

# Warehousing and Distribution Center Context NJPTA Brownfield Economic Redevelopment Project

*Prepared for the*



**New Jersey Institute of Technology and  
North Jersey Transportation Planning Authority**



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*analyses for informed decision-making™*



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A.Strauss-Wieder, Inc. is solely responsible for its content.

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## Executive Summary



The objective of the NJPTA Brownfield Economic Redevelopment analysis is to explore ways to channel new or expanded freight-related businesses into the region's numerous abandoned or idled industrial properties. Warehouses and distribution centers represent a mechanism for generating local economic value and impact from the increased amount of freight and trade anticipated to move through the region. Within this framework, the region's brownfields offer unique opportunities if a set of challenges can be overcome.

### ***Warehouses Are Economic Engines for the Region***

New Jersey has one of the leading concentrations of warehouses and distribution centers in the US. These facilities support businesses and consumers throughout the NJPTA region, the State of New Jersey, the nation and the world. Warehouses and distribution centers add value to the freight moving through them and represent a substantial economic activity in New Jersey:

- Nearly 736 million square feet of industrial property exists within northern and central New Jersey, of which at least 440 million square feet is used for warehousing and distribution centers; and
- An estimated 380,000 people work in New Jersey's warehouses and distribution center buildings, making this activity one of the leading employers in the State.

Warehouses and distribution centers generate more employment than in the past because these facilities have become the location for the last steps in the manufacturing process. In an era of global sourcing, production and marketing, the current practice is to do final assembly and customization closer to the marketplace. This practice results in greater flexibility and responsiveness to changing product demands.

### ***The Current and Projected Demand for Warehousing Space Requires More Land***

The demand for warehouses and distribution center activity is affected by three factors – the state of the economy; growth in international trade; and the availability of land. The outlook for warehousing and distribution activity in the NJPTA region is strong, though potentially hampered by a lack of available properties.

While the economy is expected to slowdown in the near future, the region's population growth and density, combined with an increasing labor force, provides a foundation for continued prosperity. In addition, international trade through the NJPTA region is anticipated to grow substantially. The Port Authority anticipates that cargo movements through the port will grow from the current 2.5 million twenty-foot container units (TEUs) to 14.4 million or more TEUs in 2040. Air cargo activity at Newark International Airport is also expected to grow.

The limiting factor in harnessing the economic value of this growth in commerce appears to be the availability of land in the NJPTA region for warehouse and distribution center development. Already, the distance ring for selecting warehousing and DC sites extends beyond the NJPTA region and the State of New Jersey. While locations continue to be developed for warehouses and distribution centers within the region, it is possible that warehouses and DCs that will support and benefit from the increased trade through the Port could be located outside of this area.

### ***The Brownfields Represent a Unique Resource***

Brownfield sites can augment the pool of available warehouse locations within the NJPTA region. Brownfield sites are properties that require some degree of environmental mitigation prior to reuse. Because brownfield sites tend to be located closer to the urban core, the Port and Newark International Airport, these sites could be of increasing importance to those warehousing operations that require close proximity to the regional market and these major transportation hubs. The locational advantage of brownfield sites may also provide greater access to labor and reduce trucking time and cost.

### ***A Series of Challenges Must Be Addressed to Harness this Resource***

Brownfields must meet the same site selection criteria as “greenfield” sites – appropriate site size and conditions; cost; time frame for site approvals and preparation; and transportation access:

- The size of the brownfield property must be sufficient to build the warehouse or distribution center.
- The cost of the site, including property acquisition, mitigation, approvals and preparation, must be reasonable enough to allow the charging of the market lease rate or purchase price for warehousing space in the area.

- Speed is of the essence in warehouse development. Warehouse operators demand an aggressive time line for the completion of new buildings, often requiring that new facilities be constructed and operational in less than a year. Unless a specific time frame for mitigation and site approval can be guaranteed, brownfield sites will not be as attractive as greenfield sites for warehouse development.
- Good transportation access between the brownfield and the region's freight network is crucial to the viability of the site. Transportation access can include proximity to highway entrances, local road conditions and access to rail yards and intermodal terminals.

If these challenges can be addressed, then the brownfields, once seen as a blight, can represent a unique opportunity for the region to maximize the economic benefits that can accrue from the increasing amount of freight moving through the area.

## I. Introduction

The *Warehouse and Distribution Center Context* was undertaken as part of a joint North Jersey Transportation Planning Authority/New Jersey Institute of Technology (NJTPA/NJIT) Brownfield Economic Redevelopment Analysis. The objective of the Brownfield Analysis is to explore ways to channel new or expanded freight-related businesses into the region's numerous abandoned or idled industrial properties. Pursuing this strategy is vital, given the staggering increase in freight movement that is anticipated to occur in northern New Jersey.

New Jersey is at a critical juncture. As the State begins the 21<sup>st</sup> century, its population now numbers 8 million, making New Jersey:

- The most densely populated state in the US;
- A major and concentrated hub of consumer activity (with the nation's second highest per capita income); and
- A State that must carefully manage its land, transportation system and resources in order to maintain the quality of life that New Jersey's residents and businesses expect.

New Jersey's residents and businesses are increasingly supported by industries located outside of the State. This traffic is not one way – building on the State's heritage as the "crossroads of commerce," New Jersey businesses are leveraging the State's transportation system to tap and serve new markets.

This commerce is not limited to the United States – rather, the economy is increasingly global in scope. Supplies are sourced, manufactured and marketed on a global scale. The result is a massive increase in the amount of freight moving today and anticipated to move in the future.

The counties that comprise the NJPTA's region<sup>1</sup> are at the epicenter. Densely populated, heavily developed and with an astonishing concentration of domestic and international freight facilities, the NJPTA region must determine how to both manage and leverage this increase in freight demand and movement to create economic value for the area.

### **A. *The Purpose of the Warehousing and Distribution Center Context***

*The Warehousing and Distribution Center Context* supports and informs the Brownfield Economic Redevelopment Analysis. The interviews and assessment in this report will help determine the suitability and feasibility of certain brownfields to support this activity. Accordingly, the *Warehousing and Distribution Center Context*:

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<sup>1</sup> There are 13 counties in the NJPTA Region: Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union and Warren.



- Provides an overview of key trends in warehouse use and design;
- Identifies considerations in site and building selection; and
- Summarizes the implications of these trends and considerations for brownfields.

### ***B. The Importance of Warehousing and Distribution Center Activity in New Jersey***

New Jersey has one of the leading concentrations of warehouses and distribution centers in the US. These facilities support businesses and consumers throughout the NJPTA region, the State of New Jersey, the nation and the world. Warehouses and distribution centers add value to the freight moving through them and represent a substantial economic activity in New Jersey:

- Approximately 440 million square feet of warehousing and distribution center space exist in the State<sup>2</sup>, with more being developed; and
- An estimated 380,000 people work in New Jersey's warehouses and distribution center buildings, making this activity one of the leading employers in the State.

Warehouses and distribution centers are integral to the domestic and international movement of goods. These structures can range in size from a few thousand square feet to over one million square feet and require good highway access to receive and deliver shipments.

### ***C. Assessment Methodology***

The material and assessment in the *Warehousing and Distribution Center Context* are based on interviews with and field visits to nearly 20 different firms and organizations. A. Strauss-Wieder, Inc. expresses its appreciation to these executives and companies for sharing their time, information and comments for this report.

The companies and executives interviewed represent the full range of private sector organizations involved in the design, development, construction and operation of warehouses and distribution centers. The operations include private, contract and public warehouses and involve domestic and international freight movement.

The interviews and field visits were supplemented with additional information and assessments related to warehousing and distribution center trends and developments that A. Strauss-Wieder, Inc. has previously developed.

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<sup>2</sup> Source: *The Value of Freight to the State of New Jersey*, New Jersey Department of Transportation, November, 2000.

#### ***D. The Structure and Use of this Report***

This report contains three chapters:

- An Overview of Warehousing and Distribution Centers;
- The State of Warehousing and Distribution Center Activity in New Jersey and the NJTPA Region; and
- Considerations for Brownfield Redevelopment for this Purpose.

The overview defines what warehouses and distribution centers are; explains their role in goods movement; and describes the activities that occur within a warehouse.

The second chapter includes discussions of the magnitude and location of warehousing and distribution center activity in the region, considerations in site and building selection, and the outlook for this activity.

The final chapter relates these trends and consideration to brownfield redevelopment. Brownfield redevelopment for this activity is placed within the context of the demand for warehousing and distribution center activity, as well as considerations in site selection.

The two appendices to this report provide case studies of warehouses and distribution centers in the NJTPA region and list the companies and organizations interviewed and visited.

## II. Overview of Warehousing and Distribution Centers

This chapter provides a primer on warehousing and distribution centers (DCs). It is important to understand the critical role that these facilities play in goods movement and the daily lives of the region's businesses and consumers. For the most part, these buildings are not mere storage facilities filled with dusty boxes; rather, warehouses and DCs are hubs of activity geared towards expediting and adding value to the goods moving through them. Accordingly, this chapter:

- Defines what warehouses and distribution centers are;
- Explains their role in goods movement; and
- Describes the activities that occur within these buildings.

### A. *Definition*

Warehouses and distribution centers are defined as structures that are primarily used for the receipt, temporary storage, possible modification/customization and distribution of goods that are enroute from production sites to where they are consumed. Warehouses and DCs are often sites where value is added to the products moving through them. Examples of value added activities include final assembly and customization of products and preparing products for the sales floor (including packaging and tagging).

There are three types of warehouses and DCs:

- *Public warehouses*, which are open to all customers seeking to store their goods;
- *Contract warehouses*, which handle two-to-three larger customers; and
- *Private warehouses*, which handle products for a single customer.

Warehousing operations vary considerably in size, ranging from just a few thousand square feet to buildings that are over one million square feet. Warehouses may contain temperature-controlled space, which is essential for maintaining perishable food.

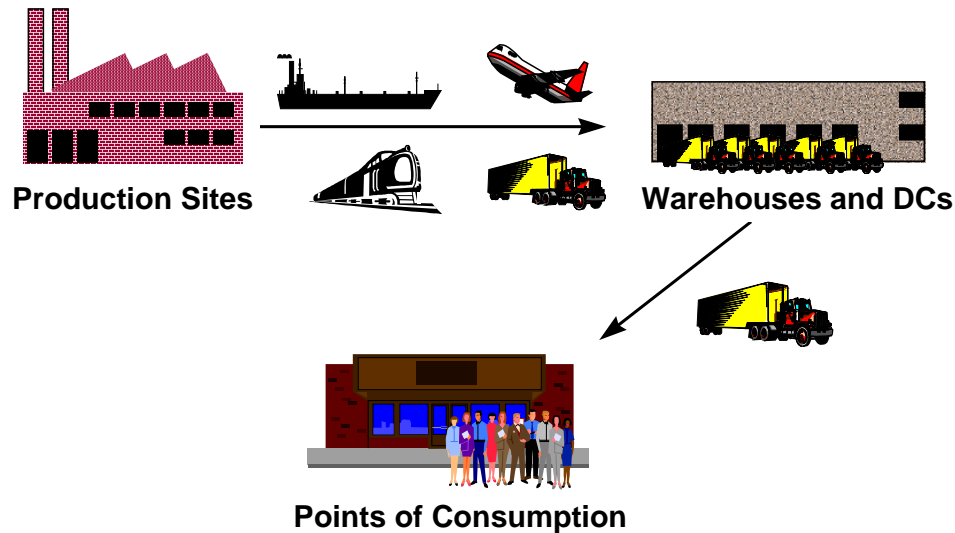
Warehouses and DCs can be located at or adjacent to airports and ports to support cargo operations. Warehouses may also have rail sidings for the receipt or shipping of products. The majority of the freight moving from warehouses and distribution centers tends to be handled by trucks.

### B. *Role in Goods Movement*

As shown in Figure II-1, goods are produced throughout the world and moved to warehouses and DCs that serve their market areas. The role of warehouses and DCs in distribution and international goods movement has dramatically changed,

as has the definition of what is a point of consumption. These changes and the current role of warehouses and DCs are described below.

**Figure II-1: Warehouses and DCs in the Goods Movement Process**



## 1. Role in Transportation

Traditionally, warehouses acted as storage and staging facilities. Goods that came off the production lines waited in warehouses for use. For example, a department store may have kept a variety of items in stock at its warehouse. Manufacturers may have maintained warehouses to stage inputs to their production lines and store finished products.

While the storage and staging functions still exist, the key objectives of today's warehouses and DCs are:

- Velocity – expediting the movement of goods;
- Customer service – ensuring that the products are “shelf-ready” to customer requirements and potentially handling returns; and
- Adding value – assembling and customizing products moving through the facility.

*Velocity* had its genesis in the “just-in-time” (JIT) movement – a management practice that seeks to minimize the amount of inventory kept on hand, thereby reducing carrying costs. In its formative years, JIT meant substituting transportation for inventory. Today, with sophisticated telecommunications, computer and tracking equipment, JIT seeks to minimize the inventory and transportation costs.

The overarching philosophy is to keep the inventory in motion; use tracking capabilities to manage the inventory while it is in transit and maintain a flexibility in transportation that allows for shifts in delivery instructions.

Within the warehouse, velocity translates into moving products through the facility as efficiently and quickly as possible. This can involve the use of bar codes and radio frequency (RF) technologies to track the products moving through the building and optimize employee movements (e.g., screens in forklifts to instruct drivers where to go). Conveyors, automated checking systems and an overall warehouse management system (WMS) are also used to expedite product handling.

*Customer Service* has become a key driver of warehouse management and practices. Today, many retailers and manufacturers require product packaging, labeling, ticketing and delivery with exacting standards. Penalties can be incurred when these standards are not met. To meet these new requirements, warehouses and DCs are now becoming the final stage of the production line for many goods. Goods are customized, assembled and made ready for retailer shelves in response to customer requirements that are transmitted directly to the warehouse. In addition, warehouses increasingly handle customer returns, a practice called “reverse logistics.” The value added activities at warehouses and DCs are geared towards the new customer service requirements.

*Adding Value* is a key component of today’s warehouses and DCs and a major generator of employment at these facilities. Warehouses may have hundreds of employees, sometimes in two shifts, undertaking value added activities at their facilities. Examples of value added activities include:

- Assembly and customization – private labeling packaging of stereo components that are shipped in bulk to the warehouse; assembly of knife sets from individual knives shipped in bulk to the warehouse; production of gourmet gift packages that combine products from multiple stores; assembly of product displays; and furniture assembly.
- Packaging and Ticketing – blister packing of kitchen gadgets; stuffing and preparation of handbags and luggage; individual book picking and packing to replenish stores and fill Internet orders; pressing and hanging of garments; and adding tickets and pricing labels to customer specifications.
- Product Repair – removing broken liquor bottles from cartons and removing damaged paper from the outer layers of paper rolls.

As one industry executive noted, “Value added activities would have been classified previously as manufacturing activity. Instead the last portion of manufacturing is deferred to the warehouse.” This warehouse activity becomes particularly important when the production lines are located overseas. Products can be customized once they reach the US, enabling quick response to differing customer

demands and requirements. In this respect, modern warehouses have often become the final stage in the manufacturing process.

Storage is still required in some cases – product costs are often determined by the size of the production run. Optimizing production runs can result in the need for some storage. In addition, warehouses can be used to *sequence* the products needed in an assembly line; that is, various products are delivered to a warehouse where they are sequenced as they will be needed and then moved to areas near the production lines. This reduces the amount of product required on the production floor and accomplishes quality control earlier in the production process.

## 2. Role in International Goods Movement

Warehouses and DCs take on additional roles when goods are moving internationally, either by air or water. These roles can include:

- Transloading overweight maritime containers – Overseas, 40-foot containers can carry up to 55,000 pounds while in the US containers are limited to carrying 45,000 pounds. However, the shipping cost of a container generally is the same regardless of the weight. Hence, shippers can save transportation costs by packing their containers to the international weight limits and then have the containers delivered to a warehouse on and near the port where the container contents can be offloaded into shipment sizes that meet US regulations.
- Hand unloading floor loaded maritime containers – Shippers often have maritime containers that have been “floor loaded” at the origin point, meaning that cartons have not been placed on pallets. Pallets take up space that can be used for revenue products. In cases where the containers have been floor loaded, warehouse workers in the receiving department unload the containers by hand, perform quality audits, palletize the cartons and enter the products into the warehouse’s computer system. Often, bar codes are added to the cartons and pallet at this stage to aid in automated tracking.
- Distribution of Breakbulk Commodities – Warehouses at or near maritime terminals often receive, store, repair, process and distribute breakbulk commodities, such as paper, lumber, steel, cocoa and coffee beans, and fresh fruit and vegetables.
- In-Bond storage and Customs inspection – when shipments are stored “in-bond” they are considered as having not yet entering the US. This defers the duty on imported items. Some warehouses also have Customs inspection service station for processing imported products for use in the US.
- Foreign Trade Zone activities – Foreign Trade Zones (FTZ) are areas considered as outside of US Customs even though they are situated on US soil. Any goods that enter the FTZ are not assessed duties until they leave the

Zone for distribution. Value added, integration of domestically produced goods with goods produced overseas, and even more complex manufacturing processes can be carried out within FTZs that allow shippers to defer, reduce or even eliminate duties on imported goods.

### 3. New Points of Consumption



Today, there are three sales channels to consumers:

- Traditional “brick and mortar” stores (which include stores, big box retailers, outlets and “club” stores);
- Mail order catalogues; and
- Ecommerce or Internet orders.

Warehouses and DCs serve all three channels.

The traditional model of consumption was for consumers traveling to retail stores to select and purchase products. Sears Roebuck began to change this when they introduced their mail-order catalogue over 100 years ago. Mail order catalogues expand the reach of retailers by producing two sales channels – traditional “brick and mortar” stores and shop-at-home service. Catalogue use has grown significantly as families have two working parents and hectic days.

Catalogue order fulfillment requires a different delivery model. Instead of going to a limited number of retail stores, individual orders must be delivered to potentially hundreds of thousands of addresses throughout the US and sometimes overseas. These individual orders are also considerably smaller than the shipments going to retail stores, as well as generally more time-sensitive. Customers do not want to wait a long time for their orders. Accordingly, different distribution channels are needed.

The integrated carriers – UPS, Fedex, Airborne, DHL and the US Postal Service – have significant expertise in servicing the magnitude of delivery locations required in catalogue fulfillment. Hence, warehouses and DCs serving this sales channel tend to interface with these carriers to deliver the orders.

Shipment sizes are also different and must be factored into warehouse operations. Rather than whole pallet loads going to a customer, catalogue shipments may be just a few items in a single carton. These items must be individually

picked by a warehouse worker, packaged and labeled to ship via an integrated carrier. This can be a more labor-intensive effort.

Today, a third sales channel – Internet or ecommerce ordering – has been added. Buying over the Internet is growing in popularity. Statistics from the 1999 Holiday season confirm this trend – an analysis by VISA estimates that “Internet shoppers using its cards spent \$1.47 billion this November and December, 179 percent more than in those months last year.”<sup>3</sup> Similarly, a New York Times/CBS News poll found that 17 percent of the adults surveyed bought gifts over the web compared with seven percent in 1998.<sup>4</sup> Current news reports indicate that this trend is accelerating in the 2000 holiday season.

None of the companies involved in ecommerce considered Internet ordering as a replacement for traditional retail stores or mail order catalogues. Instead, ecommerce is viewed as a new means for reaching potential customers. Indeed, many retailers use all three sales channels – operating stores, mailing catalogues and running web sites. Some retailers leverage the advantages of each sales channel to support the other two channels; for example, some retailers allow purchases made on the Internet to be returned to one of their retail store (examples include Eddie Bauer and Best Buys). Allowing returns at the stores encourages potential buyers into the stores and potentially generates new purchases.

Warehouses and DCs do not see Ecommerce as significantly different from other retail order fulfillment, particularly mail order fulfillment. Indeed, one industry executive noted, “Ecommerce is only the last 100 yards in the supply chain.”

Ecommerce companies can represent new customers for warehouses and DCs. These companies often outsource their logistics and distribution requirements to firms excelling in these areas.

### **C. What Goes On In a Warehouse Today?**

Many people imagine warehouses as resembling the final scene in *Raiders of the Lost Ark* – a building filled with dusty cartons lost forever. Today’s warehouses and DCs are the antithesis of this image – they are buildings that bustle with activity. While warehouses still contain traditional elements, such as storage and transportation functions, these components have evolved. State-of-the-art distribution centers are often years ahead of the rest of the transportation industry in implementing technologies that improve tracking, enhance efficiency and expedite product movement.

The activities that occur in warehouses today can include (Figure II-2):

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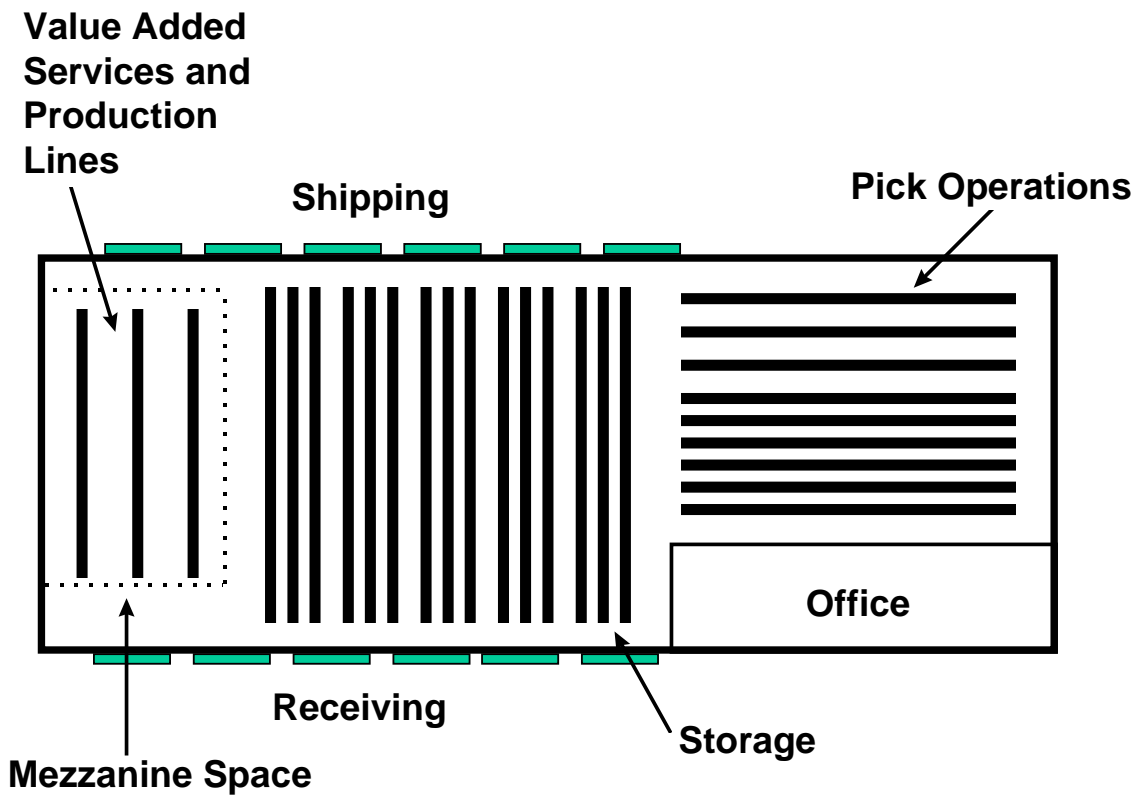
<sup>3</sup> S. Hansell, “Retailers Look Back and See Online Shopping Is Gaining,” *The New York Times*, December 24, 1999.

<sup>4</sup> *New York Times*, op. cit.



- Receiving;
- Temporary storage;
- Pick operations;
- Value added activities and production lines;
- Shipping;
- Returns processing; and
- Data processing and office functions.

**Figure II-2: Warehouse/Distribution Center Components**



Source: A. Strauss-Wieder, Inc.

## 1. Receiving

Inbound products are received in the receiving area of the warehouse. Depending on customer requirements, some product shipments may be moved directly

to outbound trucks for immediate delivery, a practice known as “cross docking.” In other cases, truck trailers, maritime containers and rail cars are unloaded. Sometimes the shipments are loaded onto pallets. Other times, as previously mentioned, shipments are floor loaded, meaning that they must be unloaded by hand.

The Receiving Department also performs quality audits of inbound products, checks actual shipments against amounts listed in documents, palletizes products, moves the products by forklift or conveyor into the storage areas, and logs in the products to the warehouse’s computer.

## **2. Temporary Storage**

Inbound products are often stored in a warehouse based on how quickly they will be needed. Products moving quickly will be stored near the pick and value added operations. Less frequently needed products are moved to more distant locations in the building. All products moved into storage are bar coded, and locations are tracked by the warehouse’s computer system. This procedure enables products to be located and moved quickly when needed. Forklift operators may be guided by on-screen commands issued by the warehouse computer by radio frequency (RF) transmission.

Storage areas are quite different than several years ago. Storage areas are taller, narrower and more compressed. Warehouses increasing use “very narrow aisle (VNA) racking systems” to increase building utilization. By decreasing the aisle width between rows of racks, more pallets and products can be stored in a smaller area. The same philosophy has led to taller racks – new warehouse construction typically has ceiling heights of 36 feet, significantly higher than several years ago. Some warehouse ceiling heights are even higher.

VNA and higher racks requires new equipment and technology to work:

- The technology starts with the warehouse floor. Floors must be extremely flat to ensure that high racks remain level all the way up to the warehouse ceiling. Today’s warehouses feature super flat floors that have been laser leveled.
- Forklifts must be designed to safely maneuver and operate in very narrow aisles and tall racks. VNA operations, therefore, use “wire guidance systems,” meaning that wires buried in the floors of the aisles guide the forklifts and ensure their safe operation. These forklifts can also extend higher and pivot in a narrower area to deliver or obtain a pallet from the racks.
- Fire suppression must also be considered in this compressed environment, along with new approaches to reduce the cost associated with installing sprinklers within the racks. Ceiling-mounted ESFR (Early Suppression Fast Response) sprinkler systems are used, which alleviate the need for expensive in-rack sprinkler systems.

Storage areas can include temperature-controlled space and secured areas. Secured areas (usually fenced, enclosed and secured within the warehouse) are used for high value and controlled substances. Similar secured areas are used to separate in-bond storage from the rest of the warehouse.

### **3. Pick Operations**

Individual items from cartons may need to be picked to fulfill an order. This is accomplished through pick and pack operations in the warehouse. In this area, racks contain open cartons of the products required. Workers guided by hand-held or cart mounted RF devices collect the items required and place them in a shipping carton (the size of which is often determined by the warehouse computer). Cartons then move, generally by conveyor to final packing and shipping.

The higher ceiling heights of the new warehouses enable the creation of mezzanine space in the building, increasing the available floor space. Pick and pack operations can occur in these mezzanine locations. At the Barnes and Noble warehouse near Exit 8A on the New Jersey Turnpike, order picking and packing occurs on two floors – the main floor and the mezzanine area above it – with the conveyor system linking the two areas to outbound shipping.

### **4. Value Added and Production Line Activities**

As previously discussed, a variety of value added activities and production can occur within the warehouse structure. Production lines and value added activities are located in a specific area of the building, with conveyors or forklifts bringing the necessary material to the area. Conveyors or forklifts also move the finished product to outbound shipped.

Computer screens and printed orders instruct the workers as to the services to be performed, including the needed inputs and the required finished products. Similar to pick and pack operations, these activities can occur both on the main floor and the mezzanine space in the warehouse.

### **5. Shipping**

The last stop in the warehouse is the Shipping Department. Prior to reaching this department, outbound loads have been checked for accuracy, received their final packaging (including such functions as insertion of foam peanuts, taping, shrink wrapping and palletizing) and are ready to be handed off to outbound trucking services.

Automated weight checking is increasing used to check the accuracy of the outbound shipments. The conveyor line passes through a “Check Weight” station where each carton is weighed. The computer automatically checks the weight of the carton against the estimated weight of the contents and carton. If the weight matches, the carton proceeds to final packaging/dunnage (biodegradable pea-

nuts and taping). If the weight does not match, then the carton is shunted to a station to be manually checked.

Outbound shipments leave the warehouse in a variety of ways, including:

- Customers may send their own trucks to pick up orders;
- The warehouse or DC may arrange its own trucks to deliver orders;
- UPS, Fedex or other integrated carriers may pick up orders directly at the warehouse or DC; and
- Loads may be directly loaded into rail cars for outbound movement. Outbound movement of paper rolls is one example of outbound rail car movements from warehouses.



The warehouse's conveyor system and/or forklifts deliver the outbound shipments to the appropriate truck bays for loading. Sometimes, the forklifts directly load the outbound trucks.

At the Barnes and Noble warehouse, a fifth exit strategy is used – Barnes and Nobles shares its building with a separate less-than-truckload (LTL) carrier that handles many of its outbound shipments, along with other customers. The Barnes and Noble warehouse conveyor merges into the LTL carrier's conveyor system to ship outbound cartons.

## **6. Returns Processing**

Warehouses may process products that have been returned to stores and other clients. In some cases, the warehouses may perform repairs and repackaging of these items. Warehouses may also act as the gathering point for these items and prepare them for return to suppliers or recycling facilities. Returns processing is part of the growing “reverse logistics” trend, which focuses on the movement of products after their original use is over.

## **7. Data Processing and Office Functions**

All warehouses contain office space, as well as computer and telecommunications equipment. As previously mentioned, a central warehouse computer often oversees inventory and manages product movement within the building. Paper work must also be processed. Lunchroom and locker space is provided for warehouse workers, as well as training and conference space.

In addition, office space in warehouses and DCs is increasingly used for sales and marketing. Many warehouse building designs incorporate features more often found in corporate office parks into the facades and office areas of DCs. The increased height of the new DCs also allows office space to exist on two levels in these buildings.

### III. The State of Warehousing and Distribution Center Activity in New Jersey

Warehouses and distribution centers are major hubs of activity, employment and traffic generation in the State of New Jersey. This chapter discusses:

- The magnitude of warehousing and distribution center activity;
- The location of warehousing and distribution center activity;
- Considerations in site and building selection; and
- The outlook for warehousing and DC activity in the NJTPA Region.

#### A. *The Magnitude of Warehousing and Distribution Center Activity*

##### 1. Magnitude

**Warehousing and DC Space:** As of the third quarter of 2000, nearly 736 million square feet of industrial space existed in northern and central New Jersey, with nearly 4 million additional square feet under construction (Figure III-1). Industrial space includes warehouses, distribution centers, manufacturing and processing facilities and research and development operations. A. Strauss-Wieder, Inc. estimates that warehouses and distribution centers account for over 440 million square feet of the area's industrial space.

In contrast, nearly 127 million square feet of office space existed in these counties (Figure III-6). In other words, *over 6 times more industrial space exists in the region*. These figures illustrate the significant presence that industrial space in general and warehouses and distribution centers more specifically have in the region.

This industrial space includes state-of-the-art warehouses and DCs with 36 foot clear ceiling heights, super flat floors and hundreds of thousands of square feet. The warehousing square footage also includes older single-story structures with lower ceiling heights and multi-story space in more urbanized areas.

While newer space is most desired, older industrial property is suitable for use for the storage and distribution of certain commodities, including cocoa, steel and paper, as well as meeting the needs of smaller companies. Older warehousing space has also attracted new tenants – Internet companies and start-up offices – who like the unusual characteristics of the buildings. Indeed, these new tenants now compete with traditional warehouse tenants for space, driving up lease and sale prices.

#### **Figure III-1: Industrial Space in Northern and Central New Jersey**

**Third Quarter 2000**

<b>County</b>	<b>Existing Space</b>	<b>Vacant Space</b>	<b>% Available</b>	<b>Under Construction</b>
Bergen	118,519,022	7,307,206	6.13%	684,989
Essex	87,787,772	7,918,457	9.02%	-
Hudson	105,438,640	6,621,547	6.28%	-
Morris	39,451,767	2,085,338	5.25%	268,950
Passaic	57,339,276	4,977,049	8.68%	-
Hunterdon	2,813,105	1,640,322	58.31%	-
Mercer	19,406,277	324,085	1.67%	-
Middlesex	158,622,373	9,915,877	6.14%	2,874,000
Monmouth	21,755,278	911,546	4.19%	-
Somerset	37,243,939	1,757,914	4.72%	-
Union	87,360,494	3,996,945	4.57%	100,000
<b>TOTAL</b>	<b>735,737,943</b>	<b>45,711,352</b>	<b>6.18%</b>	<b>3,927,939</b>

Source: CB Richard Ellis

**Employment.** Warehouses and distribution centers are estimated to employ over 380,000 workers at their facilities. As previously noted, many of the value added activities occurring at warehouses today more closely resemble the final steps in the production process.

Accordingly, the amount of employment associated with distribution centers with value added activities is significantly greater. For example, the 340,000 square foot Barnes and Nobles Distribution Center at Exit 8A on the New Jersey Turnpike employs 850 workers (see Appendix A for a case study of this DC). Warehouses with less value added activities employ much fewer workers. In many cases, productivity is achieved through the use of automation, bar coding and RF directed technologies at these facilities.

Distribution centers that process significant numbers of shipments can also generate high employment. For example, Fedex Ground's new 340,000 square foot "Super Hub" in Woodbridge, NJ employs more than 775 full- and part-time workers and can process 30,000 packages per hour.<sup>5</sup> This facility is considered Fedex Ground's largest and most advanced distribution hub. It serves as the central distribution point for the New York-New Jersey metropolitan region and overnight ground service in the Northeast.

<sup>5</sup> "Fedex Ground Opens Northeast Hub," *Journal of Commerce*, October 23, 2000.

**Figure III-2: Freight Transportation Employment in New Jersey**

Trucking Operations	64,100
Water Transportation	15,000
Rail Freight Transportation	2,400
Air Cargo Transportation	11,900
Public and Private Warehousing	380,300
Freight Transportation Arrangement	10,400
<b>TOTAL</b>	<b>484,100</b>

Source: Value of Freight to the State of New Jersey

## 2. Growth in Industrial Space

The amount of industrial space in the region continues to grow, with much of the new space being developed for warehouse and distribution functions. This growth is fueled by the:

- High density and per capita consumer expenditures of the region's population;
- Easy access to one of the nation's largest concentrations of population and businesses – the northeastern and middle Atlantic states;
- Current robust economy of the New York-New Jersey area and the nation; and
- Significant growth in international commerce.

**Types of new warehouse construction:** New warehouse and DC construction generally falls into two categories – “build to suit” and speculative construction. Both types of construction are now taking place in the region.

*Build to suit construction* is defined as having one or more tenants in place prior to commencing the project. In these cases, the tenants work with the developer/builder to customize the building to meet their needs (e.g., building size and layout, number of truck bays, column locations to accommodate racks, mezzanine space, etc.). However, developers who are leasing the completed structures to tenants will try to maintain a building design that can be easily marketed to other companies at the end of the lease. Site and building selection considerations are discussed later in this chapter.

*Speculative construction* refers to building the warehouse or DC without a tenant in place. Speculative construction usually occurs during robust real estate markets. The advantage of speculative space is that it is immediately available to



customers that need space quickly. Often, the speed at which a building can be made operation factors heavily in warehouse and DC selection decisions.

**Growth in industrial space:** Growth and the robustness of the existing market for industrial space can be measured in three ways:

- Change in the inventory of industrial space and reports of new construction;
- Trends in availability rates; and
- Trends in lease rates.

By all three measures, the region's industrial market has exhibited continued growth and vitality.

**Change in Industrial Inventory:** Nearly 30 million square feet have been added to the inventory of industry space in the region (Figure III-3) in the last two years, with an additional four million square feet of space currently under construction in 13 new buildings.<sup>6</sup>

**Figure III-3: Comparison of the Inventory of Industry Space  
 Third Quarter, 1998 to Third Quarter, 2000**

County	Space in 3Q98	Space in 3Q00	Change 98-to-00
Bergen	115,631,718	118,519,022	2.5%
Essex	84,626,772	87,787,772	3.7%
Hudson	101,552,624	105,438,640	3.8%
Morris	37,138,230	39,451,767	6.2%
Passaic	55,013,403	57,339,276	4.2%
Hunterdon	2,423,105	2,813,105	16.1%
Mercer	19,230,677	19,406,277	0.9%
Middlesex	148,559,841	158,622,373	6.8%
Monmouth	22,603,108	21,755,278	-3.8%
Somerset	36,175,788	37,243,939	3.0%
Union	85,585,275	87,360,494	2.1%
<b>Total</b>	<b>708,540,541</b>	<b>735,737,943</b>	<b>3.8%</b>

Source: CB Richard Ellis

**Availability rates:** Even as new space is constructed, the availability rate for industrial property in the region has continued to decrease, indicating that the demand for this space is robust (Figure III-4). Note that the amount of available space also decreases as older properties are demolished. The Port Authority of

<sup>6</sup> Source: CB Richard Ellis Market Index Brief, Industrial Market for Northern and Central New Jersey, Third Quarter, 2000 report.

New York and New Jersey, for example, is demolishing older shed and warehouse space at the port, though new air cargo space is being completed at Newark International Airport. In addition, older industrial property in some urban areas is either being demolished or converted to other uses.

**Figure III-4: Comparison of the Industry Space Availability Rates  
 Third Quarter, 1998 to Third Quarter, 2000**

County	Available 3Q98	Available 3Q00
Bergen	7.74%	6.13%
Essex	10.05%	9.02%
Hudson	10.40%	6.28%
Morris	10.02%	5.25%
Passaic	11.86%	8.68%
Hunterdon	51.60%	58.31%
Mercer	2.99%	1.67%
Middlesex	10.86%	6.14%
Monmouth	17.27%	4.19%
Somerset	9.15%	4.72%
Union	9.57%	4.57%
<b>Total</b>	<b>10.11%</b>	<b>6.18%</b>

Source: CB Richard Ellis

**Lease rates:** Lease rates have continued to rise during the last two years, indicating a strong demand for available space and the robust state of the economy (Figure III-5). The rise in asking lease rates also reflects the costs associated with constructing new facilities on more expensive land parcels. Rises in lease rates can lead to a greater consideration of more distant locations in site selection.

Newer buildings with the most desired features command greater lease rates while older structures attract lower rates. As new structures become available, lease rates can fall in older existing structures.

**Figure III-5: Comparison of the Industry Asking Lease Rates  
 Third Quarter, 1998 to Third Quarter, 2000**

County	3Q98	3Q00	Change 98-to-00
Bergen	\$ 5.56	\$ 6.60	18.7%

Essex	\$	5.16	\$	4.53	-12.2%
Hudson	\$	4.61	\$	5.13	11.3%
Morris	\$	5.76	\$	6.60	14.6%
Passaic	\$	5.07	\$	4.73	-6.7%
Mercer	\$	3.30	\$	3.79	14.8%
Middlesex	\$	4.36	\$	4.71	8.0%
Monmouth	\$	5.23	\$	4.96	-5.2%
Somerset	\$	4.35	\$	5.23	20.2%
Union	\$	4.51	\$	4.57	1.3%

Source: CB Richard Ellis

### 3. Contrast with Office Space in the Region

Nearly 127 million square feet of office space exist in northern and central New Jersey (Figure III-6). Similar to industrial space in the northern and central New Jersey area, the market for office space has been robust. The similarities between the two markets include:

- Increases in the amount of existing space combined with new construction.
- Decreases in the vacancy rates. The majority of the vacancy rate reductions were in “Class A” (top rated) office space, where the vacancy rate fell three percentage points.<sup>7</sup>
- Increases in the average asking lease rates. The lease rates for office space are considerably higher than industrial space. The highest lease rates for office space are being asked in Hudson County, where the average asking lease rate for Class A space is \$28.00.<sup>8</sup> The Hudson County market is closely aligned with the New York City office market.

**Figure III-6: Office Space in Northern and Central New Jersey  
 Third Quarter 2000**

County	Existing Space	Vacant Space	% Available	Under Construction	Lease Rate
Bergen	21,068,320	1,760,346	8.0%	936,000	\$ 24.93
Essex	19,410,125	2,361,935	12.1%	110,000	\$ 22.94

<sup>7</sup> Source: CB Richard Ellis Market Index Brief, Office Market for Northern and Central New Jersey, Third Quarter, 2000 report.

<sup>8</sup> Office Market, *op. cit.*

NJ Warehousing and Distribution Center Context  
 NJPTA Brownfield Economic Redevelopment Project

Hudson	14,337,921	289,985	2.0%	161,318	\$ 26.78
Morris	19,739,588	2,268,717	10.4%	2,075,000	\$ 24.72
Passaic	4,229,742	905,165	21.4%	-	\$ 20.23
Hunterdon	1,615,291	9,692	0.6%	-	\$ 22.00
Mercer	10,420,283	1,027,984	9.5%	400,602	\$ 23.22
Middlesex	16,578,377	1,251,741	7.5%	111,500	\$ 22.27
Monmouth	4,390,215	181,381	3.9%	260,587	\$ 18.90
Somerset	9,679,588	646,655	6.5%	268,944	\$ 24.71
Union	5,266,155	452,139	7.7%	605,785	\$ 22.87
<b>Total</b>	<b>126,735,605</b>	<b>11,191,554</b>	<b>8.5%</b>	<b>4,929,736</b>	<b>\$ 23.43</b>

Source: CB Richard Ellis

## **B. The Location of Warehouse and Distribution Center Activity**

Industrial space and new development are concentrated at the core of the region and along with major transportation arteries. Warehouses were originally clustered in the urban areas nearest New York City in order to serve that market. As the demand shifted to larger, single-story space and the Interstate System was built, new warehouse and DC construction shifted outward in the region to locations with large parcels of inexpensive available property with good highway access.

### **1. Key Concentrations of Activity**

The greatest concentration of industrial space is found in Middlesex County, an area long known as the epicenter of the State's warehousing and DC activity. Middlesex County has nearly 159 million square feet of rentable industrial space, with an additional 3 million square feet under construction (Figure III-1). Middlesex County's inventory of industrial space represents nearly 22 percent of all of the industrial space in the region and nearly all of the new construction.

Exit 8A on the New Jersey Turnpike in Middlesex County (which includes Cranbury, Jamesburg and Dayton) has the single greatest concentration of warehousing and DC space in the State and is one of the most desirable locations for this activity in the nation. Approximately 40 million square feet of warehousing and DC space exists immediately around Exit 8A with an additional 2 million square feet of warehousing under construction and another 3.9 million square feet of new warehousing approved for construction.<sup>9</sup> Additional warehouse projects are also under consideration for this area. Exit 8A is the location of many major

<sup>9</sup> Guy Baehr, "At Exit 8A, tempers flare over tax incentives," *The Newark Star Ledger*, November 26, 2000, Section 3, page 1.

companies' warehouses, including Barnes and Noble, Canon, Volkswagen, Crate and Barrel, Lifetime HOAN, Cooper Tire and Tommy Hilfinger. Many of these operations require access to the port and the integrated carriers.

Exit 8A is not the only location of warehousing and DC activity in Middlesex County. Significant concentrations of warehousing and DC activity occur in areas such as Edison and Carteret.

Major concentrations of industrial property also occur in Bergen, Hudson, Union and Essex Counties. Warehousing and DC activity in these areas are drawn to the close proximity to New York City, the port and airport.

## **2. Relationship to the Port and Newark International Airport**

The interviews, research and assessments conducted by A. Strauss-Wieder, Inc. found significant connections between many of the warehouses and distribution centers and the Port and Airport. These connections included:

- Nearly all of the inbound material to some of the warehouses and DCs came through the Port from overseas locations. This arrangement reflects the growing practice of global sourcing, manufacturing and marketing. In many cases, the imported material undergoes the final portion of the production process (including customization, assembly and other value added activities) at these warehouses and DCs. This activity generates significant employment in the region.
- Some of the warehouses closer to the port are directly involved in the movement of maritime cargo. Examples include overweight container transload operations, Foreign Trade Zone activities, and the storage and distribution of specific commodity types (including paper, steel, and forest products). Other warehouse uses found close to or in ports include fresh fruit, cocoa, frozen or refrigerated food, and staging space for project cargo movements overseas.
- Many of the warehouses and DCs, particularly those facilities that shipped to consumers' homes or individual stores, use the integrated carriers – UPS, Fedex, Airborne, etc. – for a large portion of their outbound movements. The integrated carriers use both ground and air transport for the movement of these shipments, depending on distance and time sensitivity. Industry executives noted a need to be close to the facilities of these carriers. However, this requirement does not necessarily translate into the need for proximity to the airport – the ground operations of these integrated carriers can be located elsewhere. For example, Fedex's new hub for ground operations is located in Woodbridge, NJ.
- In cases where the warehouses or DCs needed to interact with the air transport operations of these integrated carriers, proximity to the airport was important. The closer the DC is to the airport, the later the cut-off time to have packages picked up. For example, locations closer to Newark International

Airport may have a pick-up cut off time of 9 PM, while locations in Mercer County, NJ may have a 5 PM cut off time. The later cut-off time can improve the customer responsiveness of the warehouses, particularly for critical parts replacement and the movement of other products that require time-critical air service. Calls and requests can come in later in the day and still be handled.

- For similar reasons, air cargo consolidators and handlers tend to locate their operations in close proximity to the airport. These air cargo operations tend to require a smaller amount of space because shipments are moving very quickly. Because of their need for proximity to the airport, these businesses are often willing to pay higher lease rates for near airport locations. This ring of higher-priced warehouses is found around most airports.
- Certain air cargo operations are required to be on-airport because they need direct ramp access for their aircraft to taxi to the warehouse for loading/unloading.

### **C. Considerations in Site Selection and Building Design**

This section summarizes the key considerations in site selection and building design. While some criteria have remained the same – for example, land cost and transportation access – other criteria and considerations have emerged as the mission and needs of warehouses and distribution centers have evolved.

#### **1. Site Selection Considerations**

**Overall Site Considerations:** Based on the interviews and research conducted by A. Strauss-Wieder, Inc., the key considerations in site selections for warehouse and distribution center operations are:

- Availability of appropriately sized properties – Current and future warehouse needs drive the size of the property required. Large land parcels suitable for development are needed for modern warehouses and distribution centers – while some 100,000 square foot warehouses can be built on properties consisting of as little as 5 acres, most warehouse and DC buildings require considerably larger parcels. Generally, new warehouses and DCs exceed 300,000 square feet in size. Many approach or exceed 1 million square feet in size. A building in this size-range many house a single tenant or be subdivided for multiple tenants. For example, Dotcom Distribution occupies 240,000 square feet of an 800,000 square foot building in Edison, NJ. In addition to the actual structure, sufficient space must exist on the site for truck staging and employee and visitor parking. Further, room for expansion must exist on the property, either by expanding into additional segments of the building or through the construction of an addition to the structure. The ability to expand is a key consideration in site selection. Companies do not want to move their warehousing operations nor do they want to locate in several buildings in multiple locations. Consolidation of operations is one of the key

drivers towards the larger building sizes. Accordingly, properties ranging from 40-to-100 acres may be required for a single development, taking into account the land coverage permitted in different locations. Ideally, parcels consisting of several hundred acres are most desired – several warehouses can be constructed on the site to create a campus setting and provide adequate space for corporate expansions.

- Property cost – The cost of the property, including the cost of the approvals, permits and site preparation are an overriding consideration. Large warehouses need a large amount of land. Lower property costs have driven site selection to the outer areas of the region and into Pennsylvania. Given the lower lease rates that can be charged for warehousing and distribution space (ranging from \$4.50-to-\$5.50/square foot triple net), several of the executives interviewed indicated that the cost of the land under the building generally could not exceed \$5.00/square foot and should be lower if possible.
- Speed of the approval and permitting process – Once a decision has been made on a site, the warehouse operator and developer want to start construction and be completed as quickly as possible. As seen in two of the examples given in Appendix A – Lifetime HOAN and Barnes and Noble – the goal is to complete the process in under a year. Indeed, Lifetime HOAN selected its new Exit 7A location specifically because the developer could guarantee that the new DC would be constructed and operation on the aggressive time line mandated by the company. Potential delays in approval and permitting can reduce the attractiveness of sites.
- Property conditions – Property conditions, such as the existence of wetlands or environmental contamination, factor into site considerations. The primary concerns are the cost and time involved in the mitigation of environmental contamination or the need for pilings.
- Roadway access – Nearly all of the shipments leaving warehouses and distribution centers depart in trucks. Access to the major highways, particularly the New Jersey Turnpike is essential. Ease of access, including the condition of the local roads connecting to the highways, is a key consideration in site selection.
- Availability and access to labor – As previously noted, warehouses undertaking value added activities require a greater number of workers. Several of the executives interviewed indicated that the tight labor market combined with the more distant location of many new warehouses has made labor a critical issue. At least two of the warehouses visited used vans to transport workers from urban areas to their locations.

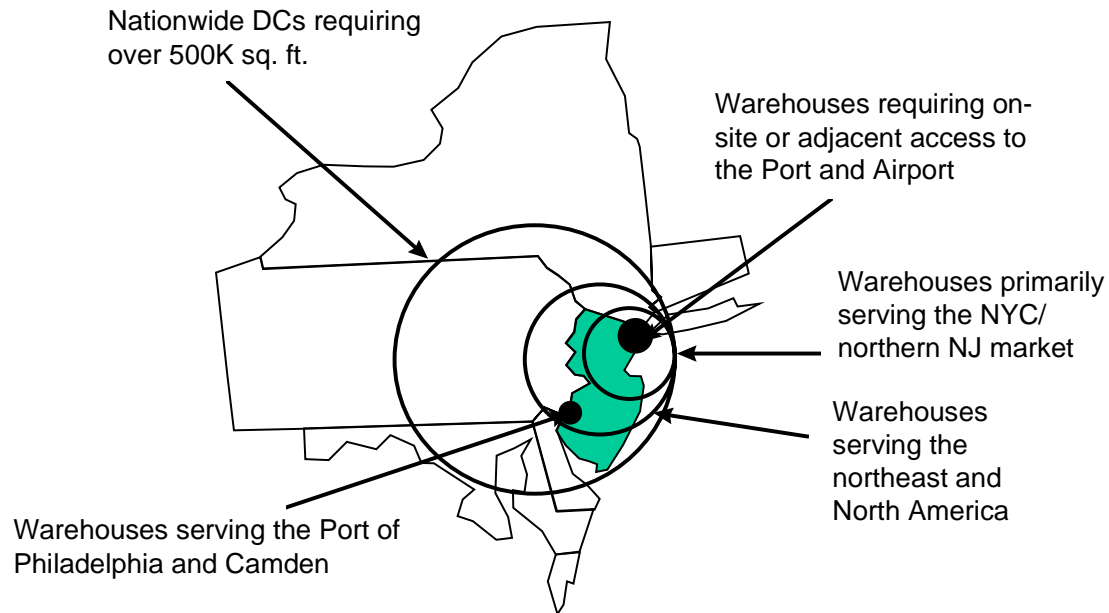
***Location Considerations vis-à-vis the New York-New Jersey Region, Port and Airport:***

Our research has found that a series of distance rings have emerging for siting warehouses and DCs in the area (Figure III-7):

- On or adjacent to the port and airport – As previously discussed, these warehouses serve functions and handle commodities that require their location on or immediately next to these cargo hubs.
- Positioned to serve the New York City market – These warehouses and distribution centers need easy, predictable and immediate access to the New York City marketplace. Trucks often need to make multiple trips daily between the warehouse and the City. For example, Webvan (which provides on-line grocery service) is locating the warehouse that will serve New York City in Secaucus, NJ. These warehouses tend to be located in the inner core of counties in the region – Bergen, Hudson, Essex and Union.
- Positioned to serve North American markets with an emphasis on serving the Northeast Corridor – These are generally larger warehouses, ranging from 300,000 square feet to over 1 million square feet. The ideal location is along the I-95 corridor, which affords them easy access to their market area. Some facilities have also located along the I-78 and I-287 corridors. Their market area includes New York City but also extends to multiple states in the area. Areas within this distance ring are also ideally situated to receive and ship cargo through the Port and Airport.
- Positioned to serve all of North America from a single location – These are the warehouses and DCs in excess of 1 million square feet. From a single location, they serve all of North America. They can locate further away from the core of the region because they need to serve a greater area. The more distant locations are also more affordable for the large land parcels required for these facilities. As one industry executive noted, “The distance ring for these types of buildings extends from Orange County, NY to Harrisburg, PA to Gaithersburg, MD.”

**Figure III-7: Location Consideration Rings for Warehouses and Distribution Centers in the New Jersey Market**





Source: A. Strauss-Wieder, Inc.

## 2. Building Design Considerations

Once the site has been selected, several considerations factor into the building design. In an ideal case, the warehouse is designed from the inside out – the optimal storage and circulation layouts, along with the types of equipment that will be used, are determined first and then the outside of the building is designed. Building design considerations include:

- Ceiling heights – new buildings contain 36-foot high clearances within the structure, an increase from the recent 32-foot design. The new higher ceiling heights permit the construction of mezzanine space to make best use of the cubic square footage of the building.
- Super flat floors with appropriate floor-loading capacity – These floors are an absolute requirement to support the racking systems installed in today's distribution centers.
- Racking systems and layouts – Laying out the racking and conveyor systems for a new building helps determine the column placements in the new structure.
- Truck doors – The number of truck doors and the size of the truck staging area outside of new distribution centers is increasing. The previous rule of thumb was one door per 10,000 square feet of space. The new rule is one truck door for every 7,000-to-8,000 square feet of space and sometimes more. The increase in truck loading/unloading areas reflects the accelerated movement of goods, along with the growing truck driver shortage. To deal

with the truck driver shortage, the emerging practice is to leave fully loaded trailers or containers at the warehouse, detaching the power unit and enabling the driver to take on other assignments. This practice replaces the procedure of keeping a driver at the warehouse two-or-more hours while their trailer or container is loaded or unloaded.

- ESFR, utilities and telecommunications – Today’s warehouses require more equipment to manage their more complex operations. Fire, security, telecommunication, computer, lighting and HVAC systems must be considered in new building designs.
- Appearance – More office space is being included in new buildings. Office space may be used for marketing, showrooms and sales, as well as warehouse administration. Rather than being “back office” space, the new offices need to have the appearance and ambiance of corporate space. Accordingly, new buildings often feature more elaborate facades and landscaping in their office areas.
- Expandability – Expandability is a key consideration in site selection. It is also a factor in building design – in designing the building layout, consideration must be given to expanding the structure with a minimum disruption to service.

#### ***D. The Outlook for Warehousing and DC Activity in the NJTPA Region***

Three factors affect the outlook for warehousing and distribution center activity in the NJTPA Region:

- The state of the economy;
- The growth in international trade; and
- The availability of land.

##### **1. The State of the Economy**

The NJTPA region, the larger New York-New Jersey metropolitan area and the nation have been experiencing a booming economy. As noted in the Port Authority’s *Regional Economy* report, “The NY-NJ region has become one of the unquestioned leaders of the nation’s current economic expansion, which is now the longest in history.”<sup>10</sup> The extraordinary strength of the area and national economies have been demonstrated through rising employment, increases in the number of firms, growing personal and corporate incomes and greater spending. All of these factors have fueled the need to move more goods and develop more distribution center capacity.

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<sup>10</sup> *Regional Economy: Review and Outlook for the New York-New Jersey Metropolitan Region*, Port Authority of New York and New Jersey, August, 2000, p. 1.

A slowdown in the economy could reduce the demand for warehousing space in the area. However, companies will continue to upgrade their facilities, and new companies may enter the marketplace and require distribution facilities. A precipitous decline in the economy, similar to downturn experienced in the late 1980s/early 1990s, could significantly affect the demand for warehousing space and new construction.

The current economic outlook for the area supports future growth based on the increases in population and labor force in the region.<sup>11</sup> The Port Authority's report notes, "Even with the incipient slowdown expected to unfold in 2001 under higher interest rates, it is expected that the region will continue to keep pace with US job growth over the next few years – something new in recent memory."<sup>12</sup>

## **2. The Growth in International Trade**

The increase in the amount of international trade, along with the value added and production services required, is anticipated to continue to fuel and increase the need for warehousing and DC space in the future. The Port Authority forecasts that the traffic moving through the Port complex will grow from the current 2.5 million twenty-foot container units (TEUs) to 14.4 million or more TEUs in 2040.<sup>13</sup> Newark International Airport already moves over 1.1 million tons of domestic and international cargo annually – one of the largest concentrations in the US

The executives interviewed uniformly noted that the hubbing of cargo through the Port will significantly enhance the attractiveness of this area for warehousing and DC activity. One executive noted that the optimal demand for distribution space used to be Columbus, Ohio. International trade and clearance issues are pulling that demand point closer to the East, placing the Northeast corridor in a "real fine position" for warehousing and distribution center operations.

## **3. The Availability of Land**

Given the outlook for continued and potentially increasing demand for warehousing and distribution center space in this area, the limiting factor then becomes the availability of land to support this development. Many of the executives interviewed questioned whether sufficient land would be available in this region to support the growth in international trade through the Port and benefit from the value added activities generated from this traffic.

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<sup>11</sup> *Regional Economy, op. cit.*, p. 2.

<sup>12</sup> *Regional Economy, op. cit.*, p. 3.

<sup>13</sup> *Building a 21<sup>st</sup> Century Port*, Port Authority of New York and New Jersey, p. 8.

Already, the distance ring for selecting warehousing and DC sites extends beyond the NJTPA region and the State of New Jersey. While locations continue to be developed for warehouses and distribution centers within the region, it is possible that warehouses and DCs that will support and benefit from the increased trade through the Port could be located outside of this area.

## IV. Brownfield Redevelopment Considerations

The objective of the NJTPA Brownfield Economic Redevelopment analysis is to explore ways to channel new or expanded freight-related businesses into the region's numerous abandoned or idled industrial properties. Warehouses and distribution centers represent a mechanism for generating local economic value and impact from the increased amount of freight and trade anticipated to move through the region. Within this framework, the region's brownfields offer unique opportunities if a set of challenges can be overcome. This chapter discusses the opportunities offered by brownfield sites and summarizes the challenges that need to be addressed.

While millions of square feet of warehousing space can still be developed on available "greenfield" sites in the NJTPA region, the number of such sites could become increasingly limited. New Jersey is already the most densely developed state in the US. Accordingly, different land uses, such as office, recreational, agricultural, residential, industrial and commercial, increasingly compete for the remaining space. New Jersey is also attempting to manage growth and preserve open space within the State.

### A. *Brownfield Opportunities*

Brownfield sites offer unique opportunities, given the current and projected level of demand for warehousing and distribution center space. The advantages of the brownfield sites include:

- Location;
- Access to Labor Markets; and
- Shorter Truck Trips.

#### 1. Location

Brownfield sites can augment the pool of available warehouse locations within the NJTPA region. The brownfields, most of which were used for industrial purposes in an earlier era, tend to be closer to the region's urban core, seaport and airport. Accordingly, these sites could be of increasing importance to those warehousing operations that require close proximity to the regional market and major transportation hubs – the two inner rings of warehousing/distribution activity noted previously.

Warehouses that serve as hubs for regional distribution and collection must be able to effectively serve their local customers. Closer-in locations reduce the number of miles that must be traveled by trucks between the facilities and customers. Warehouses and distribution operations requiring close proximity to the

airport and port (including facilities that consolidate air freight and handle overweight containers) also benefit from the availability of brownfield sites. While the airport and seaport require these functions to compete for cargo and commerce, acreage for these operations is increasingly scarce.

Competition among land uses is intensifying near Newark International Airport, Port Newark/Elizabeth and Bayonne/Jersey City. For example, warehouses and distribution activities are being relocated off of port property as the maritime terminals are expanded. Simultaneously, new land uses, including hotels, office buildings and commercial space, are being developed around the port. Reuse of brownfield properties increases the number of sites available to these operations and may allow them to remain close to the seaport and airport.

## **2. Access to Labor Markets**

Many of the executives interviewed noted the increasing difficulties involved in recruiting and retaining workforces for their facilities. Brownfield sites may provide better access to labor markets because of their locations. Brownfield sites tend to be located in more developed, urbanized locations, with potentially greater access to the region's transit system and labor pools. Interviews and discussions with warehouses and distribution centers in the vicinity of Exit 8A, for example, found that vanpools were often needed to transport workers to and from the facilities. Even without transit access, the brownfield sites would potentially require a shorter commute for employees.

## **3. Shorter Truck Trips**

As previously noted, the closer-in locations of brownfield sites potentially benefit those warehouses requiring greater interaction with the regional marketplace, Port, Airport and intermodal/transload rail terminals. This interaction usually involves truck movements. By reducing the distances between the warehouses and these origins/destinations, the average length of and time involved in the truck trips are reduced. As a result, trucking costs could be reduced because drivers can make an increased number of trips in a workday. The reduction in vehicle miles traveled (VMT) could also provide environmental benefits to the NJTPA area, particularly on the I-95, I-80, I-78 and the Route 1/9 corridors.

The closer-in locations also generate increased efficiencies for trucking operations. The shorter distances allow trucks to make several trips a day, rather than one trip. The increased number of trips increases profitability and generates better utilization of trucking equipment and drivers.

### ***B. Brownfield Challenges and Considerations***

While brownfield sites offer potential additional space for warehouse and distribution center development in the NJPTA region, a series of challenges and con-

siderations must be addressed to achieve this vision. These challenges and considerations include:

- Site size and conditions;
- Site cost;
- Time frame for site approvals, mitigation and preparation; and
- Transportation access.

### **1. Site Size and Conditions**

The criterion, “Location, location, location” will always be the first consideration in determining the attractiveness of a site. The second criterion is the size and condition of the site. As previously discussed, warehouse and DC development require certain sizes of properties, generally ranging from 5 acres to several hundred acres.

If the brownfield site meets the overall size requirement, then the considerations include:

- The coverage permitted on the site – this zoning requirement dictates the size of the building that can be constructed on the site.
- The existence of wetlands or soil conditions, which can require additional site preparation or design considerations. Some soil conditions require that pilings be sunk or the soil surcharged before a building can be constructed. The need for super flat floors requires particular attention to these soil and construction conditions.

### **2. Site Cost**

Many of the executives interviewed indicated that site cost was a key consideration in the viability of brownfield sites for warehouse development. The costs associated with obtaining, mitigating and preparing a site must be reasonable enough to allow the charging of the market lease rate or purchase price for warehousing and DC space in the area.

### **3. Time Frame for Site Approvals, Mitigation and Preparation**

Speed is of the essence in warehouse development. Brownfield sites can require extensive and time-consuming mitigation and approvals before they can be developed. Accordingly, unless a specific time frame for mitigation and site approval can be guaranteed, brownfield sites will not be as attractive as greenfield sites for warehouse development. It is more likely that potential brownfield developers will have to seek approvals and complete mitigation work prior to marketing the site, which adds to the cost of development.

#### **4. Transportation Access**

Even if a brownfield site meets the size, cost and time frame considerations, the site must still have good access to the region's transportation system. Many of the executives interviewed noted that poor local roads and connections to the Interstate System hampered brownfield sites

Access to rail lines can also be a consideration. Some warehouses and distribution operations require direct rail sidings to their facilities. Brownfield sites, with their industrial heritage, may already have rail lines running on or adjacent to them. Accordingly, existing rail access on-site could provide an additional competitive advantage to brownfield properties.

#### **C. Conclusions**

The brownfields in the NJTPA region represent a unique resource for economic development and transportation efficiency. Some efforts are already underway to address brownfield access concerns:

- The NJTPA is considering enhanced scoring of transportation projects that improve access to brownfield sites.
- The need for improved access is the motivation for Union County's efforts with the New Jersey Turnpike to create a new exit to serve the brownfield sites at Tremley Point in Linden, NJ. The County has identified Tremley Point, with over 400 acres, as a potential site for new value added warehousing and distribution activities and has attracted the interest of numerous developers and freight operations.
- Efforts to reuse the brownfields in conjunction with the anticipated increases in maritime and air cargo have also moved forward – a “string of pearls” concept is being developed that would link the port, airport, brownfields and Portway initiatives.

However, challenges still remain. The intensifying competition for land, along with site costs, mitigation, site conditions and the time involved in approval processes, may limit the number of brownfield sites available for warehousing and distribution functions. The land banking of property or the creation of public/private partnerships for the redevelopment of brownfields for warehousing and distribution have been proposed, raising the need to balance and consider community, public sector and private sector interests and objectives.

Brownfield redevelopment is possible and potentially profitable. Developers, property owners and communities will move forward on site redevelopment, whether for warehouses or other uses, as opportunities arise. In that regard, the brownfields, once seen as a blight, may offer an opportunity to maximize the



benefits accruing from the freight and trade moving through the region, as well as generate additional economic value for the entire area.

## Appendix A: Case Studies of Warehouses and Distribution Centers in the NJTPA Region

### Case Study: Lifetime HOAN Corporation

<b>Company Description:</b>	<p>Lifetime HOAN Corporation designs, markets and distributes a broad range of household cutlery, kitchenware, cutting boards and bakeware products. Items are sold under owned and licensed trade names, such as Hoffritz, Prestige, HOAN, and Farberware. They are also a licensed supplier of KitchenAid, Revere and Pillsbury.</p> <p>Lifetime HOAN is an industry leader in their market, with major retail customers throughout the US. Their customers include specialty retailers, big box retail chains, department stores and ecommerce companies.</p>
<b>Warehouse Type:</b>	Private warehouse; value added/wholesaler/distributor
<b>Location:</b>	<p>Currently located in Dayton, NJ by Exit 8A on the New Jersey Turnpike. Moving to a new facility in 2001 that is located in the Northeast Business Park in Washington Township, NJ (by Exit 7A on the Turnpike)</p> <p>The company has been at this location for 14 years. Prior to locating in Dayton, the company had a facility in Brooklyn and then in Mahwah, NJ. The location decision is discussed under “Other Comments.”</p>
<b>Square Footage:</b>	<p>Lifetime HOAN’s distribution operations currently involve three buildings, including a 300,000 square foot main facility and two 150,000 square foot satellite buildings.</p> <p>The new 7A facility will consolidate the operations of the three buildings into a single, state-of-the-art 560,000 square foot building, which can be expanded to approximately 710,000 square feet. The new building will be 39-to-40 feet tall, with 36 foot clear within the structure. The new building is located on a 50-acre site.</p>
<b>Employment:</b>	Currently between 500 and 550 workers. The new facility’s efficiency will require fewer workers.
<b>Operations Performed:</b>	The facility receives product in bulk (such as different sizes of kitchen knives). The items are made “shelf-ready” at the facility – per customer specifications, individual prod-

ucts are packaged or bundled and packaged. Packaging may include blister packing; assembly of knife sets in boxed sets and ticketing.

**Relationship to Airport/Seaport:**

Virtually all of the products arrive through the Port of New York and New Jersey from overseas. The facility receives approximately 1,600 40- and 20-foot containers annually (approximately 2,500 to 3,200 TEUs).

The cargo is not palletized; rather, the containers are floor loaded to capacity. At the warehouse, the receiving department hand unloads, does a quality audit, palletizes the cartons and enters them into the warehouse computer system.

**Area Served:**

All of North America from this location.

**Other Comments:**

Lifetime HOAN's distribution operation is in transition. They are moving from an older generation facility and warehouse operation to a state-of-the art facility. As an example of the technology shifts that will occur with the transition to the new building, the current warehouse operation includes bulk pallet storage; receiving with manual putaway; and manual sortation to confirmation scanning systems. In contrast, the new facility will feature:

- Very narrow aisle racking with swing reach turret trucks;
- Radio frequency (RF) directed piece picking carts;
- A receiving department with RF directed putaway of pallets (the warehouse computer instructs the forklift driver as to where to place the pallet);
- Automated sortation to assigned shipping lanes;
- Picking directly onto conveyors; and
- Use of mezzanine space for maximum cube utilization.

The site selection criteria leading to the move to 7A centered on having a new building up and operational before the start of the next selling season. Matrix, an industrial developer, was the only developer willing to accomplish this time line but only if Lifetime HOAN used Matrix's 7A property. Accordingly, the 7A location was selected.

The time line, increasingly typical in new warehouse construction/operation, was less than a year. Matrix broke ground for the new facility in August 2000. The schedule

calls for the building to be completed and 50 percent occupied by Lifetime HOAN in March, 2001; 100 percent occupied by April, 2001 and fully operational by July, 2001.

## Case Study: Port Jersey Logistics

<b>Company Description:</b>	<p>Port Jersey Logistics offers a full range of supply chain management services, including warehouses, consolidation, trucking services, an overweight container program, foreign trade zone and Customs bonded services, to international shippers and domestic manufacturers.</p> <p>The Port Jersey Logistics Companies include Port Jersey Distribution Services; Tyler Distribution Centers, Inc.; Bayview Packaging; Port Jersey Transportation; 21<sup>st</sup> Century Distribution and Continental Logistics.</p>
<b>Warehouse Type:</b>	Public and contract warehouse operator. Facilities include dry, refrigerated and heated buildings.
<b>Location:</b>	11 locations, including Port Newark/Elizabeth, Jersey City, Monroe Township and South Brunswick, NJ. The main office for Port Jersey Logistics is located in Jersey City, NJ.
<b>Square Footage:</b>	2 million square feet across the 11 locations.
<b>Employment:</b>	Approximately 450 workers. In addition, some work is subcontracted to a group employing handicapped individuals. One example of the work done by this outside group is the assembly of alcoholic beverages into retail Christmas gift packages.
<b>Operations Performed:</b>	<p>Port Jersey handles a wide range of commodities through its warehouses, including food products, alcoholic beverages, general consumer goods and some paper products.</p> <p>The operations performed at the warehouses include packaging of products, repacking, product assembly, alcoholic beverage licensed activities, building displays and reverse logistics/handling of returns. Port Jersey frequently mingles products from both domestic and international sources.</p> <p>The company's Overweight Container Program is designed to reduce the cost of shipping ocean containers.* Under this program, shippers load containers to the international limit (55,000 pounds) instead of the US domestic</p>

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\* Source: Port Jersey Logistics web site.

limit (45,000 pounds). When the containers arrive in the US, they are unloaded at the Port Jersey warehouses and divided into trailer loads that meet US weight limits.

Port Jersey also performs truckload and less-than-truckload (LTL) consolidation.

**Relationship to Airport/Seaport:**

Easy access to the port is very important to Port Jersey. For example, their Overweight Container Program requires close proximity to the port for the transport of these containers to the facilities where they will be unloaded.

**Area Served:**

The continental US. A majority of the outbound shipments are destined to customers in the northeastern States.

**Other Comments:**

Port Jersey uses a variety of warehouse management technologies, including bar coding and radio frequency (RF) inventory control. The company's warehouses have "slip sheet" equipment – slip sheets can be used in the place of pallets to increase the amount of goods that can be handled in a container, box car or truck trailer.

Some Port Jersey facilities have rail sidings for both the receipt and shipment of products. In addition, Port Jersey Logistics has its own trucking services, with 70 power units and 200 trailers. The company has its own in-house traffic management department to handle arrangements for transportation services, both within the region and nationwide.

## Case Study: Home Textile Fashions Company\* Distribution Center

<b>Company Description:</b>	The company is a leading importer of home textile fashions, including bedding, window treatments, table wear, area and accent rugs, and slipcovers. The company's products are sold in department stores, big box retail chains and specialty stores throughout the US, Canada, South America, Japan and Europe.
<b>Warehouse Type:</b>	Private warehouse; value added/wholesaler/distributor
<b>Location:</b>	In the vicinity of Exit 8A on the New Jersey Turnpike.
<b>Square Footage:</b>	175,000 square feet
<b>Employment:</b>	130-to-140 workers in two shifts
<b>Operations Performed:</b>	<p>This distribution center (DC) does an extensive amount of value added activities. The company noted, "You have to do it all and do not have a whole lot of time to process goods." Accordingly, the DC modifies and customizes products, packages them, does inserts, makes items "shelf-ready," and packs and ships at an individual store level.</p> <p>The stuffing of such items as comforters and pillows is outsourced to other US companies.</p>
<b>Relationship to Airport/Seaport:</b>	<p>Virtually all of the products arrive in the Port in containers from overseas. The number of containers received at the DC annually is estimated at between 450 and 500 40-foot containers (between 900 and 1,000 TEUs). Goods arrive at the DC by truck.</p> <p>The goods are not palletized in the containers. Containers are used to their maximum volume. Given the commodities shipped, containers "cube out" before they weigh out; i.e., the volume of the containers is used up before international or US weight limits are reached.</p> <p>Containers contain multiple types of items and are off-loaded by hand on to conveyors at the DC. Items are verified, bar coded and palletized.</p>
<b>Area Served:</b>	North America

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\* The company has requested that its identity not be revealed.

**Other Comments:** The building, which was constructed by Heller, is 12 years old and has ceiling heights of 28 feet. This company is the second tenant in the building.

The DC is enhancing their operations by bringing on-line a sophisticated warehouse management system and weight checks of shipments.



## Case Study: Barnes and Noble Distribution Center

**Company Description:** Barnes and Noble (B&N) is the nation's largest bookseller, employing more than booksellers in approximately 940 stores in 49 states under the Barnes and Noble and B. Dalton names.\*

**Warehouse Type:** Private warehouse, which also includes a separate less-than-truckload operator, LTA. LTA handles much of B&N's outbound movements.  
This facility is the Barnes and Noble distribution operation for all of the continental US.

**Location:** Jamesburg, NJ by Exit 8A on the New Jersey Turnpike.

**Square Footage:** The total building is 345,000 square feet of which B&N occupies 250,000 square feet and LTA occupies 95,000 square feet. Office space for the two companies occupies 30,000 square feet of this space. The building also contains a 40,000 square foot mezzanine that is used as part of the pick and pack operation.  
The site covers 40 acres. There is space on the site for a 100,000 square foot expansion. The building has a 32-foot clear ceiling height.

**Employment:** 850 employees, including 600 B&N employees and 250 LTA employees.

**Operations Performed:** This facility provides replenishment services to all of B&N's stores throughout the US, as well as supporting the company's ecommerce operation.

The building has the capacity for 16 million books. Books on the best sellers list may move from the warehouse to stores in full pallet loads. Other fast moving books may move out in full cartons. Slower moving books that have been automatically identified by each store's computers for replenishment, along with special orders and ecommerce orders are picked by the individual book, consolidated into cartons and shipped out.

Picking is done on two shifts. Approximately 150 million books are picked annually. The warehouse's computer

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\* Source: Barnes and Noble corporate web page.

predetermines the pick path, carton contents and carton size. "License plate" numbers are bar coded on each carton for tracking. Cartons move along automated conveyor lines from the pick and pack areas and are merged into a single line. The single line passes through a "Check Weight" station where each carton is weighed. The computer automatically checks the weight of the carton against the estimated weight of the contents and carton. If the weight matches, the carton proceeds to final packaging/dunnage (biodegradable peanuts and taping). The conveyor line is directly linked to the LTA sortation system to flow out of the warehouse. Cartons that do not pass the weight check are automatically shunted to a side area for employee review of the order.

150 million pounds of freight are moved annually through the warehouse. Note that LTA merges B&N freight with freight from other vendors in their operation at the warehouse.

The facility also handles reverse logistics/product returns.

**Relationship to Airport/Seaport:**

While some of the shipments move by air, the majority moves by ground transportation. The LTA freight flow for B&N includes pick up of product from vendors and distribution centers and outbound movement of shipments from B&N. Outbound shipments are moved by line haul to local sort facilities throughout the US. Individual store deliveries are made from these local sort facilities.

Line haul is primarily done in 48- and 53-foot trailers. UPS also handles outbound shipments for B&N.

**Area Served:**

The continental US. "To-store" transit times vary from one- to three-days primarily depending on the distance from the B&N distribution center.

**Other Comments:**

The construction and operation schedule for the building followed the accelerated time line seen in today's warehouse operations. Groundbreaking for the building occurred in May 1995. The facility started receiving merchandise in June 1996 and began shipping merchandise in August 1996. The Joe Morris Company constructed the building.

The building is a highly efficient and automated operation. Very narrow aisle storage is utilized with wire-guided forklifts. Conveyor systems and a highly advanced computer-

ized management system (including bar coding and RF technologies) are used to expedite movement of the product.

## Appendix B: List of Companies Interviewed and Facilities Visited

- Barnes and Nobles
- CB Richard Ellis<sup>14</sup>
- D. O. Evans, Inc.<sup>15</sup>
- Dotcom Distribution
- East Coast Warehouse (located at Port Elizabeth)
- Elberon Development Company<sup>16</sup>
- Federal Express
- Fedex Logistics
- Gross and Associates<sup>17</sup>
- Heller Construction Company and Parks
- Home Textile Fashions Company<sup>18</sup>
- Joe Morris Company<sup>19</sup>
- Lifetime HOAN<sup>20</sup>
- National Association of Industrial and Office Parks, New Jersey Chapter
- Port Elizabeth Warehouse
- Port Jersey Logistics
- PSE&G<sup>21</sup>

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<sup>14</sup> This company is a leading commercial and industrial real estate broker.

<sup>15</sup> This company develops industrial and commercial property in New Jersey.

<sup>16</sup> This company owns and manages a considerable amount of industrial property in the vicinity of Newark International Airport and Port Newark/Elizabeth.

<sup>17</sup> Gross and Associates is a major designer of and consultant to the warehousing industry. One of the executives interviewed from the firm is also currently serving as the National President of the Warehousing Education and Research Council.

<sup>18</sup> The company has requested that its identity not be revealed.

<sup>19</sup> This company is a leading builder and developer of industrial property in the State of New Jersey. Similar to Heller, this company has constructed industrial buildings on brownfields.

<sup>20</sup> The executive interviewed is formerly of Amway and is the current President of the Material Handling Society of New Jersey.

<sup>21</sup> PSE&G has an industrial development and marketing program.