

## **Off-Dock Storage of Empty Containers in the Lower Mainland of British Columbia: Industry Impacts and Institutional Issues**

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### **Abstract:**

BC's Lower Mainland is Canada's largest gateway for international container traffic. There are four deepsea container terminals. The terminals are geographically dispersed, with two in the Port of Vancouver's Inner Harbour, one on Roberts Bank, and one located on the Fraser River under the jurisdiction of the Fraser River Port Authority.

In December 2003 the Vancouver Port Authority announced a target of moving 50% of empty containers to off-dock storage. A draft protocol for achieving this target was developed, but following consultations formal implementation was deferred due to concerns expressed by port stakeholders. However, whether through the Vancouver Port Authority initiative or as a response to short term congestion problems at the terminals, the use of off-dock facilities for storage of empty containers in the Lower Mainland has increased. This has imposed additional costs on shipping lines, trucking companies and drivers. Trip patterns and compensation have traditionally been based on round trips to and from the deepsea container terminals. The introduction of off-dock storage introduced a non-revenue "third leg" to truck trip patterns. Due to the geographical dispersion of the deepsea and off-dock container yards, and to contractual arrangements limiting the dispersion of shipping lines' empty container inventory among off-dock facilities, the move to off-dock storage imposed significant inefficiencies on trucking operations.

In the summer of 2005 drayage owner-operators withdrew their services to protest low trip rates and long waiting times at port and off-dock facilities. The inefficiencies introduced by off-dock storage of empty containers was one of the major issues in the dispute. This paper will estimate the magnitude of the impact on trucking efficiencies through analysis of deepsea and off-dock container facilities, and discuss the institutional factors which hindered the adaptation of industry operating and contractual practices to accommodate the change.

### **Previous Studies Dealing with Off-Dock Storage of Empty Containers**

There are no studies publicly available dealing specifically with empty container logistics in the Lower Mainland. A private study was prepared for the Vancouver Port Authority by Sandwell Engineering Inc. in May 2002 (Leeper, 2002).

Empty container logistics in Southern California have been examined in a number of studies. The Tioga Group led a study undertaken for the Gateway Cities Council of

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\* From August through October 2005 the author served as Director of Research to the Task Force on the Transportation and Industrial Relations Issues Related to the Movement of Containers at British Columbia Lower Mainland Ports. The research presented in this paper incorporates analysis undertaken by the author in that role, and portions were published in the Final Report of the Task Force on October 26, 2005.

Government, the Port of Long Beach and the Southern California Association of Governments in 2002 (Tioga Group, 2002). This study examined issues related to the movement of empty containers, including the potential for off-dock storage. It concluded that in the short term the use of off-dock storage faces a number of obstacles including increased storage and drayage costs to shipping lines and detour costs for truckers. It also noted that current chassis logistics practices which dictate a rapid return of chassis to container terminals also limit the attractiveness of off-dock storage. However, direct transfer of off-hired lease containers from local customers to off-dock facilities was identified as potentially more attractive (Tioga 2002, pp5-6).

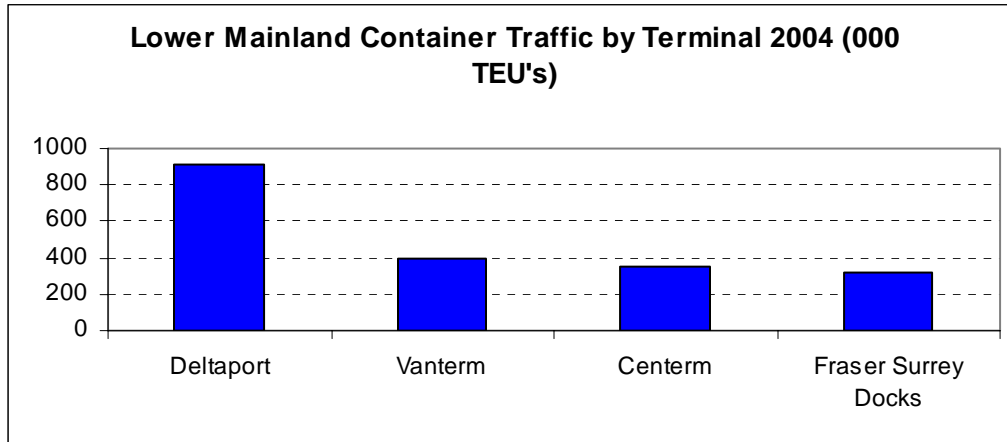
Another paper dealing with off-dock empty container storage in Southern California was published in 2003 (P.I. Le Dam Hanh, 2003). It also identified the impact of additional storage and delivery costs, and shipping lines' requirements for rapid return of chassis to the terminal as obstacles. The chronic imbalance between import and export shipments means that the number of empty containers shipped back to Asia greatly exceeds the number reused for exports. This means that the majority of empty containers have to be returned to the container terminals for evacuation and use of off-dock storage would increase costs with no immediate advantage. In the longer term the paper suggests that shipping lines may be more willing to consider off-dock storage if increased traffic levels result in increased costs and congestion at on-dock container terminals.(P.I. Le Dam Hanh 2003 p. 24.)

A 2005 survey conducted by IBI Group reported on best practices in port trucking operations, including the use of off-dock storage of empty containers. The study cited the use of off-dock facilities at the Ports of New York/New Jersey and Houston as best practices in this area, and suggested that the key factors for successful operations appeared to be use of a location close to the on-dock terminals, and integrated management of on-dock and off-dock facilities and container inventory by terminal operators (IBI Group, 2005, pp. 41-42).

### **Background on Container Transportation in the Lower Mainland**

There are four on-dock container terminals in the Lower Mainland. The terminals are geographically dispersed. Centerm and Vanterm, located in the Port of Vancouver's Inner Harbour, commenced operations in 1970 and 1976 respectively. Deltaport, located on Roberts Bank around 20 miles from the Inner Harbour, began operations in 1997. Fraser Surrey Docks, located on the Fraser River, handled relatively small numbers of containers prior to 2002. Total container throughput in the Lower Mainland was

approximately 2 million TEU's in 2004 distributed as shown below:



Approximately 65% of inbound traffic is transferred to on-dock rail for shipment to destinations outside the Lower Mainland. Forty foot containers account for an estimated 70% of traffic, which suggests around 400,000 containers per year are transferred within the region by truck. Cargo shipments are relatively balanced, with the Vancouver Port Authority reporting inbound loaded traffic of 782,675 TEU's and outbound loaded traffic of 694,787 TEU's in 2004. Outbound containerized freight consists primarily of forest products, specialty grains and waste products.

The locations of the on-dock container terminals, principal off-dock container facilities and transload facilities are shown on the map below. The development of off-dock container facilities was undertaken primarily to provide services such as container cleaning, repair and preparation for loading of export cargo such as specialty grains. There are numerous other locations where import containers are destuffed and/or export containers stuffed (transload facilities).

**Major Off-dock Container Terminals – Lower Mainland**

	Storage capacity	Date of establishment
Marco Marine Container	5000 TEU's	1986
Cdn. Intermodal Services	8500 TEU's	1984 (North Vancouver)*
Coast 2000	5400 TEU's	2003
Delta Container Ltd (Delco)	8000 TEU's	1997
Metropolitan	2800 TEU's	1992

\* 1994 current location

## Container Transportation Facilities in the Lower Mainland



### Off-Dock Storage of Containers in the Lower Mainland

Container traffic has grown rapidly in the Lower Mainland, straining the capacity of the existing on-dock container terminals. Problems of terminal capacity have been exacerbated by periodic rail service problems since early 2004. Congestion reached a crisis level at Deltaport in January 2005. The terminal operator declared force majeure due to inadequate rail capacity to clear a backlog of 5000 import containers off the terminal. A 25% reduction of import traffic was imposed on February 28 in order to clear the backlog. Terminal congestion has also led to the imposition of reduced time windows (Earliest Receiving Dates or ERD's) for delivery of export containers to the terminals. Construction projects to expand throughput capacity at Vanterm and Centerm have also contributed to terminal congestion in the last two years.

Many of the obstacles to implementation of off-dock storage identified in the Southern California studies are absent in the lower Mainland. In the Lower Mainland the container chassis are owned by the drayage companies, not by the shipping lines. All on-dock container terminals in the Lower Mainland are "grounded" operations (i.e. containers are stacked on the ground, not stored on chassis) so chassis are not required to be returned to the terminal for immediate reloading. Export and import traffic is almost balanced, so

there is more potential for reloading of export containers and fewer empties need to be returned to the container terminals for evacuation back to Asia. The on-dock terminal congestion has provided a strong incentive for the use of off-dock storage to minimize vessel delays

In December 2003 the Vancouver Port Authority announced a target of moving 50% of empty containers to off-dock storage. A draft protocol for achieving this target was developed, but following consultations formal implementation was deferred due to concerns expressed by port stakeholders. The use of off-dock facilities for storage of empty containers in the Lower Mainland has increased, though it appears to be a response to short term congestion problems rather than long term strategy. Off-dock container facilities report increases in daily gate transactions ranging from 20% to 400% over the last 18 months. Recently the container terminals (except Vanterm) have relaxed their restrictions on the return of empty containers by truck. It appears that adoption of off-dock storage as an integral part of Lower Mainland container operations will require long term adjustments in industry practices. The use of off-dock storage has significant impacts on participants in the Lower mainland container transportation network.

### **Shipping Lines**

For the shipping lines, off-dock storage increases costs relative to storage at the container terminals. Traditionally terminal operators have assessed a single “throughput charge” for each container which includes the cost of unloading from the vessel, in and out gate movements, and reloading to the vessel. Use of off-dock facilities results in gate charges averaging around \$35 per container (in and out), and additional drayage charges to the shipping lines if empty containers have to be trucked to the container terminals for evacuation. Most local drayage charges are paid directly by importers or exporters.

Implementation of the Vancouver Port Authority’s strategy for storage of empty containers off-dock was deferred to enable terminal operators to adjust their rate structures to encourage off-dock storage. VPA has secured agreements with the terminal operators that the throughput rate structure will be renegotiated with the shipping lines as their contracts are renewed, to provide incentives (or at least to offset the additional costs) for use of off-dock storage. TSI, the operator of Deltaport and Vanterm, has begun this process.

Storage of empty containers at off-dock locations makes management of shipping lines’ container inventories more complicated as they have to track and manage containers at multiple locations instead of just at the dock. The shipping lines typically contract with a small number of off-dock facilities for storage.

It appears that opportunities to reduce terminal congestion through streamlining of off-hire lease container logistics are limited in the Lower Mainland. These account for a small portion of container traffic, and shipping lines have already taken steps to transfer them directly to off-dock facilities to avoid incurring drayage costs for trucking them from the on-dock container terminals to off-dock facilities.

## **Terminal Operators**

Terminal operators are reluctant to embrace off-dock storage as a long term practice because storage of empties on the terminal can provide additional revenue when room is available. Shipping lines are typically given an allocation for storage based on their throughput levels. The terminals levy additional charges for storage of quantities in excess of each line's allocation

## **The Drayage Sector**

The move to off-dock storage has resulted in significant cost increases in the drayage industry. Due to the structure of the drayage sector most of these costs have been incurred by truck owner/operators.

Approximately 85% of drivers engaged in the Lower Mainland drayage sector are owner/operators. Owner/operators are compensated on a revenue sharing basis, nominally receiving 70% of total drayage rates set by the trucking companies. Rates are quoted on a round trip basis (i.e. importers and exporters are charged a single rate which includes transfer of containers on both a loaded and empty trip legs between their location and the container terminals). Owner/operators are paid one half of the round trip rate for each single trip leg carrying a container. They are not compensated when transporting an empty chassis.

Container operations in the Lower Mainland were disrupted by a withdrawal of services by drayage owner/operators from June 27 to August 4. The organization representing the owner/operators, the Vancouver Container Truck Association (VCTA), cited four major factors precipitating the withdrawal of services: continued competitive erosion of container rates; cost increases (particularly for fuel); introduction of 8 off-dock container terminals ("satellite terminals"); and lengthy waits at both on-dock and off-dock facilities (VCTA, August 2005).

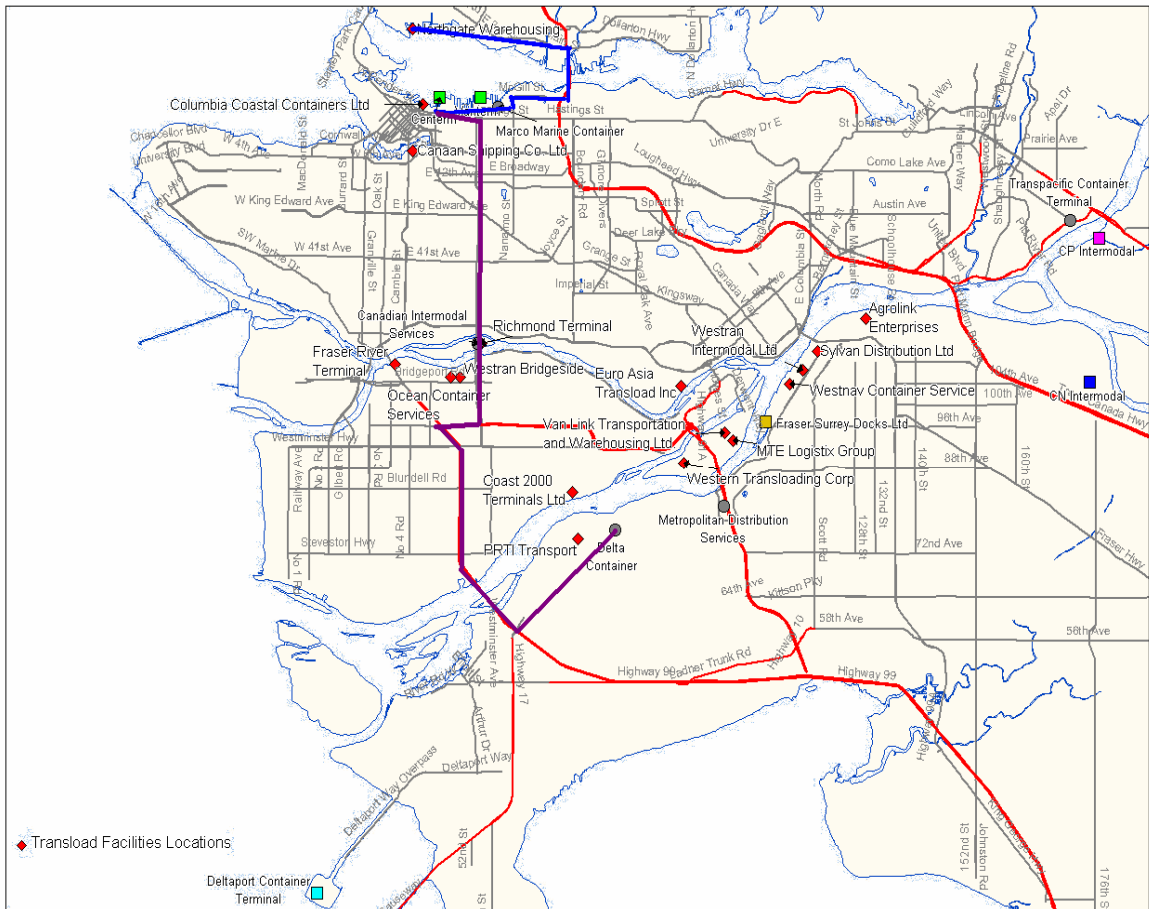
The VCTA described the impact of the use of off-dock facilities as follows:

To increase the container storage capacity the container terminals established eight satellite terminals to store empty containers. The container shipper pays a round trip rate that pays the cost of the container being taken from the terminal to a destination, emptied and returned to the dock or vice versa. Owner operators are paid the container rate for the two parts of the container's normal trip. This would mean the owner operator always travels with a container and with revenue (except when some make the first trip to a terminal at the start of the day). With the advent of satellite terminals, owner operators travel to or from such a terminal without a container and therefore receive no revenue to compensate for their time and the vehicle expenses. Satellite terminals have lineups that are longer and slower than at regular terminals. This further erodes the owner operator's ability to earn an adequate income." (VCTA 2002)

The uncompensated empty trip has come to be known as the "third leg". Due to the geographical separation of the container terminals, and the fact that each shipping line

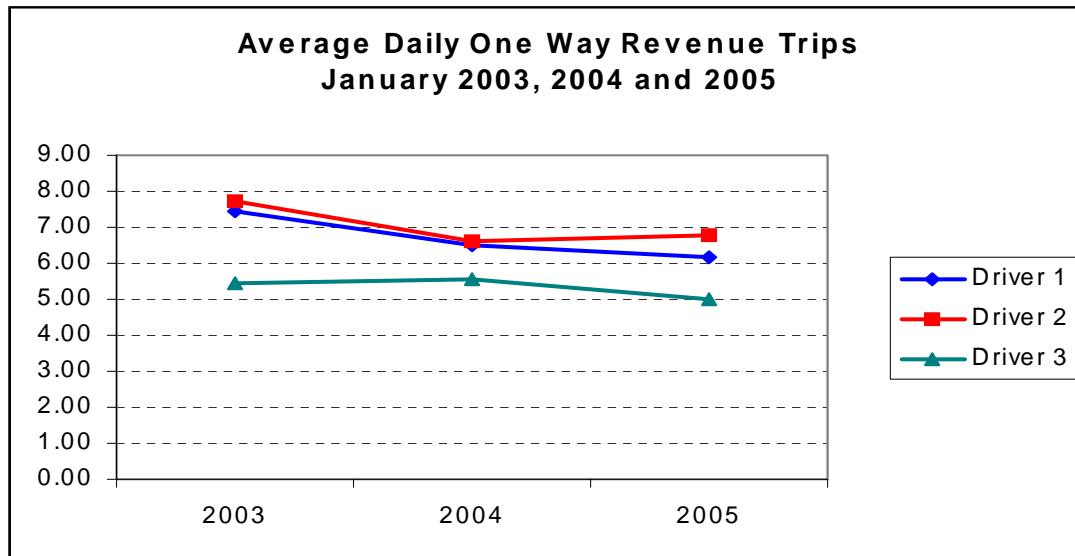
contracts with only one or two of the off-dock facilities for empty storage, the “third leg” may be longer than the revenue legs. An extreme example of this is shown on the map below. The loaded trip to the terminals is indicated by the blue line; the “third leg” to pick up an empty container by the purple. This represents the transfer of loaded export containers from a facility in North Vancouver to one of the Inner Harbour terminals, and picking up an empty at a facility in Delta (Delta Containers) to complete the round trip. The loaded trip to the terminals is indicated by the blue line; the “third leg” to pick up an empty container by the purple. The owner-operator’s compensation is based on the rate between North Vancouver and the Inner Harbour terminals. In this case the round trip mileage between the export warehouse and the Inner Harbour terminals is around 16 miles; the round trip distance between the Inner Harbour and the off-dock facility is around 36 miles.

**The “Third Leg” Problem:  
Round Trip to Inner Harbour from North Vancouver via Delta**



The efficiency of drayage operations is affected by a number of factors, including terminal delays, dispatch efficiency, and regional traffic congestion. While it is difficult to evaluate the impact of these factors in isolation, there is evidence that the efficiency of drayage operations has declined in the Lower Mainland. A comparison of the daily

average number of one-way revenue trips per day for three drivers, from two different companies, for January 2003, 2004 and 2005 is shown below. The decline in the daily average number of one-way revenue trips ranges between 8% and 17%.



Due to the trip-based structure of owner/operators' rates, a decline in average trips translates directly into a loss of income.

### Off-Dock Operators

The off-dock operators have benefited significantly from increased container volumes through their facilities. Some experience peak traffic volumes (as measured by daily gate volumes) close to the levels handled by the smaller on-dock terminals. However, off-dock volumes are dependent on the short term dynamics of the on-dock operations. When the on-dock terminals are congested, traffic is high; when congestion eases, empty containers are again accepted at the on-dock terminals and traffic levels fall. The instability makes it difficult to plan operations, or to commit additional capital for capacity expansion or operational improvements.

### Off-Dock Storage in a System Context

The storage of drayed containers off-dock is not the solution with the greatest potential for alleviating congestion at the on-dock terminals. The majority of empty containers are returned to the terminals by rail. The terminals and shipping lines have little control over this flow. The railways prefer to maximize their efficiency by hauling full trainloads to and from the on-dock terminals. There are currently no facilities (with the exception of the rail intermodal terminals) capable of receiving full trainloads of empties. The focus has been on off-dock storage of drayed containers because it is capable of implementation in the short term.

The technical aspects of storing empty containers off-dock would appear to be fairly straightforward. At a system level, the choice seems to be a simple trade-off between increased productivity at the on-dock terminals and increased trucking and off-dock facility costs. However, the inability to rapidly adjust institutional factors – in this case the rate structure for terminal charges and drayage rates - has prevented effective

implementation. In the case of drayage rates, the implementation of off-dock storage was a contributing factor in a dispute which disrupted port operations in the Lower Mainland for five weeks. This disruption had impacts on shippers and carriers far greater than the incremental efficiencies to be gained from off-dock storage, at least in the short term. This example underlines the importance of considering institutional factors in trying to implement change to complex logistics systems.

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