Rail Congestion Impacts on Puget Sound Intermodal Port Operations

Daniel Frederick Helman

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Committee:

David Fluharty

Vincent Gallucci

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University of Washington

Abstract

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Daniel Frederick Helman

Chair of the Supervisory Committee:
Associate Professor David Fluharty
School of Marine and Environmental Affairs

This work determined if the apparent rail congestion problem actually existed to the extreme it was impacting intermodal operations at Puget Sound ports. Observations were made of rail traffic in the Puget Sound basin on all four rail routes and for both railroads, Burlington Northern Santa Fe and Union Pacific. The numbers of passing trains were recorded to examine congestion on each route. The numbers of inland point intermodal trains leaving the region were recorded to determine the average numbers of containers per train. Multiple container identity numbers were recorded to examine their time on dock as a possible indicator of congestion impact. Using observed values and multiple published sources for the route capacities it was found only the Everett to Spokane route was operating at capacity. Two of the other three routes have room for capacity growth; the South line into Oregon and the East line from Auburn to Pasco. The North line into Canada is close to its capacity and is feeling pressure from increasing numbers of energy trains. The generated time on dock values only show there is a range of times with 28 hours and 25 minutes being the average time on dock for all samples. Only slight

intermittent congestion is being seen on one route. The time on dock values are inconclusive since no baseline exists for this information. Additional study would be needed to refine conclusions.

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Finally, thanks to family and friends for their patience and support.

List of Abbreviations and Acronyms

AAR	American Association of Railroads
BIC	Bureau International des Containers et du Transport Intermodal
BNSF	Burlington Northern and Santa Fe
FRA	Federal Railroad Administration
IPI	Inland point intermodal
ISO	International Organization for Standardization
PNRC	Pacific Northwest Rail Coalition
POS	Port of Seattle
POT	Port of Tacoma
PSRC	Puget Sound Regional Council
TEU	Twenty foot equivalent unit
TPD	Trains per day
UP	Union Pacific
WPPA	Washington Public Ports Association
WSDOT	Washington State Department of Transportation
WSTC	Washington State Transportation Commission

INTRODUCTION

This thesis examines the impacts of railroad infrastructure congestion on the four intermodal ports within the Puget Sound basin; the Ports of Seattle, Tacoma, Olympia and Everett. It began when the State of Washington Department of Transportation issued its 2009 report (Washington State Freight Rail Plan: 2010-2030, 2009) on the condition of rail transportation in the state and the possible future vulnerabilities of the system if capacity and safety improvements were not made. The general congestion of the rail system had not only been affecting passenger travel but was also poised to have increasingly negative impacts on freight transportation throughout the region with possible subsequent detrimental effects on the regional economy if transportation infrastructure inefficiencies were not addressed.

Anecdotal and media sources, as well as personal experience, would suggest to anyone within the region there is a rail congestion problem. There are frequent news items concerning the topic of truck and rail congestion in downtown Seattle and Tacoma (Stewart, 2013 and Kelly, 2014), as cartage trucks transfer containers of freight from the various marine terminals directly to intermodal rail yards for loading onto rail cars for transport east or south from the Puget Sound basin. Throughout the area, and not just in Seattle, there are blocked streets, traffic backing up into side streets, ferry queues being delayed, etc., as passing trains delay traffic. These are all visible symptoms of the general congestion in the port area, but are not necessarily directly related to the ability of the railroads to handle the inbound container traffic. In addition to these visible examples of congestion, the marine terminals themselves have to hold containers on the dock until they can be shifted into the next stage of transport, either by drayage or directly loaded onto rail cars. The question is whether or not there are adequate rail cars and trains to receive the containers or is congestion in railroad flow out of Seattle and Tacoma holding things up?

In response to the impact question it was desired to determine if the above congestion which appeared to be affecting port operations was the result of congestion on the railways and if so to what extent. The best indicator of impact of railway congestion would be the amount of delay inbound intermodal shipments experience once they have been unloaded from the calling ships since the greatest volume of traffic through the intermodal system was in international containers. In other words, the length of time it takes a container of goods to leave the Puget Sound basin by railroad would be a possible way to assess the role of railroads in contributing to congestion in intermodal port operations.

The literature is very sparse concerning the topic of railroad infrastructure congestion in general, and almost non-existent when focused directly on the Puget Sound region. There have been analytical studies completed for the State of Washington, Pacific Northwest Rail Coalition (PNRC), local governments and regional transportation organizations which address the needs for future rail capacity to handle increased freight and passenger train demand, and thereby decrease some of the congestion in the region.

The Washington State Freight Rail Plan (WSDOT, 2009) released in 2009 was based on previous rail studies done for the Washington State Department of Transportation (WSDOT) and mandated by the Federal Railroad Administration (FRA). The FRA, along with the American Association of Railroads (AAR), provides structure and regulation to standardize rail design and performance in the United States. The FRA mandates that in order for the state to continue to receive federal funds a continually revised rail assessment is done on a periodic basis and WSDOT complies by authorizing these reports.

The 2009 report (WSDOT, 2009) examined the condition of the rail industry in the state just after a great period of economic growth which had strained the system and been the primary driver of the congestion problem and part of the impetus for this thesis work. Like all previous and subsequent rail assessments it examined the rail infrastructure in the state in terms of condition, capacity and needed improvements to meet future needs. As indicated in its title, this report was heavily focused on freight rail movement and the economic impact the possible future congestion problems might have if not addressed.

The report stated, "….railroads are meeting the existing long-haul traffic demands, but are experiencing capacity limitations during peak volumes on some of their routes." It also identified more than 100 capital improvement projects of varying size and cost that would be needed to meet the reports goals and carry the state's rail system into the future (WSDOT, 2009).

Unlike the 2009 State Rail Plan above and the 2014 plan (Washington State Rail Plan: Integrated Freight and Passenger Rail Plan 2013-2035, 2014) to be discussed in subsequent paragraphs, both of which were completed for WSDOT, the Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment was completed for the Pacific Northwest Rail Coalition, an industry organization. This study was focused more on future marine cargo estimates and only included rail information and assessment as a component of handling marine cargoes moving through the region (PNRC, 2011).

While the PNRC report examined the rail capacity of the region primarily in terms of the impact on marine cargoes, it also included domestic freight traffic and passenger train volumes, their volumes, and the additional impacts that rail traffic had on the overall rail infrastructure. A segment by segment assessment of the region was completed describing then current rail traffic levels, the calculated capacities of each segment and possible future traffic demands based on the projected marine cargoes (PNRC, 2011).

The PNRC 2011 report concludes with a shorter list of improvement projects than the 2009 WSDOT report, many of which appear in the WSDOT document. It also concludes with the projection that increasing volume of export bulk trains, specifically energy trains, will increase the demands placed on rail capacity in the region and that both the BNSF and the UP will have to address these demands. Intermodal traffic is expected to grow at a rate of between 4.1% and 6.1% into 2030; a reduced rate from that before the economic downturn. The regional rail infrastructure should be able to accommodate all of this traffic by adjusting train size and frequency in the short term, and by some infrastructure growth in the longer term (PNRC, 2011).

The Integrated Freight and Passenger Rail Plan 2013-2035 issued in 2014 (WSDOT, 2014) provided the same types of rail capacity information as the previously mentioned studies. It adjusted many of the projections and future possible impacts to the rail system, including the impacts of some of the completed proposed projects from the 2009 report and the status of many projects underway. Projections for future rail traffic and congestion include the potential impact of increasing numbers of energy trains into the region, even though the final numbers are still to be determined by the approval of pending expansion projects in bulk export terminals at Anacortes and Bellingham.

In addition, due to increased competition from other ports along the West Coast US, the study documents the rebound in intermodal traffic just after the 2009 economic downturn and subsequent fall off to levels the current rail system was able to handle at the time of the report. Future intermodal traffic is projected to increase, but not at the pre-downturn rates. This report also increased recognition of the importance of including passenger rail traffic in the capacity and traffic assessments due to increased ridership (WSDOT, 2014).

There has also been analytical work completed that focused specifically on intermodal congestion by designing and evaluating an intermodal network flow model to analyze congestion in the entire container import logistics system in the United States, which included the Ports of Seattle and Tacoma (Fan et al., 2012). Their work expanded and built on previous work in container and rail queuing models done by others such as Leachman and Jula (2011a, 2011b, 2012), and logistics and strategic planning for transportation systems optimization (Ishfaq et al., 2010; Murali et al., 2010; and Lai et al., 2010). Leachman (2008) has also done work which focused on an economic optimization model of waterborne containerized imports from Asia to the USA. Much of this modeling work has been sponsored by the Southern California Association of Governments since it has so much impact on the largest port in the U.S., Los Angeles/Long Beach.

Statistical prediction work done by Gorman (2009) builds on optimization models and game theory work done by many others, often not in the railroad field. However, models are typically simplified because the complexity of the rail system makes any attempt at simulation or modelling beyond the scope of any practical model design. Gorman's results were based on econometric analysis of actual train traffic data, patterns and track segments, instead of simplified models. This was done to understand congestion delay impacts of additional train traffic on the examined segments. The subsequent methods were then used for predicative modeling for other track segments.

Gorman's 2009 work also had to deal with an issue that runs throughout any analysis of railroad operations. That is, because the railroads are private companies, they are reluctant to release much data for competitive reasons. For his work, he was able to get data for only eight train districts in the western U.S. from the Burlington Northern Santa Fe (BNSF) railroad. This is a little over 2 percent of the 339 BNSF districts in service in 2009 (Hemphill, 2012).

This thesis attempted to determine if the apparent rail congestion problem actually existed to the extreme it was impacting intermodal operations at Puget Sound intermodal ports. This was done using publically available sources of data as well as field observations by the author of rail and intermodal activity.

METHODS

The difficulty in obtaining information from the railroads regarding train numbers, amount of cargo, etc., was previously mentioned. The railroads typically report their quantities in carload or total tonnage amounts and do not usually make any data available other than in small blocks of historical data or in large overall values for one commodity over a years' time. For example, the BNSF might report it transported 260 million tons of soybeans in 2012 but would be reluctant to report when, where or in how many cars, all done for competitive reasons (Leachman, 2014). In order to develop the data needed to examine the nature of the congestion problem it was necessary to actually observe and record numbers of passing trains, numbers of international or inland point intermodal (IPI) containers on each train, and obtain a sampling of container identity numbers as the trains passed by or waited on a siding. This was done by the author for both BNSF and Union Pacific (UP) trains on all routes leaving the Puget Sound basin.

The train information relied on observations performed by the author at several locations throughout the Puget Sound region at random times between August 2011 and June 2014. Although there was no pattern to the chosen observation dates, it was desired to have them fall at different times of the year to show any patterns in shipping traffic due to the seasons such as summer or national holidays.

There are four possible routes by which IPI rail traffic moves into and out of the Puget Sound basin; north, from Seattle to Canada, north from Seattle, through Everett and then east through the Cascades, south from Seattle, through Auburn and then east through the Cascades, and south from Seattle to the Columbia River and then either east through the Columbia River canyon or south into Oregon. Observations were made at locations alongside all four of these routes. See Figure 1 for the study area and field observation locations.

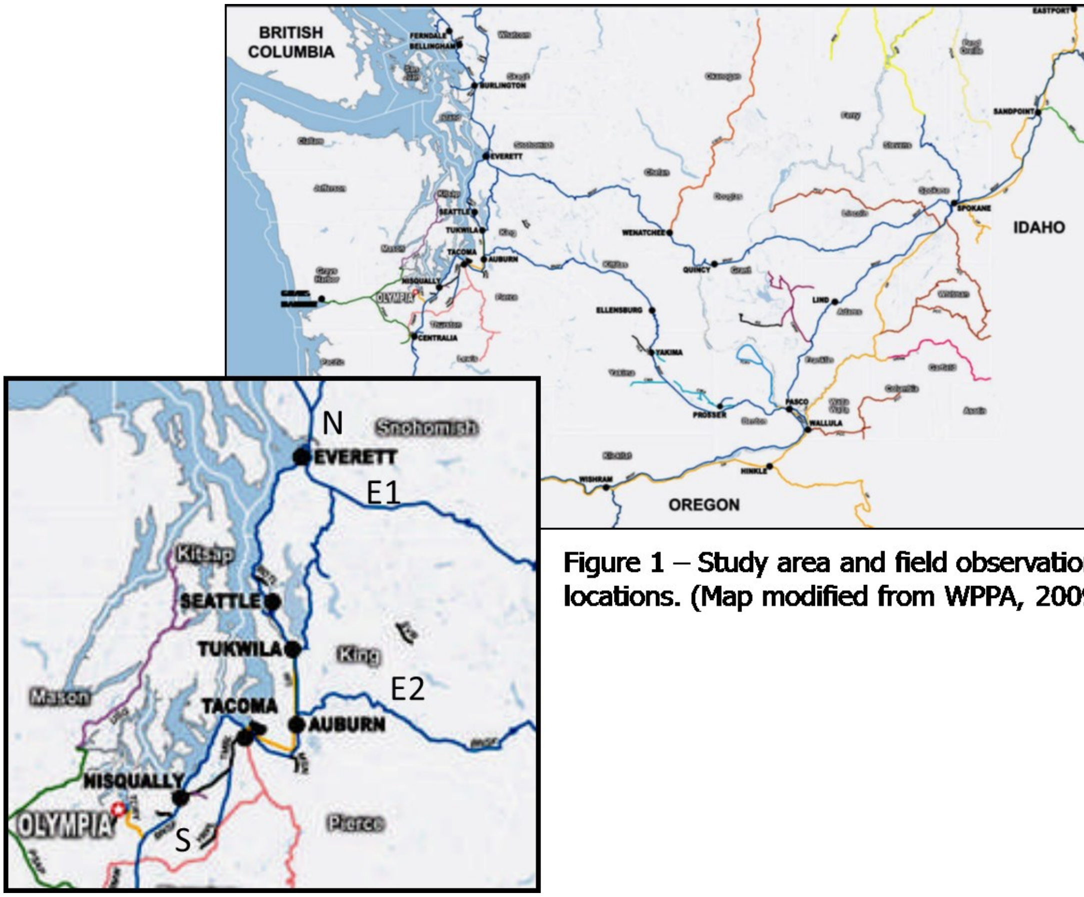

Figure 1 – Study area and field observation locations. (Map modified from WPPA, 2009)

To gather passing train information on the north route from Seattle to Canada a position was taken trackside at the Stanwood Amtrak station at 272nd Street NW and Florence Rd (48.24N, 122.35W). This location was north of Everett and thus isolated rail traffic that was going north from that going east. For the first east route, a parking lot was chosen belonging to a local construction company adjacent to the tracks in the 3000 block of Lowell Snohomish Rd (47.95N, 122.19W). For the other east route from Seattle through Auburn and then through the Cascades, a trackside position at the intersection of White Lake Rd and SE Auburn-Black Diamond Rd was used (47.30N, 122.21W). And finally the southern route required going to a trackside location south of Dupont on Old Pacific Highway SE (47.07N, 122.69W) because there are several possible routes through the greater Tacoma area. It was desired to observe all southbound traffic. Each of these four locations is hereinafter identified as north (N), east-one (E1), east-two (E2) and south (S), respectively.

At all observation locations blocks of time were used to determine train counts, i.e., 15 trains in a four hour block. The total number of trains passing by were noted and categorized as outbound international or inland point intermodal (IPI) trains, the number of containers were counted and recorded to determine the actual number of twenty foot equivalent units (TEU's) onboard that train. International intermodal trains are only loaded with international or inland point intermodal (IPI), as opposed to domestic containers, which have passed from ship to train either directly or by being moved by truck. These containers are 20′ (one TEU), 40′, or 45′ in length, whereas domestic containers are 48′ and 53′.

Also, a sample of two container identity numbers or BIC codes were taken from each outbound (either south or east) train. These numbers, officially known as ISO 6346 or BIC codes, identify the owner of the container using a three letter company code, a single character type code and a unique serial number with check digit. The BIC code name is assigned by the international organization that provides the registry, the Bureau International des Containers et du Transport Intermodal (BIC, 2015).

Several different calculations were done using the field observation data. First, observation data were extended by multiplying the number of trains on any given route observed by the unobserved part of the day and then was compared to the known capacity for that route to determine the level of congestion on the individual route. The route capacities used were those from the most recent Washington State Rail Plan released in 2014 (WSDOT, 2014). Because it was not possible to observe continuously for 24 hours, an extrapolation method was used to estimate both the total number of trains passing on each route as well as the number of outbound international or inland point intermodal (IPI) trains within the total.

The method used to extrapolate results was a simple ratio to extend the observed values to predict what values would occur in a 24 hour period. For example, if there were 10 trains of all types passing by a single point during a 6 hour observation time, then a simple ratio would suggest there were 40 trains passing by this same point during a 24 hour period since 10 is to 6 as x is to 24. This is an extremely basic attempt to determine the total number of trains per day (TPD) which when compared to published values of track capacity determine whether this observation location was below, at or above published capacity.

This simple method to estimate number of trains on each route, as determined by the author, does not account for time of day, day of week, variations in train schedules, or any other factor. It simply calculates the average number of trains per day. Because of all these possible variables observation samples were made at varying times of day and on different days of the week. See Appendix B for details. No attempt was made to repeat observations to develop any sort of pattern of observations. A final estimated value was then determined using all the samples as noted above. In addition to using this method for determining TPD, the observations were also used to determine the number of outbound intermodal trains per day.

Second, after determining the average number of international containers on each train, it was possible to approximate how many TEU's were being sent out of the basin on each route and by each railroad company, either BNSF or UP. Both sets of information were used to determine if and when the route capacity was being exceeded by comparing the total number of TEU's leaving the region to the known numbers of IPI containers arriving each month by ship. See Appendix C for this data.

Finally, the recorded container identity numbers were processed through Track-Trace, an online container tracking tool (track-trace.com). A BIC code is entered into the container search box and the most recent several weeks of movement history for the container is displayed. Since the Track-Trace response comes from the various steam ship lines and container companies it is in different formats depending on which company. It may show a simple location and time observed list for the container or a more complicated version detailing how the container was moved, i.e. by truck or train in addition to the location and time.

The key piece of data from the Track-Trace search is the amount of time it takes to move the container from the arriving ship to the railroad car and departure from the Puget Sound basin. This on-dock time was chosen as an indicator of congestion because no other measurable piece of information was available which might give an indication of congestion. If rail connections could not be made the dock has the space to store a certain number of containers until they can be shifted to rail car. If the railroads are in a state of congestion containers will not move as quickly and this time value will increase.

The general congestion of all trains will affect the time the inbound IPI containers sit on the dock and this will be discussed further in the container data section of the results.

RESULTS

Within the Puget Sound region there are seven international seaports handling shipments of all types of cargo, transported by all types of ships. Five of the seven are served by varying amounts of rail capacity and can handle and specialize in different types of cargo but only four of them can handle any type of intermodal cargo. The Port of Bellingham has near dock rail while the Ports of Anacortes and Port Angeles have no rail service on or near their facilities. None of these three ports handle any intermodal container traffic.

Port of Olympia

The Port of Olympia is the smallest of the four Puget Sound intermodal ports at only 66 acres. It is primarily a breakbulk type port specializing in bulky non-intermodal cargo such as logs, wind energy equipment and other oversize cargo. See Figure 2 for an overview showing logs and wind energy equipment blades on the dock. It has a single rail allowing for movement of these types of non-standard size cargos. It handles virtually no intermodal container traffic but does have some limited intermodal capacity and can act as a backup to the other ports in the region if needed. This includes three deep-water berths and on dock rail and harbor cranes (Port of Olympia, 2015).

Figure 2 – Port of Olympia Port of Olympia, 2014

Port of Everett

The Port of Everett is also a breakbulk type like Port of Olympia specializing in oversize and other non-intermodal cargo. There are eight ship berths and associated equipment on approximately 100 acres. The Port of Everett also acts as a backup to the other Puget Sound intermodal ports and has recently added additional rail capacity. It has on dock rail as well as harbor cranes in place but unlike the Port of Olympia it does handle between ten and twenty thousand TEU's of containers each year (Table 1).

Table 1: Container Traffic at Port of Everett (Port of Everett, 2014)

Year	Outbound TEU	Inbound TEU
2010	7,890	8,815
2011	10,028	10,890
2012	8,527	12,910
2013	9,971	13,890
2014	10,026	13,110

Virtually all of this intermodal traffic is very specialized in the form of oversized containers with standard International Organization for Standards (ISO) mounting footprints but that are not capable of passing down ordinary rail lines due to clearance issues (Author observations, 2014). These containers are loaded with aircraft parts and assemblies for the nearby Boeing plant. They are taken off their arriving ship and placed on a transfer barge for a short ride across Possession Sound to a small rail terminal near Mukilteo. See Figure 3 for a view of the barge terminal at Mukilteo. Here they are taken off the barge and placed on flatcars with ISO mounting twist-locks welded to the deck of the flatcar. The cars are then transferred up the hill to the Boeing Plant at Paine Field.

Figure 3 – Barge terminal at Mukilteo. 2014, Don Heiman

The Seattle to Everett mainline passes along the Mukilteo water front with the barge terminal on the water side and the rail spur to the Boeing plant on the other. Consequently, whenever there is a shipment of containers to move up the hill the mainline is affected to an unknown degree. At the very minimum schedules have to be adjusted to allow for the very slow short container train to cross the mainline and clear the siding. There is also a Sounder commuter train station siding at this same location adding to the complexity (Author observations, 2014).

Port of Seattle

The Port of Seattle (POS) operates numerous facilities around the Sound including the Seattle Fisherman's Terminal, Sea-Tac International airport and almost 600 acres of intermodal seaport along the downtown waterfront, on Harbor Island and in West Seattle (Port of Seattle, 2014). The seaport includes multiple deep water berths and associated harbor cranes, including six of the largest in North America. Terminal's 46 and 30 are multiple berth, deep water terminals just south of downtown Seattle. They have no on dock rail service and all container traffic is moved in and out of the terminals by drayage truck.

Terminal 18 located on Harbor Island is the largest container terminal in the U.S. Pacific Northwest. It is a mixed rail on dock and drayage terminal with harbor cranes able to work with many of the latest generation of container ships which can carry up to 10,000 TEU. Terminal 5 in West Seattle is also a mixed rail on-dock and drayage terminal with more on-dock rail capacity than T-18 (Port of Seattle, 2010, 2012, 2014).

In its peak year, 2010, the Port of Seattle handled 1.42 million TEU but had fallen to 782 thousand TEU by 2014. Table 2 shows TEU data for the POS from 2004 to 2014. The full data set is available in Appendix A (USDOT-MARAD, 2015).

Table 2: Container Traffic at Port of Seattle (USDOT-MARAD, 2014)

Year	Inbound TEU
2004	1,049,105
2005	1,342,368
2006	1,215,375
2007	1,290,337
2008	1,083,789
2009	1,072,728
2010	1,416,917
2011	1,363,786
2012	1,240,259
2013	999,098
2014	782,253

All of this container traffic has a great effect on the rail traffic in the region as subsequent data will reveal. The POS along with the Port of Tacoma are the only two sources for intermodal container traffic in the region and are both a contributor to and suffer the effects of any rail congestion problem as subsequent results will show.

Port of Tacoma

The Port of Tacoma (POT) is the largest port in the Puget Sound region with multiple facilities spread around more than 2400 acres of land in the Tacoma Tide flats, including over 600 acres dedicated to intermodal terminals. It includes 17 deep water berths and associated harbor cranes in 6 terminals, all of which are rail on dock. Because of this, inbound IPI containers spend no time in drayage transit and are loaded directly onto train cars (Port of Tacoma, 2014). Like the Port of Seattle, the Port of Tacoma sees great numbers of containers passing through each year as shown in Table 3.

Table 3: Container Traffic at Port of Tacoma (USDOT-MARAD, 2014)

Year	Inbound TEU
2004	940,638
2005	1,160,047
2006	1,091,011
2007	1,154,276
2008	1,133,163
2009	873,812
2010	835,523
2011	886,073
2012	1,091,738
2013	1,263,221
2014	1,336,497

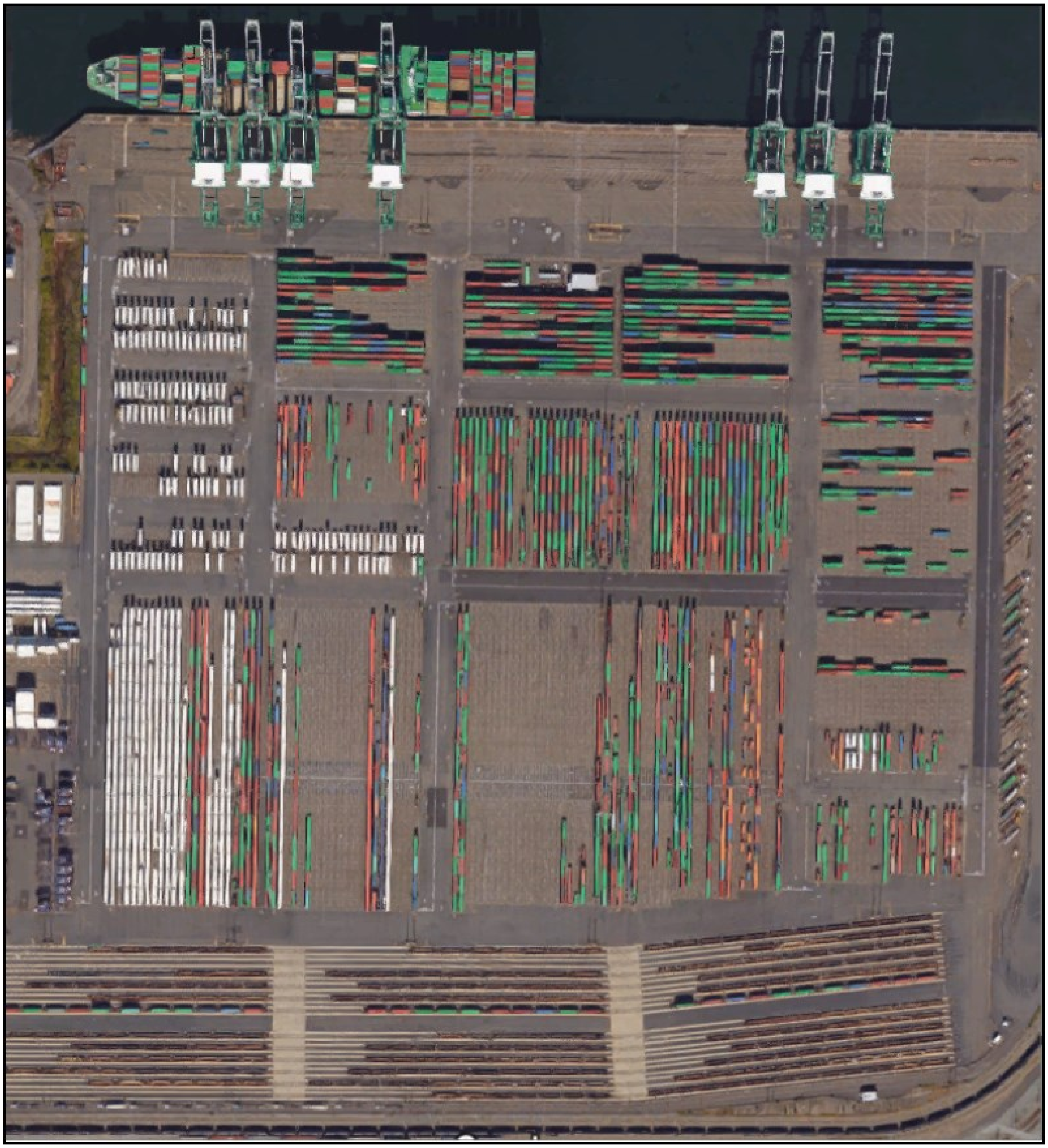

Figure 4 – Port of Tacoma An overhead view of the Evergreen Terminal at POT. At the top of the photo a ship is being unloaded while intermodal train well cars are being loaded at the bottom of the photo. Google image, 2015.

The Northwest Seaport Alliance

For many years the two busiest Puget Sound ports, Seattle and Tacoma, have competed with one another for steamship market share, often times being pitted against each other by the steamship companies to their advantage with one or the other coming up short. There has also been a great downturn in cargo over the last several years coming into both ports caused by several reasons. Some traffic shifted to East Coast ports in response to the labor issues from the fall of 2014 and has not returned. Increased capacities at new B.C. ports such as Prince Rupert and the Delta Superport have taken some market share promising less rail congestion into the Chicago area by sending intermodal traffic across Canada. Due to these losses, both ports are currently operating at 45% of capacity (Aitchison, 2014, Garnick, 2015 and Wilhelm, 2015).

Consequently they have formed The Northwest Seaport Alliance which officially goes into effect in the spring of 2016, but planning for which has taken place over many months. In fact the idea has been discussed several times over the years, but the current conditions provided an opportune time to implement the plan.

The new alliance will only affect the seaport operations of the two ports and not include other maritime or upland holdings and operations. There will be realignments and re-purposing of space at both ports with the new amount of space under the alliance brought to 1745 acres. Together the two ports container numbers will make the region into the third largest container gateway in North America. All of these factors and increased efficiencies will allow the alliance to be more competitive with other ports on the west coast (Aitchison, 2014, Garnick, 2015 and Wilhelm, 2015).

Burlington Northern Santa Fe Railroad

The Burlington Northern Santa Fe (BNSF) railroad is the primary rail service provider in the Puget Sound region. It owns and operates all four routes of rail infrastructure that enter and leave the Sound which includes rail line access into all four intermodal rail on dock ports. It operates BNSF trains on its tracks as well as allows UP freight trains, Amtrak passenger trains, Sounder commuter trains and other short-line railroads as needed to operate on certain routes (Author observations, 2012, 2013 and 2014).

Each of the four routes has unique characteristics in terms of congestion, choke points or locations where one train must wait for another to pass by or overtake, amount of traffic and the routes potential future ability to handle increased traffic. Table 4 shows historical train per day (TPD) and rail line segment capacities from 2006 to 2014, and shows the changes over those years. TPD values reflect demand during the time of assessment, while capacity values show differences in calculating the value as well as the results of improvements to the line segment. Table 4 also supports the following information about each of the Puget Sound track segments being examined.

Figure 5 – Puget Sound Area Rail Lines.
The four main rail routes in the Puget Sound region. (Modified from WSDOT, 2014).

~ Northern Route Track Segments

Seattle to Everett

This route handles all types of rail traffic, both freight and passenger, originating in and passing through Seattle coming north. This route sees coal, oil, grain, mixed freight, intermodal and passenger trains. It handles between 35 and 60 trains per day (TPD) including 11 passenger only trains and between 4 and 6 eastbound IPI trains that will turn at Everett and go east. It has a great amount of double track except along the Edmonds water front, on the lift bridge over the locks in Seattle and as it goes under downtown Everett through the Everett Tunnel. There are also choke point issues with visibility in the King Street tunnel in downtown Seattle and with Sounder and Boeing trains at Mukilteo needing to cross the mainline (Author observations, 2013 and 2014, WSDOT, 2009 and 2014).

Table 4 - Published Train Data

Rail Line Segment	2006		2009 (2008)		2011 (2009)		2014 (2010)	
	TPD	Capacity	TPD	Capacity	TPD	Capacity	TPD	Capacity
Seattle to Everett	41	45	48	60	51	80	33	81
Everett to Blaine	28/14/12	24/14/7	18	18	17	24	15	25
Everett to Spokane	27	22	16	28	18	28	16	28
Auburn to Pasco	6	10	6	16	6	24	6	39
Seattle to Auburn-BNSF	60	204	80	140	81	140	46	115
Seattle to Auburn-UP							10	48
Auburn to Tacoma-BNSF	50	122	62	60	81	140	41	115
Auburn to Tacoma-UP							10	48
Tacoma to Longview/Kalama	49	72/101	55	70	57	60	41	78
Longview/Kalama to Vancouver	49	96/146			63	100		
2006	Statewide Rail Capacity and System Needs Study, 2006							
2009	Washington State 2010-2030 Freight Rail Plan, 2009							
2011	Marine Cargo Forecasts & Rail Capacity Assessment, 2011							
2014	Washington State Rail Plan: Integrated Fredight and Passenger Rail Plan 2013-2035, 2014							

This segment's capacity has increased steadily over the years from 45 TPD in 2006, to 81 TPD in the most current report from 2014. This is mostly due to increased siding length approaching Edmonds, adding a separate Sounder siding at Mukilteo and upgrading rail and sleeper quality (Author observations, 2013, 2014 and 2015, WSDOT, 2009 and 2014).

Everett to Blaine

This route handles all types of rail traffic, both freight and passenger originating in and passing through Everett coming north. This route sees coal, oil, grain, mixed freight and passenger trains. There are no intermodal trains on this route. This line is primarily a line taking coal into Canada and crude oil to the refineries in western Washington at Anacortes and Cherry Pt. It handles between 12 and 20 TPD only as far as the refineries, and then traffic falls to only 5 to 7 TPD. The unusual values in Table 4 under 2006, 28/14/12 or 7 reflected very different traffic patterns at the time. There are also several passenger only and mixed freight trains each day.

It is almost completely a single track line with sidings at Stanwood and Mt. Vernon which have been upgraded and lengthened to accommodate increased traffic. There is also a new siding at the border to allow customs better inspection access. At the southern end, just north of Everett, trains must cross the Snohomish River and associated sloughs using older swing type draw bridges. This is a known choke point in the system and requires trains, especially heavily laden energy trains, move at very slow speeds through the area. Both the Bayside and Delta yards in Everett have recently added several 8,000ft, heavy rail and concrete sleeper sidings to handle additional traffic mostly from energy trains passing through (Author observations, 2014 and 2015, WSDOT, 2009 and 2014).

The new sidings and improved rail and sleeper quality have raised the capacity of this line, especially in the last two years, from as low as 7 TPD on the north end at the border to 25 TPD throughout. Increased numbers of energy trains will continue to drive improvements in the capacities of this line segment (Author observations, 2014 and 2015, WSDOT, 2009 and 2014).

~ Eastern Route Track Segments

Everett to Spokane

This line is the BNSF's primary route for intermodal trains in and out of the Puget Sound basin. Passenger, mixed freight, and empty east bound only energy trains have been observed on this route. There are also occasional grain trains moving in both directions. This line handles 25 to 30 TPD, including two passenger only and 4 to 6 east bound IPI intermodal trains (Author observations, 2013, 2014 and 2015, WSDOT, 2009 and 2014).

Figure 6 – Energy Trains. Empty trains wait at Everett to go east to Spokane. Photo Dan Helman.

This line is a mix of double and single track with multiple long sidings throughout. It has steep grades and tight curves near the entrances to North America's longest rail tunnel, the Cascade Tunnel at

Stevens Pass. The tunnel is the primary choke point on this line, not only because it has a single track but also because it must be vented each time a train passes through which can take as long as 45 minutes per train. Because of the tunnel, the capacity on this segment holds steady at 28 trains per day. Trains que on both sides of the tunnel and wait their turn passing through (Author observations, 2013, 2014 and 2015, WSDOT, 2009 and 2014).

Auburn to Pasco

This route out of the Puget Sound basin is used almost completely for east bound, empty, bulk commodity trains such as grain and coal. It is typically only handling 6 to 8 TPD. There are no intermodal or passenger trains on this route (Author observations, 2013, WSDOT, 2009 and 2014).

This lack of use is due to several reasons. First, in the middle of the route is the Stampede Tunnel which has a low ceiling and thus cannot handle double stack intermodal trains. Second, other routes in the Puget Sound region can handle the traffic that uses this route when their traffic numbers are down. And finally, this route is the only route in the region still using antiquated track warrant control (TWC) instead of centralized traffic control (CTC) to manage the trains on the route. CTC is in use everywhere else in the region but here (WSDOT, 2014).

The route is almost completely single track with just a few sidings, many too short for passing trains. In the past the BNSF has shut this line down for months and even years at a time all the while maintaining it in operating condition. The capacity of the line has increased over the years from 10 to 39 TPD, mostly due to the addition of holding sidings on the Auburn end and the decision to have it handle single direction traffic (Author observations, 2013, Melonas, 2012 and WSDOT, 2014).

~ Southern Route Track Segments (Separate BNSF and UP lines)

Seattle to Auburn and Auburn to Tacoma

Both the BNSF and the UP have tracks running from Seattle to Tacoma, with the BNSF having its yard at Auburn as well as the turn off to the Auburn to Pasco route discussed above. The UP's line is mostly single track with numerous sidings feeding into business parks and construction yards along the way. It runs down the west side of the Auburn Valley into their Tacoma/Fife yards just south of the Port of Tacoma. The BNSF line runs down the center portion of the Auburn Valley and also has numerous sidings. It is mostly double track and goes into their Tacoma yard adjacent to the UP yard (Author observations, 2013 and 2014).

The Union Pacific has an origination yard in Seattle just south of downtown known as the Argo yard. It handles primarily intermodal traffic but also solid waste and mixed freight traffic. The BNSF has several yards in the Seattle area. The Balmer yard near Interbay handles mostly mixed freight and grain, the Stacy yard in SODO taking drayage trucks with IPI containers, the Seattle International Gateway (SIG) just north of the Stacy yard also taking IPI container traffic and the South Seattle domestic container yard in Tukwila (Author observations, 2013 and 2014, Melonas, 2012).

Between the two lines these routes handle 60 to 100 TPD, including IPI trains going from Tacoma north to Everett for the east bound route on the BNSF and UP IPI trains going south to continue on to Portland. This route handles all types of traffic, mixed freight, oil, coal, grain, intermodal and passenger only. Loaded energy trains come north bound through this route continuing on to the Everett to Blaine route. This segment of rail has the greatest capacity of any in the region at between 150 and 200 TPD and no major choke points (Author observations, 2013, 2014 and 2015, Melonas, 2012, Hunt, 2011).

Tacoma to Longview/Kalama and Longview/Kalama to Vancouver

These two line segments are on tracks running south from Tacoma owned by the BNSF but utilized by the BNSF, UP, Sounders and Amtrak with a mix of all types of freight and passenger trains. The UP sends all its traffic including its intermodal traffic south to Portland where it goes back on UP owned tracks in the Portland area and along the south side of the Columbia River. This route handles between 40 and 70 TPD, including 11 passenger trains and 2 or 3 IPI intermodal trains (Author observations, 2014 and 2015, WSDOT, 2009 and 2014).

This route is made of entirely double and in a few places triple track. The triple tracks sections are in response to pressure from passenger train traffic and allow for better passing management. There are two single track tunnels near Tacoma (Nelson-Bennett Tunnel and Ruston Tunnel) which are the primary capacity constraints between Longview/Kalama and Tacoma. At one time they were double track but were changed to single track in order to accommodate the excess height of double stacked intermodal traffic without having to physically expand the tunnel which would have been cost prohibitive (Point Defiance Bypass Project, 2010). Some of the pressure was taken off this route by the Point Defiance Bypass Project which separated passenger traffic going south from Tacoma to Dupont from the mainline, where it rejoins. Another problem location is at Kalama where grain train traffic often affects mainline traffic (Author observations, 2013, 2014 and 2015, Reily, 2012 and WSDOT, 2009 and 2014).

Train Data

As noted above, Table 4 shows published train data along track segments throughout the Puget Sound region on the four routes that handle or might handle intermodal container traffic from the two intermodal ports being studied. The changes in data values in the table reflect the changes in rail traffic in the region in response to changes in economic conditions, market trends, competitive advantages and the shift in shipping traffic from one port to another.

Table 5 - Observation Data

Rail Line Segment	Route	Total TPD	EB/SB IPI TPD
Everett to Blaine	N	12	0
Everett to Spokane	E1	28	4 to 6
Auburn to Pasco	E2	8	0
Tacoma to Longview/Kalama	S	45	2 to 3
Longview/Kalama to Vancouver			

Author Field Observations, 2011-2014

Table 5 shows the summarized results of field observations done by the author at each of the four study locations, N, E1, E2 and S. Appendix B has the full data gathered for each of the four segments being observed. For the north (N) route, an average of 12 TPD was calculated from the observed values. There were no IPI trains observed on this route. The east two (E2) also had no IPI trains observed and a calculated average of 8 TPD.

The other two routes did have observed intermodal traffic, E1 going east from Everett and S going south from Tacoma. The E1 route had a calculated value of 28 TPD with 4 to 6 IPI trains eastbound each day. All of the trains on this route were BNSF trains. The S route going south from Tacoma had a calculated value of 45 TPD with 2 to 3 IPI trains southbound each day. This route had a mix of BNSF and UP trains, with all the IPI train traffic UP. All of these calculations were simple averages based on observed counts and a calculated total count divided by the total number of observations.

Container Data

In addition to the train counts observed, the total number of TEU's on each south or east bound IPI train was recorded. This value was used to calculate an average number of TEU's per train leaving the Puget Sound basin. During all the observations a total of 64 trains were observed with a calculated average of 420 TEU's per train. The field observation values for this are in Appendix C (Author observations, 2012, 2013 and 2014).

Columns 8 and 9 of Table 6 show the results of estimating how many IPI trains each day were needed to handle the daily quantity of IPI containers being sent out of the Puget Sound basin. These values were determined based on calculating the daily amount of containers, according to the breakdowns in columns 3 through 7, needed to be transported and the number of trains it would take to transport them using the field observation train data for the number of trains per day and the average number of TEU's on each train. The complete Table 6 and calculations are provided in Appendix D.

1	2	3	4	5	6	7	8	9
Table 6		**Local**	**Domestic**		**IPI**		**UP TPD**	**BNSF TPD**
		10%	**30 Percent**		**60 Percent**			
	Total TEU		**1/3 UP**	**2/3 BNSF**	**1/3 UP**	**2/3 BNSF**	**(2-3)**	**(4-6)**
2004Jan	83,722	8372.2	8363.8	16752.8	16727.7	50233.9	1.3	4.0
2004Feb	79,565	7956.5	7948.5	15921.0	15897.1	47739.7	1.3	3.8
2004Mar	101,878	10187.8	10177.6	20385.8	20355.2	61127.5	1.6	4.9
2004Apr	107,210	10721.0	10710.3	21452.7	21420.6	64326.7	1.7	5.1
2004May	93,008	9300.8	9291.5	18610.9	18583.0	55805.5	1.5	4.4
2004Jun	105,192	10519.2	10508.7	21048.9	21017.4	63115.9	1.7	5.0
2004Jul	103,507	10350.7	10340.3	20711.8	20680.7	62104.9	1.6	4.9
2004Aug	99,399	9939.9	9930.0	19889.7	19859.9	59640.1	1.6	4.7
2004Sep	131,077	13107.7	13094.6	26228.5	26189.2	78646.9	2.1	6.2
2004Oct	126,251	12625.1	12612.5	25262.8	25224.9	75751.3	2.0	6.0
2004Nov	131,889	13188.9	13175.7	26391.0	26351.4	79134.1	2.1	6.3
2004Dec	138,548	13854.8	13840.9	27723.5	27681.9	83129.5	2.2	6.6

The monthly amount of inbound IPI containers is shown in column 2, however not all of the inbound IPI containers are transported out of Puget Sound by train. Of the total monthly container traffic in column 2, typically 10% are delivered by truck to destinations within an approximate 500 mile radius of

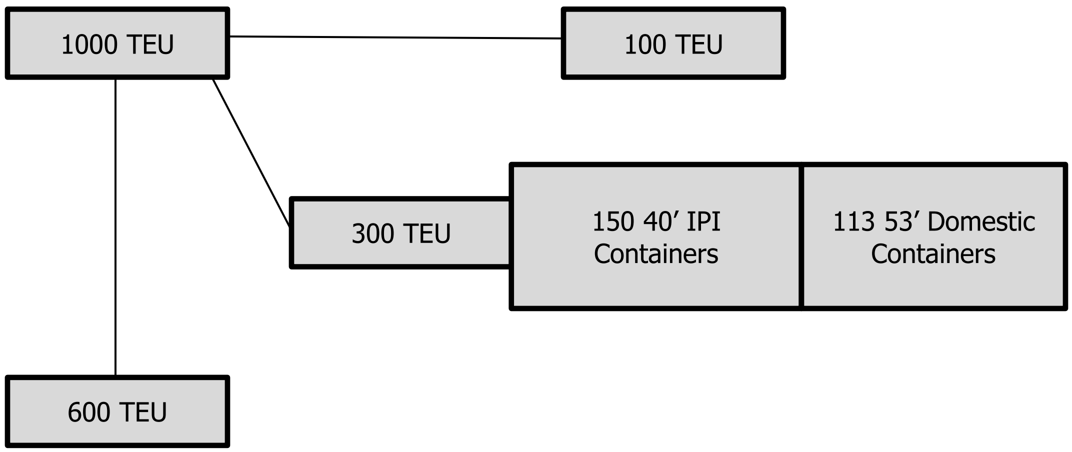

Figure 7 – Container Distribution. Container distribution in the region. (Hunt, 2011, Melonas, 2012, Reily, 2012, Yoshitani, 2009 and Author Observations, 2011-2015)

the Puget Sound basin. 30% are sent to logistics warehouses in the region where three 40 foot international containers are unloaded and repacked into two 53 foot domestic containers. Most of these operations take place in the Kent and Fife areas near the two ports. And the final 60% are transferred to rail cars for inland shipment by rail. The 30% and 60% portions are both shared by the BNSF and UP in a two to one ratio. See Figure 7 for a visualization of this breakdown showing how each 1000 TEU are processed by the railroads and the ports. Also see Table 6, columns 3 through 7 for 10+ years of monthly data broken apart in support of the Figure 7 graphic.

While these percentage values appear precise, they are the combined opinions of port and railroad officials who reported during personal conversations that this was the approximate mix of how container traffic moved in the region (Reily, 2012, Yoshitani, 2009, Melonas, 2011, Hunt, 2011, Author Observations, 2011-2014).

As stated before, a TPD value and the number of east or south bound IPI container trains were both calculated for each route and shown in Table 5 based on recorded observations (Appendix B). Table 6 shows the numbers of inbound IPI containers and the breakdown by type and railroad. Again, using these numbers and the calculated value for TEU/train based on observation, columns 8 and 9 show how many IPI container trains would be needed to handle the inbound container traffic. This is based on the

60% IPI value and the known 2:1, BNSF to UP ratio from earlier in this section. The UP can only send trains south and the results show they need never exceed their observed 2 to 4 TPD value. The BNSF only sends trains east, unless the Seattle-Everett segment or east tracks are compromised, and they only exceed their 4 to 6 TPD value occasionally, as highlighted in Table 6.

The container portion of the data in Appendix C also shows two container numbers chosen randomly from each of the 64 passing IPI container trains on the two routes where they were observed, E1 and S. The container numbers were passed through Track-Trace [tracktrace.com] to determine their movements, and the time from discharge from the ship until the train is moving to transport them out of the Puget Sound basin was noted. The average time calculated from these searches was 1695 minutes, or 28 hours and 25 minutes. The response from Track-Trace varied depending on the steamship line, but typically contained date, time and location information for the container being tracked. Figure 8 shows the time data.

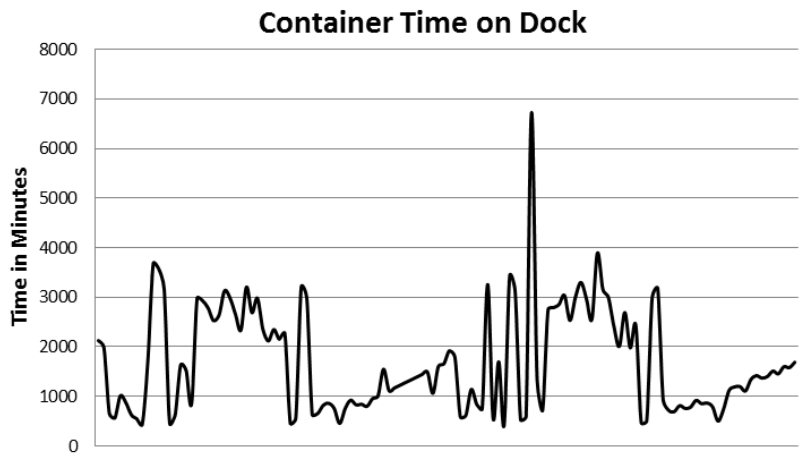

Figure 8 – Container Time on Dock. This shows the time on dock for all 128 sampled containers as reported by Track-Trace. The average was 1695 minutes or 28 hours and 25 minutes. The full data set is in Appendix C.

The information obtained from the Track-Trace searches was the time the container sat on the dock until it was moving on the rails out of the Puget Sound basin. The time data generated were used to determine if there was any effect of rail congestion on port operations by suggesting that excessive times indicated a congestion problem, although no previous work done by anyone have established a baseline or value for what might be considered an excessive time.

The time values were also examined to determine if there was a pattern to associate the times with any known railroad activity and also see if there was any other pattern to the data to provide insight into the process. Each BIC generated such a large amount of data only the needed time value was retained so it was not possible to determine which port the container had passed through.

DISCUSSION

Examining each of the four routes for which data have been gathered there are several things to be pointed out. The four routes make up a very dynamic rail system, and with just a few exceptions it is able to accommodate one way or another almost all the demands being placed on it.

The southern (S) route has tremendous capacity that has been and is underutilized. Even during the peak time of use in 2010, when the region was rebounding from the economic downturn, it was only being used to about 60% of its capacity. The UP only sends a few trains down the route each day under its agreement with the BNSF. That may increase in the future, but not likely in the short term. The BNSF has made several improvements to this route since 2009, most notably the additional siding space for grain trains at Kalama. The rest of this route is double track all the way from the tunnels near Tacoma to the Columbia River.

The east (E2) route through Auburn and up through the Stampede Tunnel has the most flexibility, especially if it is completely dedicated to "draining" the Puget Sound rail network of empty bulk trains such as coal, grain and oil. It is performing some of that function now, but with only a change to CTC its capacity would increase dramatically. This route has the Auburn yard which has room for growth as a place for even more holding tracks. It is unlikely the tunnel will be enlarged to handle double stack intermodal traffic since the price to do so was reported at $25 million and that was several years ago (Reily, 2012).

The east (E1) route from Seattle to Everett then up to the Cascade Tunnel under Stevens Pass does have the limit of 28 TPD which has been consistent throughout all of this study. The published route capacities in Table 4 along with the observed values in Table 5 show that the E1 route from Everett to Spokane is operating at its capacity of 28 trains per day. Despite many improvements in the Everett area to sidings and yards, there is still roughly only one train per hour allowed through the tunnel. The approaches to the tunnel have improved, but there may be a time when the BNSF has to route more intermodal traffic south to take pressure off E1. At this time, it has the capacity to do that if needed (Author observations, 2013 and 2014).

Finally the north (N) route. This was traditionally the least used of the four routes. However due to the increase in energy trains over the last few years, and the possibility of even greater traffic on this route in the future, it has been very active. The BNSF has been making numerous improvements to this route; new and improved sidings, replacing wooden trestles with concrete precast, improving rail and sleeper quality, improving signaling and adding storage tracks to the Everett yards (Author observations, 2014, and BNSF, 2013).

The data observed and the values calculated from the observations suggest that at this time there is no congestion problem of any consequence. The times highlighted in Table 6 are the exception and indicate months during which time the BNSF exceeded their 4 to 6 TPD values. The values over the maximum value are fairly small and they may have been able to easily handle the additional train traffic by adjusting operating methods such as train length or re-routing another train. In order to know additional field observations would have to be made.

There is high confidence in the IPI trains observed value and the number of TEU's per train values since they were actually observed and recorded by the author, but less confidence in the extrapolated value for the number of IPI trains per day. The data also do not reflect any time of day patterns. This could also have an effect on the TPD and IPI TPD values, and consequently on the 420 TEU per train value.

The time on dock values only provide an indication of congestion due to lack of capacity of train transportation, but no conclusion can be drawn from the values since no previous research has been done using the simple time value or establishing a value as a baseline. Similarly, there could be other barriers in the port [cranes, drayage, etc.] that can also account for the time of transit from port to rail car. A larger sample size would be better as well as recording other information about the time value such as which port, terminal, railroad, etc.

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Appendix A – Puget Sound Container Traffic

Table 1 – Total Loaded Container Traffic

U.S. Department of Transportation
Maritime Administration
U.S. Waterborne Foreign Container Trade by U.S. Customs Ports (1997 - 2014)
Total Trade (Imports and Exports) in Twenty-Foot Equivalent Units (TEUs) - Loaded Containers Only

U.S. Custom Ports	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tacoma, WA	940,638	1,160,047	1,091,011	1,154,276	1,133,163	873,812	835,523	886,073	1,091,738	1,263,221	1,336,497
Seattle, WA	1,049,105	1,342,368	1,215,375	1,290,337	1,083,789	1,072,728	1,416,917	1,363,786	1,240,259	999,098	782,253

Table 2 Total Inbound Loaded Container Traffic

U.S. Department of Transportation
Maritime Administration
U.S. Waterborne Foreign Container Trade by U.S. Customs Ports (1997 - 2014)
Imports in Twenty-Foot Equivalent Units (TEUs) - Loaded Containers Only

U.S. Custom Ports	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Seattle, WA	680,780	874,774	793,637	784,981	658,653	622,044	888,103	772,656	726,430	544,964	424,559
Tacoma, WA	601,187	794,332	735,962	722,378	651,244	457,963	495,600	519,955	649,104	733,072	817,697

Appendix B – Field Observation Train Data

These data are the recorded train observation data and the calculated train per day and IPI train per day values based on the observations made by the author. The value highlighted at the bottom of the TPD column is the average trains per day for this route. The value highlighted at the bottom of the EB or SB IPI Trains column is the total number of those trains observed. And finally, the value highlighted at the bottom of the last column is the calculated value for the number of EB or SB IPI TBD based on the number observed during the observation time and extrapolated using a simple ratio as follows;

Observed IPI trains per number of hours = Unknown per 24 hours

Field Observation Train Data

	Location	Date	Start Time	End Time	Hours	NB or EB	SB or WB	Total Trains	TPD	EB or SB IPI Trains	EB or SB IPI TBD
1	E1	8/9/2011	1230	1700	4.5	4	2	6	32	2	11
2	E1	8/17/2011	1500	2000	5.0	4	2	6	29	1	5
3	E1	9/9/2011	1700	2200	5.0	3	2	5	24	1	5
4	E1	12/14/2011	1630	2230	6.0	3	3	6	24	2	8
5	E1	12/16/2011	1500	1900	4.0	5	2	7	42	2	12
6	E1	3/23/2012	1800	2200	4.0	3	2	5	30	1	6
7	E1	3/30/2012	1900	0100	6.0	5	3	8	32	1	4
8	E1	4/6/2012	0900	2100	12.0	8	6	14	28	3	6
9	E1	4/9/2012	0800	1400	6.0	4	2	6	24	2	8
10	E1	4/17/2012	1500	1900	4.0	1	3	4	24	0	0
11	E1	4/30/2012	2030	0030	4.0	3	3	6	36	2	12
12	E1	5/14/2012	2200	0200	4.0	3	3	6	36	1	6
13	E1	9/7/2012	0900	2230	13.5	8	6	14	25	3	5
14	E1	9/25/2012	1700	2100	4.0	3	2	5	30	1	6
15	E1	10/12/2012	2030	2330	3.0	2	1	3	24	1	8
16	E1	12/15/2012	1500	0100	10.0	6	4	10	24	3	7
17	E1	4/6/2013	1100	1900	8.0	5	4	9	27	1	3
18	E1	4/10/2013	1200	1800	6.0	4	5	9	36	1	4
19	E1	5/13/2013	2030	2330	3.0	2	1	3	24	0	0
20	E1	5/18/2013	2000	0200	6.0	5	4	9	36	2	8
21	E1	5/20/2013	0600	1200	6.0	4	3	7	28	2	8
22	E1	6/13/2013	2200	0200	4.0	2	1	3	18	0	0
23	E1	7/23/2013	0600	1500	9.0	2	4	6	16	1	3
24	E1	9/21/2013	2100	0200	5.0	3	3	6	29	2	10
25	E1	9/26/2013	2000	0200	6.0	5	2	7	28	1	4
26	E1	12/14/2013	1630	2230	6.0	3	3	6	24	1	4
27	E1	4/23/2014	1800	2200	4.0	0	2	2	12	0	0
28	E1	5/18/2014	2000	0000	4.0	2	3	5	30	0	0

29	E1	5/24/2014	0900	1500	6.0	5	3	8	32	2	8
30	E1	6/4/2014	0900	1300	4.0	3	3	6	36	1	6
									28	40	6
1	E2	8/7/2011	0900	1900	10.0	4	0	4	10	0	0
2	E2	8/19/2011	1300	1800	5.0	1	0	1	5	0	0
3	E2	8/21/2011	2030	2330	3.0	1	0	1	8	0	0
4	E2	10/2/2011	1500	2200	7.0	3	0	3	10	0	0
5	E2	10/8/2011	1100	1500	4.0	2	0	2	12	0	0
6	E2	11/14/2011	1200	1600	4.0	2	0	2	12	0	0
7	E2	4/1/2012	2030	2330	3.0	2	2	4	32	0	0
8	E2	4/7/2012	2000	0200	6.0	3	0	3	12	0	0
9	E2	4/13/2012	0600	1200	6.0	3	1	4	16	0	0
10	E2	4/12/2012	1930	2230	3.0	0	0	0	0	0	0
11	E2	4/27/2012	1600	2200	6.0	3	0	3	12	0	0
12	E2	5/16/2012	1100	1900	8.0	3	0	3	9	0	0
13	E2	9/1/2012	1000	1800	8.0	3	1	4	12	0	0
14	E2	9/15/2012	1630	2330	7.0	2	0	2	7	0	0
15	E2	10/9/2012	1800	0200	8.0	4	0	4	12	0	0
16	E2	2/11/2013	2000	0000	4.0	1	0	1	6	0	0
17	E2	2/27/2013	0900	1600	7.0	2	1	3	10	0	0
18	E2	3/13/2013	0900	1500	6.0	1	0	1	4	0	0
19	E2	4/18/2013	0900	0200	5.0	1	0	1	5	0	0
20	E2	5/22/2013	1700	2200	5.0	0	0	0	0	0	0
21	E2	6/1/2013	2030	0000	3.5	0	0	0	0	0	0
22	E2	6/5/2013	1500	2330	8.5	4	0	4	11	0	0
23	E2	7/24/2013	1100	1700	6.0	2	0	2	8	0	0
24	E2	9/1/2013	1200	0000	12.0	4	2	6	12	0	0
25	E2	1/23/2014	1930	2330	4.0	1	0	1	6	0	0
26	E2	2/14/2014	1500	2000	5.0	1	0	1	5	0	0
27	E2	3/12/2014	1200	1900	7.0	2	0	2	7	0	0
28	E2	5/8/2014	1400	1800	4.0	0	0	0	0	0	0
29	E2	5/28/2014	1600	2330	7.5	2	0	2	6	0	0
30	E2	6/1/2014	1100	1800	7.0	1	0	1	3	0	0
									8	0	0
1	N	8/4/2011	1500	1900	4.0	1	1	2	12	0	0
2	N	11/21/2011	2000	0200	6.0	1	1	2	8	0	0
3	N	11/16/2011	0900	1800	9.0	2	2	4	11	0	0
4	N	12/4/2011	1800	2230	4.5	1	1	2	11	0	0
5	N	3/20/2012	1800	2200	4.0	1	1	2	12	0	0
6	N	3/26/2012	1900	2200	3.0	0	1	1	8	0	0
7	N	4/2/2012	1200	1600	4.0	1	1	2	12	0	0

8	N	4/11/2012	1500	1900	4.0	1	2	3	18	0	0
9	N	5/1/2012	1500	1800	3.0	0	0	0	0	0	0
10	N	5/3/2012	2030	2330	3.0	0	1	1	8	0	0
11	N	5/19/2012	1900	2300	4.0	1	1	2	12	0	0
12	N	5/26/2012	0700	1200	5.0	2	1	3	14	0	0
13	N	6/1/2012	0900	1800	9.0	3	2	5	13	0	0
14	N	8/29/2012	1100	1500	4.0	0	0	0	0	0	0
15	N	9/3/2012	1100	2000	9.0	3	2	5	13	0	0
16	N	9/9/2012	1500	2230	7.5	1	3	4	13	0	0
17	N	9/11/2012	1930	2230	3.0	0	0	0	0	0	0
18	N	9/16/2012	1700	2000	3.0	0	1	1	8	0	0
19	N	9/20/2012	1700	2100	4.0	1	1	2	12	0	0
20	N	9/30/2012	2030	0200	5.5	1	1	2	9	0	0
21	N	10/1/2012	1500	1900	4.0	2	0	2	12	0	0
22	N	12/4/2012	1100	1800	7.0	3	2	5	17	0	0
23	N	4/20/2013	1200	2100	9.0	3	4	7	19	0	0
24	N	4/27/2013	1930	2330	4.0	2	1	3	18	0	0
25	N	5/1/2013	1730	2230	5.0	2	3	5	24	0	0
26	N	7/19/2013	1500	2200	7.0	3	2	5	17	0	0
27	N	9/5/2013	1200	1600	4.0	1	2	3	18	0	0
28	N	11/14/2013	1600	2200	6.0	1	3	4	16	0	0
29	N	12/9/2013	1100	1900	8.0	3	2	5	15	0	0
30	N	5/17/2014	1830	2230	4.0	2	1	3	18	0	0
									12	0	0
1	S	8/26/2011	1800	0000	6.0	6	5	11	44	1	4
2	S	11/1/2011	0900	1500	6.0	6	5	11	44	2	8
3	S	11/8/2011	0900	1400	5.0	6	5	11	53	1	5
4	S	12/1/2011	1200	1900	7.0	6	6	12	41	1	3
5	S	12/15/2011	1700	2200	5.0	3	3	6	29	0	0
6	S	12/29/2012	1900	0000	5.0	4	4	8	38	0	0
7	S	4/10/2012	0900	1930	10.5	12	8	20	46	2	5
8	S	4/28/2012	0800	1500	7.0	7	5	12	41	2	7
9	S	5/13/2012	1400	1900	5.0	6	2	8	38	0	0
10	S	5/30/2012	1830	2230	4.0	5	4	9	54	0	0
11	S	8/30/2012	1700	2200	5.0	5	5	10	48	1	5
12	S	9/5/2012	1600	2100	5.0	5	3	8	38	0	0
13	S	9/10/2012	1630	2330	7.0	5	5	10	34	2	7
14	S	10/4/2012	1800	0200	8.0	6	3	9	27	0	0
15	S	10/30/2012	1900	2330	4.5	4	2	6	32	1	5
16	S	12/8/2012	0900	2100	12.0	16	9	25	50	2	4
17	S	4/1/2013	0800	1400	6.0	4	4	8	32	0	0
18	S	5/4/2013	1500	1900	4.0	6	2	8	48	0	0

19	S	5/9/2013	1900	0000	5.0	8	5	13	62	1	5
20	S	5/30/2013	1900	0200	7.0	9	7	16	55	0	0
21	S	6/28/2013	1830	2230	4.0	7	3	10	60	1	6
22	S	6/30/2013	1200	2200	10.0	18	10	28	67	2	5
23	S	7/8/2013	1500	2000	5.0	9	5	14	67	0	0
24	S	8/15/2013	0400	1200	8.0	12	5	17	51	1	3
25	S	8/30/2013	0900	2200	13.0	23	9	32	59	1	2
26	S	9/19/2013	1700	0200	9.0	10	6	16	43	1	3
27	S	9/29/2013	1630	2230	6.0	11	6	17	68	0	0
28	S	10/1/2013	1500	2200	7.0	8	5	13	45	1	3
29	S	5/21/2014	1100	1900	8.0	12	4	16	48	1	3
									45	24	3

Appendix C – Container Data

These data are the number of containers on each of the observed IPI trains on routes E1 and S which is observed number of containers converted to TEU by multiplying it by two since each 40' container is the equivalent of two TEU's. This was done to determine an approximate average number of TEU's per IPI train. The average number of TEU was calculated at 420 TEU per train and shown at the bottom of the column.

The other portion of this spreadsheet shows the two recorded BIC numbers per train and their subsequent Track-Trace generated time on dock value. This is the time from container unloading until it is moving on the train. All of the time values were added and the average calculated. That result was 1695 minutes, or 28 hours and 25 minutes, and that is also shown at the bottom of the data.

Container Field Observation Data and Track-Trace Results

Date	EB or SB IPI Trains	Contain-er Count	TEU	Container Number	Time on Dock in Minutes	Container Number	Time on Dock in Minutes
8/9/2011	2	241	482	TCNU6155108	2125	TCLU8460667	1920
8/9/2011		223	446	UESU4224402	1990	SUDU8592712	1800
8/17/2011	1	247	494	FSZU7069688	659	HJCU3986512	592
9/9/2011	1	248	496	CBHU9032891	562	CBHU8799533	612
12/14/2011	2	210	420	HJCU4127834	1010	HASU4075177	1140
12/14/2011		224	448	HJCU4380832	875	SUDU7542538	840
12/16/2011	2	225	451	UETU5117938	629	OOLU7257488	750
12/16/2011		221	442	HASU4075541	548	SUDU6562936	466
3/23/2012	1	192	384	EISU3573808	436	EMCU6357458	556
3/30/2012	1	216	432	CMAU5969916	1680	BSIU9041758	1700
4/6/2012	3	210	420	CCLU7035607	3680	UNIU4023079	3256
4/6/2012		208	416	YMLU8175755	3575	TRLU7344047	3423
4/6/2012		198	396	TCLU8258411	3158	DFSU4029958	3126
4/9/2012	2	260	520	SENU5061771	458	DFSU4082135	524
4/9/2012		205	410	TGHU6674297	625	CAXU8207971	601
4/30/2012	2	214	428	FCIU8060522	1630	SUDU8748039	6727
4/30/2012		192	384	GVCU5302696	1524	MSKU5214874	1354
5/14/2012	1	204	408	TRHU2458291	857	SUDU8801772	715
9/7/2012	3	234	468	CLHU3885794	2980	OOLU5828232	2749
9/7/2012		228	456	NYKU3513069	2930	GESU6015321	2791
9/7/2012		236	472	OOLU5825568	2784	TCLU3426699	2854
9/25/2012	1	243	486	CMAU5175468	2527	CRXU9775255	3037
10/12/2012	1	185	370	NYKU3543171	2638	TRLU5421618	2531
12/15/2012	3	175	350	NYKU3511457	3125	MORU2147142	3002
12/15/2012		168	336	INKU6191056	2985	MORU1144817	3299
12/15/2012		203	405	DFSU4042292	2658	HTCU4006524	2969
4/6/2013	1	193	387	NYKU3364543	2340	HTCU8547126	2560

4/10/2013	1	215	430	TCNU6644834	3204	OOLU7668348	3890
5/18/2013	2	203	406	HJCU6034553	2690	EVGU2158744	3161
5/18/2013		104	208	EVGU3149587	2980	EVGU5263144	2999
5/20/2013	2	221	442	TRLU5606189	2354	TRLU5604978	2418
5/20/2013		153	306	TEXU7152046	2119	CMAU5471258	2008
7/23/2013	1	203	406	NYKU2633735	2348	TTNU5701547	2691
9/21/2013	2	241	482	NTKU2965092	2154	NYKU2898475	1980
9/21/2013		207	414	DVRU0626363	2270	CMAU5778611	2432
9/26/2013	1	236	472	OOLU8249635	458	EVGU4219587	469
12/14/2013	1	212	423	NYKU3313923	562	NYKU3323583	512
5/24/2014	2	104	208	CMAU9061269	3204	CMAU5771254	2998
5/24/2014		221	442	SCMU5342626	2990	SCMU4387777	3178
6/4/2014	1	153	306	NYKU5462198	635	EVGU5243888	740
8/26/2011	1	261	522	MSKU5429879	655	HJCU4286533	719
11/1/2011	2	203	406	CMAU5721874	820	CMAU5168471	692
11/1/2011		169	338	EVGU5429873	860	HASU3541129	814
11/8/2011	1	203	406	MSKU3224444	758	CMLU5473971	758
12/1/2011	1	249	498	NYKU2875491	456	CMAU5364877	502
4/10/2012	2	179	358	EMCU3654785	754	NYKU4653297	921
4/10/2012		203	406	DRYU9132016	923	TCNU5243981	854
4/28/2012	2	239	478	SCMU4007365	829	HJCU5146399	867
4/28/2012		203	406	TCLU5282111	842	EVGU4257788	791
8/30/2012	1	253	506	MSKU4739217	799	MSKU4699756	783
9/10/2012	2	234	468	CMAU5148752	956	CMAU5107845	925
9/10/2012		221	442	NYKU4128754	1010	NYKU4258887	1118
10/30/2012	1	214	428	MAGU5473555	1063	TCLU5687949	1191
12/8/2012	2	203	406	NYKU3548715	1117	NYKU3526999	1200
12/8/2012		189	378	EMCU3612547	1171	YMLU7842959	1110
5/9/2013	1	201	402	INBU5439417	1225	TGHU9345171	1341
6/28/2013	1	217	434	FSCU4265471	1279	MAGU8110500	1419
6/30/2013	2	201	402	CMAU4653985	1333	NYKU6987845	1369
6/30/2012		200	400	NYKU5458883	1387	MSKU5126125	1401
8/15/2013	1	204	408	YMLU8157387	1440	FSCU4609373	1512
8/30/2013	1	221	442	YMLU8124268	1494	YMLU8148126	1456
9/19/2013	1	254	508	CMAU4256871	1548	CMAU4255627	1600
10/1/2013	1	234	468	FSCU3659918	1602	NYKU5498752	1580
5/21/2014	1	209	418	CAIU8848725	1656	GATU4099708	1690
	64		420		104932		111983
						1695	
						28HR 25MIN	

Appendix D – Container Distribution

Table 6 shows container data in TEU and how containers are moved through the Puget Sound intermodal port and rail system according to the combined inputs of port and rail spokespersons and author observations. Columns 1 and 2 are the months and combined total loaded inbound IPI containers handled by the two ports, Seattle and Tacoma. Columns 3 through 7 show the breakdown by type and railroad of the monthly total. For example June of 2004 shows a total of 105,192 TEU of inbound loaded IPI containers. 10% were distributed by truck to local destinations within a few hundred miles of the port at the most. The remaining 90% were split into 30% domestic and 60% IPI, with each of those being handled by the BNSF and UP in a 2 to 1 ratio, respectively. Columns 8 and 9 involve calculating how many IPI trains would be needed, based on the 420 TEU average per train field observations provided, to ship out the value shown. Staying with the June 2004 example, the BNSF needs to carry 63115.9 TEU during the month. Highlighted column 9 values indicate months where the needed number of IPI trains exceeded the observed TPD value for that route.

(63115.9 TEU / 30 days) = 2103.86 TEU per day

2103.86 TEU per day/ 420 TEU per train = 5.0 trains for that day

1	2	3	4	5	6	7	8	9
Table 6		**Local**	**Domestic**		**IPI**		**UP TPD**	**BNSF TPD**
		10%	**30 Percent**		**60 Percent**			
	Total TEU		**1/3 UP**	**2/3 BNSF**	**1/3 UP**	**2/3 BNSF**	**(2-3)**	**(4-6)**
2004 Jan	83,722	8372.2	8363.8	16752.8	16727.7	50233.9	1.3	4.0
2004 Feb	79,565	7956.5	7948.5	15921.0	15897.1	47739.7	1.3	3.8
2004 Mar	101,878	10187.8	10177.6	20385.8	20355.2	61127.5	1.6	4.9
2004 Apr	107,210	10721.0	10710.3	21452.7	21420.6	64326.7	1.7	5.1
2004May	93,008	9300.8	9291.5	18610.9	18583.0	55805.5	1.5	4.4
2004 Jun	105,192	10519.2	10508.7	21048.9	21017.4	63115.9	1.7	5.0
2004 Jul	103,507	10350.7	10340.3	20711.8	20680.7	62104.9	1.6	4.9
2004 Aug	99,399	9939.9	9930.0	19889.7	19859.9	59640.1	1.6	4.7
2004 Sep	131,077	13107.7	13094.6	26228.5	26189.2	78646.9	2.1	6.2
2004 Oct	126,251	12625.1	12612.5	25262.8	25224.9	75751.3	2.0	6.0
2004 Nov	131,889	13188.9	13175.7	26391.0	26351.4	79134.1	2.1	6.3
2004 Dec	138,548	13854.8	13840.9	27723.5	27681.9	83129.5	2.2	6.6
2005 Jan	120,929	12092.9	12080.8	24197.9	24161.6	72558.1	1.9	5.8
2005 Feb	120,528	12052.8	12040.7	24117.7	24081.5	72317.5	1.9	5.7
2005 Mar	121,262	12126.2	12114.1	24264.5	24228.1	72757.9	1.9	5.8
2005 Apr	117,711	11771.1	11759.3	23554.0	23518.7	70627.3	1.9	5.6
2005May	117,003	11700.3	11688.6	23412.3	23377.2	70202.5	1.9	5.6
2005 Jun	145,178	14517.8	14503.3	29050.1	29006.6	87107.5	2.3	6.9
2005 Jul	131,789	13178.9	13165.7	26371.0	26331.4	79074.1	2.1	6.3
2005 Aug	149,298	14929.8	14914.9	29874.5	29829.7	89579.5	2.4	7.1
2005 Sep	162,432	16243.2	16227.0	32502.6	32453.9	97459.9	2.6	7.7
2005 Oct	150,859	15085.9	15070.8	30186.9	30141.6	90516.1	2.4	7.2
2005 Nov	125,998	12599.8	12587.2	25212.2	25174.4	75599.5	2.0	6.0

2005 Dec	128,647	12864.7	12851.8	25742.3	25703.7	77188.9	2.0	6.1
2006 Jan	117,065	11706.5	11694.8	23424.7	23389.6	70239.7	1.9	5.6
2006 Feb	111,075	11107.5	11096.4	22226.1	22192.8	66645.7	1.8	5.3
2006 Mar	129,979	12997.9	12984.9	26008.8	25969.8	77988.1	2.1	6.2
2006 Apr	125,336	12533.6	12521.1	25079.7	25042.1	75202.3	2.0	6.0
2006May	119,630	11963.0	11951.0	23938.0	23902.1	71778.7	1.9	5.7
2006 Jun	134,008	13400.8	13387.4	26815.0	26774.8	80405.5	2.1	6.4
2006 Jul	123,861	12386.1	12373.7	24784.6	24747.4	74317.3	2.0	5.9
2006 Aug	135,121	13512.1	13498.6	27037.7	26997.2	81073.3	2.1	6.4
2006 Sep	147,352	14735.2	14720.5	29485.1	29440.9	88411.9	2.3	7.0
2006 Oct	136,758	13675.8	13662.1	27365.3	27324.2	82055.5	2.2	6.5
2006 Nov	140,633	14063.3	14049.2	28140.7	28098.5	84380.5	2.2	6.7
2006 Dec	124,359	12435.9	12423.5	24884.2	24846.9	74616.1	2.0	5.9
2007 Jan	114,416	11441.6	11430.2	22894.6	22860.3	68650.3	1.8	5.4
2007 Feb	121,331	12133.1	12121.0	24278.3	24241.9	72799.3	1.9	5.8
2007 Mar	117,646	11764.6	11752.8	23541.0	23505.7	70588.3	1.9	5.6
2007 Apr	117,712	11771.2	11759.4	23554.2	23518.9	70627.9	1.9	5.6
2007May	128,215	12821.5	12808.7	25655.8	25617.4	76929.7	2.0	6.1
2007 Jun	138,096	13809.6	13795.8	27633.0	27591.6	82858.3	2.2	6.6
2007 Jul	129,897	12989.7	12976.7	25992.4	25953.4	77938.9	2.1	6.2
2007 Aug	128,916	12891.6	12878.7	25796.1	25757.4	77350.3	2.0	6.1
2007 Sep	140,503	14050.3	14036.2	28114.7	28072.5	84302.5	2.2	6.7
2007 Oct	128,185	12818.5	12805.7	25649.8	25611.4	76911.7	2.0	6.1
2007 Nov	120,058	12005.8	11993.8	24023.6	23987.6	72035.5	1.9	5.7
2007 Dec	119,510	11951.0	11939.0	23914.0	23878.1	71706.7	1.9	5.7
2008 Jan	102,627	10262.7	10252.4	20535.7	20504.9	61576.9	1.6	4.9
2008 Feb	122,481	12248.1	12235.9	24508.4	24471.7	73489.3	1.9	5.8
2008 Mar	105,893	10589.3	10578.7	21189.2	21157.4	63536.5	1.7	5.0
2008 Apr	111,456	11145.6	11134.5	22302.3	22268.9	66874.3	1.8	5.3
2008May	111,350	11135.0	11123.9	22281.1	22247.7	66810.7	1.8	5.3
2008 Jun	121,058	12105.8	12093.7	24223.7	24187.4	72635.5	1.9	5.8
2008 Jul	106,163	10616.3	10605.7	21243.2	21211.4	63698.5	1.7	5.1
2008 Aug	105,032	10503.2	10492.7	21016.9	20985.4	63019.9	1.7	5.0
2008 Sep	121,842	12184.2	12172.0	24380.6	24344.0	73105.9	1.9	5.8
2008 Oct	112,795	11279.5	11268.2	22570.3	22536.4	67677.7	1.8	5.4
2008 Nov	97,776	9777.6	9767.8	19565.0	19535.6	58666.3	1.6	4.7
2008 Dec	94,796	9479.6	9470.1	18968.7	18940.2	56878.3	1.5	4.5
2009 Jan	90,980	9098.0	9088.9	18205.1	18177.8	54588.7	1.4	4.3
2009 Feb	73,908	7390.8	7383.4	14789.0	14766.8	44345.5	1.2	3.5
2009 Mar	83,258	8325.8	8317.5	16659.9	16634.9	49955.5	1.3	4.0
2009 Apr	72,792	7279.2	7271.9	14565.7	14543.8	43675.9	1.2	3.5
2009May	83,121	8312.1	8303.8	16632.5	16607.6	49873.3	1.3	4.0
2009 Jun	89,039	8903.9	8895.0	17816.7	17790.0	53424.1	1.4	4.2

2009 Jul	90,304	9030.4	9021.4	18069.8	18042.7	54183.1	1.4	4.3
2009 Aug	94,529	9452.9	9443.4	18915.3	18886.9	56718.1	1.5	4.5
2009 Sep	112,363	11236.3	11225.1	22483.8	22450.1	67418.5	1.8	5.4
2009 Oct	102,768	10276.8	10266.5	20563.9	20533.0	61661.5	1.6	4.9
2009 Nov	97,903	9790.3	9780.5	19590.4	19561.0	58742.5	1.6	4.7
2009 Dec	93,418	9341.8	9332.5	18692.9	18664.9	56051.5	1.5	4.4
2010 Jan	100,641	10064.1	10054.0	20138.3	20108.1	60385.3	1.6	4.8
2010 Feb	91,242	9124.2	9115.1	18257.5	18230.2	54745.9	1.4	4.3
2010 Mar	94,755	9475.5	9466.0	18960.5	18932.0	56853.7	1.5	4.5
2010 Apr	95,143	9514.3	9504.8	19038.1	19009.6	57086.5	1.5	4.5
2010May	125,575	12557.5	12544.9	25127.6	25089.9	75345.7	2.0	6.0
2010 Jun	140,979	14097.9	14083.8	28209.9	28167.6	84588.1	2.2	6.7
2010 Jul	132,268	13226.8	13213.6	26466.8	26427.1	79361.5	2.1	6.3
2010 Aug	128,659	12865.9	12853.0	25744.7	25706.1	77196.1	2.0	6.1
2010 Sep	128,258	12825.8	12813.0	25664.4	25625.9	76955.5	2.0	6.1
2010 Oct	122,079	12207.9	12195.7	24428.0	24391.4	73248.1	1.9	5.8
2010 Nov	109,392	10939.2	10928.3	21889.3	21856.5	65635.9	1.7	5.2
2010 Dec	104,829	10482.9	10472.4	20976.3	20944.8	62898.1	1.7	5.0
2011 Jan	110,986	11098.6	11087.5	22208.3	22175.0	66592.3	1.8	5.3
2011 Feb	92,468	9246.8	9237.6	18502.8	18475.1	55481.5	1.5	4.4
2011 Mar	97,457	9745.7	9736.0	19501.1	19471.9	58474.9	1.5	4.6
2011 Apr	100,082	10008.2	9998.2	20026.4	19996.4	60049.9	1.6	4.8
2011May	95,782	9578.2	9568.6	19166.0	19137.2	57469.9	1.5	4.6
2011 Jun	102,184	10218.4	10208.2	20447.0	20416.4	61311.1	1.6	4.9
2011 Jul	107,846	10784.6	10773.8	21580.0	21547.6	64708.3	1.7	5.1
2011 Aug	106,902	10690.2	10679.5	21391.1	21359.0	64141.9	1.7	5.1
2011 Sep	110,374	11037.4	11026.4	22085.8	22052.7	66225.1	1.8	5.3
2011 Oct	107,624	10762.4	10751.6	21535.6	21503.3	64575.1	1.7	5.1
2011 Nov	117,624	11762.4	11750.6	23536.6	23501.3	70575.1	1.9	5.6
2011 Dec	99,306	9930.6	9920.7	19871.1	19841.3	59584.3	1.6	4.7
2012 Jan	106,605	10660.5	10649.8	21331.7	21299.7	63963.7	1.7	5.1
2012 Feb	82,231	8223.1	8214.9	16454.4	16429.8	49339.3	1.3	3.9
2012 Mar	105,945	10594.5	10583.9	21199.6	21167.8	63567.7	1.7	5.0
2012 Apr	108,047	10804.7	10793.9	21620.2	21587.8	64828.9	1.7	5.1
2012May	111,765	11176.5	11165.3	22364.2	22330.6	67059.7	1.8	5.3
2012 Jun	125,193	12519.3	12506.8	25051.1	25013.6	75116.5	2.0	6.0
2012 Jul	118,168	11816.8	11805.0	23645.4	23610.0	70901.5	1.9	5.6
2012 Aug	112,319	11231.9	11220.7	22475.0	22441.3	67392.1	1.8	5.3
2012 Sep	125,272	12527.2	12514.7	25066.9	25029.3	75163.9	2.0	6.0
2012 Oct	123,574	12357.4	12345.0	24727.2	24690.1	74145.1	2.0	5.9
2012 Nov	105,936	10593.6	10583.0	21197.8	21166.0	63562.3	1.7	5.0
2012 Dec	114,466	11446.6	11435.2	22904.6	22870.3	68680.3	1.8	5.5
2013 Jan	114,667	11466.7	11455.2	22944.9	22910.5	68800.9	1.8	5.5

2013 Feb	106,613	10661.3	10650.6	21333.3	21301.3	63968.5	1.7	5.1
2013 Mar	95,580	9558.0	9548.4	19125.6	19096.9	57348.7	1.5	4.6
2013 Apr	99,760	9976.0	9966.0	19962.0	19932.0	59856.7	1.6	4.8
2013May	99,221	9922.1	9912.2	19854.1	19824.4	59533.3	1.6	4.7
2013 Jun	114,630	11463.0	11451.5	22937.5	22903.1	68778.7	1.8	5.5
2013 Jul	103,677	10367.7	10357.3	20745.8	20714.7	62206.9	1.6	4.9
2013 Aug	101,981	10198.1	10187.9	20406.4	20375.8	61189.3	1.6	4.9
2013 Sep	116,475	11647.5	11635.9	23306.6	23271.7	69885.7	1.8	5.5
2013 Oct	94,848	9484.8	9475.3	18979.1	18950.6	56909.5	1.5	4.5
2013 Nov	97,228	9722.8	9713.1	19455.3	19426.2	58337.5	1.5	4.6
2013 Dec	94,214	9421.4	9412.0	18852.2	18824.0	56529.1	1.5	4.5
2014 Jan	101,074	10107.4	10097.3	20224.9	20194.6	60645.1	1.6	4.8
2014 Feb	88,785	8878.5	8869.6	17765.9	17739.2	53271.7	1.4	4.2
2014 Mar	92,975	9297.5	9288.2	18604.3	18576.4	55785.7	1.5	4.4
2014 Apr	100,143	10014.3	10004.3	20038.6	20008.6	60086.5	1.6	4.8
2014May	108,901	10890.1	10879.2	21791.1	21758.4	65341.3	1.7	5.2
2014 Jun	111,836	11183.6	11172.4	22378.4	22344.8	67102.3	1.8	5.3
2014 Jul	92,292	9229.2	9220.0	18467.6	18439.9	55375.9	1.5	4.4
2014 Aug	86,732	8673.2	8664.5	17355.1	17329.1	52039.9	1.4	4.1
2014 Sep	124,626	12462.6	12450.1	24937.7	24900.3	74776.3	2.0	5.9
2014 Oct	110,566	11056.6	11045.5	22124.3	22091.1	66340.3	1.8	5.3
2014 Nov	84,953	8495.3	8486.8	16999.1	16973.6	50972.5	1.3	4.0
2014 Dec	114,482	11448.2	11436.8	22907.8	22873.5	68689.9	1.8	5.5
2015 Jan	81,587	8158.7	8150.5	16325.6	16301.1	48952.9	1.3	3.9
2015 Feb	84,750	8475.0	8466.5	16958.5	16933.1	50850.7	1.3	4.0
2015 Mar	150,406	15040.6	15025.6	30096.2	30051.1	90244.3	2.4	7.2
2015 Apr	97,502	9750.2	9740.4	19510.2	19480.9	58501.9	1.5	4.6
2015May	106,032	10603.2	10592.6	21217.0	21185.2	63619.9	1.7	5.0
2015 Jun	123,747	12374.7	12362.3	24761.8	24724.7	74248.9	2.0	5.9
2015 Jul	99,949	9994.9	9984.9	19999.8	19969.8	59970.1	1.6	4.8
2015 Aug	113,972	11397.2	11385.8	22805.8	22771.6	68383.9	1.8	5.4
2015 Sep	132,790	13279.0	13265.7	26571.3	26531.4	79674.7	2.1	6.3

Data values in column two from POS and POT websites prior to the formation of the Northwest Seaport Alliance and combined to calculate total.