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PANAMA CANAL EXPANSION IMPACTS ON U.S. EAST COAST PORTS

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ABSTRACT

The Panama Canal serves as the passageway that connects the Atlantic Ocean with the Pacific Ocean which reduces vessel transit time by allowing vessels routed to the U.S. East Coast to avoid sailing around South America. In response to larger vessel sizes and the global shipping industry, the Panama Canal began an expansion project in late 2007 that was completed in May of 2016. The changes to the Panama Canal are impacting the global shipping industry, shipping traffic and individual ports.

In anticipation of heightened shipping traffic, U.S. East Coast Ports heavily invested and upgraded their port capabilities. The four ports of Boston, New York-New Jersey, Philadelphia, and Baltimore are examined by analyzing their current capabilities and port improvement initiatives. Recommendations are then made to the individual ports and two strategies are discussed which can be adopted by any of the ports along the East Coast. The study concludes by looking at the relevance of the expansion of the Panama Canal and port improvements in relation to the future of the global shipping industry and increasing vessel sizes.

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Chapter 1

INTRODUCTION

As the passageway that links the Atlantic Ocean with the Pacific Ocean, the Panama Canal is an important component of international trade and maritime transportation. The Panama Canal is strategically a part of over 140 maritime routes. The Canal reduces both transit time and risk of shipments by allowing vessels routed to the U.S. East Coast to avoid sailing around South America. In late 2007, the Panama Canal began an expansion project that continued until May of 2016. The expanded canal added a wider lane of locks to allow larger vessels to pass through. The changes to the Panama Canal are causing several impacts across the international shipping industry and global shipping traffic. As changes occurred to the Panama Canal to accommodate larger vessels, individual ports also needed to be updated. In the United States, major ports on the East Coast expect heightened shipping traffic but are not yet prepared to handle the changes in shipping traffic or vessel size.

This thesis will examine the impacts of the Panama Canal expansion on specific U.S. East Coast ports. Ports will be examined based upon their current conditions and capacities. Aspects that will be discussed are channel depth at the individual ports as well as berth depth, inland connections at the ports, and port operations. Through the examination of these ports, both positive and negative impacts will be highlighted as well as the best course of action that each port should follow in order to meet the new demands of international maritime trade.

With the purpose of providing better knowledge and understanding of the Panama Canal, this study provides a high-level view of the history of the Canal and its capabilities. After

describing the formation of the Panama Canal and the respective countries that held control of the Canal, this study looks at the capabilities of the Canal before the expansion was complete. Then the study explains the reasons behind the expansion project and the financial investment into the new Panama Canal. The new capabilities of the Canal, as of the completion of the Canal in 2016, are described and detailed through figures and compared to the Canal pre-expansion. The second half of the study connects the Panama Canal to U.S. Ports and discusses the perceived impacts of the new canal on East Coast ports. Then the individual ports of Boston, New York-New Jersey, Philadelphia, and Baltimore are examined and specific improvement strategies are proposed for each port based upon the goal to remain competitive in the international shipping market. After the individual port recommendations there are additional strategies proposed that explore opportunities beyond investments and improvements. The global shipping market is continuously changing and the future of the Panama Canal in relation to the shipping market and vessel growth is addressed in the final part of this study.

Chapter 2

Panama Canal Historical Background

The Panama Canal has been regarded as a strategic part of international maritime trade since its origins in 1914. However, the usage of this piece of land begins before the construction of the Canal. The United States gained the right to construct and operate across the Isthmus of Panama as a result of the Treaty of 1846. Over the succeeding years the Panama Railroad opened and operated. In 1869 the French successfully opened the Suez Canal which led them to also work on the Panama Canal. There were several problems with their construction and the United States took control of the building process in 1904 and completed the Canal in 1914.

The organization, construction, and operations of the Panama Canal required several forms of law and authority as the Panama Canal developed. The Panama Canal Act of 1912 was established as, "An act to provide for the opening, maintenance, protection, and operation of the Panama Canal and the sanitation and government of the Canal Zone." (Smith 1927). This act defined the territory over which the United States could build and operate. Through this act, the Canal Zone and the Panama Canal became the official titles used for the area. Private titles ended as the U.S. President was given authority to determine the land in the Canal Zone as necessary for canal purposes or not. The U.S. President was also given authority to establish and change the tolls for usage of the Canal.

In 1914, U.S. President Wilson issued an order to "Establish a Permanent Organization for the Panama Canal". Several departments were established to control the Canal. In August of 1914, the canal was officially opened as the first steamship passed through the Canal. See Figure 1 for a visual representation of the Panama Canal. This description is to understand the process

that occurs as the canal is operated: (Smith, *The Panama Canal; its History, Activities and Organization*)

> The vessel approaches the canal entrance between the break-waters in Limon Bay, an arm of the Caribbean Sea, and heads due south through a channel dredged for some two-thirds of its length in the bay and for the rest cut through the land. The channel…leads directly to Gatun Locks…The total lift of these locks from sea-level to lake level averages 85 feet…The vessel upon leaving Gatun locks enters Gatun Lake, the largest artificial lake in the world. The channel in Gatun Lake varies in width…to Gaillard Cut….Upon entering Gaillard Cut which carries the canal through the continental divide, the channel from this point leads past Balboa into the Bay of Panama" (Smith, 1927).

After World War II, relations between the U.S. and Panama became tense as Panama began to feel that the Canal Zone was rightfully theirs. In 1977, U.S. President Carter signed the Torrijos-Carter Treaty which gave Panama free control of the canal as long as the canal remained in a state of permanent neutrality. Panama gained complete control in 1999 and the Panama Canal Authority (ACP) gained responsibility for full control and direction of the waterway. Today, the Panama Canal Authority continues to operate the Panama Canal.

Canal Capabilities

After the construction was completed in 1914, the Panama Canal infrastructure included two sets of locks which essentially allowed two lanes of traffic. One set was located at the Atlantic end of the canal and the other set was at the Pacific end. The existing locks at that time, 33.5 meters or

110 foot wide lock chambers, allowed the passage of vessels carrying up to 5,000 TEUs. Vessels that carry the maximum load that can pass through the Panama Canal are known as Panamax vessels. As a result of its strategic location, the Panama Canal is a vital part of global trade. In 1966 the transportation traffic greatly increased and lines to enter the canal became lengthy prompting the ACP to install lighting to facilitate the overnight traffic. By 2005, five percent of international shipping traffic passed through the Panama Canal and nearly seventy percent of all cargo to and from the U.S. crossed the Panama Canal (PBS, 2017). American ships traffic the canal the most, followed by those from China, Chile, Japan, Colombia and South Korea (Nix, 2014).

Causes for expansion

Prior to 1999, when the Canal was under U.S. control, it was managed similar to a utility with the purpose to break-even in regards to tolls and fees. However, under the ACP the Panama Canal evolved into a new entity with the purpose to be a profitable and competitive enterprise. Beginning in 1998, the Canal administration began to conduct studies and investigations with the long-term perspective to determine future requirements of the Canal. Over the next few years, these studies revealed that there was an increasing and profitable maritime transport global demand that can provide more traffic through the Panama Canal. However, the studies also determined that a large part of this growing demand originates from vessels that did not fit through the Canal due to their dimensions (ACP, 2006). The larger vessels which have the capacity to carry over 5,000 TEUs, are known as Post-Panamax vessels and cannot fit through the Panama Canal. These vessels are advantageous to shippers as they lend to economies of scale. Furthermore, according to the ACP, these studies “indicated the necessity to enhance

Canal capacity to: (1) handle the increasing cargo volumes that are anticipated to use the maritime route through Panama; and, (2) allow the transit of larger vessels and thus take advantage of, to Panama's benefit, the economies of scale, productivity increases and efficiencies that handling these vessels entails." (ACP, 2006).

The Suez Canal is one of the Panama Canal's main competitors as it also provides a route from Asia to the U.S. East Coast ports. The Suez Canal had the capabilities to allow passage of Post-Panamax vessels. This was a direct threat to the Panama Canal's maritime market demand share and usage rates as shippers looked to transition to the larger vessels. The sailing time required to pass through the Panama Canal is shorter than that of the Suez Canal, however the ability to route Post-Panamax vessels through the Suez Canal offsets that advantage. At the time that the expansion was proposed, twenty-seven percent of the world's capacity of containerized maritime shipping were vessels too large to fit through the Canal (Drewry, 2005). This Post-Panamax capacity was also projected to increase by 2011 to thirty-seven percent as larger vessels would enter the global containership fleet. When examining the different markets, the containerized cargo demand for the Canal is projected to increase at an average annual rate of 5.6 percent starting in 2005 until 2025 (ACP, 2006). Other segments including vehicle carriers, cruise ships, and dry bulk were also expected to increase in volume demand through the Canal.

Based upon the operational times and cycles of the existing locks of 2006, the Panama Canal was projected to reach maximum capacity between 2009 and 2012. Therefore, even though the demand was projected to rise for usage of the Panama Canal, it would not be able to accommodate or handle the increase of vessels. This would cause the Canal's growth to plateau and rely on toll increases for increasing revenues instead of capturing more shipping volumes.

The totality of these factors led to the 2006 proposal to expand and improve the Panama Canal. If the Canal wanted to remain competitive in the maritime industry, it was imperative that changes be made. In April 2006 an expansion was proposed and by the end of October 2006 the expansion of the Panama Canal, which totaled U.S. $5.2 billion, was approved in a national referendum.

Expansion Program

Construction to expand the Panama Canal began in September 2007. There were four main components to the expansion program; Post-Panamax locks, Pacific Access Channel excavation, improvements to navigation channels, and improvements to water supply. Refer to Figure 1 for a visual depiction of the Panama Canal and each of the components of the expansion program. The first day of commercial operation after the expansion program was completed occurred on June 26th 2016.

The Post-Panamax locks, also known as the third set of locks or new locks, will be constructed on the Atlantic and Pacific entrances to the Canal. This is the largest and most comprehensive project of the expansion program (ACP, 2013). The new locks will allow the passage of Neo-Panamax vessels. Neo-Panamax vessels are those which can pass through the new Panama Canal and have the capacity to carry up to 13,000 TEUs. These vessels are equivalent to the length of four U.S. football fields. Neo-Panamax vessels comprise sixteen percent of the global container fleet but carry forty-five percent of container cargo and therefore it is important for the Panama Canal to be able to accommodate these vessels. Refer to Figure 2 for a visual comparison of the existing locks and the third set of locks. Different from the other two sets of locks, the third set of locks will operate with a lateral system which assists the water-

saving basins. The third set of locks are a key component for Panama to remain competitive in the maritime shipping market. The new locks will include rolling gates which increases the capacity and flexibility of operations and requires shorter maintenance times (ACP, 2013). Refer to Table 1 for a comparison between the capabilities of the previous locks of the Panama Canal and the new set of locks. Prior to expansion, vessels that could not fit through the locks were often referenced using the term Post-Panamax and vessels that fit within the locks were called Panamax. The term Post-Panamax is still utilized after the expansion program to refer to the vessels that are still too large to fit through the new locks. As described above, Neo-Panamax vessels are those which can fit through the third set of locks after the expansion program.

Table 1: Panama Canal Infrastructure

	Previous Locks: Panamax Vessels	Post Expansion New Locks: Neo-Panamax Vessels
Maximum capacity of transmitting vessels	4,400-5,000 TEUs	12,000-13,000 TEUs
Vessel draft	12.4 m	15.2 m
Operating water depth	12.8m	18.3m
Lock chambers	304.8m long	427m long
	33.5 wide	55m wide
Length of maximum vessel	294m	366m

Source: Panama Canal Authority

The other three components of the Expansion Program are projects that facilitate and support the third set of locks. The Pacific Access Channel was created to link the third set of

locks on the Pacific side to the Culebra Cut. This occurred through different phases of dry excavation of material. A dam was also built to separate the waters of Miraflores Lake from the waters of the new Pacific Access Channel.

Improvements to navigation channels occurred by dredging both entrances on the Pacific and Atlantic Oceans, the Culebra Cut, and the Gatun Lake. Dredging was necessary in order to permit Neo-Panamax vessels to safely pass through the Canal. The navigation channel of Culebra Cut was deepened while Gatun Lake was both deepened and widened. Additional work was carried out on the Gatun Lake in order to improve the Canal's water supply.

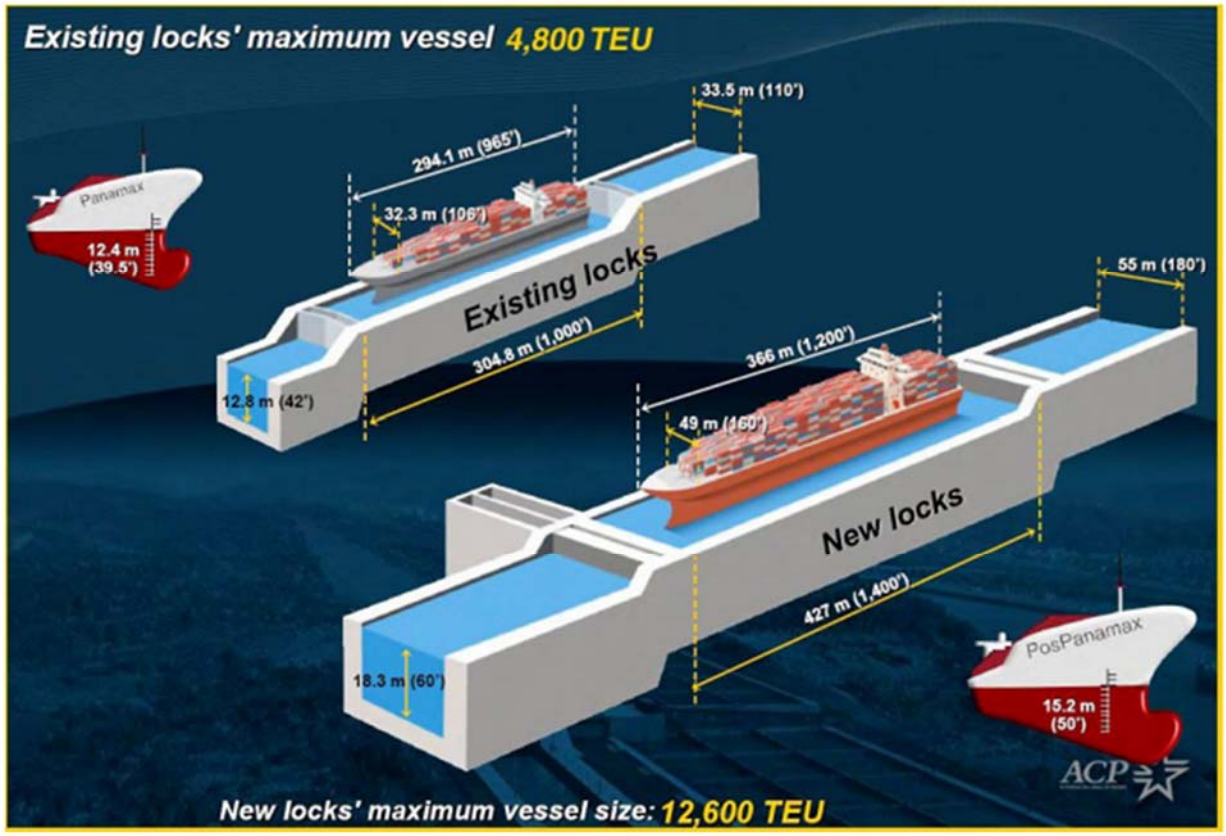
Improvements to water supply which occurred through the Expansion Program increased the water storage capacity of Gatun Lake. This rose the maximum operating level of the lake to help facilitate an additional 1,100 transits per year (ACP, 2013). This occurred through altering structures in both the Gatun and Pedro Miguel locks as all the Gatun spillway gates were extended and two additional gates were built.

Figure 1: Panama Canal Aerial View with Expansion Changes

1 &2	Pacific Access Channel and Improvements to navigation channels
3	Post-Panamax Locks
4	Improvements to water supply at Gatun Lake

Source: Panama Canal Authority

Figure 2: Comparison of Existing locks and Third Set of Locks



Source: Panama Canal Authority, Feb 2011

Chapter 3

Anticipated Impacts of the New Panama Canal

U.S. Ports, the Panama Canal, and Trade Route decisions

Several of the major U.S. ports are located on either the West or East Coast. With three out of the top five waterborne trading partners for the U.S. being the Asian economies of China, Japan and South Korea, the traffic of the U.S. ports are intertwined with the Panama Canal (DOT, 2013).

Imports that arrive from East Asia are routed to the U.S. East Coast through one of three ways; around the tip of South America, through the Panama Canal, or through the Suez Canal. Although vessels can sail around the tip of South America, this route has the longest transit time and involves higher risks and costs. As a result, since its inauguration in 1914, the Panama Canal has provided a strategically important trade route for vessels to reach the East Coast and decrease transit times. The Panama Canal is an important part of the international trade between East Asia and the U.S. as evidenced by the thirty-nine percent of all goods routed between these two regions passing through the Panama Canal (Webster, 2015). However, as vessel capacities rose and could not pass through the Panama Canal, many vessels were routed to the U.S. West Coast ports (USWC) and transported through intermodal to the East Coast instead of direct transportation by way of U.S. East Coast ports (USEC). Refer to Figure 3 for a map of the major USWC ports, USEC ports examined in this study, and the Panama Canal.

Since the approval of the expansion program for the Panama Canal, there has been ample discussion surrounding the possible demand shift from USWC to USEC resulting from the opportunity for Neo-Panamax vessels to pass through the Panama Canal's third set of locks.

Vessels traveling to the USEC by passing through the Panama Canal, instead of intermodal transportation from USWC, cut transit times by five days and reduce costs. Ship operators select trade routes based upon the factors of cost, time and capacity (Webster, 2015). Since shipping through the Panama Canal costs less compared to routing to the West Coast and combining with intermodal (Webster, 2015), this presents an opportunity to reduce both shipment and overall supply chain costs by sending vessels through the Panama Canal. Refer to Table 2 for a direct comparison of trade route costs. With these considerations, the predicted shift from USWC to USEC is based primarily on the shift of intermodal freight and it is predicted that between twenty and twenty-five percent of West Coast freight volumes could be routed to the expanded Panama Canal (Webster, 2015).

Table 2: Comparative times and costs for trade routes

Route	Transit Time (Days)	Export Costs per TEU	Estimate Transit Costs per TEU	Intermodal (Rail)	Total Cost (per TEU)
Shanghai to West Coast port and Rail to New York	19-22	$867	$840	$2,800	$4,500
Shanghai to New York via Panama Canal	25-26	$867	$2,100	N/A	$2,967

Source: Lawrence, 2016

However, there are other influences besides cost that heavily impact international trade dynamics such as wait times for passage through the Panama Canal, repeated labor issues and congestion at USWC ports, sustained low energy prices in North America and higher labor costs

causing a shift in manufacturing away from East Asia (Webster, 2015). The Suez Canal is an alternative shipping route that poses a threat to Panama Canal usage since it can also accommodate Neo-Panamax vessels as well as vessels in the market that are already larger than the Neo-Panamax. There are currently vessels in the shipping market, Super-Post-Panamax, that can carry TEU volumes beyond the capabilities of the new Panama Canal. However, the roundtrip transit time for a vessel through the Suez Canal is longer than through the Panama Canal. For example, it takes seventy-seven days roundtrip from Shanghai to New York through the Suez Canal versus fifty-six days through the Panama Canal (Webster, 2015).

The USWC will continue to be a major player and there won't be a complete shift of USWC demand to USEC since Super-Post-Panamax vessels cannot fit through the Panama Canal. Probably resulting from these exterior influences on container traffic, other predictions have indicated lower shifts in demand. It was estimated ten percent of West Coast freight will be diverted through the Panama Canal by 2020 (Boston Consulting Group, 2015). Ten percent of freight represents about forty percent of containers flowing through the U.S. but this prediction is still conservative compared to some of the others. David Egan of industrial real estate brokerage CBRE Inc. predicts that changes will be minor and gradual over time since shipping traffic has been moving to the USEC for some time in order to mitigate the risks of the labor strikes at the USWC ports (Chao, 2016). The immediate impact of the expanded Panama Canal may not be as significant as originally predicted but the increased throughput and routing opportunities created by the expanded canal will be advantageous for the future of maritime shipping (Gro intelligence, 2016). An example of routing opportunities is illustrated by the potential for USEC ports to expand their inland market share. Due to the larger vessels and lower cost, it may be possible to ship to the USEC and then move further west through intermodal. This gives USEC

ports the opportunity to gain inland market share and may cause the equilibrium cost of shipping to the middle regions of the country to move east (Ross, 2016).

A year after the expanded Panama Canal was opened, the shift in shipping traffic still remains uncertain. However, the larger question that remains pertinent to the U.S. is concerning the capabilities of USEC ports. Even though the extent of the demand shift from USWC to USEC is uncertain, any shift in shipping traffic can only be realized if the USEC ports are able to accommodate the larger vessels. This question will be answered through examining the capabilities of the USEC ports, improvement projects that occurred or are currently in place, and determining strategies for the USEC ports.

Figure 3: USWC and USEC Ports

Chapter 4

USEC Port Preparations

USEC Port Overview

East Coast ports will need infrastructure upgrades in order to accommodate the larger vessels that can now pass through the Panama Canal. Baltimore was one of the only initial East Coast ports that could handle the Neo-Panamax vessels. Other USEC ports such as New York-New Jersey (NY-NJ) need to dredge to accommodate larger vessels. The Neo-Panamax vessels already transport forty-five percent of U.S. container shipments and it is predicted that by 2030 the larger vessels will carry more than sixty percent of all containers shipped across the globe (Booth, 2013). It is essential that the USEC ports renovate in the near future not to just accommodate the possible influx of traffic from the Panama Canal but also to better position themselves for the future of maritime transportation as the standard size of global vessels increases.

The U.S. Army Corps of Engineers estimates that U.S. ports are spending between $6 and $8 billion a year to modernize port facilities. The improvements of U.S. ports are in three main categories: land-side connections which include the roads and rail lines that lead into the ports, water-side connections such as deepening and widening to accommodate the Neo-Panamax vessels, and port facility infrastructure (Rosen, 2015).

The USEC ports examined in this study are Boston, New York-New Jersey, Philadelphia, and Baltimore. There are other ports on the USEC that are executing improvements to accommodate the Neo-Panamax vessels such as Charleston, South Carolina and Norfolk, Virginia. See Appendix A for a complete listing of the USEC ports and annual vessel calls based

upon the most recent data from the U.S. Department of Transportation. The focus of this study was narrowed to the four selected ports located in the northeast region of the USEC. The locations of these northeast ports are mapped in Figure 3. These four ports are well-known and they are a major facet to the respective state economies of each port. The concurrent analysis of these four ports is also conducted due to the presence of regional competition and impacts on market share that occurs as a result of the close proximity of these four ports.

Boston

Boston ranks in the mid-30s amongst the 100 largest ports in the U.S. but it is one of only seventeen ports capable of handling the Neo-Panamax vessels (Bailey, 2017). The port of Boston receives port calls from twelve of the world's largest ocean carriers. However, Neo-Panamax vessels can only enter and exit the port at high tide. The existing cranes cannot reach the higher and wider stacked boxes and Neo-Panamax vessels docked at the port's current container ship berths interfere with the Logan Airport flight path. Therefore, The Massachusetts Port Authority, Massport, is embarking on several improvement projects to equip the Conley Container Terminal to handle the larger vessels that would be arriving via the Panama Canal.

The Boston Harbor Dredging Project was approved by Congress in 2014 and dredging began in April of 2017. The project received funding from The Massachusetts Port Authority, the commonwealth of Massachusetts and most recently federal funding that was approved June of 2017. The dredging project will deepen the North Entrance Channel from forty-five feet to fifty-one feet and the Main Channel from forty feet to forty-seven feet (Port of Boston, 2017). Additionally, it will create two fifty foot berths at Conley Terminal (Port of Boston, 2017). Boston received state funding to build a new berth and procure three new cranes to accommodate

the larger vessels in relation to the berth and airport flight path. Two existing berths will be strengthened and deepened and a new technologically advanced gate will be built.

The port of New York-New Jersey has been experiencing congestion and delays over the past few years so Boston can potentially be an alternative for the larger vessels (Morley, 2016a). Boston's Conley Container Terminal total volume of 2016 was five percent greater than 2015 (Massport, 2017). This is evidence that more vessels are already choosing to utilize the port of Boston and that Boston is capable to handle the growth. The Journal of Commerce recognized Boston as the most improved port in the U.S. in terms of productivity increases (Bailey, 2017). This growth demonstrates the importance of the funding that was dedicated to the various improvement projects. Most recently, Massport received the second largest U.S. DOT FASTLANE Grant awarded to a U.S. port. The improvement projects are estimated to need up to two years to complete. Once the improvements projects are complete, Boston will be prepared to fully accommodate the Neo-Panamax vessels and provide more competition to the other USEC ports.

New York-New Jersey

Vessels headed to USEC ports have multiple port calls, one of which always includes New York-New Jersey due in part to the highly concentrated consumer demand (Bonney, 2016). Forty percent of the container traffic of the East Coast is routed for a port call at the New York Port (Reuters, 2016). The NY-NJ Port ranks third among all U.S. ports and first amongst all USEC ports in terms of total tonnage (U.S. Army Corps of Engineers, 2016). The port has ten terminals including six for handling container cargo and one for bulk and break bulk cargo. Across all six terminals there are thirty-two cranes that can service Neo-Panamax vessels and at

two of the terminals there are cranes with the capability to operate with Super-Post-Panamax vessels which have the container capacity upwards of 20,000 TEUs and reach beyond the capacity of the expanded Panama Canal. There is some variation across the terminals in terms of maximum vessel operations but an advantage of the NY-NJ Port is the capability to service vessels of 12,000 TEUs at each terminal. One of the main competitive advantages of the NY-NJ Port is its ability to service almost all types of cargo at one of its six terminals. Currently, three of the terminals have water depth of fifty feet which is necessary for the larger vessels.

Resulting from infrastructure improvements that were recently completed, the NY-NJ Port is equipped to handle the larger vessels passing through the Panama Canal, however there are still improvements that need to be made so the port can attract increased trade traffic and larger vessels arriving from the Panama Canal. The projects in place by the NY-NJ Port address infrastructure upgrades that are highly necessary if the port wants to remain at the top for the East Coast. The Port Authority of New York and New Jersey approved a ten-year, $2 billion capital investment which focuses on the inland access, harbor deepening, and terminal improvements as well as $1.3 billion for the Bayonne Bridge Navigational Clearance Project. In 2016 the NY-NJ Port saw the completion of the fifty foot navigation channel deepening project. The cornerstone of all these improvements is the Bayonne Bridge which began in May 2013. This bridge, which spans the tidal strait between New York and New Jersey, was originally 151 feet above water which was not high enough to allow the passage of the Neo-Panamax vessels. The Bridge was raised to 215 feet and as of June of 2017 it received navigational clearance by the U.S. Coast Guard allowing vessels carrying up to 18,000 TEUs to travel underneath it to port terminals. The bridge is scheduled to reach full completion by 2019 with the wider roadway in each direction for motorists.

The Bayonne Bridge project was originally planned to allow passage of the larger vessels around the same time as the Panama Canal was set to be completed. However, since the bridge was delayed it restricted the initial capabilities of the terminals at the NY-NJ Port. However, now that the bridge is complete, NY-NJ Port is capable to receive port calls from larger vessels. The Boston Consulting Group predicted that the NY-NJ Port will gain market share and is competitively located to capture the routes of Neo-Panamax vessels (Boston Consulting Group, 2015). The Bayonne Bridge leads to four of the NY-NJ Ports' largest container terminals so any influx of demand from larger vessels can be spread across various terminals. The Red Hook Container Terminal is accessible outside of the bridge but the depths at this terminal are not capable to handle the larger vessels.

Philadelphia

The Port of Philadelphia operates fifteen piers and terminals along the Delaware River in Pennsylvania. With the intent to capture more market demand resulting from the expansion of the Panama Canal, Philadelphia began the Main Channel Deepening Project of the Delaware River. Additionally, a few years later in 2016, the Port Development Plan was approved and supported with a $300 million investment from the Pennsylvania Commonwealth. The port also re-branded to the name Philaport to signify the beginning of a new era for the port and to align with the new capabilities and improvements of the port. Philaport is seeking to become an industry leader of container handling, create auto processing efficiencies, and improve logistics for Pennsylvania exports and imports (PRPA, 2016).

The Main Channel Deepening Project was the first improvement project in preparation for the larger vessels passing through the Panama Canal. The original depth of the channel is

forty feet and currently construction in underway to deepen the depth to forty-five feet from the Philadelphia Harbor in Pennsylvania to Beckett Street Terminal in Camden, New Jersey to the mouth of the Delaware Bay (Philaport, 2016). This will allow larger vessels to enter the port of Philadelphia. Additionally, twelve of the sixteen bends in the channel will be widened to improve navigational safety and the Marcus Hook Anchorage will also be deepened to forty-five feet. The construction and deepening of the Delaware River currently continues as part of a contract and is projected to be completed by the end of 2017.

The Port Development Plan of 2016 impacts two main terminals at the port of Philadelphia and adds acreage to the Publicker Lot and Philadelphia Auto Port. The Tioga Marine Terminal is capable of handling all cargo from containers to break bulk including perishables, ro-ro, and heavylifts. This terminal has five warehouses including dry, heated and cold storage. The development plan for this terminal includes improvements to one of the warehouses and acquiring a mobile harbor crane with the intent to achieve twenty-one percent increase in break bulk capacity (PRPA, 2016).

The Port Development Plan also includes changes to the Packer Avenue Marine Terminal. The Packer Avenue Marine Terminal, partially due to its versatility, is currently the busiest and primary container terminal at the port of Philadelphia. Therefore, the improvements are not only necessary to develop capabilities to serve larger vessels but also if the port is looking to mitigate the risk of port congestion. This terminal has immediate access to two major rail yards and has five cranes including two that are capable to service Neo-Panamax vessels. The terminal has refrigerated warehouses which will be an advantage over the increased refrigerated cargo capability of the Neo-Panamax vessels. To some extent, The Packer Avenue Marine Terminal is currently suited to accommodate Neo-Panamax vessels and so the

improvements intend to double the growth in container capacity (PRPA, 2016). The improvements include infrastructure improvements to the berth and a new berth of forty-five feet, new fendering to handle larger ships, enhancements to the terminal electric grid to support additional load, outfitting with three new electric Neo-Panamax ship-to-shore gantry cranes, relocation of warehouse space off the terminal, installation of electrical hook ups for ships while in port, removal of outmoded cranes, and conversion of two Hyundai cranes from diesel to electric. Many of these improvements directly relate to the port's ability to service the larger vessels and after completion in 2020 Philaport will be better suited to capture demand from the Neo-Panamax vessels.

As the Main Channel Deepening Project is completed by December 2017, the improvements at the Packer Avenue Marine Terminal will occur at about the same time. The alignment of the projects will allow the deeper-draft vessels to reach the port of Philadelphia through the deepened canal and then be fully serviced by the updated terminal.

Baltimore

The port of Baltimore is located at top of the Chesapeake Bay in Maryland and has six public terminals and direct on-dock access to rail service. Baltimore is prepared for the larger vessels with a harbor of fifty feet deep, one berth with the depth of fifty feet, and crane upgrades. The berth and new cranes came as a result of a public-private agreement in 2010 between the Maryland Port Administration and Highstar's Capital Ports America Chesapeake regarding the Seagirt Marine Terminal. The four new cranes at the Seagirt Marine Terminal began operation in January 2013 and are capable to reach twenty-two containers wide for use with Super-Post-Panamax vessels. In addition, the Seagirt Marine Terminal has seven cranes capable to service

Neo-Panamax vessels. The approach to the channel was adjusted to facilitate the turning radius of the larger vessels. This resulted in Baltimore being one of three USEC ports immediately capable of handling the largest vessels (Karpovich 2016). This is an advantage that allowed the Port of Baltimore to immediately service the vessels that passed through the expanded Panama Canal.

The Port of Baltimore was one of the most equipped and timely ports to be ready for the larger vessels arriving via the Panama Canal. Additionally, the Port of Baltimore has gained a strong reputation after recognition by the Journal of Commerce as the most efficient port in 2014 and 2015 (AJOT, 2015). Efficient ports are favorable in the eyes of shipping companies who are looking to avoid and reduce long wait times that are involved in entering the port and unloading containers. Thus, as the larger vessels arrive at USEC ports, Baltimore's reputation of efficiency serves as a competitive advantage amongst the other ports capable of handling Neo-Panamax vessels. Even though it is efficient, the Port of Baltimore is the farthest inland USEC port which causes vessels longer transit time to arrive at the port but this also results in docking within closer proximity to the market and demand. The Ports America Chesapeake also gained operational responsibility for intermodal container service at the port. This consolidation of management is another angle in which Baltimore is prepared for an influx of shipping traffic and capable to handle demand efficiently.

Chapter 5

Recommendations for USEC Ports

Boston

The improvements at the Port of Boston are not yet completed and the estimated completion of 2019 puts a strain on their capability to accommodate the Neo-Panamax vessels. Boston's first priority needs to be completing their improvement projects which includes dredging the channel. Although Boston can receive calls from the larger vessels when the tide is high, this causes Boston to be dependent on the nature of the tides. Carriers usually have fixed, pre-determined schedules and Boston cannot fully provide the consistency that carriers need. The dependency on the tides can impact the wait times and transit times of the vessels which also directly relates to costs and efficiency. The Maritime Industry is competitive and each carrier operates around costs and thus Boston may suffer from dependency on the tides.

In order to make their port attractive to carriers despite the limitations created by the tides, Boston needs to gain a sense of control over the inherently uncontrollable nature of the tides. Boston should develop a processing schedule for the vessels based upon the schedule of the tides. Boston has already successfully tested the handling of a larger vessel but it was faced with unloading challenges. Nonetheless, the port is capable to receive the Neo-Panamax vessels during high tide and this should be capitalized on as they anticipate the completion of the channel deepening.

In Boston there are an average of two high tides per day and therefore the maximum amount of times Boston can receive the larger vessels is during each of these two high tide windows (NOAA, 2017). Vessels are unloaded when they arrive at the port whether it is in the

early morning or on the weekend; however, the standard operating hours of the Conley Terminal are 8am-4:15pm. Therefore, Boston should develop an operating schedule or specialized crew in relation to the high tides if they want to attract Neo-Panamax demand. The high tide is rather predictable and follows a pattern throughout the calendar year. The high tide of each day is usually forty to sixty minutes later than the day before and therefore only about half of the days in a month have one high tide during the standard operating hours of the port (NOAA, 2017). With the current operating schedule, the Port of Boston is only in full operation during approximately one-fourth of the high tides. Boston should recruit, hire, and train a special crew to operate the port during the high tide hours that are outside their standard hours. This will only need to occur up until they finish dredging the channel. Maritime Shippers are already making adjustments to their routes and port calls since many USEC ports are making improvements. Therefore, it will be advantageous for Boston not to wait until the channel is complete to attract new carriers. Boston needs to more effectively utilize the high tide to fill the gap in their capabilities until the channel is fully dredged.

The Port of Boston has operational characteristics that make it attractive to carriers and these must be communicated as a way to capture Neo-Panamax vessel demand. As mentioned in the earlier discussion of Boston, it was recognized by The Journal of Commerce as the most improved port in the U.S. in terms of productivity increases (Bailey, 2017). Since 2015, cargo volume and productivity increased at the port and this is in part due to the fact that trucks can get in and out of the Conley Terminal in about thirty-two minutes whereas at other ports this process can be hours long (Bailey, 2017). The truck turnaround time is a huge advantage over other ports that experience congestion such as New York-New Jersey and Boston needs to strategically promote their efficiency and improvements to capture larger vessel demand. Boston's truck

turnaround time and efficiency is a competitive advantage and through promotional strategies it needs to become a defining characteristic that builds their port identity to be known as a port that is capable to efficiently accommodate the larger vessels.

New York-New Jersey

The Port of New York-New Jersey is the most prominent and well known port on the USEC as it holds the position as the top USEC port (Braden, 2016). However, NY-NJ cannot rely on its reputation to capture demand from the larger vessels arriving via the Panama Canal. The NY-NJ port needs to make both marketing and infrastructure changes to be better equipped to maintain its position relative to the other USEC ports.

The Port Authority of New York and New Jersey adopted the abbreviation of PANYNJ and this is used during forms of communication and throughout their website. Re-branding the port and changing the commonly used name to something that is more recognizable than the current six letter abbreviation would help the port develop an identity that embodies its reputation and infiltrate the maritime industry with a name that is more easily recognized. The Port of Philadelphia recently underwent a re-branding process where they strategically adopted the name “Philaport” because of its brief, clean, memorable, and distinguishes the port amongst other port authorities (Philaport, 2017). The Massachusetts Port Authority is recognized as Massport which allows the port to have an identity in a similar way as Philadelphia. The shipping industry is experiencing many changes and it would be an appropriate and well-suited time, especially as they complete port improvements, to re-brand the name of the New York-New Jersey Port and port authority.

Although New York-New Jersey is known as the top port on the USEC, this is due to its large market share of the containerized traffic which results in frequent congestion at the port. Congestion can result from a variety of factors, all of which leads to negatively impacting the efficiency of the port and the productivity. Truck congestion, a main source of congestion at NY-NJ, occurs as containers are transported from the dock. This congestion can be alleviated by on-dock or near-dock rail access which is currently not present at all the terminals. An intermodal rail project began in 2016 at GCT's Bayonne Terminal and is scheduled to be completed in mid-2018. Once this is complete, it will be the only major terminal at the NY-NJ port to have this connection to rail that is capable to handle large volumes of cargo (the GCT New York terminal has on-dock rail access).

Developing infrastructure is even more pertinent as larger vessels may strategically choose to "load center" at the NY-NJ Port (Morley, 2016b). This is a strategy where carriers unload larger quantities at fewer ports. Since NY-NJ is already the first stop for seventy-six percent of East Coast services (Morely, 2016b) and the consumer population is large and dense in the surrounding area, the port can potentially receive an influx of cargo as carriers chose NY-NJ as a site to load-center. A large vessel can require thousands of trucks to transport cargo to rail access and warehouses. NY-NJ must be prepared for the increase in cargo and the trucks that will come along with that; rail would be a viable solution instead of using trucks for the transportation from the dock. NY-NJ should be careful to not develop over-capacity of rail and therefore it would be most efficient to have two ports with on-dock or near-dock access. This would entail that NY-NJ constructs more intermodal rail at one of the other major terminals to further expand their rail network which will include the GCT Bayonne Terminal in 2018. With

the combination of these two intermodal rail systems, NY-NJ could effectively decrease the cargo dwell time and overall port congestion.

NY-NJ should also examine other ways to reduce congestion such as forecasting and planning of truck arrivals. In early 2017, the GCT Bayonne Terminal began scheduling truck appointments. This should be a method that the entire port permanently implements and continuously improves as they gather data. Trucks often wait in lines and queue up outside terminal gates which causes congestion, impacts surrounding neighborhoods, and raises costs for the trucking companies (Smith, 2017). Appointment systems can cause problems of their own if a vessel or truck arrives late due to traffic or if changes need to be made. However, GCT USA reported that the truck management system has decreased the turn-time for trucks by forty percent in comparison to non-appointment times (McDonald, 2017). Therefore, a port as large as NY-NJ will greatly benefit from an appointment system and needs to develop a port wide appointment system that is both efficient and flexible when necessary.

One of the recent issues relating to congestion at the NY-NJ Port is the usage and management of chassis. Trucks use chassis to transport and move the containers and the inventory of chassis may need to change as more cargo arrives at the port on the Neo-Panamax vessels. There are three main chassis companies at the NY-NJ port and when trucks use chassis owned by different companies this creates congestion since they have to be returned to a specific location. Truckers would benefit from a "gray-pool" chassis system at the port which means that a truck can use a chassis to move a container to a terminal and then has the freedom to continue to use the chassis for another terminal or the truck can return the chassis at any location. This concept was proposed to the NY-NJ port in 2014 but has yet to be implemented (Morley, 2017b).

Two of the obstacles with this gray-pool chassis concept are the ownership and maintenance of the chassis. If a gray-pool system was implemented, then there would need to be a port wide database that would track the flow of the chassis between terminals and the status of chassis condition. Additionally, the database would be helpful in tracking the dispersion of the chassis at each terminal. Since the chassis are shared and do not have to return to a specific location then a procedure needs to be determined in the circumstance in which one terminal may acquire a higher inventory of chassis. Before the pool is implemented, each terminal and location needs to set the minimum number of chassis it needs to operate based upon demand. Thus, if a location is releasing chassis but not receiving many returns, this would allow that location to gain chassis from another location. If the chassis are fully shared, then determining who is responsible for the repairs and maintenance also needs to occur. One of the standards to be in the pool system would be that the first location that receives a chassis in need of repair is responsible to do so. With the possible increase of containers at the port that will arrive on the larger vessels, the ports will be in need of more chassis. If the port of NY-NJ can develop and implement a port wide chassis system this could reduce the congestion and delays experienced by truckers and stabilize the supply of chassis at the port.

The Red Hook Container Terminal at NY-NJ is accessible outside of the Bayonne Bridge but the depths at this terminal are not capable to handle the larger vessels. The operating agreement for this terminal ends in 2018 and as the port authority determines the strategy for this port, they should invest in the terminal so that it can accommodate the larger vessels. There is discussion to terminate the operation of this port but it has the potential to remain as a resource for the city. Since Red Hook is located outside the Bayonne Bridge, the port of NY-NJ could potentially reduce congestion and improve efficiency by routing Neo-Panamax vessels to this

terminal. Red Hook could help balance the potential influx of Neo-Panamax vessels that will be traveling under the bridge and into the main section of the port. Red Hook Terminal is also strategic for the state because it provides security, exemplified by the utilization during hurricane Sandy, and is connected to the maritime industry in addition to its utilization as a container terminal (Gill, 2017). In order to be prepared to handle the larger vessels, Red Hook terminal would need to increase the depth of the dock from forty-two feet to at least forty-eight feet. The terminal would also need to procure cranes with the capabilities to load and un-load the larger vessels.

Another strategy for utilizing the Red Hook Terminal is to continue operation with the current depth but to route more of the smaller, Panamax vessels to this terminal. This would help increase the revenue at the terminal and the shipping traffic which are some of the existing concerns of the port authority. This would allow the other terminals, with existing capabilities for Neo-Panamax, to service the larger vessels and capture the demand. If Neo-Panamax vessels choose to load-center at NY-NJ then the other terminals need to be prepared for the influx of traffic and container off-loading. Diversion of the Panamax vessels to Red Hook would open the other terminals to service more of the Neo-Panamax vessels. By either improving the capabilities or utilizing the Red Hook terminal with a different strategy, this would give NY-NJ the ability to balance their shipping traffic.

Philadelphia

The current investments at Philaport will increase port depth to forty-five feet and this enables Philaport to accommodate the Neo-Panamax vessels but not all the vessels shipping cargo across the maritime industry. Philaport received a large amount of resistance from New

Jersey, Delaware, and environmental groups when they were planning the deepening of the channel. Those at the port view the forty-five foot depth as only currently sufficient for Philaport (Loyd, 2017). However, with a long-term perspective, it would be strategically beneficial for the Philaport depth to be fifty feet. Since there were many challenges with gaining the support to deepen the channel to forty-five feet, Philaport should begin the process to receive approval for fifty feet. Lawsuits and resistance can take years to resolve and Philaport should move towards this strategy in order to ensure Philaport remains competitive long-term.

The Packer Avenue Marine Terminal is the primary container terminal at Philaport and due to its versatility it is currently the busiest terminal at Philaport. The traffic at this port will continue and possibly get worse, as the improvements at the port are completed in 2020 which enable the terminal to receive port calls from the larger vessels. In anticipation of potential congestion, the port should implement truck scheduling and expand the operating hours at the terminal gates. Truck scheduling will prevent trucks from waiting at the gates and balance out the flow of traffic. It is anticipated that more cargo will be unloaded from the larger vessels and although the Packer terminal has rail access, inevitably trucks will also be used as a means of transportation. Truck scheduling will allow the port to have more control over the traffic congestion. The extended schedule will be developed through the addition of night and weekend operating hours at the Packer Terminal and charging different rates for the trucks depending on when the trucks enter the terminal. A similar system was implemented at the port of Los Angeles-Long Beach and it helped spread the truck traffic across both day and night (Mongelluzzo, 2016). In combination with the investments made at the Packer Terminal, these congestion mitigation strategies will enable the port to better manage the cargo from Neo-Panamx vessels through efficient operations.

Baltimore

Baltimore was one of the first USEC ports immediately capable to service the larger vessels arriving via the Panama Canal. Baltimore is prepared to handle the larger vessels but some maritime shippers chose to not call on Baltimore since it requires more transit time, eight hours, to travel up and down the Chesapeake Bay to reach this inland port. If Baltimore can properly communicate the capabilities of the port and reputation of efficient operations, then this would be beneficial in capturing new calls from larger vessels over the long-term. Baltimore is a close distance to NY-NJ and if shippers are looking to avoid the congestion at this highly trafficked port, then Baltimore is a viable option. In 2015 the Maersk shipping line called on the port of Baltimore after almost two decades of not including Baltimore on their shipping route (Dresser, 2015). This was an important milestone for Baltimore as the beginning of potentially increased traffic from the larger vessels, especially since their volumes of containerized cargo have been lagging (Dresser, 2015). The Maersk port call is evidence that vessels are willing to choose the less congested port of Baltimore. The port of Baltimore needs to carry the momentum from the recent larger port calls and should convey that the advantages of their port efficiency and their ability to serve the larger vessels outweighs the extended transit time to reach the port. Additionally, since the Neo-Panamax vessels carry a higher volume of containers, the extra transit time of traveling up the Chesapeake Bay to the port is more cost-effective for the larger Neo-Panamax vessels in comparison to the Panamax vessels. This message can arrive in the form of rebranding the identity of Baltimore so that shippers are not initially hesitant to the idea of a port call to Baltimore. The trade-off decision is ultimately made by the shipper but Baltimore can increase their efforts to communicate their competitive advantages and convince shipping companies to add Baltimore to their vessel schedule.

Baltimore has the necessary capabilities to handle larger vessels, however, the Howard Street Tunnel is restricting intermodal transportation capacity. The tunnel is currently a freight rail bottleneck since the current demand of cargo movement has outgrown the capabilities of the 121 year old tunnel which only allows the passage of single stacked rail cars due to height restrictions. The most economically efficient way for trains to transport cargo is by double-stacking the containers and many other port-rail connections on the USEC are capable to do so. Baltimore's application for federal funding in 2016 was rejected and they are applying again in 2017. Expanding the tunnel to allow westbound trains to double-stack would increase economies of scale since double-stack rail allows the same amount of railroad assets to move twice the volume of cargo. Railroads are priced higher for Baltimore compared to other ports (Morley, 2017a). If Baltimore does not receive federal funding the second time, it should develop a public-private partnership with the regional rail companies in order to receive funds to expand the tunnel. Since many ports are investing in upgrades to accommodate the Neo-Panamax vessels, the competitive advantage needs to extend beyond the port and encompass the port connections and intermodal connections. The expansion of the Howard Street Tunnel will take the port of Baltimore one step further to being a cost-effective port call opportunity. The ability to double-stack the rail will result in decreased prices for domestic freight shippers, rail operations and port customers (Morley, 2017a). Baltimore needs to continue to seek funding for this infrastructure project and develop various funding strategies in order to convert the tunnel from a bottleneck to a productive intermodal connection.

Chapter 6

Advanced Strategy for USEC Ports

Specialization and Collaboration of USEC Ports

As multiple USEC ports prepare for the Neo-Panamax vessels, this heightens the competition to capture the demand from these larger vessels. There is the potential for the shift in demand from USWC to USEC not to be as significant as expected. It is premature to measure the complete impact in terms of increases in cargo to the USEC but the ports should be planning for other ways to increase their revenues beyond simply relying on their port improvements. Two ways in which USEC ports could aim to capture demand is through specialization on certain commodities and alternatively collaborating with another USEC port.

Capturing more demand from the larger vessels has the potential to be realized through a port's specialization on a particular commodity. As discussed earlier, the Neo-Panamax vessels will load-center at the ports in order to increase efficiency. If a port focuses on handling a particular commodity then that port can seek to partner with shippers and have the shipper load-center that commodity. The port can offer incentives for processing and receiving particular commodities and this will draw demand of this commodity from other ports. For example, Baltimore is the top ranked port in the U.S. for handling automobiles, light trucks, and machinery (AJOT, 2015). Baltimore could continue the trend of their top ranking in this commodity by strategically promoting their port for this commodity, negotiating with shippers, and increasing their efficiency of processing this commodity. This strategy will require more examination of variables such as the potential growth of commodities, revenue potential for

different commodities and revenue drivers for a port. Though this strategy of specialization remains an opportunity for the ports as the shipping industry shifts and demand changes.

The second strategy that can be implemented by the USEC ports is collaboration amongst one another. This already is occurring between the ports of Georgia and Virginia through a pioneered agreement that received approval from the federal government to discuss coordinating operations in April of 2017. Consolidation in the shipping industry and the potential for load-centering may result in the removal of some ports from carrier trade routes. The industry consolidation came in the form of the world's top ocean carriers entering into three alliances that controls ninety percent of shipments on global routes (Phillips, 2017). To minimize the impact of the industry consolidation, Georgia and Virginia are coordinating operations such as investment in new equipment and negotiations with carriers. This will help reduce over-capacity that can occur if multiple ports are making identical investments in an attempt to capture the same demand. Collaboration was not approved to extend into the negotiation of or approval of terminal rates or charges. Coordination is also occurring on the USWC as evidenced by the merging of Tacoma and Seattle, WA operations and infrastructure investments in 2015. When ports are allowed to exchange information, this gives each individual port a better foundation to make operational and strategic decisions. The cooperation that will occur between Georgia and Virginia should be examined by other USEC ports to observe and determine the benefits of this strategy. It can be especially advantageous for two ports that operate to serve the same market of consumers. Every port may not experience the cargo growth that was expected and collaboration is a potential strategy to increase the growth for two smaller, struggling, or less trafficked ports.

Chapter 7

The Future of the Panama Canal and the Global Shipping Market

Vessel Sizes beyond the Neo-Panamax

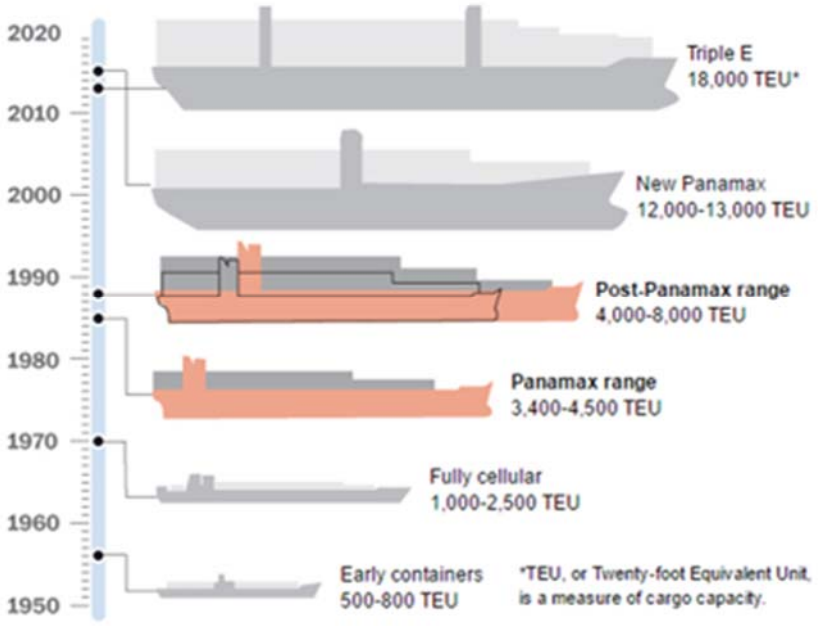
The expanded Panama Canal allows the passage of Neo-Panamax vessels which are those that can carry up to 13,000 TEUs and this is the vessel size that the USEC ports are preparing to accommodate. However, there are vessels in the global shipping industry, Super-Post-Panamax, that are already too large to pass through the Panama Canal. Over the past several decades, since the first container vessel in the 1950s, the vessel sizes have been increasing and capable of carrying more cargo since the larger vessels lead to greater economies of scale. The world's largest class of vessels, Triple E, can transport up to 18,000 TEUs and are too large for the new, third set of locks on the Panama Canal. Refer to Figure 3 to see a visual representation of the increase of vessel sizes overtime. With more cargo on a single vessel this reduces costs and allows the shipper to spread the fixed costs over a greater amount of cargo thus leading to more efficiency.

However, with the third set of locks at the Panama Canal and the investments being made by USEC ports, the majority of cargo will continue to be transported by Neo-Panamax vessels. Although Neo-Panamax vessels only comprise sixteen percent of the world's container fleet, they carry forty-five percent of the world's cargo and by 2030 the Neo-Panamax vessels will transport sixty percent of the world's containers (Booth, 2013). Due to the recent investments made for Neo-Panamax vessel accommodations, the world's fleet probably will not move towards majority Triple E vessels. However, the world's fleet will shift as older vessels with less capacity will begin to be utilized less frequently as shippers chose the economy of scale

advantages of the Neo-Panamax vessels. The majority of the shipping industry will increasingly rely on Neo-Panamax vessels. Shippers will be looking to take advantage of the new infrastructure at the ports. With the completion of the expanded Panama Canal and improvements at ports, the shipping industry is going to change and new routes will develop with the Neo-Panamax vessels.

The pressure of the Super-Post-Panamax vessels will not be felt for quite some time but these vessels should not be overlooked, especially since they offer maximum efficiency. In addition to the Triple E vessels, there are other large vessels such as Aframax and Chinamax. The Triple E vessels are not routing to the U.S. but are used for trade between some of the other continents. The larger vessel sizes cannot be utilized until the ports are capable. As it stands today, twenty ports around the world can handle the Triple E vessels, none of which are U.S. Ports. Although the expanded Panama Canal is not compatible with the largest vessels in the world, it is currently sufficient to allow passage for the majority of the world's cargo. However, it is important to follow the patterns of industry development since these patterns eventually caused adjustment to the Neo-Panamax vessels and there is the potential for another industry wide change in a few decades in order to adapt to the Triple E vessels.

Figure 3: Increase of Vessel Sizes Overtime



Source: Cuadra, Alberto. Thorp, Gene. Webster, Bill. The Washington Post. 2013.

Chapter 8

Conclusion

The expansion of the Panama Canal brought unprecedented changes to the global shipping industry by allowing Neo-Panamax vessels to pass through. These vessels are capable of carrying more than double the TEUs of the previous vessels that routed through the canal. This infrastructural change of the passageway that links the Atlantic Ocean with the Pacific Ocean was predicted to shift shipping traffic and change the demand at the USEC ports. The USEC ports of Boston, New York-New Jersey, Philadelphia and Baltimore each made investments and improvements to prepare to accommodate the larger vessels.

Boston developed their port for larger vessels mainly through the Boston Harbor Dredging project, changes to their berths and the addition of cranes capable for the Neo-Panamax vessels. These projects are still underway until 2019 and this leaves Boston dependent on the high tide as the only way to accommodate the larger vessels. Until the time that Boston is fully equipped, it needs to commission a special crew to operate the port during each high tide in order to service the larger vessels. The port of Boston has defining characteristics that are a competitive advantage over the other ports such as minimal truck turnaround time. Through the use of promotional strategies, Boston should develop a strong identity as an efficient port in order to capture the shift in shipping traffic.

The port of New York-New Jersey is the top port on the USEC and also the most congested. The investments at this port were made to continue to attract port calls from the majority of carriers. The infrastructure changes at NY-NJ were recently completed and the

cornerstone of these was the expansion of the Bayonne Bridge to allow navigational clearance of the larger vessels. To better position itself against its reputation of congestion, NY-NJ should rebrand itself and adopt a name that is easier to recognize instead of its lengthy title which is often abbreviated to PANYNJ. Congestion at the port can be alleviated by increasing on-dock or near-dock rail service and implementing a port wide truck scheduling system. NY-NJ should address the potentially increasing issues with chassis by beginning a "gray-pool" system. The final recommendation for NY-NJ is to devise a strategy for the Red Hook terminal once the contract ends in approximately one year. Since Red Hook is outside the Bayonne Bridge, opportunities include improving the terminal to enable the docking of larger vessels or to route the smaller vessels to this terminal, both with the intent to alleviate port congestion.

The Main Channel Deepening Project was one of the major changes made to the Port of Philadelphia in addition to adjustments to the Tioga Marine Terminal and the Packer Avenue Marine Terminal. These adjustments included cranes, berths, warehouses, and other infrastructure projects. The port also re-branded to Philaport to develop a stronger identity in the industry and mark the beginning of a new era for the port. To remain competitive in the long-term, Philaport should begin the process for dredging to fifty feet since their previous dredging process received a large amount of resistance. In anticipation of potential congestion at the Packer Avenue Marine Terminal, the port should implement truck scheduling and expand the operating hours at the terminal gates.

The port of Baltimore was initially one of the first ports capable to handle the Neo-Panamax vessels. This resulted from many investments including deepening the harbor to fifty feet and procuring four new cranes at the Seagirt Marine Terminal. Even though the port of Baltimore has a very strong reputation of efficiency, it is the farthest inland USEC port which

deters some vessels due to the longer transit time to arrive at the port. As one of the first prepared ports and the most efficient, Baltimore needs to strategically and properly promote that it is equipped for the larger vessels. Baltimore can serve as an alternative to the congestion at the nearby NY-NJ port and this should be communicated as a way to offset the slightly longer transit time to reach the port. Additionally, to be better prepared for the increase of container traffic, Baltimore needs to renovate and expand the Howard Street Tunnel to allow the passage of double-stacking rail. This would provide greater economies of scale and if the port does not receive federal funding they should seek a public-private partnership.

Beyond the specific recommendations for each port, there are additional strategies any of the ports can implement to capture more shipping traffic and receive more port calls. Commodity specialization and coordination with other USEC ports will allow the ports to leverage their strengths and leverage collaboration to combat the consolidation that occurred in the global shipping industry.

The size of ocean vessels has been increasing since the first one was in operation in the mid-1950s. The expansion of the Panama Canal was a change in response to the growing size of the global shipping fleet and this adjustment has resulted in changes across many ports including the USEC. There are already vessels, such as Triple E, too large to pass through the expanded Panama Canal. Although this may not have any implications in the near future, the impact of the Triple E vessels should be closely tracked because just like the Neo-Panamax vessels, they could cause an industry wide change that would again cause ports to invest and improve.

APPENDIX A

East Coast Ports	Vessel Calls (2009)
Porland, ME	397
Portsmouth, NH	-
Boston, MA	520
Providence, RI	-
New Haven, CT	-
New York-New Jersey	4,430
Perth Amboy, NJ	-
Philadelphia, PA	2,171
Chester, PA	-
Wilmington, DE	-
Baltimore, MD	1,562
Virginia Ports	2,502
Wilmington, NC	514
Charleston, SC	1,865
Savannah, GA	2,219
Brunswick, GA	231
Jacksonville, FL	1,487
Miami, FL	893

Source: U.S. Department of Transportation, 2010.

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EDUCATION

Pennsylvania State University **University Park, PA**
Masters of Professional Studies in Supply Chain Management *Graduation:* August 2017
Bachelor of Science Smeal College of Business: Supply Chain Management
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- Schreyer Honors College
- Dean's List: 8/8 semesters
- Kohl's Discretionary Fund Scholarship (2014 – 2015); BP Pipelines Inc. Scholarship (2015 – 2016)

CIEE with Penn State University **Seville, Spain**
Advanced training in Spanish language skills *May 2015 – July 2015*

WORK EXPERIENCE

WhiteWave Foods **Broomfield, CO**
Indirect Procurement Intern *June 2016 – August 2016*
MAYA Advertising **Los Angeles, CA**
Advertising Intern *June 2014 – August 2014*
Pennsylvania State University **University Park, PA**
Exam Proctor *Spring 2015-Spring 2017*

EXTRACURRICULAR ACTIVITIES & AWARDS

Boeing Case Competition **University Park, PA**
Second Place *Spring 2017*
Penn State Cross-Country/Track & Field **University Park, PA**
Varsity Scholarship Athlete *August 2013 – May 2017*
Student Athlete Advisory Board (SAAB) **University Park, PA**
Team Representative *August 2013 – May 2017*
Smeal Student Mentors **University Park, PA**
Team Leader *August 2015 – May 2017*

Other Activities: *Penn State Christian Athletes Treasurer; Athletic Director's Leadership Institute, Fit for Fritz* fundraising campaign
Other Awards: *Big Ten Women's Indoor Track Champions (2014); Athletic Scholarship (2013 – present); Big Ten Distinguished Scholar (2015 - 2016); Supply Chain Department Schreyer Scholarship (2015 – 2016);Big Ten Women's Crosscountry Champions (2015)*