ELIZABETH PORT AUTHORITY MARINE TERMINAL PERMANENT EXPRESSRAIL INTERMODAL TERMINAL

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INTRODUCTION

In December 1991, the board of commissioners of the Port Authority of New York and New Jersey approved funds for final design and construction of a new on-dock rail terminal, to be located at the Elizabeth Port Authority Marine Terminal. Initially planned for a throughput capacity approaching 125,000 marine containers annually, the new facility will be expandable in modules of about 50,000 units each.

In 1991 the concept of an on-dock rail terminal was not new. In fact, as part of their ongoing effort to improve operational efficiency and reduce ship-to-rail transfer costs, many U.S. ports, especially those on the West Coast, had already embarked on ambitious rail programs in response to the phenomenal growth of mini-landbridge (MLB) business. Faster than the traditional all-water route through the Panama Canal and boosted by rail double-stack efficiencies, MLB contributed significantly to the growth of West Coast ports and at the same time caused them to invest significant sums in development of state-of-the-art rail facilities.

Following the meteoric rise in rail activity at West Coast ports in the past two decades, inevitably Atlantic Coast ports became aware of the intermodal phenomenon and began to emulate their Pacific counterparts by constructing modern intermodal rail terminals. It appeared that every North Atlantic port authority made plans, and many actually embarked on ambitions rail programs, with full confidence that they would become a major load center, and derive all the resultant economic benefits if they had a modern on-dock rail terminal.

Indeed, the growth of East Coast rail facilities prompted accusations of overbuilding by some industry observers, who believed there would not be enough rail business to fill rail terminal overcapacity. If the question been posed, "Is there overbuilding of rail terminals among the North Atlantic ports?" Most port directors would have answered "Yes, but not here." Some observers believe, as new projects continue to be proposed, that the North Atlantic ports may well follow the example of the steamship industry, in which many trades in the world have more vessel capacity than needed to carry available cargo.

Too much capacity can result in pricing services below cost, just to maintain market presence. In the case of steamship lines, this means that over time, carriers might go out of business or redeploy vessels on more profitable routes. In the case of ports, which often rely on some type of public financing, the risk is one of an inadequate return on increasingly scarce resources, which might be better deployed on other projects.

At the Port of New York and New Jersey, this was the prevailing climate as plans were developed for a new on-dock rail terminal. However, one unique advantage, which greatly aided the risk analysis for this project, was that there had been a pilot facility in operation since 1991. At that time the former near-dock portside terminal was phased out, and all double-stack business was moved to an interim on-dock facility, where some existing pier trackage was adapted for the purpose by Maher Terminals, a marine terminal operator. ExpressRail, so named for marketing purposes, offered an excellent opportunity to test customer acceptance of the new service with relatively little capital investment. If the experiment had failed, the on-dock facility could have been closed, and rail business could have been returned to the mothballed portside terminal, where it had been handled previously.

At the time of the Port Authority board's action, the benefits of the interim on-dock operation in concert with a range of other rail cost-cutting measures, had already produced encouraging results. The port's rail intermodal volume, which had languished at fewer than 20,000 units annually only 3 years earlier, had nearly quadrupled by the end of 1991. By the first quarter of 1994, the interim facility's capacity was being taxed severely, and temporary capacity had to be added until the new construction project could be completed.

Although it was a significant factor, the on-dock rail facility alone was not responsible for all the growth. Many other elements, some external and some controllable, combined to produce the unprecedented growth in the port's rail business. This paper seeks to describe the environment in which this growth took place; the planning process, which resulted in the design for the new facility; how the new facility's location was selected; and how the type of operation and loading equipment to be used was ultimately determined.

Perhaps most important, the paper seeks to convey that the terminal is justified largely on the basis of business, which had already developed as a result of the pilot project, with guardedly optimistic projections and provisions for future expansion.

Project Objectives

The objectives of the permanent ExpressRail on-dock rail facility follow:

1. Enhance the inland reach of the Port of New York and New Jersey to the high-growth consumer and production markets of the Midwest and Canada;
2. Increase terminal efficiency in transferring cargo from ocean vessels to railroads;
3. Improve the cost effectiveness of moving goods to and from inland markets by expanding competitive rail services, routes, and pricing;
4. Expand the volume and market share of inland-originating exports and inland-destined imports, while minimizing adverse effects on regional air quality;
5. Prepare the port for future opportunities emerging from industry trends of ocean carrier rationalization and vessel sharing; and
6. Increase the proportion of the port's intermodal containers moving by rail to improve regional air quality and relieve traffic congestion.

Port Competition and Rail Connectivity

All major North Atlantic ports, including New York, Baltimore, Norfolk, Montreal, Halifax, Boston, and Philadelphia are well-positioned to access the Midwest market, and several of them compete for Canadian markets as well. These hinterland markets have become important competitive battlegrounds for East Coast ports in attracting new import and export activity. Fueling their competitive spirit is the fact that the Midwest has strong projected retail sales growth and industrial production. Similarly, Canadian markets also hold strong import and export growth potential.

Because of the distance between these ports and their inland markets and because of the greatly improved efficiency railroads have achieved in the past decade, cost-efficient and timely rail services are critical to capturing market share in the Midwest and Canada. Recent rail labor agreements are making rail options more competitive for shorter hauls as well. Strengthening a port's inland reach depends not only on the services and rates offered by the railroads, but also on the total intermodal system, including on-port facilities, electronic data interchange systems, services, and operating practices involved in moving cargo seamlessly between ocean vessels and railroads. No stone is being left unturned as efforts continue to find new ways to achieve intermodal efficiencies.

Industry trends also are driving the importance of intermodal effectiveness in a port's competitive equation. Continued poor financial performance among many of the world's ocean carriers has been fueled by two factors: slow trade growth in recent years and excess global shipping capacity. This combination has been particularly detrimental for steamship lines serving the Atlantic trade lanes, where trade growth has been the slowest and excess capacity the greatest in recent years. As a consequence, ocean carriers have been rationalizing services through a growing number of alliances and vessel-sharing agreements designed to reduce shipping capacity and increase profitability.

One of the results of this restructuring is that steamship lines are continuing to reduce their number of port calls in an attempt to maximize use of modern, large vessels, whose operating costs can exceed $50,000 a day. This practice of "load centering" will necessarily focus ship activity at locations that offer strong local consumer markets, effective distribution networks to inland markets, and efficient intermodal cargo transfer capabilities. Therefore, the successful implementation of a port's rail and intermodal strategies can play a large role in its future ability to attract new cargo.

Rail's Importance at the Port of New York and New Jersey

Recognizing the cargo growth potential of inland markets, the Port of New York and New Jersey embarked on cost-cutting and service strategies to increase its volume of inland containers. The first step was taken in 1987 when the tonnage assessment levied on cargo to fund the longshore workforce's benefits package was reduced for containers moving beyond 260 mi from the port. It has been further reduced twice since that time, in 1988 and 1990. In combination with these cooperative actions of the New York Shipping Association and the International Longshoremen's Association, the Port Authority introduced its Container Incentive Program in 1988, which offered direct financial incentives to customers for containers moving more than 260 mi, by rail, to and from the port.

In 1990 an extensive examination of rail issues to identify strategic alternatives led to greater partnering with Conrail, the port's primary carrier, to attract new

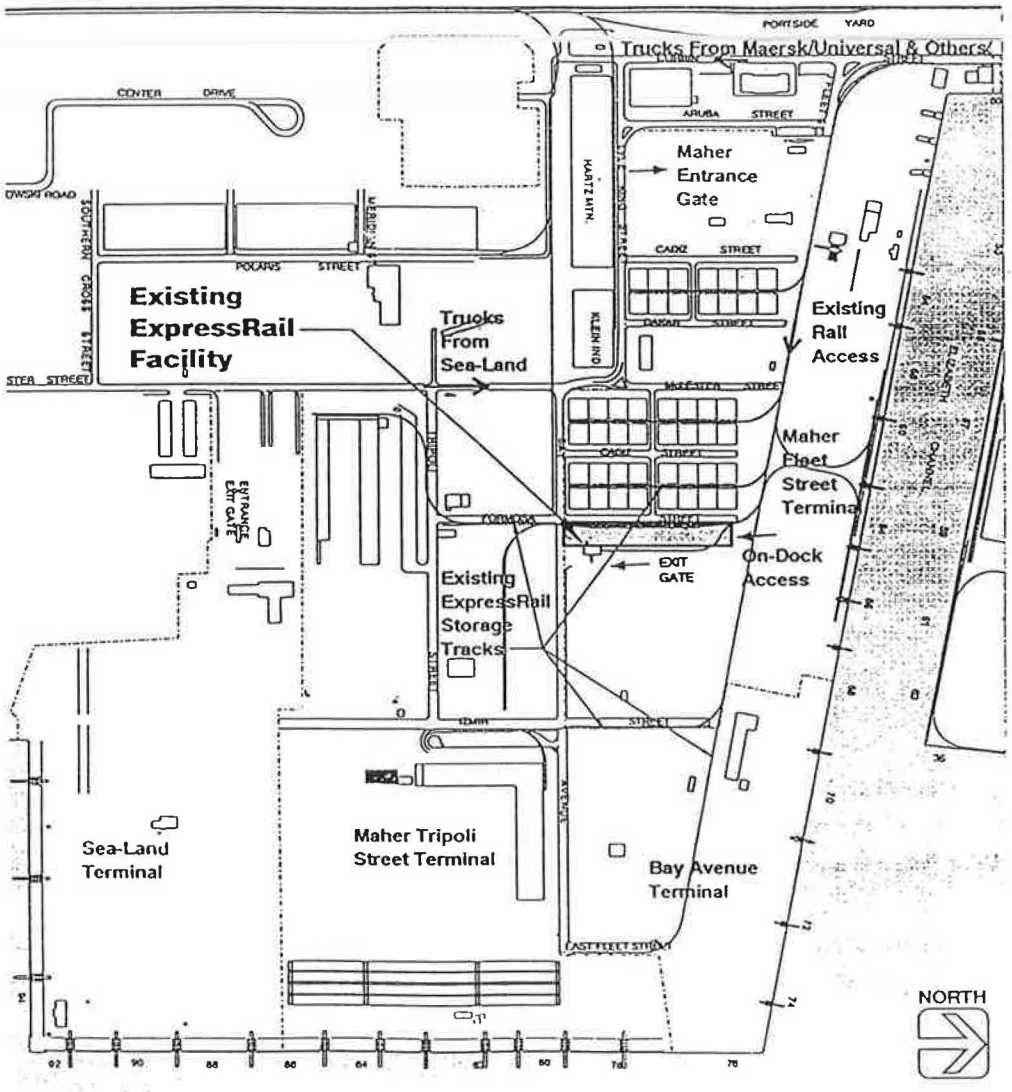

FIGURE 1 Existing expressrail facility.

rail traffic to the region. A study of rail service needs identified the port's intermodal system costs, including ship-to-rail transfer costs, as being relatively high compared with competitor ports. Furthermore, the analysis indicated that the port would benefit from a consolidation of the dispersed New Jersey rail terminal activity into a single modern facility designed to reduce the costs of intermodal transfers. (The port's customers had been draying containers to any of half-a-dozen rail terminals throughout northern New Jersey.)

The introduction of new rail services further spurred the need for terminal efficiencies. In May 1991 Conrail introduced double-stack rail service and improved schedules between Chicago and the Port of New York and New Jersey, which created line-haul cost efficiencies that were passed on to customers in the form of reduced rates. The port, meanwhile, supported the Canadian Pacific Railroad's 1991 acquisition of the Delaware and Hudson Railway to strengthen access to Canadian markets. In April 1991 Conrail and the newly merged Canadian Pacific–D&H cooperated to provide a joint service between the port and Montreal and Toronto. With service and line-haul costs vastly improved, terminal efficiency remained the missing ingredient in the port's rail strategy.

In August 1991 the Port Authority, Conrail, and Maher Terminals took the first steps to improve rail terminal efficiency and reduce ship-to-rail transfer costs. Conrail's primary rail operation for the port was relocated from the outdated portside yard immediately

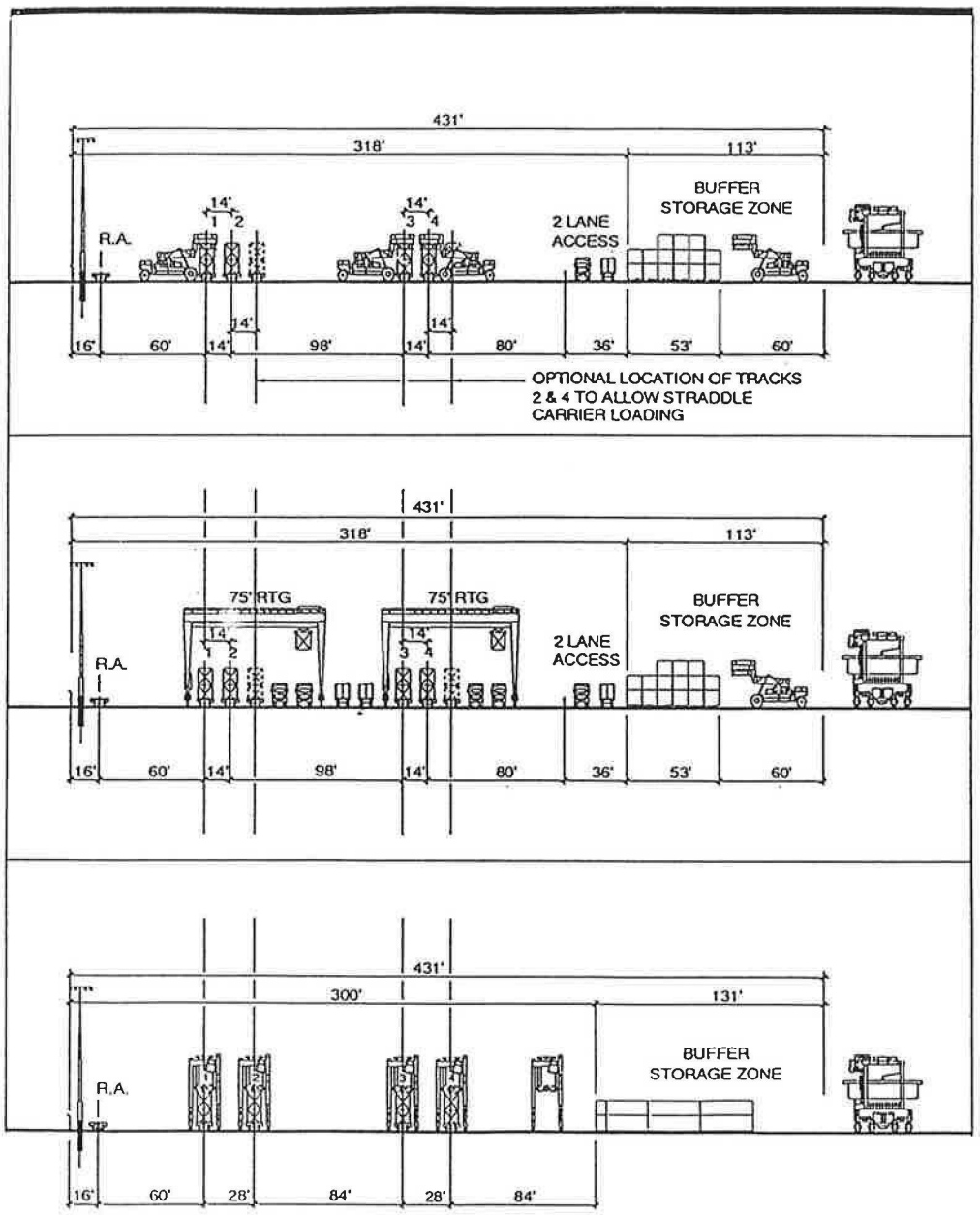

FIGURE 2 Operating alternatives.

west of the port, to an interim on-dock rail facility adjacent to the vessel berths at the Elizabeth Port Authority Marine Terminal (Fig. 1). Despite less-than-optimal operational conditions, attributable to track limitations and car storage constraints, the pilot ExpressRail facility achieved the desired effect of reducing the time and cost involved in intermodal transfers. The cumulative result of this rail strategy enabled the Port of New York and New Jersey to become fully competitive, in terms of cost and service, to the major Midwest and Canadian markets.

The growth of rail activity at the port demonstrated the strategy's success. In 1988 the portside yard handled only about 20,000 units; by 1993 the port's intermodal rail activity quadrupled to more than 80,000 containers. Despite the harsh winter of 1994, the port's rail business

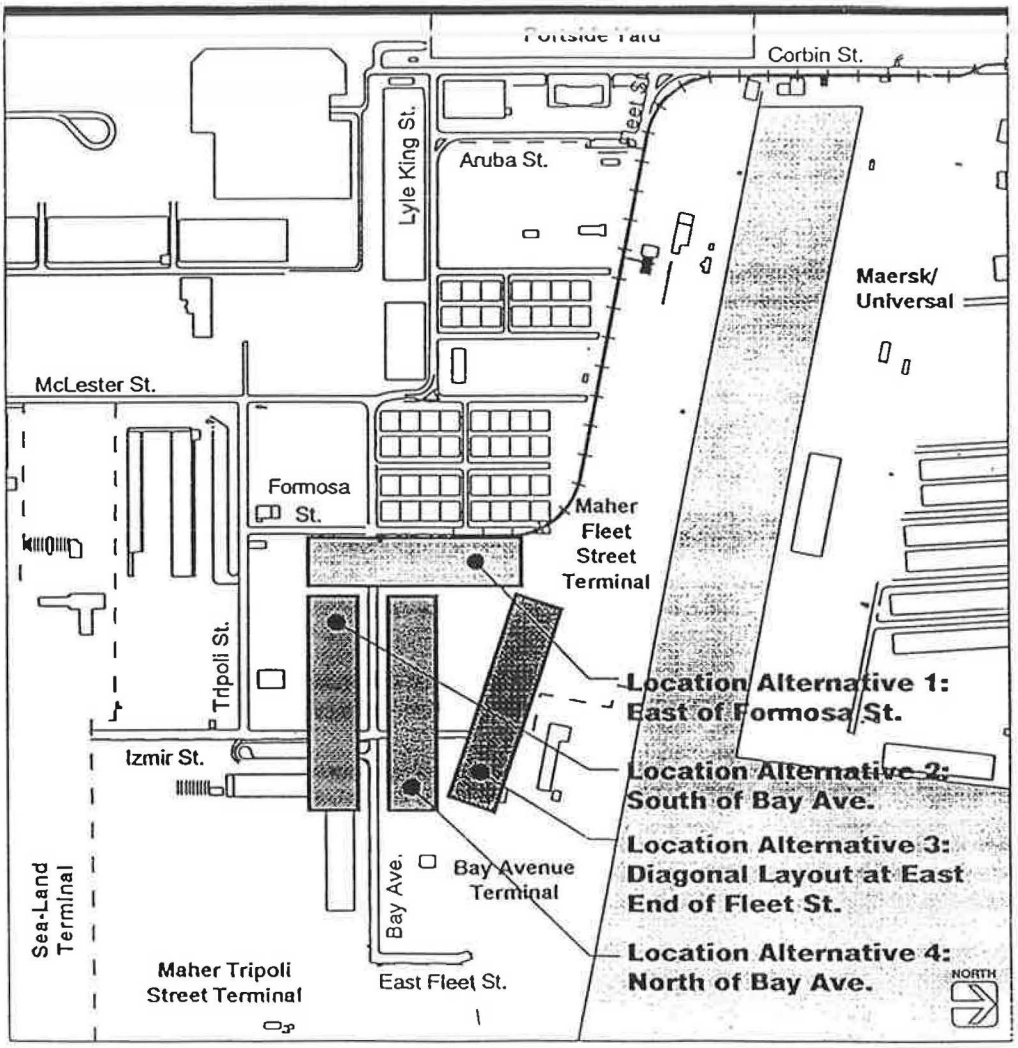

FIGURE 3 Alternative locations.

increased more than 40 percent in the first half of the year. The 1994 figure was up 71 percent from the same month in 1993, and July brought an all-time record of more than 10,000 containers in a single month.

At the same time, the port's market share of inland cargo increased significantly from that of its primary competitors. The significance of this market-share increase is that the growth in volume experienced in 5 years was not just "natural" growth, but a reflection of the port's improved competitive position. This market-share increase also proves that the increase in rail activity is new business for the port and not simply a modal transfer (truck switching to rail).

Permanent On-Dock Rail Facility

The success of the interim ExpressRail operation has been marked by its milestone throughputs and also has pushed the upper limit of the interim facility's maximum practical capacity of 65,000 container lifts per year. The 1993 activity at the interim ExpressRail facility averaged about 80 percent of capacity; however, by the end of the year, the upward growth curve had pushed the facility beyond its realistic capacity. To cope with the increasing volume, additional trackage in the port's Elizabeth Marine Terminal had to be pressed into service in the first quarter of 1994 to provide capacity relief until an expanded terminal could be constructed.

		Summary (Raw Scores: 1-10)			
Category	Weight* (1-10)	1 FLT/FLT	2 FLT/SC	3 RTG/FLT	4 SC/SC
Cost	9.0	7.5	7.9	7.4	8.9
Productivity	8.0	8.0	8.0	8.4	7.4
Flexibility and Expandability	6.0	5.9	5.4	8.0	4.7
Marketability	7.0	7.5	7.3	8.0	6.8
Total Score	*300.0	220.0	218.7	237.4	214.7
Percent of Maximum Possible		73.3%	72.9%	79.1%	71.6%
*10 = Highest importance – 1 = lowest importance					

FIGURE 4 Summary of equipment mode selection.

In response to the growing volume and in anticipation of achieving the long-term forecast, in February 1992 the Port Authority retained the services of Vickerman-Zachary-Miller (VZM) to explore physical configurations for the on-dock rail operation. VZM determined that the current interim track configuration could not realistically handle significant increases in rail container activity. More important, the tracks being used had been constructed years ago to accommodate automobile rail loadings and were not optimally configured for double-stack activity. As a result the existing track was susceptible to rapid deterioration and would require increased operating and maintenance expenditures to maintain service and safety standards.

In any event the cost of rebuilding the interim facility in kind was high, and this approach was not considered a viable alternative because of the inherent inefficiencies of the existing track configuration. A completely new permanent facility could incorporate the efficiencies of an operation designed specifically for double-stack rail activity, while increasing capacity to much more than 100,000 units per year and providing the opportunity for future expansion to 150,000 or 200,000 units, if needed.

Benefits of a New Intermodal Facility

The economic impacts of an expanded facility were calculated on the basis of a very conservative forecast scenario. Accelerated European economic recovery, expanding trade with South America, and successful attraction of Southeast Asian cargo to the U.S. East Coast hold the potential to increase railcargo volumes and related economic benefits. Under a conservative forecast scenario, the new on-dock rail facility would account for 818 new jobs and $30 million in incremental wages in 1995, its first full year of operation. Overall, the facility is expected to generate an additional $111 million in economic activity for the region.

In addiction to its economic benefits, the project will allow the port to achieve significant increases in cargo volumes and market share without stressing the congested regional highway system with additional truck activity. In this manner the project will contribute to the port's business objectives, while minimizing adverse effects on air-quality standards.

Project Assumptions

The proposed Express Rail facility will be located within the Elizabeth Port Authority Marine Terminal, serving as a public on-dock rail intermodal terminal to the four marine container-handling facilities: Maher's Fleet Street and Tripoli Street terminals and the Sea-Land and Bay Avenue terminals (Fig. 6). The ExpressRail facility also will serve as an effective, albeit more remotely located, intermodal alternative for the Universal/Maersk complex located on the southern Newark peninsula, the Global Terminal in Jersey City, and the Red Hook Terminal in Brooklyn.

The facility will be operated by a terminal operating company under contract with the Port Authority of New York and New Jersey. Selection of the terminal operator will be conducted with the participation of the servicing railroad. The Port Authority's agreement with the terminal operator, which will be a typical land-lease arrangement, will include Port Authority–specified, customer-service performance

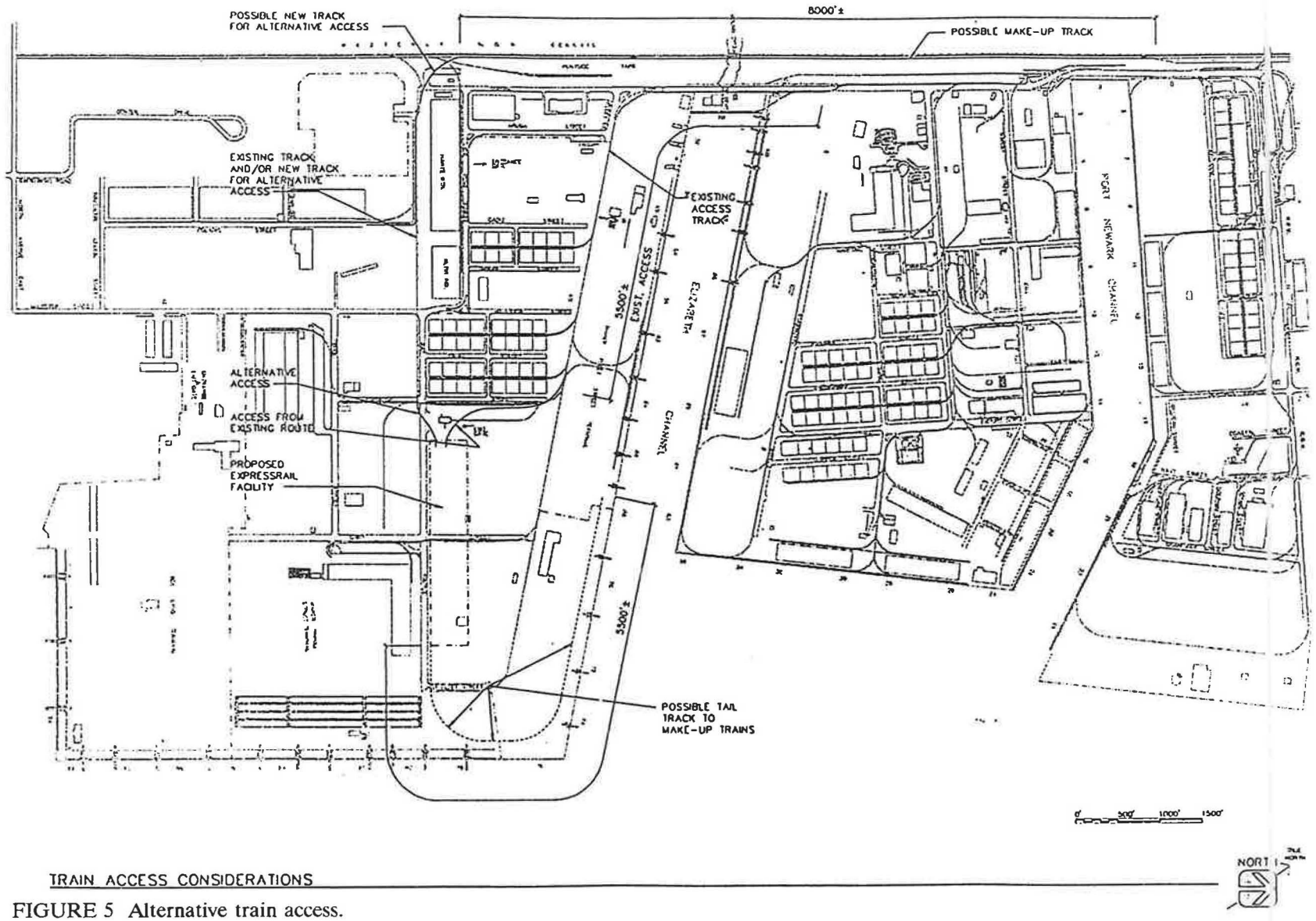

FIGURE 5 Alternative train access.

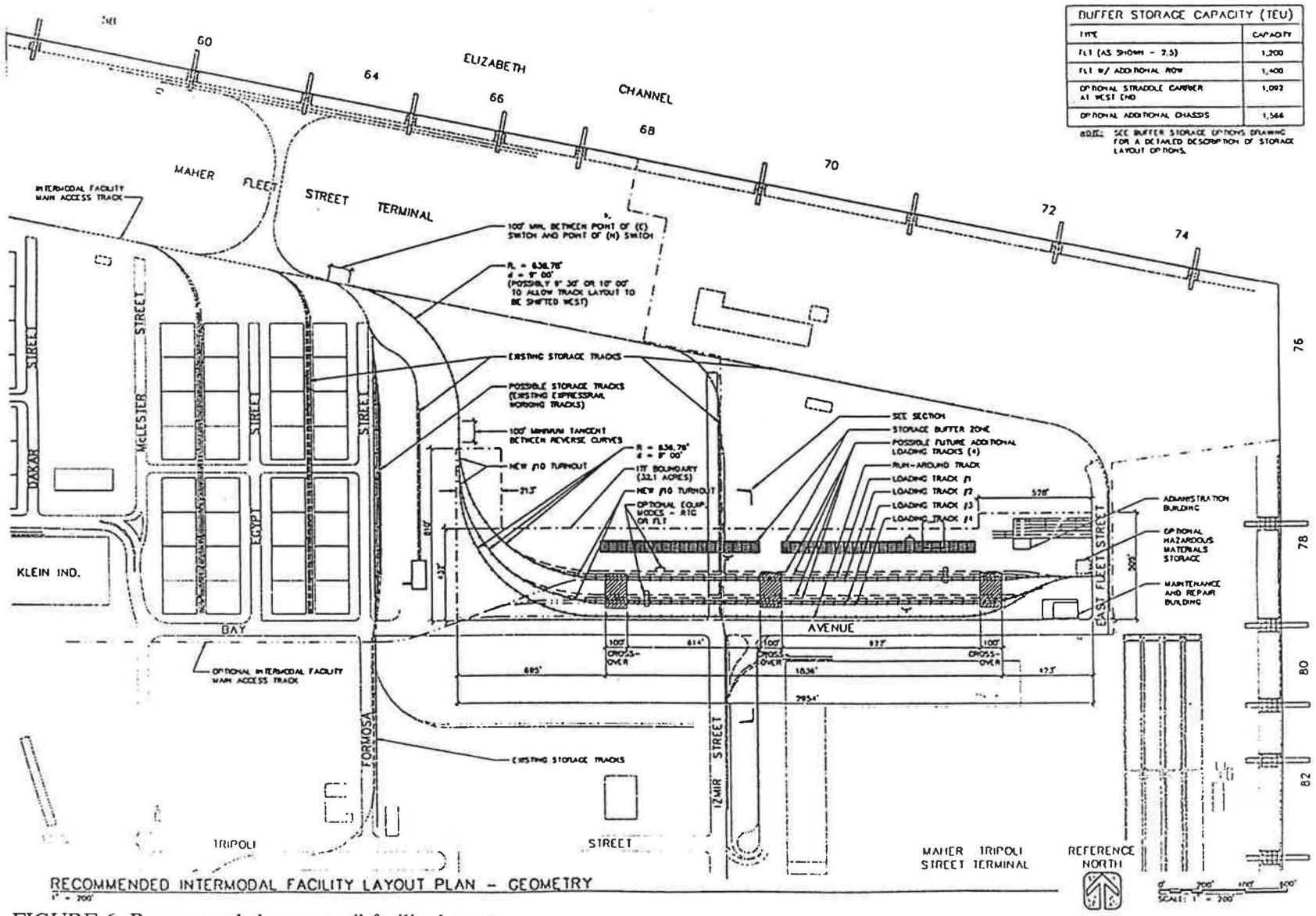

FIGURE 6 Recommended expressrail facility layout.

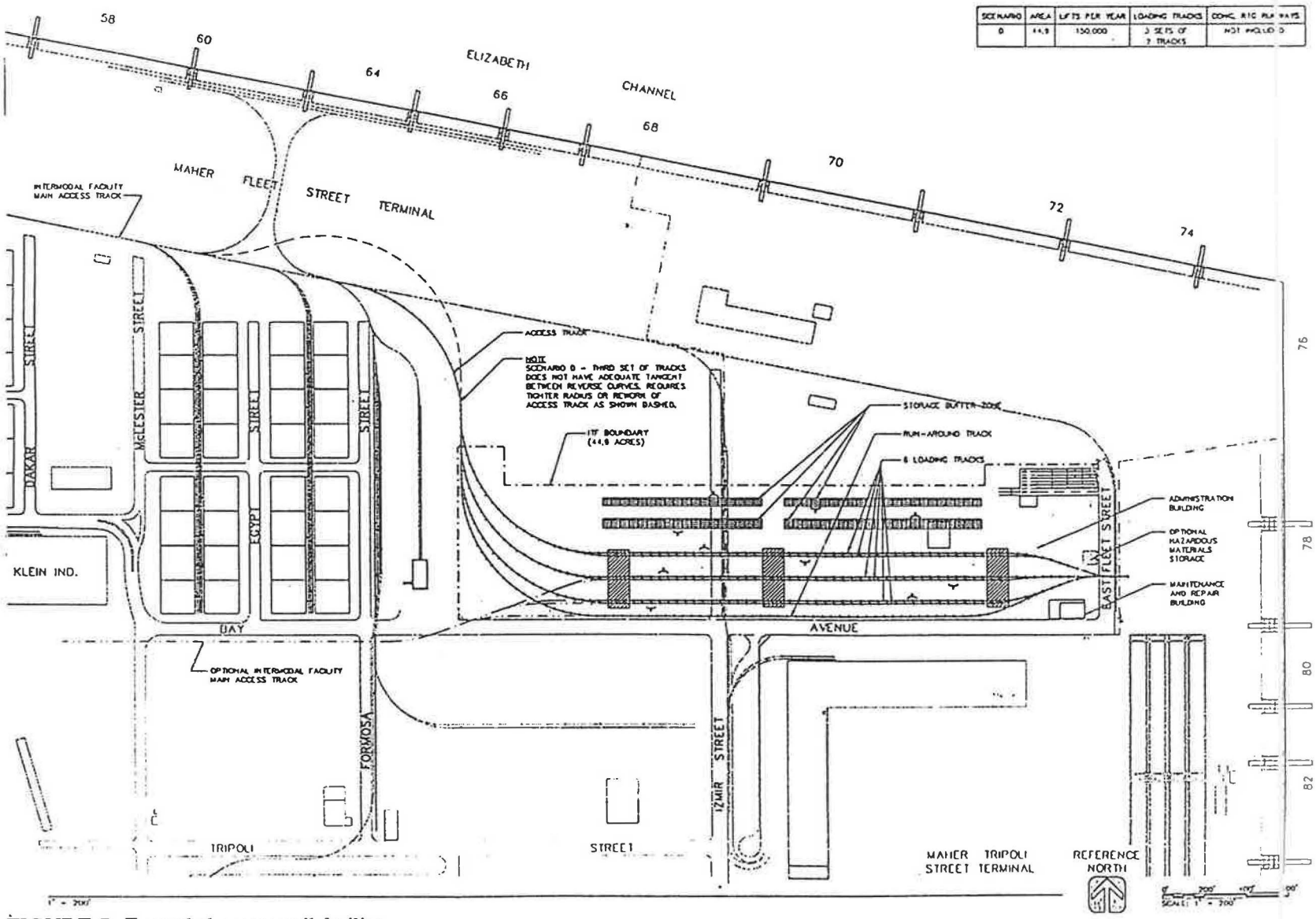

FIGURE 7 Expanded expressrail facility.

standards against which the agreement may be terminated at the Port Authority's discretion.

The terminal operator also will enter into an operating agreement with Conrail, the railroad that will service the ExpressRail terminal. The nature of the agreement between the terminal operator and servicing railroad will be centered on the loading and unloading (i.e., safety) standards and practices specified by the railroad and the Federal Railroad Administration, thereby insulating the Port Authority from the commercial liabilities associated with cargo carrier handling responsibilities.

It is currently anticipated that the Port Authority will acquire state-of-the-art loading and unloading equipment required to operate the terminal. This will ensure, among other things, continuity of operation if it becomes necessary to change terminal operators.

General Background

To select the final, recommended equipment-handling mode, planners used a methodology that compared equipment operating systems. In an intermodal transfer yard, the total equipment operating system consists of (A) loading and unloading the train; (B) moving the containers between the train and a short-term storage area, commonly called the "buffer"; and (C) transferring the containers between the buffer and the point at which the container is picked up or dropped off at the facility by the customer. This comparison of systems allowed a more accurate and valid evaluation of alternatives than would be produced by a comparison of isolated equipment used for individual operations within the terminal. This approach included the following steps:

1. Review all possible types of container-handling equipment.
2. Combine types of equipment for train loading/unloading with equipment for buffer storage and transfer to and from buffer storage.
3. Review function and cost implications of all systems, and select final alternatives.
4. Perform a detailed matrix analysis on the final alternatives, considering operating and capital costs, function, flexibility and marketability, which led to a recommended terminal system that is responsive to the project goals and objectives.

The review of container-handling equipment included equipment successfully used or contemplated to be used on international or U.S. intermodal rail terminals such as the following:

1. Forklift (port packer, top loader);
2. Rubber-tired gantry;
3. Straddle-carrier;
4. Rail-mounted crane;
5. Fixed overhead crane system; and
6. Monorail/conveyer system.

Of these the fixed overhead and monorail/conveyer systems are relatively unproven and inflexible and potentially difficult and expensive to implement. Therefore, these systems were not pursued as viable options.

Starting with a possible 36 alternative combinations of track/storage equipment options, 25 alternatives were eliminated during the initial analysis as being either too impractical to implement, too expensive, or requiring too much land. Of the nine alternative combinations remaining, five were eliminated on the second round of analyses due to physical incompatibilities, safety concerns, or their lack of flexibility in operation.

The result of these analyses yielded four final alternative systems, which follows. The first designation is the equipment that loads and unloads the train, and the second designation is the piece of equipment that works the buffer storage area:

1. Forklift truck/forklift truck;
2. Forklift truck/straddle-carrier;
3. Rubber-tired gantry/forklift truck; and
4. Straddle-carrier/straddle-carrier.

Preferred-Equipment Alternatives

The four final equipment alternatives were evaluated against a set of critical objectives, and a financial analysis that included estimated capital and operating costs was performed.

A summary of the comparative analysis is presented in Figure 4. The scores were determined by quantitative analyses and experience gained from studying and designing other intermodal facilities. The final scores reflect the combined input of the consultant, Port Authority staff, and Maher, the current facility operator.

The analysis yielded close results; therefore, flexibility to change equipment modes in the future is very important. The final recommended facility layout allows the eventual operator the flexibility of operating with

these alternatives: forklift trucks, rubber-tired gantries, or straddle-carrier (Fig. 2).

Facility-Location Alternatives

The proposed ExpressRail intermodal facility will serve the Port of New York and New Jersey's marine terminals, including Maher's Fleet Street and Tripoli Street terminals and the Bay Avenue, Sea-Land, Universal/Maersk (accessible from Red Hook via barge), and Global terminals.

Four likely alternative locations are shown on Figure 3. These alternatives were evaluated based on the following objectives:

1. *Expansion capability.* Capital cost to expand, area required to accommodate expansion, impact of expansion on both marine traffic and marine terminal operations, and flexibility of operations.
2. *Train access.* Impact on train and marine terminal operations, impact on port truck traffic, cost to provide, and flexibility.
3. *On-dock user access.* Time and labor required to move (dray) containers between intermodal yard and marine terminal, impact on marine terminal land use and operations, and access to marine terminals.
4. *Off-dock user access.* Impact on port truck traffic and time and labor to dray containers.
5. *Impact on port traffic.* Minimize possible delays and safety concerns, minimize cost of reshaping port road infrastructure, and minimize impact on existing marine terminal traffic and operations.

The train access for the existing ExpressRail facility crosses Corbin Street just north of the Elizabeth Channel and proceeds through Maher's Fleet Street Terminal. This track accommodates approximately twenty 307-ft-long double-stack cars without having to interfere (other than the actual crossing) with Corbin Street traffic. The new facility must provide at least this level of service.

Preferred Facility Location and Access

Of the four location alternatives, Alternative 1 (east of Formosa Street) would provide little or no expansion capability; would require closing Bay Avenue, a major terminal roadway; and would not allow the possibility of any optional rail access other than what currently exists.

Alternative 2 (south of Bay Avenue) would be centrally located, but it would not be on-dock for any of the users. This location would actually increase the time and cost to move containers from the marine terminals to ExpressRail. It would negate one of the key components of providing an on-dock rail terminal; namely, quick, efficient, cost-effective movement between the rail terminal and marine yards. It would require all users to cross over major terminal roadways, and expansion would require demolition of Maher's Tripoli Street Container Freight Station.

Alternative 3 (diagonal layout at east end of Fleet Street) provides a "straight-in" run for the train from the existing access track, but it uses up valuable container yard space that would more effectively be used for marine operations at the Fleet Street and Bay Avenue terminals.

The recommended location, Alternative 4 (north of Bay Avenue) has the following key advantages:

- Minimum intrusion into existing container terminals for an on-dock location;
- Minimum impact on port traffic;
- Central location for all users;
- Good alternative access possibilities; and
- Good expansion possibilities.

Recommended Plan

The recommended ExpressRail facility layout incorporates all the necessary features and beneficial characteristics identified in the analysis and evaluation. It is essential that the facility's infrastructure be developed to facilitate flexibility and expandability; therefore, the recommended site and track layout was carefully chosen to ensure operational flexibility and allow future expansion.

The recommended facility has a maximum practical throughput capacity of 100,000 units per year and occupies approximately 32 acres. As volume increases, the facility can be expanded to a maximum practical throughput capacity of 150,000 units per year by the addition of a third pair of loading tracks (Fig. 7). The estimated additional cost for this expansion is $1.7 million. The expansion requires an additional 13 acres, to be taken from Maher's Fleet Street terminal. Finally, if future conditions warrant, this alternative offers the opportunity to relocate the rail access route (Fig. 5).

CONCLUSION

As of August 1994, intermodal rail activity at the Port of New York and New Jersey continued to experience

unprecedented growth. Volume in the first half of 1994 was more than 40 percent ahead of the volume for the same period the year before, more than double the average intermodal growth being experienced by railroads in general. July 1994 set an all-time intermodal record for the number of rail boxes handled during the month of July in previous years, amounting to an annualized rate of more than 200,000 twenty-ft equivalent units.

The process of adding a new on-dock rail terminal was based on the principle that it be conceived, designed, and constructed in response to growing volume instead of in anticipation of future demand. Flexibility will be built into the facility to facilitate future growth, based on the experience with the pilot project. The theory of "If we build it, they will come" does not necessarily hold true with an entity subject to as many external complexities as an on-dock rail facility. In any case, the Port of New York and New Jersey does not anticipate overcapacity at its rail facilities.