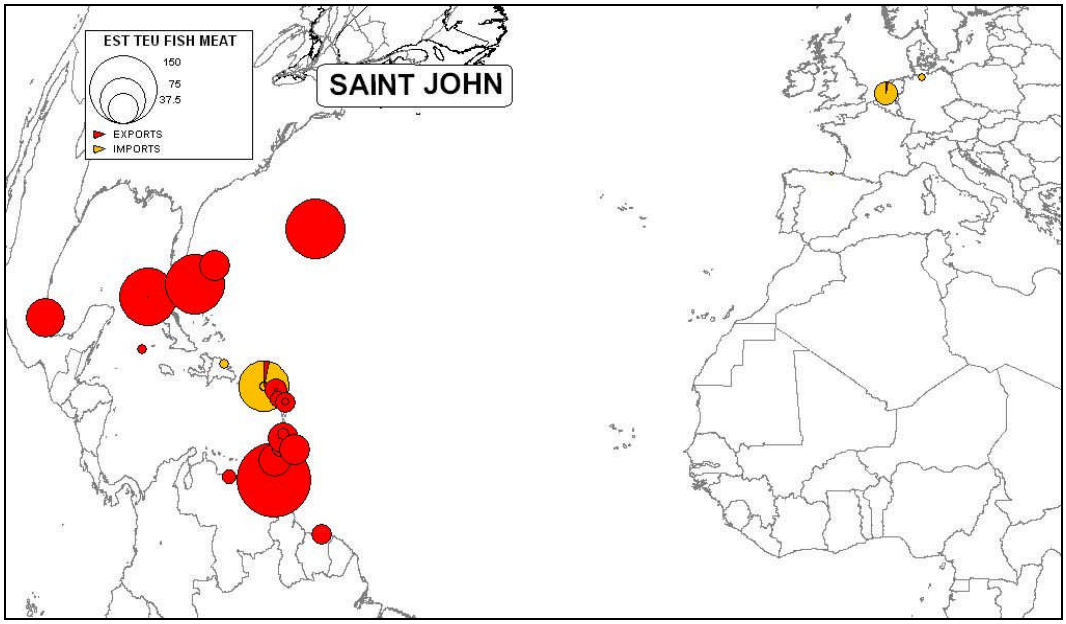



**Source:** Transport Canada, 2003

**Figure 22: Saint John Markets**

Its primary carrier is Tropical Shipping to the Caribbean, and Kent Line provides breakbulk and some container service to Europe. National Shipping Company of Saudi Arabia calls at the port primarily for forest product exports to India.

Saint John's refrigerated cargoes move to and from the markets indicated below.




**Source:** Transport Canada 2003

**Figure 23: Saint John Refrigerated Cargo Market**

### 4.5.2 New Brunswick terminals

The Port of Saint John has a 54 acre container terminal operated by Logistic Stevedoring Inc. as Brunterm. It serves one carrier, Tropical Shipping, which provides service to West Palm Beach. Intermodal service is provided to Montreal through three short line operators.

CN operates a large domestic intermodal terminal in Moncton, which serves New Brunswick and the Maritimes, with truck connections through to Newfoundland.

## 4.6 Newfoundland

### 4.6.1 Ports of St. John's and Corner Brook

St. John's is, for obvious reasons, the largest and most important general cargo port in the Avalon region. It is not the largest port by tonnage, as Come-by-Chance handles more tonnage.

In May 2001, the port signed a 15 year lease with an option for a further five years with Oceanex, which operates container/roll-on roll-off services between Newfoundland and both Montreal and Halifax. This service also constitutes the vast majority of the cargo base at St. John's.

The two Oceanex services carry a combination of domestic cargo originating in Quebec, Ontario and the Maritime provinces, as well as overseas transhipment cargo. The Halifax service carries cargo from Europe, Southeast Asia, the Far East, the Mediterranean and the Middle East, whereas the Montreal service tends to carry European and Mediterranean cargo. The Halifax service also carries CN's domestic intermodal cargo as well as most new automobiles entering Newfoundland. Chrysler products enter via Port aux Basques.

Corner Brook is an important marine gateway for western Newfoundland. There is a former Transport Canada wharf (now transferred), used mainly by Oceanex, as well as a private facility owned and operated by the Kruger newsprint mill. It is also a significant bulk port, handling fuel oil, limestone, dolomite, and cement. The port was divested in 2005.

The Oceanex service calls at Corner Brook on the outbound voyage from St. John's to Halifax. It connects with overseas carriers at Halifax carrying export cargoes such as forest products. The Marine Atlantic service, which operates from Port aux Basques, NL to North Sydney, NS, carries many domestic trailers filled with wood pulp and lumber, which is transloaded in Dartmouth, Nova Scotia into marine containers.

### 4.6.2 Newfoundland terminals

There are three container facilities in Newfoundland and Labrador. The largest is in St. John's. The port has 37 berths, counting those on all sides of the harbour. In 2001, Pier 17 was redeveloped at a cost of $10 million and is currently being offered for lease by the St. John's Port Authority as a multi-purpose facility. The port has also commenced development of a general-purpose tourism facility along the downtown waterfront area. The

Harvey Group has redeveloped Pier 16 into another multi-purpose facility that has effectively doubled the size of their terminal, which is privately owned.

Argentia is located about 90 miles or 150 km from St. John's, on Placentia Bay. After having served as a US military base for many years it now awaits the construction of the Voisey's Bay nickel smelter in Argentia, which is expected to be in place by 2011. The port of Argentia has carved out a niche as an alternative to St. John's for international container cargo. The vast majority of Argentia's containerized exports consists of fresh and frozen fish and live seafood being shipped with Eimskip to Reykjavik, Iceland. Containerized imports also include a significant amount of seafood, as well as paper, packaging material, beer, fertilizer, bottled water, and sporting goods.

The bi-monthly Eimskip service originates in Reykjavik, Iceland, where it interlines with other Eimskip vessels serving ports in North Europe and Scandinavia. The service rotation is Reykjavik →Argentia →Shelburne, NS→ Boston/Everett, MA → Richmond, VA → Shelburne→ Argentia→ Reykjavik.

As mentioned above, Corner Brook is an important marine gateway for western Newfoundland. The Oceanex service calls at Corner Brook on the outbound voyage from St. John's to Halifax. It connects with overseas carriers at Halifax.

# 5.0 State of Play—Railways and Trucking

## 5.1 Railway Network and Intermodal Terminals in Canada

Canada is served by five Class I railways and about 60 shortline and regional rail carriers. In total, Canada's railways utilize about 31,000 mainline track miles; of those, 21,154 miles are operated by CN with 11,813 miles in eight provinces and CP with 9,168 miles in six provinces respectively. CN operates between British Columbia and Nova Scotia whereas CP operates between British Columbia and Quebec.

### 5.1.1 Lines of business

Canadian railways organize their lines of business into three distinct categories for freight transportation (notwithstanding passenger operations):

- *Bulk*, which is the movement of goods that are not packaged, such as agri-products and mining products. Bulk cargo is often moved in "unit train" service. Unit trains are defined as trains that operate from origin to destination with essentially the same cars and locomotives throughout the journey;
- *Carload*, which typically consists of general merchandise that can be transported via other modes; and
- *Intermodal*, which typically is used to transport general merchandise in containers utilizing several modes. Intermodal can be further divided (see below) into Import/Export (otherwise called Overseas or Marine) and Domestic.

### 5.1.2 Intermodal networks

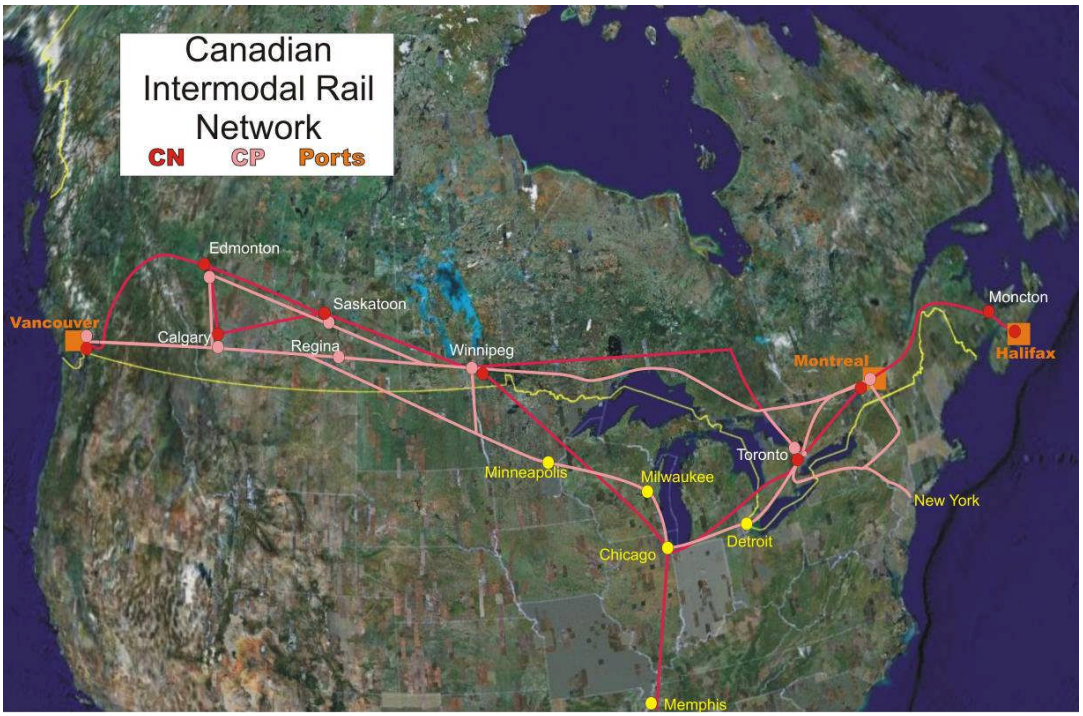
CN and CP each have intermodal terminal operations serving essentially two distinct markets. First is the domestic intermodal market, which can be described as containers that have adaptable modality from truck to rail (and short sea) and are in service only in North America. Second is Import/Export or marine containers with adaptable modality between truck, rail and ship. These international containers typically are owned and controlled by shipping lines and move goods into (import) as well as out of (export) Canada, without the need to repack the goods between modes.

Regional and short line railways do not currently participate in intermodal container activities for a number of reasons (see Railway Business Environment) however; this does not preclude their willingness to do so.

Currently, CN operates nine of their own intermodal terminals in Canada, including Vancouver, Edmonton, Calgary, Saskatoon, Winnipeg, Toronto, Montreal, Moncton and Halifax. In addition, it offers container services through the Vancouver region (four terminals—Centerm, Vanterm, Deltaport and Fraser Surrey Docks), the Port of Montreal, and the Port of Halifax (two terminals—Ceres and Halterm). This network forms the key nodes of the CN Canadian intermodal network. CN also has terminals in the US (Detroit, Chicago,

Memphis and New Orleans, as well as serving the Port of New Orleans directly). Intermodal services are offered between US and Canadian cities, including domestic (North American) and international (outside North America) container routes. CN intermodal services cross at two primary US border crossings—Port Huron/Sarnia (Toronto–Chicago route) and International Falls (Winnipeg–Chicago route). In addition, CN offers interline services to other ports and terminals via other rail carriers (Jackson, Mississippi via KCS, etc.).

CP operates nine intermodal terminals in Vancouver, Edmonton, Calgary, Regina, Saskatoon, Winnipeg, two in Toronto (Obico and Vaughan), and Montreal. Further, CP serves international containers in the Vancouver region (four terminals—Centerm, Vanterm, Delta Port, and Fraser-Surrey Docks) and the Port of Montreal. Similar to CN, CP has US intermodal terminals in Detroit, Chicago and Minneapolis. CP crosses the US border at Windsor/Detroit (Toronto–Chicago service) and has US border service crossing at Rouses Point, NY (Montreal–New York), Fort Erie (Toronto–New York), and Emerson, MB (Winnipeg–Minneapolis), as well as Portal, ND (Minneapolis–Calgary). It should be noted that each railway serves a number of other ports through commercial access agreements, but these are not on the key intermodal network.




**Source:** UMA Engineering

**Figure 24: Canadian Intermodal Rail Network Map**

## 5.2 Operations

### 5.2.1 Modal balance

One of the basic issues in any multimodal system is to maximize modal connections. In particular, there is often no match between ship and train capacity. While both ship size and train size are growing, one ship can equal four or more 6,000 foot trains, or two or more 14,000 foot trains. In order to move containers most effectively, a one-to-one match would be ideal. Railways are moving toward seven days a week scheduled service, on standard train lengths with railcars that continually remain together and can be stripped and reloaded. In domestic market service, the railways achieve great capacity using price as an incentive. But with import containers, balance will likely only occur in very few lanes, where traffic arrives daily in the right volumes at the port. This situation often results in containers sitting and waiting, resulting in increased efforts and costs on the part of shipping lines to sort out their higher and lower priority loads. Terminal congestion is also a potential outcome of this condition at ports and inland terminals.

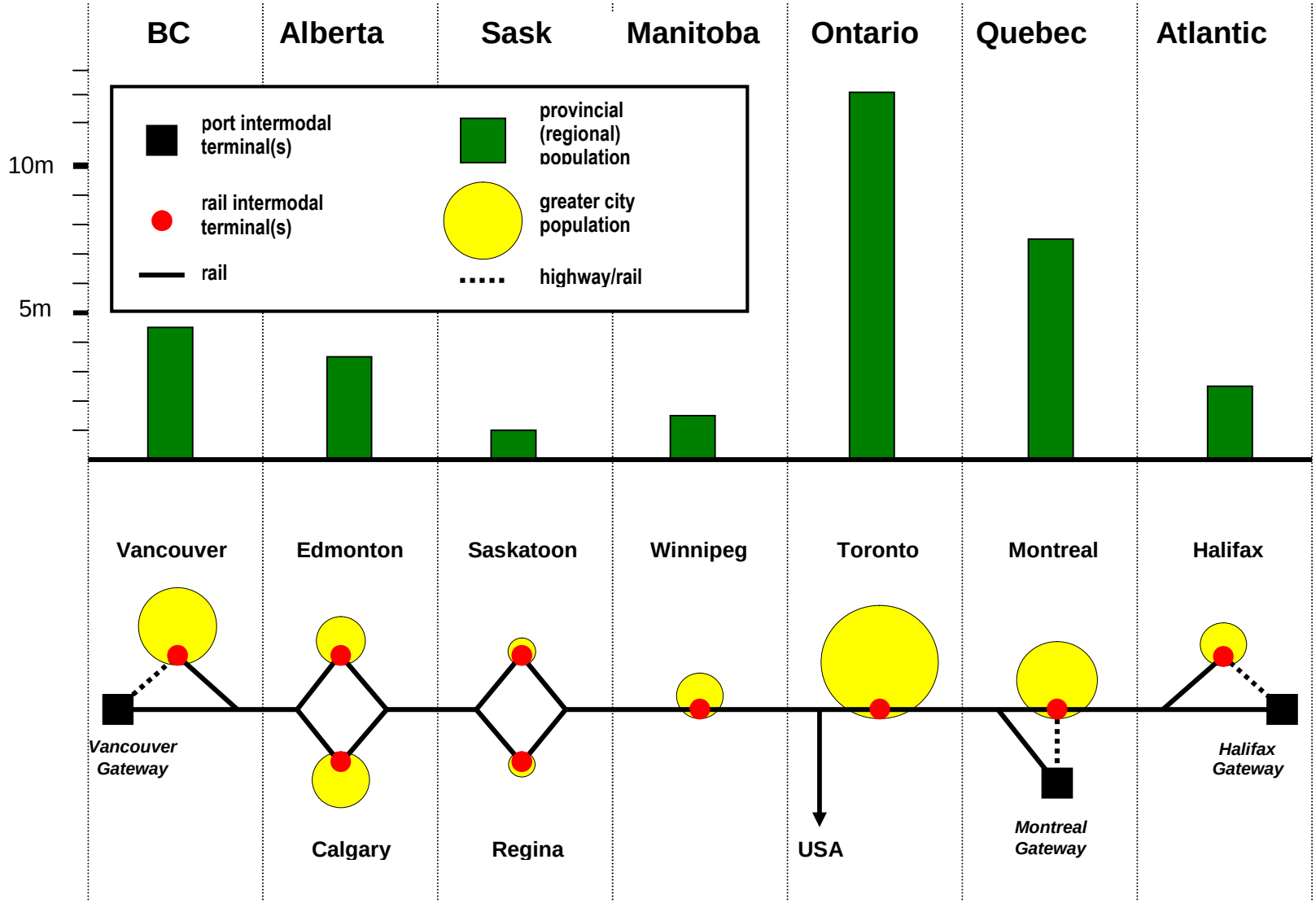
Both railways and shipping lines strive to maximize assets and will provide additional service, provided the user is willing to pay for it. Shippers are alternatively driven by low cost and superior service, but in the freight world low price usually becomes a dominant factor.

### 5.2.2 Railway terminals

Intermodal terminals are important nodes for intermodal business, because inland terminals are where truck and train modes intersect. For ports, they are more complicated, since three modes come together for the transfer of containers between ship, trucks and rail.

Originally containers (20 foot and 40 foot in length) were used only for international (overseas) movement of goods. However, the security, ease of handling and ability to use three modes of transport without touching the goods inside the container, has led to the growth of the domestic container business. These domestic containers range in lengths from 45 foot to 53 foot and are designed to replace truck trailers as a way to move domestic cargo, although most of them have interior height restrictions compared to a trailer which restricts some cargo loading. These containers have largely replaced “piggyback” movement of trucks riding on railway flatcars on both CN and CP, but they are more difficult to load on railcars because of their increased size and variability, particularly in view of the latest trend to move containers by stacking them two high on railcars (called double stack or DS). Previously, intermodal terminals were low capacity roll-on/roll-off truck trailer operations. They have now evolved and grown to the point where intermodal terminals are highly sophisticated technological and operational enterprises.

The largest population areas, not surprisingly, handle the largest number of containers (see Figure 25) The intermodal delivery systems comprise these “hub” terminals and are serviced by truck deliveries to/from the local consignees and shippers. The number of terminals is predicated on sufficient traffic to warrant a terminal versus the alternative costs of trucking product from a larger node.




**Source:** (JS&A) Statistics Canada railway data

**Figure 25: Canadian Intermodal Port and Railway System and Population Base**

For example, terminal volumes of less than 20,000 units per year, or 27 units per day each way, do not typically generate enough rail traffic to make the terminal investment viable, unless the alternative trucking distances are very large, or unless there is a special commodity being handled that can cover higher terminal charges. Conversely, large terminals offer opportunities for 24 hour 7 days a week operation with better asset utilization, both with equipment and manpower, as well as better service hours for cartage companies.

The railways, which operate a hub and spoke intermodal operation, with terminals as the hubs and trucks operating as the spoke, also have an interest in limiting the number of terminals to optimize costs, revenues, and customer service. Shippers have voiced concerns that not enough terminals exist. However, having too many hubs turns the hubs into spokes, reducing service and increasing costs. Shortlines continually look to having terminals located on their lines, but most are too short a distance from a major hub and do not represent large enough volumes to be cost effective in the network. (See Section 5.2.3 below)

#### Terminal support

Traditionally, the intermodal terminals were supported by rail classification yards in close proximity, and operation of mixed trains (intermodal plus carload) was common. The evolution of railway terminals in Canada has accompanied the growth of intermodal facilities in close proximity to classification yards. The classification yards are generally supported by main diesel shops, car repair shops and operating personnel. The trend toward unit trains of intermodal containers, in a strip and reload mode where railway cars are not switched but simply unloaded and reloaded, has reduced the support structure required. The trend is away from high cost classification yards which make up traditional carload service, toward more standalone intermodal terminals as the number of commodities moved by containers increases, and intermodal terminals require less traditional railway support facilities, since the car distribution handling and switching is performed (substituted) not on the rails, but on the roads, and with the local truck deliveries.

Intermodal terminals represent large capital investments, and typically consume a good share of costs for handling containers over any given route. Whether converting switching yards or establishing brand new terminals, railways have invested considerable capital in building new facilities.

### 5.2.3 Railway lines

Destination trains, as is already the case with bulk train movements of grain and coal, are becoming more the norm for intermodal shipments as volumes increase. The railways attempt to move enough volume to fill an entire train which can run as one unit from origin to destination. This minimizes operating costs, increases capacity of the mainline (fewer movements to dispatch and pass), and increases service reliability by eliminating intermediate switching of cars and other stops. Therefore, for cost and service benefits, the railways encourage this type of full train movement if possible.

In addition, for every new hub terminal on the network, the numbers of origin/destination service offerings grow and the number of blocks (groups of containers by destination) also

grows. This requires increased switching and balancing problems with railcars. Therefore the railways do not encourage additional new intermodal container terminals unless they have a substantial volume or can attract specific destination volumes. At the same time (working against this) is the fact that longer trains have higher payload and reduced costs as mentioned earlier. The railways have moved historically from 5,000 foot long trains to now up to 10,000 foot and are looking at new technologies to have up to 14,000 foot of traffic. Filling these volumes makes it difficult not to increase the number of destination blocks on a given train, unless volumes increase accordingly. So the railways are continually adjusting service to gain the best match of train mile service and economics.

Today containers are stacked where possible up to two high (double stacks) on specially designed railway cars loaded by large, expensive mobile cranes. These “double stack” loadings posed height issues that exceeded traditional standard railway clearances and the railways have responded, at large capital cost, by removing hundreds of overhead clearances, including tunnels and bridge restrictions, to be able to handle this relatively new way of moving goods.

There are many loading restrictions that make complete double stack loading of a given train problematic, particularly to destinations that handle purely domestic cargo and various sizes of containers. In addition, some railcars have weight as well as size restrictions, limiting full use of the double stack principle. For example, 53 foot domestic containers cannot be put into many intermodal cars, except on the top level of double stack, and only if the proper type of containers and weights are on the bottom. This is particularly important for shipments of bulk items like grain, where they tend to reach weight capacity before reaching volume capacity. Furthermore, 20 foot boxes are preferred for specialty grains, but have loading restrictions because of their size and weight. While the railways do not penalize these units in terms of pricing, these containers may not be moved out of a given terminal if the loading patterns are not right for a given train. This uncertainty of movement does not assist in encouraging such traffic.

## 5.3 Container Traffic Flows

### 5.3.1 General

In studying the container flows by rail, CN and CP were able to provide 2005 intermodal data. It should be noted that due to confidentiality, figures for Eastern Canada are combined. In addition, due to the fact the data are compiled from two independent data bases which have been combined and culled for data integrity, we are projecting an overall accuracy of $\pm$10%, with less accuracy on segmented flows.

This being said, the data confirm anecdotal evidence compiled in this study, and therefore are viewed as representative of the current overseas container flow situation on rail. In addition, the use of domestic containers by rail is not shown as they are overly complex, represent smaller volumes, and do not affect the positioning of empty overseas containers. On the contrary, the overseas (also called marine or international) containers drive the use and flow of some domestic traffic as discussed later in this section.

Note that container movements shown within a single province on the Origin/Destination chart (see Figure 7, page 19) are indicative of multiple railway terminals within that area. For example, Alberta consists of Edmonton and Calgary terminals, and some rail container movements occur between them. Quebec and east consists of Montreal, Moncton and Halifax. The US includes several intermodal terminals.

The maps show flows by arrows which indicate direction between province/areas and whose widths are indicative of the flow volumes. Some of these arrows are very small. Each map also contains the Originating/Destination pairs which quantify the flows. Containers are broken into 20 foot and "Other." More than 98% of the "Other" category consists of 40 foot containers, with the rest being larger than 40 foot, i.e. 45 foot or 53 foot. The percentage breakdown of international equipment container size moving on CN and CP is as follows:

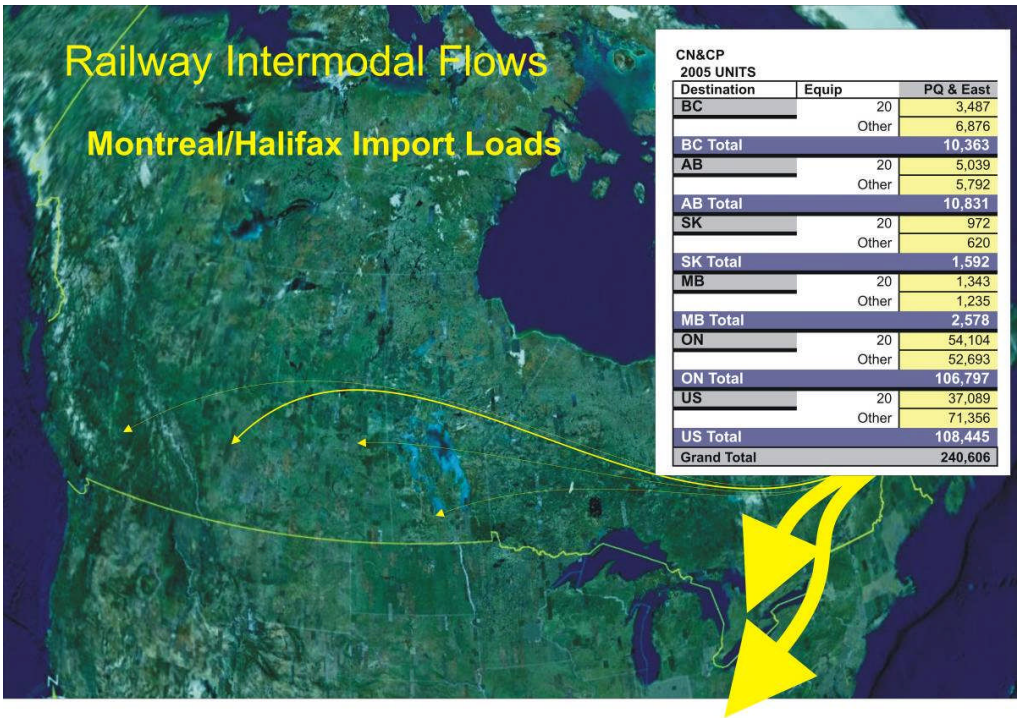
| EQUIP SIZE | 2005 UNITS |
|---|---|
| **20 FT** | 34.82% |
| **Other** | 65.16% |
| 40 FT | 63.76% |
| 41-45 FT | 00.01% |
| 45 FT | 01.38% |
| 53 FT | 00.01% |

**Figure 26: Percentage by Equipment Type of International Containers by Rail**

### 5.3.2 Import loads

Figure 27 shows loaded import container flows from the east, which reflect the high population base in eastern Canada, as well as the high number of Distribution Centres. Note the high number of container loads into Ontario and the US by rail. Overseas container cargo that is unloaded from these containers in the east may continue westward by rail, but in the larger domestic container equipment as outlined earlier in this study.

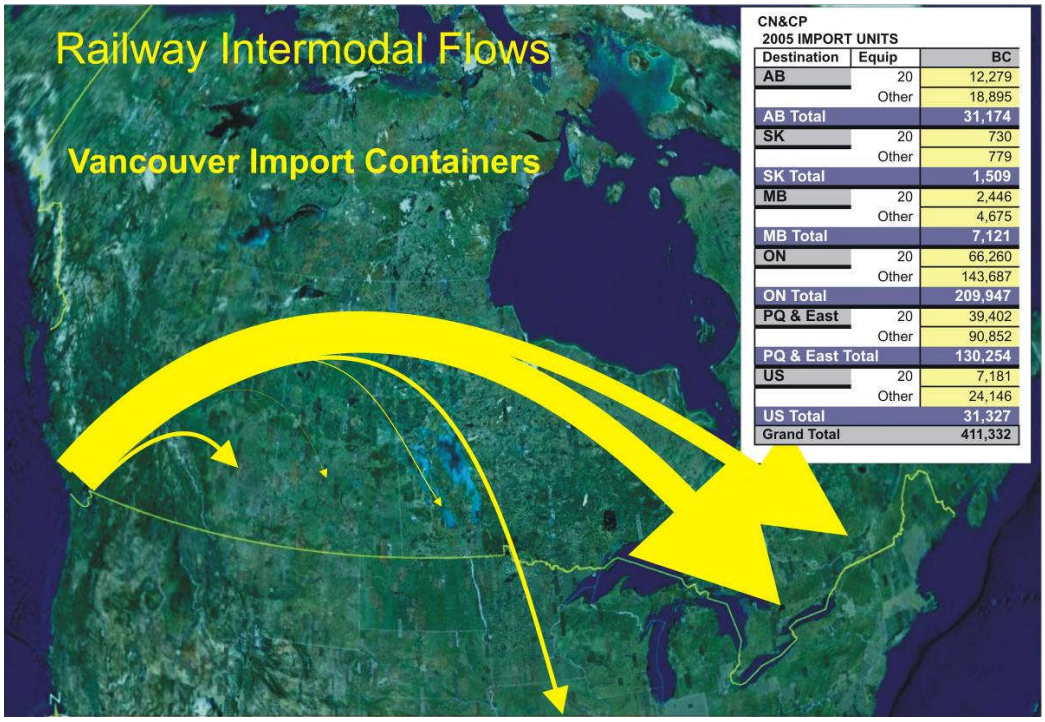
Figure 28 shows loaded container flows from the west. With the advent of North American off-shoring and outsourcing of manufacturing capacity to Asia Pacific countries, the proliferation of inbound containers into Canada has grown dramatically in the past five to ten years. The majority of this traffic reaches the Greater Toronto/Montreal area(s).




| Destination | Equip | PQ & East |
|---|---|---|
| BC | 20 | 3,487 |
| | Other | 6,876 |
| BC Total | | 10,363 |
| AB | 20 | 5,039 |
| | Other | 5,792 |
| AB Total | | 10,831 |
| SK | 20 | 972 |
| | Other | 620 |
| SK Total | | 1,592 |
| MB | 20 | 1,343 |
| | Other | 1,235 |
| MB Total | | 2,578 |
| ON | 20 | 54,104 |
| | Other | 52,693 |
| ON Total | | 106,797 |
| US | 20 | 37,089 |
| | Other | 71,356 |
| US Total | | 108,445 |
| Grand Total | | 240,606 |

**Source:** CN and CP

**Figure 27: Eastern Canada Loaded Import Container Flows**




| Destination | Equip | BC |
|---|---|---|
| AB | 20 | 12,279 |
| | Other | 18,895 |
| AB Total | | 31,174 |
| SK | 20 | 730 |
| | Other | 779 |
| SK Total | | 1,509 |
| MB | 20 | 2,446 |
| | Other | 4,675 |
| MB Total | | 7,121 |
| ON | 20 | 66,260 |
| | Other | 143,687 |
| ON Total | | 209,947 |
| PQ & East | 20 | 39,402 |
| | Other | 90,852 |
| PQ & East Total | | 130,254 |
| US | 20 | 7,181 |
| | Other | 24,146 |
| US Total | | 31,327 |
| Grand Total | | 411,332 |

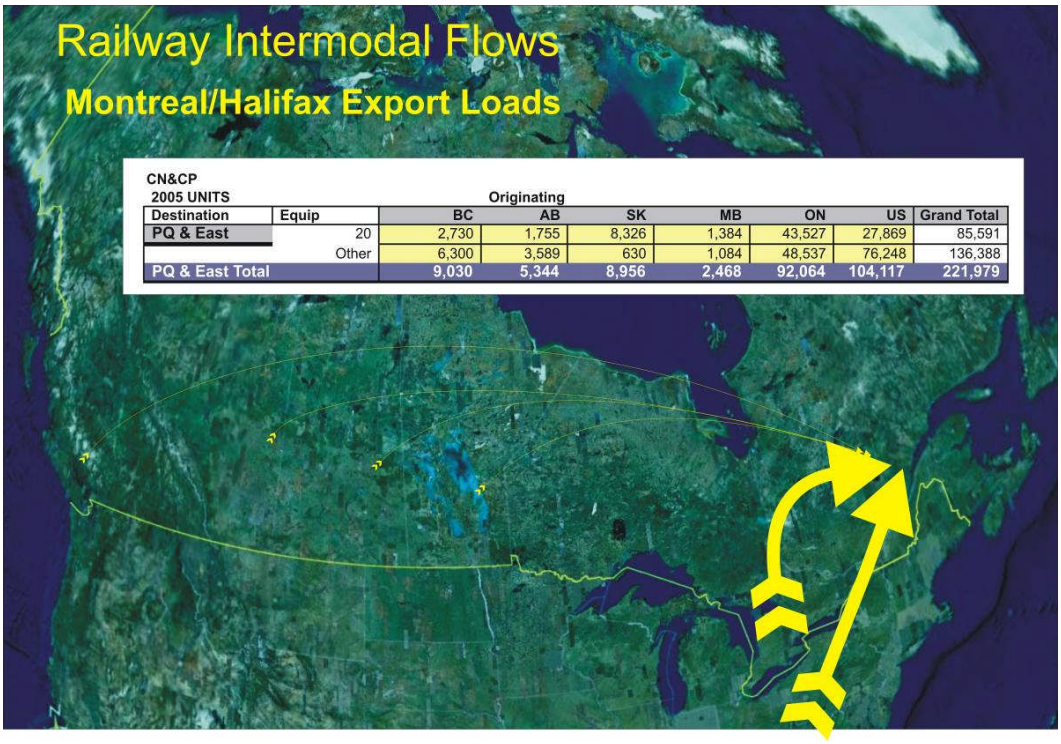
**Source:** CN and CP

**Figure 28: Vancouver Loaded Import Container Flows**

Although Alberta is currently experiencing huge economic growth, consumption of products is largely contingent on demography and, as indicated above, the highest populated areas experience the greatest inflows.

### 5.3.3 Export loads

As expected, the vast majority of export loads are generated from Ontario and Quebec through the Ports of Montreal and Halifax, as shown in Figure 29 below.

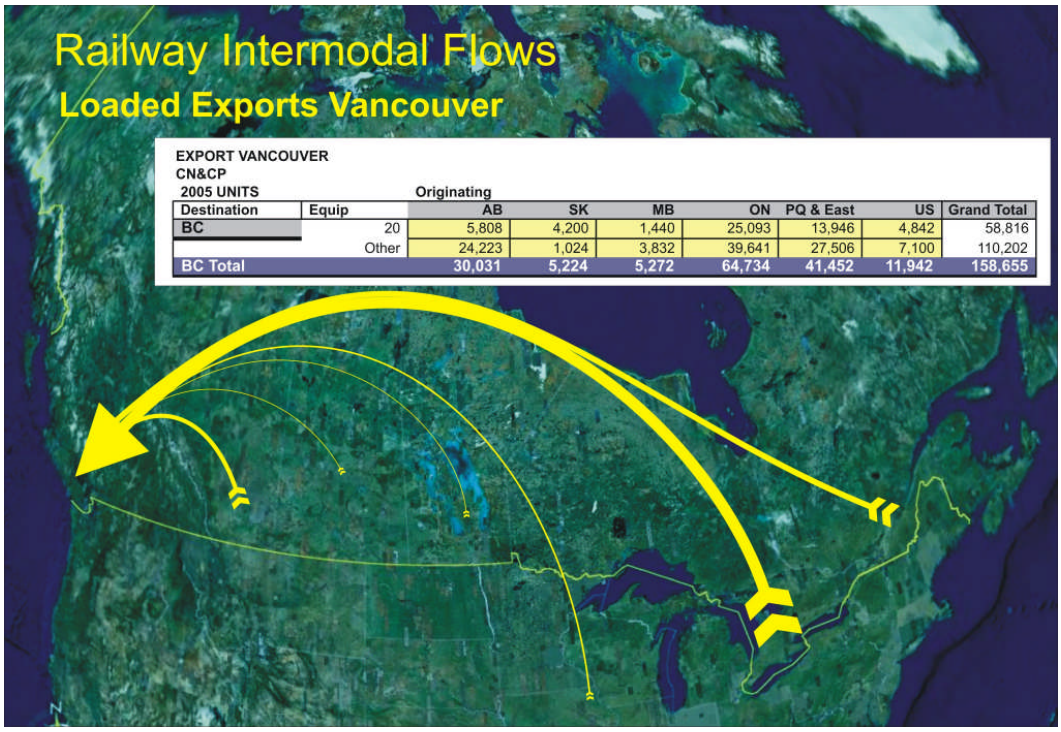



| Destination | Equip | BC | AB | SK | MB | ON | US | Grand Total |
|---|---|---|---|---|---|---|---|---|
| PQ & East | 20 | 2,730 | 1,755 | 8,326 | 1,384 | 43,527 | 27,869 | 85,591 |
| | Other | 6,300 | 3,589 | 630 | 1,084 | 48,537 | 76,248 | 136,388 |
| PQ & East Total | | 9,030 | 5,344 | 8,956 | 2,468 | 92,064 | 104,117 | 221,979 |

**Source:** CN and CP

**Figure 29: Export Flows through Montreal and Halifax**

To the west, Quebec and Ontario produce the majority of export loads, with some exports from Alberta and to a lesser extent the US. The balance of import versus export load can be as high as a 3:1 entering versus leaving Central Canada to Vancouver.



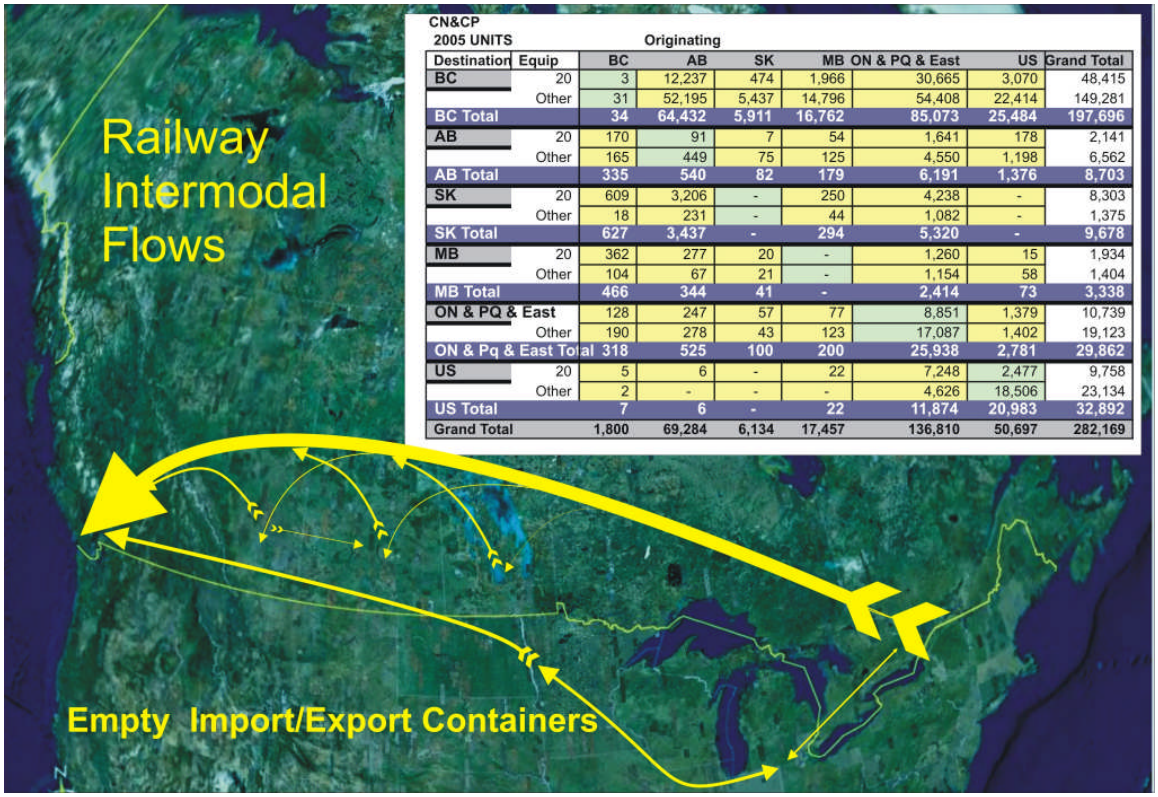

| Destination | Equip | AB | SK | MB | ON | PQ & East | US | Grand Total |
|---|---|---|---|---|---|---|---|---|
| BC | 20 | 5,808 | 4,200 | 1,440 | 25,093 | 13,946 | 4,842 | 58,816 |
| | Other | 24,223 | 1,024 | 3,832 | 39,641 | 27,506 | 7,100 | 110,202 |
| BC Total | | 30,031 | 5,224 | 5,272 | 64,734 | 41,452 | 11,942 | 158,655 |

**Source:** CN and CP

**Figure 30: Exports Flows through Vancouver**

The distribution of empty containers can be readily seen in the chart of Figure 31.

There are some limited cross shipments of empty marine containers due to competitive market conditions amongst the various steamship lines. The lines also have various container types and sizes, which often accounts for these cross shipments as well.




CN&CP
2005 UNITS
Originating

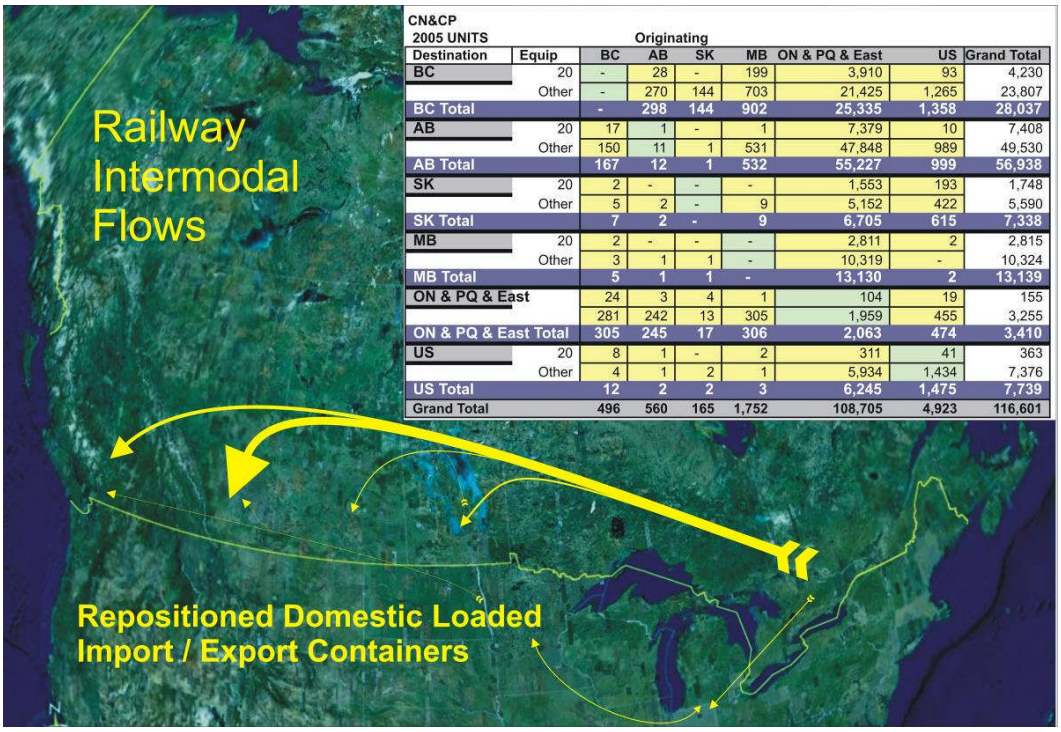
| Destination | Equip | BC | AB | SK | MB | ON & PQ & East | US | Grand Total |
|---|---|---|---|---|---|---|---|---|
| BC | 20 | 3 | 12,237 | 474 | 1,966 | 30,665 | 3,070 | 48,415 |
| | Other | 31 | 52,195 | 5,437 | 14,796 | 54,408 | 22,414 | 149,281 |
| BC Total | | 34 | 64,432 | 5,911 | 16,762 | 85,073 | 25,484 | 197,696 |
| AB | 20 | 170 | 91 | 7 | 54 | 1,641 | 178 | 2,141 |
| | Other | 165 | 449 | 75 | 125 | 4,550 | 1,198 | 6,562 |
| AB Total | | 335 | 540 | 82 | 179 | 6,191 | 1,376 | 8,703 |
| SK | 20 | 609 | 3,206 | - | 250 | 4,238 | - | 8,303 |
| | Other | 18 | 231 | - | 44 | 1,082 | - | 1,375 |
| SK Total | | 627 | 3,437 | - | 294 | 5,320 | - | 9,678 |
| MB | 20 | 362 | 277 | 20 | - | 1,260 | 15 | 1,934 |
| | Other | 104 | 67 | 21 | - | 1,154 | 58 | 1,404 |
| MB Total | | 466 | 344 | 41 | - | 2,414 | 73 | 3,338 |
| ON & PQ & East | | 128 | 247 | 57 | 77 | 8,851 | 1,379 | 10,739 |
| | Other | 190 | 278 | 43 | 123 | 17,087 | 1,402 | 19,123 |
| ON & Pq & East Total | | 318 | 525 | 100 | 200 | 25,938 | 2,781 | 29,862 |
| US | 20 | 5 | 6 | - | 22 | 7,248 | 2,477 | 9,758 |
| | Other | 2 | - | - | - | 4,626 | 18,506 | 23,134 |
| US Total | | 7 | 6 | - | 22 | 11,874 | 20,983 | 32,892 |
| Grand Total | | 1,800 | 69,284 | 6,134 | 17,457 | 136,810 | 50,697 | 282,169 |

**Source:** CN and CP

**Figure 31: Empty Import / Export Containers Central and Western Canada to Vancouver**

As shown in Figure 32, a large number of empty containers flow westward from Ontario and East. The total number of empties would be much higher (actually double), except for the fact that it is permissible to use empty international containers enroute to their port of exit in domestic service, but only for one domestic move. This law (cabotage) allows for some efficiency of use of an empty container that would otherwise travel unloaded, particularly with the container imbalance to areas of central Canada where imports far outnumber export loads.

This use is called domestic repositioning (DRP). The law allows for the use of the foreign-owned container as if it were brought into Canada for domestic use, without paying import tax on the actual container box.




CN&CP
2005 UNITS

| Destination | Equip | Originating BC | AB | SK | MB | ON & PQ & East | US | Grand Total |
|---|---|---|---|---|---|---|---|---|
| BC | 20 | - | 28 | - | 199 | 3,910 | 93 | 4,230 |
| | Other | - | 270 | 144 | 703 | 21,425 | 1,265 | 23,807 |
| BC Total | | - | 298 | 144 | 902 | 25,335 | 1,358 | 28,037 |
| AB | 20 | 17 | 1 | - | 1 | 7,379 | 10 | 7,408 |
| | Other | 150 | 11 | 1 | 531 | 47,848 | 989 | 49,530 |
| AB Total | | 167 | 12 | 1 | 532 | 55,227 | 999 | 56,938 |
| SK | 20 | 2 | - | - | - | 1,553 | 193 | 1,748 |
| | Other | 5 | 2 | - | 9 | 5,152 | 422 | 5,590 |
| SK Total | | 7 | 2 | - | 9 | 6,705 | 615 | 7,338 |
| MB | 20 | 2 | - | - | - | 2,811 | 2 | 2,815 |
| | Other | 3 | 1 | 1 | - | 10,319 | - | 10,324 |
| MB Total | | 5 | 1 | 1 | - | 13,130 | 2 | 13,139 |
| ON & PQ & East | | 24 | 3 | 4 | 1 | 104 | 19 | 155 |
| | | 281 | 242 | 13 | 305 | 1,959 | 455 | 3,255 |
| ON & PQ & East Total | | 305 | 245 | 17 | 306 | 2,063 | 474 | 3,410 |
| US | 20 | 8 | 1 | - | 2 | 311 | 41 | 363 |
| | Other | 4 | 1 | 2 | 1 | 5,934 | 1,434 | 7,376 |
| US Total | | 12 | 2 | 2 | 3 | 6,245 | 1,475 | 7,739 |
| Grand Total | | 496 | 560 | 165 | 1,752 | 108,705 | 4,923 | 116,601 |

**Source:** CN and CP

**Figure 32: Repositioned Import / Export Containers East-West**

For example, an international container may be used for a domestic load in Toronto destined for Edmonton, where it is offloaded and the empty container then continues to the port of exit and onto a ship, with or without an export load.

The ratio of DRP containers leaving Central/Eastern Canada is approximately one DRP load to one empty container (1:1).

In 2005, some 100,000 domestic loaded marine containers moved from Central/Eastern Canada to Alberta and were released empty for furtherance through the Vancouver gateway.

Another way to show the empty flows is by percentage as shown in below in Figure 33.

**EMPTY RAIL FLOWS** CN&CP

| 2005 Empty UNITS | | Originating | | | | Percentage by Originating Province | | % by Destination |
|---|---|---|---|---|---|---|---|---|
| Destination | Equip | BC | AB | SK | MB | ON & PQ & East | US | Grand Total |
| BC | 20 | 0% | 25% | 1% | 4% | 63% | 6% | 24% |
| | Other | 0% | 35% | 4% | 10% | 36% | 15% | 76% |
| BC Total | | 0% | 33% | 3% | 8% | 43% | 13% | 70% |
| AB | 20 | 8% | 4% | 0% | 3% | 77% | 8% | 25% |
| | Other | 3% | 7% | 1% | 2% | 69% | 18% | 75% |
| AB Total | | 4% | 6% | 1% | 2% | 71% | 16% | 3% |
| SK | 20 | 7% | 39% | | 3% | 51% | | 86% |
| | Other | 1% | 17% | | 3% | 79% | | 14% |
| SK Total | | 6% | 36% | | 3% | 55% | | 3% |
| MB | 20 | 19% | 14% | 1% | | 65% | 1% | 58% |
| | Other | 7% | 5% | 1% | | 82% | 4% | 42% |
| MB Total | | 14% | 10% | 1% | | 72% | 2% | 1% |
| ON & PQ & East | | 1% | 2% | 1% | 1% | 82% | 13% | 36% |
| | | 1% | 1% | 0% | 1% | 89% | 7% | 64% |
| ON & PQ & East Total | | 1% | 2% | 0% | 1% | 87% | 9% | 11% |
| US | 20 | 0% | 0% | | 0% | 74% | 25% | 30% |
| | Other | 0% | | | | 20% | 80% | 70% |
| US Total | | 0% | 0% | | 0% | 36% | 64% | 12% |
| Grand Total | | 1% | 25% | 2% | 6% | 48% | 18% | 282,169 |

**Figure 33: Empty International Container Flows by Percentage**

This shows that 48% of all empties moving by rail are generated in Ontario, Quebec and East. Alberta generates 25%. It also shows that 70% of all empty containers moving by rail are destined to Vancouver. Only 3% are destined to Saskatchewan, with 86% of these being 20 foot containers. It is also important to note that there are additional DRP moves onto the Prairies not shown in Figure 33 that increase the number of potential empties that could be used for loading in those provinces, assuming sufficient economics and other factors are present.

With regard to marine containers to and from Vancouver, the following applies. For every three loaded import containers moving eastward through the Vancouver gateway to Central and Eastern Canada, one export load, one empty and one DRP marine container will move westward.

Stated another way, and perhaps more precisely, on an average marine container train leaving the Central/East for the West, it will consist of approximately 30% empties and 40% export loads headed for Vancouver, with 30% DRP loads headed for terminals across Canada.

Of those DRP loads, 25% will be headed for Vancouver, 55% to Alberta, and the remaining to Saskatchewan and Manitoba. Once unloaded, those DRP containers will be moved by rail either empty (or some will be loaded with exports) to or within the Vancouver gateway. (See Figure 34.)

Of the 99,000 empty container units shown in Figure 34, moving from Central/Eastern Canada to the West, approximately 85,100 of these are moving directly to Vancouver. Only about 6,200 are Alberta-bound, roughly 5,300 are Saskatchewan-destined, and just over 2,400 are headed for Manitoba. The data also reveal that over 80% of loaded marine containers moving to Alberta/Saskatchewan and Manitoba are in DRP use.

| CN&CP Units | | Rail Profile Central/Eastern to W Canada (Marine Containers) | | | |
|---|---|---|---|---|---|
| Destination | | Export Loads | Empties | DRP Use | |
| BC | 20 | 42,526 | 30,665 | 3,910 | |
| | other | 74,023 | 54,408 | 21,425 | |
| BC Total | | 116,549 | 85,073 | 25,335 | 25% |
| AB | 20 | 5,044 | 1,641 | 7,379 | |
| | other | 5,813 | 4,550 | 47,848 | |
| AB Total | | 10,857 | 6,191 | 55,227 | 55% |
| SK | 20 | 973 | 4,238 | 1,553 | |
| | other | 620 | 1,082 | 5,152 | |
| SK Total | | 1,593 | 5,320 | 6,705 | 7% |
| MB | 20 | 1,345 | 1,260 | 2,811 | |
| | other | 1,240 | 1,154 | 10,319 | |
| MB Total | | 2,585 | 2,414 | 13,130 | 13% |
| TOTAL | | 131,584 | 98,998 | 100,397 | 330,979 |
| | | 40% | 30% | 30% | |

**Source:** CN and CP

**Figure 34: Specific Rail Profile Central/Eastern to Western Canada**

Figure 35 shows another view of the same profile by TEUs.

| CN&CP TEUs | | Rail Profile Central/Eastern to W Canada (Marine Containers) | | | |
|---|---|---|---|---|---|
| Destination | | Export Loads | Empties | DRP Use | |
| BC | 20 | 42,526 | 30,665 | 3,910 | |
| | other | 148,046 | 108,816 | 42,850 | |
| BC Total | | 190,572 | 139,481 | 46,760 | 25% |
| AB | 20 | 5,044 | 1,641 | 7,379 | |
| | other | 11,626 | 9,100 | 95,696 | |
| AB Total | | 16,670 | 10,741 | 103,075 | 56% |
| SK | 20 | 973 | 4,238 | 1,553 | |
| | other | 1,240 | 2,164 | 10,304 | |
| SK Total | | 2,213 | 6,402 | 11,857 | 6% |
| MB | 20 | 1,345 | 1,260 | 2,811 | |
| | other | 2,480 | 2,308 | 20,638 | |
| MB Total | | 3,825 | 3,568 | 23,449 | 13% |
| TOTAL | | 213,280 | 160,192 | 185,141 | 558,613 |
| | | 38% | 29% | 33% | |

**Figure 35: Specific TEU Rail Profile Central/Eastern to Western Canada**

While this shows TEUs are relatively equally balanced compared to whole container units, slightly more TEUs are used as a total percentage for DRP use. This indicates domestic

traffic favours “Other” containers (longer than 20 foot), while empty units consist of a higher percentage of 20 foot than “Other” units.

It should also be noted that it is difficult to easily describe marine container flows through the Prairies since they move in three types of modes (empty, import load and DRP) from/to both East and West. However there are obviously substantial opportunities for increased source loading of grain on the Prairies should sufficient economic and market factors support it.

## 5.4 Railway Business Environment

Both CN and CP are commercially driven. As a result, careful attention is paid to both cost and revenue implications of any decision to alter their operations. As with other transportation businesses such as the airlines and steamship lines, they are moving to yield management models. This applies to drayage companies who strive to avoid bobtail movement miles (tractor miles without a load), and steamship lines that strive to fill every container slot on a given vessel. This is no different than the railways, where business decisions are made to maximize their trainloads and equipment velocity.

Aside from running longer trains as outlined above, the railways are looking for opportunities to increase the capacity of their terminals with less capital investment, by focusing on operating efficiency. These operating changes have required some changes to their business rules to enable increased capacity. These changes have forced discipline onto other partners in the intermodal chain, i.e. shipping lines and shippers, and have helped simplify and refocus the railways on service delivery.

## 5.5 Empty Container Storage

Historically, and unlike their US railway counterparts, CN and CP offered storage of empty containers at their intermodal terminals to the steamship lines for relatively little cost. This was done in order to attract and compete for the new and growing container business. While these rates were far below compensatory levels, railway intermodal container business was originally treated as an incremental cost. Given the (previously) relatively small volume of intermodal container shipments compared to other carload traffic, this made business sense. However by the mid 1990s, the railways experienced significant growth in international container movements. Their ever increasing volumes could no longer be viewed as incremental business since it was becoming a major business sector for the railways. This recognition resulted in various tariff increases to better cover the real costs of storing, handling and moving containers. At the same time, it should be noted that shipping line contracts are confidential and therefore actual tariffs will vary, particularly given that the two railways have reacted to these cost pressures differently in the face of intense competition for shipping lines’ business.

## 5.6 Empty Container Railway Linehaul

The railways also historically offered very attractive backhaul rates for empty containers to their major steamship line customers. As the volumes began to increase and intermodal

became a major segment of the business, recognition that intermodal fixed and variable costs would need to be recompensed resulted in substantial increases to empty container tariffs, whether containers were moved empty or loaded; the overall costs are similar for the railway.

This change affected empty international containers in two ways. One was to encourage the steamship lines to work harder to find export loads in order to help recover some of their costs. As can be appreciated, this change was not welcomed by the steamship lines, as it increased their costs, as well as their logistics and administrative workload.

The second effect was the increasing use of empty international containers at major empty sourcing locations, such as Toronto and Montreal, for domestic loads. This is called domestic repositioning. These containers are sent, if not to the point of export, then at least to a location closer to the point of export. For example, approximately 116,000 international containers were used for domestic loads in 2005. The majority of these were used for moving loads from Toronto to Calgary or Edmonton. This has the effect of balancing domestic containers and maximizing loaded container moves.

The majority of domestic repositioning therefore tends to bypass shorter hauls to Manitoba and Saskatchewan from central Canada because: 1) the volume is driven by the population base in Alberta and BC; and 2) the longer distance favours the terminals closer to the port of exit to maximize cost recovery for the steamship lines with less empty container miles.

## 5.7 Loaded Container Linehaul

Where unit (or block) trainload movements occur, i.e. whole trainloads from a single origin to a single destination can be achieved, the railways' costs decrease, and their rates tend to do likewise. As such, attractive rates can be charged between major destinations, when compared to shorter distances between smaller terminals, when less than trainload volumes are available. This is due to proportionally increased costs in switching, handling and support infrastructure for smaller volumes, discouraging shipment from or to the smaller terminals on the rail systems. This may contribute to the perception that rates are a cost impediment to serve grain on the Prairies.

This is particularly true in that grain is seasonal as well as being subject to market conditions, and therefore shipments fluctuate dramatically throughout the year. This puts pressure on container supply and increases costs for shipping lines (the owner of the container) as it is does for the railway which is expected to position the container where it is in demand. Therefore, sufficient revenue must be attached to these moves to attract willing suppliers.

## 5.8 Container Ownership

The ownership of containers raises some interesting points. It is important to note that railways would prefer to have balanced movements of loaded containers in both directions in every lane, as it would maximize their revenue per container. This is only true, however, as long as any additional handling costs at intermediate terminals, as well as any additional line haul costs due to switching and handling, are fully compensated. One way is to have sufficient volumes to increase the number of containers moving in unit trains. However, the

influence the railways have in this respect is limited, in that they do not own the international containers and while they can influence with price, they do not have final control over whether a container moves empty or loaded. The owner of the container has the final say.

Grain containers also need to be food grade acceptable. Twenty foot units are preferred based on weights. But most existing 20 foot containers are used for heavy loads such as steel. Mixing these two commodities (food and non-food grade) is a problem. Inspection from contamination is required and costs are often incurred to make these containers suitable to carry grain.

Bulk grain railway cars were originally purchased beginning in the early 1970s by the federal, Saskatchewan, and Alberta governments and the Canadian Wheat Board (known collectively as the "government fleet") because grain movements under the Crows Nest Pass Rates did not compensate the railways sufficiently to invest in new grain-carrying rolling stock. The federal cars are still owned by the Government of Canada.

Both railways operate allocated portions of the government fleet as their own cars. The railways are responsible for the day to day management and operation of the cars as well as for the maintenance of the cars. The same idea could, in theory, be applied to grain containers which could be financed by a group or groups of shippers or other non-government source as a separate pool of containers.

Were such a pool of containers in place, the ownership of the containers would be a small piece of the transportation cost. Containers are an inexpensive component in the transportation chain. Forty foot containers can be leased for about US $4.00 per day, and 20 foot for about US $2.50. A round trip of 52 days from the Far East for a 20 foot container translates into a US $125 ownership cost. However, this is compared to the average generated revenue of about US $3,500 per container on a load from the Far East. And, as we explain in the section on Shipping Lines (Section 6.6), the shipping lines are more motivated by turning the container back to Asia for a $3,500 load as quickly as possible, than delaying that container for an additional 14 days (round trip) for a lower rate on back haul grain. This forced grain "headhaul" would in fact be the financial "backhaul." So the ownership of the box might help with direct control of positioning containers, but would do little to compensate the cost of moving grain, unless other operating changes and additional cost recovery is included.

Furthermore, the logistics of controlling international containers is far more difficult. In effect, this would make grain in containers the headhaul, with the more lucrative consumer goods from the Far East becoming a backhaul. This could have some merit, provided a system was in place to strictly monitor and control the containers' positioning on a world-wide basis. However, there would be serious barriers, such as international coordination and policing. Without specific lanes and steamship partners, it is doubtful this could work effectively. Specialty grains move to many markets. Product is seasonal and variable. Without further study, the practicality of such a scheme is unclear. This is discussed further in Appendix C—Best Practices.

## 5.9 Capital Requirements for Railway Terminals

With the ever increasing volumes of containers, intermodal terminal construction has continued at all major terminal points. Existing terminals have been expanded and new ones have been built. Capital requirements for intermodal railway terminals are large. The annual double digit growth in container movements places high demand on terminal capacity and the railways continually attempt to find ways to better use their assets. Capital expansion is now viewed as the final option, with operational changes as the preferred option.

The railway terminals were handling both the loaded and empty container storage at their terminals, placing two types of operation and processes into every terminal, requiring different skills and types of equipment. This increased overall operating costs at these terminals and certainly used up terminal capacity. In addition, complaints from trucking and drayage companies about their in-terminal waiting times in congested railway terminals continued to highlight the terminal capacity and service issue.

Loaded container fees have not traditionally covered the costs of shunting loaded containers from piles where four handlings were being made to uncover one container. As the loaded piles increased in size, operating costs increased exponentially. As part of the process to better utilize assets and their in-terminal services, the railways have begun to reduce congestion and increase velocity of containers. One way railways have begun to regain capacity at busy terminals is by increasing storage fees for both empty and loaded containers to better reflect operating cost impact. Both railways have made different specific decisions as to which terminals and to what degree customers are impacted; nevertheless, the trend of increased storage fees is now in place.

### 5.9.1 Loaded container storage

As part of the new emphasis on increasing terminal capacity and container velocity, the railway companies have recently begun to increase general storage tariffs to what they view as compensatory, for the fully allocated costs of storage of loaded containers within their terminals. This has not been uniformly applied, with the most congested terminals receiving the most attention. These fees are sufficiently high that other facilities, referred to as satellite intermodal terminals, have been opened by independent companies in the major metropolitan areas. This action has aided in keeping railway intermodal terminals operating with a reasonable throughput container velocity in the face of ever increasing volumes.

However, this trend has adversely impacted some shippers and trucking companies, as the dray companies are required in many instances to triangulate movement to meet customers' needs. Drayage companies now often have to pick up containers from satellite yards to move to rail intermodal yards or to cross dock or loading facilities. This may cause increased costs to the trucking companies that are invariably passed to the shippers in an attempt to reduce cost. This condition also exists with empty containers as seen in the next section.

### 5.9.2 Empty container storage

Empty containers require different services from loaded containers, such as inspections, grading, repair and stacking. Efficient empty handling cranes are not the same cranes that effectively handle loads. So empty container functions of the intermodal terminal is in reality a separate type of operation, other than where empty containers are loaded directly to rail or from rail. The steamship lines welcomed in-terminal empty yards because they provided a "one stop shop" where inspection and repair could be done within one facility. This made quality of process and price easier to control for the steamship line.

However, the empty containers and process take up valuable terminal capacity. Therefore railways have freed more terminal capacity for handling loaded containers by minimizing empty container storage areas in their more congested terminals. This is done either through enforcing strict rules limiting the number of containers allowed to be stored, or punitive tariffs. This has been unwelcome news for steamship lines that have absorbed increased bobtail miles (tractor miles driven without a container). Whereas in the past, dray companies had been able to drop off a load and pick up an empty at the rail terminal in one move, they now have to travel between the rail and empty container yard, in many cases adding on substantial dray cost mileage. This cost is passed on ultimately to the shipper.

## 5.10 Terminal Logistics

Railways have begun to not only schedule trains, but to schedule all aspects of the delivery system. This applies to making appointment times for all drayage companies that handle containers on behalf of the shipping lines and their customers to access the railway terminals. They have also moved toward a strip and reload operation at some terminals to reduce in-terminal service times for the trucking companies as well as their own handling costs. These efforts are an attempt to increase velocity of the containers within the areas controlled by the railways.

On the domestic side, this approach has made the system more efficient because the business tends to run in smaller quantities, and the flow can be evened out dramatically with good information systems and incentives. However, on the overseas market side, the increased volumes of containers are more difficult to handle due to the large capacity of container ships compared to the average trainload. This results in large number containers that need to be moved or stored at any given time.

At the same time, the new logistics rules being put into place at the railway terminals have put more pressure back onto the railway customers to put more discipline into their systems and push back those disciplines to their customers. While painful, not all the impacts are necessarily negative. It forces the entire chain to rethink cost and efficiencies. Therefore it is not clear whether these changes have produced the optimized supply chain on overseas traffic, when the complete costs of transportation are taken into account.

## 5.11 Trucking

Trucking is an integral part of all container cycles in North America (in Europe, a small percentage of door moves are made with barges). The final delivery of import freight, the return of the empty container to the container yard, the positioning of the container at the point of loading, and the drayage to the rail or port terminal all generally involve trucking.

Trucks are the link between the nearest terminal (port or rail) and the point of delivery/ loading. In most cases trucking is one-way freight as the empty container haul is generally identical to that of the full container. For example, when delivering freight to a consignee, the trucker will generally pick-up the freight at a terminal, dray the container to the receiver of the goods and in most instances wait for the container to be discharged, then return the empty container to the terminal. For export cargoes, the empty container is sourced from the nearest terminal and, in most cases, returned loaded to the same terminal. In some locations, where the utilization of port or rail terminals is high, empty container yards will be used for re-delivery and storage of empty containers rather than add to the congestion of the port or rail terminal.

Truck drayage is in the order of $2.25 per kilometre for long haul and charged at a fixed price for local delivery per container to account for the time required at the terminal and at the point of delivery/loading. Rates vary, but would range as follows, depending upon location:

**Table 5.1: Indicative Local Trucking Costs**

| Region | Cost |
|---|---|
| Vancouver | $340 |
| Toronto | $325 |
| Montreal | $250 |
| Halifax | $250 |
| Western Canada | $175 |
| Note: All rates subject to varying fuel surcharges as well | |

**Source:** Shipping agent

The trucking part of the transportation cycle can represent a significant cost, all of which is incremental cost to the carrier. The cost of handling and storage of empty containers can also add up quickly and carriers tend to try and minimize the number of containers at inland destinations.

From port terminals, the shipping lines attempt to triangulate their moves in order to save most of the empty haulage cost and avoid the cost of two empty container handlings. This requires that they coordinate the delivery of freight with an opportunity to pick-up export freight in the same general area with the same container. They instruct the trucker to combine the two moves and save part of the empty haulage costs. Such moves require a significant amount of planning and coordination; the following are some of the requirements for triangulation to work:

- The timing of the import delivery and the export pick-up must coincide;

- The container type must fit the requirement for export;
- The truck driver must inspect and clean the container, otherwise the line will incur additional trucking costs and miss the export appointment;
- The delivery schedule must be reliable and the pick-up schedule must be more flexible than otherwise; and
- The trucking dispatchers must be available to deal with unforeseen events.

When the container is used for domestic freight to reduce the cost of repositioning, the level of coordination required for triangulation is all but impossible as the two moves—the delivery by the domestic carrier and the pick-up by the shipping line—are independently controlled.

Another variant is to use an empty container yard that is geographically closer to the customers. Such empty yards offer more flexibility in terms of coordination and typically a lower cost of handling and storage than the main terminals.

Each of the major ports studied handles a significant amount of cargo into and out of the port by truck. They can be summarized as follows:

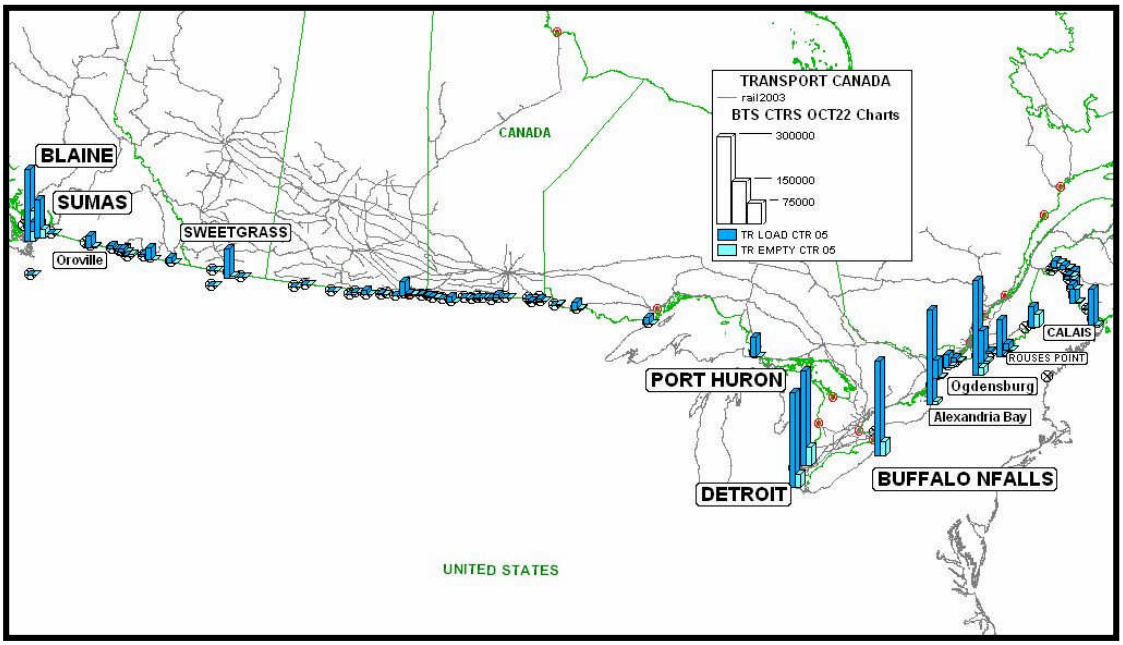
**Table 5.2: Port Truck Volume 2004**

| Port | Truck volume (TEUs) |
|---|---|
| Vancouver | 460,000 |
| Montreal | 245,000 |
| Halifax | 120,000 |

**Source:** Port data

### 5.11.1 Cross border container trucking

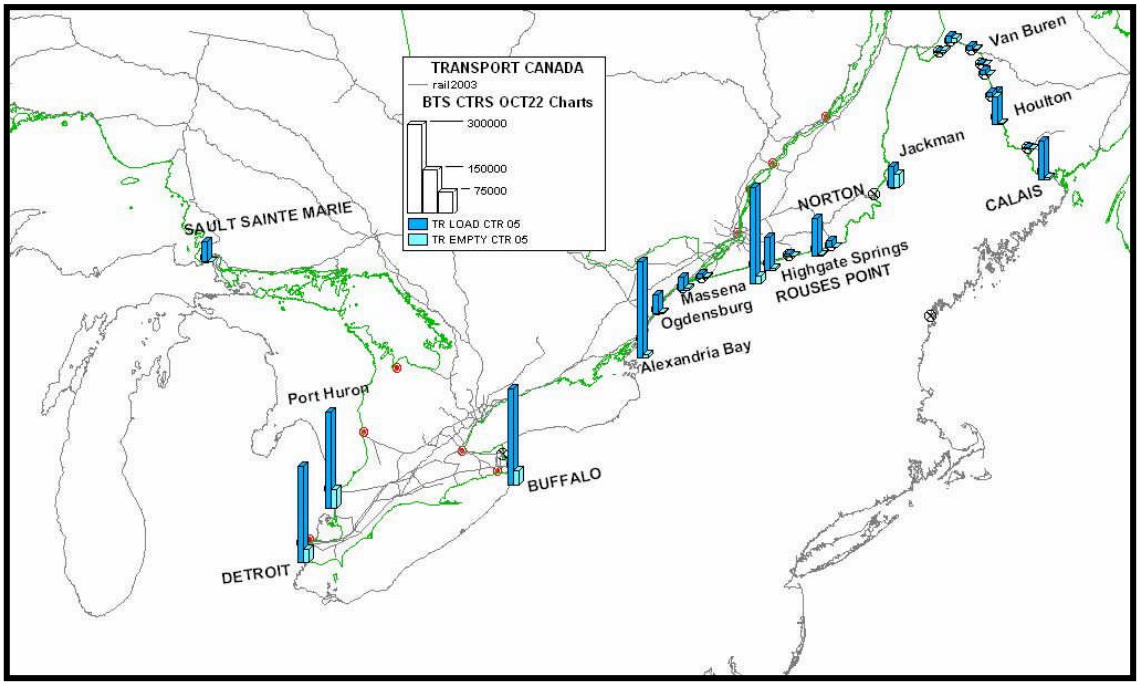
The data we obtained for two aspects of cross border container movements were less than ideal. BTS data are only available for two-way movements. Shown graphically, the data reveal a significant amount of cross border traffic.




**Source:** Bureau of Transportation Statistics

**Figure 36: Cross-Border Truck Traffic, Loaded and Empty**

By regions, the data are quite revealing as well, as Figure 37 for Eastern Canada shows:




**Source:** Bureau of Transportation Statistics

**Figure 37: Cross-Border Truck Traffic—Eastern Canada, Loaded and Empty**

Montreal is known to be an important entry point for imports into New England via the several services calling there. Halifax services northern Maine blueberry producers, as containers are trucked to Maine from the Nova Scotia port. In the mid-west, containers are trucked to intermodal terminals in Toronto.

### 5.11.2 Trucking in the container logistics system

As mentioned above, trucking is an essential part of the supply chain system. Shippers are dependant upon truckers to pick up their containers at the pier or intermodal terminal, for movement to the Distribution Centre (DC), warehouse, or store. After delivery, the container may have another load to pick up, or the container may be deposited in a container depot off dock or in a warehouse district. Local drayage by truck can usually compete with rail up to 500 miles away, depending, of course, whether rail service is even offered.

Most warehouses and DCs are located near population bases, whereas many exporters are located outside metropolitan areas. Warehouses and DCs will supply stores in remote communities on a store-by-store basis. The container will never usually go near these locations.

Below are some good examples of export moves requiring significant trucking.

**Table 5.3: Estimated Regional Container Trucking Costs**

| Commodity | Origin | Port | Approx. Drayage Cost |
|---|---|---|---|
| Peat moss | Caraquet, NB | Halifax | 322 x $2.25 = $724.50 |
| French fries | Florenceville, NB | Halifax | 354 x $2.25 = $$796.50 |
| Newsprint | Temagami, ON | Montreal | 405 x $2.25 = $911.25 |
| Nickel | Sudbury, ON | Toronto | 248 x $1.00 = $558.00 |
| Pulse | Saskatoon, SK | Edmonton | 325 x $2.25 = $731.25 |

**Source:** MariNova calculation

The charge will usually have a fuel surcharge added to it as well, ranging from 8% to 18%, depending on location. In the case of the Sudbury shipper, they would also have a rail cost from Toronto to Montreal or Halifax before the shipment would be lifted onto a vessel.

# 6.0 State of Play—Regional Perspective

## 6.1 West Coast

The explosive growth in import container traffic, primarily from China, has been (and continues to be) a challenge for all of the transportation components involved in the system through Vancouver, and has resulted in major capacity constraints. This is having repercussions along every related supply chain.

The marine terminals have completed expansion programs and Deltaport's third berth will add much needed capacity in 2008. The ability to bring Fraser-Surrey back into the equation as a main line player seems unlikely based on the continued shift to larger ships. Whether the Prince Rupert Terminal (scheduled to commence operations in late 2007) has a significant effect will depend upon the characteristics of the service—at present 80% of its throughput is slated for US destinations.

The railways have also undertaken a number of significant measures to expand capacity from Vancouver through to the Rocky Mountains—through capital investments, joint one-way running along the Fraser Canyon, and co-production arrangements for serving the Burrard Inlet terminals.

The VPA, the marine terminals, and the railways have taken a number of procedural steps to enhance the velocity of movement through the system and increase aggregate capacity. This has included truck reservation systems, narrowed booking slots, reduced free time, plus much-increased storage rates for containers that are left on-terminal. In addition, under its *Fluidity Program*, Deltaport has rationed capacity for its container lines by limiting import container volumes, and similarly the railways have been rationing available train lengths for some time.

The importance of effective truck transportation between the nodes within the Greater Vancouver Gateway should not be under estimated. In addition to direct moves between the dock and the shipper or consignee trucks move the majority of containers between the dock and the import transload facility, or in the reverse, between the export transload facility and the dock, and empty containers between all nodes. The cost effective use of trucks has been seriously eroded by a number of factors: the heavy congestion on most trunk roads within the Greater Vancouver Gateway throughout much of the day; the inability of the system to adopt longer receiving/shipping hours because of the costs involved and limited demand for service during non-regular hours; the independent truckers' job action; and concerns over the application of the mediator's award.

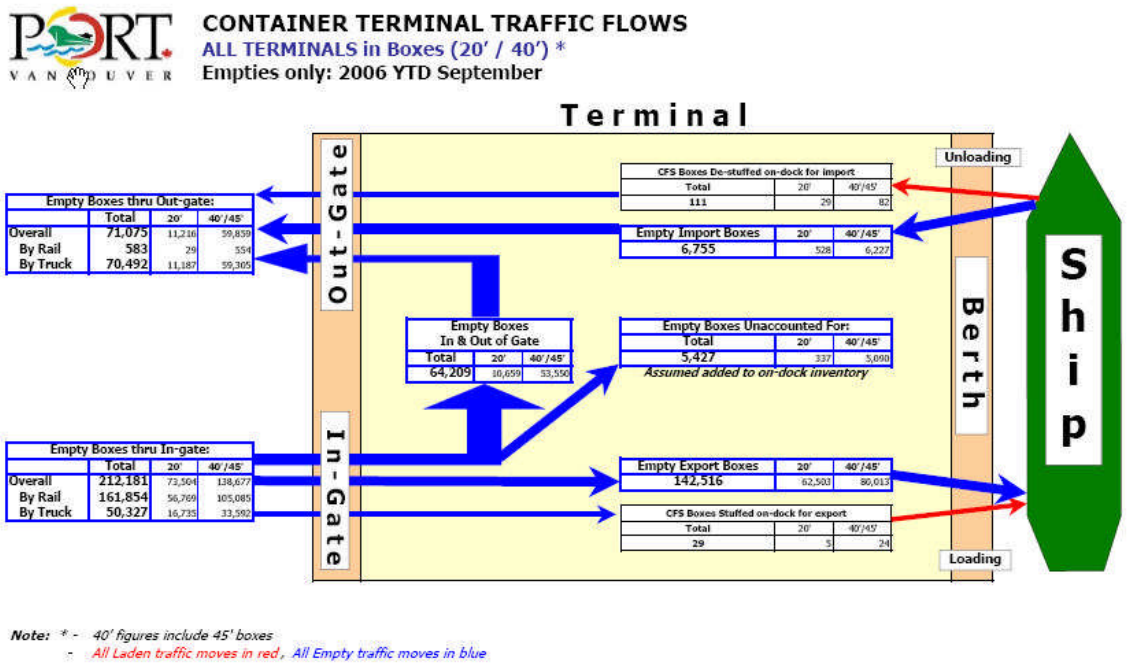
## 6.2 Empty Containers

Historically, shipping lines and terminals (both deep-sea marine and rail intermodal) incorporated the handling and storage of empty containers into their negotiations. In effect, empty containers were treated as a necessary adjunct to the laden opportunity, and a component of full service.

This included, for example, a free inward gate empty move for each outward gate move, and free storage for a number of containers on the deep-sea terminal in proportion to the line's throughput. In 2001, nearly 20% of the gate moves at the Vancouver terminals were associated with empty containers stored on-dock; most of these were truck-based.

Inland, the railways often utilized empty marine containers for a westbound domestic cargo move. The line could then either use the container for local export stuffing or could take advantage of a subsequent free move westward under the relevant domestic repositioning program. The railways were also willing to store empty marine containers at their intermodal terminals at little or no charge.

As capacity limits were approached at the terminals, it became apparent that empty containers were a major impediment to the effective management of laden moves. The issue became so acute that the VPA instituted an Empty Container Committee. The situation as of September 2006 is illustrated by Figure 38 below

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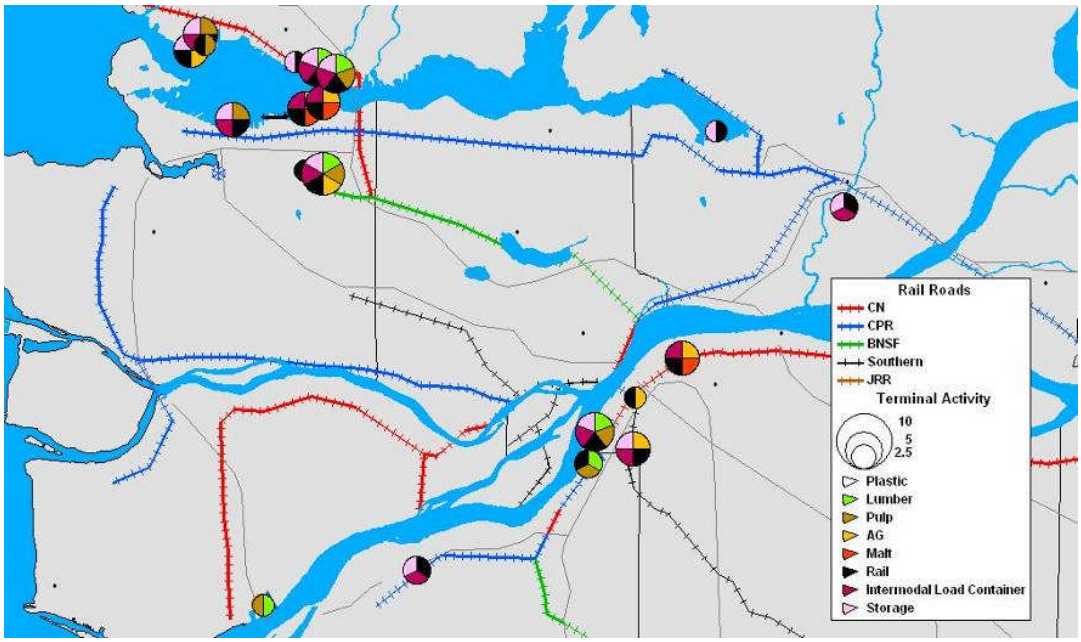
**Source:** VPA

**Figure 38: Container Terminal Traffic Flows**

In addition to getting laden containers off the terminals as quickly as possible, it also became imperative to shift empties off the dock immediately or, preferably, to prevent them from entering the terminals unless scheduled for loading empty to the ship. The result was the elimination (or severe curtailment) of free time and the adoption of punitive storage rates—variously $100/$175 per day, with increases to $225 anticipated at some particularly strained terminals. Initially adopted by the marine terminals, this approach has been followed by the railways at their intermodal terminals.

With a growing demand for the storage of empty containers, a number of off-dock facilities in Greater Vancouver expanded their existing storage capacities and have offered fairly sophisticated storage, repair, access, and gating services. The response inland has been more ad hoc. For example, in the Edmonton area, four or five facilities now offer empty container storage, but the hours of operation are limited and the facilities themselves are somewhat rudimentary. The limited volumes involved may hinder the development of better facilities.

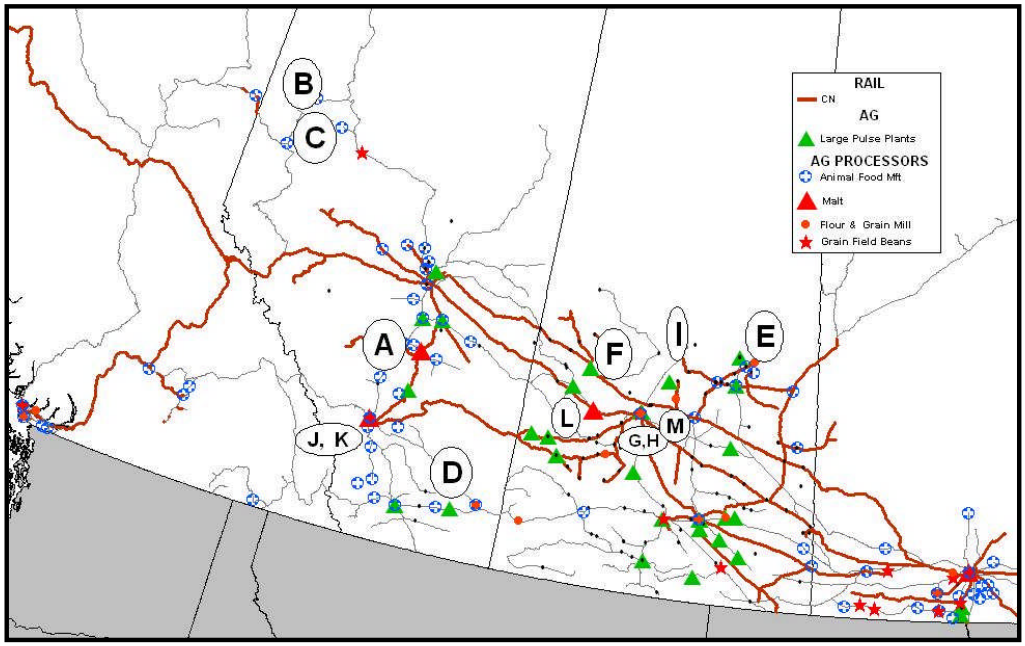



**Source:** LMS Marketing Services

**Figure 39: Transload and Container Handling in Vancouver Region**

## 6.3 Prairies

The map below illustrates key agricultural demand nodes on the Prairies.




**Source:** Industry sources

**Figure 40: Agricultural Demand Nodes**

There is significant demand for container service on the Prairies. On a commodity basis, we estimate the following tonnage and TEUs of agricultural products volume moving to Vancouver.

| Ref | AG Shipment Ests PR | Region | Product | MKT | MT | Est TEUS |
|---|---|---|---|---|---|---|
| A | AB | Olds | Hay | Japan | 160,000 | 7,619 |
| B | AB | Peace | Malt | Japan | 30,000 | 1,429 |
| C | AB | Peace | Hay | Japan | 80,000 | 3,810 |
| D | AB | South | Mustard | Japan | 7,000 | 333 |
| E | SK | Tisdale | Alfalafa | Japan | 20,000 | 952 |
| F | SK | North Battelford | Peas | India | 80,000 | 3,810 |
| G | SK | Saskatoon | Lentils | China | 50,000 | 2,381 |
| H | SK | Saskatoon | Peas | India | 100,000 | 4,762 |
| I | SK | Prince Albert | Peas | India | 100,000 | 4,762 |
| J | AB | Calgary | Malt | Japan | 80,000 | 3,810 |
| K | AB | Calgary | Malt | China | 100,000 | 4,762 |
| L | SK | Biggar | Malt | China | 100,000 | 4,762 |
| M | SK | Clavet | Canola Meal | | 25,000 | 1,190 |
| | | | | | **707,000** | **33,667** |

**Source:** Industry sources

**Figure 41: Agricultural Shipment Estimates**

### 6.3.1 Alberta

Several Alberta shippers were interviewed for this study. They included representatives from the forest products, malt, and chemical sectors; a number of shippers and shipper associations declined to participate or had limited ability to contribute. The intent was to obtain a flavour of operational context and issues, not to conduct an exhaustive survey.

Each shipper had chosen its method of shipping (transload or source load) to suit the prevailing circumstances. Those that did source load had no serious difficulties accessing suitable containers. Their issues primarily related to juggling empty pick-up times from the satellite yards, efficient loading, and delivery to the intermodal yard. The refusal of the railways to store empty containers, the resultant (somewhat ad hoc) response by the private sector to the opportunity, and their restricted hours of operation had obviously created some issues.

Otherwise, the primary issue raised by all shippers was reliability (and the perception of reliability) of the Port of Vancouver, especially consequent to the truckers strikes.

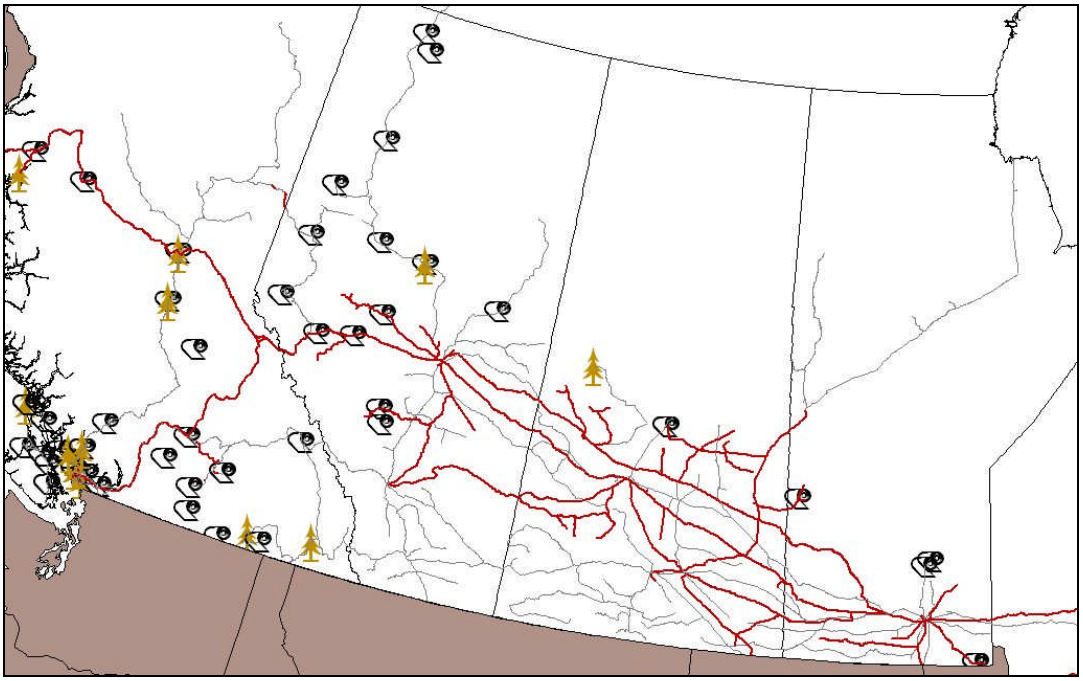
One forest products shipper splits its pulp exports 50/50 between breakbulk and container. The majority of the containerized product is transloaded in Vancouver. About 1,000 containers per year are source loaded, with the containers trucked to/from Edmonton. The choice is motivated by inventory availability and letter of credit (L/C) issues. If the L/C is not to hand, then the product is shipped out by rail—by the time it is transloaded, the L/C has arrived and the shipment can be containerized in accordance with the requirements. In general, source loading is slightly cheaper overall. The use of railcars is more efficient, but source loading avoids double handling, as well as congestion and job-action (trucker) issues.

One chemical shipper source loads all its export cargo. Sodium chlorate has a value of about $500/metric tonne (mt). Half of production is for export. One tonne bags are used and stuffed at 20 bags per 20 foot (40 foots weigh out at 30 bags). Attempts to bag and load containers in Vancouver did not work well. This shipper has added extra staff and has experienced major inconvenience consequent to the decision by the railways not to store empties on their intermodal terminals.

A second chemical producer source loads all of its packaged ethylene goods for export, and transloads the majority of its bulk shipments to containers in Vancouver. Product value is in the region of US $1,200/metric tonne. Total container usage is 12,000 x 40 foot per year. The shipper has its own hopper cars (100 mt). Transload is the less expensive option. The primary issues related to ports are reduced windows and labour issues. The shipper recognized initial problems with the change in empty storage but considers these resolved or worked-around.

The malt exporter interviewed has a production of 140,000 mt, of which 70% is exported offshore. Value is barley, price dependent and in the $300-$450/mt range. The product is loaded into owned hoppers (70-80 mt) and railed (CP or CN) to one of two transload facilities. The product is transloaded to malt-grade and Japan-malt-grade containers, which are readily accessible in Vancouver, with a 50/50 split between 20s and 40s. High volumes keep the costs down. The main issues are hopper turn times and rail congestion.

Forestry is also important across the Prairies, as the following map illustrates:



**Source:** Industry sources

**Figure 42: Locations of Principal Pulp, Paper and Lumber Production, Western Canada**

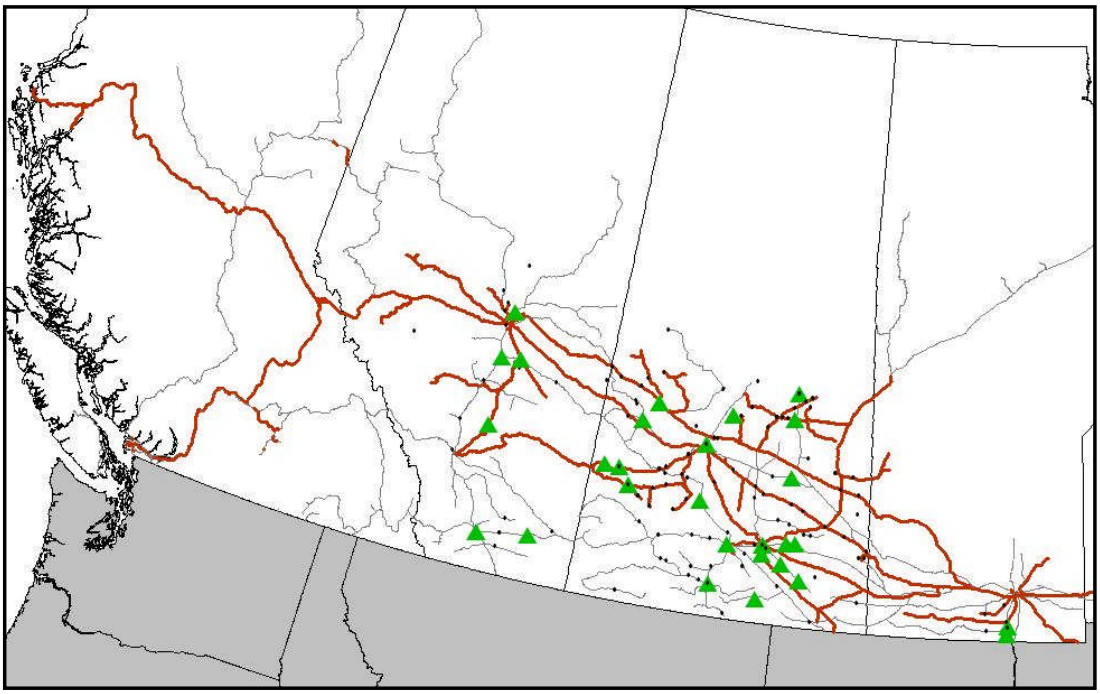
Pulp and Paper locations are indicated by the paper roll symbol and integrated operations mills and paper-pulp are indicated by a tree symbol. The majority of exports for producers truck rail product to the Port of Vancouver and stuff containers. There is some container source loading.

### 6.3.2 Saskatchewan

Interviews were conducted with Agricultural Pulse, Forestry, and Agricultural Implement manufacturers, as well as third party (3PL) transload providers.

#### Pulse sector

The pulse sector is comprised of over 100 plants across Saskatchewan varying in sizes from 5,000 to 200,000 mt per year. The plants compete against each other for farmers' crops and for export business. Some companies are affiliated with either grain traders or larger offshore marketing companies, which provide a base market to the company in the province. This makes it easier for the company to plan its end use demand and forecast its container demand.



**Source:** Industry sources

**Figure 43: Location of Pulse Sector Plants**

The industry demands more 20 foot marine containers due to the range of markets serviced. Shippers indicated that the use of 20 foot units exceeded 90%. However, there is more availability of 40 foot international and 53 foot domestic units due to the retail volume that is shipped to the province. In addition, the industry requires food grade inspected containers.

The trade lanes for pulse crops have been well documented in past studies. Key corridors include Montreal for lentils destined to the Middle East, peas to Europe (feed and food), and mustard to Europe. Shipments of peas are dominant through Vancouver to Asia with India having the greatest growth. Lentils to South American and Asian markets have remained constant through Vancouver. Depending upon the pulse company, the variation in shipping can be 70-80% Montreal or Vancouver.

Shippers across the province use either CN at Saskatoon or CP at Saskatoon or Regina, depending upon their location and the shipping line that is utilized to move product to market.

With respect to whether a company source loads in Saskatchewan or at the port depends upon its position in the value chain. If the company is affiliated with the end market then source loading is utilized more than loading at the port. One company has shifted from source loading in Saskatchewan to port loading, whereas another would source load more if more containers were available. However, not all lines service or are represented in the region, thus there is a limited supply of containers, hence the use of domestic rail or domestic containers to ports for stuffing at port.

From the interviews, the number of containers being source loaded in Saskatchewan over the last three years, as compared to port loading, has remained constant at about 36% of total shipments (see Table 6.1). Note that in 2003 there were drought conditions that impacted the production of pulse crops. Although not all the smaller pulse companies were interviewed, the largest companies that participated provided a very good representation of container volumes.

**Table 6.1: Pulse Sector Container Source Load from Saskatchewan to Ports**

| Mode Type | 2003 | 2004 | 2005 |
|---|---|---|---|
| Source Load CTR PR | 7,725 | 11,100 | 14,000 |
| Source Load Port | 14,650 | 19,800 | 23,650 |
| Total Containers | 22,375 | 30,900 | 37,650 |
| Source Load Province % | 35% | 36% | 37% |

**Source:** Interviews

Figure 44 illustrates the changes in containerized shipments of peas and lentils from 1995 to 2004, through the Port of Vancouver. In 2003 and 2004, the drought impacted the volume of lentil shipments.

#### Agriculture implement manufacturers

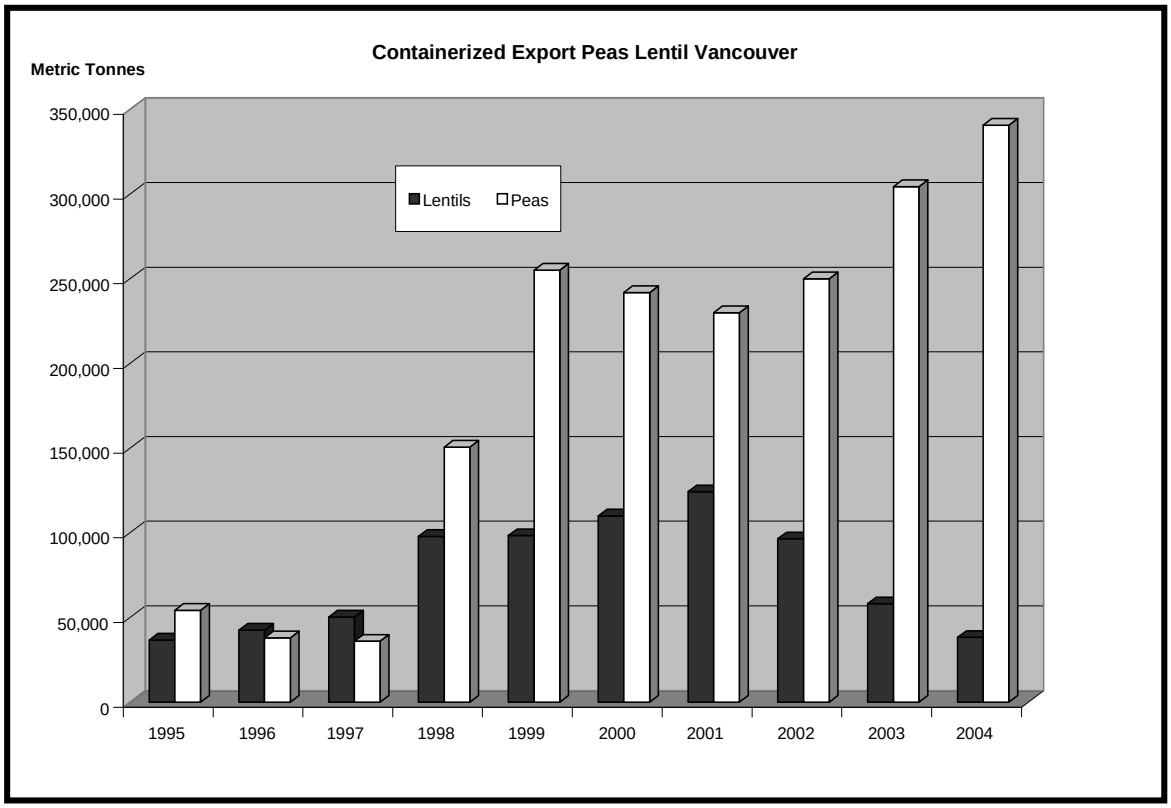
There were four companies contacted and interviewed. This sector ships less than 150 containers per year. Most manufacturers were reluctant to provide actual data estimates. One indicated that they ship just one to three containers per year. Those that responded indicated they use 40 foot high cubes. Shipping lanes were to Montreal for Eastern Europe and Ukraine and Vancouver for shipments to Australia. Most shippers use third party booking agencies for containers.

### 6.3.3 Manitoba

The Canadian Wheat Board (CWB) told us they do very few shipments of grain in containers off the Prairies. When they do ship in containers, they load at the Port of Vancouver. They have also done a test through Montreal. The biggest issue for them is the cost per tonne of shipping by container versus a hopper car. Currently, the cost per tonne for a carload is CAD $40 per tonne and dropping. One hopper car can handle as much grain as three 40 foot containers.

#### Malt processing

The CWB's Barley Marketing division essentially does little source loading from the Prairies, as it is more economical to move grains in hopper cars to port and subsequently transload to marine containers or breakbulk at that point. It is evident that the current supply chain and logistics of western Canadian agricultural products is functioning reasonably well, however, there is opportunity for improvement. The movement of empty containers from Eastern and Central Canada or the US for loading on the Prairies is hampered by the availability of food grade containers. The preferred container type is the 20 foot marine




**Source:** Statistics Canada, 1995-2004

**Figure 44: Containerized Export of Peas and Lentils through Vancouver, 1995-2004**

container. Both of these factors are important in the selection and subsequent possible movement of grains in containers. Malt barley that the CWB markets can be transported in 20 foot marine containers from the Prairies provided marine rates are lower than the total costs of shipping in hopper and transloading at the Port of Vancouver.

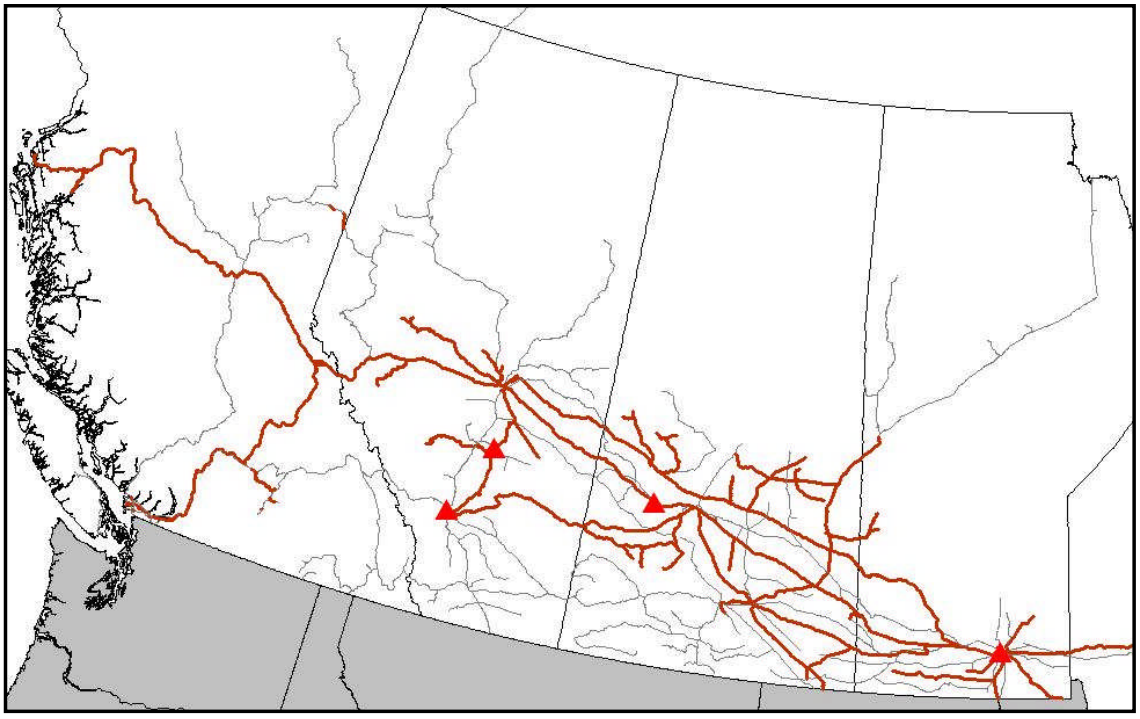
Malt processing is done in the following locations in the following volumes:

**Table 6.2: Western Canadian Malt Plants Capacity, 2004**

| Province | Location | Malt Plants | Malt Capacity Mt |
|---|---|---|---|
| AB | Calgary | Canada Malting Co. Ltd. | 325,780 |
| AB | Alix | Rahr | 140,000 |
| MB | Winnipeg | International Malting | 95,000 |
| SK | Biggar | Prairie Malt Limited | 245,000 |
| **Total** | | | **805,780** |

**Source:** Industry sources

It can also be illustrated as below:



**Source:** Industry sources

**Figure 45: Malt Processing on the Prairies**

Other malt companies interviewed also indicated that they source load at port due to economics and container availability. However, there has been interest in the new CN transload that was built at Edmonton. CN is targeting malt companies to source load containers in Edmonton.

Another grain shipper indicated they ship about 3,000 containers per annum through Vancouver. They prefer 20 foot equipment but can use 40 foot boxes *if rates are discounted to compensate*, as 40 foot containers weigh out before they cube out. Yet another shipper indicated they ship about 1,500 20 foot boxes and 100 40s per annum, with about 40% source loading and 60% port loading. Ports vary between Vancouver, Montreal and Halifax.

### 6.3.4 Future container utilization on the Prairies

From the interviews the key issues identified that hinder the future use of containers include:

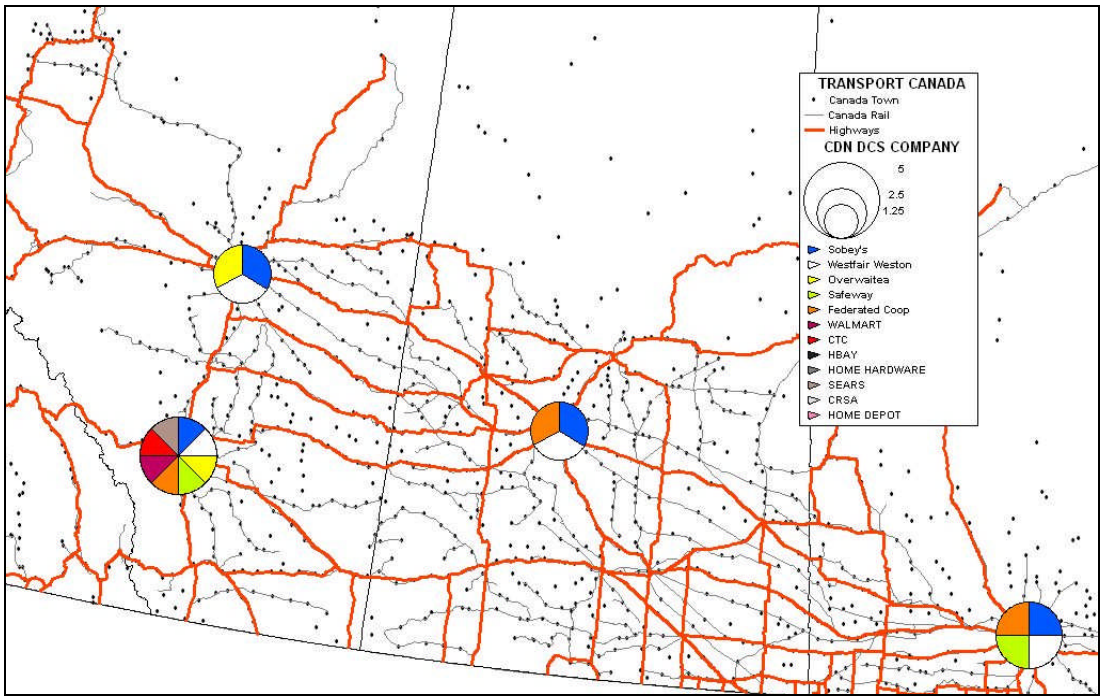
- Availability of 20 foot containers;
- Rail service standards for delivery;
- Cost for demurrage and storage penalties for containers;
- Lack of penalties to railroads for poor service;
- Booking procedures for containers;
- Lack of competition for local drayage;
- Costs;

- Inspection services; and
- Supply of containers—5-10-15 in one shipment in order to meet order sizes.

Most companies identified the source loading of containers as cost competitive with bulk boxcar or hopper and stuffing at the port. However, with rail bulk or boxcar shipments to port, a company can increase the amount of volume to tranship, as one boxcar can load three containers.

The mixes of modes also offered shippers some flexibility so they do not have to rely on one service type. However, the rail service standards for domestic containers and box or hopper cars are inconsistent and delays due to rail service have hindered shippers' needs to fulfil orders and meet sailing dates.

The emergence of Calgary and Edmonton as regional DCs will open up opportunities for Prairie shippers to access empty containers as the availability of empty containers is driven by inbound freight.




Note: Not all sites may be shown
**Source:** Ryerson Tech Retail and Distribution Data

**Figure 46: Sites of Major Known Company DCs**

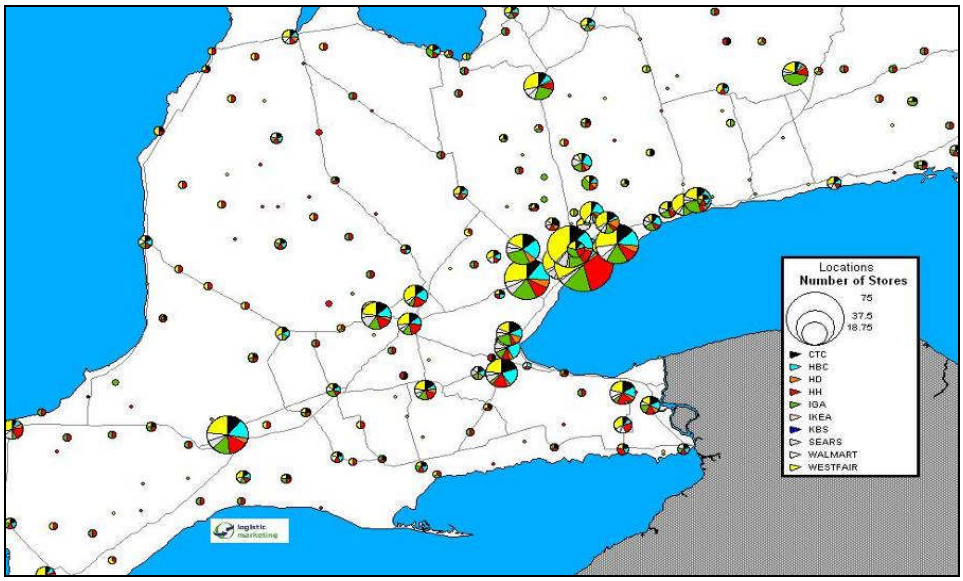
Calgary has become the central DC centre for western Canada as it has attracted the largest cluster of retail regional DCs that service towns across all of western Canada. Not all of the smaller DCs are shown due to data availability; for example Regina has 1-3 smaller food retail DCs for local services. Saskatoon services northern destinations and also has the central DC for Federated COOP within the city.

## 6.4 Central Canada

### 6.4.1 Distribution centres

The location of DCs in Canada has been concentrated in Southern Ontario and Montreal due to the large concentration of retail stores in the Windsor-Quebec City Corridor. Figure 47 and Figure 48 below compare the differences in store concentrations between Southern Ontario and Eastern Canada. Figure 48 shows the locations of DCs in Southern Ontario and Quebec. These figures illustrate the market retail forces that have resulted in the location of DCs in close proximity to the highest concentration of stores (and people).

The major retail chains have centralized DCs and are concentrated in Southern Ontario due to the large concentration of stores in this market. Most companies do freight consolidation from their DCs.

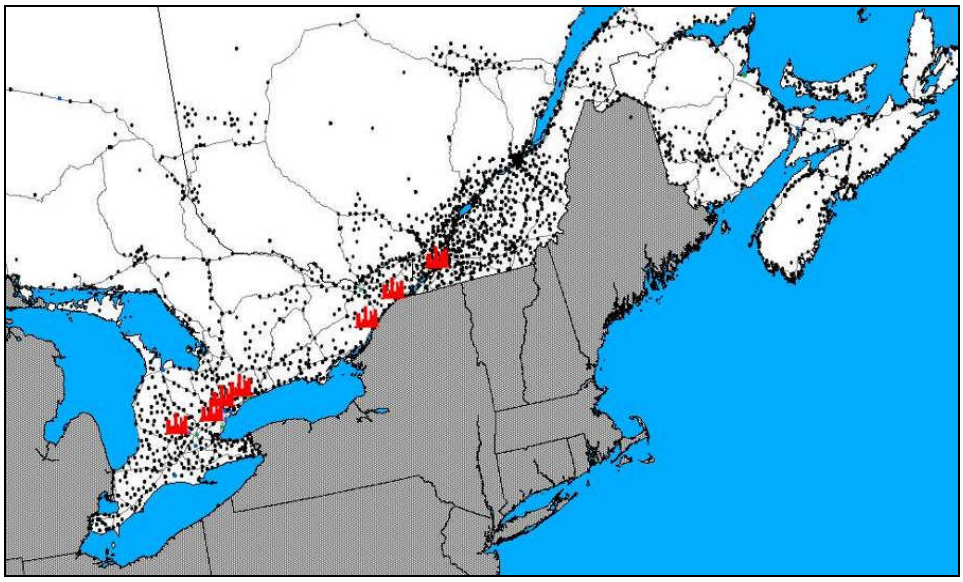



**Source:** MariNova Consulting Ltd., "Greater Halifax Distribution Study," 2004

**Figure 47: Locations of Stores in Golden Horsehoe**

Figure 48 shows this concentration by the number of key retail stores by town across Eastern Canada. Note the distribution of stores is population driven for both food and commercial items.

Due to Canada's geography, most retailers operate a centralized location in Ontario and have regional sites in Calgary or Montreal to service these markets.



**Source**: MariNova Consulting Ltd., "Greater Halifax Distribution Study," 2004

**Figure 48: Location of DCs in Central Canada**

Regional DCs are situated across Canada in Western Canada; (Calgary, Winnipeg) and in Atlantic Canada (Moncton and Halifax). Transload container sites are situated at the port cities of Vancouver, Montreal, and Halifax. At these sites, inbound containers are de-stuffed and loaded onto domestic equipment for direct shipment to stores. Transload locations are based upon frequency and products sourced from various trade corridors.

## 6.5 Atlantic Canada

In the Atlantic region, domestic lanes are largely eastbound 53 foot traffic, which is the higher volume headhaul trade lane, consisting of grocery and department store freight for such retailers as Loblaws, Canadian Tire, Wal-Mart and Home Hardware.

The challenge is to marry domestic moves with steamship carryings. CN Intermodal does use some steamship lines' equipment for domestic moves into Atlantic Canada. So does Oceanex, the domestic short sea service that operates from Montreal and Halifax to and from Newfoundland.

Other challenges in Atlantic Canada include equipment size mismatches; they are using 40 foot high cubes in what is, in effect, a 53 foot market. Also, there is dry equipment available when the need is for heated or reefer boxes.

There are also seasonal pressures. Some cargoes need to be protected from freezing in winter, while others need temperature control year round. As on the Prairies, there are peak commodity harvest seasons for products such as potatoes and Christmas trees. Some exporters, such as those shipping newsprint, peat moss and waste, have a difficult time accessing equipment, because the lines tend to be very selective about carrying this cargo. Some lines are also shutting out local cargo for better paying US cargo.

There is a lot of demand for empties in Atlantic Canada, as there is more demand for export than import. The export requirements are mostly reefer, which are replenished from central Canada, the Caribbean, New York, ports in the Mediterranean, and sometimes as far away as California.

For dry containers, there are lots in North America (i.e. New York, Toronto and Montreal). Many lines use CN's domestic programs. The programs work well on the West Coast and CN is now doing it in Atlantic Canada. One line brings about 50-60% of its weekly requirement to Halifax in this manner and brings the rest from New York or elsewhere in North America.

At least two Halifax lines are involved in moving cargoes into and out of the Prairies, and do their best to accommodate this market with 20 foot equipment, which is repositioned from Toronto and Montreal by rail. Some boxes move as CN domestic units and others move as empty repositions. Even though they are CN customers, they are also moving some containers to CP destinations such as Regina.

Anecdotally, we were told that "if they had double the amount of equipment they could fill it." All units moving to the Prairies are source loaded and returned to them very quickly. Most 20 foot units are sent back to the East to be loaded out to the Mediterranean region.

Most lines have minimum revenue guidelines they have to meet; otherwise they do not move the cargo. For a shipment to the Mediterranean, they need about US $2,000 all in, covering the following:

- Rail Toronto/Montreal to Saskatoon;
- Local drayage;
- Container preparation;
- Rail Saskatoon to Halifax;
- Halifax lift;
- Ship contribution;
- Mediterranean lift; and
- Local drayage.

The service that operates from Montreal and Halifax to St. John's and Corner Brook is a good example of creative logistical planning and efficient use of intermodal containers.

One company, Oceanex, has equipment located throughout North America, but similar to CN, has access to other shipping lines' equipment and third party equipment. At its core, Oceanex is a domestic carrier. They still have customers for 20s and 40s but often make use of free containers from Maersk, Zim, P&O and Hapag-Lloyd; the cargo inside, however, is "theirs." The international lines seem more prudent than before; there has been a decline in empty reefers in Newfoundland as lines are now waiting for actual orders before sending them over.

In the Newfoundland trade, empty ratios are very high at 80:20. Worse, 100% of inbound loads are full and only 20% outbound loads are full. Basically, it is a one-way market, with only fish and newsprint coming off the island. They are flexible on rates coming back and just looking for a contribution on export.

Oceanex is involved in some innovative moves; for example, a line based on the West Coast, which has moved containers as follows:

- Full load Far East to Ontario;
- Send to NL with domestic cargo;
- Bring back to Halifax empty;
- Load empty in Halifax; and
- Load onto CSCL in Halifax.

Oceanex owns the following units (supplemented by international containers):

- 53s – 463;
- 48s – 759;
- 40s – 939;
- 20s – 360;
- Total – 2,300

Because of the success they have had, they want to go to 53s for all future capital expenditures. To this end, their new ship, *Oceanex Avalon,* was built with expandable cell guides able to accommodate 53 foot units that are also 8'6" wide. Their new containers are also built with ocean carrier castings so they can be stacked more than two high.

## 6.6 Interviewees' Perspectives

### 6.6.1 Shippers and shipping lines

One major freight forwarder indicated they import almost 75,000 TEUs into Canada with a 65:35 split between 40s and 20s. Whenever possible, it de-stuffs the containers at Vancouver and loads the contents into 53 foot domestic containers, which are sent eastward. The peak season is August to November.

Feedback from shipping lines in Central Canada indicated that for most lines (and because it is the biggest consumer market in the country), Toronto is a big source of empties. One line brings imports through Vancouver and keeps sending them eastward, where they exit the country through Montreal. Another sends them all the way to Halifax. Some are also repositioned back to Vancouver (and occasionally Calgary or Edmonton). They rely on the railway's domestic repositioning programs for most of these moves.

The issue of shipping grain from the Prairies is problematic for some lines. As one of them told us:

> We are not interested in shipping grain from the Prairies. We pay about US $2.80 per 20 ft and US $4.00 per 40 per day. We need at least US $800 a box to make up for delays and make up empty rail rates to make it interesting to us. High volumes of exports from Asia make it tough to add more cycle time in a tight supply. We average US $3,000-$3,800 and up for a loaded import box depending upon origin and destination. If there is a surplus, it may be worth it; supply is tight—very tight. Containers flow much easier to the larger terminals. The other issue is there is not a great supply of 20 ft, which is what the grain shippers like. They cost us at least $100 per box to inspect and make sure the container is okay for food. So this is another problem. Also storage rates at the

> railway terminals mean we can lose our shirt on any delay and we need to move the containers out of the terminal right away, no matter if the shipper is ready to load. So this can cost more money.

Another line was more precise:

> The demand for box exports from Asia has made it difficult to add more cycle time in a tight supply. We average US $3,100 and up for a loaded import box depending upon origination and destination. The average cycle time for us is 52 days without repositioning. Best time is 42 days. If we reposition the container, particularly to the Prairies, we are looking at an additional 14 day delay on average. This includes time to get loaded on a train ex Toronto/Montreal as empty repos go only when there is room. Then there is waiting time to get loaded at the other destination. The shippers order on spec a lot of the time and in large volumes—i.e. 20 containers at a time. That means we lose around US $800 revenue opportunity per container if the container is delayed 14 days going direct to the Port for a new load. We need at least US $400 more in revenue to offset the railway empty haul cost in order to make it worth taking the delay, especially if loads are waiting in Asia. If there is a surplus, it may be worth it, but again supply is tight—very tight. Containers flow much easier to the larger terminals like Vancouver. The other issue is there is not a great supply of 20 ft containers which is what the grain shippers like. They cost us at least CAD $100 per box to inspect and make sure they are okay for food. We do not import food. Twenties are used for things like heavy bulk products like steel etc. on the import move, which can contaminate the container. So this is another problem."

This situation is a real life example of the drivers at play and was a common refrain amongst all of the shipping lines that were interviewed, particularly those serving the West Coast. The container may only be worth about $1.00 per day but as we saw earlier, there are only two containers per vessel slot and the revenue leg is from Asia to Canada, or Europe to Canada. Shipping lines on the West Coast told us they earn 80% of their revenue on the inbound leg. It is imperative to return the container to Asia as quickly as possible with as few delays as possible. Based on a 42 day cycle, the container can make eight round trips per year to Canada, and earn gross annual revenue of 5 x US $3,500 = US $28,000 on the inbound leg alone. Based on a 52 day cycle, it can only make seven trips, or earn $24,500. If the Prairie shipper is only willing to pay the same rate as the port loading rate, there is no incentive for the shipping line to carry this cargo and reduce the number of turns on its equipment.

Another consideration as to whether a shipping line sends an empty back to Asia versus loading a full box is that it is simply easier and quicker to lift empties onto the vessel. They can be stowed anywhere on the vessel, compared with a heavy 20 foot box which would need to be stowed at or near the bottom of the vessel.

Another shipping agent told us that providing containers for source loading is difficult to justify unless there is import cargo and an export load already waiting. The situation is exacerbated by the railways' policy not to allow empty storage, thus necessitating the use of off-docks and a local dray.

If there is no import box, the line must absorb an empty repositioning move to, say, Winnipeg, and then a full line haul rate to Vancouver, which is more costly than an empty move from, say, Toronto to Vancouver. This will amount to approximately US $2,000 in total before the box is lifted onto a vessel (US $500 empty Toronto–Winnipeg; US $1,500 full Winnipeg–Vancouver). Montreal rates are only marginally more expensive. Moreover, the rate on a full container from Toronto or Montreal to Vancouver is around US $1,650,

which would appear to disadvantage the Prairie shipper. The rail lines, however, prefer to move containers in unit trains over great distances, which they find more efficient and cost effective.

Certain shippers object to the lines expecting to recover their out-of-pocket costs, so the lines' response is, in many cases, to pass on the "opportunity." However, in most cases, the inland portion is *not* assessed by the lines at 100% of their costs and export rates do not always reflect the full cost, but just a contribution.

### 6.6.2 Retailers

Only two retailers spoke to the study team for this assignment. However, they were extremely representative of the prevailing situation with respect to port usage, transloads, use of 53 foot containers and domestic repositioning.

One retailer has its own fleet of 5,000 53 foot domestic containers, into which they transfer import product from 40 foot units, from where the cargo would be shipped to DCs in Calgary and Toronto. The 53 foot units are sub-contracted back to the railway or a 3PL, and on the return leg to port the units carry domestic or international freight. Of a total of over 50,000 TEUs per annum, fewer than 1,500 are shipped empty from Calgary to Vancouver.

The other retailer has a relatively new transload facility in the Vancouver area. It was strategically located in an area that is equidistant from three VPA container terminals and across the road from an export transload facility. This facility handles 100% of the companies' Asian imports and 100% of all marine containers are destuffed in Vancouver before being transloaded into domestic 53 foot units. They also use some marine containers for moves to stores on the Prairies, but no further than Alberta.

# 7.0 Key Issues

## 7.1 Commercial Issues

Container shipping lines are commercially driven. The capital investment required to own ships and containers is significant and these companies depend on high levels of volume to turn a profit. The pricing of international container transportation is very demand sensitive and shipping rates go up and down quickly with business cycles. Demand also varies seasonally, by container type and by trade.

No two shipping lines are exactly identical in their approach to business or in their philosophy in regards to operating policy or empty repositioning, but they are all seeking to maximize their contribution to fixed costs.

The following are issues that affect the movement of grain and seeds from the Prairies to Canadian ports in containers and the availability of this transportation service. These issues are considered from the shipping line's perspective and partially explain why this freight has been so problematic for them and, especially, the shipper. Ultimately, shipping lines and other service providers such as the railways will do what is best for them and only by taking this perspective can solutions be found.

### 7.1.1 Rates

The fronthaul or primary booking of the container drives the movement of containers. Fronthauls are the bread-and-butter of shipping lines, and in the case of most West Coast Canadian services, account for 80% of revenues. They pay for the incremental cost of transportation, the full value of the fixed costs, a portion of the repositioning costs, and, after that, there is some left over for profit in the better years.

Grain, seeds, and other export commodities such as peat moss and lumber exported from Canada have generally moved as backhaul, taking advantage of the shipping line's need to reposition containers after a fronthaul move, to pay only the incremental cost of the transit, and some contribution to fixed costs. In some cases, shipping lines have agreed to ship at less than the full incremental cost when containers are available and need to be repositioned anyway, for example when empty 20 foot containers need to be positioned to China.

In other cases, the containers are not available on-site and need to be positioned for the freight, as grain and specialty seeds may be competing with other export cargo from the port. In such cases, the rate will be at least the full cost of inland transportation in both directions, plus other incremental costs, plus a larger contribution to fixed costs than the line can get from other freight at the port when the line is able to fill the export vessel.

This has resulted in a high degree of variability in the rates shippers are asked to pay and leaves them with little control over these rates. This variability is particularly severe in the trans-Pacific trade where capacity for the fronthaul China trade has been such an issue. On the more mature and better balanced trans-Atlantic trade, the variability in rates is somewhat reduced and the rates tend to be higher.

Shippers will likely view the lowest rates as representing the cost to the shipping lines and anything above the low-end range as profit (or in extreme cases gouging) to the shipping lines, while the lines will view the full rate as compensatory and anything less as a benefit (if not a subsidy) to the shipper.

Both shippers and the shipping lines would prefer to stabilize the rates, but at opposite ends of the rate spectrum.

### 7.1.2 Timing

The timing of container movements is in large part responsible for the large variation in rates. When other exports are strong, rates will be higher. Shippers, such as grain or speciality seed producers, need to move their freight in a timely fashion and when the timing conflicts with other opportunities for either the shipping line or the railway, it can be difficult to get service. The conditions that exist in terms of the demand for containers, i.e. the prevailing freight rates and the availability of railcars and suitable empty containers, are largely unknown to shippers and certainly outside their control.

While advance loading of the export commodities could partially resolve some of these issues, container capacity and land space on container terminals would be tied up for storage and the freight would incur additional demurrage and storage costs.

The peak season premium on the trans-Pacific container trade can exceed the contribution of typical backhaul freight and when lines are forced with a choice between the two alternatives—find an export load or ship it empty—it can be better for them to ship empties back to China to meet the peak demand.

### 7.1.3 Container types

Backhaul freight (such as seeds and grain) is typically, indeed, preferably shipped in 20 foot containers. The containers must be in good condition and clean; in some cases, the containers must be “food grade.” There has been a tendency for container lines to move towards larger containers, particularly for finished products that tend to be lighter. Today, as referenced earlier, the world-wide 20 foot container fleet represents 47% of the fleet, but only 31% of the TEUs. When containerization began, 20 foot containers were the norm, but the tendency towards larger containers is expected to continue.

As we have seen, a large percentage of import containers to the larger consumer areas such as Toronto and Montreal are carried in 40 foot containers, while the demand on the Prairies is for 20 foot boxes.

Some of the main uses for 20 foot containers are steel products, beverages (such as wine and beer, etc.), construction materials (such as ceramic tiles, granite and marble etc.), chemicals, scrap paper, wood pulp, and wood products. Twenty-foot containers are generally used for heavy products, although some heavy cargoes also move in 40 foot containers. The cost per tonne can be lower in some cases due to the cost structure of the various components of container movements; for example, terminal handling and trucking costs are more frequently proportional to the number of containers rather than the number of TEUs.

Refrigerated containers are costly and in high demand for certain commodities on a seasonal basis. They tend to move empty to meet the demands of the fronthaul freight rather than be used for backhaul.

### 7.1.4 Logistics

Matching shippers' needs with the availability of empty containers at minimum cost requires that import containers be immediately positioned for export as part of the same move. In this scenario, an import container would be delivered to the consignee, then positioned for export, and then delivered to the rail terminal for carriage to the port. When this triangulated move is not performed, the costs of an extra truck move and two extra handlings are incurred.

Shipping lines and railways are putting more emphasis on asset management. Railways have instituted reservation systems that require advance planning and most shipping lines now have some type of penalty/charge system to adjust rates for empty repositioning costs/ benefits into certain markets. For example, a shipper may receive a credit for moving a container out of a chronically imbalanced import market like New York. Bookings into that market would incur a penalty to at least partially account for the average cost of repositioning.

The advance planning requirement of the railway reservation system is somewhat incompatible with the very notion of "opportunity cargo," as this type of cargo is attractive to shipping lines only as a second choice after more regular and better paying freight. Additionally, for a railway to efficiently handle 20 foot containers on double stacked railcars requires matching an empty or light 40-45-48-53 foot container for the top tier. Often, they are not available in the same location (for example: 20 foot containers from ocean terminals and 53 foot boxes from domestic terminals).

Container repair is mostly performed in Asia or in Europe. For the shipping line that is shipping empties back to those markets anyway, it is preferable to ship containers in need of repair empty rather than to repair them in Canada for backhaul. Contamination can also be a problem; containers left unclean or with a chemical smell can be unacceptable to move certain products and shipping lines do not wish to incur extra haulage costs. Some shippers will not accept a box that is less than one year old, because of the chemical smell inside.

### 7.1.5 Disconnects between export and import markets

There is a disconnect between where Canada's peas, beans and lentils (as well as grain) are being shipped, and where the equipment required for the headhaul (import load) is desired.

In many cases, the countries and destinations requiring those commodities are poor countries with major infrastructure issues. Twenty-foot units filled with grain are exported to India, but Canada imports garments or furniture in 40 foot high cube units.

Food exports to China move inland, but shipping lines need the containers in China closer to the coast, where most manufacturing takes place. In some respects, Canada is the opposite of this phenomenon. The major cites in most countries are located at the coast, but Canada's major cities (with the exception of Vancouver) were developed inland.

## 7.2 Policy and Regulatory Issues

### 7.2.1 Duty relief on international marine containers

Pursuant to Canada's participation in the Customs Convention on Containers (1972), marine containers used in international trade are automatically granted duty relief when entering Canada, subject to certain limitations. The relevant limitations are that the container:

- Must be exported within 30 days of the date of importation; and
- May be used in one domestic move, providing that move is incidental to its role in international traffic, which is further defined as a domestic move between the point of discharge of the imported cargo and the point of loading for export, or the point of exit (if empty).

Because each container shipping line maintains a comprehensive inventory of their containers, it is designated as *post audit container operator*. Revenue Canada is therefore able to readily determine all container movements through audit, and it is not necessary for every container to have its own cargo control document (over and above the control document required for the cargo it contains).

The primary motivation of any shipping line is to keep the containers moving and to minimize or eliminate dwell time. Equipment control staff scrutinize the status of all their containers within Canada on a continuous basis. Free time for each container is monitored and, after expiration, demurrage is charged to the shipper/consignee promptly. Where a container sits in any container yard (marine or rail terminal) for account of the line, free time is minimal and storage charges punitive. When an empty container is located in a satellite yard, the over-riding motivation is to secure an export load or move it to port position for immediate evacuation back to Asia in order to position it for a high-earning headhaul load.

The railways and some 3PLs use marine containers for domestic moves by agreement with the shipping lines. The railway or 3PL gets an inexpensive container for a domestic move, typically between Toronto/Montreal and Calgary/Edmonton/Vancouver. The shipping line gets its container back in a place it can be used for exports or, in the case of the traditional domestic reposition, gets a free move westward to port position.

The consultants are not aware of any circumstances where Revenue Canada has rebuked or fined a line for not meeting its obligations under these provisions. That said, it is probable that the discretion available to Customs has been applied with respect to the 30-day rule. In general, however, it can be said that the shipping lines are sufficiently self-motivated that neither the 30-day nor the single-domestic-move rule places any significant limitation on their activity.

A body of opinion in the central Prairies (specifically, Saskatchewan and Manitoba) asserts that these relief provisions are onerous and represent a significant impediment to the natural (and necessary) development of containerized export grains and pulses. In this context, the US provisions are cited as advantageous, in that international marine containers are permitted to remain in that country for a year.

As has been shown, container flows within Canada are primarily between ports and major population centres for marine containers engaged in import and export, and between major population centres for marine and domestic containers engaged in domestic moves. From the shipping lines' perspective, providing empty containers to relatively remote areas requires empty repositioning plus the allocation of extensive equipment time to relatively low value products that cannot afford to pay a fully compensatory freight rate and also require a food-grade container. Taking into account that the line's options include transloading exports at port position, or evacuating the empty to Asia, it is perhaps not surprising that the number of lines prepared to bid on these exports is quite limited.

The above is not to say that the existing relief provisions may be too onerous to readily accommodate a major shift in grain handling from bulk to source loading containers. In addition, a rule that is essentially unnecessary, or is either not enforced or is not enforceable, should probably be removed or amended if its presence might in any way be detrimental.

As one shipping line executive told us:

> The existence of the 30 day rule has no apparent bearing on the supply of containers for grain exports. The attraction of export cargo is a function of low cost positioning to the point of loading, a compensatory freight rate and a destination in Asia which is a source of cargo. In the absence of these elements it is more cost effective for the marine carrier to send the container as an empty directly to the place in Asia where it can be used to generate the next high value revenue move.

One area which might be worthy of additional examination could be that which stipulates that only one incidental move is permitted under current cabotage restrictions. For instance, if a shipping line (or a railway) had cargo to move in a marine container being repositioned from Toronto to Edmonton or Saskatoon, that container would have to carry on to port in an empty state. This would appear to represent a lost opportunity.

### 7.2.2 *Grain Transportation Policy*

The *Western Grain Transportation Act* (WGTA), enacted in 1983, committed the federal government to sharing the cost of rail transportation for western grain to Canadian ports. The federal government's monetary contribution was paid directly to the railways. The size of the government commitment was influenced by inflation, the results of quadrennial costing reviews, and later by budgetary constraints.

Historically, the cost of movement from Thunder Bay to the St. Lawrence was deducted from Canadian Wheat Board (CWB) pool revenue. Until the 1970s, the use of Thunder Bay and Vancouver prices as pooling points worked because the St. Lawrence price was higher than the Vancouver price, and the difference covered the cost of movement. However, when the price of West Coast grains increased, the price of Seaway costs increased and the availability of small ships to reach Thunder Bay declined, and the Vancouver price became approximately equal to the St. Lawrence price.

The WGTA subsidy was later eliminated, effective August 1, 1995, and the Act was repealed. The Canadian Transportation Act of 1996 brought in maximum freight rates on grain. In 2000, the CTA was amended to remove maximum freight rates and in their place a revenue cap was initiated. The revenue cap is a limit on the revenues the railways can earn on

the transportation of grain irrespective of whether it moves in bulk or containers. It does not apply to intra-Prairies or inter-Prairie rail movements or all rail shipments to the US or Mexico, or movements from Thunder Bay to Montreal. There is no payment by government to the railways for the movement of this freight.

Not all western grain movements are subject to the revenue cap. Grain movements that are subject to the revenue cap must originate west of Armstrong or Thunder Bay and must move via a prescribed railway (currently CN or CP). Shipments destined to export markets are eligible movements but must be handled through a West Coast port, Thunder Bay or Armstrong. As of the week of November 27, 2006, with CN's purchase of Railnet, shipments from the Peace River area to Vancouver are covered under the program. Shipments destined to Eastern Canadian domestic markets are also eligible but must be routed via Thunder Bay or Armstrong where the revenue cap applies to the movement from the western division to Thunder Bay or Armstrong, but not beyond. Shipments through a West Coast port for export to the US for consumption are excluded.

There are over 50 types of grains defined as eligible grains under the revenue cap and which are listed in the schedule attached to the legislation. These include the six major grains: wheat; barley; canola; oats; rye; and flax.

While some evaluations of the variable costs do exist, we suggest the data so far is inconclusive as to whether the cap encourages or discourages the use of containers for grain. A review should be undertaken specifically to understand the full costs of shipping grain by railcar versus container, including all associated infrastructure costs (terminals), suitability of containers at the consignee end of the supply chain, and the impact on grain collection/ transportation systems generally.

### 7.2.3 Short sea shipping

Short sea shipping could potentially offer local solutions to congestion, as in the Vancouver region, as well as alternative routings of containers to inland destinations, as on the East Coast. It can also provide access to empty containers, as per Boston-Halifax. An imaginative plan is being developed to move containers from ocean terminals in Vancouver to off-dock transload facilities.

However, a number of obstacles to the development of short sea shipping have emerged and have been discussed in several previous studies. These include:

- The 25% duty payable on foreign-built vessels;
- *Jones Act* restrictions in US that make multi-porting difficult;
- Stevedoring rates on feeder versus mother ship cargo (more of a commercial issue);
- Inability to obtain pilotage exemption in St. Lawrence; and
- Start-up costs.

# 8.0 Business Opportunities

The issues, as seen from the shipping line's perspective, raise some potential solutions that are worthy of further investigation. As indicated in the flow of marine containers by rail data, about one-third of marine containers moving to Vancouver from Eastern Canada bypass the Prairie provinces. Another one-third of otherwise empty marine containers are loaded with domestic freight and are repositioned to the Prairies, however 55% of those end up in Alberta to be reloaded or emptied for furtherance to Vancouver. Only solutions that satisfy the needs of the carriers (in this case shipping lines and railways) can be implemented without raising the average rates. They are all worthy of further study in Phase II.

## 8.1 Source Load versus Port Load

It was beyond the scope of this phase to examine the cost differential between source load (which seems most desired on the part of Prairie shippers) and port loading, which seems the preferred option for shipping lines. The Quorum presentation[16] suggests the difference is especially acute in Saskatchewan, whereas it is about 6% in Alberta. It points out that special crops are not conducive to whole unit train movement and car allocation is an issue.

The Quorum study "Container Measures Study: Issues and Discussion for Proposed Measures for the Grain Monitoring Program"[17] (on which the above presentation is based) included a movement economic model based on actual costs and the risks associated with container availability, repositioning and storage, which cause delays to the shippers and increase the risks.

One of the present study team did some work in 2001, which showed a similar cost differential. Phase II should address the cost of source versus port loading.

### 8.1.1 Transload Facilities

The current CN model of utilizing inland terminals (e.g. the new terminal in Edmonton) to ship carload provides many advantages. Product now flows in carload and is reloaded to containers for furtherance to ports for loading to a ship. This method of operation provides the opportunity for the steamship lines and railways to better utilize container capacity. A large proportion of the Canadian domestic reposition of marine containers flows into Alberta from Central Canada. From Alberta, those same loaded containers are made empty and forwarded to the Port of Vancouver. Rather than shipping empty containers to Vancouver, shippers could move commodities originating in the Prairies that could move by either rail or truck to the transload point. Among the benefits of providing for two modes of transportation to transload are reliability of service and costs competitiveness. In summary, carload or truckload could move commodities to the point of container availability. This process does

[16] Quorum Corporation, "The Movement of Grain in Canada: Issues and Measures," Presentation, July 2006.

[17] Quorum Corp, "Container Measures Study: Issues and Discussion for Proposed Measures for the Grain Monitoring Program," *Report of the Grain Monitor: Supplemental Program*, June 2006.

not preclude the possibility of shipping carload direct to port as is the custom today. By constructing the logistical process in this manner, a sustainable platform for a flexible and cost effective supply chain is available to the shipper.

These facilities do not necessarily have to be developed by the railroads, as there are many examples of third party facilities in Vancouver, Toronto, Montreal and Halifax.

### 8.1.2 Satellite Terminals

CN and CP no longer handle empty marine containers at some of their largest intermodal terminals unless the empties are booked for immediate evacuation for account of the shipping line. Similarly, both railways have ensured—through punitive storage rates, narrow receiving windows and truck reservation systems—that laden containers have minimum dwell time either before being loaded on to a train, or after unloading.

In general, the intent of the railways is to maximize terminal throughput in the face of burgeoning demand and limited capacity, and to bring some discipline to a congested system. It has, however, left shipping lines and shippers with storage and access issues with respect to empty containers.

- Shipping lines need storage to maintain the necessary inventory of empties to service export bookings; and
- Shippers need ready access to empties at a favourable location, one that allows them to stuff the container at their premises at a reasonable time and also permits them to deliver into the intermodal facility within the designated window for a specific slot (i.e. related to a specific ship).

In the Edmonton region, four satellite facilities have grown to service the needs of lines and shippers since January 2006. In each case, the services offered are an extension of existing business activities such as trucking or third party warehousing. These facilities are OCTS, MTE Logistec, Uchan and Shadow. Storage is offered either on chassis or grounded (empty and/or laden) to asphalt/concrete. None of the facilities work 24/7. Most operate eight to ten hours per day, Monday through Friday, some with Saturday morning service.

Hours of operation and location seem to be the primary issues. For example, in order to achieve a restricted Monday morning slot at an intermodal yard, shippers need to access and stuff an empty on Friday and then move it laden to a city yard on Friday or Saturday morning. This becomes especially pressing if the product is rated hazardous, in which case a secure staging facility is mandatory. In addition, trucking activity is concentrated in the city's more congested areas (because of yard locations) and during rush hours (because of limited windows).

The locations chosen for the satellite yards were based on existing activity. The hours of operation are restricted because the volume of business available during extended hours has proven insufficient to justify opening longer. The aggregate result is additional expense, frustration, and environmentally-poor practices.

It is recognized that individual yards have invested funds in facilities and equipment in a free market response to a specific situation. That said, however, there would be value in examining Edmonton (as a pilot, and other locations with railway intermodal yards, subsequently) to establish whether a co-operative effort could result in one (or two) appropriately located satellite yards that could, because of economies of scale, provide the lines and shippers with optimal service levels and also be profitable.

### 8.1.3 Inland Terminals

Another variation on both the transload and satellite terminal option would be to combine them with an inland terminal or intermodal facility. These would need to be located where there is either a) sufficient import volume to generate empty containers, or b) sufficient export volume to attract empty containers, as well as c) sufficient volume to pay capital and operating costs. Capital costs will include building the terminal and equipping it with top lifters and RTGs, and operating costs will include labour, fuel, etc. The terminal will need to operate year round and be open during each business day at least. As above, we estimate daily throughput requirements at a minimum of 20,000 units per year, or 27 per day in each direction.

Key success factors for the location of inland container terminals was developed from the literature reviewed. These include:

- Large service region to draw containers;
- Access to competing rail lines preferable with access to mainline service;
- Access to major highway networks;
- Access to trucking companies and local drayage carriers;
- Access to population centres;
- Diverse shipper base, i.e. retail, manufacturing, agriculture and resource;
- Ability to service more than one rail line;
- Suitable land base for development at low costs, drainage, soils;
- Complimentary services such as third party clusters of distribution services regional warehouses;
- Access to custom, inspection services, repair; and
- Minimum base container volume.

## 8.2 Shippers Associations, Pools and Co-ops

### 8.2.1 Shippers Association

The Midwest Shippers Association was created to assist smaller operators/growers located in the Midwest to market their identity preserved (IP) products to international markets and provide logistic and educational services to members.

The Association provides the following services to its members:

- Negotiates annual volume contracts with container lines;
- Assists in documentation requirements;

- Issues marine insurance;
- Conducts educational forums; and
- Hosts annual conferences re marketing IP and logistics.

They have similar issues to sourcing containers in the Midwest as Western Canada does. They will book and supply containers to Midwest. Drayage is from Minneapolis to North Dakota or Iowa at US $600 to US $800 per container. Empties typically are sourced from Chicago with demurrage charges applying at rail yards.

New contracts are to be negotiated with container lines expecting 30-40% increases in rates in Q1 2007, as container lines are renegotiating their current five to ten year contracts with Class 1 carriers in the US.

This Association provides a format and window to smaller shippers and growers who may not want to market products directly to larger grain companies such as Cargill, Cenex Harvest States (CHS), and Archer Daniels Midland (ADM). Through educational and trade forums, they provide exchange and interaction between both the grower and end users, as they identified marketing as a service they can provide to interested end users. They have had delegates from Japan, Taiwan, and other Asian countries attend their annual conference in Minneapolis.

Their exports are 80% to Japan, 10% to Taiwan, and another 10% to the EU. They also have limited access to funding resources, and thus are very selective as to what activities to engage and invest in, and where they can get the best returns for their members. Most recently, they have been emphasizing marketing and freight contracting services.

### 8.2.2 Co-ops and Pools

A co-operative effort could be undertaken to reduce logistics costs for Prairie container shippers. The economic structures already exist on the Prairies for pooling or co-operative arrangements amongst shippers to reduce their overall logistics costs. These solutions could include a seasonal inland terminal for empty/laden storage/dispatch, and other services.

There is a small company in Nova Scotia called Nova Agri Limited, which markets and ships produce to the Caribbean on a co-operative basis for five farm operations in the Annapolis Valley. Each organization had been seeking distribution facilities on various islands in the Caribbean when it was decided to pool their resources and ship to the same destinations in the same containers. Another company, Canjam Trading, specializes in shipping Maritime region products to one market, Jamaica, to which there is direct, weekly shipping service available from Halifax.

In Toronto, Grifcold, a freight forwarder recently acquired by Kuehne & Nagel, has long specialized in the shipment of refrigerated containers, serving markets world-wide. It is an example of starting small, developing a niche, and growing with the trade.

### 8.2.3 Shared Large Bookings

This idea suggested by one of the shipping lines involves a conference type of negotiation between a number of interested shipping lines and a shipper(s) for a relatively large volume on a first come/first served basis. For example, three shipping lines could negotiate a fixed rate to move 10,000 tonnes of freight on an opportunity basis. This would allow the lines to triangulate their moves and plan their container positioning to meet their requirements, but would require some sort of storage/loading facility. This concept could work at the point of origin of the freight or at/near the port.

### 8.2.4 Coordinating Timing of Shipments

The shipments could be planned to match the typical seasonal availability of containers and space on ships. They would ideally be spread fairly evenly between the months of October to May, to avoid competing with the peak season out of Asia of July and August.Wholesale Intermodal Service

A solution such as Pacer Stacktrain could be sought in the Canadian context. This company is a 3PL provider of transloading and backhaul drayage for both domestic and international containers from the US West Coast and US Midwest. They also service Mexico and Canada, and have been affiliated in the past with APL, which operated the APL Linertrain. The company also provides domestic and international freight brokerage services, warehousing services, and local drayage. It is a publicly held company traded on the NYSE.

This company handles one million TEUs annually, over 20% of total containerized rail shipments in North America. It has contracts with various mid-size lines, and $375 million in annual sales. It has its own equipment, including leased railcars and containers, and provides third party services to warehouses and cross docks. It has 1,858 double stack railcars, 28,231 containers, and 28,697 chassis for 53 foot domestic containers. It operates over 54 ramps, 48 container yards and has the largest domestic container fleet in North America.

Pacer Stacktrain’s clients include the auto sector, which represents 20% of movements. Other clients include CH Robinson, General Electric, Sony, Union Pacific, Toyota, Whirlpool, Big Lots, The Scotts Company, Shaw Industries, Owens Corning, and Sysco. The company also has 1,000 international clients.

It has long-term contracts with UP, BNSF, CSX, KCSM and CN. It provides repositioning services to container lines for their units, and in 2005 repositioned 91,628 units, slightly down from 2004 when volumes were 94,827.

### 8.2.5 Purchase of Container Chassis

Several Prairie shippers complained about a lack of container chassis and trucking services to serve the container market. This would appear to be an opportunity for pooling by several shippers. Chassis are very inexpensive and the barriers to entry very small.

## 8.3 Develop the Use of 40 Foot Containers

There may be a number of cases where shipping 30 tonnes in a 40 foot container works out to less than the cost of shipping 20 tonnes in a 20 foot container, on a per tonne basis. It is very much dependant on the assumption for railcar utilization. This would require finding ways to handle product in and out of containers efficiently and devising a rate structure that more closely reflects costs.

As there is a vast surplus of empty 40 foot containers world-wide, including Canada, and a concomitant scarcity of 20 foot units, Prairie shippers should find ways to utilize the equipment that is available to them. If 20s are not available and 40s are, they should not expect a rate reduction, as this will not interest the shipping line. There may be opportunities to co-pack heavy grains with a lighter commodity in the same container, as well.Ownership of Containers

In the early days of containerization, Nova Scotia shippers of apples and blueberries had difficulty accessing reefer containers, so they pooled their resources and purchased a fleet of containers which they turned over to three shipping lines to carry. When their product was not is season, the shipping line leased the containers from the shippers for use in other markets.

If Prairie shippers absolutely MUST have access to 20 foot containers, perhaps they could purchase a fleet of them and contract with the shipping lines to carry them. At US $1,850 per container, they are not costly. In this way, the backhaul would become the headhaul for the Prairie shipper and they could earn revenue by leasing the container to the shipping line for the return move, although this would only be minimal. The biggest issue would be equipment control and getting the containers to port.

## 8.4 Use of Plastic Liners rather than Food Grade Containers

A major issue with Prairie grain shippers seems to be the need to use food grade containers, which adds another layer of cost to their container moves. It may be possible to develop plastic liners that could be used for grain shipments.