

Extended Hours of Operation at the Port Facilities in New Jersey: A Feasibility Analysis

FINAL REPORT



Prepared for
NEW JERSEY DEPARTMENT OF TRANSPORTATION
Bureau of Freight Services

Prepared by
NEW JERSEY INSTITUTE OF TECHNOLOGY
International Intermodal Transportation Center

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The New Jersey Department of Transportation designated New Jersey Institute of Technology as the International Intermodal Transportation Center (IITC), a university-based resource program that works closely with public and private sector transportation stakeholders to facilitate economic development and quality of life improvements linked to the intermodal transportation corridor.

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1. INTRODUCTION

This chapter provides information about the purpose of the research presented in this report, and presents the report organization.

1.1. The Purpose of the Report

The purpose of this report is to present the findings and recommendations of the Extended Business Hours Task Force (EBHTF). The impetus for establishing the EBHTF came from the New Jersey Department of Transportation's (NJDOT) Logistics Council. The Logistics Council was an initiative that brought together stakeholders in the state's freight transportation industry, from both the public and private sectors, to discuss issues related to the freight movement in New Jersey. The Council's Operations and Facilities Committee recommended that NJDOT create a forum to discuss the use of extended business hours of operation at the port terminals as a strategy to:

- Reduce congestion on the regional highway network, and
- Achieve more efficient utilization of port facilities.

The primary objective of the EBHTF, as the NJDOT Logistics Council defined it, was to investigate if the Extended Business Hours (EBH) strategy could be helpful, and if so to what extent, and to identify potential obstacles for its implementation. NJDOT reached out to NJIT's International Intermodal Transportation Center (IITC) to establish the EBHTF and to coordinate its meetings and discussions. The EBHTF objectives, as outlined by the NJDOT's Logistics Council, are listed in Appendix A.

Through a series of meetings, the EBHTF was able to identify the port stakeholders (e.g., port terminals, warehouses, truckers, steamship lines, etc.), understand the business rules and interests under which each of them operates, identify current and future concerns, look at the potential impacts of extending hours of operation at the stakeholders' facilities and to analyze whether this change would be implementable from the perspective of all stakeholders involved.

IITC carried out this work as part of the NJDOT Freight Planning Support Task Order 59. This report is a final deliverable for subtask B of the task order.

1.2. Organization of the Report

The report is divided into seven chapters. Chapter 2 provides background information that describes the issues at the Port of New York and New Jersey (PONYNJ). It discusses the regional and national significance of the PONYNJ, anticipated growth of the port-related cargo, and challenges that the port and the regional transportation network are facing in light of the growing demand for freight. Chapter 3 gives an overview of the objectives and methodological approach used in this study. Chapter 4 outlines the business perspective and operating practices of all the stakeholders involved in the transport of marine containers in New Jersey. Chapter 5 discusses the major findings of the EBHTF. Chapter 6 provides a summary of conclusions, and Chapter 7 concludes the report with policy and research recommendations.

2. BACKGROUND

The previous chapter described the impetus for the research summarized in this report, and provided information about organization of the report.

In this chapter the New York – New Jersey metropolitan region and the role the Port of New York and New Jersey (PONYNJ) plays in the region are described. For this purpose the freight data and related economic activity indicators are used. This will help the reader understand the issues and paint a picture of the importance of the PONYNJ to the regional and U.S. economy. The basic socio-economic statistics describing the port are presented first. Then, the impact of the port on New Jersey, regional and U.S. jobs is ascertained. The chapter concludes with an analysis of traffic conditions on the roads surrounding the Port.

2.1. Location, Regional Demographics and the Market

The Port of New York and New Jersey (PONYNJ) complex consists of marine port facilities under the jurisdiction of the New York Customs District. It includes the Port Authority of New York and New Jersey (PANYNJ) container and bulk terminals in Port Newark/Elizabeth and Global Marine Terminal in New Jersey, Howland Hook Terminal on Staten Island, and Red Hook Terminal in Brooklyn (see Figure 2.1). In addition, the port complex includes several privately operated liquid and dry bulk terminals in New Jersey and Brooklyn, NY.

The PONYNJ is located in the geographical centroid of the Boston to Washington Corridor, the greatest consumer market in the world. This market is responsible for nearly 25% of the U.S. Gross Domestic Product (GDP)¹. Moreover, one-third of the nation's buying power² is within a

¹ U.S. Bureau of Economic Analysis Estimates for 2001. The Northeast region consist of Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

² Buying power is defined as the total post-tax personal income of residents that is available to spend on goods and services. Source: "Freight Planning Support System – Final Summary Report," prepared for

radius defined by an overnight truck trip from Central New Jersey. All within a much shorter drive time, the entire State of New Jersey is easily accessible and holds a significant consumption potential. New Jersey is the fourth smallest state in the nation but is also the most densely populated with the total population of 8.7 million³. Add to this a Gross State Product of \$365.4 billion⁴. In 2005, New Jersey ranked third in the country with a per capita income of \$43,771⁵. To conclude, New Jersey's location, population and wealth position it as a center for an enormous demand for goods. This demand in turn puts great emphasis on the transportation system that is necessary to efficiently accommodate the movement of the goods.

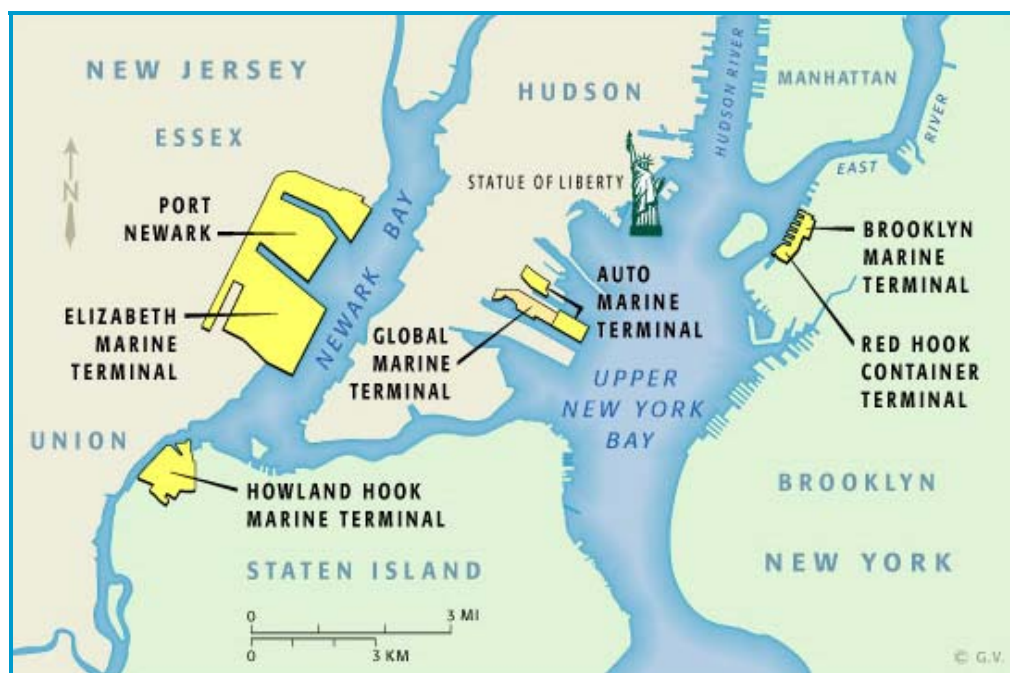


Figure 2.1. PANYNJ Seaport Facilities (Source: PANYNJ website)

North Jersey Transportation Planning Authority, by the National Center for Transportation and Industrial Productivity, New Jersey Institute of Technology, July 2003.

³ U.S. Census Bureau, 2006 estimate.

⁴ U.S. Bureau of Economic Analysis Estimates for 2006.

⁵ New Jersey Department of Labor, 2006

2.2. Regional Goods Movement

The PONYNJ complex is part of one of the most highly evolved, intricate networks of highway, rail, marine port, and air cargo facilities in the nation. Port Newark/Elizabeth is the largest port-of-entry on the East Coast and the third largest in the nation, measured by the annual volume of marine containers handled⁶. In 2006, the PONYNJ handled 86.2 million tons of cargo and 5.1 million twenty-foot equivalent container units (TEUs). Its automobile import/export terminals processed 852,297 vehicles. The total value of freight handled was \$149 billion⁷. Adjacent to the Port Newark/Elizabeth is the Newark Liberty International Airport. The airport handled 969,936 metric tones of air cargo in 2006, ranking 22nd in the world and 9th in North America⁸. New Jersey's highway network consists of several major interstate highways: NJ Turnpike/I-95 serving the north-south traffic patterns and I-78/I-80 serving the east-west movements. The NJ Turnpike alone handles over 20,000 trucks per day at its busiest section adjacent to Port Newark/Elizabeth⁹. New Jersey's rail system includes many large and important rail transfer yards and terminals and functions as a main thoroughfare for much of the rail freight moving in the Northeast.

2.3. Impact of the Port on the Economy

PONYNJ has a tremendous impact on the regional and national economy with numerous jobs depending on the cargo going through the Port. According to the New York/New Jersey Port Economic Impact Study¹⁰ the PONYNJ businesses provided an estimated 122,550 direct full-

⁶ Journal of Commerce, Volume 7, Issue 31, July 31, 2006.

⁷ Port Authority of New York and New Jersey (PANYNJ), "Port of New York and New Jersey Sets Cargo Record In 2006," Press Release Number: 22-2007, March 20, 2007

⁸ Airports Council International Statistics, <http://www.airports.org/>, March 2007

⁹ New Jersey Turnpike Authority.

¹⁰ "Economic Impact of the New York/New Jersey Port Industry in 2004", Report prepared by the Edward J. Bloustein School of Planning and Public Policy at Rutgers, the State University of New Jersey and A.

time-equivalent jobs in the New York/New Jersey metropolitan region¹¹ in 2004. Most of the jobs were in the distribution and warehousing sector. Including indirect and induced employment, resulting from the direct economic activity at the port, the study estimated that the total of 232,900 jobs in the region was supported by the port activity. The study also estimated that port activity provided \$12.6 billion in personal income, contributed around \$3.8 billion in federal and \$2.0 billion in state and local tax revenue. The study estimated an increase in employment due to the port activity of almost 20% compared to the estimates made for the port in 2001. The 2004 study did not provide the estimates of the nationwide jobs supported by the PONYNJ; in 2001 the same research team estimated that PONYNJ activity supported around 413,000 jobs nationwide (not including production of the goods shipped).

2.4. Growth in Cargo Traffic

During the last several years, the region's freight transportation system has experienced a dramatic growth in cargo volume due to increased international trade – a trend which has continued through the recent recession. During the 2000 to 2006 period, the average growth of container traffic (measured in TEU) has been 9% per year, based on published PANYNJ Trade Statistics. This far exceeds the PANYNJ forecasted annual growth of 4.2% per year for the same period (forecasts were made in 2000)¹². In 2006, the PONYNJ handled 5.1 TEUs, a volume that had been forecasted for 2015 in a PANYNJ report published in 2000. This intense level of activity is expected to continue and grow well into the future.

In addition to the great regional demand for goods, the growth will be facilitated by the deepening of the shipping channels that access Port Newark/Elizabeth to 50 feet. The deepened channels will allow the port to accommodate a new class of mega-ships – with up to twice the capacity of most current vessels – that increasingly is being used for intercontinental ocean

Strauss-Wieder Inc, for the New York Shipping Association, August 2005. Downloaded from <http://www.nysanet.org/pdf/NYNJPortEconomicImpacts2004FinalReport.pdf>

¹¹ In the study the New York/New Jersey metropolitan region includes 26 counties in and around the New York City, Long Island, and northern New Jersey.

¹² “Building a 21st Century Port,” Port Authority of New York & New Jersey, 2000.

shipping. The use of these mega-ships will enable Asian goods to be transported more economically to U.S. East Coast ports, taking a route through the Suez Canal and across the Atlantic Ocean with intermediate stops along the way.

As a result of expected growth in freight traffic, and especially containerized cargo moving through the PONYNJ, New Jersey is poised to reap tremendous economic benefits from freight and logistics services in its role of the freight distribution platform for the Northeastern United States. It is these circumstances that could reinforce the region's access to a powerful and sustainable economic engine and potentially generate many thousands of new jobs and untold business opportunities over the coming decades. However, in order to fully realize the above economic benefits, the State of New Jersey will need to overcome serious challenges. New Jersey's transportation network (especially in northern New Jersey) is already highly congested. The congestion can hamper the ability of freight to move efficiently through the region. If the congestion is not mitigated, the potential economic benefits could turn into serious problems very rapidly. If freight that arrives into a port terminal can not efficiently proceed on to its ultimate destination, the PONYNJ may lose some of its market share to other ports along the eastern seaboard. Investments in the port and operational improvements in the way port and landside access is managed are needed in order to accommodate future growth.

2.5. Traffic Congestion as an Impediment to the Regional Growth

One of the major negative implications of the growing population and freight transportation demand are increased travel delays due to traffic congestion on New Jersey roadways. This impact can be expressed in monetary terms. According to the latest NJIT estimates, the annual cost of congestion in New Jersey was \$8.1 billion in 2003. Around \$2.1 billion of the total is attributed to the congestion related to operating costs to truck operators.¹³ Congestion has other negative impacts on the overall economy, especially those economic segments that are directly dependent on the transportation of goods. Congestion causes increases in travel times, decreases

¹³ "Mobility and the Costs of Congestion in New Jersey – 2003 Update," Final Report prepared for the Blue Ribbon Commission and the New Jersey Department of Transportation by the National Center for Transportation and Industrial Productivity at the New Jersey Institute of Technology, October 2003.

in the reliability of deliveries, and in turn disrupts delivery schedules and inventory control operating plans in warehousing and distribution facilities. According to the same NJIT study, traffic delays and the costs of congestion will increase at a more rapid rate than traffic volumes. Given the fact that a majority of roads are operating at capacity during the peak travel hours, as data from the New Jersey Congestion Management System (NJCMS) indicates, even small increases in traffic volume will result in disproportionately large increases in delay and thus cost. Conversely, a small or marginal decrease in volumes, especially during peak hours, can produce significant savings in the cost of congestion. NJIT studied an impact of decreasing peak period vehicle miles of travel (VMT) in Essex, Union, Hudson, and Middlesex counties in New Jersey. The majority of all port related truck VMT occurs in these counties. The analysis showed that a reduction in the morning and afternoon peak VMT by 0.1% could generate savings of \$12 million per year, and reduction of 0.5% could save \$59 million annually. The cost of congestion includes the cost of unproductive time for passengers, lost productivity for commercial vehicles, and wasted fuel for all motorists.

In a recently released report “The Trucks are Coming: What Growing Truck Traffic Will Mean for New Jersey’s Quality of Life”, the Tri-State Transportation Campaign predicts that truck traffic on New Jersey roadways could grow by as much as 80% between 1998 and 2020. This predicted growth is due largely to two factors: projected growth in international and domestic freight demand (discussed in the previous section) as well as the enormous dependence on truck as the primary mode for moving goods. According to recently released Freight Analysis Framework (FAF) estimates for 2007¹⁴, close to 70% of all freight tonnage moving through New Jersey is transported by truck (and only 6.2% by rail). The Tri-State Transportation Campaign predicts that this will increase to 77% by 2020¹⁵. The PANYNJ statistics show that only 12% of

¹⁴ Provisional FAF Commodity Origin-Destination Database estimates for 2007 are available on FHWA website at http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm.

¹⁵ “The Trucks are Coming: What Growing Truck Traffic Will Mean for New Jersey’s Quality of Life,” Tri-State Transportation Campaign, January 2005.

port containers are handled by the on-dock rail facility ¹⁶. The rest, or 88%, are transported to and from the port terminals by truck.

2.6. Summary

The anticipated level of demand for highway capacity by the freight industry, along with other traffic, will put New Jersey's roadway network to the test. It will result in increased congestion, delays, pollution and an overall decrease in the quality of life for all New Jersey residents. On the other hand, the port is critical to the region's economy and expected growth in marine trade offers the region opportunities for economic growth. The above concerns may ultimately have an impact on the ability of the PONYNJ to both attract new customers and retain current ones. While port related trucking contributes only a fraction of the traffic and congestion, the port is uniquely dependent on some of the most congested segments, making it more vulnerable to these effects. As the analysis shows, even small reductions in traffic on highly congested facilities during peak hours can result in significant reductions of travel delay, corresponding improvements in the level of service, and savings in terms of congestion cost. Therefore, there is likely to be a significant benefit both to the port and to the general travelling public from a redistribution of port related trucking to less congested times of day. Thus, an organized and well planned effort will be needed in order to facilitate the port growth and make it sustainable from the point of view of the regional transportation system.

¹⁶ PANYNJ 2008 Trade Statistics,

http://www.panynj.gov/DoingBusinessWith/seaport/pdfs/2008_Trade_Statistics.pdf.

3. STUDY APPROACH

The previous chapter showed that New Jersey ports are an important generator of economic activity in the region. The anticipated regional population and economic growth, as well as growth in international trade, will increase demand at the regional marine freight terminals, especially demand related to the transport of marine containers. However, the regional transportation system is already strained: the highway system is chronically congested and many roadways operate at or close to capacity, especially during peak commuter hours. In a situation when available space for highway and port expansions is extremely scarce, new approaches for managing capacity are needed to accommodate future demand. The approaches may include pricing the use of the port facility and internalizing the costs that the port users impose on the traveling public and society in general, or establishing some kind of congestion pricing program that would encourage greater use of off-peak hours.

This chapter describes the extended business hours of operation at freight-handling facilities as an operational strategy, and outlines the study approach used by the EBHTF to investigate the feasibility of implementing this strategy in New Jersey.

3.1. Extended Business Hours of Operation as an Operational Strategy

Given the trend of growing traffic demand and limited ability to physically increase highway capacity in the highly urbanized and densely populated northern and central portions of New Jersey, it is desirable to seek alternative approaches to better (or more efficiently) utilize the existing highway infrastructure. Extending the business hours of operation of the freight handling facilities beyond the conventional 7 a.m. to 5 p.m. regional work hours is one of the alternatives that is worthwhile to explore. The idea behind the EBH strategy is to shift trucks calling on the port away from most congested peak hours of traffic (usually 7 - 9 a.m. and 4 - 6 p.m.) and on to off-peak hours (i.e. mornings before 7 a.m. and evenings after 6 p.m.). In addition to reducing congestion on the access routes, spreading the inbound and outbound truck traffic in the port terminals would be beneficial for terminal operators. The uniform stream of trucks evens out the workload and is conducive to efficient utilization of container handling

equipment. No extra equipment would be needed to meet the peaks in the operation and then sit underutilized during the off-peaks.

3.2. Methodology for Analyzing Feasibility of the EBH Concept

To answer the question of the feasibility of EBH at the port terminals, NJIT conducted a study that consisted of four major tasks:

1. *Identify the stakeholders and review their operating practices.* NJIT identified players that would be impacted by the EBH and whose participation in the EBH initiative is needed in order for the strategy to succeed. Business decision-making models for each stakeholder group were developed to ascertain the likelihood and conditions under which the stakeholders would be likely to accept the EBH. For this purpose the NJIT team reviewed relevant regional studies and professional journals in order to gather the background information necessary to identify the relevant stakeholders and the important issues that need to be addressed. The “Journal of Commerce”, a weekly industry publication focusing on marine freight transportation and international trade, proved to be an extremely useful reference.
2. *Review similar EBH practices.* Similar EBH practices that have been implemented in the U.S. or internationally were analyzed. After initial review, we focused on analyzing the OffPeak Program that utilizes Peak Traffic Mitigation Fees (TMF) to induce the spreading of peak period port related container traffic in the Ports of Los Angeles and Long Beach (POLALB). Several in-depth articles covering the development and implementation of the program helped the research team frame the discussions with industry sources about the possibility of introducing a similar concept in New Jersey.
3. *Analyze impacts of port-generated truck traffic.* The impact of the port related truck traffic on the overall vehicle volume on New Jersey’s roadways was analyzed in order to ascertain the impact of that traffic on the regional highway network. This was done by using PANYNJ Truck Origin-Destination (O-D) Survey data in combination with the New Jersey Statewide Truck Model (NJSTM), a standard tool used for freight demand modeling in the state.

4. *Organize meetings/conversations with freight industry experts in New Jersey.* Meetings with stakeholders were held in order to complete the picture of the current and future state of port related traffic and potential for implementing the EBH concept in New Jersey. The research team organized meetings with:
 - a. Port terminal operators,
 - b. Trucking companies,
 - c. Steamship lines,
 - d. Warehouse/distribution center operators, and
 - e. Port Authority of NY & NJ and NJ Department of Transportation.

The stakeholder meetings were formatted as open discussions facilitated by NJIT research team members. The results of the first three subtasks were presented at the meetings in order to frame the discussion and entice the exchange of ideas.

The results of the technical analysis, review of similar practices, and meeting notes were compiled and analyzed and the major findings are discussed in the next chapter. That chapter ties together the results of the technical analysis conducted by NJIT and facts obtained from the stakeholders. The findings are the sole responsibility of the authors.

3.3. Summary

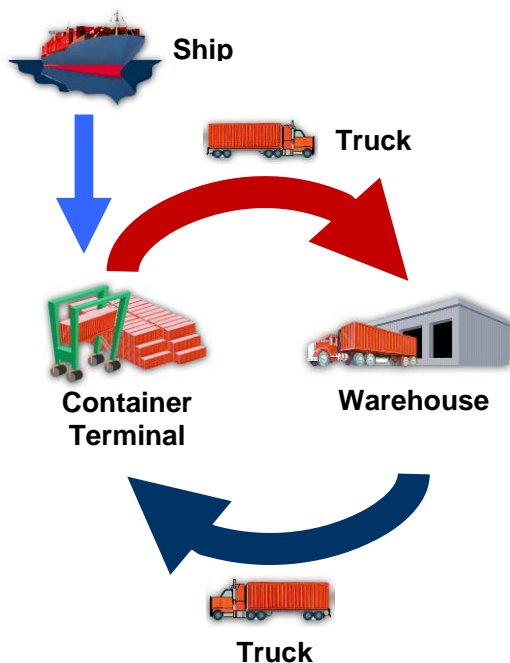
Extending business hours at the port container terminals and other facilities that handle marine containers (warehouses, distribution centers, truck terminals) beyond conventional operating times (usually 6 a.m. to 4 p.m. on weekdays) is recognized as a measure that can help increase the efficiency of the regional transportation system, and improve utilization of the available highway and port terminal capacity. In order to analyze the feasibility of this concept and implementation scenarios in New Jersey, NJIT identified the port stakeholders and reviewed their operating practices, reviewed similar extended business hours practices, analyzed the impact of the port generated truck traffic on New Jersey roadways, and organized meetings with regional freight

industry experts to discuss the extended business hours initiative. The findings of these research activities are presented further in this report.

4. BUSINESS PERSPECTIVE AND OPERATING PRACTICES OF STAKEHOLDERS

The previous chapter describes the concept and expected benefits of the extended business hours at the port and other (warehousing) facilities that handle containerized international marine cargo. A research approach designed to understand the issues surrounding implementation of this concept in New Jersey is described.

In order to ascertain the potential for success of the EBH concept, one must understand the business environment in which the stakeholders involved in the port operations operate, and analyze their goals and objectives, focusing on their commonalities. In addition to NJDOT, the EBHTF included representatives from the PANYNJ and private sector stakeholders that fall into the groups identified in Figure 4.1 below.



Stakeholders:

1. *Port Terminal Operators*
2. *Warehouses/DCs*
 - Public Warehouses
 - Regional Retail Distribution Centers
3. *Trucking Companies*
 - Owner Operators
 - Regional Trucking
 - National Trucking Companies
4. *Steamship Lines*

Figure 4.1. Private Sector Stakeholders of the Extended Business Hours Task Force

All four of the private industry stakeholder groups have the same basic objectives:

- Provide high-quality service;
- Manage costs and use proper pricing schemes to recover costs and maximize profit;
- Optimize the use of equipment and/or land (this translates into better productivity);
- Manage demand; spreading the peak demand should result in better utilization of equipment.

While the general objectives are similar, various stakeholders may have different perspectives, sometimes within the same sector. This made the study very challenging, but at the same time resulted in a clearer, more comprehensive understanding of the need, implementation obstacles and potential impacts of the EBH strategy.

In order to understand the stakeholders' attitude toward the EBH strategy, it is necessary to understand their particular business environments and objectives and how they make decisions. The perspectives of the stakeholders are described next.

4.1. Port Terminal Perspective

In making business decisions, port terminals must take into account the following costs:

- *Land Lease/Property Cost:* most of the port terminal operators lease land from the PANYNJ.
- *Other capital expenditures:* port terminals buy infrastructure such as terminal truck gates, and cargo handling equipment such as cranes, straddle carriers, top loaders, etc.
- *Operating expenses:* these include labor which is organized, utilities and equipment usage and maintenance. These also include overhead expenses such as insurance, marketing, etc.

The port terminal business is a capital cost intensive operation with high equipment cost (a new ship-to-shore crane can cost in excess of \$5,000,000). In a container terminal, a large steady

volume of containers is required to move through the terminal so that the high fixed cost can be spread over a large number of container units.

The ownership structure of port terminal operators at the PANYNJ container facilities is unique for the majority of terminals are not owned by the steamship lines or their subsidiaries (except the APM Terminal which is owned by A.P. Moller – Maersk). Therefore, the terminals have little flexibility in coordinating between their operations and ship schedules and have limited choice but to accept and accommodate the schedule of the steamship lines in order to keep their business.

The steamship industry is and always has been an “industry of peaks”. The arrival of each ship, especially the large post-panamax vessels, creates a discrete event and a mountain of containers to be discharged the moment the ship berths at the port. This event results in a large number of truck-tractors hauling containers entering the Northern New Jersey regional highway network. It is extremely difficult to “smooth out” the arrival of containers at the port and the corresponding demand on our highway network. However, a successful port terminal will try to stage the creation of ship arriving peaks by carefully scheduling and accommodating the ships at the port terminal so that these peaks can be translated/mapped into a uniform load for the port equipment.

4.1.1 Successful Strategy

A port terminal operator’s goal is far from obvious. As a private business, it needs to provide returns to its shareholders, thus it needs to maximize profit. Assuming that it markets its services properly, has a good handle on its capital and operating costs, and can price its services appropriately to meet market needs, the terminal operator can maximize profit using the following strategies:

- Increase the throughput of the cranes and at the gates, thus maximizing the utilization of the equipment. The cost of capital will be divided by (allocated to) an ever increasing number of containers, thus reducing an average cost of container handling.

- Partition the cargo by service (akin to the separation of air passengers to business and economy class) and charge higher rates/prices for higher quality (priority) service. This strategy would yield significantly higher revenue while the operating cost would increase only marginally. The end result is higher profitability.
- Spread the peak demand on the land side (truck pick-ups and drop-offs) to achieve a more uniform utilization of terminal and equipment capacity throughout the day. An appointment system for trucks picking-up and/or dropping off containers at the port is one example of a peak-spreading measure. Utilizing sophisticated load balancing and facility capacity charges more revenue can be generated, whereby shippers or truckers would have to pay (or pay more) for certain (more desirable) appointment times. This way utilization of the off-peak hours would increase, resulting in improved productivity of equipment that would have been sitting idle otherwise.

4.1.2 Ideal Conditions

Ideally, the port terminal operators want a uniform ship calling schedule as well as evenly distributed (throughout the hours of operation) container drop-offs and pick-ups. These conditions would allow for a more efficient use of terminal equipment.

Figure 4.2 shows that under ideal conditions in which the peak loads can be spread over time, the number of straddle carriers¹⁷ (green line) would be reduced compared to the current operations (red line) in which additional straddle carriers are needed in order to handle the peak demand. The red line in the graph can be thought of as a container yard's hourly-capacity: it shows the maximum number of trucks that can be handled in an hour with the existing straddle carrier fleet (or the required number of straddle carriers to handle a given truck demand.)¹⁸

¹⁷ Straddle carriers are heavy vehicles used in port terminals for moving and stacking marine containers. In this example straddle carriers are used for illustration purposes, although the same analysis applies to any other type of equipment for stacking and transporting containers in terminals.

¹⁸ The straddle carrier fleet will have to be slightly larger to allow for maintenance and down-time.

To ensure that the straddles are always working, the congestion outside the terminal gates must be reduced (or eliminated) and the high throughput of containers through the gate must be maintained. Under the ideal conditions, a port terminal operator would be able to better manage its service, its demand, as well as its pricing functions. The objective, which would be accomplished under ideal conditions, is to increase profit while growing volume and improving productivity. A reservation or appointment system with proper pricing mechanisms may result in the spreading of the peak in addition to achieving better use of equipment.

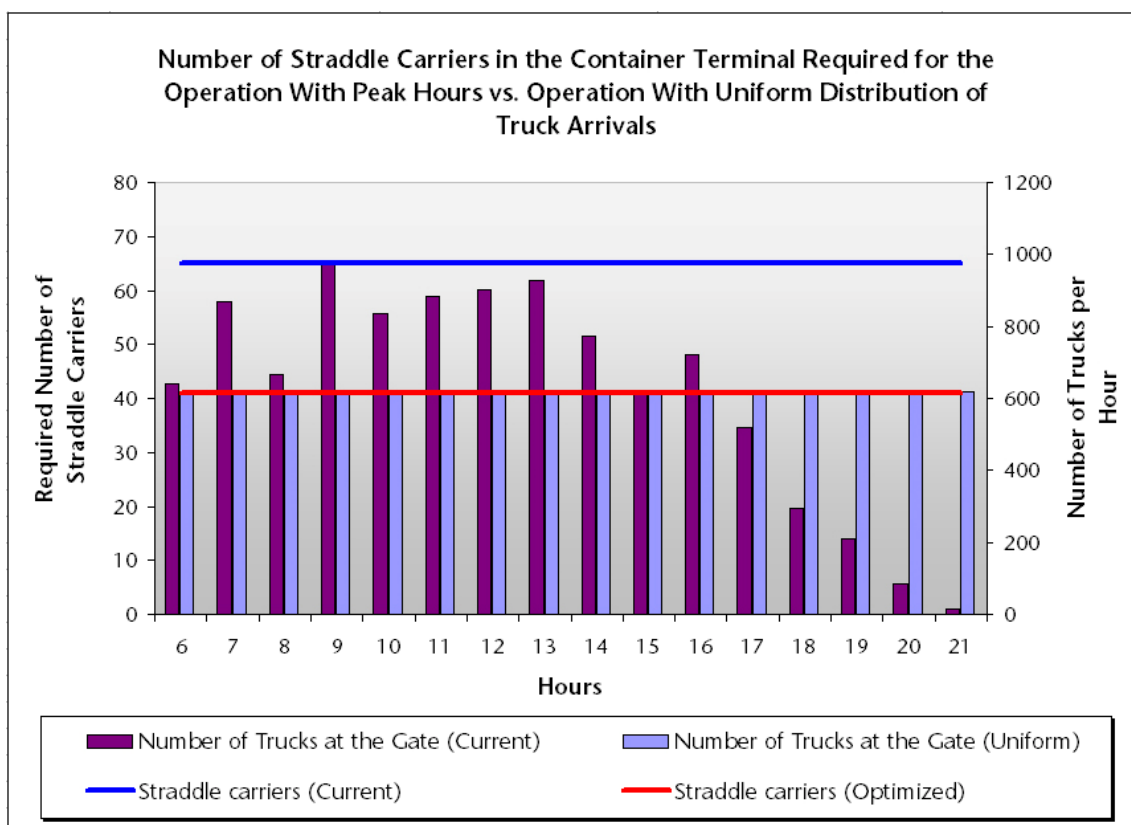


Figure 4.2. Comparison of typical versus ideal straddle carrier operations at a port terminal

4.2. Trucking Companies’ Perspective

Compared to other modes (e.g. rail or barge), trucking requires a much lower capital investment. Trucks are relatively easy to acquire, licensing and insurance fees are manageable, and the

terminals do not require a large amount of land. On the other hand, trucking has high operating cost with a driver hauling a single truck trailer or container. The price of fuel is a significant portion of the operating cost.

The costs include:

- *Capital expenditures* including truck ownership, storage/maintenance yards
- *Operating expenses* including labor, fuel (usually on a per-mile basis), and truck maintenance.

4.2.1 Ideal Conditions

The trucking companies strive to maximize the load factor of their fleets. In other words, their objective is to minimize unproductive or empty miles that are incidental to loaded movements. The unproductive miles involve moving an empty container or trailer – deadheading, and moving the truck-tractor for repositioning – bobtailing. Truckers can significantly increase equipment productivity by extending the use of equipment during off-hours (e.g. by adding a third shift). Truckers can offer competitive rates because the equipment cost can be spread over longer operating hours. Such competitive pricing allows the trucking company to be more competitive in the market.

Time windows – time periods during which a trucker is allowed to visit the customer – decrease the opportunity for the trucker to match the loads and increase productive mileage. The removal of time windows, and having longer business hours during which a trucker could call on the customer, would improve the productivity and reduce the unit cost of the trucking operation.

Figures 4.3 - 4.6 show different off-peak scenarios from a trucker's point of view illustrating the impact of partial implementation of off-peak work hours at port terminals and warehousing facilities. Scenarios 1 and 2 deal with the port terminal side of the trucking operation and illustrate the difference between the ideal conditions in which all port terminals are open and a situation in which the trucker cannot pick-up the next load from an adjacent terminal because it is closed during the off-peak.

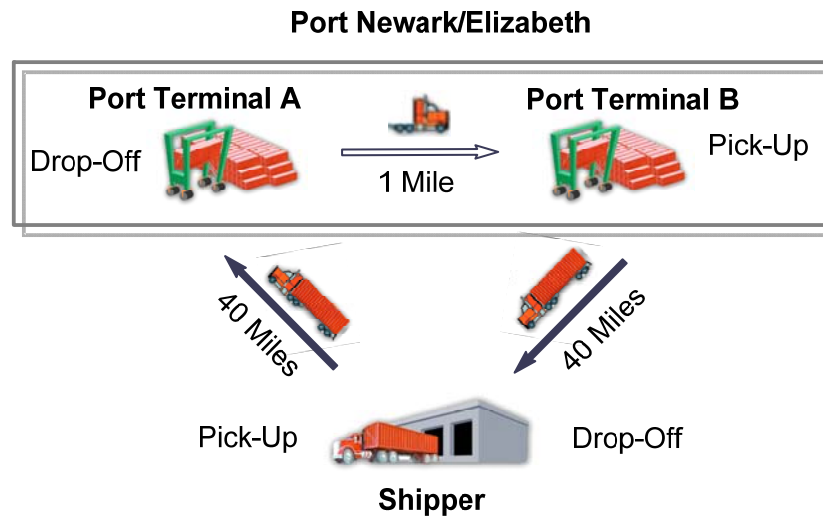


Figure 4.3. Scenario 1: Ideal conditions. All port terminals and shipper warehouses are open during the Off-Peak, providing optimized efficiency with minimum empty trips. In this example a truck accomplishes 2 drop-offs and pick-ups, hence traveling 40.5 miles per container move.

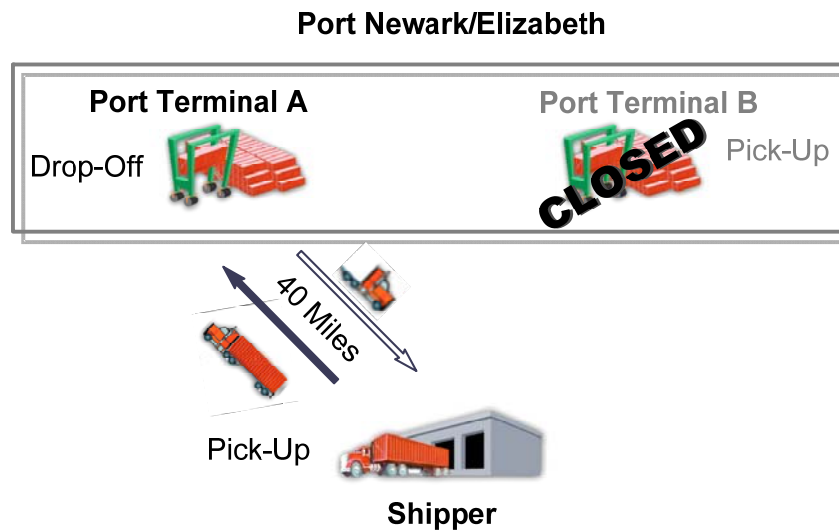


Figure 4.4. Scenario 2: One port terminal is closed during off-peak. This adds a constraint to truckers as to available pick-up/drop-off alternatives and can cause an inability to match loads, resulting in additional empty miles. In this extreme example the truck productivity decreased by 50% as the distance per container move almost doubles from 40.5 miles to 80 miles.

In Scenario 1, shown in Figure 4.3, the trucker can successfully complete the triangulation (street turn) and connect a drop-off with a pick-up within the port complex. In Scenario 2 (Figure 4.4) the trucker is limited to operate only at open facilities. This results in significant “empty miles”, decreased productivity and thus inefficient operation with high costs.

A similar comparison could be developed for the shipper (warehousing) side of drayage (Scenarios 3 and 4, shown in Figures 4.5 and 4.6). These examples show that productivity can be doubled if all the facilities are open and available for a pick-up/drop-off allowing for the triangulation.

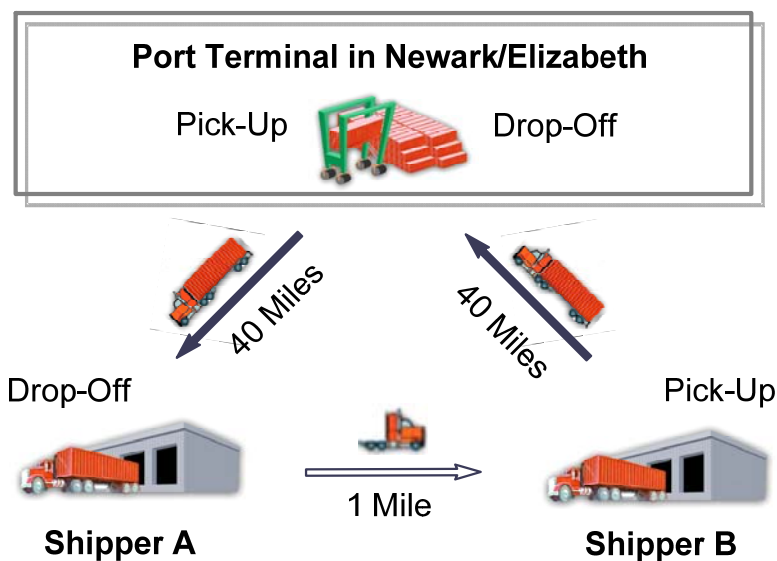


Figure 4.5. Scenario 3: All (major) shippers open during off-peak. Similar to Scenario 1, all port terminals and shipper warehouses are open during the off-peak, providing optimized efficiency with minimum empty (unproductive) trips and vehicle-miles.

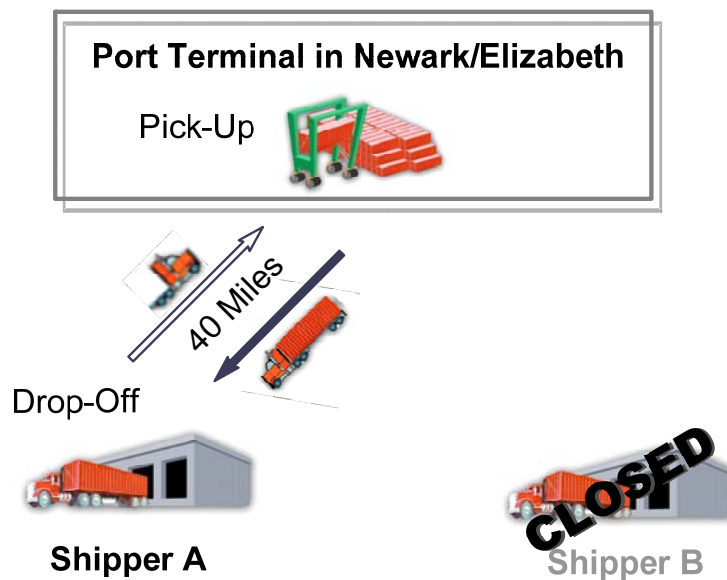


Figure 4.6. Scenario 4: Adjacent shipper closed. As in the example in Scenario 2, this adds a constraint to truckers as to available pick-up/drop-off alternatives, causing an inability to match loads and creating additional unproductive truck-miles. Similarly to Scenario #2, productivity in this example decreased by 50% as the cost per container move almost doubled.

Trucking companies want volume to be balanced by direction thus minimizing the amount of empty miles traveled. They would like to see flexible time windows at the port terminal as well as the warehouse/distribution center side. This would allow for better scheduling and load matching. Ideally all terminals would be open during the off-peak (i.e. evening and late night) hours thus enabling a drop-off of one container at one terminal and a pick-up of a return container either at the same or adjacent terminal during this time as illustrated in Scenario 1 in Figure 4.3. Any constraint such as a closed terminal or warehouse has the potential to decrease the efficiency of trucking operation (e.g. by 50% in Scenarios 2). If a trucking company were to have a secured yard that allows short-term storage (e.g. overnight) of containers, the impact of time windows would be somewhat alleviated. This is not very common but it does provide some form of a solution that may make running trucks during the evening and/or late night hours possible provided one end of the pick-up/drop-off remains open.

4.3. Warehouses/Distribution Centers' Perspective

The costs include:

- Facility Purchase/Lease.
- *Capital expenditures* including all of the required equipment.
- *Operating expenses* including labor, utilities and equipment wear and tear, and maintenance.

4.3.1 Road to Success

Establishing a warehouse/distribution center can be quite capital intensive with the involvement of land, building and warehousing equipment. Some of them can be specialized with highly automated computerized inventory retrieval systems. The operators' objective is to increase the throughput of inventory units so that the average inventory/storage cost per unit (e.g. pallet, or stock-keeping unit (SKU)) is minimized. The quick turnaround of goods would increase the productivity per unit of equipment or square foot of space.

4.3.2 Ideal Conditions

The warehouse/distribution center operators would like to see increased reliability in scheduling truck arrivals/departures allowing for better planning of labor needs and equipment utilization. This would result in increased efficiency while maintaining high levels of productivity.

4.4. Steamship Line Perspective

Steamship lines face the following costs:

- *Vessel cost* – the capital cost of owning or leasing a vessel
- *Port Terminal Costs* – the capital cost of owning or leasing the terminal.

- *Operating expenses* – including labor, utilities and equipment wear and tear, terminal vessel charges, and maintenance. If the steamship line calls on an independent terminal, the rate it is charged for handling a container becomes an operating cost.

The industry is a high capital and high operating cost industry because it requires fixed costs for vessels and terminal berths and highly skilled labor.

4.4.1 Road to Success

Given the high capital cost, the steamship line needs to have vessels processed (unloaded/loaded) at the port terminals quickly so that they can be on their way and deployed on another revenue generating trip.

The size of vessels is governed by the economics. Usually, the impetus for the trend in increasing vessel size is the accompanying decreasing average cost on a per container basis. The large capital cost dictates that the ship limits the time and frequency of port calls – bigger ships move between two hub ports while the hub ports are serviced by smaller ships arriving from feeder ports. The ability of a larger vessel to call a port is also governed by the port constraints, such as channel depth and air draft.

The steamship industry deals with peaking phenomena due to the increased consumer demand in advance of the Christmas and Hanukkah gift giving season. A ship arrival creates a need for equipment and space at the port terminals, as well as highway capacity. Steamship lines that own their port terminals can to some extent coordinate terminal operations with ship arrivals through sailing schedules and scheduled calls of their ships. The schedule can be adjusted so that the constant stream of containers is maintained. The uniform flow results in the handling equipment being fully utilized all the time.

At the Port Newark/Elizabeth, steamship lines control pick-up and delivery schedules and drayage (hauling) operations for 60% of containers. Steamship lines in those cases contract drayage truckers to deliver containers to (or pick containers up at) the consignee's, and therefore may be able to institute practices that encourage off-peak drayage. On the other hand, many

consignees use multiple steamship lines to bring in their international cargo, making it hard to coordinate container pick up and delivery schedules. For various reasons, including economics and antitrust immunity issues, steamship lines have been unenthusiastic about exchanging chassis or containers, or participating in pools to coordinate this exchange. These practices, however, could contribute to better utilization of trucks and container equipment, and make container pick-ups and deliveries during evening hours a more viable option both for port terminals and warehousing facilities (or other consignee sites).

4.4.2 Deciding on Ports of Call

In making a decision which port of call to use to enter the New York market, a shipper and a steamship line have multiple cost components to consider. The market can be accessed from the Port Newark/Elizabeth (or other PANYNJ port facilities in New Jersey and New York), or from other ports on the eastern seaboard, including Baltimore, Boston, Norfolk, or even Halifax, Canada. All of these are a relatively short train or truck ride away. A shipping line will likely prefer Port Newark/Elizabeth if the profit¹⁹ it earns there is larger than what it would make if diverted to another port.

Given that the revenue portion can be assumed to be fixed (it is a function of what the market can bear in a particular traffic lane), the port choice criterion is reduced to minimizing the transportation cost. Thus, the port option that will yield the lowest cost will be chosen. The process by which the steamship companies choose among the ports of entry into the New York metropolitan market is shown in Figure 4.7.

4.4.3 Value of Cargo as a Determining Factor for Port Selection

The value of cargo is also a factor in determining the route and thus the port of entry a steamship line will select to access the market. Low value goods are price-elastic with respect to the shipping rate (i.e. transportation cost) and the increase in the transportation cost may cause a change in

¹⁹ Profit = Transportation Revenue – Transportation Cost (vessel operating cost, terminal fee, truck drayage rate, rail line haul, inventory cost in transit, etc.)

the port of entry. For example, if it becomes cost prohibitive to deliver a container through Port Newark/Elizabeth, rerouting the ship to Baltimore and moving the freight from there by rail and/or truck can be an attractive option.

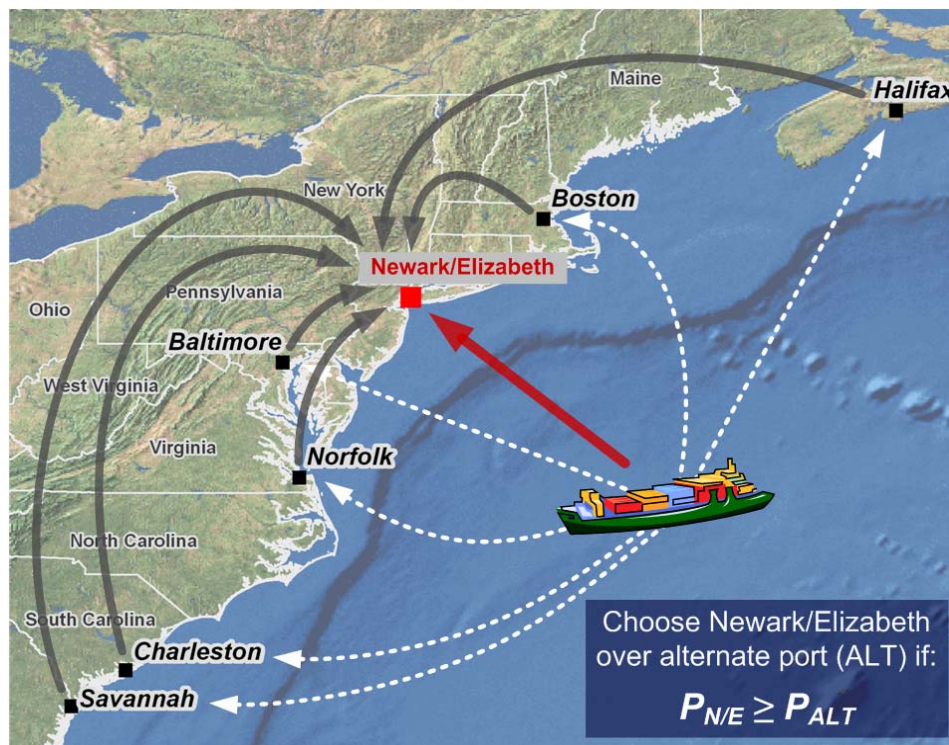


Figure 4.7. Selection of the port of entry for the Port Newark/Elizabeth (P = profit)

Time sensitive and rate inelastic goods, which are usually goods of high value, demand that they be delivered in a timely fashion and with short transit times. In this case, Port Newark/Elizabeth will remain the only viable option.

Congestion can impose additional cost on the speed of delivery. The knowledge of the nature of goods and their sensitivity with respect to the rate and time/speed is a critical factor to consider when strategic decisions are made to select the port of call for a shipment.

4.5. Regulatory Agencies' Perspective

The role of a regulatory agency is to manage public infrastructure as entrusted by society. In doing so, it needs to:

- Be cognizant of the externalities – the cost they impose on the society;
- Internalize these costs and behave responsibly;
- Consider both investment and operating measures (e.g., EBH) to manage supply and demand.

Besides private industry stakeholders, regulatory agencies also play an important role in creating conditions for an efficient regional freight transportation system. PANYNJ is a bi-state agency responsible for managing, maintaining, and developing the seaport. The NJDOT is responsible for managing, maintaining, and developing transportation infrastructure and providing an efficient and safe transportation system in the State of New Jersey. Together these two organizations have the ability (and obligation) to influence regional movement of people and goods by implementing transportation policies and regulations. Both NJDOT and PANYNJ recognize the challenges facing the region and especially the port and have been proactive in implementing a variety of measures including both infrastructure improvements and regulatory policies to ensure unimpeded port development and growth. However, they are also aware of a limited ability they have for physically expanding capacity of both port terminals and the adjacent highways to accommodate the growing container and truck traffic. Therefore, solutions designed to increase the efficiency and utilization of available infrastructure (e.g., extended business hours at freight handling facilities) rather than building new capacity are becoming more desirable for both PANYNJ and NJDOT.

However, both agencies recognize obstacles to implementation of EBH and potential shortcomings of incentive/disincentive programs that would promote implementation of this concept. These are outlined in [Section 5.5.3](#) of this report.

4.6. Summary

Understanding the roles, operating characteristics and business objectives of the stakeholders involved in container transport, is crucial for assessing the impact and feasibility of implementing the concept of extended hours of operation. The objective of port operators, truck operators, and shippers (i.e. warehouses and distribution centers that handle their cargo) is to maximize their respective profits by minimizing costs associated with container movements. This is accomplished by maximizing the efficiency of operations, including utilization of their equipment and workforce. Therefore, as long as the EBH provide higher savings through improved efficiency than costs associated with its implementation, the stakeholders would be interested in it. However, due to the nature of the container shipping process which connects the stakeholders and can only work through interactions among them, the EBH strategy can be successful only if all stakeholders participate. This participation would include port terminals, warehouses, steamship lines, trucking companies, truck and container depots, and other freight facilities where marine containers are picked-up or delivered.

Regulatory agencies can also benefit from this concept because it would effectively shift some of the peak period traffic to off peak bringing about better utilization and increased efficiency of the overall regional transportation system. This in turn can impact future investments in the regional transportation infrastructure as available funds are limited and may not be sufficient to meet the growing need for additional infrastructure capacity. Higher efficiency and better utilization of the available capacity would certainly help better manage both demand and future infrastructure investments.

5. FINDINGS ON POTENTIAL VIABILITY OF THE EXTENDED BUSINESS HOURS CONCEPT IN NEW JERSEY

In previous chapter we ascertained the need for all stakeholders to participate in extended hours of operation in order for the concept to be successful. It is also clear that that all stakeholders ultimately have to have an economic benefit from extending hours of operation. To get a better understanding of feasibility, as well as obstacles for implementing EBH concept in New Jersey, a series of meetings was organized by the EBH Task Force with all relevant stakeholders to discuss their perspectives, ideas, and experiences with the EBH concept. In this chapter we summarize the findings from these meetings, as well as relevant studies and industry sources that provided additional information about EBH concept and related issues. The findings are summarized by stakeholder as this seemed to be the best way of describing issues surrounding the implementation of the EBH.

5.1. Port Terminals Perspective and Implementation Experience

Two port terminal operators in New Jersey have implemented extended gate business hours on a regular basis: Maher Terminals in Port Elizabeth, and Port Newark Container Terminal in Port Newark. The other terminals considered implementing similar programs, but concluded that operating conditions and demand did not warrant the required investment and effort to implement the programs.

5.1.1 *Extended Hours of Operation at Maher Terminals, Inc.*

Maher Terminals in Port Elizabeth has been operating off-peak hours (until 10 p.m.) at the truck gates for almost three years. The terminal management analyzed the terminal's operating conditions and concluded it already had enough container volume at the time to warrant longer hours of operation in order to keep the fluidity of the terminal operations. However, the program has generated little success as the shift of truck traffic to the off-peak is still not substantial enough to make the operation cost-effective for Maher Terminals. Only 7% of daily truck moves take place during the extended hours despite the much shorter turn times (e.g., 30 minutes

during off-peak versus one hour or more during the peak hours). On the average the terminal handles 5,000 - 6,000 truck moves per day.

Figure 5.1 below shows the hourly distribution of trucks at Maher Terminal gates by date. The low volumes shown in the data will not make the EBH strategy cost effective. Due to low truck turnout and underutilization of off-peak (evening) gate hours, the savings in capacity, efficiency, and equipment one would hope to achieve with extended business hours, are smaller than the costs associated with operating the terminal during the extended hours. Basic economic principles suggest that if any operational strategy to improve terminal efficiency is to be successful, i.e. cost effective, it must generate savings that at least cover variable cost associated with it. The variable cost in this case includes labor and part of equipment-related operating expenses. A cost-effective (or rather break-even) operation would be achieved if the revenue from the off-peak trucks would at least offset the additional operating cost at the terminal.

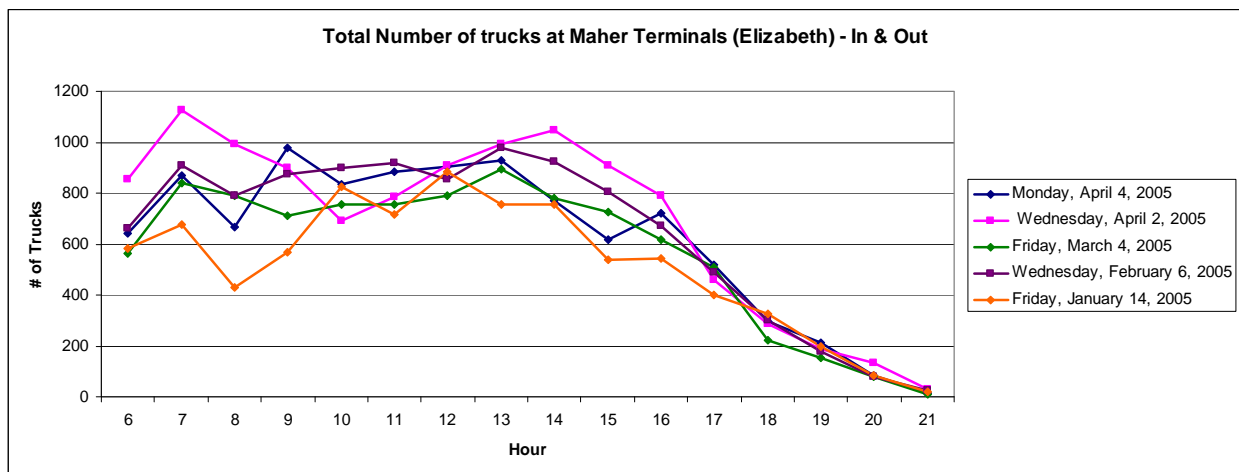


Figure 5.1. Maher Terminal Truck Gate Volumes.²⁰

For the reasons stated above, the extended gate hours at Maher Terminals is currently not economically self-sustaining. However, Maher Terminals continue to operate late evening gate

²⁰ Source: Maher Terminals Inc.

hours as part of a global marketing strategy in order to position itself as THE leading port terminal on the eastern U.S. seaboard. Maher Terminals remain committed to this type of operation as it provides a great service to many of its largest customers. Maher feels that this is the best way of preparing for the arrival of large post-panamax container ships and the projected growth in container traffic.

Several questions arise from this Maher Terminals case study:

1. What percentage of trucks during the off-peak hours would make this operation economical?
2. Why is the trucking industry's acceptance of the extended gate hours at the ports, as measured by the turnout, so poor?
3. Would some kind of incentive/disincentive program increase the truck turnout?

These questions are addressed further in this chapter.

5.1.2 Extended Hours of Operation at Port Newark Container Terminal

Port Newark Container Terminal (PNCT) operated extended terminal hours during the peak season in 2005 in order to handle containers more efficiently. Every Tuesday and Thursday during October and November of 2005 the gates were open until 8 p.m., or four additional hours over the regular gate hours. PNCT implemented this program after a meeting with the Association of Bi-State Motor Carriers to discuss truckers' concerns over queuing outside the terminal and long turn times. It was concluded that implementing extended gate hours could help alleviate these problems. However, PNCT has found the extended hours program to be unsuccessful, as very few truckers (single digits in terms of daily percentage) were utilizing the off-peak hours despite the much shorter turn times (e.g., 30 minutes during the off-peak, versus one hour or more during the peak). Although daily container volumes were and still are large enough to support extended gate hours (generating around 2,500 – 3,000 truck moves per day), PNCT will not continue operating off-peak if truck volumes during that period do not increase.

5.1.3 Other Terminals' Perspective

The **APM Terminal** in Port Elizabeth considered implementing extended truck gate hours but gave up the idea after a thorough analysis. The APM terminal management concluded that it would probably be able to improve the efficiency of gate and overall terminal operations by implementing automation technologies at the gates and other parts of the terminal. They believe that this would be more effective than extending the hours of operation at the gates. The average turn time at APM Terminal in 2006 was around 55 minutes. APM introduced the idea of an online appointment system as a potential way of making the gate operation more efficient. However, initial discussions about this initiative did not seem to generate enthusiasm among truckers.

New York Container Terminal (NYCT), which operates the former Howland Hook Terminal on Staten Island, NY, and **Global Container Terminal** in Bayonne, NJ, have offered late gate hours on “as needed” basis when business warranted. However, these terminals have not considered operating extended gate hours on a regular basis as the volumes are not large enough to warrant this type of operation. NYCT has short turn times compared to other larger terminals and therefore has no need to pursue extended gate hours at this time. Their average turn time in 2006 was 30 minutes with 80% under 25 minutes. Of the pick-ups and drop-offs where there was a problem, turn times were still within 45 minutes.

5.1.4 Terminal Capacity Utilization and Profitability as Business Factors of Implementing Extended Hours of Operation

A critical component of the port terminal operations, and the one that may ultimately drive the introduction of the Extended Business Hours strategy, is limited terminal capacity. The land occupied by the terminals is finite and cannot be expanded. While the terminal operators work on improving the efficiency of their terminals every day, the impact of such changes cannot solve the problem alone. The containers must be able to be moved off terminal quickly and efficiently. There are two ways to accomplish this: eliminate bottlenecks immediately outside the port terminal gates and/or extend the business hours of operation at the terminal gates. Ideally, the solution would involve both strategies and result in smoother, more efficient access to/from the

terminals as well as more access to the terminals as the gate hours are extended. Additionally, extending the gate hours would enable the trucks to travel on roadways under less congested conditions. The quick and efficient transfer of containers off of the capacity-constrained terminal lots will only become a more serious concern as the projected growth of container traffic continues, eventually driven by the arrival of the large post-panamax container ships.

In addition, if (or when) the container volume becomes higher than the capacity dictated by the current daily operating hours, port terminals would have no other option but to extend gate hours if they are to meet customers' demand. According to the terminal officials who participated in the EBHTF meetings, the port is not in this situation yet, i.e. container volumes handled by the port have not reached the port capacity. However, it would be beneficial to ascertain the ultimate port container handling capacity under the current operating hours and compare it to anticipated growth in demand. This would help paint a picture of what the future will look like and when a strategy for increasing capacity (other than physical expansion of course) would have to be implemented.

Some Task Force participants from the port terminal community believe that ultimately profitability will drive the implementation and success of extended hours of operation. As the port reaches capacity, it is believed that market forces will intervene in search of other options such as off-peak or extended hours of operations. This line of reasoning however does not address the issue of landside congestion and bottlenecks that exist in the regional highway system that serves port truck traffic. As such, the highway capacity issue has to be looked at in a systematic fashion and be analyzed together with port terminal capacity and operating efficiency.

5.1.5 Labor Issues vis-à-vis Extended Gate Hours

The current International Longshoremen's Association (ILA) contract does not allow terminals to operate in shifts. In order to stay open off-peak, the terminals must keep employees overtime. This includes the full crew (not just gate operators) although there may be no ships to unload. This requirement necessarily increases the cost of operating extended gate hours (and cost per container move). Additionally, the day after an overtime shift there is a tendency for terminal employees to not come to work leading to a labor shortage as was recently experienced at PNCT.

However, while this is an important cost consideration, the terminals task force representatives did not think they were critical enough to make or break the decision to implement the EBH (the terminals can handle this through contract negotiations, etc.). As long as a sufficient volume of containers can be generated over which this labor charge can be spread, the EBH is a viable concept. By contrast, the southern ports (e.g., Norfolk, Virginia, and Savannah, Georgia) have a more flexible position in terms of labor, i.e. they do not experience the same labor requirements as the PONYNJ.

5.1.6 Port Market Competition as a Factor

Most of the port terminal representatives present at the Task Force meetings agreed that a large part of the container market currently served through PONYNJ is captive to our ports. However, according to the participants in the Task Force meeting with terminal operators, “port alternate” cargo, or cargo that could shift to other ports if they provide more efficient and cost-effective linkages to final destinations, represents about 15-20% of the current port container market. This market has a great potential for rapid growth in the near future as shippers shun the trip from POLALB and across the mini-landbridge to the East Coast but rather use the all-water service from Asia. Terminal operators at the PONYNJ are currently positioning themselves to capture this growth. However, if the cost or difficulty of shipping this cargo through the PONYNJ increases in the future, it could shift to other ports such as Norfolk (and other Virginia ports) or Savannah. Terminal operators at the PONYNJ want to preempt this scenario, mainly through improvements in terminal capacity and efficiency. However, the issue of congestion outside of their gates will have to be addressed as well, since the growing traffic and delays on the regional highway network make the port drayage business less and less productive and efficient.

5.2. The California Experience and Steamship Lines’ Perspective

The Ports of Los Angeles and Long Beach in California introduced a program called OffPeak in July 2005 with the objective to shift port related truck traffic from peak to off-peak hours of the day, i.e. to evening and night hours when there is less congestion on nearby highways. The program came into existence through a collaborative effort between port stakeholders, including port terminals (most of which are operated by steamship lines), shippers, port authorities, and

labor unions. However, it was not entirely a voluntary effort, but rather one that came about as a result of strong and persistent political pressure from the state legislature related to negative environmental impacts generated by the port drayage operations. The port trucking community also did not endorse the program at the time of its inception but had to go along and adjust to it once it was put in place.

The idea behind the program was to extend business hours of the port terminals and institute a Peak Traffic Mitigation Fees (TMF), which would be in effect during peak hours, thus encouraging truckers (and shippers) to utilize off-peak hours to the maximum extent possible. This in effect induces the spreading of peak period congestion onto the off-peak. At the same time the proceeds from the fee collection would be used to offset (or pay for) costs associated with operating an extra shift at terminals from Mondays through Fridays. Port terminal operators created a not-for-profit company called PierPASS Inc. to operate the OffPeak program which is charged with collecting TMF from shippers, consignees or their agents.

The terminal hours of operation at the POLALB are as follows:

- Off Peak Hours: 6 p.m. to 3 a.m. (Monday through Thursday) and 8 a.m. to 6 p.m. on Saturday;
- Peak Hours: 3 a.m. to 6 p.m. (Monday through Friday).

The TMF fee structure is as follows:

- \$50/TEU during the peak hours (initially was \$40);
- No TMF is charged for empty containers and chassis, domestic containers, transshipments to other ports or for intermodals that use the Alameda Corridor;
- No TMF is charged during the off-peak hours.

5.2.1 Impact of the OffPeak Program

In July 2008, marking a three-year operation milestone of the OffPeak program, PierPASS Inc. announced that the program has diverted more than 9 million truck trips from peak daytime

traffic since the program began.²¹ This translates to approximately 68,000 weekly peak truck trips or around 40 percent of all daily container movements. The initial plan to sunset the program after three years of operation has been abandoned given the OffPeak's tremendous success.

5.2.2 Contributing Factors in Establishing the OffPeak Program and Comparison with New Jersey

While the OffPeak program is considered a great success in Southern California, an overwhelming majority of the EBHTF members agreed that one could not expect that program to find similar success if implemented at the PONYNJ container terminals. California's OffPeak program is seen as unique given that it came about as a response to persistent political pressure from the environmental lobby and the particular political and business climate in that state. The South Coast Air Quality Management District (SCAQMD), which to a large extent forced the issue of extended gate hours at port terminals in Southern California, has significant regulatory authority and powers. This includes the ability of SCAQMD to levy significant fines for failure to comply with its mandates once they are set. In comparison, there does not seem to be an equivalent force in the New Jersey/New York metro area that could play a similar role. In addition, air quality is not as dire issue in New Jersey/New York as it is in Southern California. Hence, getting public support for forcing the issue of extended hours of operation in New Jersey on clean air grounds is less likely to be effective.

There are also many characteristics of the POLALB, namely operational, labor and location that led to OffPeak Program's taking root there, and they are different from the conditions that exist at the PONYNJ. The port terminals at POLALB are run by the steamship lines, making coordination easier than at the PONYNJ where the terminals, except for APM, are privately owned and independent of steamship lines. At the POLALB, the facilities, schedules, bookings, container pick-ups and deliveries are virtually controlled by the shipping lines. This allows them to coordinate resources and have a better handle of the overall logistics. A successful implementation of the EBH at the terminal gates, and/or at any other part of the supply chain in

²¹ "PierPASS OffPeak Program Diverts More Than Nine Million Truck Trips from Daytime Traffic over First Three Years of Operation," PierPASS Inc. press release, July 23, 2008. Available online on the PierPASS website at: http://www.pierpass.org/press_room/releases/?id=66 (accessed July 24th, 2008).

the PONYNJ region will require greater coordination and collaboration of all involved parties, especially among steamship lines, terminals, and shippers. In addition to differences in port operator characteristics, the size and makeup of the customers at the two ports differ as well. Seventy-one percent of the customer base at PONYNJ consists of shippers moving less than 100 containers per year. In marked contrast, POLALB handles cargo predominantly for large national shippers.

Consequently, the steamship line representatives that participated in EBHTF discussions suggested that a solution in New York and New Jersey should be developed independently through a truly collaborative effort among all stakeholders. They also suggested that an appointment system for port truckers could be more feasible in New Jersey than extended gate hours, and thus should be studied as an alternative. The appointment system as an alternative to the EBH concept is discussed in [Section 5.5.2](#) of this report.

5.2.3 Truckers' Representatives Stakeholders' Comments on the OffPeak Program

Finally, truckers that participated in the EBHTF discussions feel that a success of the OffPeak program especially with regards to truckers is questionable. They felt that the benefits of the program in California did not trickle down to the truckers as the drayage rates were not adjusted to include any compensation for operating trucks in the evenings and late nights.

5.3. Trucking Perspective and Experience in New Jersey

Independent contractors (owner operators) make up the majority of the trucking operation involved in drayage of marine containers in New Jersey. According to a PANYNJ truck origin-destination study conducted in 2005²², owner operators operate about 64% of port drayage trips in New Jersey. They get paid by the load/movement, and therefore their business model is different from the bigger trucking companies with hired drivers who get paid by the hour. Truckers who participated in the Task Force meetings expressed that they would welcome any

²² "Port Authority Marine Container Terminals Truck Origin-Destination Survey 2005," Final Report, Prepared for the Port Authority of New York and New Jersey by Vollmer Associates, 2006.

change that can result in increasing the productivity of their moves. They acknowledge that working during the off-peak hours is more efficient for truckers: a trip that during the day may take 2 hours can be completed in 45 minutes at night.

However, it appears that for most of the truckers there was no real benefit of using the extended gate hours at Maher Terminal and PNCT. The main reason, as they suggested, is that in the evenings and late at nights, there are not many customers who are open. Therefore, once they pick up a container from the port, truckers have nowhere to go. Larger trucking companies have secured yards where their drivers can drop-off container chassis after the shippers' facilities close for the day which can then be delivered next day. But small trucking companies and owner-operators, who make up the majority of drayage fleet in New Jersey and New York ports, do not have secured container yards for overnight container/chassis storage. In that sense, truckers said that having such a facility relatively close to port and their customers would allow them and shippers more flexibility in arranging container pick-ups and deliveries, improve turn times, and provide conditions for better utilization of off-peak hours at the port. The concept of moving containers off of the terminal property to a point inland where they can be redistributed is something that is currently being considered by the PANYNJ under their Portfields Initiative. Similar to this is a concept of an inland port distribution network, whereby trucks can shuttle containers off of the port at night to an inland container staging area or depot approximately 10 miles away. This would move containers outside of the congested port region during daytime hours and free up daytime capacity at the port and on the roadway network adjacent to the port.

While the overwhelming majority of the port trucking operation takes place during the peak daytime hours (even when port terminals are open late in the evening), there are several companies that are taking advantage of the extended truck gate hours. A good example is a company that has found a frequent customer in Rhode Island and has added the third shift to some of the trucks in its fleet. A truck can pick-up a container for this customer from the port terminal in the evening, drive it overnight to its destination, and arrive in time for an early morning delivery. As a result, the truck avoids peak congestion at the port terminal, along the way to Rhode Island, and at the customer's terminal. This situation has had a tremendous (positive) impact on that trucking company's productivity.

5.3.1 Driver Shortage

The issues of driver shortage came up in discussions about the economics of port drayage business. While trucking companies would shift operations to the off peak hours if desired conditions were present, they feel that the ongoing driver shortage would need to be addressed to fully implement the strategy of extended business hours. However, it seems logical that extending business hours to off-peak (evening and night) should have a positive effect on recruiting new drivers for it opens the profession to those that want to operate in local drayage but are not otherwise available. There is obviously a question of compensation for working in evenings and nights, and this will have to be addressed by shippers and truckers when it comes to implementing extended hours of operation.

5.4. Warehousing Perspective of the Extended Business Hours

As explained in [Section 4.2.1](#) of this report, the concept of utilizing extended business hours to divert truck traffic to off-peak (evening and night) hours would only work from an economic perspective if both container pick-up and drop-off locations are open to truckers. Although the number or percentage of regional warehousing facilities that stay open after outside of conventional business hours is unknown, anecdotal evidence indicates that many big warehousing facilities do stay open in evenings or nights (some even 24/7). For example, our study found that East Coast Warehousing in Elizabeth, Linens 'n' Things in Swedesboro, and IKEA in Elizabeth are open during the off peak. However, only some of them ship or receive containers during those hours. Most shippers use this time to load and unload containers and trailers, stack pallets and repackage goods if necessary. Some warehousing and distribution facilities may not operate extended business hours, but have secure truck or trailer yards attached to their facilities that allow trucks to drop-off containers after hours (even during the night). This is not a very common practice but does alleviate some of the truckers' concerns and may convince them to operate off-peak. Still, there are a number of warehouses and distribution centers that do not operate off peak at all. The main reason for this is that they do not have the volume required to justify an additional shift of labor and other expenses associated with keeping the facility open and running with extended business hours.

A recent study conducted by NJIT outlines the factors driving the selection of sites and geographic locations for distribution facilities in Northern New Jersey metropolitan region.²³ The study concluded that there is a trend of large retailers consolidating their distribution and warehousing functions in a single or small number of large, highly automated and efficient facilities, with large square footage. This trend indicates that big retailers are potentially the biggest receivers of import cargo, but third party logistics (3PL) warehouses that consolidate cargo for multiple shippers continue to occupy a significant part of the market, and have to be considered when analyzing where the containers are going. It would be very beneficial to know not only who the biggest shippers are at Port Newark/Elizabeth (Wal-Mart, Home Depot, GAP Inc.), but also where and in what kind of facilities the majority of containers go after they leave the port terminals (e.g. distribution center “A” at exit 8A – 15 TEU/day, public warehouse “B” in Meadowlands – 25 TEU/day, etc.). At this point it is unclear which DCs are open in the evenings to accept deliveries, both in terms of approximate number/percentage and container volume.

5.5. Regional Transportation Planning Perspective

When discussing the extended business hours at the port terminals in New Jersey with representatives of the PANYNJ and NJDOT, several important questions emerged:

1. What is the impact of the port truck traffic on regional highway system, and how effective would extended hours of operation at freight terminals be in increasing the efficiency of the system and reducing congestion?
2. Besides extending the gate hours, are there other options worth exploring? What about an appointment system?
3. Can incentives/fees be used to help change truck traffic patterns and shift the truck trips to less congested times of day?
4. How to get buy-in from the industry and communities for implementing late night and/or early morning freight pick-ups and deliveries?

²³ “Cashing in on New Jersey’s Economic Engine,” International Intermodal Transportation Center, Task 6: Market Analysis, Final Report. Published by NJIT. Available at http://www.transportation.njit.edu/iitc/Reports/IITC_Task%206.pdf

These issues are further addressed in the discussion that follows.

5.5.1 Impact of port container traffic on regional highway system

To quantify the impact of port-related truck traffic on regional highway congestion, it would be necessary to determine the portion of the overall truck traffic that is port-related. Also, in order to quantify potential benefit of extended hours of operation at the port as a congestion reducing strategy, it would be important to know how the movement of these trucks varies by hour of the day as well as day of the week. Since this kind of information is not readily available, NJIT conducted a preliminary analysis of the port-related freight traffic in an attempt to provide a context for the analysis of possible effects of extending hours of operation at the port.

The analysis focused on two elements of the port freight traffic: port-related truck tonnage and port-related truck VMT. The analysis of the port tonnage was based on the data from the PONYNJ trade statistics. The analysis of the port related VMT was based on the most recent port truck survey conducted by the PANYNJ. The survey included only the PANYNJ container terminals. The statistics on the overall freight flows and tonnage in New Jersey was obtained from the New Jersey Statewide Freight Plan²⁴. It is worth noting that the freight tonnage that originates or has a final destination at the PONYNJ facilities may be captured multiple times in the Statewide Freight Plan Statistics, which is based on the 2003 Reebie (now Global Insight) Transearch Database. For example, a cargo container may be trucked from a port terminal to a public warehouse 1-2 miles away, where it is striped. The cargo is then transloaded into a single or split among multiple domestic trailers for delivery to the customer(s). While the PONYNJ tonnage statistics refers to the first leg of these shipments only, the Transearch dataset captures (or records) the same tonnage twice: once for the trip between the port terminal and the warehouse and the second time for the trip between the warehouse and the final destination. In other words, Transearch dataset captures freight tonnage on each leg/trip as it moves through a particular logistics chain and the underlying freight transportation highway network. For transportation planning and facility design purposes it is important to know origin and

²⁴ The New Jersey Comprehensive Statewide Freight Plan, September 2007; available online at <http://www.state.nj.us/transportation/freight/plan/study.shtml>

destination of each trip in the logistics chain, not only the first origin and the final destination. This information is captured in the so called trip tables and it provides basic information for the analysis of traffic (freight) flows in a transportation network. Full understanding of the freight flows is crucial for transportation planners and engineers to plan and design highway facilities to handle the traffic volume and tonnage generated by the freight demand. Since the cargo transported in all of the trips in the example above originated at the port, it is clear that knowing not only the tonnage originating at the port, but also how it moves through the transportation system, is important for rational transportation planning and system design. Therefore, all or part of the tonnage transported in "linked" trips could be considered "port-related tonnage", not only the tonnage on the first leg²⁵. This is especially important when discussing shifting the trips in time, as changing the departure of the shipment on the initial trip from the port terminal will consequently shift the timing of a set of moves that are incidental to the initial trip.

The following conclusions can be drawn from the analysis of the PONYNJ and the statewide freight statistics:

- PONYNJ freight, measured in total annual tonnage²⁶, has an estimated 9% share of the statewide truck-hauled tonnage with either an origin or a destination in New Jersey.
- Based on tonnage data, it is estimated that the PONYNJ related truck trips comprise between 9% and 18% of all truck trips with an origin or destination in New Jersey.²⁷
- Assuming that the majority of this traffic moves during peak hours, it clearly significantly contributes to congestion on regional highways.

²⁵ Often times international cargo is mixed with domestic cargo at transloading facilities, which further complicates this kind of analysis

²⁶ Tonnage is expressed in short tons = 2,000 lbs.

²⁷ The actual percent share will depend on how much of the Port-related tonnage is transloaded within New Jersey. Under the assumption that each Port-related ton hauled by trucks is transloaded at least once, this percentage would be 18%. Under the assumption that none of the tonnage leaving or entering the port on trucks is transloaded within New Jersey, this percentage would be 9%.

- PANYNJ containerized truck traffic is a significant portion of truck VMT in the heavily congested urban area surrounding the PANYNJ facilities. In Union and Essex counties, where the port terminals are located, this share climbs to 15% and 12% respectively, compared to the overall truck VMT.

It is important to note that the PANYNJ truck O-D survey only analyzed trucks moving containers. Hence, the VMT percentages reported here include only drayage of containerized cargo between a PANYNJ facility and the first point of rest. The lack of O-D data for truck trips related to automobile and bulk cargo transport to and from the port terminals prevented inclusion of these trips in the analysis. The inclusion of these trips would therefore increase the Port's share in the overall truck VMT, and would likely amplify the impact they have on the regional highway system and congestion. The details of this analysis are provided in [Appendix B](#).

As noted in [Section 2.5](#) of this report, the preliminary analysis showed that a reduction in VMT during the peak hours could lead to significant savings in congestion cost. A VMT reduction of 0.5% in Essex, Union, Hudson, and Middlesex counties, where most of the port related trucks operate, would generate a savings of \$59 million annually for New Jersey travelers. This includes the cost of unproductive time for passengers, lost productivity for trucks, and wasted fuel for all motorists. It is reasonable to assume that any action leading towards a reduction in port related truck traffic during peak hours would contribute to savings in terms of congestion cost, and would free up some of the available highway capacity.

To determine the impact of port drayage on roadway conditions it is also necessary to identify the routes utilized by trucks hauling containers, and the daily truck volumes on these roadways that are associated with the port container traffic. NJIT conducted a preliminary analysis of routes utilized by the Port's trucks based on the PANYNJ origin-destination survey data. The findings of the analysis are shown in Figures 5.2 and 5.3.

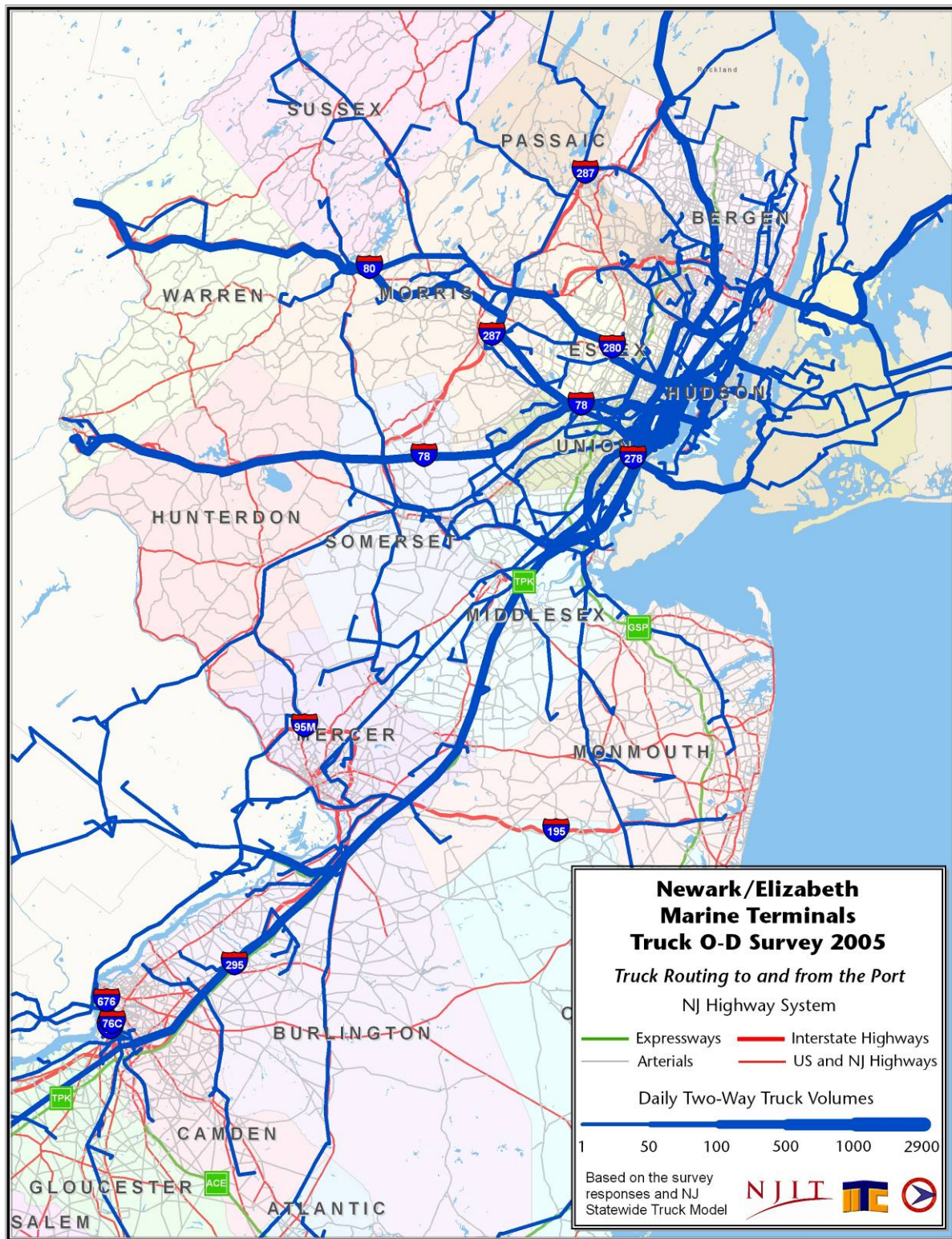


Figure 5.2. Estimated routes and volumes of the Port’s trucks

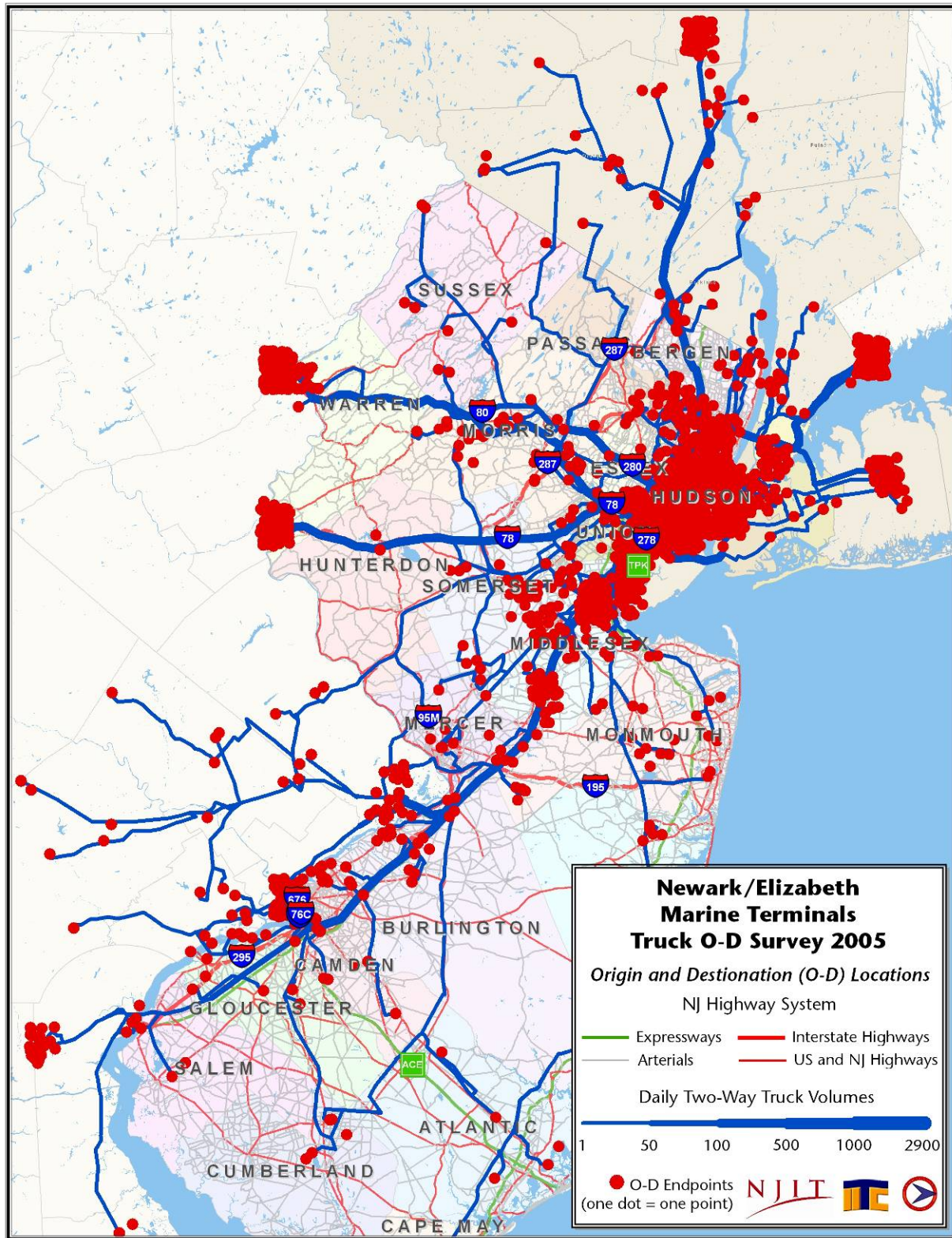


Figure 5.3. Port truck routes and Origin-Destination (O-D) points

- Figure 5.2: This map shows that the port related truck traffic to/from the Port Elizabeth/Newark marine terminals is heavily concentrated in the port area. Travel to/from the New Jersey Turnpike Exits 7, 8A and 10 areas, where major big-box distribution centers are mainly located, is not as significant as one may have expected. This may be largely due to the survey only capturing the truck moves with a trip end at the port. Many more truck trips with port-originating or destined goods may exist on New Jersey roadways but could not be quantified from the survey results. In addition to NJ Turnpike, significant volumes can be observed in I-78 and I-80 corridors, as well as US 1&9 in Union and Middlesex Counties.
- Figure 5.3: The map shows that a large portion of port traffic has its origin and/or destination in northern New Jersey, and in particular within 10 miles of the port. (*Note that in the figure some of the endpoints located outside New Jersey and neighboring counties were lumped together at the outer border of the modeled network and associated with the highway routes that trucks use to get to or from those endpoints*). It seems that the industry has recognized that northern New Jersey is the best jumping point for the New York metropolitan market. This is beneficial as far as minimizing VMT and maximizing employment and tax-ratables in New Jersey. However, this may carry additional negative effects such as diesel emissions, congestion, and deteriorated pavement that come with large truck volumes. As far as interstate movements, there is heavier demand east and west across northern New Jersey (I-80, I-78, and via the George Washington Bridge to/from I-95 Connecticut & I-495 Long Island) than north and south (I-95 Maryland, the Pennsylvania Turnpike, and I-87 upstate New York) to/from the port. Competing ports to the south may be siphoning demand for goods to/from the mid-Atlantic, while eastern and central Pennsylvania provide the linkage to the rail intermodal yards and the rest of the nation.

The 2005 truck O-D survey showed that the first stop for majority of import containers leaving the port terminals are 3PL and other warehousing facilities. Most of these facilities are located in close proximity to the Port (as shown by red dots in Figure 5.3). One can hypothesize that the majority of these containers will be unloaded at these facilities and their cargo transferred into domestic trailers for subsequent delivery to domestic locations (process of transloading, also

referred to as “stripping and re-stuffing” in warehouse parlance). This may help explain a large number of 53-foot trailers observed on the highway network in the Port region.

Stripping and re-stuffing is very often completed in a very short period of time (1-2 hours) by cross-docking merchandise from containers to trailers²⁸. The effect of this is that many truck-trailers seen on the roads could actually contain the goods that were in the marine containers just hours earlier. For highway capacity planning purposes, these truck trailers should be considered to be “port-related”. The extended business hours and/or an appointment system would change container pick-up and delivery schedules at the Port, which in turn would have an impact on the time of day when these trips are made. If the container drayage trips from the port to transloading points are shifted to off-peak hours, it follows that many of the subsequent transloading-related trips would also be shifted to off-peak hours. This could greatly reduce congestion on the regional highway network during peak hours. To quantify these impacts, it is suggested that more data and information be collected on the transloading of port cargo.

5.5.2 *Appointment System*

The representatives of the steamship lines and the PANYNJ suggested that the appointment system could bring about the same benefits of EBH in terms of more efficient utilization of both the port facilities and the regional highway system. It was suggested that the appointment system, as an alternative to the EBH concept, could also help distribute trucks more uniformly throughout the work day, relieving regional highways of a portion of truck traffic during the congested peak periods. The PANYNJ considers an appointment system at the port terminals to be a more feasible and more viable solution for more efficient utilization of the highway capacity than introducing evening and night truck gate hours. In their opinion, the system would have the same peak-spreading effect as extending business hours and giving truckers incentives to use it, since truckers would be forced to use time slots allocated to them by the terminal operators.

It was noted, however, that there was an attempt by the PANYNJ to implement an appointment system in port terminals facilitated through its Freight Information Real-Time System for

²⁸ Interview with East Coast Warehouse.

Transport (FIRST), which failed to gain buy-in from terminals and trucking community. Implementation of this concept was attempted before at New Jersey port terminals through the FIRST demonstration project sponsored by the PANYNJ. Despite expected positive effects on both congestion and air quality, the success of this project was limited due to the complexity of the shipping process and problems related to data sharing and communication among the stakeholders. Specifically, steamship lines and terminal operators were concerned about the level of data security and thus were willing to share only limited shipment and container information. Consequently, the data about the status of container shipments to be picked up at terminals or shipper sites was incomplete and not timely, so it was very hard and inefficient for truckers to confirm shipment availability and make appointments based solely on the FIRST system. As a result of these problems, the operation of the FIRST system was discontinued.

Several research studies examined the effects of appointment systems implemented in other large ports across the U.S. A recent study by the METRANS Transportation Center in Southern California²⁹ concluded that there is no evidence that the appointment system at the terminals in the Port of Los Angeles and the Port of Long Beach has affected queuing at the marine terminal gates. Thus, it did not affect distribution of truck trips throughout the day. In addition, the study found that data management and timeliness issues presented obstacles to the greater success of the appointment system. As a result, truckers had no incentive to make appointments as they did not affect their turn-times. The majority of the port terminals did not see the appointment system as a means of improving their operations. Most of them implemented the system in order to meet legislative requirements and avoid state imposed container fees. It is clear that in order to have a success with any future attempts to implement an appointment system, these obstacles will need to be overcome.

Another concern raised during this study regarding an appointment system is the fear that it may not be effective in the long run when anticipated growth of international cargo starts materializing. One way to address this concern could be to introduce (or “encourage”) the

²⁹ Giuliano, Genevieve; O’Brien, Thomas; Hayden, Sara; Dell’Acquila, Paul. “Assessment of Terminal Gate Appointment System at Ports of Los Angeles and Long Beach,” Proceedings of the Transportation Research Board 85th Annual Meeting, Washington, DC, January 2006.

appointment system to meet current needs/demand, but then start advancing the extended business hours concept when demand hits a particular threshold. Introducing some kind of incentive to truckers and shippers to work during the off-peak hours, or a fee for those who don't, may be needed in order to advance the extended business hours or appointment system concept.

5.5.3 Feasibility and Impact of Instituting Fees as an Incentive

The idea of instituting some sort of container fee (similar to the PierPASS concept) or congestion pricing on highways accessing the port complex was strongly discouraged by the PANYNJ. The reason is a fear that such measures would cause the port to lose competitiveness when compared with other ports of entry on the eastern seaboard (e.g. ports in Virginia, Georgia, and even Halifax in Canada). The PANYNJ worries that the additional cost of transporting containers during peak hours associated with the fees would cause shippers to switch their containerized cargo to other ports before it would force the regional freight industry as a whole to implement extended hours. Ultimately, the bi-state agency believes that introducing a fee system similar to PierPASS would have more negative effects on port's competitiveness than existing peak hour congestion at the terminal gates and on highway links connecting port to cargo destinations. Furthermore, the PANYNJ is concerned whether it would be justifiable to force the shipping community to pay the price of congestion problems as they contribute only a share.

The NJDOT is not opposed to introducing an incentive/disincentive program with some kind of congestion fee to advance either extended hours or appointment concepts, although it does recognize the marketing concern of the PANYNJ. On the other hand, the NJDOT has to deal with traffic congestion on a statewide basis and in doing so is willing to explore solutions that provide the highest relative benefit for the residents of New Jersey. As shown in [Appendix B](#), port-related container truck traffic comprises around 4.4% of the statewide total truck VMT; however, it represents 10-15% of the truck VMT in the port region (including major roadways in Union, Essex and Hudson Counties). Therefore, there is an opportunity to address the issue of traffic congestion in this densely populated area through a program that would shift the portion of this truck traffic to less congested off-peak and evening hours. While most of the passenger

and commercial traffic would be hard or impossible to divert to evenings and nights, container pick-ups and deliveries may be easier to spread over the longer period of the day.

5.5.4 Ensuring Buy-in From the Industry and the Community

The NJDOT emphasized it would be important to ensure cooperation, if not collaboration, of all the participants in the logistics chain in order for this concept to succeed. Besides the port terminals, consignees, warehouses and distribution centers that receive or dispatch the containers also have to stay open and truckers have to be willing to drive in the evenings. They are concerned, though, that some communities adjacent to both port complex and warehousing/distribution facilities would not welcome (or worse yet would strongly oppose) prolonged truck traffic in or around their neighborhoods into the evening or night time. Municipal ordinances in some cases may actually forbid truck traffic after a certain time of day. This should be investigated prior to instituting any incentive/disincentive program.

5.6. Summary

The EBH of operation have been in place at the Maher Terminals in Port Elizabeth for several years. However, this operating strategy has not been successful as only about 7% of truck moves are realized during the off-peak (evening) hours. PNCT in Port Newark implemented the extended business hours for a limited period of time and decided to cancel the project due to poor response from truckers. In both cases, it is assumed that the inability of truckers to make pick-ups or deliveries off-port during the off-peak is the main reason for the poor results of extending gate hours experienced in New Jersey.

In Southern California ports, however, the OffPeak program is considered a great success. The program is developed and implemented by the port terminal operators and it provides extended gate hours at all port terminal facilities at the Port of Los Angeles and the Port of Long Beach. All containers picked up during peak hours are subject to a fee the revenue from which is used to cover the costs of operating the terminals during the off-peak.

Despite the success of the OffPeak program in California, the EBHTF participants agreed that similar results of such a program may not be transferable to New Jersey. One reason would be due to the dissimilar makeup of the port customer base which has different operating and business characteristics from its counterpart in Southern California. Other reasons include lower container volumes in New Jersey ports as well as the perception that the environmental and traffic issues are not as dire as they are in Southern California. However, NJIT's preliminary analysis shows that the impact of port trucking on New Jersey roadways is significant especially in close proximity to the port.

Due to the low participation rates demonstrated to date, the port terminal operators were concerned that keeping gates open in the evening alone wouldn't be enough to induce truckers to use later gate hours. The cost associated with adding a work shift at the port terminals and warehousing facilities is high and volumes are not substantial enough to justify the cost of the additional shift.

Clearly, a voluntary program such as the one currently implemented by the Maher Terminals is not meeting expectations. But the PANYNJ position is that imposing a fee may create problems for the port competitiveness relative to other ports on the eastern seaboard. Instead, PANYNJ and some steamship lines suggested an appointment system as an alternative. The appointment system, on the other hand, may not be effective in terms of mitigating congestion and improving efficiency of the port terminal and trucking operations, as demonstrated by the study conducted among port terminals and truckers in Southern California.

6. CONCLUSIONS

6.1. Stakeholder Input

Presently, 90% of the PONYNJ generated trucks are using New Jersey roadways during the daytime peak periods³⁰. A strategy that would encourage these truck moves to take place in the off-peak periods could have a significant impact on the region's congestion.

The concept of extended business hours was identified by the members of the Extended Business Hours Task Force (EBHTF) as a solution that could lead to achieving a greater efficiency throughout the logistics chain. This would allow all players to simultaneously achieve their objective of maximizing profit and would alleviate some of the congestion on New Jersey's roadways.

However, implementation of this concept at Maher Terminals and Port Newark Container Terminal (PNCT) was met with limited success as measured by attracted (or peak delayed) truck volume. The shift of truck traffic to off-peak in either terminal was not substantial enough to make the operation economically self-sustaining. Substantial investment in an additional shift and an inadequate response from shippers and truckers has stifled momentum among other port terminals to implement a similar concept. The port terminals agree that the only way extended business hours can be cost effective is if a sufficient numbers of trucks utilize the gates during night time hours. In addition, some terminals do not have a problem handling the container volume during the current work hours and thus do not warrant the need for an additional shift. However, all of the terminal operators agreed that if and when the volume warrants it they will resolve labor and any other issues to support off-peak operations provided they have greater assurance that trucks will utilize late gate hours.

While the reasons for implementing extended business hours at the two terminals were different, the reasons for poor performance are similar. The main problem was (and continues to be)

³⁰ Based on the information gathered through the survey of terminal operators, current use of off-peak port terminal truck gates is well under 10%.

inability of truckers to realize productive moves in and out of the terminals as most of the shippers' facilities did not extend their business hours. That means that if a trucker were to pick-up a container at the port for one such customer, s/he would need to keep it overnight at his/her yard until the shipper's facility opens up the next morning at which time it can be delivered. Most truckers do not have a place to deliver a container off-peak or an appropriate place to leave a container overnight which effectively prevents them from utilizing the gate service extended hours. Notable exceptions are those trucking companies that have access to a secured yard for safe overnight storage and could add additional shifts to their trucks or those that had customers they could reach with an overnight drive. The conclusion is clear: either the EBH concept needs to be embraced by all parties in the logistics chain or secure container yards need to be provided to which containers can be delivered during off-peak.

If the volume is sufficient to justify the extended business hours of each stakeholder, then all stakeholders can enjoy the benefits. However, the opposite is not true; there is no consequence on a particular stakeholder should it decide not to have the EBH. There are no incentives in place that are offered by either the other stakeholder or the regulatory agency to compel the reluctant stakeholder to adopt the EBH.

6.2. Conditions for Implementing Extended Business Hours

Two distinct options to making extended hours operation a success have crystallized in Task Force discussions: *Collaboration* or *Coercion*. Collaboration refers to voluntary interaction and coordination between all the stakeholders in the goods movement cycle. It would include port terminals, warehouses and regional distribution centers, steamship lines, and the trucking that links everything together. All stakeholders must be open for business during the off-peak hours to make it economically worthwhile for the individual businesses that make up the goods movement cycle.

The second option is a form of coercion in terms of user fees or incentives to induce the stakeholders to embrace the new practice of extending the hours of operation. The OffPeak program and a fee concept implemented through PierPASS Inc. at the Southern California ports,

is a good example of such a strategy. However, a well thought out and implemented incentive program may achieve desired results as well.

While collaboration and coordination among the stakeholders was identified as a preferred route towards the implementation of the extended business hours, the EBHTF members agree that there are many obstacles. First, it is important to understand that each leg of the goods movement cycle is made up of a variety of businesses, large and small, that operate using their own business models which drive any decision they make. As a result, not only each stakeholder group but each business within each group will have their own set of ideal conditions that are necessary to make the extended business hours become economically viable for them. While some of the stakeholders feel that the strategy is viable today, others feel that they don't handle enough volume in order to justify extending their hours of operation today (this is especially true of smaller warehousing companies) but feel that it would be a good strategy once their volumes increase in the future. In other words, the stakeholders will be driven by the sheer volume of goods that they are handling and available capacity. The fear of market share and profit loss would drive their attitude towards extending business hours, or any other operating strategy to improve efficiency or otherwise increase capacity.

However, letting market forces alone drive the process would be socially irresponsible. The society may start experiencing the negative effects of traffic growth (including port generated traffic) such as overwhelming traffic congestion, poor mobility, and air pollution much before the market forces react to self-regulate. Regulatory agencies will be expected to develop policies to mitigate traffic congestion and other negative effects of growing traffic demand, ensuring that the burden of economic growth and urban development be equitably shared. In doing so, they need to search for optimal strategies and scenarios that bring about the highest common benefit at the minimum cost.

6.3. Implementation Scenarios

Based on the discussion presented in the [Section 6.2](#), we can define two possible strategies of implementing the concept of extended business hours:

1. **Industry-driven collaborative effort among the stakeholders.** Collaboration among all of the stakeholders is the approach preferred by the members of the EBHTF. It is a proactive approach motivated by the understanding that whether today or at some point in the near future something needs to be done to address the issues of terminal/stakeholder efficiency and landside congestion at the PONYNJ. While the collaborative solution would be an ideal one, it is not very likely that it will happen. The goods movement cycle is too complicated in terms of the number of players, their size and type of operation, and their individual objectives and needs. Some may not be handling the sufficient volumes required to justify the investment in EBH of operation. Being left to their own devices, those players will revert to a solution that will negatively impact other players. No incentives are in place for them to participate. This makes a collaborative solution an unlikely outcome. It will be naïve to expect that the players will reach a collaborative solution.
2. **Incentive/disincentive for utilizing off-peak hours through tolls or other fees.** A fiscally responsible solution would be to introduce fees that are a function of system usage. The primary stakeholder public agencies that can introduce such fees are the NJDOT, New Jersey Turnpike Authority, and PANYNJ. The state may try to induce the shift of truck traffic to off peak by working with the regional toll collection agencies to introduce new and adjust existing truck tolls. The adjustment would be reflected in increasing peak tolls and decreasing off peak tolls. Nevertheless, the change in toll structure will not address the problem of truckers not having adequate secure yards to drop-off or pick-up containers during the off-peak hours. The revenue from the tolls, however, can be returned to the truckers in the form of investments in secure yards or inland container terminals. The solution is efficient for it would require that truckers pay for the use of a road during the peak hours to offset the congestion they impose on others. It would be equitable for those truckers that embrace the off peak hours for it would “reward” them with the secure yard facility. The PANYNJ could work together with the State of New Jersey through the NJDOT to implement a system similar to the PierPASS at the POLALB. The economics would be the same as in the case of tolls. The stakeholders are charged for use of the facility during the high usage time period. Those moving off peak receive perks that reward the change in their travel patterns and behavior. It is far

from clear how this would work in New Jersey, if at all, because the pressure does not seem to be there to the degree that it was present in California. The OffPeak program and PierPASS Inc. were established under heavy political pressure generated primarily by the environmental lobby. This took several years in an environment that was conducive to the environmental cause. Although some stakeholders expressed pessimism and reservations about the viability of introducing a program similar to PierPASS in New Jersey, despite its success in California, it is worthwhile exploring the program's transferability (possibly with modifications and adjustments) and its potential effects.

7. RECOMMENDATIONS

Through discussions with the stakeholders, review of their business practices and experiences with the implementation of extended business hours at port facilities to date the research team identified key issues to be addressed by this concept and obstacles to its implementation in New Jersey. Preliminary technical analysis shows that this concept may be a viable option and may bring about benefits for the traveling public as well as the statewide transportation system by promoting more efficient use of available transportation capacity on New Jersey's highways.

Based on the findings of the study, NJIT's research team is making the following recommendations to NJDOT:

1. *Evaluate the feasibility and impacts of a fee-program or incentive based program to implement extended business hours in New Jersey*

The purpose of the feasibility study would be to estimate the effects of the extended business hours concept on the transportation system in New Jersey, especially highway network congestion and air quality in the port region. If the study shows that the effects are significant and positive, the next step would be to analyze in detail potential implementation scenarios. The experience from the OffPeak program in Southern California and discussions conducted at the meetings of the Extended Business Hours of Operation Task Force suggest that instituting a financial incentive/disincentive for utilizing off-peak hours through tolls or other fees, seems to be the only solution that is both efficient and equitable and is also socially responsible and sustainable. It is more likely to be successful than a strategy of coordinating a market response to transportation system needs; it provides a clear path to success although it may take time to implement. The feasibility study should address the following issues:

- What would be the impact of the extended-hours concept on the terminal operation as well as on reducing congestion and related air pollution on New Jersey roadways? The benefit of peak spreading needs to be quantified. For this purpose a detailed analysis of the volume and distribution of port-related truck traffic by hour of the day should be conducted. This can be investigated through overlaying terminal/gate truck volumes by the overall regional traffic volumes during peak and off-peak periods. It was noted that

while extended hours of operation may be helpful, there may be other strategies (i.e. appointment system; toll incentives) that could potentially generate better results, and therefore should be investigated as well.

- *What kind of fee or incentive would be the most effective in implementing the extended business hours strategy?* Potential options include a congestion fee for those containers that move during the peak periods (similar to PierPASS), a combination of an appointment system and appointment fees depending on the time of day, or introducing a new highway toll or fee during the peak or providing a discount on existing tolls or other fees for trucks during off-peak.
- *How would the funds collected from the fees be used?* Depending on the type of fee and selected concept, this money could be used to offset costs of extending business hours at the terminals or financing other projects that would increase the efficiency of port drayage and create conditions for better utilization of off-peak hours. For example, the revenue from the fees could be used to offset costs associated with an additional shift at the port terminals; supplement funding for infrastructure improvements at terminal gates; or fund information technology systems to improve data exchange and communication between truckers, port operators and shippers.
- *What would be the impact of the fees on the port's competitiveness?* The concern that instituting fees may impact the port's competitiveness relative to other ports on the eastern seaboard should be specifically addressed. This can be evaluated in the context of the structure of shippers currently using the PONYNJ, regional freight flow patterns, logistics chains and the economics of shipping vis-à-vis available options for international transportation between shippers and ports of entry.

2. *Study the viability and effectiveness of an Appointment System*

An appointment system would in essence cap the peak-period traffic through the port terminals. It would spread the traffic throughout the current hours of operation and effectively force some of the pick-ups and deliveries to shift to less congested and underutilized time periods of the day. With further growth of traffic this measure could be revised to address extending business hours of operation instead of appointments. An

alternative strategy for implementing an appointment system would be to institute fees or incentives for pick-ups and drop-offs at the port terminals without an appointment, or to auction the appointment times during the peak-periods. Drawing an example from air transportation, auctioning the appointment times would be similar to imposing the landing fees and gate charges on the airlines. The study should include review of similar practices at other U.S. ports and worldwide.

3. *Study the effectiveness and feasibility of Inland Port Truck Terminals*

Establishing one or more “satellite” or “inland port” truck terminals in New Jersey may complement and improve conditions for the implementation of extended business hours at port terminals. These facilities would provide secured overnight storage for containers and would stay open to truckers late night to ensure that all containers picked-up at the port or at shipper’s facilities can be staged there until they continue the trip next day. Further investigation into the feasibility of establishing inland truck terminals to allow truckers to pull containers out of the port terminals at night is necessary. The idea would involve a shuttle type of operation where truckers would move the containers from the inland port terminals to a secure yard terminal in the port vicinity for delivery to the port the following day. This would address, in part, the truckers’ concern that closed warehouses and the related inability to realize a drop-off after hours makes this operation economically unjustifiable. The truck terminal should be established at a location that does not suffer from traffic congestion, or at least not to the extent currently observed on roadways adjacent to the port. That way trucks would also benefit from shorter wait times when they come to pick up the containers left at the truck terminal instead of going to the congested port terminals and waiting in the lines at their gates. This reduces congestion immediately around the port during the most congested hours and in effect increases the port terminal capacity with the capacity of the inland terminal. The location should also be selected to minimize truck VMT; it would not make sense to induce longer trips and increased mileage between port terminals to shippers as that would be contrary to the objectives of making the drayage operations more efficient and would add more VMT to already congested highway network in New Jersey.

4. *Conduct an O&D survey of the port truck traffic to determine second and third tier destinations of goods (beyond place of first rest).*

This study should investigate the transshipment practices that occur once the container leaves the port. A large number of container shipments continue their trips in 53-foot domestic trailers after the containers are stripped at the first point of rest, usually adjacent to the port. Shifting the first leg of their trips (from port to warehouse) to off-peak may produce a domino effect by shifting the trip to a final destination to the off-peak as well.

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APPENDIX A: EBHTF OBJECTIVES

The following objectives were identified by the NJDOT Logistics Council:

- Understand the players
- Focus on the movement of containerized cargo during off peak hours.
- Identify all elements/stakeholders of a typical supply chain.
- Review and understand economics and operations of different stakeholders.
- Identify issues affecting different stakeholders and look for common issues across the supply chain (e.g. effect on delivery operations and scheduling, cost, etc.).
- Initiate and manage the Task Force focusing on the Newark/Elizabeth Port Region.
- Identify the role that NJDOT and stakeholders can play in the process
- Facilitate participation of stakeholders in a comprehensive and meaningful discussion
- Define the most desired structure and future agendas for Task Force/Stakeholder Meetings.
- Ensure that all stakeholders are involved.
- Serve as a liaison in discussions with local governments regarding the potential need/benefit of Extended Hours.
- Serve as a liaison with PANYNJ and other transportation agencies
- Evaluate the EBH of operations strategy
- Identify potential obstacles to introducing EBH
- Confirm facts and dispel myths surrounding extended hours of operations.
- Investigate factors that could help promote the implementation of Extended Hours (e.g., toll incentives).
- Create a collaborative environment
- Strategy: define/outline what actions may be necessary to create a win-win situation for all parties in the supply chain.

- Look for common benefits or opportunities to create win-win situations.
- Provide incentives or assistance to the industry in advancing the implementation of the Extended Hours.

APPENDIX B. ANALYSIS OF TRAFFIC CONGESTION AND IMPACT OF PORT TRAFFIC

Estimating the impact of port related trucks on overall traffic volumes on major regional highways is a first step in getting a handle of what is at stake and the potential savings that may come from introducing the EBH concept in New Jersey. It is important to identify the real impact (in terms of congestion and roadway damage) that current and future freight that moves through the Ports of New York and New Jersey (PONYNJ) has on New Jersey roadways.

To quantify this impact, NJIT analyzed the relationship between the total truck tonnage in New Jersey and the truck tonnage generated by the PONYNJ, as well as truck VMT generated by the port-related truck moves. The total New Jersey truck tonnage was estimated using the data from the New Jersey Comprehensive Statewide Freight Plan New Jersey Statewide Freight Plan³¹, released in September of 2007. The data, shown in the Table B-1, is based on the 2003 Reebie Transearch Database used in this study.

Table B-1. Estimated New Jersey Statewide Truck Flows by Weight (Short Tons)

Flow Type	Tonnage (Short Tons)
Inbound	103,873,482
Outbound	117,584,251
Intrastate	126,807,290
Through	118,059,233
TOTAL	466,324,256

Source: The New Jersey Comprehensive Statewide Freight Plan, September 2007

³¹ The New Jersey Comprehensive Statewide Freight Plan, September 2007; available online at <http://www.state.nj.us/transportation/freight/plan/study.shtm>

The PONYNJ total tonnage comes from the PANYNJ Trade Statistics and is shown in Table B-2. It includes the total import and export tonnage that moved through the New York Customs District in 2003.

Table B-2. Summary of the PONYNJ Annual Tonnage in 2003

Flow Type	Tonnage (Short Tons) ³²
General Cargo	
Imports	18,652,627
Exports	7,287,269
TOTAL	25,939,896
Bulk Cargo	
Imports	57,252,857
Exports	3,276,272
TOTAL	60,529,130
General and Bulk Cargo Total	86,469,026

Source: PONYNJ Trade Statistics, available for download at http://www.panynj.gov/DoingBusinessWith/seaport/html/trade_statistics.html (11/27/2008)

The truck mode share for the total tonnage in Table B-2 is determined from the literature and the industry sources. The mode share is obtained from the Comprehensive Port Improvement Program (CPIP) report³³. Table B-3 shows a port-wide mode share breakdown by cargo type.

The Port Commerce Department of the PANYNJ suggested³⁴ that CPIP estimates are not entirely accurate for two reasons:

³² PANYNJ provides tonnage in metric tons in the statistics available on their website. For the consistency in this analysis metric tons were converted to short tons using the relationship 1 metric ton = 1.102 short tons.

³³ CPIP, Volume 1: The Plan, September 2005 (page 107, Table 8.1), available for download at http://www.panynj.gov/DoingBusinessWith/seaport/pdfs/cpip/V1_Plan.pdf (11/27/2008)

1. they represent mode shares at the PANYNJ facilities only, excluding non-PANYNJ facilities at the Port of New York & New Jersey (PONYNJ);
2. Truck share for liquid bulk cargo is overestimated as most of the petroleum products, which make up the majority of bulk cargo, move in and out of the port by pipeline or barge. The rest of the liquid bulks, according to Port Commerce Department experts, move evenly by truck and rail. The commodities include mostly edible oils and juice.

Table B-3. Estimated portwide mode shares by cargo type

Cargo Type	Truck Share	Other Modes (Rail & Barge)
Containers	85%	15%
Automobiles	90%	10%
(Other) General Cargo	95%	5%
Dry Bulks	95%	5%
Liquid Bulks	90%	10%

Source: CPIP, Volume 1: The Plan, September 2005 (page 107, Table 8.1),

http://www.panynj.gov/DoingBusinessWith/seaport/pdfs/cpip/V1_Plan.pdf

(11/27/2008)

Based on the data from the PANYNJ Port Commerce Department, the truck share of the port tonnage is estimated to be as follows:

- The 87% truck share of General Cargo tonnage translates into 22.6 million tons in 2003.
- Port Commerce estimate for 60.5 million tons of Bulk Cargo is broken down to 85% crude petroleum and petroleum products, 12% Dry Bulk, and 3% Other Liquid Bulk.
- Crude petroleum and petroleum products make up 51.4 million tons in 2003. Majority of this tonnage is handled by the private oil/petroleum facilities throughout New York Harbor, and it moves out of or into the port by barge and pipeline.

³⁴ Series of meetings, e-mails, and phone conversations between the research team and PANYNJ Port Commerce Department.

- Dry bulk tonnage make up 7.6 million tons in 2003. The 90% truck share translates to approximately 6.8 million tons.
- 1.4 million tons of Other Liquid Bulk (such as edible oils, orange juice) move 65% by truck or 0.9 million tons.

This mode share breakdown is also shown in Table B-4.

Table B-4 Port Commerce revised mode share by cargo type

Cargo Type	Truck Share	Estimated Truck Tonnage (2003)
General Cargo*	87%	22.6 million
Dry Bulks	90%	6.8 million
Liquid Bulk Petroleum	0%	0
Liquid Bulk Other	65%	0.9 million
All Cargo		30.3 million

* Includes automobiles, containers, and other general cargo

Based on Table B-4, the truck share of port import and export cargo in 2003 was about 30.3 million tons. This is approximately 9% of the total truck tonnage originating or terminating in New Jersey (provided in Table B-1). This is a significant finding as it shows that the port alone is an important, if not the largest single concentrated generator of truck tonnage in New Jersey, and therefore has a tremendous impact on both the traffic condition and infrastructure health of New Jersey's roadways.

It is worth noting that the freight tonnage that originates or terminates at the port may be captured multiple times in the Reebie Transearch Database. For example, a cargo container may be trucked from a port terminal to a public warehouse 1-2 miles away, where it is striped. The cargo is then transloaded into a single or split among multiple domestic trailers for delivery to the customer(s). While the PONYNJ tonnage statistics refers to the first leg of these shipments only, the Transearch dataset captures (counts) the same tonnage twice: once for the trip between the port terminal and the warehouse and the second time for the trip between the warehouse and

final destination. In other words, Transearch dataset captures freight tonnage on each leg/trip as it moves through a particular logistics chain and freight transportation system. For transportation planning and system design purposes it is important to know origin and destination of each trip in the logistics chain, not only the first origin and the final destination. This is captured in so called trip tables that provide basic information for analysis of traffic (freight) flows in a transportation network. Full understanding of the freight flows is crucial for transportation planners and engineers to plan and design highway facilities to handle the traffic volume and tonnage generated by the freight demand. Since the cargo transported in all of the trips in the example above originated at the port, it is clear that knowing not only the tonnage originating at the port, but also how it moves through the transportation system, is important for transportation planning and system design. Therefore, all or part of the tonnage transported in "linked" trips could be considered "port-related tonnage", not only the tonnage on the first leg. (Often times international cargo is mixed with domestic cargo at transloading facilities, which further complicates this kind of analysis.) This is especially important when discussing shifting the trips in time, as changing the departure of the shipment on the initial leg from a port terminal will accordingly change timing of a set of moves that are incidental or consequential to the initial leg.

The 9% truck tonnage share of the Port-related cargo as calculated above does not consider transloading of tonnage reported in the PONYNJ statistics. Under the assumption that each ton of cargo that enters or leaves the port on truck is transloaded at least once in New Jersey, the share of port-related truck tonnage would climb from 9% to 18%. This is a significant share of the overall statewide truck tonnage and it would be beneficial for the analysis to get a better understanding of the extent of transloading of the port-related cargo.

The second part of the analysis focused on identifying the routes that the PONYNJ generated trucks use and the portion of the total heavy truck traffic that they represent. NJIT used data from the PANYNJ's Origin-Destination (O-D) survey³⁵ at the container port terminals and the New Jersey Statewide Truck Model to determine routes that surveyed trucks used. The results of

³⁵ The Origin-Destination (O-D) survey was conducted by Vollmer Associates for the PANYNJ in May 2005.

this analysis are summarized in Table B-5. It is important to note that the PANYNJ truck O-D survey only analyzed trucks moving containers. Hence, the VMTs and VMT percentages shown in Table B-5 include only drayage of containerized cargo. The lack of O-D data for truck trips related to automobile and bulk cargo transport to and from the port terminals prevented including these trips in the analysis. They would certainly increase the Port's share in the overall truck VMT if included in the analysis. The calculated percentages therefore understate the share of truck VMT that can be attributed to the PONYNJ-related flows.

Truck survey results, summarized by Vollmer Associates, were adjusted with NJIT estimates of the total daily gate moves at each container terminal in order to estimate daily and annual port-related truck VMT on New Jersey highways as presented in the Table B-5.

While truck traffic generated by the container terminals represents approximately 4% of the total heavy truck vehicle miles traveled (VMT) statewide, there are two New Jersey counties in which port container truck VMT constitutes a significantly greater share. In Union and Essex counties, the location of the largest container port terminals, this share climbs to 15% and 12% respectively (Table B-5).

The next question is: when are these trips taking place? What is the temporal distribution of truck trips?

Presently 90% of the PONYNJ generated trucks are using New Jersey roadways during the daytime peak periods³⁶. In addition, they are causing themselves harm by relentlessly competing day after day for scarce capacity at the truck gates and land access roads during the normal business hours. A strategy that would encourage these truck moves to shift to the off-peak periods would have a significant impact in terms of reduced social cost. In addition to the countless hours of time wasted in traffic, the consumer is stuck with the bill for millions of gallons of wasted fuel through the high cost of products they purchase. Clearly, a strategy that would encourage these truck moves to take place in the off-peak periods could have a significant

³⁶ Based on the information gathered through the survey of terminal operators, current use of off-peak port terminal truck gates is well under 10%.

impact on the region's congestion problem and in turn result in more efficient operations at the truck gates as the trucks would not have to deal with the most congested conditions themselves.

Table B-5. Port Newark/Elizabeth Truck Trip VMT by County (inbound and outbound)³⁷

County Name	Daily Port Truck VMT	Annual Port Truck VMT	Port Truck VMT % of Total Heavy Truck VMT
Union	102,518	26,654,612	15.0%
Essex	65,306	16,979,546	11.9%
Warren	23,791	6,185,765	9.1%
Hudson	30,482	7,925,337	6.6%
Middlesex	50,936	13,243,370	4.0%
Morris	27,369	7,115,871	3.9%
Hunterdon	12,162	3,162,167	3.5%
Bergen	30,567	7,947,355	3.2%
Mercer	13,416	3,488,093	2.6%
Somerset	12,867	3,345,335	2.5%
Burlington	17,055	4,434,241	2.3%
Sussex	1,767	459,362	1.6%
Salem	1,787	464,622	1.2%
Gloucester	4,948	1,286,394	1.2%
Camden	3,928	1,021,381	1.1%
Passaic	2,760	717,709	0.9%
Monmouth	2,231	580,138	0.5%
Cumberland	491	127,750	0.5%
Cape May	182	47,447	0.3%
Atlantic	580	150,793	0.3%
Ocean	725	188,573	0.3%
<i>STATEWIDE NEW JERSEY</i>	<i>405,869</i>	<i>105,525,863</i>	<i>4.4%</i>

³⁷ Based on NJIT routings of the 2005 PANYNJ Port Truck Survey responses on the NJ Statewide Truck Model network, and NJIT's estimate of 18,500 one-way gate truck moves per day at Newark and Elizabeth port terminals.

Not only does it make sense to introduce the EBH from the congestion relief point of view, but this strategy would result in environmental improvements with fewer pollutants emitted from fewer idling diesel trucks.

NJIT's cost of congestion study³⁸ implied that the majority of roads are operating at capacity, and even small increases in traffic volume will result in disproportionately large increases in delay and thus cost. Conversely, a small or marginal decrease in volumes, especially during peak hours, can produce significant savings in cost of congestion. NJIT studied an impact of decreasing peak period VMT in Essex, Union, Hudson, and Middlesex counties in New Jersey, which account for the majority of port related truck VMT. The analysis showed that a reduction in morning and afternoon peak VMT by 0.1% could generate savings of \$12 million per year, and reduction of 0.5% could save \$59 million annually. The cost of congestion included cost of unproductive time for passengers, lost productivity for commercial vehicles, and wasted fuel for all motorists. The analysis of network performance also showed that there is little excess capacity in the roadway network to accommodate additional growth, especially during peak-travel hours.

The above concerns related to the transportation system are clearly important to moving freight across the state which in turn has a substantial impact on the ability of PONYNJ to both attract new customers and retain current ones. New approaches of managing capacity are needed and they may include pricing the use of the port facilities and internalizing the costs that the port users imposed on society. Reduction, if any, in the cost that may be brought about by the introduction of the EBH can be considered an economic benefit. Conversely, an investment in implementing the EBH can be considered an offset to this cost.

³⁸ "Mobility and the Costs of Congestion in New Jersey – 2003 Update," Final Report prepared for the Blue Ribbon Commission and the New Jersey Department of Transportation by the National Center for Transportation and Industrial Productivity at the New Jersey Institute of Technology, October 2003.