Twin Cities Region
Intermodal Terminal Needs Study

A Report To The

Metropolitan Council

Submitted By

R.L. Banks & Associates, Inc.

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INTRODUCTION AND SUMMARY

Objectives of the Project

Consistent with the objective of fostering better transportation in the Twin Cities Region and recognizing the need for demand and capacity information on which to base evaluation of opportunities for freight infrastructure investment, the Minnesota Intermodal Regional Terminal Study (MIRTS) coordinating group comprised of private and public sector organizations used contractor assistance to perform an assessment of needs for terminal capacity in the Twin Cities area to handle intermodal freight. This study has been part of a larger effort by MIRTS involving the study sponsors consisting of staff of Metropolitan Council, Minnesota Department of Transportation (Mn/DOT), Burlington Northern Railroad (BN), and CP Rail System (CPRS).

The study team consisted of staff of R.L. Banks & Associates, Inc. (RLBA, a Washington DC consulting firm), N.K. Friedrichs & Associates, Inc. (NKF, a Minneapolis market research firm) and In-Terminal Services (ITS, a subsidiary of Mi-Jack Products of Hazel Crest, IL). During the course of the study, the RLBA study team worked closely with the MIRTS coordination group providing technical assistance and inputs.

Intermodal traffic is boxed freight using a combination of truck for local movement, generally, at both origin and destination and rail for the intercity long haul. The phrase "rail intermodal" is commonly understood to refer to the transportation of container or trailer-like units moving on rail intermodal equipment (flat or stack cars). Such freight moves in both marine and domestic containers or in trailers, so-called "box" business, and includes Roadrailer and the experimental Iron Highway technologies.

The Twin Cities' rail intermodal terminals give the region access to a global network of efficient surface freight transportation which provides business with competitive charges and service arrangements for shipping and receiving the very wide spectrum of "boxable" freight that moves in rail intermodal service. This network benefits consumers with competitive prices on most domestic and imported items. To the extent that freight moves on rail rather than over the highway, all citizens benefit from improved environmental and highway safety conditions and taxpayers incur lower highway repair costs. Opportunities for public investment in rail intermodal infrastructure, provide a mechanism for the Metropolitan Council to assure that the railroads will provide efficient services and competitive rates.

The purpose of the study was to analyze the supply of intermodal service in the Twin Cities Region in terms of terminal capacity in the context of projected demand for intermodal freight service. The approach involved completing the following objectives:

- To analyze the adequacy of existing intermodal terminals;
- To identify existing capacity needs and deficiencies;
- To evaluate terminal design options that address those needs;
- To determine trends in intermodal demand levels and characteristics;
- To prepare forecasts of demand for intermodal freight service;
- To identify regional long term terminal capacity needs; and
- To evaluate terminal design options that address long term need.

Organization of the Report

The results of the study are presented in five parts. The Introduction addresses the nature of intermodal freight transportation, the role of the intermodal terminal in the system and how terminal capacity is measured and evaluated. Burlington Northern's St. Paul intermodal terminal, known as Midway Hub, is described and evaluated in terms of capacity under both current conditions and given proposed short term improvements to the facility developed as part of the study. CPRS's Minneapolis intermodal terminal, Shoreham Yard, is evaluated in similar terms. As a basis for evaluating future intermodal terminal needs, the next part of the study develops demand data and forecasts and presents a projection of future intermodal volume considered most likely by the MIRTS coordination group. Finally, criteria for a new multi-user terminal are addressed and a plan presented for a single large facility to be shared by railroads serving the Twin Cities, sufficient to accommodate the long term demand as projected in the MIRTS most likely growth scenario.

Summary of the Approach

Information on the characteristics of intermodal terminals was developed relying on a Federal Railroad Administration intermodal study. Study railroads provided data through MIRTS on the characteristics of each terminal which was supplemented by field inspection and interviews with terminal managers. Materials and information provided included maps, acreage, hours of operation, track charts, inventory of lift machinery and hostling tractors (vehicles used to move intermodal units on chassis), terminal loading and unloading system and procedures, inbound and outbound intermodal train statistics including train size and operating schedule, parking area data, statistics on truck movements, statistics documenting intermodal equipment dwell times, detailed lift statistics, and blocking and switching data.

Capacities of the existing terminals were quantified in conjunction with MIRTS and potential areas for expanding capacity at existing terminals identified. The analysis developed an overview of the intermodal network serving the Twin Cities Region along with its current and projected characteristics.

Assessment of short term needs was based on recent traffic trends. Demand for rail intermodal service in the Twin Cities has been growing. Prior to 1993, for example, demand was relatively steady but in 1993 both railroads operating intermodal terminals in the Twin Cities experienced a 6 percent increase over the 1992 volume handled at these terminals measured in total annual lifts. In 1994 that growth rate accelerated and Twin Cities' intermodal volume increased almost 12 percent in one year.

The study based the assessment of both short and long term intermodal terminal capacity needs on an analysis of freight movements to and from the Twin Cities region and forecasts of intermodal demand for a range of scenarios which recognize various constraints on achieving rail intermodal's full market potential. The analysis included a thorough review of the expected impact on demand (as assessed by area traffic managers) of a set of factors covering a wide range of supply and demand variables.

In developing scenario forecasts to evaluate terminal capacity needs, the fundamental issues were to determine which sectors of the economy will be attracted to rail intermodal service and which markets were strong growth candidates. In addressing these issues, the following general factors were recognized.

- Double stack service is the most cost effective method of transporting containerizable freight in most markets,
- Railroad intermodal business has a strong positive trend nationwide, which is very likely to continue,
- Railroads are developing sophisticated service packages involving trucking and steamship companies, which will continue to erode trucking's share of intercity freight in many markets, and
- Railroads are expanding the network of markets enjoying these services in response to customer demand.

Demand information used to develop growth projections was developed from interviews and surveys of freight customers and intermodal providers, including truckload carriers. Freight flow data was purchased from a vendor, Reebie Associates, which uses the TRANSEARCH model for documenting freight flows and relies on the WEFA Group's Series 480 national economic forecast for estimates of 5 and 10 year freight flow forecasts. RLBA calibrated the Reebie model using data collected in this study and adjusted and extrapolated Reebie's forecasts using the Minnesota Department of Revenue's control forecasts from its 20 year projections based on the REMI model MNFS-53.

Critical local demand factors taken into consideration in developing projections included:

- Characteristics of goods that move via intermodal freight,
- Characteristics of existing Twin Cities Region intermodal markets,
- Key factors which must combine to build successful service: facilities and competitive rail and local truck operations, and
- Characteristics of potential markets and traffic lanes into which the current intermodal service providers could expand.

Summary of Findings

Given estimates of existing intermodal terminal conditions and projections of long term demand, an evaluation of long term facility needs was developed. Criteria and design specifications for a large, multi-user facility to meet those needs were prepared.

In general terms, productivity and efficiency are critical factors in determining a region's competitiveness and transportation infrastructure is a fundamental component of a region's economy affecting those factors. Policy analysts and planners can have confidence in the established principal that improvements in the Twin Cities Region's infrastructure will prompt long term changes in distribution strategies which, in turn, will prompt economic development activities. It is on that premise that MIRTS explored the potential for increasing intermodal terminal capacity to meet projected demand.

The study found that Burlington Northern's intermodal facility, Midway Hub Center, is close to the limit of practical capacity and was likely to exceed that limit given only a modest increase in demand without any improvements. CPRS's facility, Shoreham Yard, was found to have a particular need to improve parking capacity for a certain equipment type and, generally, to be in need of additional track capacity so as to improve overall operating efficiency.

Expanding Capacity At Study Terminals. The Twin Cities Region Intermodal Terminal Needs Study was designed to estimate capacity at the BN and CPRS intermodal facilities in the Twin Cities area, identify options for expanding capacity at those terminals and design specifications for a multi-user facility. As discussed in the following sections of this report, based on data provided by MIRTS, field inspections and interviews, the BN and CPRS intermodal facilities in the Twin Cities were evaluated and options for expanding capacity were developed.

In evaluating terminal improvement options the following factors were considered:

-Terminal layout (size and shape),
-Terminal operating efficiency,
-Environmental and land use impacts,
-Lift capacities (maximum annual and peak),
-Technological applications, and
-Development costs.

The RLBA study team worked closely with the MIRTS Coordination Group to evaluate options for expanding existing capacity and to establish criteria for a single multi-user facility in the Twin Cities Region. The analysis found some options for expanding capacity and/or improving efficiency at existing terminals. However, based on projected demand, such improvements would be effective only in the short term for Burlington Northern even given implementation of available technological improvements such as container design, container carrying equipment and electronic management systems.

Developing Multi-User Facility. Long term needs for handling intermodal traffic in the Twin Cities Region clearly require a new facility, especially given new planned services by railroads not now part of the MIRTS group. Based on specifications provided by MIRTS, the study prepared design parameters for a multi-user facility adequate to serve projected demand and meet terminal operating efficiency standards. A terminal layout, sensitive to environmental and land use considerations, was prepared, lift capacities evaluated, and development costs estimated.

Major criteria for site selection of a new facility are size and layout of available property, access to the highway system, distance to users and adequacy from public perspective in terms of land use, environmental and community acceptance considerations. MIRTS has developed an implementation plan to aggressively develop the option of a multi-user facility in the next two years. Options identified in the study for improving existing terminals should be evaluated in the context of that effort and other pressures on the railroads. Among these pressures are competitive market and corporate financial considerations, and barriers in the form of local restrictions on and potential opposition to any site improvements.

Although the lack of a jointly served intermodal terminal in the Twin Cities is due to the inherent economics of the railroad business, a well situated joint intermodal terminal would clearly provide significant benefits to the Twin Cities Region shippers. Although benefits have not been quantified as part of this study, it is clear that costs of providing intermodal service would be stabilized because of efficiencies which a new modern facility would provide which would be expected to level rates charged users. These efficiencies would come from a variety of sources including the following:

-Shared capital costs,
-Terminal operating efficiencies,
-Switching efficiencies,
-More efficient equipment handling, and
-Elimination of local trucker empty moves between terminals.

In addition, a single multiuser facility is likely to spur industrial development as it would attract users and suppliers to locate nearby such centralized services.

With regard to implementation of a single terminal used by all railroads serving the area, a number of significant potential barriers seem to exist. One such question is whether the Twin Cities Region's railroads would be willing, given projected growth in domestic container demand and existing capacity to share a single terminal. One area railroad has recently pursued developing a form of intermodal technology (Iron Highway) not requiring traditional terminal lift handling (although requiring other standard intermodal business services). Another railroad (not a participant in the previous phase of MIRTS activity), which is initiating intermodal service to the area in 1995, is controlled by Union Pacific, a strong business competitor of Burlington Northern.

Conclusions. Given current conditions and existing restrictions a limited number of options were found to be suitable improvements to existing facilities. Local barriers, especially city use restrictions and lack of community support, make it seem unlikely that these short term options could be implemented. This indicates that the most attractive long term strategy for the region is to pursue development of a new multiuser facility. Alternatives to a multi-user facility include limiting growth for Burlington Northern, relocating BN's facility and development of new facilities for Union Pacific/CNW and, possibly, Wisconsin Central. Although some of these options may be considered viable, it is clear that the region would lose significant benefits related to improved efficiency of local intermodal and trucking operations.

Technological improvements were expected to improve the attractiveness of intermodal to users, stimulate demand and improve terminal efficiency. Technology, however does not seem to provide means to expand practical terminal capacity as is needed in the Twin Cities. Technology, on the other hand, will allow improved equipment management and accounting systems and, thereby, facilitate development of a multiuser facility.

The sharp growth of intermodal has created needs for a wide variety of capital investments by railroads and equipment suppliers. Thus, terminal needs are competing for capital with needs to increase capacity of corridors, locomotive fleets, intermodal equipment fleets and rail equipment fleets. Capital represents a not insignificant barrier to implementing terminal improvements in the Twin Cities region.

Aside from individual railroad problems related to specific sites such as providing effective and efficient access to each railroad's main line system, on balance, the potential benefits to the region of developing a modern, efficient well located intermodal terminal clearly are significant enough to merit continued development of the MIRTS long term objective.

Intermodal Rail Terminal Capacity Analysis Methodology

INTERMODAL RAIL TERMINAL CAPACITY ANALYSIS METHODOLOGY

Background

Intermodal traffic is freight moving on at least two modes of transportation. A railroad providing rail intermodal freight service operates that service as a system which consists of the following elements:

- A set of intermodal rail freight terminals ("hubs" or facilities), which originate and terminate the rail portion of intermodal movements,
- A set of main line segments (or traffic lanes) of varying capacity with appropriate track configuration and signals connecting the intermodal terminals in a network configuration,
- A pool of rail intermodal cars of various types which move in a closed system in traffic lanes among the railroad's intermodal terminals and provide, subject to market conditions, a fixed supply in each lane of containers and trailers designed to be handled in intermodal service,
- A service-based schedule of trains moving intermodal rail cars among the network of hubs, and
- A fleet of locomotives assigned to power trains according to the system scheduled.

The capacity of a railroad's intermodal system is constrained, in turn, by the capacity of each of these five elements. Assuming an adequate supply of rail cars, traffic lane capacity, for example, is a constraining factor in several ways:

- Sufficient power must be available to properly power all intermodal trains to meet corridor transit times;
- Overall utilization of the corridor must be such as to accommodate all intermodal trains to meet service-based schedules offered shippers; and
- The existing schedule of intermodal trains defines the maximum number of units that can be moved in a corridor on a given day.

Thus, traffic lane capacity will be a step function of the number of trains operated at any time. Further, the capacity for moving loads is a function of needs to reposition empties among terminals. Finally, the terminals in the corridor must have adequate terminal capacity to handle the maximum number of units the railroad service plan is designed to move within the time available based on train schedules and customer local service needs. The analysis discussed here concerns this final element at the interface of movement by both truck and rail and focuses on terminal capacity and its sub-elements, assuming fixed capacity in the other four system elements.

In contrast to elements of free-flowing open systems like tunnels, bridges, highways or even storm drains wherein the effects of peak demand are to clog or congest the facility creating system overflow and run-off, a rail intermodal facility is part of a closed system wherein a fixed or limited supply of both intermodal and rail equipment generally controls the lift demand within a given range. In other words, terminal lift demand is limited by external supply factors noted above with the result that the overflow demand for intercity freight service "spills over" to the truck mode on a daily basis. This serves to allow terminal management (in contrast to marketing management) to focus on more efficient management of peak demand in the short run and on broader system and terminal design questions in the long run. Marketing management focuses on matching demand to available trailer and container supply in the short run and market share goals in the long run.

An overview of the U.S. intermodal system from a national perspective is provided by the June 1990 report Double Stack Container Systems: Implications for U.S. Railroads and Ports jointly sponsored by two agencies of the U.S. Department of Transportation, the Federal Railroad Administration (FRA) and the Maritime Administration (MARAD). An appendix of that report, which is reproduced for convenience as Appendix One to this document, includes the results of a survey of the railroad industry regarding characteristics of intermodal terminals in 16 major cities. Although the data is circa 1989 and not current, it provides an interesting overview of the system and the characteristics of an extensive sample of 60 major intermodal facilities. The Soo Line's St. Paul facility was surveyed in the FRA study but not Burlington Northern's (BN) terminal. Table 1 summarizes the FRA-MARAD data in terms of number of facilities in each city (as reported), estimated total acreage for facilities, length of track available for intermodal rail cars, the equivalent number of rail cars of different types which could be placed on those tracks at any one time, the numbers of lift machines and an estimate of the lift capacity. In the FRA-MARAD study, daily lift capacity (referred to as track capacity in this report) is derived as a constant function of track feet and assumes fully utilized standard 89 foot Trailer-On-Flat-Car (TOFC) cars are used twice a day. Annual lift capacity estimates (Appendix A) were calculated as 365 times the daily lift capacity. For purposes of this study, this approach significantly overstates terminal capacity.

Terminal Activities

Rail intermodal terminals are complex systems whose performance is based on interactions among various terminal sub-system elements in a dynamic environment. Terminal elements include available space for parking intermodal equipment (trailers, containers and chassis) and for placing of rail equipment as well as handling equipment. Terminal productivity is strongly influenced by its layout, operating strategy and demand.

Rail intermodal terminals are complex systems whose performance is based on interactions among various terminal sub-system elements in the dynamic environment created by the railroad's intermodal system. Terminal elements include space for parking intermodal equipment (trailers, containers and chassis), track space for placing rail equipment, and handling equipment. Terminal productivity is strongly influenced by the layout of the terminal, type and quantity of equipment, operating strategy and demand.

The intermodal process begins with the traffic manager who wishes to arrange intercity transportation for a unit load of boxable freight. If rail intermodal service is available between the origin and destination and competitive, the manager (or an agent) will contact the railroad to establish price and service availability. If the railroad can provide an empty trailer or container of the size requested and meet the service requirements of the

TABLE 1

SUMMARY OF INTERMODAL TERMINAL CAPACITY CIRCA 1989 IN MAJOR HUB CITIES

	NUMBER OF HUBS	ACRES	GIVEN TRACK FEET	ESTIMATED DAILY LIFT CAPACITY	------LIFT MACHINES------ SIDELOAD	OVERHEAD	TOTAL	-CAPACITY GIVEN TRACK SPLIT- 100% FLATCARS	100% DOUBLESTACK	50/50 MIX
ATLANTA	2	119*	25,114	2,196	5	7	12	270	82	176
BALTIMORE	2	91	13,299	1,163	5		5	143	44	94
CHICAGO	14	972*	235,861	20,622	33	24	69	2536	773	1655
COLUMBUS	2	80*	7,626	667	4	0	4	82	25	54
DENVER	3	131	20,491	1,792	1	2	6	220	67	144
DETROIT	3	24*	18,099	1,582	7	3	10	195	59	127
HOUSTON	4	190	30,132	2,634	5	5	10	324	99	212
KANSAS CITY	4	84	27,717	2,423	3	3	9	298	91	195
LOS ANGELES	4	564	96,162	8,408	21	7	28	1034	315	675
MEMPHIS	4	98*	14,415	1,260	4	2	9	155	47	101
NEW ORLEANS	4	52	12,555	1,098	3	4	7	135	41	88
NORTH JERSEY	3	136	38,617	3,376	14		14	415	127	271
PORTLAND	3	90	18,576	1,624	6		10	200	61	131
SEATTLE	3	97	34,317	3,000	3		16	369	113	241
ST. LOUIS	4	109	27,900	2,439	8		10	300	91	196

* ACRES APPROXIMATED FOR ONE TERMINAL.

SOURCE: APPENDIX A

traffic manager, an order will be placed. If the railroad cannot meet the requested need, the manager will contact a trucker to arrange intercity service.

A review of the various steps in the intermodal process and activities which occur within a rail intermodal freight terminal will serve to clarify consideration of sub-system elements:

1) Given an order, the intermodal process begins when the railroad dispatches a local trucker or drayman to move an empty box from storage (likely at the intermodal terminal) to the origin point.

2) Cargo is loaded in a box (that is, a highway trailer with permanently attached truck chassis or some form of container sitting on a separable highway chassis) at the point of origin.

3) The box is hauled ("drayed") by tractor from the point of origin to a transfer facility ("origin rail intermodal terminal").

4) The box is inspected at the terminal entrance gate and, after administrative information is confirmed, usually, is parked at the facility until the appropriate time for loading; a container may be stored on its chassis or on the ground in which case the chassis is available to handle another container; the total time a box spends at the origin terminal prior to being loaded on a rail car is referred to as the origin terminal "dwell time"; outbound loads tend to have short dwell times representing a small part of a day.

5) The box is hauled from its storage location to a "staging" spot alongside the loading track by terminal hostling or lift equipment; in cases where the box is not stored but moves directly to a spot alongside a rail car, the operation is referred to as advanced staging or, if it is immediately loaded on a rail car, "live lifting"; in order to move on a desired scheduled intermodal train, the box must have arrived at the terminal before a published "cutoff" time.

6) The box is loaded ("lifted" or "ramped") onto a rail car specifically designed to hold the box in either configuration; trailers and containers are loaded either singly on flatcars or, in a double stack configuration, in well cars, clearance restrictions permitting.

7) The loaded rail car is moved ("switched or pulled") from the loading track to a storage track at or near the origin terminal or at a supporting rail yard to be formed into a road train for departure at the scheduled time.

8) The box is moved intercity in one or more trains (almost always) dedicated to hauling intermodal rail cars; if the routing of a shipment involves more than one train, the box may remain on its original rail car or be reloaded onto another rail car; in some cases, most notably involving movement on more than one railroad with a transfer in Chicago, the box may be unloaded from its original rail car at one facility and drayed to a second intermodal rail terminal where it is rehandled as described in steps #4-#8.

9) The loaded rail car arrives in the destination city and is put on a storage track until the appropriate time when it is switched onto an unloading track (same as a loading track) within the destination city intermodal rail terminal.

10) The box is unloaded ("deramped") at the destination terminal by terminal lift equipment and, usually, moved to a storage location; a container may be stored on a chassis or on the ground.

11) The box is stored until the appropriate time for pickup which is usually after a scheduled time referred to as the "release time"; the total time a box spends at the destination terminal after being unloaded from a rail car is referred to as the destination terminal "dwell time"; under existing agreements an intermodal customer has free use of a railroad owned or leased box for seven days after its "release" at the destination terminal; non-railroad equipment has a set number of free storage days at the terminal. As a result, customers tend to use the intermodal rail terminal to store goods which in turn stresses the storage capacity of the facility.

12) The box is removed from storage by a local trucker (drayman), inspected at the gate and trucked to the final destination point at a facility of the beneficial owner of the goods shipped.

13) The owner of the goods unloads the box and contacts the railroad to pick up the empty box.

14) The railroad dispatches a drayman to move the empty box to another customer or return it to storage (likely at the intermodal terminal).

The functions provided by an intermodal rail terminal encompass activities described in steps #1 and #4-6 for outbound and #10-#11 and #14 for inbound freight. Other listed activities are performed by other elements of the intermodal system including road train crews, local switch crews and drayage companies.

Measuring Terminal Capacity

Chapter 14.4.2 of the American Railway Engineering Association's (AREA) 1994 Manual for Railway Engineering , entitled Design of Intermodal Facilities, relates the current professional guidelines on intermodal facilities. Significantly, this manual, which is a virtual encyclopedia on technical aspects of railroading, is silent on the question of a facility's capacity. It indirectly addresses the question when it offers the following observation on sizing a rail intermodal facility:

> The size of a terminal depends on the number of trailers/containers loaded and unloaded in a specific time period, the length of time the trailer/container is held at the facility and the method of operation.

The AREA Manual is not helpful in shedding light on how a design engineer might size a facility given specifications as to expected demand and associated rail operations. But AREA is not alone in the brevity of the treatment given to the topic of capacity of rail intermodal terminals. The FRA-MARAD report failed to define facility capacity, rather the study viewed terminals as defined by various requirements for track, equipment and space any one of which "could constitute the limiting factor for a facility." The approach used in the analysis presented here to evaluate the "capacity" of the two study terminals is similar in that it focuses on those same three critical factors.

The voluminous 1976 pioneering FRA report, National Intermodal Network Feasibility Study, devoted great attention to the details of TOFC terminal designs, operations and costs, but also did not quantify capacity. That study, rather, assumed four levels of activity defined in terms of "transfers" a day.

The capacity of a transportation facility, which can be viewed in a variety of ways, is a significant consideration especially at the design phase (as per the FRA studies) and as demand for use of the facility grows and improvement options need to be evaluated (as applies in the Twin Cities). On the one hand, at an aggregate level, the operational throughput of a facility over some period of time is a relevant perspective; while on the other, at the dynamic level, efficiency, delay and congestion measures are critical to understanding facility performance during periods of peak demand.

Capacity, in itself, is a somewhat meaningless concept in the context of operating a rail intermodal facility or system as a number of alternative measures could be applied. For example, the absolute maximum volume a facility could handle in a 24 hour period is one measure of capacity. Throughput is another aggregate measure of a facility's capacity. It is based, on the one hand, on demand for intermodal service and, on the other, on the capacity of a number of inter-related activities needed for a facility to function. The latter include managing the flow of trailers and containers (intermodal equipment) in and out of the facility, storing intermodal equipment, providing chassis for inbound containers, transporting intermodal equipment within the facility between storage areas and flat cars and lifting intermodal equipment on and off flat cars. In addition to these activities which usually are performed by one or more contractors, the railroad must provide rail flat cars in a timely manner for loading and unloading and move cars between the intermodal terminal and the linehaul intermodal trains. The more frequently the railroad pulls outbound loaded flat cars and places inbound loaded flat cars on terminal tracks the greater the volume of intermodal traffic potentially handled at a facility in any given period.

Typically, a more economically meaningful measure of capacity would be constrained "optimal capacity," that is, the volume at which railroad profit is maximized, or alternatively, the railroad's unit cost is minimized subject to meeting a reliability standard. This would be the volume at which the facility is operating most efficiently. From the railroad's perspective there are a number of relevant variable costs including payments (per unit) to terminal and gate operators and (possibly) railroad equipment and switching costs. Depending on the terminal operator's payment schedule and which company provides terminal handling equipment, a terminal manager likely would consider optimal capacity to be the volume which maximizes his profit.

Capacity is a dynamic measure which can be estimated for varying time frames such as a day, a week or a year. Also, in measuring capacity, it is assumed that the physical plant is fixed as are the resources used to operate the facility. In other words, costs are assumed constant over the measurement period. This applies, for example, when a railroad contracts out terminal operation at a fixed unit rate subject to a sliding scale based on volume.

In practice, when a facility is overutilized, facility operating costs increase. Terminals tend to operate in this mode (that is, at the limits of practical capacity) at first only during periods of seasonal peak demand, but more so as growth continues. Beyond this point, facility capacity tends to be increased in three stages. Usually adjustments of a moderate nature are made initially by increasing the supply of mobile equipment. At a second level, major investment in fixed lift equipment could provide additional space within the available acreage. Finally, improvements involving additional land (including relocation) tend to be more expensive and require longer lead times.

The approach presented here focuses on facility analysis which involves evaluating each terminal component individually in terms of its independent characteristics (or capacity) as well as its inter-relationships with all other components. For purposes of this capacity analysis, external railroad functions supporting the intermodal terminal are considered fixed parameters. Capacity of three major functions performed within the terminal itself are evaluated. These concern track capacity, lift capacity, and storage capacity which are defined as follows:

> Track capacity is a function of not only the static layout of the terminal and length of tracks but also of the frequency with which the railroad switches flat cars in and out of terminal tracks, the mix of equipment and average or standard utilization rates. Track capacity increases as the number of switches a day increase subject to available lift capacity during the time between switches.
>
> Lift capacity is a function of the time available to unload and load flat cars, the type, number and mix of machines assigned to load and unload intermodal equipment and the rate at which such equipment is delivered to and removed from trackside. The latter is a function of the mix of units that require storage, the size and location of storage areas and the distribution of individual trailers and containers being handled among the storage sites.

> The size of storage areas by unit type is a static measure of storage capacity. Storage capacity is dynamic as well, being a complex function (which is difficult to measure) of how the facility is operated and the diverse aspects of the space needs of intermodal equipment when on terminal property.

The theoretical measurement of capacity defined above is greater than "real life" or practical capacity. In addition, external train operations and scheduling, which are governed by physical and marketing considerations distinct from those of the terminal, usually set practical capacity at a level well below "absolute" capacity. From this perspective, facility throughput is constrained more by lift capacity than by track capacity which may generally be viewed as relatively unconstrained over a 24 hour period. Although storage capacity might seem to be less of a constraint on terminal throughput, more flexible and controllable by railroad management, industry practice tends to make storage a pressure point which tends to become more intense as volume increases.

The task in the terminal is to maximize the flow of equipment through the facility within the constraints of the railroad's and beneficial customers' parameters (i.e. late cut-off and release, excess storage time, documentation, block loading, etc.), in as minimal a time period as possible. This is accomplished primarily through timely scheduling and proper sizing of terminal forces. Assuming adequate track space, available lift equipment and ample hostling vehicles, parking capacity constraints directly influence the number of hours allocated to handling the flow-through of trailers and containers. In situations of inadequate storage, drivers tend to spend more time shuffling equipment or driving greater distances to and from trackside. In addition, lift machines perform excess lifts from crowded container stacks, a practice commonly known as "cherry picking".

Thus, the throughput capacity of an intermodal terminal is limited by the most restrictive of three general physical and operational terminal characteristics: track capacity, storage capacity and lift capacity. Although track space may be sufficient to handle a given volume, storage constraints could well be the determining factor in overall terminal capacity, assuming no change in facility practice. Likewise, ample storage certainly won't guarantee terminal efficiency should track space and lift capabilities be inadequate.

Measurement of capacity of these individual terminal elements is useful insofar as variables constraining any one factor (e.g., acreage or hours of operation) may be identified and modified in the future so that a terminal may be able to accommodate more traffic. Adjustments may be practicable in either the short or long term, as each has very different capital and operating cost implications.

The scope of the capacity analysis presented here will concentrate on the physical aspects of the terminal plant as it relates directly to the demand for intermodal unit lifts and historical storage requirements. Current constraints of facility hours of operation, dwell time agreements, lift equipment, and train service schedules are taken as given.

Factors affecting track, lift and storage capacity at an intermodal rail terminal are enumerated in the following sections and a methodology for calculating each of the three elements of terminal capacity is presented. A more comprehensive and theoretical analysis would involve an in depth study of numerous factors outside the scope of the study as designed. Some of these considerations which are not explored in this analysis are cycle and turnaround times for lift and hostling equipment inside the terminal and for truck and chassis both within and without each facility, intermodal flatcar turnaround times, and equipment surge/deficit tendencies.

Measuring Track Capacity

Track capacity pertains to the ability of the terminal to load and unload rail intermodal equipment and is a measure of the theoretical maximum number of intermodal units that could both arrive and depart the facility during any given period of time. In measuring track capacity, it is assumed there are no volume limits or constraints due to insufficient container storage space and that adequate workers and equipment are available to handle the theoretical demand during the time involved. The principal determinants of track capacity are:

-Length of ramp/deramp tracks,
-Number and length of support storage tracks,
-Train sequencing and scheduling,
-Method of ramp/deramp, and
-Facility hours of operation.

Train sequencing is a basis for establishing the schedule for use of the ramp/deramp tracks to process units moving on a particular train and for setting cutoff and release times for highway movement of intermodal units. Assuming local availability of rail intermodal cars for outbound traffic, challenging train sequencing does not necessarily limit the interval of time available for outbound loading as units can be loaded at anytime and prepositioned for outbound train switching. Train scheduling and its relation to shipper and receiver business hours can have a more practical effect on flows of intermodal equipment in and out of the terminal.

The method of operation for the movement of intermodal equipment within the rail terminal as well as the characteristics and capacity of lift equipment affect the average time required to deramp an inbound unit as well as the average time to ramp an outbound unit. Those times control the total time required to ramp or deramp a given number of rail intermodal cars and consequently the total number of intermodal units that can be handled during a given period of time.

For purposes of this study, daily track capacity is the number of 45 foot intermodal units which could be handled daily on available loading tracks during schedules switching hours. It is determined by the number of intermodal rail cars which can fit on each track segment, which is a function of the length of each segment, the average length of TOFC cars and of COFC stack cars and the average mix of each type. A facility's track capacity is also determined by the utilization of rail cars, that is, the percent of rail car slots used in both directions on average. Finally, track capacity is determined by the number of turns or number of times per day the same track can be utilized to process train consists, which is a function of hours of operation and train schedules.

Intermodal terminals have evolved in a wide variety of sizes related to available acreage and expected demand. (See Appendix A). The AREA manual categorizes track space as related to various demand situations as follows:

> Medium-volume terminals consist of multiple parallel tracks with the appropriate space between each set of tracks for equipment operation. The tracks vary in length from about 1,000 to 3,000 ft. and are usually stubbed although some facilities have flow-through trackage.
>
> High-volume terminals have typical track length of 3,000 to 8,000 ft. with a driveway crossing near the middle of ease of trailer handling by yard hostlers. High-volume terminals can handle up to 1,000 units per day flowing through the facility. The typical high-volume terminal does not have the track capacity needed for a full day's volume of rail car traffic and cars must be pulled into or out of the facility several times a day.

Measuring Lift Capacity

Lift capacity relates to the capability of a terminal to unload, position, and reload intermodal units and measures the theoretical maximum number of units which could be handled given a fixed track capacity, lift resources (that is, a specific set of machines and manpower), and the distribution of units to be handled within the facility. Lift capacity is a function of:

- The number and types of equipment available for the positioning of intermodal units (cranes, forklifts, hostling trucks),
- Appropriateness of equipment given terminal layout and particular work demands,
- Downtime for mechanical reasons,
- Manpower available to employ equipment,
- Work rules,
- Hours of operation,

- Terminal layout (productivity and capacity may be reduced by remote parking, or irregular track configurations), and
- Operating procedures, which may be marketing-influenced by specialized customer services such as amount of free time or empty staging.

The rate at which intermodal equipment can be lifted on and off flat cars varies with the experience and skills of the lift equipment operator. Refined depth perception is an especially important skill. Of course, the rate at which a lift operator performs also depends on the manner in which intermodal units are delivered trackside (staged). In the best of all cases, equipment is advance staged, in which case the lift operator need not wait for unit positioning. Alternatively, coordination with groundmen and hostlers moving intermodal equipment to and from storage areas, or street drivers in the case of "live lifts", is critical to the operators lift rate.

One manufacturer has demonstrated that an outstanding operator can load or unload one container every minute. With advanced staging, the best rate for trailers is one every 90 seconds. For planning purposes and considering safety ñeeds, a more practical rate suggested by this company is two minutes per container. For planning purposes, another manufacturer suggests using the following lift operator rates to pick and place units. The maximum rate for containers is 40 to 50 an hour for either double stack well cars or flat cars. The best rate for trailers is 30 to 40 an hour. These rates assume no travel time for the operator and no delay waiting for equipment to load.

The AREA Manual suggests average rates are even lower. The following extensive excerpts from the AREA Manual presents the general level of consideration given to lift capacity by the industry.

> There are three types of TOFC/COFC facilities in terms of the method used for loading and unloading: end, side and overhead. Each has different cycle times. The approximate unit lift cycle time for each method during typical TOFC/COFC loading/unloading operations is five minutes for end-loading, two and one-half to the three minutes for side-loading (TOFC) and one and one-half to two minutes for overhead loading (TOFC). In the latter two cases, COFC handling times are somewhat faster.

(According to AREA), replacing side-loader equipment with crane-loading equipment should be explored when lift volumes approach 250 to 350 lifts per day. Overhead loading is usually provided at high-volume terminals with 300 or more lifts per day. A terminal equipped with two cranes can be used for daily volumes in the range of 300 to 600 lifts a day (high-volume). This terminal configuration can then be expanded from 600 to 1,200 lifts a day by adding tracks and cranes.

Terminal operators will vary in their opinion regarding the merits of sidelift equipment versus overhead lift equipment. This is generally a speed versus flexibility argument. The overhead equipment has faster cycle times and is very efficient when moving from one end of the track to the other loading or unloading a unit at each position. Side loading equipment generally has a higher ground travel speed allowing it to move around the facility quicker to handle "Hot" loads at random locations.

Expanding terminals to volumes of more than 1,000 lifts a day should be considered only after a very thorough analysis has been made of truck-traffic flow-patterns. In major cities where volumes of these magnitudes may be available, the efficiency of several high-volume terminals located at strategic points around the city should be contrasted with the efficiency of a single very-high-volume terminal. [End of AREA excerpts].

Lift capacity is limited by a variety of factors including the type and number of lift units available, the time available to work a given set of flat cars and the dynamics of staging intermodal equipment. As previously noted, generally speaking, given the opportunity to switch terminal tracks as often as necessary to keep lift equipment active, track capacity may be viewed as not being a limiting factor on a facility's throughput. Note, however, that this is somewhat of a simplification given the need to maintain a blocking plan. If a train is to be made up of strings of more than one set of cars, additional car switching may be necessary to arrange blocks in appropriate train order. Staging of intermodal equipment and the efficiency of movement of vehicles within the terminal are significantly affected by the amount and organization of available space within the facility. Thus storage capacity, discussed below, is the third and, in some ways, the most critical of the capacity limiting factors of a rail intermodal freight terminal.

A detailed lift-capacity analysis involving access to contractor records and detailed evaluation of terminal operators was outside the scope of this study. The methodology employed is to rely on an assessment of a broad measure of terminal operator efficiency, namely revenue lifts per man-hour, which is a fundamental indicator of lift productivity.

In-terminal Services (ITS) provided statistics on 30 of its terminals over the entire range of volumes. Lifts per manhour cover a very wide range in practice from a minimum of 0.2 to a maximum of 7.0 lifts per manhour. This statistic is a good indicator of terminal productivity. Terminals which function efficiently within their capacity parameters usually exhibit lifts per hour in the range of 3.5 - 4.0.

As shown in Figure One, the ITS sample ranged between 1.55 and 5.07 lifts per manhour over a very wide range of annual lifts. In-house ITS standards expect **average** performance to be 3.0 lifts per man-hour. ITS data indicate that efficient, under-capacity facilities will reach 4.0 lifts per man-hour or higher. These are typically newer facilities designed for large volumes which are typically running at less than 50 percent capacity. Conversely, facilities that have grown beyond traditional designs exhibit lifts per man-hour in the 2.0 range or less. ITS's experience approximates a normal distribution with a mode of 3.5 lifts per manhour except at the high end where only a few terminals performed above the 4.0 lifts a manhour rate.

It should be noted that as illustrated in Figure One, which relates lift efficiency and volume, this measure of lift capacity is not correlated with volume alone but as the previous discussion indicates is the outcome of a complex process wherein capacity is a significant factor.

A central question answered by detailed lift capacity analysis is whether the rate of lifts per man hour is maintained at a competitive, cost-effective level. Efficiency can be defined as accomplishing the maximum work in the minimum amount of time. In order to be efficient and maintain high standards of on-time performance in peak periods or when a facility is operating beyond

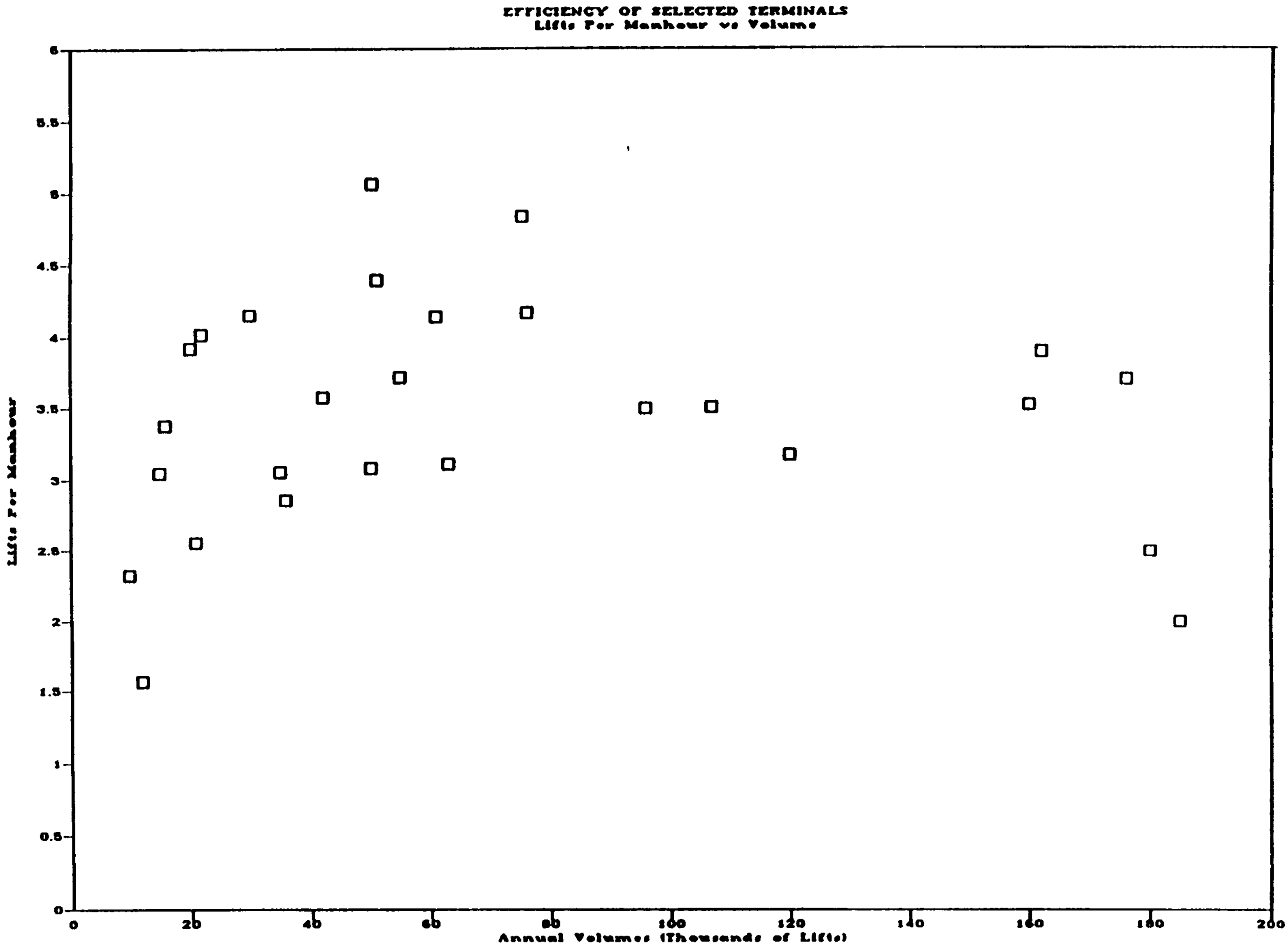

EFFICIENCY OF SELECTED TERMINALS
Lifts Per Manhour vs Volume
Lifts Per Manhour
Annual Volumes (Thousands of Lifts)
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
160
180
200

FIGURE ONE

practical limits, additional drivers, groundmen, and operators must be allocated to the operation, which results in an overall deterioration of lifts performed versus man-hours worked. This is reflected in a lower lifts per man-hour ratio.

Measuring Storage Capacity

In cases, such as with an intermodal rail terminal, where the facility provides a storage as well as a transfer function, measuring capacity becomes a complex interaction among functions competing for resources (in this case, space). Space requirements for storage are, of course, interrelated with space requirements for rail tracks both for loading/unloading and for storage of rail cars as well as space for efficient movement of lift equipment and road vehicles throughout the facility. For purposes of analysis, storage capacity is considered a buffer between the modes and is evaluated independently of throughput capacity where that term is applied to flow of intermodal units to and from the rail mode.

Measuring storage capacity is ordinarily a straight forward calculation of unit volume with capacity being the maximum amount of holding space. In the case of an intermodal rail terminal, the demand for space is a dynamic one including four distinct aspects of terminal operation and handling activities: inbound units on chassis, inbound units needing ground storage, outbound units on chassis and outbound units needing ground storage. The requirements of each activity differ and space demands vary over time as the ebb and flow of intermodal freight are driven by several independent processes: the shipping companies' production processes, the receiving companies' consumption processes and the usually complex train operating schedules of the railroads.

Storage capacity also constrains the number of units that can be processed through a container yard. Principal determinants of storage capacity include:

- Available acreage,
- Manner and mix of container storage: wheeled (stored on chassis) or grounded (stacked),
- Container stacking configuration for grounded containers,
- Availability of trackside storage (staging),
- Seasonal variability (i.e. empty positioning/empty surplus),
- Chassis management system,
- Free storage time allowed by railroad on loaded units; and
- Dwell time requirements of empty equipment.

The analysis aims to determine if adequate acreage is available to accommodate the dwell times of containers, trailers, and chassis as mandated by rail marketing requirements. For purposes of this study, storage capacity, or the total required storage slots, is measured as the sum of slot requirements (in both loaded and empty modes) of the four intermodal flow segments: total inbound trailers, total outbound trailers (both including containers shipped on chassis), total inbound containers and total outbound containers. Space requirements for each segment are factored by the average dwell time (which varies by segment) to derive storage days. If as normally occurs, there are separate wheeled and grounded storage areas each area is analyzed separately.

Lift Equipment

Terminal capacity is also impacted by the relationship between lift equipment methodologies, storage procedures, and overall yard configuration.

Sideloaders work particularly well in facilities that demand high storage times, whereby containers are grounded and stacked two-to-three high in rows one-to-two deep. Grounded containers must be rehandled when placed on a chassis for movement and eventual departure from the facility. Accessibility is significantly easier for the mobile sideloader that can traverse the facility at higher speeds to service the entire stacking arena.

Overhead gantry cranes, on the other hand, are much less mobile and restricted to specific runways. Grounded storage may only be accomplished within the confines of the inside clear width, which often limits roadway widths and associated tractor-trailer movement underneath the crane. Cranes do, however, have several unique advantages in facilities that rely strictly on a wheeled operation (containers stored on chassis). Terminals designed for crane utilization allow the terminal operator maximum flexibility in staging chassis in two lanes adjacent to the track prior or subsequent to the ramp/deramp function. The crane can then, in one continuous operation, deramp all the containers without relying on drivers and hostling tractors. This not only significantly reduces the time required to strip a train, but also increases storage capacity through additional trackside parking for equipment immediately departing the facility via highway or rail.

The sideloader is recommended to operate in aisles no less than 70 feet in width. Track pairs mandate access from both sides of a track (150 feet) or 75 feet minimum between single tracks. In general, at a sideloader facility; expansion will required 75 feet additional feet for maneuvering for each additional track.

In terms of track capacity, cranes will traditionally allow more parallel trackage within a confined width. This is because of the crane's ability to straddle more than one track. The crane can accommodate track pairs in 60 feet of space, with additional track pairs requiring only 60 feet more in width. High volume facilities will quickly realize significantly more track space in a more confined facility if said facility is designed for crane operations.

The terminals involved in this study each have their own particular brand of the aforementioned philosophies to best handle their mix of traffic within the constraints of the respective facilities. These will be discussed below.

External Factors - A System Perspective

In addition to evaluating intermodal terminal components, it is important to note that from a system perspective a railroad needs to consider the external factors related to its capacity to move rail intermodal equipment to and from an intermodal facility. In particular, the number of intermodal rail cars delivered for unloading each day as well as the related number of cars, or intermodal slots available, limit terminal demand. Thus, external factors include system-wide intermodal equipment and locomotive supply, policies for allocating that equipment by corridor, policies for allocating cars or slots among terminals in the same corridor, line capacity in the corridor and policies for allocating that capacity among competing lines of business (coal, grain, intermodal and merchandise). One recent example of this interaction at the system level involved Burlington Northern. The railroad adjusted its intermodal network in 1994 because of a need to reallocate locomotive power to enhance intermodal service levels.

Burlington Northern's St. Paul Intermodal Terminal

BURLINGTON NORTHERN'S ST. PAUL INTERMODAL TERMINAL

Overview

Burlington Northern Railroad (BN) operates a rail intermodal terminal in western Saint Paul called Midway Hub Center located at 1701 Pierce Butler Route. The terminal runs from east to west to a point just over one mile east of the Minneapolis city limits and parallels Pierce Butler, its southern border, and Energy Park Drive, the northern border of the Burlington Northern mainline right of way. East of Midway light industrial property extends along the railroad right of way. Midway is confined on the west end by a pond. A residential area is located south of Midway and a commercial area to the north. The Snelling Avenue overhead bridge crosses the facility with the bulk of the ramp/deramp operations occurring west of the bridge. Figure Two shows the location of the Midway Hub Center in relation to rail lines, the region's road network and community boundaries.

The following describes the facility and its activities in more detail, estimates the capacity of Midway and presents a plan for short term improvement at Midway which would generate a modest increase in capacity. The analysis is based on information provided by Burlington Northern concerning facility characteristics and operating schedules and on terminal lift activities through December 1994.

Layout

The Midway facility occupies approximately 52 usable acres on a long one and one-half mile piece of property of varying widths. Figure Three illustrates the layout of the property which falls roughly into three working areas. The west section, at its widest, is approximately 475 feet tapering to 225 feet at both ends. This section is served by three ramp/deramp tracks (identified as track numbers 2, 3 and 4). Track number 2, adjacent to the storage tracks on the north side, is the longest at 4,350 feet. Track numbers 3 and 4 are paired on 16 foot track centers and are 2,600 and 2,500 feet in length

METROPOLITAN COUNCIL

FIGURE TWO

TWIN CITIES INTERMODAL FACILITIES

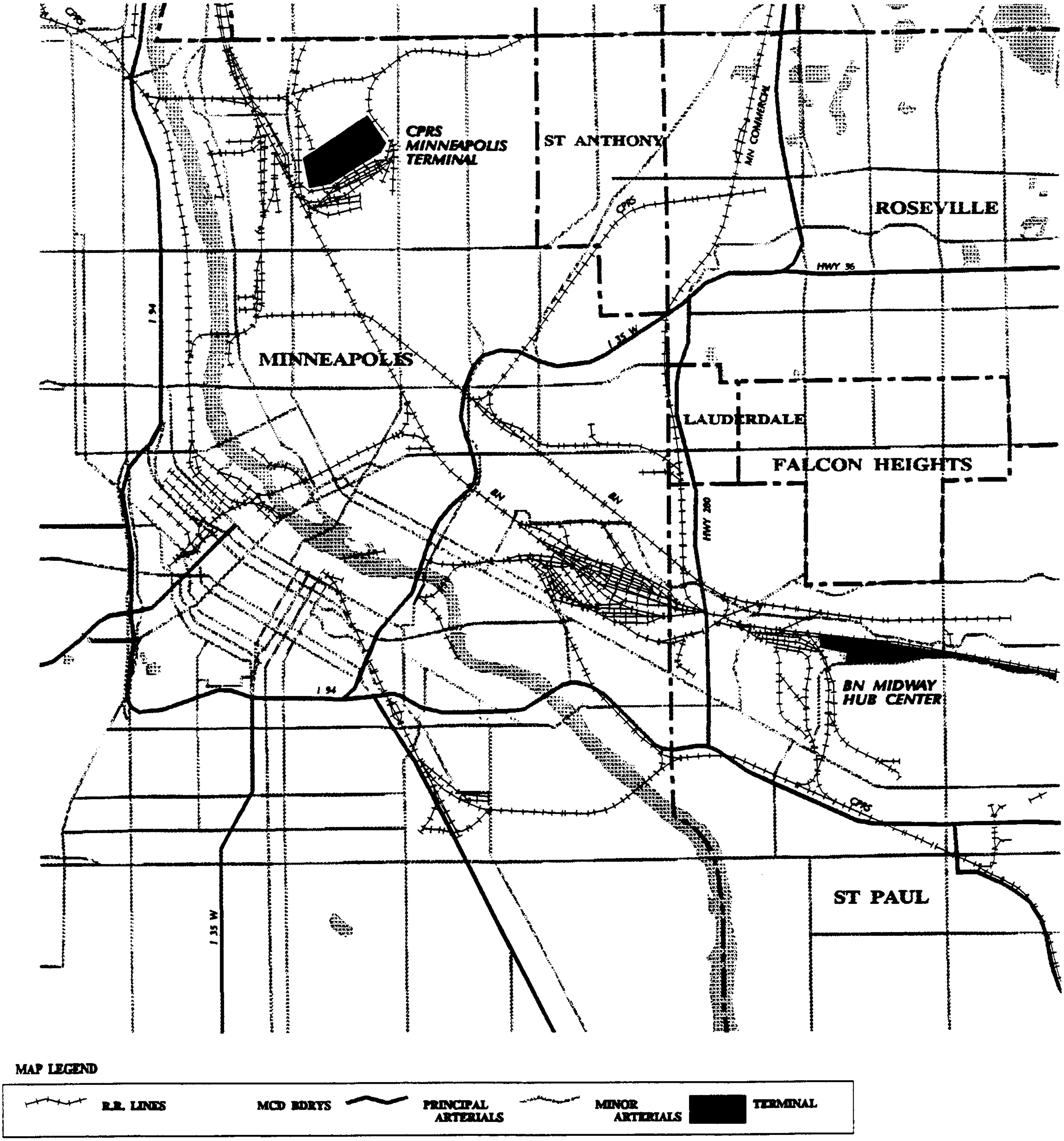
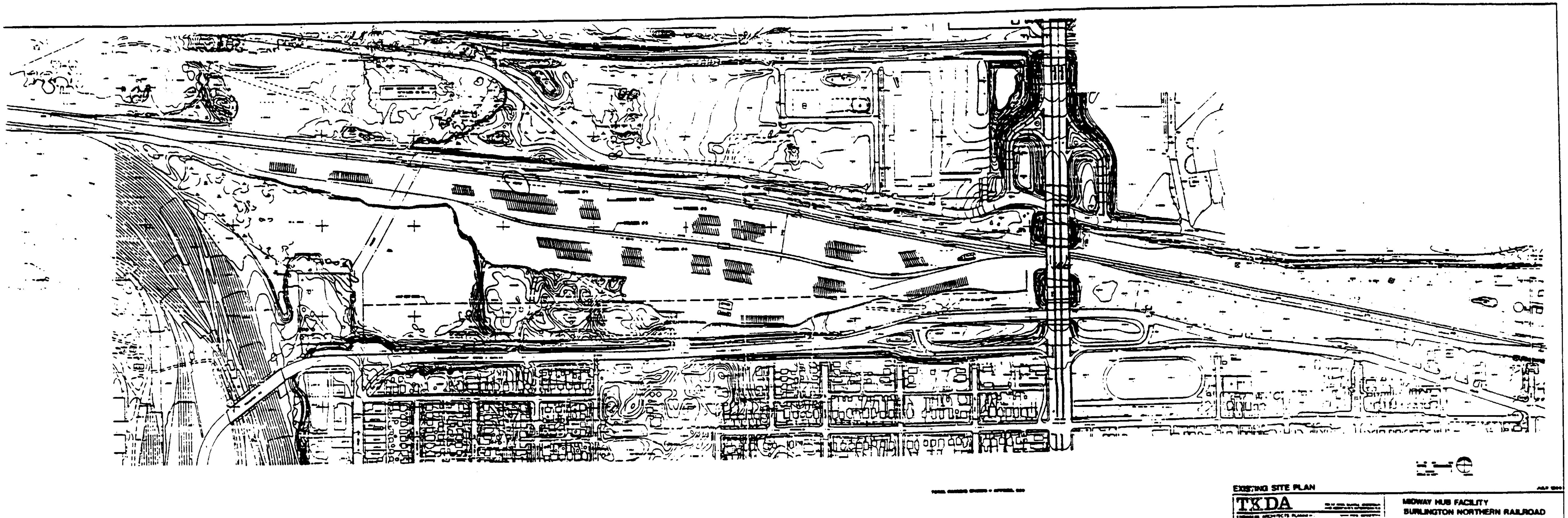


FIGURE THREE



respectively. The total length of these three working tracks is 9,450 feet. Center and perimeter storage for trailers and containers is employed adjacent to all three working tracks.

Operations and Lift Volumes

Midway Hub Center is an important element in BN's intermodal system, handling about 100 trains a week. Located on BN's traffic lane linking Chicago and the Pacific Northwest, Midway Hub links the region's shippers with more than two dozen other Hub Centers in the Midwest, Northeast, Southeast and West. Until the spring of 1994, BN offered intermodal service to and from Texas. Midway Hub handled about 148,000 loaded units in 1993 and over 180,000 in 1994, a 22 percent increase.

Intermodal is a significant part of BN's Twin Cities business having been about one fifth of the railroad's area tonnage until 1993 when intermodal exceeded one quarter of the total. Over the last four years, the volume of intermodal freight moved to and from Minnesota by Burlington Northern has increased each year except 1991, which experienced a slight decline. In 1993 BN's intermodal tonnage exceeded two million tons. All but about 10 percent of this intermodal traffic moves by truck in and out of BN's Midway Hub in St. Paul.

Since the mix of trailers and containers handled at an intermodal facility is one determinant of capacity, it is important to note the nature of BN's mix. In 1993, Midway deramped an equal number of trailers and containers but ramped slightly more containers (52 percent) than trailers (48 percent). Table 2 is a summary of selected characteristics of the terminal and its operations.

TABLE 2

TERMINAL CHARACTERISTICS USED IN CAPACITY ANALYSIS
BN MIDWAY HUB

Acreage		
Terminal Working Area	52.1	Acres
Woods and Hilltop	9.7	Acres
Hours Operated		
Week Days	24	Hours
Week Ends	18	
Number/Length of Tracks		
Inside Yard:		
Load/Unload #4	2,500	Feet
Load/Unload #3	2,670	
Load/Unload #2	2,350	
N and S Auto	2,200	
Subtotal	11,650	
Outside:		
Storage (4 Tracks)	2,600	Feet/Track
Number of Lift Machines	4	
Number of Hostling Tractors	8	
Number of Employees	46	
Number of Parking Spaces	1,050	
Trucks Per Day (Weekdays)	Lifts + 50-100	

TABLE 2
(Concluded)

TERMINAL CHARACTERISTICS USED IN CAPACITY ANALYSIS
BN MIDWAY HUB

Load/Unload System Mix		
Grounded Units		
Non-Grounded Units	100	Percent
Dwell Time (1993 Average)		
Inbound - Loaded	43	Hours
- Empty	70	
Outbound - Loaded	6	
- Empty	57	
Storage - Empty	84	
Weekly Trains By Period Of Day		
Deramping Times:		
0000 - 0600	7	Trains
0600 - 1200	12	
1200 - 1800	19	
1800 - 2400	7	
Ramping Times:		
0000 - 0600	5	
0600 - 1200	14	
1200 - 1800	32	
1800 - 2400	4	
Average Length of Train		
Inbound from East	33	Cars
Inbound from West	68	
Outbound to East	62	
Outbound to West	22	

Source: MIRTS.

Terminal Capacity Assessment

The following reviews current levels of capacity at Midway with regard to loading and unloading tracks, lift machinery and trailer and container storage.

Track Capacity. For purposes of this study, only Tracks 2, 3, and 4 are assumed available for ramp/deramp operations. At any moment the capacity of each track, in terms of the maximum number of intermodal units (that is, trailers and containers) that cars on the tracks could handle in each direction, varies with the mix of double stack and standard intermodal flat cars placed on the track illustrated for three hypothetical cases as follows:

		One Way Unit Capacity		
		TOFC	50/50	STACK
Track Number 2	4,350 feet	90	125	160
Track Number 3	2,600 feet	54	72	90
Track Number 4	2,500 feet	52	71	90
	9,450 feet	196	268	340

Given these measures, the capacity of these tracks over any period of time is defined by the number of times rail equipment is placed on the loading tracks. Typically, this turnover rate averages two times a day. As the above illustrates, with two switches a day and a balance of double stack and standard equipment (the 50/50 example), maximum potential of Midway's three loading tracks is twice 268 or 536 intermodal units in each direction, or a total of 1,072 units. Additional units could be handled if one or more of Midway's tracks were switched a third time.

According to a Burlington Northern Railroad announcement (dated August 10, 1994), Midway broke the daily volume record (since broken) by handling 767 lifts on August 3. Clearly that volume could be accommodated even in the 50/50 scenario by two turns a day if just over 70 percent of available slots were utilized.

Theretically, these estimates indicate that the track capacity at Midway is adequate to handle even peak days with daily volumes over 1,000 units.

Lift Capacity. Intermodal equipment at Midway is handled by four sideloading lift machines and eight hostling tractors. Aside from scheduled maintenance, a very low (e.g., two percent) downtime rate is to be expected. No data were developed on contractor performance at Midway, on the rate at which these machines handle units, or on downtime rates. However, as noted above, performance goals for sideloaders is considered to be in the range of 40 to 50 an hour for containers and 30 to 40 for trailers. At those rates, for example, about 18 machine hours would be required on a day in which 350 trailers and 350 containers were handled.

Based on analysis of a hypothetical operation at Midway for a heavy demand day, it is concluded that three sideloaders could adequately handle necessary lifts at current demand levels. For a theoretical peak capacity day (about 950 units, as developed below) use of a fourth lift machine at Midway likely would be required depending on the distribution of lift demand over the course of the day.

Storage Capacity. In mid-1994, the Midway facility converted from a grounding/stacking operation to a 100 percent wheeled operation, whereby all containers are stored on chassis. Storage requirements, therefore, are configured strictly in terms of parking spots. The designated parking areas are located throughout the entire facility and total approximately 1,050 slots (including over 180 east of Snelling Avenue) which on an annual basis, is equivalent to over 383,000 available parking slots. Current volume levels and previously noted dwell times indicate that on **average** storage is 70 percent utilized. Peak and dynamic demands dictate the need to use all available acreage adjacent to lead tracks to provide additional storage of trailers and containers on chassis.

Trackside storage reduces the need for parking slots. It is estimated that a significant percentage of rail outbound trailers are staged directly at trackside as this is a priority whenever feasible. This maneuver is not always possible, because inbound flatcars may not yet be unloaded or certain blocks may not be in the process of being loaded at that time. Likewise, whenever possible, inbound trailers are left trackside for pick-up by street drivers. No data were developed, however, on this aspect of Midway's terminal operations in 1994.

Summary of Assessment. BN's intermodal terminal in St. Paul, Midway Hub Center, experienced sharp growth in 1994 with annual totals more than 20 percent above the total volume handled in 1993. Consequently, the facility has experienced capacity pressures in some aspects of its operations. Midway's capacity to handle current demand levels is summarized as follows:

1) Track capacity at Midway is adequate given sufficient switching and turnover rates,

2) Lift capacity likely is challenged on very heavy days but not otherwise, and

3) Storage capacity is at 70 percent of its limit under static conditions. Recognizing the significant extent of very heavy demand as well as normal peaking patterns, under dynamic conditions Midway seems to be nearing practical limits of storage capacity. New methodologies of operation regarding trackside staging likely would assist in providing additional storage. However, other constraints, such as excessive weekend dwell time still skew the numbers above efficient operating levels. The analysis suggests that additional growth will only magnify the problem and create associated operating diseconomies.

Nominal Terminal Capacity

For purposes of facility planning, a nominal measure of Midway's capacity was developed based on the assumption that sufficient trackside parking would be utilized to relieve pressure on storage capacity and that lift machinery would continue to be adequate to meet peak demands. Based on a theoretical analysis of peak daily demand, it is estimated that Burlington Northern's Midway Hub Center has a nominal or theoretical capacity of about 230,000 intermodal units on an annual basis. A derivation of this estimate follows.

Peak Day Track Capacity. Midway's theoretical peak day track capacity is a function of three critical variables:

- Times a day the loading tracks are turned,
- Trailer/container mix, and
- Percent of available car slots that are utilized.

Estimated nominal capacity assumes that Midway is turned twice a day on average, which is consistent with other capacity studies. Midway's 1993 annual statistics indicate that (aside from reloads) trailers accounted for 49 percent of the lifts. This is significantly higher than Burlington Northern's system average and reflects the fact that much of Midway's business also moves on eastern carriers which are trailer oriented. Recognizing the continued strong trend on Burlington Northern to increase container share while maintaining a strong trailer presence at Midway, estimated capacity is based on a mix of 47 percent trailers for planning purposes.

Although no data were developed for use in the study as to the percent of total slots that are utilized at Midway, it is assumed that slot utilization at the facility is about 87 percent. Given this rate, as well as the turn rate and equipment mix noted above, the theoretical design peak capacity at Midway is about 950 units a day or, for example, about 500 containers and 450 trailers given the mix assumed here.

Theoretical Annual Capacity. To expand a peak day figure to an annual one, weekly and day of week patterns need to be recognized as must the fact that it is unrealistic to assume a facility can operate continuously at peak levels. Thus, in a given peak period (such as a week), it is appropriate to assume some mix of peak, less than peak and low volume days. For purposes of this analysis, based on 1994 Midway experience, weekly capacity is defined as consisting of one peak day, five days at 75 percent of peak and one day with lift volume at half the peak. Using this approach and the assumptions noted above, Midway's weekly track capacity is estimated to be about 5,000 units or a daily average of 715 units. Thus, for a 31 day peak month such as October, Midway's peak month capacity is estimated to be about 22,000 units.

Terminal capacity measurement is useful in analyzing peak period demands on a facility. Because such periods tend to be seasonal in nature, measuring capacity on an annual basis is less meaningful. However, the study approach requires a nominal "annual" capacity to compare to forecast demand. Annual track capacity is interpreted to mean that when annual lift volume is projected to exceed that nominal level, it is very likely the distribution of that demand over the course of the forecast year will include peak demand periods when the daily lift volume will exceed the estimated peak daily capacity.

To develop an annual figure from a 22,000 unit peak month base, seasonal patterns also need to be recognized, as annualizing peak period capacity without weighting for the absence of peak demand in many months obviously would develop a misleading annual figure. To avoid this problem, as a matter of definition, for purposes of developing the number of annual lifts equivalent to the peak month track capacity, this method assumes the distribution of annual capacity by month is the same as the distribution of annual lift demand by month.

Over the last five years, October lifts at Midway have been an average 9.6 percent of annual lift volume. Using that rate, Midway's nominal annual track capacity is estimated to be about 230,000 units. (As previously noted, this is based on two turns a day, a 47 percent trailer mix and a 75 percent slot utilization rate). Thus, Midway's 1993 lift volume of about 148,000 units represents about two-thirds of the theoretical nominal annual capacity. The facility experienced a sharp increase in volume in 1994 and operated at 78 percent of nominal capacity.

To put the capacity question in context, Figure Four illustrates the distribution of weekly lift volumes, given normal seasonal patterns, for a base case of 180,000 annual lifts. Peak demand occurs in only two weeks of the year when volume is above 4,000 lifts a week. If annual demand increases

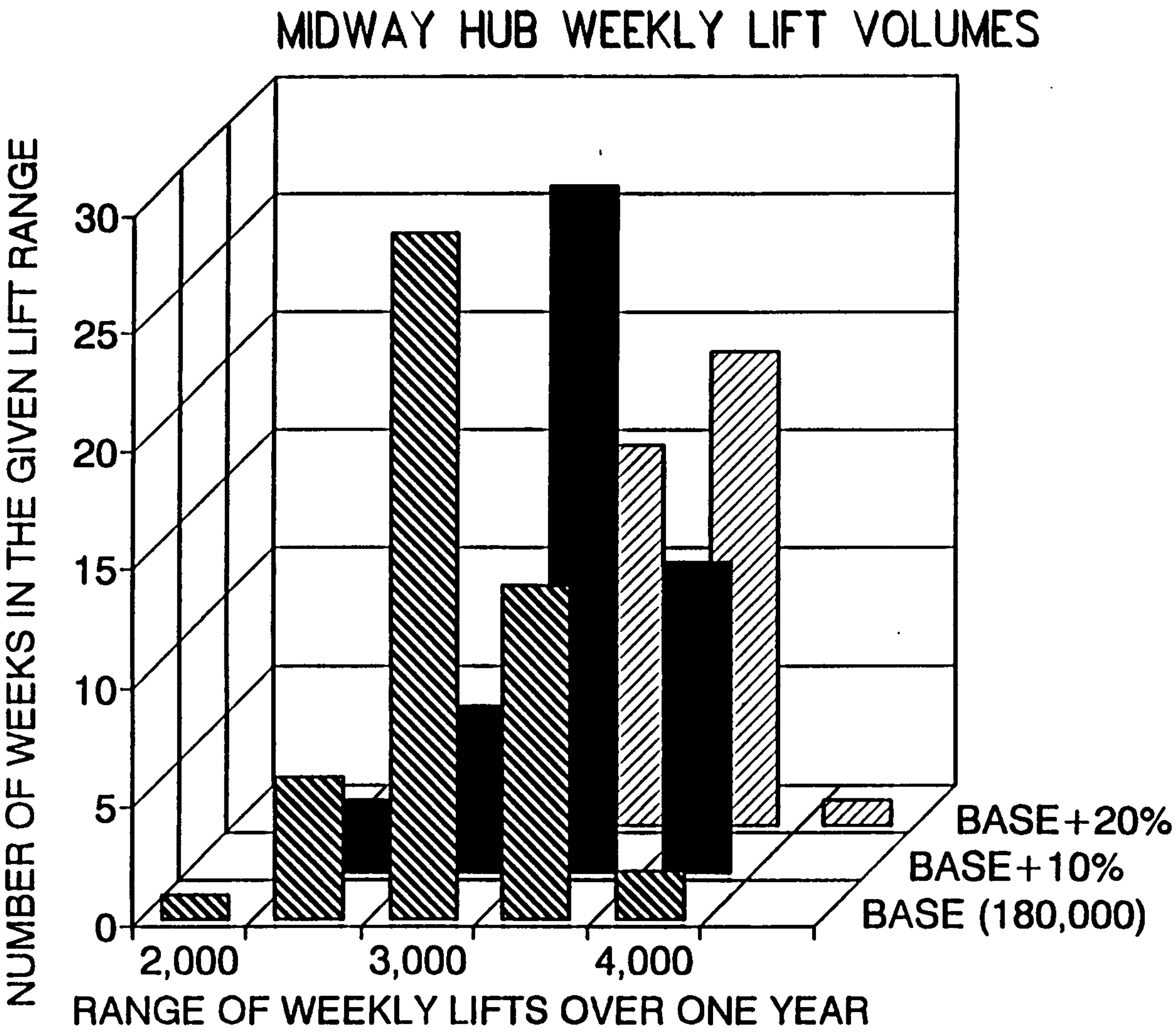

MIDWAY HUB WEEKLY LIFT VOLUMES
NUMBER OF WEEKS IN THE GIVEN LIFT RANGE
0
5
10
15
20
25
30
2,000
3,000
4,000
RANGE OF WEEKLY LIFTS OVER ONE YEAR
BASE+20%
BASE+10%
BASE (180,000)

FIGURE FOUR

10 percent (less than half the 1994 increase) and the increase is distributed uniformly throughout the year, lifts would be in the peak range 13 weeks of the year.

A 20 percent increase over a 180,000 lift base would mean that weekly lifts would exceed the 4,000 per week level about 20 times a year. This illustrates the type of pressure Midway could experience in the next few years.

Practical Capacity. It is important to recognize that a terminal has a practical capacity which is likely in the range of 80 to 85 percent of its theoretical capacity. For BN's Midway Hub, it is estimated that the facility's practical capacity is in the range of 185,000 to 195,000 lifts a year. Thus, Midway Hub is approaching the limits of practical capacity and, likely would exceed practical capacity if 1995 business increased as little as 5 percent.

Short Term Improvements

As business volumes continue to expand, existing capacity inadequacies will further impede productivity levels and the railroad's ability to supply an efficient and economical intermodal service to its customers. As an interim measure, BN's facility has the potential for expansion within the confines of its existing property.

One opportunity to increase Midway's capacity in the short term involves evaluation of lift equipment used at the facility from the perspective of space requirements. BN's Midway Hub Center relies exclusively on sideloaders to conduct ramp/deramp operations. The facility, which has traditionally stacked grounded containers for storage purposes, has converted to a wheeled operation with Transamerica supplying chassis to support the operation. In this environment, the mix of traffic, dwell times, and track configuration could, with some reconfiguration, support either a crane or sideloader operation. The potential benefits of using overhead cranes at Midway were analyzed in exploring expansion possibilities at Midway and found to be attractive.

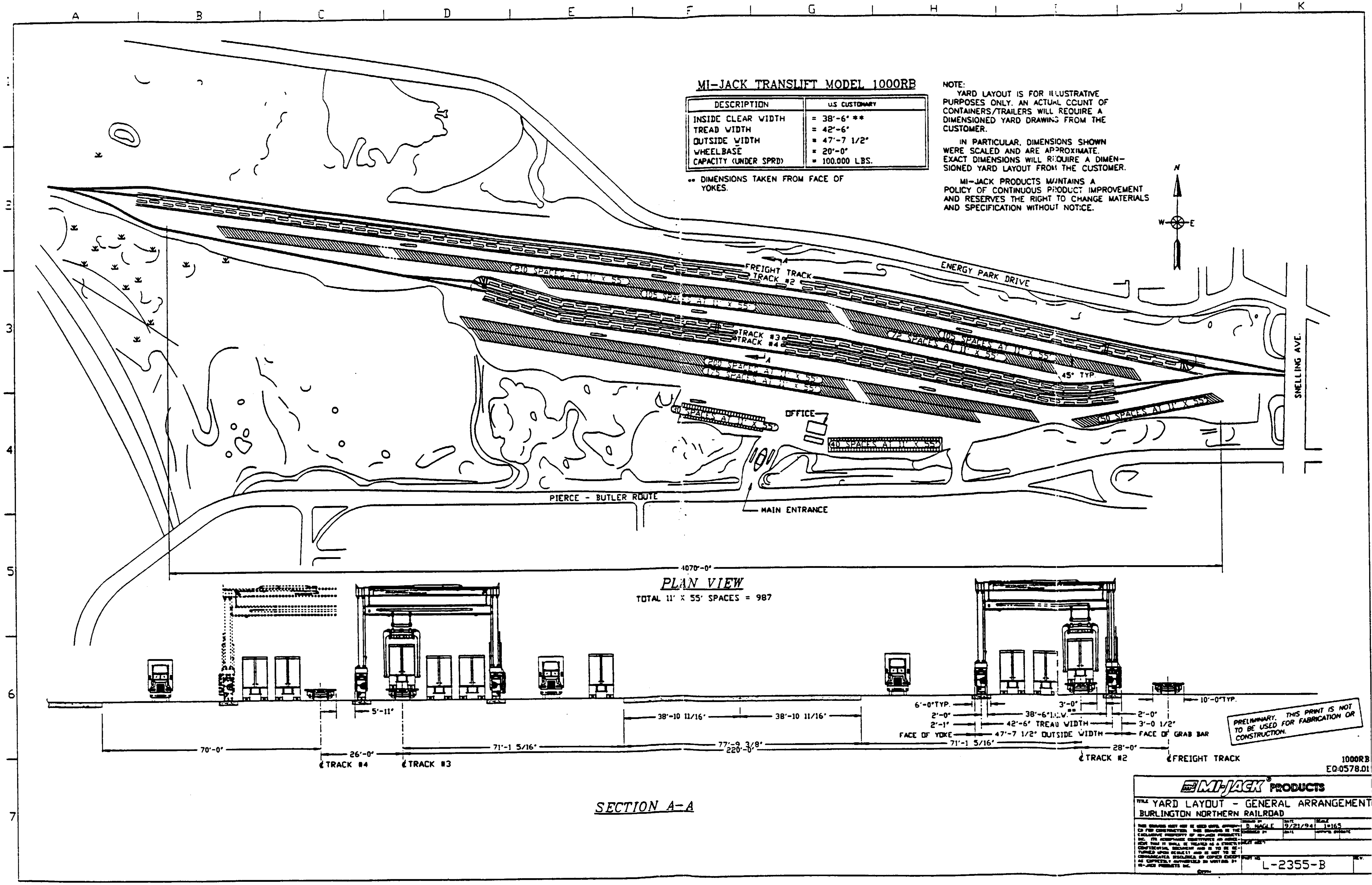
Lack of space eliminates the possibility of increasing track capacity at Midway, although increased switching, higher utilization of rail car slots and greater use of double stack equipment would provide more capacity. However, improvement of parking requirements is possible by introducing use of overhead gantry cranes to replace sideloading equipment. Cranes would permit extensive use of trackside parking, reducing the demand for scarce storage space. In addition, wide maneuvering lanes required for sideloaders could be reduced creating additional parking space. It is estimated that the net effect would be to increase terminal capacity 15 percent. Cranes also likely would increase terminal operating efficiency.

Parking at the existing BN facility is inadequate, and boundaries constrain expansion. The primary benefits of a crane operation are the ability to operate in a more confined area to advance stage trailers and chassis in two lanes adjacent to the ramp/deramp track. If Midway were converted to overhead gantry cranes in place of sidepick loaders less maneuvering room would be required and more parking room would be available.

An additional benefit of replacing sideloaders stems from the fact that a crane lends itself particularly well to the doublestack application. Chassis can be parked side by side adjacent to railcars for quick loading/unloading cycles without the subsequent use of hostling vehicles. If sideloaders are utilized, each chassis first must be positioned and then removed from the staging area before the sideloader can access the railcar again. This results in less than optimum cycle times compared to an overhead crane system. Quicker cycle times naturally translate into more expedient movements of trailers and containers to and from the facility which frees up storage space in a more expedient manner.

Figure Five is a sketch of a "design enhancement" at Midway which illustrates how cranes might operate at the facility. Implementing this improvement entails adding crane pads to support the high crane weight along all existing tracks and purchase of two new overhead cranes.

FIGURE FIVE


MI-JACK TRANSLIFT MODEL 1000RB
DESCRIPTION
U.S. CUSTOMARY
INSIDE CLEAR WIDTH = 38'-6" **
TREAD WIDTH = 42'-6"
OUTSIDE WIDTH = 47'-7 1/2"
WHEELBASE = 20'-0"
CAPACITY (UNDER SPRD) = 100,000 LBS.
** DIMENSIONS TAKEN FROM FACE OF YOKES.
NOTE:
YARD LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. AN ACTUAL COUNT OF CONTAINERS/TRAILERS WILL REQUIRE A DIMENSIONED YARD DRAWING FROM THE CUSTOMER.
IN PARTICULAR, DIMENSIONS SHOWN WERE SCALED AND ARE APPROXIMATE. EXACT DIMENSIONS WILL REQUIRE A DIMENSIONED YARD LAYOUT FROM THE CUSTOMER.
MI-JACK PRODUCTS MAINTAINS A POLICY OF CONTINUOUS PRODUCT IMPROVEMENT AND RESERVES THE RIGHT TO CHANGE MATERIALS AND SPECIFICATION WITHOUT NOTICE.
N
W
E
FREIGHT TRACK
TRACK #2
TRACK #3
TRACK #4
ENERGY PARK DRIVE
SNELLING AVE.
PIERCE - BUTLER ROUTE
MAIN ENTRANCE
OFFICE
45° TYP.
210 SPACES AT 11' X 55'
105 SPACES AT 11' X 55'
105 SPACES AT 11' X 55'
72 SPACES AT 11' X 55'
200 SPACES AT 11' X 55'
175 SPACES AT 11' X 55'
30 SPACES AT 11' X 55'
40 SPACES AT 11' X 55'
50 SPACES AT 11' X 55'
4070'-0"
PLAN VIEW
TOTAL 11' X 55' SPACES = 987
5'-11"
38'-10 11/16"
38'-10 11/16"
6'-0" TYP.
2'-0"
2'-1"
FACE OF YOKE
38'-6" I.C.W.
42'-6" TREAD WIDTH
47'-7 1/2" OUTSIDE WIDTH
3'-0"
2'-0"
3'-0 1/2"
FACE OF GRAB BAR
10'-0" TYP.
70'-0"
26'-0"
71'-1 5/16"
77'-9 3/8"
220'-0"
71'-1 5/16"
28'-0"
℄ TRACK #4
℄ TRACK #3
℄ TRACK #2
℄ FREIGHT TRACK
PRELIMINARY. THIS PRINT IS NOT TO BE USED FOR FABRICATION OR CONSTRUCTION.
SECTION A-A
1000RB
EQ-0578.01
MI-JACK PRODUCTS
YARD LAYOUT - GENERAL ARRANGEMENT
BURLINGTON NORTHERN RAILROAD
D. NAGLE
9/21/94
1"=165'
L-2355-B

As itemized in Table 3, a plan to respace tracks, install concrete crane pads and purchase two such cranes is estimated to cost $4,000,000 with $1,500,000 for cranes. The estimate is based on the following changes at Midway Hub Center necessary to implement this short term improvement:

- Shift track number three northward by 10 feet to allow for a crane pad between tracks three and four.
- Remove track number one to allow for a crane pad between track number two and the freight house track.
- Extend freight house track lead westward to tie into track number 2 lead.
- Employ the use of two rubber-tired gantry cranes with a 40 foot inside clear width. The cranes would operate over track numbers two, three, and four.
- Retain all existing storage space (parking slots). An additional 175 potential trackside parking slots would be created.
- Retain one container handling sideloader to serve as back-up, as well as to perform isolated chassis transfers from the trackside to preserve the integrity of the chassis pool.

Existing track and paving condition is adequate.

Other design options could be considered, which would allow for added loading track space. However, because there are operational alternatives to increasing track capacity, the economics of more radical options are not justified.

With improvement it is estimated that Midway Hub's capacity would increase 15 percent. This would boost the facility's practical capacity to the range of 210,000 to 220,000 lifts. Thus, these short term improvements would provide a margin for growth of only about 20 percent over 1994's demand level.

TABLE 3
BN INTERMODAL TERMINAL ENCHANCEMENT COSTS

	Quantity	Unit	Unit Cost	Total	
SITEWORK					
Grading	0	Cubic Yard	$4	$0	
Fill	0	Cubic Yard	25	0	
Install Subgrade	0	Square Yar	9	0	
Improve Gravel Base	0	Square Yar	4	0	
Break Pavement	0	Square Yar	15	0	
Break/restore for Pads	17,700	Lineal Foot	30	531,000	
Remove Track	0	Track Foot	4	0	
Remove Turnout	0	Each	900	0	
Track Salvage	0	Track Foot	(6)	0	
Rehabilitate Track	0	Track Foot	12	0	
Subtotal				531,000	
CONSTRUCT					
Paving	0	Square Yar	21	0	
Concrete Crane Pad	17,700	Lineal Foot	67	1,185,900	
Track	0	Track Foot	130	0	
Turnout-Slow Speed	0	Each	45,000	0	
Turnout- Medium Speed	0	Each	90,000	0	
Road/Rail Crossing	0	Lineal Foot	420	0	
Rail Access Lead	0	Mile	2,000,000	0	
Engine Drip Pan/Separator	0	Each	95,000	0	
Light Pole	0	Each	11,000	0	
Fencing	0	Lineal Foot	19	0	
Subtotal				1,185,900	
STRUCTURES					
Office Building	0	Square Foot	60	0	
Shop Building	0	Square Foot	45	0	
Truck Canopy	0	Square Foot	20	0	
Subtotal				0	
UTILITIES					
Install/Relocate	Unknown	Lump Sum		0	
SUBTOTAL				$1,716,900	
ENGINEERING AND PM 17 percent				291,873	
CONTINGENCIES 25 percent				502,193	
CONSTRUCTION SUBTOTAL				$2,510,966	
EQUIPMENT					
Gantry Cranes	2	Each	750,000	1,500,000	
Sidepick Salvage	2	Each	unknown	unknown	
Hostler Tractors	0	Each	40,000	0	Contract
Equipment Subtotal				1,500,000	
TOTAL				$4,010,966	

Source: RLBA estimate.

CPR's Minneapolis Intermodal Terminal

CPRS'S MINNEAPOLIS SHOREHAM INTERMODAL FACILITY

Overview

Intermodal rail freight shipments moved by CPRS to and from the Twin Cities area move through the railroad's intermodal terminal in northeast Minneapolis located at 615 30th Avenue NE. (See Figure Two on page 31.) The following presents the study team's assessment of CPRS's Shoreham intermodal operation and presents a plan for short term improvements at that facility designed to improve handling of intermodal freight.

The analysis of the capacity of this facility presented here relies on data provided by CPRS consisting of a fact sheet of terminal data and total monthly lifts by type for 1992, 1993 and the first seven months of 1994. The fact sheet information provided by CPRS, which also was distributed to the MIRTS coordination group, is presented in Table 4. Lift statistics were made available subject to a confidentiality agreement which provides that the data is to be used only by the study team for assessing the capacity of Shoreham and will not be communicated in the assessment submitted to the coordination group. The statistics confirmed the lift averages presented in the table.

Layout

As illustrated in Figure Six, Shoreham Yard, which is configured on a triangular piece of property, is comprised of two areas: the primary intermodal operating area and an adjacent empty container yard (CY) storage depot. The adjacent CY is on property leased by CPRS to Trimodal, the operator of its Shoreham terminal, which also provides a storage service for steamship companies. This independent facility is not part of CPRS's facility being evaluated here.

TABLE 4

TERMINAL CHARACTERISTICS USED IN THE CAPACITY ANALYSIS
CPRS SHOREHAM

Acreage		
Terminal	36	Acres
Repair	1	Acres
Hours Operated		
Week Days	18	
Week Ends	12	
Number/Length of Tracks		
Load/Unload #1	2,430	Feet
Load/Unload #2	1,400	Feet
Subtotal	3,830	
Storage (9 Tracks)	1,361	Feet/Track
Distance Between Tracks	4	Feet
Number of Packers	3	
Number of Hostling Tractors	5	
Number of Employees		
Lift Operators	7	
Hostlers	7	
Clerical	6	
Mechanical	4	
Other/Management	5	
Total	29	
Number of Parking Spaces		
Trailers - Loaded	190	
Trailers - Empty	270	
Containers (TEUs)	550	
Number of Trucks Per Day	250	
Tractor Time in Terminal	18	Minutes

TABLE 4
(Concluded)

TERMINAL CHARACTERISTICS USED IN THE CAPACITY ANALYSIS
CPRS SHOREHAM

Load/Unload System Mix		
Grounded Units	59	Percent
Non-Grounded Units	41	Percent
Dwell Time		
Trailers - Loaded	96	Hours
Trailers - Empty	48	
Containers - Loaded	144	
- Empty	72	
Weekly Trains By Period Of Day		
Arrival Time:		
0000 - 0600		
0600 - 1200	7	
1200 - 1800	14	
1800 - 2400		
Departure Time:		
0000 - 0600	5	
0600 - 1200		
1200 - 1800	5	
1800 - 2400	7	
Average Length of Train		
Inbound from East	30	Cars
Inbound from West	11	
Outbound to East	37	
Outbound to West	0	
Weekly Car Flow		
Outbound Per Week	629	Cars
Inbound Per Week	427	
Time to Spot/Pull Trains		
Minimum	45	Minutes
Maximum	90	
Number of Switches Per Day		
Minimum	8	
Maximum	10	

Source: MIRTS.

CP Rail System

MINNEAPOLIS, MN Intermodal Terminal

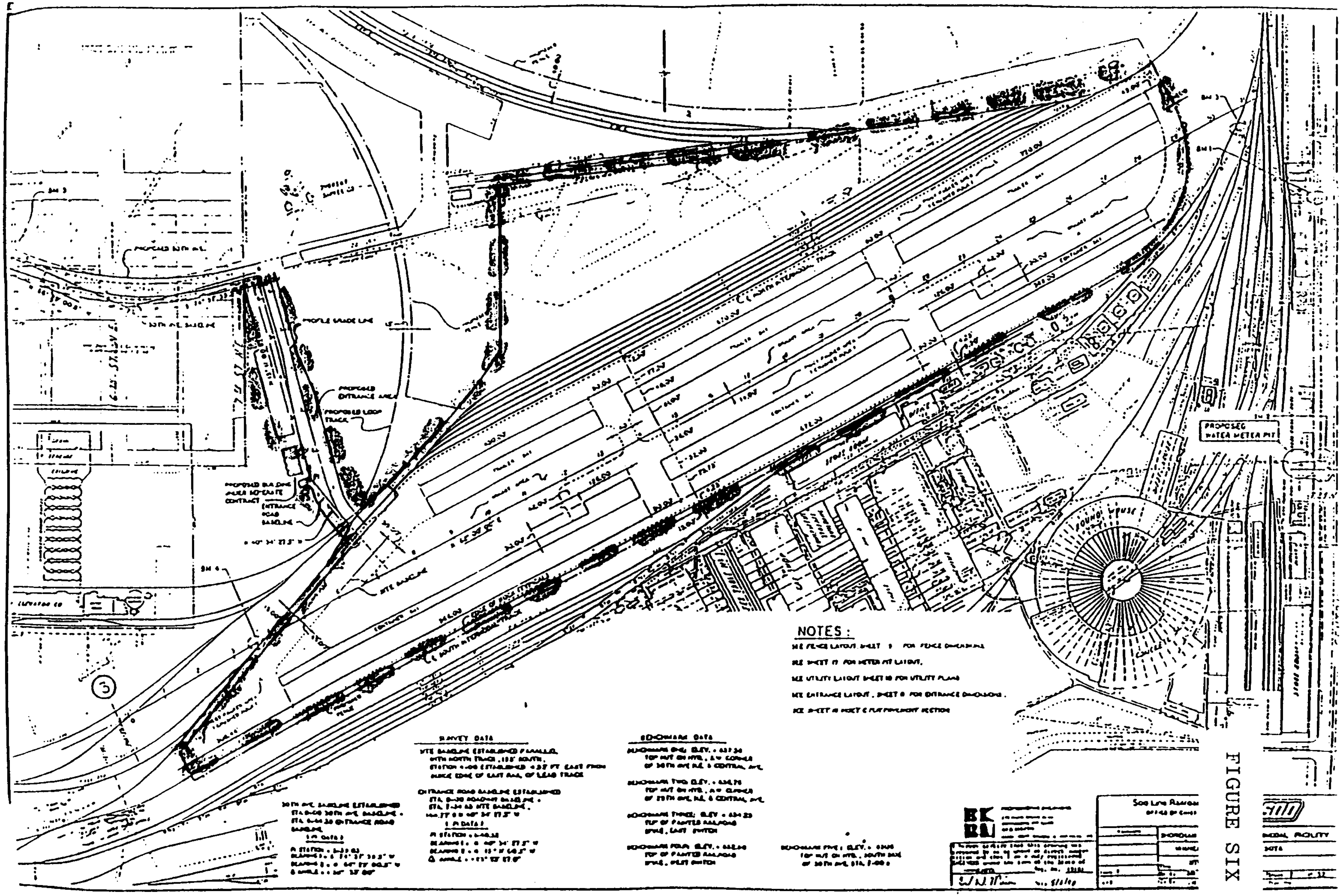


FIGURE SIX

The 37 acre site is defined by two sets of storage tracks (9 total with average length of 1,361 feet). The storage track space is ample to support empty flatcar staging and overflow loaded flatcars waiting for space on the unloading tracks.

Adjacent to each set of storage tracks is one intermodal track for unloading and loading (south and north intermodal tracks). The south track is 2,430 feet in length and the north track 1,400 feet, where length is workable length exclusive of connecting track segments.

The area between the north and south intermodal tracks is used for storage. Parking and storage at Shoreham consists of allocated space for 190 loaded trailers, 270 empty trailers, and 550 twenty foot equivalent unit (TEU) slots for containers, loaded or empty (exclusive of the empty container depot).

Major arterials in the vicinity are University Avenue to the west, Central Avenue to the east, Broadway on the south and St. Anthony Parkway about a half mile to the north. The truck route to the facility is via University to 30th Avenue and access from the south is restricted because the highway bridge over the BN and CPRS main lines just south of 30th Avenue has a weight limit of 18 tons. Access to the property from Central Avenue is limited to the railroad's maintenance facility. Interstate 694 is located over two miles north of the site via University Avenue.

Operations and Lift Volumes

CPRS provides daily intermodal rail services to and from Minneapolis which connect the Twin Cities with Chicago and other major cities on the CPRS system east of Chicago in the Northeast U.S. and Canada, including port facilities at Montreal. CPRS also provides connections beyond Chicago and Kansas City with railroads providing intermodal service throughout the U.S. Daily intermodal service between Minneapolis and cities in western Canada on the CPRS System also is provided. These services, totaling 38 trains a week in mid-1994, are in dedicated intermodal trains except for westbound Canadian intermodal traffic which moves in manifest freight trains. The railroad operates three intermodal trains inbound each day (two from the east and one from the west) and one eastbound intermodal outbound each day. Five days a week two other eastbound intermodal trains operate to Chicago.

According to the May 1994 train schedule provided to MIRTS by CPRS, significant demands are made on the terminal operator to handle intermodal freight promptly and efficiently. On a six train day, seven hours are available to both deramp the first arrival of the day and ramp the first departure. There is a narrow window of only 30 minutes between that departure and the arrival of the second train. A period of 2 hours 30 minutes is available to deramp the second arrival before the third arrives. There are only two hours between that arrival and the second departure. It is assumed that the third arrival waits for track space, as its rail equipment is likely used for the last outbound train of the day. According to the schedule, this period between 5 P.M. and 7 P.M. is clearly the bottleneck in the facility's operations. The final departure of the day occurs 4 hours 30 minutes after the second departure.

In addition to Shoreham, CPRS operates two other facilities handling intermodal freight in this part of the CPRS system, one about 250 miles northwest of Minneapolis at Thief River Falls and the other about 215 miles to the southeast at Portage, WI. Rail cars to and from both of those facilities are worked at Shoreham Yard as empty trailers destined for loads at the satellite facilities are ramped and, in addition, various switching and positioning of empty rail cars occurs.

CPRS moves both intermodal trailers and marine containers of varying sizes through the facility. In terms of units (not weighted for size), containers represent 56 percent of the units handled and trailers 44 percent. Loaded units (of either type) account for about four of every five units handled.

There is a good mix of 20, 40 and 48 foot intermodal containers handled at the facility and an average of 38 feet per unit is assumed in the analysis. At present, the facility operates 16 hours daily during the week and 12 hours daily on the weekends, for a total of 104 hours a week. CP uses a method of operation called "one track/one staging area" which assigns the same track to deramp an inbound and ramp the following outbound trains.

As noted in Table 4 above, CPRS reports that the average aggregate lifts a day amount to 159 loaded units and 43 empty units. This equates to an average weekly lift volume of about 1,400 or about 73,000 units a year which is assumed to be representative of facility activity in the 12 month period ending June 1994.

Terminal Capacity Assessment

Characteristics of Shoreham Yard are described and evaluated in terms of loading and unloading tracks, lift machinery, storage of containers and trailers and overall terminal operations.

Track Capacity. "Static" track capacity over a given period, or the ability of the terminal track to handle intermodal units given current train operations, is measured by the total number of intermodal units that can be accommodated during the measurement period by the two ramp/deramp tracks. On an average daily basis, static track capacity for CPRS's Minneapolis terminal is estimated to be the maximum number of intermodal units that can be loaded on standard intermodal flat cars (with outside car length assumed to be 94 feet and 8 inches). Given that car length, the long and short loading/unloading tracks at Shoreham could accommodate 25 and 14 flat cars, respectively. As noted in Table 4, the average car length of CPRS outbound trains is 37 cars with inbound trains not exceeding an average of 30 cars. Thus, on average each train (with a maximum of six a day) could be accommodated by road crews on the two tracks. Longer than average trains would require a second turn to be handled by a switch crew.

However, average aggregate lifts per day suggest that, in practice, not all trains are accommodated with one switch. On average, the maximum number of intermodal units which could be handled on 25 and 14 flat cars is

58 and 32 units, respectively, or a total of 90 intermodal units a turn, based on a weighted average of various sizes of containers and trailers handled at the facility. In contrast, the average number of units ramped on a daily basis is just over 100. The average number of units deramped daily also is about 100. This suggests that some trains require a second switch. In practice, CPRS reported, there are a minimum of eight and a maximum of ten switches daily to handle trains at Shoreham.

For purposes of this assessment, given track feet and a frequency of switching, track capacity is defined as a theoretical or hypothetical measure of the maximum number of intermodal units which could be handled during a given period. The following assumptions apply to estimating track capacity at Shoreham:

1) Each switch handles the maximum number of cars that will fit on the track (39 flat cars),

2) Each car generates the maximum number of deramps and ramps while it is on the track (90 of each given the maximum number of rail cars for a total of 180 lifts) and

3) Three sets of intermodal rail cars are switched five days a week and two sets on two days a week, a total of 19 switches a week.

Thus, given these assumptions, the characteristics of Shoreham's layout and general level of business, the facility's track capacity on an annual basis could be calculated as the product of 180 lifts per switch and 985 switches a year which is a theoretical handling capacity of about 178,000 intermodal units a year. Based on this measure, Shoreham is handling about 40 percent of its maximum track capacity.

In practice, given the static capacity of Shoreham's two loading tracks and its operating schedule, three factors determine the number of intermodal units that may be ramped and deramped on a given day: the mix of intermodal equipment, the percent of rail car slots (on average) used both inbound and outbound, and the number of turns or switches a day for each of the two tracks. From this perspective, under ideal conditions the track capacity at

Shoreham is adequate to handle volumes likely experienced in the year ending June 1994. This rate clearly is above current demand at Shoreham which, according to Table 4, averages 202 units a day.

This is not to say that operating conditions at Shoreham are pressure free. Pressure arises from a number of "real world" constraints which reduce capacity to less than the optimal amount. For example, improvements could result from changes in train scheduling, regularizing and reducing intervals, etc. A summary assessment of these factors follows.

> <u>Track Length</u>: The north and south ramp/deramp tracks at the Shoreham facility are extremely short and cannot individually accommodate a train exceeding 3,800 feet in length, which is equivalent to 39 standard flatcars. Given that all outbound trains **average** 37 cars, if the median is close to the average, this means the facility is handling trains in two parts eight or nine times a week. To handle trains of over 39 cars, strings of cars, not exceeding 25 and 14 cars respectively, must be switched to and from available storage tracks. This is not only a costly venture in terms of excess switching, but could result in inefficient utilization of terminal equipment and operating forces, idled while switching is in progress, a 90 minute interruption.
>
> <u>Train Sequencing</u>: The sequencing of arrivals and departures at the facility are believed to be somewhat onerous. Under a one track/one staging area scenario, arrival schedules leave little room for error in terms of stripping a train, clearing the staging area, re-staging, and ultimately loading outbound traffic in order to meet prescribed cut-off times.
>
> <u>Ramp/Deramp Methodology</u>: Because CPRS's traffic consists of a significant percentage of import containers on flat cars which use an above average amount of storage time after arrival at the terminal, container grounding is compulsory. Consequently, CP is unable to take advantage of trackside staging for outbound or of being able to pre-position empty chassis for inbound container traffic. The ramp/deramp area must be completely cleared of inbound traffic before loading can begin and outbound traffic must, subsequently, be rehandled from the grounding/parking areas to trackside. Double and sometimes triple handling of containers clearly limit the productivity of the terminal operation.

Under ideal conditions, track capacity at CPRS's Minneapolis intermodal terminal is adequate to handle current volumes. However, suboptimal track length, train sequencing, and ramp/deramp methods seem likely to result in frequent temporary strains on efficient operations when demand peaks.

Lift Capacity. Intermodal equipment at Shoreham is handled by three sideloading lift machines and five hostling tractors. No data were developed on contractor performance at Shoreham, on the rate at which these machines handle units or on downtime rates. However, as noted above, a performance goal for sideloaders is considered to be in the range of 40 to 50 an hour for containers and 30 to 40 for trailers and, aside from scheduled maintenance, a very low (e.g., two percent) downtime rate is to be expected.

The interval between paired trains in and out of Shoreham is 7, 4.5 and 7.5 hours, respectively, inclusive of track down time for switching. Given that lift equipment is required to handle between about 50 and 70 units, on average, in each of these situations, the capability of the lift machines seems adequate on average for current demand.

It is estimated that Shoreham performs at a level of about 3.0 lifts per man hour, which is an arbitrary alternative measure of capacity as it is influenced by virtually every facet of the terminal operation, rail operation, physical configuration, and customer service requirements. Having a long-term contractor at the facility has served to refine existing practices to maximize productivity and it is the study team's assessment that the current lift ratio is considered the best possible performance under the current operating environment. This suggests the facility is operating slightly below the most efficient range (3.5 - 4.0) found in a sample of facilities operated by ITS and could benefit from improvements affecting operations.

CPRS utilizes sideloading equipment to handle the ramp/deramp operation. Because of the high ratio of storage time on inbound containers coupled with the limited storage space, the operator is forced to stack containers in rows two to three deep and two high. Storing and stacking containers is accomplished much more efficiently with the mobile flexibility of a sideloader. Likewise, when containers are ready to depart the terminal "accessing" specific containers in stacks is also performed with greater ease by the sideloader.

Storage Capacity. Available intermodal unit storage space at CPRS's terminal is currently assigned as follows: 190 loaded trailer slots, 270 empty trailer slots, and 550 20-foot unit (TEU) slots for containers or equivalently, 275 40-foot unit (FEU) slots. Trailer slots are also used for containers on chassis. All chassis are stored and maintained at Trimodal's adjacent empty container depot and, as such, do not figure into the storage capacity equation.

While this allocation could be shifted to accommodate shifts in demand, the least-utilized space (for empty trailers) is incapable of handling loaded trailers or stacked containers, both of which are in need of additional storage space, because of inadequate ground and subsurface support.

Advance staging of equipment is minimal at the facility. In most instances trains must be stripped of inbound cargo prior to outbound traffic being staged for ramping.

The principal variable, other than number of slots, that determines annual storage capacity is the dwell time for each type of equipment, inbound and outbound. The dwell time, or time a unit stays in terminal storage, is largely a function of marketing requirements (e.g., free time allowed) and varies widely among types of units. For purposes of this study, a statistical average as supplied by the railroad (Table 4) is assumed for each unit. An assessment of capacity for each storage type is as follows:

> Loaded Trailer Capacity. Annual loaded trailer (and container on chassis) parking capacity equals 190 slots. At current demand volumes of 69 a day, an average dwell time of 4 days per unit would result in 145 percent utilization of allocated space on an average daily basis. In practice, CPRS experiences higher

average dwell times, resulting in serious capacity shortages for loaded trailers and containers on chassis. Because minimal advance trackside staging occurs, each outbound trailer is assumed to occupy one parking space prior to trackside staging for loading.

Empty Trailer Capacity. Based on CPRS's current allocation of 270 spaces and given only a two day dwell time for these units, empty trailer capacity exceeds storage demand by a significant amount. Empty slot/day capacity is estimated to be over nine times actual usage. Even with seasonal and daily variations, empty trailer capacity will almost always exceed demand by about a factor of five.

Grounded Container Capacity. Allocated annual storage for 20 foot and 40 foot containers, both loaded and empty at CPRS's terminal equals 550 TEU slots/day. Dwell time is six days for loaded containers and three days for empties. It is understood that few Montreal export shipments incur additional storage days awaiting export documentation. Empty dwell time is immediately prior to those containers being shipped from the facility as empty containers otherwise are stored off-site in an empty container yard.

75 percent to 80 percent of containers are grounded subsequent to arrival or prior to departure. There are four primary container storage bays--each two rows deep and stacked two high. There is available ground space for 225 TEU's but, in actuality a sideloader only can access 137 TEUs efficiently. The other, covered, containers only can be reached with multiple handling. Except for distant, remote parking, this type of storage scenario, is one of the most counter-productive in terms of maximizing terminal operating efficiency. Containers are handled two to four times more than is necessary during the allowable dwell time.

A high percentage of import traffic naturally implies higher storage given trade practices. This is reflected in a six day average dwell time which limits storage capacity. Storage capacity appears to be a significant factor in limiting the facility's efficiency, productivity, and growth potential. In practical terms, grounded container capacity has been reached and most likely, exceeded. Variations due to seasonality, day-to-day volume changes and size and intervals of individual trains are significant enough to make loaded storage space a serious problem. The mix of traffic, high import volumes, train sequencing, and storing methodologies are all critical factors that contribute to this facility currently being beyond the limits of storage capacity.

Annualizing available parking space for each type of unit and allocating slot days based on average dwell times (Table 4) indicates that about 108,000 intermodal units can be stored at Shoreham. About 46 percent of that capacity is for empty trailers, 25 percent for empty containers, 16 percent for loaded trailers and 13 percent for loaded containers.

Of the three elements of capacity at Shoreham evaluated in this analysis, storage is the most restrictive and thereby, the base for establishing the facility's, theoretical capacity at 108,000 units a year. Applying the concept that practical capacity (discussed above) is in the range of 80 to 85 percent of theoretical capacity, Shoreham Yard's practical capacity is estimated to be between 86,000 and 92,000 lifts a year. Thus, based on the volume handled in the study year, Shoreham is at two-thirds of theoretical capacity and over 80 percent of practical capacity.

<u>Summary of Assessment</u>. During the study period (the 12 months ended June 1994), CPRS operated 38 intermodal trains a week to and from the Twin Cities which moved an average of over 1,100 rail cars weekly. It is estimated that CPRS's Twin Cities intermodal facility at Shoreham Yard handled over 1,414 intermodal units a week or about 73,000 annually. Summary conclusions about the capacity of the elements of the terminal are as follows:

1) At Shoreham, relationships among lift equipment methodologies, storage procedures, and overall yard configuration have become established so as to best handle the mix of traffic within existing constraints.

2) Lift capacity is clearly adequate to meet demands under study period conditions. In terms of lift efficiency, the rate is not a superior one because of excessive downtime for switching. In addition, stacking containers requires multiple handling which affects productivity.

3) There is a significant shortage of storage capacity for loaded trailers, while there seems to be an excess for empty trailers. Grounded container capacity has been reached and is likely exceeded in period of high demand.

Variations due to seasonality, normal day of week peaking of demand and intervals of individual trains are significant enough to make loaded storage space a serious problem. Trackside storage and staging would obviate the need to use remote parking for outbound traffic prior to same day departure, thereby increasing storage capacity requirements.

4) Under ideal conditions, track capacity at Shoreham is adequate to handle current volumes. However, suboptimal track length, train sequencing, and ramp/deramp methods may result in frequent temporary strains on capacity.

5) Although a fully wheeled operation would be more productive in terms of fewer lifts, the restrictive acreage and dwell time simply do not allow any other option.

6) In practice, Shoreham requires a high level of switching because of insufficient track space to complete some operations before the track must be made available for higher priority equipment.

Short Term Improvements

The current Shoreham Yard intermodal facility is characterized by limited and disjunctive tracks. Only 39 standard length flat cars can be worked on at any one time and that on two tracks over 100 yards apart. Because of severely limited track capacity, the terminal operator experiences downtime when the tracks are being switched 8 to 10 times a day and the railroad experiences increased switching hours because of the need to rehandle cuts of cars. Two of three inbound trains are rehandled because of the need to give up the track. Further, CPRS has one arrival and one departure scheduled (in that order) within a two hour window in the peak evening period. This obviously exacerbates demands for already scarce facility resources.

The net effect is that the facility requires an above average amount of switching, which in turn idles terminal operations for extended periods. In addition, the need to clear tracks promptly increases the demand for trailer and container parking space and requires additional work by terminal operators to unnecessarily handle and rehandle units.

Much of this inefficiency would be eliminated if Shoreham had more and longer tracks. Switching needs would be reduced as would parking requirements given the opportunity to use trackside parking for some inbound and outbound units.

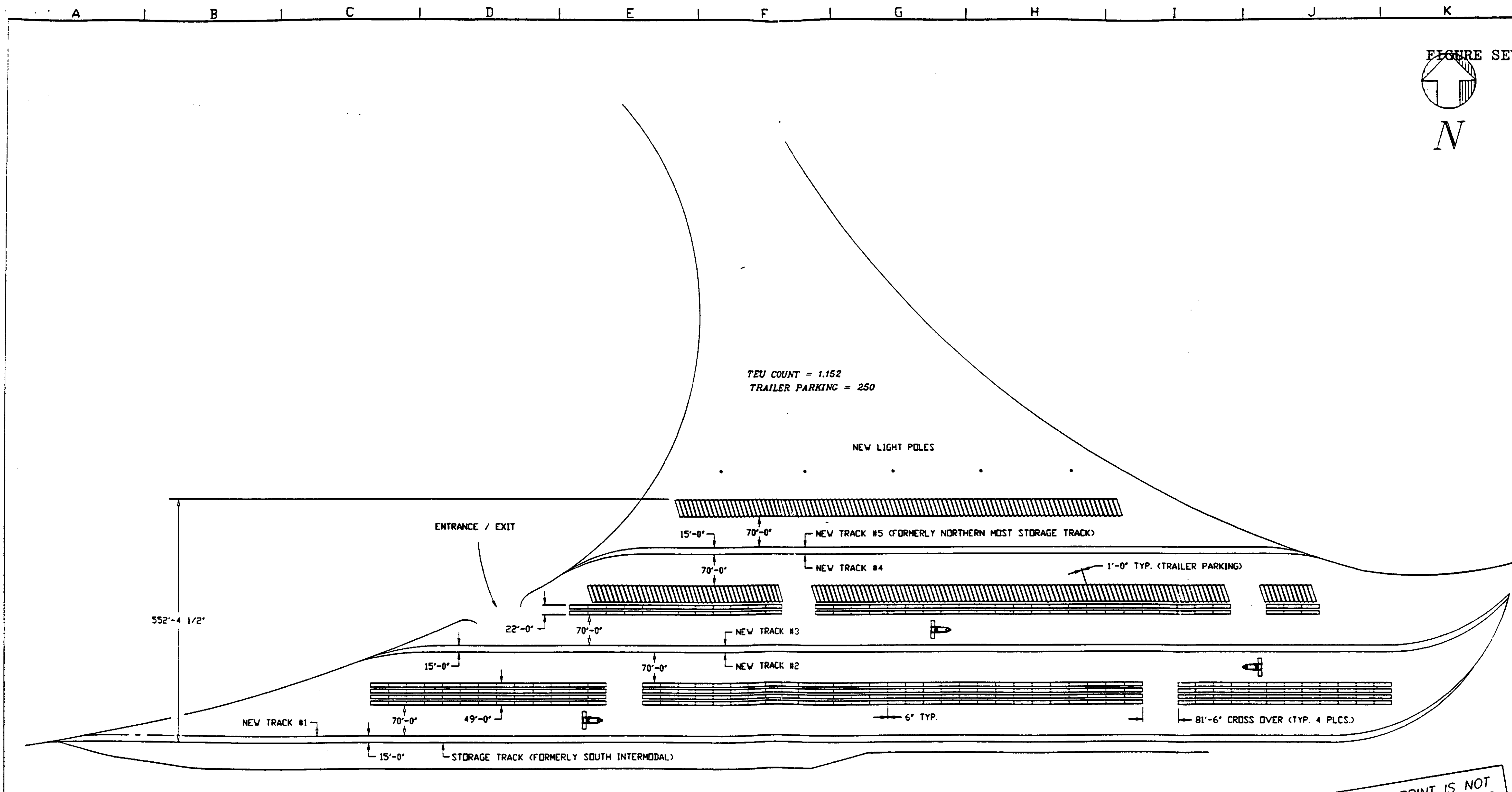
The proposed improvement for Shoreham is based on this approach with the goal of achieving those efficiency benefits. Expanding capacity per se should not be the primary incentive for improving Shoreham Yard. An analysis of track capacity, for example, indicates that, even given the current configuration and operating level, theoretically another 100,000 units could be handled. That estimate is a design consideration and not based on consideration of operating efficiency or other factors.

The primary improvement needed at Shoreham is to maximize the time available for flat cars to be worked before needing to yield the track (temporarily) to allow unloading of an incoming train or, in the ultimate, to eliminate the need to interrupt terminal operations. This would be accomplished if track space were increased. Two alternatives for expanding Shoreham in this way are discussed.

The simplest way for Shoreham to be expanded would be to utilize the original intermodal facility adjacent to the northwest sector of the site in the area currently occupied by Trimodal Services for use as a depot for storing empty steamship company containers. Incorporating this area would increase Shoreham's capacity by adding approximately 300 TEU storage slots (assuming two high and two deep stacking) and 1,500 feet of track which would allow for 15 additional car spots. However, given the site layout, that additional track space would not seem to present an opportunity for improvement in switching operations.

A more aggressive approach for use of current Shoreham Yard acreage is presented in Figure Seven. The proposed design would consist of three pairs of parallel tracks running east-west. The southern most pair of tracks would include the current south intermodal track and a new track (#1). The

FIGURE SEV



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MJ9090
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MI-JACK PRODUCTS

TITLE YARD LAYOUT
CLIENT: SOO LINE RAILROAD COMPANY

CM	9/22/94	1"=200'

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northern most pair (new tracks #4 and #5) would be in the location of the current northern most storage tracks. The other pair (new tracks #2 and #3) would be located approximately mid-way between the outer pairs of tracks.

This layout would provide the following storage space:

- Two rows for trailer parking, one to the north and the other to the south of the paired tracks #4 and #5, with a capacity of 250 trailers. The southerly area would include two openings for cross-overs.

- Two rows for container storage, each with two crossovers, with a total capacity of 1,152 TEUs; one row of containers stored two deep would run along the edge of the southerly row of trailers to the north of the middle pair of tracks and a second row of stored containers four deep would bisect the area between the middle and southerly pairs of tracks.

The improvement plan to implement the second alternative provides for the following (moving from north to south and not in priority order):

1. Install four new light poles north of the north storage tracks in the current repair area.

2. Expand the width of the work area about 120 feet using the repair area beyond the northern most storage track. The new area would include an unbroken row of trailer parking (100 units) against the new facility border and a 70 foot lane for working the new track #5 as noted below.

3. Rework the north storage track area as follows. Remove all tracks except for the northern most one and a second track separated by 15 feet. These tracks would be about 1,230 feet in length and would be used as intermodal tracks.

4. Install two new intermodal tracks of about 2,030 feet in length with a 15 foot separation (new track #3 and #2, respectively) approximately midway between the current north storage track and south intermodal track.

5. The area between new tracks #3 and #4 will include two 70 foot lanes for working the tracks, a 22 foot wide row for ground storage of containers (38 TEUs in length and two deep) and, flush with the containers a row of trailers (150 units). Two passage ways through these storage areas will be included.

6. Install a 2,300 foot track (new track #1) 15 feet inside the current south intermodal track.

7. The area between new tracks #2 and #1 will include two 70 foot lanes for working the tracks and a 44 foot wide row for ground storage of containers (53 TEUs in length and four deep). Two passage ways through these storage areas also will be included.

8. Rework the south storage area to include the current south intermodal track as the facility's storage track

9. The following features of Shoreham Yard would not be affected by the improvement program:

   a. The length of the facility,
   b. The entrance area, including offices and gates,
   c. Rail access tracks, and
   d. Repair areas.

While obviously more expensive, this layout would more than double existing ramp/deramp trackage, while preserving the existing Trimodal operation. It would allow for two trains to be spotted on the ramp/deramp tracks simultaneously.

Improving Shoreham by expanding from two short tracks to more and longer tracks will affect capacity in two ways. The theoretical track capacity (already more than adequate) will significantly increase simply because more track space is being added. Further, making more tracks available will eliminate the need to clear trackside for other trains which, in turn, will allow increased use of trackside parking and consequently decrease the need for parking slots in storage areas.

The proposed improvement has been designed to be implemented in two phases. A first phase would expand from two tracks to three and from about 3,800 to about 4,800 track feet. A second phase would add two additional tracks and about 4,100 track feet. The number of standard flat cars which could be accommodated would increase from 39 (on two tracks) to 50 (on three tracks) in phase 1. In phase 2, capacity for 42 cars (on two new tracks) would be added. Thus, theoretical track capacity would increase almost 30 percent in the first phase and another 84 percent in the second phase assuming use of standard intermodal flat car equipment. The net increase over existing track capacity would be about 135 percent. As CPRS increased the number of double stack units in the Twin Cities market theoretical track capacity at Shoreham would increase proportionately. However, the facility will continue to be challenged with short tracks especially before phase 2 is implemented.

Parking capacity changes at Shoreham would be based on changes in available parking area and the amount of trackside parking which depends on the nature of the freight and train schedules and sizes. Total storage area would increase 18 percent in the first phase but the addition of two tracks in the center of the facility in the second phase would result in a net decrease of about 10 percent in available parking area from current capacity.

The rate of trackside parking depends on operating policies but it is estimated that over a third of all units would use trackside parking given phase 1, not requiring a storage slot, and over half given phase 2 improvements. About three quarters of units parked trackside would be trailers with a corresponding reduction in requirement for trailer storage slots. The net effect would be to allow an allocation of storage space sufficient to meet the needs of each type of unit and to increase storage capacity about 40 percent.

The first phase of improvements at Shoreham would remove three of the north storage tracks and the north loading track, rehabilitate the remaining two tracks, pave surfaces both north and south of those tracks, install lighting and add one new track beside and north of the existing south intermodal track. As shown in Table 5, the estimated cost of Phase 1 is about $1,800,000.

Phase two encompasses constructing two new "middle" tracks through the center of the yard and adding about 4,600 feet of loading-accessible trackage. As itemized in Table 6, the estimated cost of this phase also is about $1,800,000.

TABLE 5

CP RAIL INTERMODAL TERMINAL ENCHANCEMENT COSTS
PHASE I

	Quantity	Unit	Unit Cost	Total	
SITEWORK					
Grading	0	Cubic Yard	$8	$0	
Fill	0	Cubic Yard	25	0	
Install Subgrade	15,517	Square Yard	9	139,650	
Improve Gravel Base	0	Square Yard	4	0	
Break Pavement	3,239	Square Yard	15	48,583	
Break/restore for Pads	0	Lineal Foot	30	0	
Remove Track	6,463	Track Foot	4	25,850	
Remove Turnout	8	Each	900	7,200	
Track Salvage	6,463	Track Foot	(6)	(38,775)	
Rehabilitate Track	3,410	Track Foot	12	40,920	
Subtotal				223,428	
CONSTRUCT					
Paving	15,517	Square Yard	21	325,850	
Concrete Crane Pad	0	Lineal Foot	67	0	
Track	2,590	Track Foot	135	349,650	
Turnout-Slow Speed	2	Each	45,000	90,000	
Turnout- Medium Speed	0	Each	90,000	0	
Road/Rail Crossing	360	Lineal Foot	420	151,200	
Rail Access Lead	0	Mile	2,000,000	0	
Engine Drip Pan/Separator	0	Each	95,000	0	
Light Pole	5	Each	11,000	55,000	
Fencing	1	Lump Sum	13,700	13,700	
Subtotal				985,400	
STRUCTURES					
Office Building	0	Square Foot	70	0	
Truck Canopy	0	Square Foot	20	0	
Subtotal				0	
UTILITIES					
Install/Relocate	Unknown	Lump Sum		0	
SUBTOTAL				$1,208,828	
ENGINEERING AND PM 17 percent				205,501	
CONTINGENCIES 25 percent				353,582	
CONSTRUCTION SUBTOTAL				$1,767,911	
EQUIPMENT					
Gantry Cranes	0	Each	750,000	0	
Hostler Tractors	0	Each	40,000	0	Contract
Equipment Subtotal				0	
TOTAL				$1,767,911	

Source: RLBA estimate.

TABLE -6

CP RAIL INTERMODAL TERMINAL ENCHANCEMENT COSTS
PHASE II

	Quantity	Unit	Unit Cost	Total	
SITEWORK					
Grading	0	Cubic Yard	$8	$0	
Fill	0	Cubic Yard	25	0	
Install Subgrade	1,022	Square Yard	9	9,200	
Improve Gravel Base	0	Square Yard	4	0	
Break Pavement	6,644	Square Yard	15	99,667	
Break/restore for Pads	0	Lineal Foot	30	0	
Remove Track	0	Track Foot	4	0	
Remove Turnout	0	Each	900	0	
Track Salvage	0	Track Foot	(6)	0	
Rehabilitate Track	0	Track Foot	12	0	
Subtotal				108,867	
CONSTRUCT					
Paving	1,022	Square Yard	21	21,467	
Concrete Crane Pad	0	Lineal Foot	67	0	
Track	5,120	Track Foot	135	691,200	
Turnout-Slow Speed	4	Each	45,000	180,000	
Turnout- Medium Speed	0	Each	90,000	0	
Road/Rail Crossing	480	Lineal Foot	420	201,600	
Rail Access Lead	0	Mile	2,000,000	0	
Engine Drip Pan/Separator	0	Each	95,000	0	
Light Pole	0	Each	11,000	0	
Fencing	0	Lineal Foot	19	0	
Subtotal				1,094,267	
STRUCTURES					
Office Building	0	Square Foot	70	0	
Truck Canopy	0	Square Foot	20	0	
Subtotal				0	
UTILITIES					
Install/Relocate	Unknown	Lump Sum		0	
SUBTOTAL				$1,203,133	
ENGINEERING AND PM 17 percent				204,533	
CONTINGENCIES 25 percent				351,917	
CONSTRUCTION SUBTOTAL				$1,759,583	
EQUIPMENT					
Gantry Cranes	0	Each	750,000	0	
Hostler Tractors	0	Each	40,000	0	Contract
Equipment Subtotal				0	
TOTAL				$1,759,583	

Source: RLBA estimate.

Demand Analysis

DEMAND ANALYSIS

Approach

As a basis for determining long term intermodal terminal needs in the Twin Cities, study objectives included the following two related analyses of intermodal demand:

-To determine trends in demand levels and characteristics; and

-To prepare forecasts of demand for intermodal freight service.

The study based the assessment of both short and long term intermodal terminal capacity needs on an analysis of freight movements to and from the Twin Cities region and forecasts of intermodal demand for a range of scenarios which recognize various constraints on achieving rail intermodal's full market potential. The analysis included a thorough review of the expected impact on demand (as assessed by area traffic managers) of a set of factors covering a wide range of supply and demand variables.

In developing scenario forecasts to evaluate terminal capacity needs, the fundamental issues were to determine which sectors of the economy will be attracted to rail intermodal service and which markets were strong growth candidates.

Trends in Twin Cities freight movements were reviewed in detail and 5, 10 and 20 year forecasts developed for alternative intermodal growth scenarios. Source data included information provided by the railroads and the Minnesota Department of Revenue, a commercial data base known as TRANSEARCH, a telephone survey of area traffic managers concerning truckload size shipping patterns and telephone interviews with a variety of others in the intermodal business in the Twin Cities. Railroad provided data documented trends in the less-than-truckload (LTL) segment of users, the largest component of the domestic intermodal market in which we include United Parcel Service and

U.S. Postal Service traffic. The survey was used to develop data on characteristics of non-LTL domestic traffic and on international cargo, as most companies contract out the details to numerous brokers, third parties, logistic companies, intermodal marketing companies, or in the case of major national accounts, to major truckload carriers.

Results of the demand analysis are presented in two parts: market research and intermodal forecast. The value of the market research was to provide a reality check on the forecast model especially with regard to establishing the basis of growth given planned improvements in the intermodal system as well as likely growth markets and reasonable rates of growth.

Market Research

The scope of the study included market research to establish:

1) A solid foundation for developing long term projections of intermodal freight flows to and from the Twin Cities for a range of growth environments (low, medium and high) and

2) A basis for developing expert opinion on intermodal market factors on which the MIRTS coordination group could establish a most reasonable intermodal growth scenario.

The MIRTS forecast, presented at the conclusion of this chapter, established the demand level used to set parameters for a prospective multi-user intermodal terminal.

The market research is presented in two parts describing the methodology and summarizing key results, respectively. Additional materials developed for this part of the study are included as appendices.

Survey Methodology. A telephone survey of traffic managers was conducted as part of the study to collect data on the characteristics, preferences and opinions of freight managers using intermodal terminals in the Twin Cities area. A survey instrument was developed so that the following topics would be addressed by each respondent:

-Nature of business, company and goods movement,
-Location of freight facilities,
-Specifics of moving major commodities,
-Specifics of using intermodal including equipment, terminals and routes,
-Factors affecting use of intermodal, and
-Near and mid-term outlook for the company.

A complete copy of the instrument is included as Appendix B.

The sample of area traffic managers to be contacted was developed beginning with an overview of the structure of industries of potential intermodal users. Dun & Bradstreet statistics on numbers of companies by SIC code and number of employees located within the six county area of the Metropolitan Council and as well as numbers of companies outside the zone but within the service area of Twin Cities intermodal facilities were reviewed to develop that structure. Individual companies were identified as potential subjects using three sources: the Major Company Book published by the Greater Minneapolis Chamber of Commerce, The Minneapolis-St. Paul Job Bank - 1994, and the 1994 edition of The Official Directory of Industrial and Commercial Traffic Executives (known as the Bluebook). A target list of companies was developed to provide a representative sample based on type of business, size and location. Companies in over 60 lines of business were included in the survey sample. Key traffic managers to be surveyed were identified using the Blue Book and with assistance of the railroads. In some cases, selected companies were asked to provide the appropriate traffic manager.

More than 80 Twin City region companies were contacted by N.K. Friedrichs & Associates, Inc. (NKF) and invited to complete a 30 to 45 minute telephone interview concerning freight movement characteristics and opinions on rail freight intermodal services. 55 companies covering a wide range of industries and sizes completed interviews. Responses were tabulated by NKF and compiled in a two volume Technical Appendix consisting of data tables tabulating all but responses to open ended questions. These volumes were provided to the study sponsors and are incorporated in this report by reference only. A selected summary of the insights developed follows with a more detailed description of responses to specific questions presented in Appendix C.

Summary of Survey Responses. 55 companies covering a wide range of industries and sizes completed interviews. Three in five survey participants reported using rail intermodal. One third of the users (one in five of the respondents) used intermodal for both inbound and outbound freight and two-thirds used intermodal only in one direction. It should be noted that these results cannot be expanded to the universe of study region companies as the survey design was not based on a random sample but a representative sample of known or likely intermodal users.

Overview of Respondents. The super majority of firms surveyed were manufacturers (75 percent). Among retailers, warehousing and distributing companies 80 to 90 percent of the firms surveyed used rail intermodal services. Proportions of users and non-users are not significantly different for manufacturing firms or wholesalers from proportions in the total sample.

As company size increased, so did the proportion of intermodal users. For companies with at least 500 employees, more than two of three respondents used intermodal. For companies with 1,000 or more employees, more than four out of five used intermodal. Only one of 12 companies with at least 2,000 employees did not use intermodal.

Almost three of five truckload freight handling locations of respondents are in the metro area. Among intermodal users, 37 sites were in the Twin Cities Metropolitan Area and 33 were outside (many respondents handled intermodal freight at more than one location). Among all users, the average distance (unweighted by volume) cited was 45 miles to Shoreham and 47 miles to Midway Hub with a maximum of 235 miles.

Transportation Characteristics. Respondents moved literally hundreds of different products and commodities. Goods moved via rail intermodal covered a wide range of items. The value of goods moved inbound to the Twin Cities was higher for rail intermodal users than for non-users. About two in three users reported that their inbound goods were average or high value. Only three of ten non-users reported similar values. With outbound freight, the reverse applied. Non-users had a relatively higher share of high value shipments (three of five) than intermodal users (one in five).

Weekly volume of respondents averaged about 215 total truckload size shipments a week and ranged up to a maximum of 1,700 shipments. Respondents divided almost evenly based on volume using 65 total loads a week as the dividing line. Among companies with over 65 loads a week, 19 of 25 used rail intermodal services while only 11 of 28 companies with smaller volumes used intermodal. Use of intermodal ranged as high as 238 intermodal units a week.

Intermodal Terminals. Total Twin Cities intermodal demand accounted for by respondents averaged 823 units a week (335 trailers and 488 containers). This represents an estimated one quarter of the Twin Cities volume truckload size segment, that is exclusive of non-truckload size shipments handled by carriers such as United Parcel Service, U.S. Postal Service and LTL trucking companies.

Survey respondents included 22 companies using intermodal for inbound freight. Four out of five of these companies used Midway and three of five used Shoreham. Two of five used both facilities for inbound goods.

Of the 19 respondents using Twin Cities intermodal terminals for outbound freight, about nine of ten used Midway and six of ten used Shoreham. Almost one of every two companies used both terminals for outbound intermodal movements.

Flow Patterns. Truckload size shipments moved between the Twin Cities and an extensive network of origins and destinations, both domestic and international. Survey respondents reported having major suppliers or customers in 40 states with 33 a major source of inbound freight and 37 states major destinations for outbound products. Illinois was the trading partner cited most frequently. California, Minnesota and Wisconsin were cited almost as frequently and by the same number of respondents. Iowa, the major northeastern states and Texas were cited by at least half the respondents. Illinois was the origin most frequently cited and California the most frequently cited destination.

Rail intermodal is essential to the movement of international cargo. One in three intermodal users imported compared with only one in ten non-users of intermodal. Over 40 percent of rail intermodal users exported, more than double the rate for non-users.

Service Requirements. Three in four companies responded that freight was received daily with the proportion of users in this category greater than non-users. Four in five companies reported daily shipments, 91 percent of the users and 61 percent of the non-users.

Most respondents (82 percent) indicated that goods needed to be on-time or moved consistently or reliably. With regard to both inbound and outbound flows, intermodal users were almost evenly divided between these categories with reliability being selected slightly more frequently than timeliness. Non-users required goods to be on-time more frequently than they required arrivals to be reliable.

Half of all inbound users of intermodal reported the service was more expensive than truck with all but one indicating somewhat more expensive (as opposed to much more). About one in five indicated the costs were about the same and one in five inbound user said intermodal costs were somewhat less expensive than truck. More than three in five outbound users of rail intermodal said the service was more expensive than truck with a slight majority reporting a somewhat more expensive service. In another part of the survey, respondents showed their sensitivity to the question of cost, as 72 percent indicated that a reduction in the relative cost of rail would increase intermodal use.

Intermodal Usage Factors. Respondents were asked whether various improvements might increase their companies use of rail intermodal service in the Twin Cities area. Improvements (19 in all) addressed the following six sets of factors:

-Rail linehaul service,
-Rail intermodal terminal service and capacity,
-Drayage service,
-Supply of intermodal equipment,
-Electronic services, and
-Costs.

Improvement in rail linehaul service was the factor cited most frequently by respondents. This occurred in each sub-population (users, non-users and users by direction of use), whether counts were unweighted or weighted by total or intermodal volumes.

With regard to specific improvements, users and non-users responded somewhat differently with only two common elements among the top five choices of each group, perhaps reflecting differences between experience and perception. The top five improvements desired by users (in descending order) were reduced rail transit time, reduced intermediate terminal time at Chicago, improved availability of trailers and containers, improved reliability of rail, and reduction in the relative cost of rail. Non-users rated improved reliability highest, reflecting a long-standing image problem of railroad service, notwithstanding that transit time was rated more important than reliability by non-users. Other top choices for non-users were rail and drayage transit times and terminal times at the destination and in the Twin Cities.

In addition to evaluating hypothetical improvements, respondents were asked directly if certain specific changes would lead to increased intermodal use. Additional terminal capacity in the Twin Cities area would mean increased intermodal use by half the users and one third of non-users. Also, almost two of five non-users indicated they would use intermodal if their business situation improved and shipping volume increased.

Survey participants responded strongly when asked an open ended question inviting a full expression of their opinions on rail intermodal service. Important issues noted covered a very wide range including size of the terminal hubs, the ability of the railroads to expand terminal capacity, special equipment needs, the system of supplying chassis, trailers and containers, transit time, consistency and reliability of service, moving freight through Chicago, product damage, collecting for damage and packaging costs to prevent damage, condition and availability of equipment (especially trailers), terms of payment, level of rates, manpower at terminals, and handling of perishables.

Almost 40 percent of intermodal users reported that volume had increased in 1994, about one third experienced no change and over one quarter had intermodal volume decline. More than half of users with increased volume attributed it to growth in demand. A few increased rail intermodal because of supply problems with trucking service. One respondent (the largest user located outside the metropolitan area) attributed increased use of rail intermodal to improvement in rail service reliability as well as more reliable drayage service.

Business Outlook. Both users and non-users are optimistic about future business prospects with 93 percent forecasting short term growth. The average increase expected in the next two years was almost 9 percent with a number of increases offered in the range of 20 to 30 percent.

Over a five year horizon, both users and non-users remained bullish, but users were slightly more optimistic in this case than non-users. Together 94 percent expected some growth, with an average of over 7 percent projected over the three to five year range. When the expected growth rates of intermodal users are applied to their 1994 intermodal volume, intermodal volume for these users would increase 33 percent over five years.

Growth Markets. Major U.S. markets where growth is expected (in descending order) are in the Midwest, northeast, and west coast areas. Only four firms, of which two were high volume firms, mentioned growth in international markets. Sources of inbound commodities to accommodate expected growth (in descending order) are the northeast, southeast, Midwest and west coast. Large volume firms expected the latter two areas to be the major sources of commodities. International sources of supply were mentioned as growth areas by three firms, none of which were high volume firms.

When firm size based on intermodal freight volume is taken into account, California, Washington, and the northeastern states are expected to be the main sources of commodities to meet product market growth. The region expected to exhibit most growth for outbound shipments was local (Wisconsin, Minnesota, South Dakota) followed by the southwest (Arizona and Nevada). The significance of international markets also increased among large intermodal users with Japan, Canada, and Mexico the main partners cited when responses are weighted by volume.

Other Interviews. Inputs on the characteristics of intermodal movements in the Twin Cities were solicited from about a dozen service companies and operators in the business. A summary of views, which tended to be critical of intermodal service, is as follows:

> Railroads are very volume oriented, less customer focused and have difficulty responding to the intermodal marketplace because of their size.
>
> From the perspective of this segment of the intermodal business, railroads need to focus on improving service and reducing cost. Improving service will require offering reliabile service consistently throughout the year through demand peaks and valleys. Long term growth requires railroads to become more entrepreneurial and responsive to the market.
>
> LTL truckers supplement highway trips with inbound rail as more LTL freight goes into the Twin cities than comes out. From a truckers persective, this operational advantage of intermodal is offset by several negative factors including loss of control by the trucker and increased exposure to delay as a derailment will tie up more than one load.
>
> Intermodal marketing companies (IMCs) must monitor intermdal operations in order to insure railroads deliver necessary service. IMCs promise customers 90% service and the railroads supply 70% levels. Experiences include inconsistent train schedules and poor communications.
>
> IMCs use railroad trailers to move business over the highway between both Chicago and Kansas City and the Twin Cities under certain market conditions.
>
> Railroad terms of payment will tend to impede participation of smaller retail IMCs in intermodal business.
>
> It certainly would seem that there is a rationalization taking place in the IMC business and that big, proactive, innovative players which evolve as divesified transportation service companies will win out. Such companies would invest in equipment to be competitive and spread the risk among their lines of business. Survivors will enjoy an unlimited future in intermodal and be able to handle almost any commodity. Large asset based intermodal companies are expected to be able to work more effectively with railroads in meeting service needs.

Intermodal Forecast

The process of developing an intermodal forecast for terminal planning consisted of the following:

- Reviewing historical data including market research on freight flow characteristics,

- Evaluating a commercial model of those flows (TRANSEACH) and adjusting flow estimates as appropriate,

- Evaluating intermodal growth environment factors relevant to developing the following three forecast scenarios in the light of national trends and regional market research:

  -Low growth assuming status quo and no economic growth,
  -Medium growth assuming elimination of regional barriers, and
  -High growth assuming elimination of external system barriers.

- Quantifying a long term trend in Twin Cities intermodal demand given assumptions about factors relevant to each scenario, and

- Synthesizing scenario based trends, market research and expert opinion to determine the MIRTS coordination group's consensus on a most reasonable intermodal demand projection for facility needs planning.

A summary of method and findings at each step of the process follows.

TRANSEARCH Data Base. Freight flow data was purchased from a vendor, Reebie Associates, Inc., which uses the TRANSEARCH model for documenting freight flows and relies on the WEFA Group's Series 480 national economic forecast for estimates of 5 and 10 year freight flow forecasts.

TRANSEARCH data for the Minneapolis-St. Paul Business Economic Area (BEA) were evaluated for 1988, 1990, 1992, 1997 and 2002, including the following reports :

1. Market Profile Report , an overview of freight demand for the Twin Cities BEA in terms of total annual tonnage by mode of transportation (including intermodal) for inbound and outbound freight by commodity,

2. Market Commodity Report for freight-all-kind (the primary code for intermodal cargo), a breakdown of tonnage moved between the Twin Cities and 180 other BEAs by rail intermodal, and

3. Traffic Lane Flow Report for 28 major trading partners, a breakdown of all commodities moving between the Twin Cities BEA and a given BEA, including annual tonnage by mode of transportation.

Modal share and modal shift assumptions inherent in the Reebie computer model were calculated and reviewed with the coordinating group. In addition, WEFA growth rates inherent in the Reebie model were calculated and compared with those inherent in the Minnesota Department of Revenue (MDR) control forecasts (MNFS-53) derived from the REMI model. The Reebie/WEFA 10 year forecast was extrapolated to a 20 year forecast using the MDR results and trends in modal shares developed in consultation with the coordinating group.

It is clear that there are limitations to using a 1992 flow model (the latest available) given the continued surge in intermodal business in the rail industry. As seen above, Twin Cities intermodal volume experienced sharp growth after 1992 of over 9 percent. Also, the TRANSEARCH forecast from the 1992 base is deficient in that it does not account for the recent four year National Master Freight Agreement with the Teamsters union whereby LTL carriers may expand use of rail intermodal from 10 to 25 percent of total company traffic.

Indeed, the national LTL carriers are already implementing the agreement and restructuring their systems to take advantage of rail intermodal services. Thus, it is likely that the growth of freight moved LTL over the highway to and from the Twin Cities is not likely to experience the growth rate forecast by TRANSEARCH as business handled by LTL carriers will increasingly move to and from the Twin Cities on rail intermodal rather than by highway. Current Twin cities rail intermodal volume moving in the accounts of LTL carriers is estimated to be about 10,000 loads on an annual basis. If this is indeed about 10 percent of the LTL business and an increase to 25 percent would be the equivalent of an additional 15,000 intermodal loads to and from the Twin Cities.

Despite its limitations, the TRANSEARCH model served a useful purpose in the study of providing a consistent base for evaluating various planning and growth factors. It also allowed analysis of the competitive base in major intermodal corridors which was a useful framework for evaluating forecast scenarios.

Trends In Total Intermodal Traffic. According to the TRANSEARCH model forecast, the average annual growth rate for Twin Cities freight tonnage by all seven modes of transportation for the forecast period 1992-2002 is 4.3 percent for inbound and 4.4 for outbound flows. Rail intermodal's projected growth rates are 3.8 percent inbound to the Twin Cities and 5.6 percent outbound.

Among intermodally competitive modes, the truck sector (truckload, LTL and private trucking) is projected to grow 4.3 percent a year for inbound and 5.3 percent for outbound. Thus, the Reebie model projects a slightly superior rate for outbound intermodal compared with truck and an inferior rate for inbound traffic over the decade. Inbound all three truck segments outperform rail intermodal in the Reebie model but outbound rail is outperformed only by the relatively small LTL sector. According to the TRANSEARCH database, LTL is only four percent of total truck volume and about three-fifths the size of intermodal in tonnage moved to and from the Twin Cities. TRANSEARCH forecasts a reduction of that gap to about 10 percent by 2002, a trend likely to be offset by the 1994 labor agreement.

Trends In Intermodal Traffic Lanes. If the analysis focuses on the more relevant set of traffic lanes with intermodal service, growth rates for truck freight are slightly above the rates for all lanes because of a projected sharp growth (9 percent) in private trucking in certain lanes. Appendix D documents TRANSEARCH estimates of tonnage originated in the Twin Cities moved to about two dozen BEAs. Appendix E presents TRANSEARCH estimates of tonnage delivered to the Twin Cities from about two dozen BEAs.

Inbound Lanes. The largest markets in terms of tonnage inbound to the Twin Cities are Chicago (BEA 83) for intermodal and truckload freight, New York City (BEA 12) for LTL and Kansas City (BEA 105) for private truck freight.

According to TRANSEARCH (based on the ICC Carload Waybill Sample), intermodal freight inbound to the Twin Cities is concentrated in a small number of markets. The top five intermodal origins account for 80 percent of total tonnage and the next ten lanes generate an additional ten percent so that 90 percent of the volume is generated by 15 origins. However, the practice of rebilling intermodal freight and using a rubber interchange at Chicago eliminates the ability to sample true origin to destination intermodal flows and, consequently, distorts the true pattern of intermodal flows.

All three truck sectors are forecast to grow over the period 1992-2002 at average rates for inbound freight in all intermodal lanes with only two exceptions. Double digit growth over the ten year period is forecast for LTL shipments to Jacksonville and private truck moves to Philadelphia. TRANSEARCH does not project significant growth in any inbound intermodal lane with only two lanes (Mobile and New Orleans) forecast to grow more than six percent. Four of the top five Twin Cities inbound intermodal lanes (Chicago, Los Angeles, Kansas City and Portland) are forecast to grow at below average rates over the 1992-2002 period. Only Seattle (third largest inbound lane) is forecast to experience above average growth and this at only

5.2 percent. It is noteworthy that the rankings of Twin Cities intermodal markets did not change as between 1992, 1997 and 2002 tonnages, indicating the static nature of the TRANSEARCH model.

As for intermodal's share of traffic lane tonnage, in general, it appears that as the traffic lane length of haul increases intermodal's market share increases and has larger variance. According to TRANSEARCH, Los Angeles and Seattle each had 70 percent of the inbound Twin Cities tonnage. New Orleans and Portland are other inbound traffic lanes where intermodal has a significant market share (33 and 27 percent respectively). Chicago is an apparent exception to the distance-share theory as intermodal has a 32 percent share of traffic in this short haul market. Part of the explanation seems to be the fact that Chicago is not the true origin (or destination) of a significant portion of the traffic rebilled over Chicago by the railroads. This is a significant data limitation which merited adjustment to model estimates.

The TRANSEARCH model generally did not forecast any significant change in shares from the base year (1992). For inbound intermodal freight, the top two inbound lanes (Chicago and Los Angeles) are forecast to have intermodal's market shares decrease by one percentage point between 1992 and 1997. Among the major lanes only Seattle is projected to experience an increase in intermodal's share of the market and that by a modest one percentage point over the same period.

Outbound Lanes. Outbound intermodal moves from the Twin Cities are not as concentrated as inbound flows as the top dozen destinations generate 80 percent of total TRANSEARCH tonnage. Over 25 lanes must be aggregated to reach the 90 percent level for outbound intermodal moves.

As for outbound lane ranks, as was the case for inbound freight, Chicago is the leading destination for intermodal and truckload freight and New York City for LTL. Milwaukee is the leading destination for private truck moves and Kansas City, the leading origin for this inbound mode, is only the fourteenth largest outbound private truck lane.

Some outbound freight lanes with intermodal traffic experience above average truck growth over the forecast period. For the truckload sector only outbound Duluth and Milwaukee volumes are projected by TRANSEARCH to grow at double digit rates. No LTL outbound lane with intermodal competition reaches the seven percent level. Six private truck lanes with intermodal competition (Seattle, Portland, Duluth, Milwaukee and New York City) achieve double digit growth in outbound intermodal lanes.

The TRANSEARCH forecast of outbound intermodal market shares for the ten year period provides for small (one percentage point) increases for the top three outbound lanes (Chicago, Seattle and Portland) as well as for five other smaller markets. Only one small outbound market (Detroit) is projected to lose market share (one point) over the ten year period. With outbound intermodal traffic, the TRANSEARCH data do not show the strong relationship between market share and length of haul noted above for inbound markets.

Summary of TRANSEARCH Forecasts. To summarize the analysis of traffic lane forecasts for the Twin Cities provided by the TRANSEARCH model, generally, truck freight is projected to grow at moderate rates in intermodal freight lanes. Market shares for intermodal freight are projected to change only slightly over the ten year forecast period.

Summary of REMI Forecasts. REMI model forecasts were used as a cross check against the TRANSEARCH model and as a basis for forecasting beyond 2002. REMI projections for a variety of relevant variables are at slower growth rates than are incorporated in the TRANSEARCH model. Projected trends in population, employment and output are discussed below.

According to the REMI model, the population of Minnesota is expected to grow at an average annual growth rate of 1.6 percent between 1992 and 1995. Population growth will be slower in subsequent decades: an average annual rate of 0.9 percent for 1995-2005 and, for 2005-2035, 0.8 percent annual growth.

Employment is projected to grow at an average annual increase of 1.9 percent between 1992 and 1995. This growth rate will fall to 1.6 and 0.5 percent for 1995-2005 and 2005-2035, respectively. Employment in manufacturing is predicted to grow at a low annual rate of 0.3 percent between 1992-1995 and become increasingly negative over the forecast period with an average annual rate of -0.2 percent for the medium-run (1995-2005) and -0.9 percent for the long-run (2005-2035) forecast. In the non manufacturing sector a positive but decreasing growth rate is expected (3 percent for 1992-1995, 2 percent for 1995-2005, 1 percent for 2005-2035). The farm sector on the other hand will experience negative growth rates in employment for all forecast periods. The decline in this sector will decrease in the long-run. The REMI model assumes a natural rate of unemployment of 5 to 6 percent for all forecasts which drive these employment rates.

Output of local industries is expected to increase at a steadily decreasing rate. The average annual growth rates are predicted at 3.2 percent, 2.6 percent and 1.8 percent for the short to the long-run. The growth in imports and exports will follow this general pattern of output growth.

Regional imports and exports grow at positive rates with higher growth rates in the 1992-1995 period. Overall these rates are low to moderate for all forecast periods, with a high of 5.6 percent for durable imports in 1992-1995, and tend to fall in the long-run.

For the forecast period, real per capita disposable income is expected to grow at an annual rate of 0.5 percent in the short-run, 1.5 percent in the medium-run and 0.6 percent in 2005-2035.

Comparison of REMI and TRANSEARCH Forecasts. Generally, the REMI results track the TRANSEARCH estimates. REMI model variables that best follow the general trend of the TRANSEARCH data are: wholesale and retail employment generated by regional exports, imports for local use (all categories), exports from the region, especially durables and retail, selected employment in rail and, to a lesser extent motor vehicles and material moving, and finally output of the local trucking industry.

For the REMI model growth rates for 1992-2002 for non-employment variables are 2 to 4 percent for imports and exports and 2 to 5 percent for local output. For this period the rates for intercity, outbound and inbound freight from the TRANSEARCH model are: 3 to 6 percent for rail (including intermodal), 4 to 6 percent for truck, and 3 to 6 percent for air and water.

For 2002-2035, the REMI model growth rate forecasts for imports are in general slightly lower than REMI forecasts for 1997-2002 (except for Agri/For/Fish services). For exports and local output, the long-run forecasts are, for the most part, no more than 1 percent lower than medium-run forecasts as well. This suggests some but not a significant attenuation in growth assumptions after 2002.

To summarize, projections of the REMI model for our chosen variables follow the general trends of the TRANSEARCH data suggesting that the economic bases for study projections are consistent. Long-run REMI forecasts for imports, exports and local transportation output for the 2035 horizon are for the most part no more than 1 percent lower than their 1997-2002 forecasts which indicates a reasonable approach to developing forecasts beyond 2002, the TRANSEARCH horizon. It should be noted that growth rates discussed above represent a floor for intermodal potential given that the competitive process involves diversion of traffic now moving on highways to rail.

Adjustments To TRANSEARCH. Several adjustments to the TRANSEARCH model results were made as part of the forecast process. A portion of intermodal traffic reported as originating or terminating in Chicago were assumed to move beyond Chicago by rail intermodal and was allocated among major traffic lanes and regions. Impacts of the 1994 Master Freight Agreement whereby LTL carriers were able to increase use of rail intermodal were accounted for in the forecast. Canadian traffic flows were added to the market data base. Each of these adjustments is discussed below. In addition, small adjustments were made in several regional traffic lanes when data provided by the railroads indicated a significant difference with the TRANSEARCH model estimate.

Chicago Through Traffic. A significant volume of intermodal traffic moving into Chicago is moved out of Chicago by a second railroad. Industry pricing and accounting practices do not record these transactions as a single movement. Consequently, the true origins and destinations of a significant portion of Twin Cities intermodal business is unknown.

The MIRTS forecasting methodology requires estimating the missing traffic in order to more clearly understand market shares in major intermodal corridors.

The FRA-MARAD Double Stack Study reported (page 72) that preliminary research indicated the volume of such "rubber-tired" interchanges was as much as 40 percent of the trailer traffic. Applying that estimate to TRANSEARCH estimates of Twin Cities traffic results in the following market shares for rail intermodal by corridor:

	Inbound	Outbound
California	73%	13%
Texas	9	22
Northeast	10	11
Southeast	10	21

LTL Traffic. Short term forecasts were adjusted to account for the impact of implementing the benefits of the National Master Freight Agreement whereby LTL carriers may increase intermodal loads from 10 to 28 percent of their total business. Based on the TRANSEARCH database, it is estimated that LTL carriers handle about 2,000,000 tons of freight to and from the Twin Cities. The LTL impact is estimated to have a maximum potential of 13,000 to 14,000 lifts a year with most of those assumed to be routed through Midway. This additional business is assumed to be phased in at a rate comparable to the recent growth trend.

The LTL increase represents a significant portion of TRANSEARCH model LTL tonnage (which does not include any UPS highway movements) in each long haul corridor. Inbound diverted LTL flows ranged from 50 to 60 percent of projected 1997 Reebie LTL tonnage and about 70 percent in outbound long haul corridors.

Canadian Traffic. TRANSEARCH includes no Canadian flows which, given the linkage with the Port of Montreal established by CPRS, is a significant traffic lane for Twin Cities intermodal flows. To supplement this deficiency with public information, the analysis relied on intermodal and truck flows between eastern Canada and northeast locations served by CPRS and (unspecified) points beyond Chicago. These data are published in a report prepared for the City of Detroit entitled Detroit River Tunnel Traffic Diversion Analysis, dated November, 1993.

The Detroit study developed market dimensions used to estimate flows in a Twin Cities - Montreal corridor forecast discussed below. The two Canadian railroads were reported as handling about 200,000 intermodal units beyond Chicago in 1991 in these lanes. Just under half the volume was to and from eastern Canada. In addition, the report identified about 285,000 truckloads as having moved between eastern Canada and the area beyond Chicago.

MIRTS Forecast Scenarios. The study developed a forecast of future intermodal demand based on low, medium and high intermodal growth environments (scenarios) based on factors and assumptions summarized in Table 7. The low growth scenario is based on the status quo. The medium growth scenario assumes conditions internal to the region change while system factors external to the Twin Cities region are unchanged. It is assumed that improvements in external factors would stimulate an intermodal growth environment referred to as the high growth scenario. After reviewing the results of forecasts based on the three environments MIRTS developed a consensus of the coordination group as to the most reasonable growth scenario for Twin Cities intermodal demand.

Successive growth scenarios assume barriers are eliminated or significantly reduced which serve to enhance the competitiveness of intermodal service thereby stimulating demand. These include improvements in terminal capacity as previously discussed as well as improvements in regional drayage service (not evaluated in the study) in the medium growth scenario.

There are a wide range of external constraints to intermodal growth in the Twin Cities (and in other areas) considered in the high growth scenario with the following types of impacts:

> Equipment shortages and imbalances involve power, wells and flat cars, and trailers and containers. These elements mean some intermodal service is discontinued to allow a railroad to balance equipment; e.g., BN's withdrawal from the Texas market in 1994. Shortages of wells means some intermodal services discontinued as above or supply on specific trains reduced in which case loads are lost or delayed.
>
> Intermodal traffic bottlenecks at major gateways such as Chicago's infrastructure mean carriers build delays into their schedules and the issue is considered at the time of mode choice.
>
> Standards for equipment would reduce the plethora of sizes and types of equipment and possibly improve supply conditions.
>
> Operational procedures constrain railroad intermodal schedules These include everything except system infrastructure (hubs and connecting lines as well as an area's local infrastructure including locomotive and car facilities and lines between those facilities and yards and the intermodal terminal). Operational procedures establish which trains are run and when, what is carried on each train, how the units are blocked etc.

Table 7

MIRTS COORDINATION GROUP FORECAST SCENARIOS

HIGH INTERMODAL GROWTH ENVIRONMENT

Major external and internal constraints to the region effecting the rate of growth are removed or significantly reduced.

External:
- -Equipment shortages,
- -Intermodal traffic bottlenecks at major gateways,
- -Lack of uniform standards for equipment,
- -Delays to implement electronic shipment management systems
- -Delays to improve other operational procedures, and
- -Absence of rail/trucking strategic service alliances.

Internal:
- -Terminal capacity and
- -Drayage service.

MEDIUM INTERMODAL GROWTH ENVIRONMENT

The constraints to growth, internal to the region, are removed or significantly reduced. Those constraints, external to the region, remain.

LOW INTERMODAL GROWTH ENVIRONMENT

An extended period with no increase in economic activity beyond current levels as experienced during the 1990-1993 period, and intermodal constraints internal and external to the region remain in place.

> Rail/trucking strategic service alliances are a significant part of recent industry growth spurts.

The presence of constraints indicates lack of sufficient capital or inadequate return on necessary investments to attract capital to capacity expansion projects. It may be a characteristic of intermodal that fierce truck competition will always set a price ceiling naturally limiting return on investment in rail intermodal capacity. That is to say that some external constraints may be permanent.

Based on cycles in the industry it would not be unreasonable to expect that at some point in the growth of the system that railroads might begin to limit investment if not withdraw from certain markets or traffic lanes. A lot depends on the level of truck competition. In the long haul markets, if the driver shortage stabilizes or improves price pressure on railroads will continue possibly limiting elimination of barriers.

Notwithstanding lower than average profit margins on intermodal business, railroads have funded intermodal projects because of strong demand and spectacular growth. The railroad's have had good financial experiences in recent years, albeit seriously set back by the floods of 1993, which have provided a strong cash basis for capital projects. However, the impact of planned mergers on intermodal capital projects introduces another element of uncertainty.

Summary Of Market Forecast. Using an adjustment approach described above based on Reebie Associates' TRANSEARCH database, the total volume of boxable freight moved to and from the Twin Cities area in intermodal market amounted to almost 14,800,000 tons in 1992. For purposes of evaluating intermodal terminal needs in the Twin Cities, volume estimates over a 20 year planning period were developed for three growth scenarios. A Low Intermodal Growth Scenario assumes restrained economic activity averaging 1.4 percent a year. A Medium Intermodal Growth Scenario assumes double that rate which is more in line with the REMI model results for relevant sectors used by the Minnesota Department of Revenue. A High Intermodal Growth Scenario assumes double the medium rate for the first decade which is the rate used in TRANSEARCH and for the second decade falls back to the lower REMI based rate used in the medium growth scenario. Using these growth rates, forecasts of the total boxable freight market for the Twin Cities in which intermodal competes are as follows:

TWIN CITIES BOXABLE FREIGHT MARKET FORECASTS
(THOUSANDS OF TONS)

	1992	2002	2012
Low Growth	14,800	16,900	19,200
Medium Growth	14,800	18,900	24,300
High Growth	14,800	23,100	29,700

A forecast of rail intermodal tonnage was developed by applying the growth environment assumptions discussed above. It was assumed that lead time required to implement local environmental improvements would extend to 1997 the time when intermodal's market share would improve in the medium growth scenario. Similarly, significant improvements in external factors were assumed not to come into play until 2002. The net effect is that rail market shares are expected to show only modest improvement until the second decade of the planning period.

The freight flow analysis and forecast revolved around growth opportunities in six long haul intermodal corridors serving Twin Cities markets (listed in order of estimated current intermodal tonnage): Northwest, California, Northeast, Southeast, Montreal and Texas. The short haul Twin Cities intermodal market, which includes Chicago, St. Louis and Kansas City and accounts for over a quarter of all Twin Cities intermodal traffic, was evaluated separately.

All BEAs within 600 miles of the Twin Cities are considered to be short haul intermodal markets and not part of any corridor. The short haul market is one with the most potential for the introduction of new technologies in the Twin Cities such as Roadrailer and Iron Highway. The nature of businesses which have been attracted to Roadrailer (such as paper companies) suggests that the Twin Cities is not a leading market for that technology. In theory, the potential for Iron Highway to link Chicago with its neighboring short haul industrial centers is great. However, for purposes of this study it is assumed that neither the technology nor the market will be developed in a sufficiently timely manner to affect the intermodal markets under consideration here.

Details of projected market dimensions and rail intermodal volume forecasts at the corridor level are presented in Appendix F. A summary of the characteristics of long haul intermodal markets is presented in Appendix G. The forecast of total intermodal tonnage for the three scenarios is as follows:

TWIN CITIES INTERMODAL TONNAGE FORECAST
(THOUSANDS OF TONS)

	1992	2002	2012
Low Growth	3,500	4,200	4,500
Medium Growth	3,500	4,600	6,100
High Growth	3,500	5,600	10,100

Tonnage forecasts were converted to estimates of intermodal unit loads handled at rates of 15 and 20 tons per load depending on the railroad and direction of flow. This was intended to account for the relative mix of domestic and international traffic. Loads were similarly converted to terminal lifts using a factor of about 0.8 loads per lift. These coefficients were developed by calibrating available tonnage and lift data for the study terminals.

Using the above factors, the forecast of intermodal demand in the Twin Cities in terms of annual lifts is as follows:

TWIN CITIES INTERMODAL LIFT FORECAST

	1992	2002	2012
Low Growth	192,000	302,000	323,000
Medium Growth	192,000	334,000	440,000
High Growth	192,000	404,000	772,000

Figure Eight illustrates the forecasts of demand for intermodal terminal lifts in the Twin Cities for the three scenarios in the context of historical demand beginning in 1988. A brief synopsis of each scenarios follows.

Low Intermodal Growth Environment. In this scenario, it is assumed that economic activity is restrained and is comparable to experience in the Twin Cities in the early 1990s. During that period intermodal experienced about a 6 percent decline before beginning a strong surge up to the present. The analysis has assumed that intermodal volume growth from this source would be limited to less than one percent a year (equivalent to about 2,000 lifts).

In addition to that type of growth, This scenario provides for annual increases between 1995 and 1997 of 25,000 to 30,000 lifts to reflect implementation of the LTL agreement and subsequent average annual increases of about 2,000 lifts a year. Total Twin City lifts would increase from about 230,000 in 1994 to about 300,000 by the end of decade and experience a modest increase of about 20,000 additional lifts in the following decade.

Medium Intermodal Growth Environment. This scenario is not restricted by design to any economic assumptions but limits growth by assuming that no major rail intermodal system improvements outside the Twin Cities are implemented. Constraints to intermodal growth inside the region are assumed to be eliminated over the next three to five years. Growth rates derived from the RIMS model averaging about three percent were used to generate medium growth tonnage.

The medium growth scenario experiences the same increases as the low growth scenario over the next three years. Beginning in 1998, under this scenario Twin City lifts increase by an average of 8,000 to 9,000 a year. In the final decade of the planning period average annual increases in the number of lifts are in the 10,000 to 11,000 range. Total lifts in the region exceed 300,000 about 1998 and 400,000 about a decade later in growth scenario.

TWIN CITIES INTERMODAL TERMINAL STUDY
Lifts For Alternative Growth Scenarios

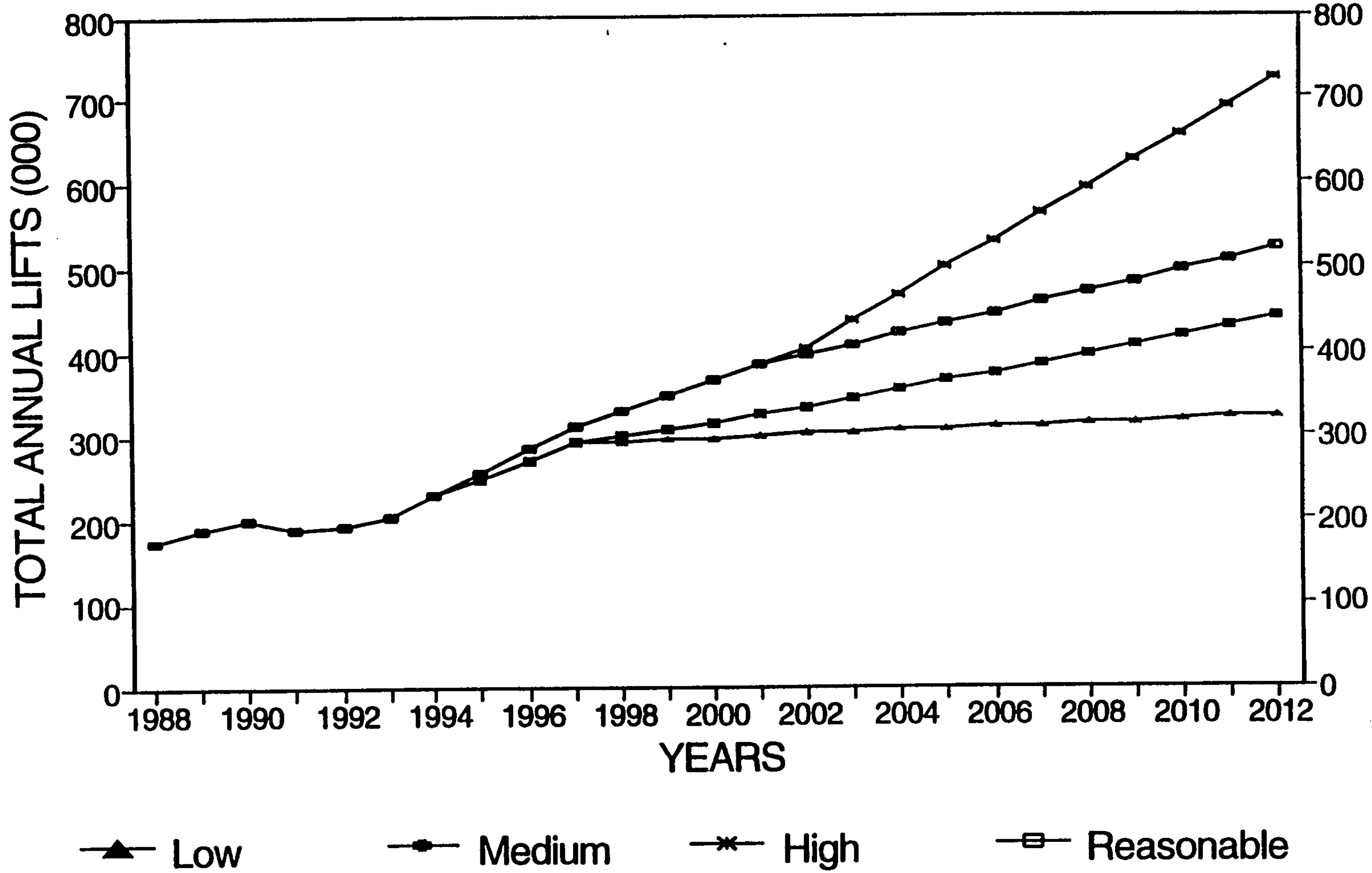


FIGURE EIGHT

High Intermodal Growth Environment. Growth assumed in the other scenarios remains in place and additional growth is stimulated by the elimination or significant reduction of major limits to growth of intermodal traffic external to the Twin Cities region in this case.

Reebie market growth rates were used through 2002 and lower RIMS based rates in the second decade of the planning period. Between 1994 and 1997 growth averages between 27,000 and 28,000 lifts a year. In the last five years of the first decade increases are in the 18,000 to 19,000 lift range as the initial phase in of LTL increases is completed. In the second decade of the planning period when intermodal is expected to make strong increases in long haul market shares, lifts increase annually by a very strong average of almost 32,000 a year. This is an even stronger rate of increase than was experienced in 1994.

Under the high growth scenario total Twin City lifts exceed 300,000 in 1997 and grow by 100,000 lifts every three to five years, which is phenomenal growth.

The distribution of demand among Twin Cities markets shows significant shifts given this scenario. It is estimated that the short haul market (less than 600 miles) accounts for 46 percent of total boxable freight tonnage. Among long haul corridors, total demand is greatest in the Northeast corridor (16 percent) followed by the Southeast (10 percent), California (9) and Northwest (8) corridors. The balance of the freight moves in the Texas and Montreal corridors in comparable volumes.

MIRTS Consensus. After reviewing the forecasts presented above, the MIRTS coordination group developed its consensus on a most reasonable growth scenario. As illustrated in Figure Eight, this scenario tracks the high rate of growth between 1994 and 2002 and the medium rate of growth thereafter. Table 8 presents a breakdown of total market and rail intermodal tonnage by traffic lane for the MIRTS most reasonable scenario. Also shown are the resulting average annual growth rates for the market in the second decade of the planning period.

TABLE 8
MOST REASONABLE GROWTH SCENARIO FORECAST

MARKET DIMENSIONS

	CORRIDORS	THOUSANDS OF TONS 1992	2002	2012	ANNUAL GROWTH
INBOUND	SHORT HAUL	3,474	4,956	5,510	1.1%
	CALIFORNIA	509	764	865	1.3%
	TEXAS	618	997	1,162	1.5%
	NORTHEAST	1,002	1,542	1,763	1.3%
	SOUTHEAST	953	1,572	1,846	1.6%
	MONTREAL	329	476	532	1.1%
	NORTHWEST	388	566	635	1.2%
	ALL LANES	7,272	10,873	12,313	1.2%
OUTBOUND	SHORT HAUL	3,468	5,986	7,165	1.8%
	CALIFORNIA	668	1,014	1,154	1.3%
	TEXAS	311	512	601	1.6%
	NORTHEAST	1,329	2,042	2,332	1.3%
	SOUTHEAST	469	725	830	1.4%
	MONTREAL	585	780	848	0.8%
	NORTHWEST	671	1,169	1,404	1.9%
		7,502	12,228	14,334	1.6%
	BOTH FLOWS	14,774	23,100	26,647	1.4%

RAIL INTERMODAL VOLUMES

	CORRIDORS	THOUSANDS OF TONS 1994	1997	2002	2012
INBOUND	SHORT HAUL	482	553	673	831
	CALIFORNIA	525	552	596	763
	TEXAS	96	116	150	202
	NORTHEAST	109	155	231	302
	SOUTHEAST	120	163	236	324
	MONTREAL	28	32	40	49
	NORTHWEST	337	364	410	515
	ALL LANES	1,696	1,936	2,335	2,987
OUTBOUND	SHORT HAUL	478	612	836	1,195
	CALIFORNIA	137	383	791	1,022
	TEXAS	88	84	77	106
	NORTHEAST	343	329	306	399
	SOUTHEAST	149	134	109	142
	MONTREAL	253	282	330	389
	NORTHWEST	392	562	846	1,217
	ALL LANES	1,840	2,386	3,295	4,470
	BOTH FLOWS	3,536	4,321	5,630	7,456

According to the most reasonable scenario, Twin Cities lift demand would exceed 300,000 in 1997 and reach the 400,000 lift level by 2003. In the second decade of the planning period lifts would increase at an annual rate in the 12,000 to 13,000 unit range. Near the end of that period, demand would reach 500,000 lifts under this scenario.

The long-term (2012) lift forecast of over 520,000 lifts was used as the basis for sketching the characteristics of a large multi-user intemodal terminal to meet the needs of the Twin Cities which are presented in the following chapter.

Prospective Multi-User Twin Cities Region Intermodal Terminal

PROSPECTIVE MULTI-USER TWIN CITIES REGION INTERMODAL TERMINAL

Intermodal Terminal Needs

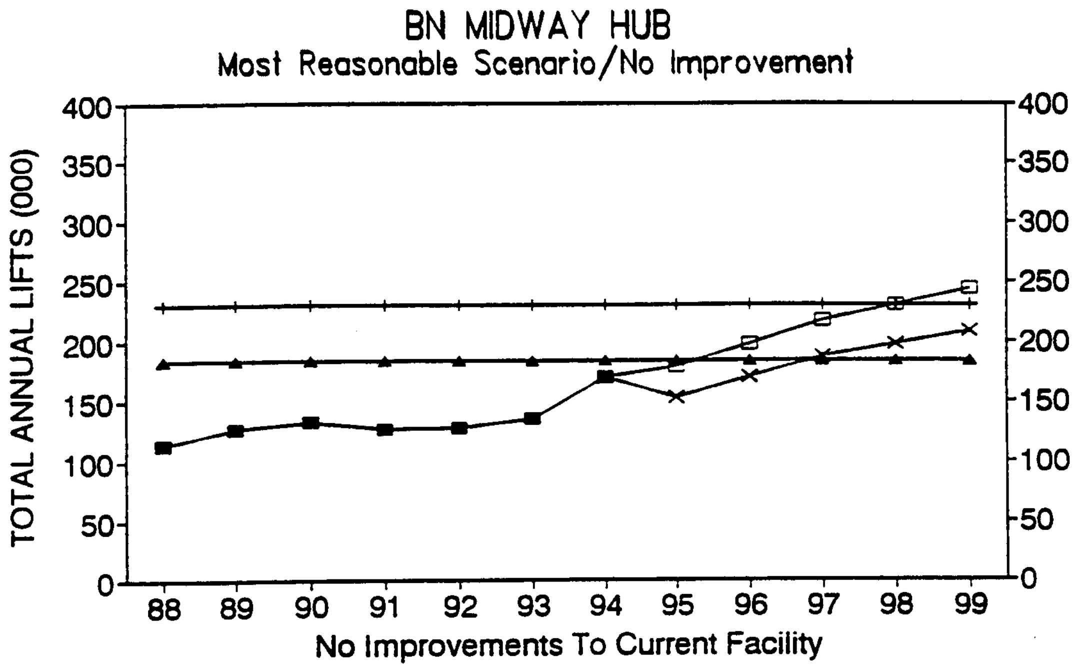
Total intermodal terminal demand in the Twin Cities is estimated to be about 250,000 lifts. The theoretical capacity of existing terminals is estimated to be 230,00 lifts at Midway and 108,000 at Shoreham, a total of about 340,000 lifts. The practical capacity of Midway Hub is roughly between 190,000 and 200,000 lifts and Shoreham's practical capacity is about 89,000 lifts. The combined practical capacity is in the range of 270,000 to 290,000 lifts. With improvements to both terminals, practical capacity would increase to about 320,000 lifts.

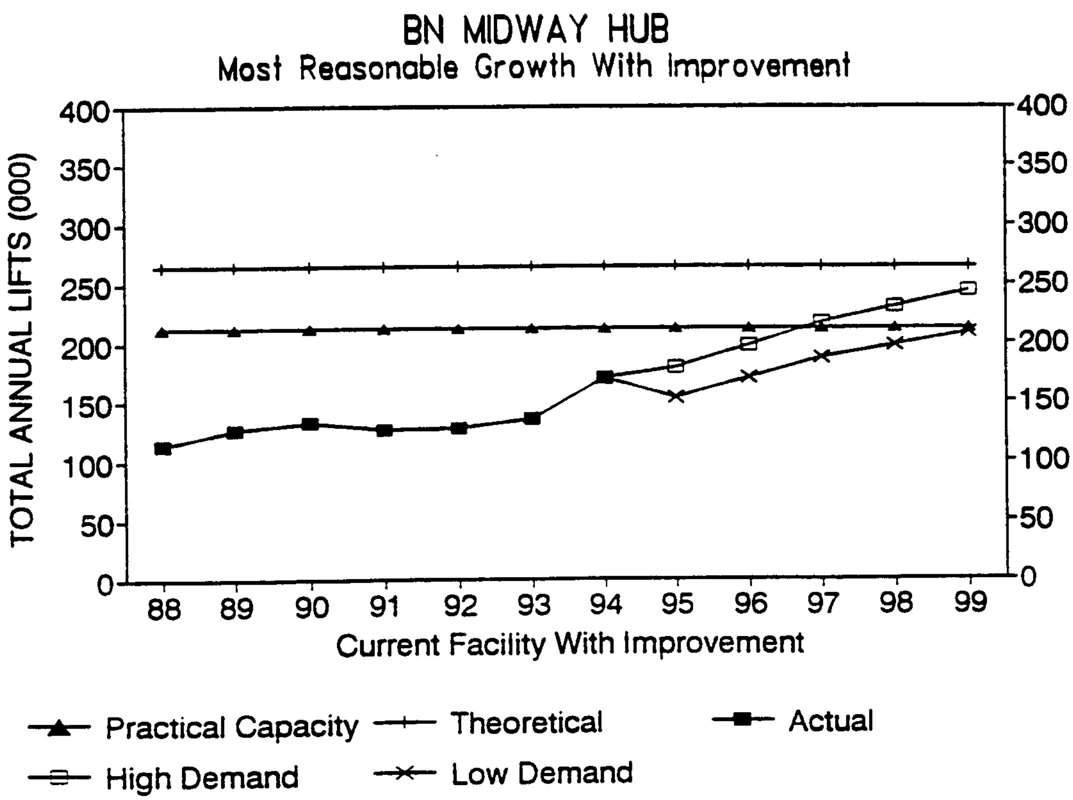
The results of the Midway Hub capacity analysis are compared with volume trends based on the MIRTS most reasonable growth scenario in Figure Nine. Volume trends are presented for two cases: a high demand case wherein BN maintains its market share and a low demand case where that share is reduced ten percentage points in anticipation of increased competition for Twin Cities rail intermodal business. The figure is in two parts: the upper part shows capacity limits if no improvements are made and the lower part raises capacity limits 15 percent to reflect terminal improvements. As has been previously noted, in each case Midway Hub exceeds its practical capacity within the short term planning horizon illustrated even if improvements are made.

The analysis of Shoreham indicated no capacity constraint, per se (and hence no illustration of trends). In only one hypothetical case, maintaining market share and not improving Shoreman, might the CPRS facility reach the limit of its practical capacity. However, as previously noted, operating efficiency rather than capacity improvement is the main incentive for CPRS investment at Shoreham.

Facility capacity at the study terminals was found to be most dependent on track and parking capacity. A review of technological developments failed to identify factors which might impact these aspects of intermodal terminal

FIGURE NINE


BN MIDWAY HUB
Most Reasonable Scenario/No Improvement
TOTAL ANNUAL LIFTS (000)
0
50
100
150
200
250
300
350
400
88
89
90
91
92
93
94
95
96
97
98
99
No Improvements To Current Facility


BN MIDWAY HUB
Most Reasonable Growth With Improvement
TOTAL ANNUAL LIFTS (000)
0
50
100
150
200
250
300
350
400
88
89
90
91
92
93
94
95
96
97
98
99
Current Facility With Improvement
Practical Capacity
Theoretical
Actual
High Demand
Low Demand

capacity in a significant way. Information technological improvements (such as, electronic management systems) will improve the efficiency of the terminal in terms of gate processing and location of intermodal equipment in the terminal but not affect capacity needs as measured in this study. Developments in container design have tended to focus on smaller domestic units (such as, C.H. Robinson's triple stacking refrigerated unit) which are expected to service niche markets and not significantly affect terminal capacity needs. No significant developments in container carrying equipment were identified which might affect capacity utilization; however, as discussed above, recommendations for increasing terminal capacity include consideration of alternative lift machines already available.

The capacity analyses demonstrate that there is a clear need to provide additional intermodal terminal capacity in the Twin Cities even to meet projected short term demand. In the long term, the most reasonable growth scenario projects terminal lift demand to reach 400,000 lifts by 2003 and 500,000 near the end of the planning horizon. The purpose of the following analysis is to develop the concept of a single regional facility of sufficient size to meet projected demand that would be used by all railroads serving the Twin Cities.

Terminal Characteristics

The railroad industry has a tradition of operating jointly owned facilities and companies. However, there are only a few intermodal terminals operated by one railroad with a second railroad as a tenant, usually where the tenant has a small local presence and a relatively modest amount of intermodal business to be handled. There are no operations of the scale considered here but a preliminary study has been completed of the potential for development of a super terminal to serve up to seven railroads in Detroit.

In planning a facility in the Twin Cities area, it is important to note limitations of the Sauk Village site expressed by major railroads. Canadian National is having difficulty attracting tenants to join it in leasing what will be a privately developed 350 acre facility at Sauk Village, 30 miles south of downtown Chicago. Negative factors include the distance from shippers and its location on a short line railroad which would control access to the facility. The major attraction of the site was expected to be that it would allow an eastern and western railroad to transfer intermodal units efficiently eliminating the rubber tired transfer that, as discussed above, is so pervasive in Chicago.

The principal attractions of a Twin Cities terminal shared by railroads providing intermodal service to the region would include shared capital investment, shared operating costs of common functions and increased demand related to an expected stimulus associated with eliminating internal barriers to users. Common functions would be in the context of a condominium operation which would thereby provide railroads with the capability to maintain individual corporate identify to market its services and control train schedules. Another attraction of a properly located common site would be that it would attract co-location by major intermodal users.

Under a condominium arrangement railroads would share certain facility assets such as entrances, storage tracks, a chassis pool and EDI equipment to manage the flow of containers. In addition, certain services would be purchased in common such as for an operator, gate management and railcar switching.

With regard to location it is appropriate to note the guidance of the AREA Manual For Railway Engineering which notes as follows:

Factors influencing the facility location and design are accessibility to major highways and water routes, and capacity and clearance capability of the serving rail lines. The location studies must consider the equipment type, the traffic volume, railroad operations, highway traffic patterns and central location with respect to market area.

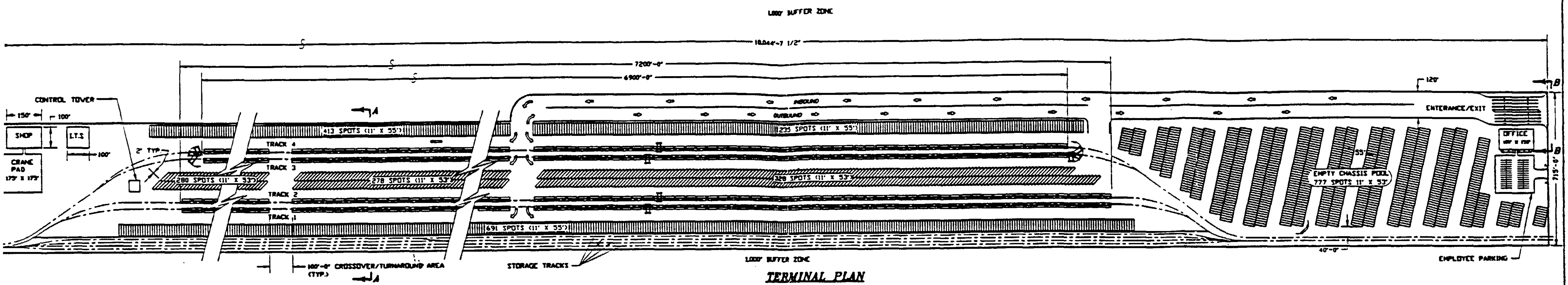
The ideal facility topography is relatively level with good cross drainage and stable foundation material. The site should allow a design that facilitates through train pick-up and set-out, or termination and origination where possible. A minimum of switch engine moves should be used to assure the most economical return.

The above considerations represent the railroads' needs. In evaluating specific sites for a new facility, extensive community needs also will be evaluated and mitigation actions identified as part of the normal site planning, review and approval process. Depending on the proximity of a site to the interstate highway system, there is likely to be a significant increase in truck traffic on local streets. If not located in a mainline corridor, rail lines accessing the area likely will experience significant increases in train movements. Increases in truck and train movements will affect noise and air quality. In addition, the size of the intermodal facility and the nature of its surfaces will increase water runoff in the area which may be expected to be addressed by storm water management measures during the planning process.

A new intermodal terminal based on the layout in the accompanying schematic (Figure Ten) would cost about $110,000,000 as detailed in Table 9. Actual cost could vary depending upon the specific site. It would include four long loading tracks totaling 28,200 usable feet as well as four storage tracks capable of holding about 40,000 feet of railcars. All parking and driving surfaces would be paved. This cost also includes $15,000,000 for 600 acres of buffer zone, which could have other commercial uses, encompassing 1,000 feet in each direction from the 154 acre yard.

The actual facility layout would differ slightly from this conceptual arrangement in that railroad curved leads would be eased, so two loading tracks would be longer than the 7,200 feet shown and the two other tracks would be equivalently shorter that the indicated 6,700 feet. Also, storage tracks provided in the illustration may be insufficient at design capacities given the presence of four users. An additional 11,000 feet of storage track has been included in the capital cost estimate.

Practical track capacity is estimated to be between 540,000 and 560,000 units annually, depending on the rate of use of double stack equipment. In addition to extensive use of trackside parking, possible through the use of

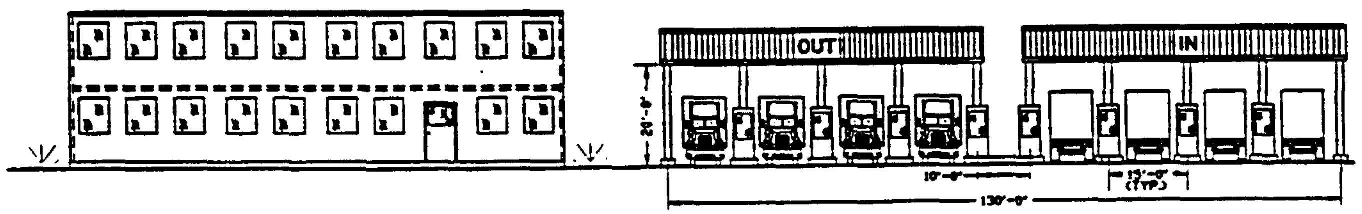


TERMINAL PLAN

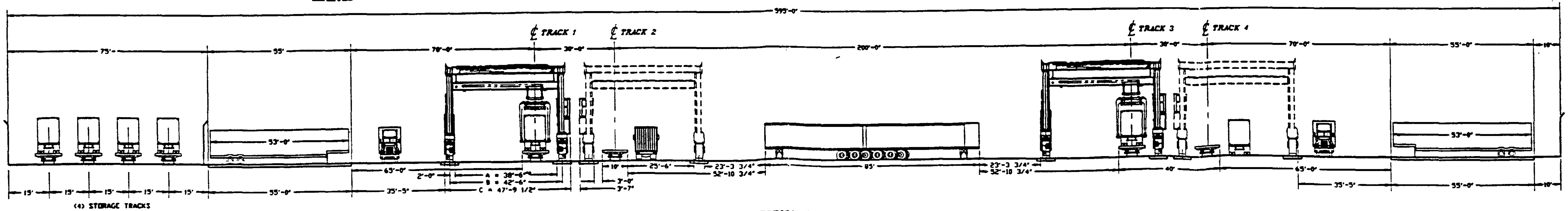
0 100 200 400 600 800 1000
GRAPHIC SCALE IN FEET

TRACK DATA	
TRACK #	94' RAILCARS
TRACK 1	67
TRACK 2	67
TRACK 3	70
TRACK 4	70
TOTAL	274

TRAILER STORAGE DATA (AS ILLUSTRATED)	
TYPE	QUANTITY
11' X 53'	1,663
11' X 55'	1,339
TOTAL	3,002



SECTION "B-B"



SECTION "A-A"

MI-JACK TRANSLIFT MODEL 1000RB	
IT	DESCRIPTION
A	INSIDE CLEAR WIDTH (MIN.)
B	TRACKING WIDTH
C	OVERALL WIDTH AT BASE
D	WHEEL BASE 24'-0" NOT SHOWN

PRELIMINARY, THIS PRINT IS NOT TO BE USED FOR FABRICATION OR CONSTRUCTION.

NOTES:
MI-JACK PRODUCTS MAINTAINS A POLICY OF CONTINUOUS PRODUCT IMPROVEMENT AND RESERVES THE RIGHT TO CHANGE MATERIALS AND SPECIFICATIONS WITHOUT NOTICE.

SHEET 01 OF 01

100RB
EQ:0599.01

MI-JACK PRODUCTS

GENERAL ARRANGEMENT - INTERMODAL SITE
MINDOT (MINNESOTA DEPT. OF TRANSPORTATION)

D. NAGLE | 01/17/95 | 1 = 230

L-2456-D | 0

TABLE 9
NEW INTERMODAL FACILITY CAPITAL COST

	Quantity	Unit	Unit Cost	Total	
SITEWORK					
Grading	3,906,389	Cubic Yard	$4	$15,625,556	
Fill	0	Cubic Yard	25	0	
Install Subgrade	611,454	Square Yard	9	5,503,090	
Subtotal				21,128,646	
CONSTRUCT					
Paving	611,454	Square Yard	21	12,840,543	
Concrete Crane Pad	30,200	Lineal Foot	67	2,023,400	
Track	75,000	Track Foot	130	9,750,000	
Turnout-Slow Speed	28	Each	45,000	1,260,000	
Turnout- Medium Speed	0	Each	90,000	0	
Road/Rail Crossing	2,200	Lineal Foot	400	880,000	
Rail Access Lead	3	Mile	2,000,000	6,000,000	
Engine Drip Pan/Separator	0	Each	95,000	0	
Light Pole	201	Each	11,000	2,209,900	
Fencing	21,430	Lineal Foot	19	407,170	
Subtotal				35,371,013	
STRUCTURES					
Office Building	15,000	Square Foot	65	975,000	
Shop Building	15,000	Square Foot	45	675,000	
Truck Canopy	37,500	Square Foot	20	750,000	
Subtotal				2,400,000	
UTILITIES					
Install/Relocate	Unknown	Lump Sum		3,000,000	
SUBTOTAL				$61,899,659	
ENGINEERING AND PM 17 percent				10,522,942	
CONTINGENCIES 25 percent				18,105,650	
CONSTRUCTION SUBTOTAL				$90,528,251	
LAND					
Acres	154	Acre	25,000	3,850,143	
Buffer Acres	601	Acre	25,000	15,022,016	
Subtotal				18,872,159	
EQUIPMENT					
Gantry Cranes	4	Each	750,000	3,000,000	
Hostler Tractors	0	Each	40,000	0	Contract
Equipment Subtotal				3,000,000	
TOTAL				$112,400,410	

Source: RLBA estimate.

overhead cranes at the facility, available parking represents a capacity of over one million unit days. When operating at its practical capacity, it is estimated that 65 percent of this parking space would be utilized.

Few intermodal yards are either new or this big, so for a benchmark, consider the new Chicago area Willow Springs Intermodal Terminal opened in 1994 by The Atchison, Topeka & Santa Fe Railway. This 269 acre facility also has four loading tracks, but lengths are only 5,075 to 5,500 feet in length and four storage tracks totaling 20,050 feet in length with main lot parking for 2,000 trailers and additional trackside spaces for another 860. In contrast, the Twin Cities conceptual plan offers 1,252 trackside and 777 main lot spaces. Based on track feet the new Santa Fe facility is about two-thirds that of the conceptual drawing and its cost at $73,000,000 is similarly about two-thirds of the projected $110,000,000.

Appendix A

Terminal Capacity At Major Hubs

Appendix Table 9
TERMINAL CAPACITY AT MAJOR HUBS

RR	Terminal	Acres	Track Feet	Car Capacity Flat Cars	Car Capacity Stack Cars	Estimated Daily Lift Capacity	Estimated Annual Lift Capacity	Lift Machines Side-loaders	Lift Machines Over-head	Lift Machines Total	Actual 1987 Lifts	Actual 1988 Lifts
UP	LA	120	21,390	230	70	1,870	673,258		6	6	220,000	255,000
ATSF	LA	110	34,503	371	113	3,017	1,085,995	9	0	9	395,280	434,778
SP	LA	76	17,670	190	58	1,545	556,170	4	0	4	142,240	155,769
SP	Long Beach/ICTF	258	22,599	243	74	1,976	711,312	8	1	9	370,000	395,943
Subtotal		564	96,162	1,034	315	8,408	3,026,735	21	7	28	1,127,520	1,241,490
UP	Seattle	20	11,904	128	39	1,041	374,683	3		3	112,852	118,388
BN	Seattle	29	11,718	126	38	1,025	368,828			10	195,115	186,187
BN	Seattle	48	10,695	115	35	935	336,629			3	107,296	99,939
Subtotal		97	34,317	369	113	3,000	1,080,141	3	0	16	415,263	404,514
UP	Portland	50	6,300	68	21	551	198,295	2		2	91,236	88,422
BN	Portland	18	9,951	107	33	870	313,211			4	94,938	99,033
SP	Portland	22	2,325	25	8	203	73,180	4	0	4	51,280	53,717
Subtotal		90	18,576	200	61	1,624	584,687	6	0	10	237,454	241,172
10 CNW	Global One	110	15,624	168	51	1,366	491,771	2	4	6	256,000	330,300
UP	Chicago	32	10,416	112	34	911	327,848		2	2	83,791	77,443
GT	Chicago	33	7,161	77	23	626	225,395	3	2	5	59,084	60,247
CR	Chicago/S Layf	N/A	17,577	189	58	1,537	553,243	5		5	298,273	298,007
CR	Chicago/51st	30	6,696	72	22	585	210,759	3		3	89,846	101,884
CR	Chicago/47th	102	11,160	120	37	976	351,265	2	1	3	165,059	166,914
CSX	Ch/Forest Hill	22	18,414	198	60	1,610	579,588		2	2	151,380	120,460
CSX	Ch/Bedford Pk	280	42,700	459	140	3,733	1,343,999	4	3	7	144,000	235,921
NS	Chicago	11	11,160	120	37	976	351,265	4	2	6	125,377	135,673
SOO	Bensenville	47	24,180	260	79	2,114	761,075	3	1	4	104,524	80,737
SOO	Schiller Pk	45	7,905	85	26	691	248,813	4		4	84,078	78,111
ATSF	Chicago	128	27,621	297	91	2,415	869,381	2	6	8	498,098	532,673
ATSF	Galesburg	12	93	1	0	8	2,927	1	1	2	8,566	7,692
BN	Chicago/Cicero	11	29,016	312	95	2,537	913,290			10	389,602	355,935
BN	Chicago/W.Ave	9	6,138	66	20	537	193,196			2	48,334	41,359
Subtotal		872	235,861	2,536	773	20,622	7,423,814	33	24	69	2,506,012	2,623,356
SOO	St Paul	56	3,813	41	13	333	120,016	3		3	66,747	58,118
GT	Detroit	7	4,800	52	16	420	151,082	3	2	5	24,704	49,032
CR	Detroit	10	7,347	79	24	642	231,250	3		3	33,407	31,166
NS	Detroit	N/A	5,952	64	20	520	187,341	1	1	2	38,904	32,320
Subtotal		17	18,099	195	59	1,582	569,673	7	3	10	97,015	112,518

Appendix Table 9
TERMINAL CAPACITY AT MAJOR HUBS

RR	Terminal	Acres	Track Feet	Car Capacity Flat Cars	Stack Cars	Estimated Daily Lift Capacity	Estimated Annual Lift Capacity	Lift Machines Side-loaders	Over-head	Total	Actual 1987 Lifts	Actual 1988 Lifts
NS	Kansas City	3	2,700	29	9	236	84,984	0	0	0	16,125	14,904
UP	Kansas City	6	8,370	90	27	732	263,449	1		1	38,408	45,656
ATSF	Kansas City	40	5,952	64	20	520	187,341	0	3	3	113,399	151,741
BN	Kansas City	20	7,440	80	24	650	234,177			3	63,464	86,467
Subtotal		84	27,717	298	91	2,423	872,403	3	3	9	282,301	352,381
UP	Denver	45	7,750	83	25	678	243,934	1		1	30,270	24,580
ATSF	Denver	60	4,650	50	15	407	146,361	0	2	2	39,918	53,078
BN	Denver	26	8,091	87	27	707	254,667			3	95,180	106,000
Subtotal		131	20,491	220	67	1,792	644,962	1	2	6	165,368	183,658
UP	Houston		5,952	64	20	520	187,341					
ATSF	Houston	94	7,440	80	24	650	234,177	2	2	4	96,055	128,738
SP	Houston	91	11,253	121	37	984	354,192	3	1	4	132,681	146,600
SP	Houston/Barb Cut	5	5,487	59	18	480	172,705		2	2	34,450	35,512
Subtotal		190	30,132	324	99	2,634	948,416	5	5	10	263,186	310,850
UP	St Louis	30	5,859	63	19	512	184,414	2		2	46,920	57,485
CR	East St Louis	45	9,951	107	33	870	313,211	4		4	134,000	141,000
NS	St Louis	20	7,626	82	25	667	240,031	2		2	40,104	29,627
BN	St Louis	14	4,464	48	15	390	140,506			2	75,819	89,424
Subtotal		109	27,900	300	91	2,439	878,163	8	0	10	296,843	317,536
NS	Columbus	N/A	2,697	29	9	236	84,889	1		1	N/A	
CR	Columbus	40	4,929	53	16	431	155,142	3		3	82,888	91,422
Subtotal		40	7,626	82	25	667	240,031	4	0	4	82,888	91,422
CR	Kearney, NJ	80	16,833	181	55	1,472	529,825	8		8	343,319	341,660
CR	North Bergen	38	15,159	163	50	1,325	477,135	4		4	98,000	100,000
CSL	Little Ferry	18	6,625	71	22	579	208,524	2		2	na	43,788
Subtotal		136	38,617	415	127	3,376	1,215,485	14	0	14	441,319	485,448

Appendix Table 9
TERMINAL CAPACITY AT MAJOR HUBS

RR	Terminal	Acres	Track Feet	Car Capacity Flat Cars	Stack Cars	Estimated Daily Lift Capacity	Estimated Annual Lift Capacity	Lift Machines Side-loaders	Over-head	Total	Actual 1987 Lifts	Actual 1988 Lifts
CSX	Baltimore	59	7,998	86	26	699	251,740	3		3	69,058	102,469
CR	Baltimore	32	5,301	57	17	463	166,851	2		2	59,000	71,000
Subtotal		91	13,299	143	44	1,163	418,591	5	0	5	128,058	173,469
CSX	New Orleans	6	5,580	60	18	488	175,633		2	2	54,541	79,827
NS	New Orleans	10	1,488	16	5	130	46,835		2	2	25,500	22,000
UP	New Orleans	2	2,325	25	8	203	73,180	1		1	26,203	11,367
SP	New Orleans	34	3,162	34	10	276	99,525	2	0	2	63,356	65,484
Subtotal		52	12,555	135	41	1,098	395,173	3	4	7	169,600	178,678
CSX	Atlanta	79	15,810	170	52	1,382	497,626	3	1	4	194,542	202,789
NS	Atlanta	N/A	9,304	100	31	813	292,847	2	6	8	146,588	169,727
Subtotal		79	25,114	270	82	2,196	790,473	5	7	12	341,130	372,516
NS	Memphis	9	1,953	21	6	171	61,471		2	2	35,000	35,000
CSL	Memphis	N/A	1,395	15	5	122	43,908	2		2	42,883	56,333
BN	Memphis	25	5,580	60	18	488	175,633			3	91,860	102,967
SP	Memphis	55	5,487	59	18	480	172,705	2	0	2	80,850	82,755
Subtotal		89	14,415	155	47	1,260	453,718	4	2	9	250,593	277,055

Source: Railroad contacts and published descriptions.

Appendix B

Intermodal Freight Telephone Study Questionnaire

N. K. FRIEDRICHS & ASSOCIATES, INC.
2500 CENTRE VILLAGE
431 SOUTH 7TH STREET
MINNEAPOLIS, MN 55415

____ (1-4) __1__ (5)

QUESTIONNAIRE
TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY

RECORD NAME: ____________________

JOB TITLE: ____________________

COMPANY: ____________________

ADDRESS: ____________________

CITY & STATE: ____________________

VERIFY PHONE #: ____________________

THANK RESPONDENT AND DISCONTINUE.

INTERVIEWER: ____________________ DATE: ____________________

YOU ARE TO INTERVIEW THE KEY DECISION MAKER REGARDING FREIGHT SHIPMENTS.

Hello, this is (NAME) from Friedrichs & Associates. We are working with the Metropolitan Council to conduct a study with key Transportation Managers, and we would like to include your opinions.

1. Are you the person who manages the inbound or outbound freight for your company?

Yes .... 1 → **CONTINUE.**
No .... 2 → **ASK FOR THE APPROPRIATE PERSON.**

B. Do you receive or ship freight in truckload size quantities?

Yes .... 1 → **CONTINUE.**
No .... 2 → **THANK RESPONDENT AND DISCONTINUE. TALLY AT #1 ON CONTACT SHEET.**

2-A. Thinking of your freight handling locations in Minnesota and Western Wisconsin, how many truckload size shipments do you receive in a typical week?

____________ (6-9)

B. And how many do you ship in a typical week?

____________ (10-13)

C. **IF THE SUM OF "A" AND "B" IS 5 OR MORE, CONTINUE.
IF NOT, THANK RESPONDENT AND DISCONTINUE. TALLY AT #2 ON CONTACT SHEET.**

3-A. Is your business primarily manufacturing, wholesaling, retailing, warehousing, or some other type?

Manufacturing 1
Wholesaling 2 (14)
Retailing 3
Warehousing 4
Other:
_______________________________ 5 (15-16)

B. What are the major products that your company manufactures or distributes? (17-21)

____

____

____

4-A. When dealing with truckload size quantities, how many freight handling locations do you have in Minnesota and Western Wisconsin?

_______________ → IF ONE, ASK B. (22-24)
IF MORE THAN ONE ASK C.

B. In what direction is that location from the Minneapolis/St. Paul metro area?

North 1
South 2
East 3 (25)
West 4
Is in the metro area 5
Other: _________________________ 6

C. In what direction are most of these locations from the Minneapolis/St. Paul metro area?

North 1
South 2
East 3 (26)
West 4
Is in the metro area 5
Other: _________________________ 6

D. What is the mileage between your company's major freight handling facilities in Minnesota and Western Wisconsin and the Burlington Northern Hub on Pierce Butler in St. Paul?

_______________________ miles (27-29)

_______________________ miles (30-32)

_______________________ miles (33-35)

Don't Know ....X (36)

4-E. What is the mileage between your company's major freight handling facilities in Minnesota and Western Wisconsin and the Soo Line Hub on 30th Avenue North East in Minneapolis?

______________ miles (37-39)

______________ miles (40-42)

______________ miles (43-45)

Don't Know ....X (46)

5. Approximately how many full time employees does your company have in Minnesota and Western Wisconsin?

______________ (47-50)

6. How important are freight services to your company's competitiveness? Would you say -- **READ LIST:**

Extremely important 1
Very important 2
Somewhat important 3 (51)
Not very important 4
or Not at all important 5

7. Who are your major truckload carriers? **DO NOT READ LIST. PROBE:** Any other major carriers?

Builders Transport 1
Cannon Express 2
Celadon Trucking............... 3
Freymiller 4
Heartland Express 5 (52)
Intrenet................................. 6
J. B. Hunt.............................. 7
Landstar 8
M. S. Carriers 9
Marten Transport 0
MNX 1
Munson Transportation 2
P.A.M. Transport 3
Schneider 4 (53)
Swift Transportation 5
USA Truck 6
Werner Enterprises 7
Other: (54-57)
______________________________ 8
____
____
____

8. Now I have some questions about rail intermodal shipping. Are you familiar with this term? **IF NOT CERTAIN, READ DESCRIPTION:**

By rail intermodal I mean freight that is shipped in a trailer or container with part of the movement by railroad. Usually, the trailer or container is picked up at the origin facility or port by truck and delivered to a rail intermodal terminal. The trailer or container is loaded on a rail car, transported by rail to an intermodal terminal in the destination region and then delivered to the destination facility or port by truck.

A. Do your major suppliers have access to rail intermodal service?

Yes 1
No 2 (58)
Don't Know 3

B. Do your major customers have access to rail intermodal service?

Yes 1
No 2 (59)
Don't Know 3

C. Do your major truckload carriers use rail intermodal either for your company or for other shippers?

Yes 1
No 2 (60)
Don't know 3

9-A. Now thinking of your freight handling locations in Minnesota and Western Wisconsin, do any of your inbound or outbound shipments move by rail intermodal?

Yes .... 1 → CONTINUE.
No .... 2 → SKIP TO Q.10. (61)

B. Is your rail intermodal volume greater in 1994 than it was in 1993?

Yes .... 1 → CONTINUE.
No .... 2 ⎤
Same as in 1993 .... 3 ⎥ → SKIP TO Q.10. (62)
Don't Know .... 4 ⎦

C. Why is it greater in 1994? PROBE ONCE AND CLARIFY FULLY. (63-65)

____

____

____

____

____

10-A. Are <u>you</u> responsible for the <u>inbound</u> freight that you receive by either rail intermodal or by truck?

Yes .... 1 → SKIP TO C. (66)

No .... 2 → CONTINUE.

B. Who would I speak to for additional information on your inbound freight?

NAME: ____________________

PHONE #: ____________________

C. And are <u>you</u> responsible for the <u>outbound</u> freight that you ship by either rail intermodal or by truck?

Yes .... 1 → SKIP TO NEXT APPROPRIATE SECTION. (67)

No .... 2 → CONTINUE.

D. Who would I speak to for additional information on your outbound freight?

NAME: ____________________

PHONE #: ____________________

E. CONTINUE WITH NEXT APPROPRIATE SECTION.

___ 2
(1-4) (5)

INBOUND FREIGHT

Now please think about the inbound freight that you receive either by rail intermodal or by truck at locations in Minnesota and Western Wisconsin.

1-A. How many shipments of truckload size inbound freight do you receive in a 12 month period.

(6-10)

____

B. How many of these shipments move only by truck from port of entry or point of origin to destination – and how many move by rail intermodal in a trailer or container?

by Truck .... ____________ (11-15)

by Rail Intermodal ..... ____________ (16-20)

MUST TOTAL TO ANSWER AT A: [ ]

2. IF ANSWER TO RAIL INTERMODAL AT "B" IS ZERO, SKIP TO Q.4 ON NEXT PAGE.

A. How many rail intermodal shipments come in a trailer and how many in a container?

in Trailer .... ______________ (21-25)

in Container ...... ______________ (26-30)

MUST TOTAL TO RAIL INTERMODAL ANSWER AT 1-B: [ ]

B. IF ANSWER TO TRAILER AT "2-A" IS ONE OR MORE, ASK: What is the length of the most common size trailer that is used?

(31-32)

____

C. IF ANSWER TO CONTAINER AT "2-A" IS ONE OR MORE, ASK:

- What is the length of the most common size container that is used?

(33-34)

____

- How many of the (READ ANSWER TO 2-A "CONTAINER") containers that you receive in a 12 month period move through a port? (35-39)

______________________ IF NONE, SKIP TO Q.3.

2-D. Which major steamship companies handle your product that then moves by inbound rail intermodal freight into Minnesota or Western Wisconsin? DO NOT READ LIST. PROBE: Any others?

ACL 1
American President 2
Evergreen 3
Hanjin 4
Maersk Line 5 (40)
Mitsui O. S. K. Lines 6
NYK Line 7
OOCL 8
Sea-Land Service 9
Other:
______________________________ 0
______________________________ (41-42)
____

Don't know X

3. Which railroads handle your inbound rail intermodal freight that is shipped into Minnesota or Western Wisconsin? DO NOT READ LIST. PROBE: Any others?

Burlington Northern 1
Canadian Pacific/Soo Line 2
Chicago and North Western 3
Canadian National 4
Conrail 5 (43)
CSX 6
Norfolk Southern 7
Santa Fe 8
Southern Pacific 9
Union Pacific 0
Other:
______________________________ X
______________________________ (44-46)
____

4-A. What are the major commodities that you receive in shipments of truckload size either by truck or rail intermodal in Minnesota and Western Wisconsin? (47-49)

____
____
____

4-B. What are the major origination points for these commodities? **IF NEEDED, READ LIST:**

Canada 1 (50)
Mexico 2
United States - **SPECIFY STATES:** (51-54)

____

____

____

Overseas - **SPECIFY PORTS OF ENTRY:** (55-57)

____

____

____

C. What percent of these commodities are imported from Canada, Mexico, or some other country?

__________ % (58-60)

D. **IF ANY ARE IMPORTED, ASK:** What percent is from -- **READ LIST.**

Canada .... __________ % (64-66)
Mexico .... __________ % (67-69)
Other ports of entry:
(61-63)

____________________ .... __________ % (70-72)

____________________ .... __________ % (73-75)

____________________ .... __________ % (76-78)

MUST TOTAL ANSWER AT "C": [ ]

____ (1-4) 3 (5)

E. What percent of the commodities that you receive in truckload size in Minnesota and Western Wisconsin come from each of the following sources -- **READ LIST AND THEN GO BACK OVER THE LIST, ONE AT A TIME:**

From a supplier's plant .... __________ % (9-11)

From a warehouse or distribution center .... __________ % (12-14)

Directly from a port of entry .... __________ % (15-17)

or From some other source:
(6-8)

____________________ .... __________ % (18-20)

____________________ .... __________ % (21-23)

MUST TOTAL TO [100%]

4-F. How frequently do you receive these commodities – **READ LIST**:

Daily 1
More often than once a week........ 2
Once a week 3 (24)
2 or 3 times a month.................... 4
Once a month 5
or Less often 6

G. What is the average transportation rate for these commodities, excluding any ocean freight charges?

$______________per Ton 1
(25-27) Pound.......... 2 (28)
Mile 3
Other: ______________ 4

H. What is your preferred length of truck, trailer, or container for an inbound shipment of these commodities?

______________ (29-30)

I. What percent of these inbound commodities would you classify as high, average, or low value? By high value I mean $100,000 or more for a 48 foot size shipment. Low value is $30,000 or below.

High.................. ________% (31-33)
Average............. ________% (34-36)
Low.................... ________% (37-39)

MUST TOTAL TO 100%

J. Is the time sensitivity of your major inbound commodities – READ LIST:

Overnight 1
Too meet a schedule on-time 2
Too meet a schedule consistently or reliably ... 3 (40)
Some other time sensitivity................................ 4
or is it not time sensitive 5

K. Who chooses the shipping method and routes for your major inbound commodities that are shipped into Minnesota or Western Wisconsin-- READ LIST: (YOU MAY HAVE MORE THAN ONE ANSWER.)

You 1
Your supplier 2 (41)
or A third party 3

4-L. **IF A THIRD PARTY IS USED, ASK:**

What percent is decided by a third party?

_______________% (42-44)

What is the name of this third party? **DO NOT READ LIST.**

American President (APL or APDS) 1
Alliance Shipping 2

Commerce Express 4
CSXI 5 (45)
Dart Intermodal 6
GST 7
Global Transportation 8
Hub City 9
Intermodal Sales Corporation 0
Intermodal Transport (ITCO) X
Norman G. Jensen .... Y
King Shipping 1
Mark VII 2
McCann's Transportation Company 3
Midwest Gateway 4
Midwest Shippers 5 (46)
Rail Van 6
Riss 7
C.H. Robinson 8
Twin Modal 9
Other:
_______________ 0
_______________ (47-49)
____

5. **REFER TO PAGE 6, Q.1-B. IF RAIL INTERMODAL IS USED, CONTINUE BELOW. IF NOT, SKIP TO NEXT APPROPRIATE SECTION.**

A. For shipments of these commodities that come by rail intermodal, which intermodal terminals are used at the major points of origination or ports of entry?

RAILROAD (50-58)	CITY (59-67)

5-B. And which intermodal terminals are used closest to the <u>point of destination</u> ? **DO <u>NOT</u> READ LIST.**

<u>RAILROAD</u>	(68)	<u>CITY</u>	(73)
Canadian Pacific/Soo Line	1	Minneapolis	1
Burlington Northern	2	St. Paul	2
Other:	(69-72)		(74-77)
______________	3	______________	3
______________	4	______________	4
______________	5	______________	5

C. What is the relative cost of moving these inbound materials by truck as compared with rail intermodal? Is truck shipment -- **READ LIST:**

Much more expensive 1
Somewhat more expensive 2
About the same 3 (78)
Somewhat less expensive 4
or Much less expensive than rail intermodal shipping ... 5
DO NOT READ: Don't Know X

D. If you needed to increase the <u>size</u> of your inbound shipments, would that increase your use of intermodal service?

Yes 1
No 2 (79)
Don't Know 3

E. If the method of <u>packaging</u> major inbound commodities was improved, would that increase your use of intermodal service?

Yes 1
No 2 (80)
Don't Know 3

6. **CONTINUE WITH NEXT APPROPRIATE SECTION.**

___ (1-4) 4 (5)

OUTBOUND FREIGHT

Now please think about the outbound freight that you ship either by rail intermodal or by truck from locations in Minnesota and Western Wisconsin.

1-A. How many shipments of truckload size outbound freight do you make in a 12 month period.

(6-10)

____

B. How many of these shipments move only by truck from point of origin to port of exit or destination – and how many move by rail intermodal in a trailer or container?

by Truck .... ____________ (11-15)

by Rail Intermodal ..... ____________ (16-20)

MUST TOTAL TO ANSWER AT A: [ ]

2. IF ANSWER TO RAIL INTERMODAL AT "B" IS ZERO, SKIP TO Q.4 ON NEXT PAGE.

A. How many rail intermodal shipments are made in a trailer and how many in a container?

in Trailer .... ____________ (21-25)

in Container ...... ____________ (26-30)

MUST TOTAL TO RAIL INTERMODAL ANSWER AT 1-B: [ ]

B. IF ANSWER TO TRAILER AT "2-A" IS ONE OR MORE, ASK: What is the length of the most common size trailer that is used? (31-32)

____

C. IF ANSWER TO CONTAINER AT "2-A" IS ONE OR MORE, ASK:

- What is the length of the most common size container that is used?

(33-34)

____

- How many of the (READ ANSWER TO 2-A "CONTAINER") containers that you ship in a 12 month period move through a port? (35-39)

______________ IF NONE, SKIP TO Q.3.

2-D. Which major steamship companies handle your product that was carried by rail intermodal from Minnesota or Western Wisconsin? DO NOT READ LIST. PROBE: Any others?

ACL 1
American President.................... 2
Evergreen.................................... 3
Hanjin.. 4
Maersk Line................................. 5 (40)
Mitsui O. S. K. Lines 6
NYK Line...................................... 7
OOCL 8
Sea-Land Service 9
Other:
________________________________ 0
________________________________ (41-42)
____
Don't know X

3. Which railroads handle your outbound rail intermodal freight that is shipped from Minnesota or Western Wisconsin? DO NOT READ LIST. PROBE: Any others?

Burlington Northern 1
Canadian Pacific/Soo Line 2
Chicago and North Western 3
Canadian National 4
Conrail 5 (43)
CSX 6
Norfolk Southern........................ 7
Santa Fe 8
Southern Pacific.......................... 9
Union Pacific 0
Other:
________________________________ X
________________________________ (44-46)
____

4-A. What are the major products that you ship in truckload size either by truck or rail intermodal from Minnesota and Western Wisconsin? (47-49)

____
____
____

4-B. What are the major destination points for these products? IF NEEDED, READ LIST:

Canada 1 (50)
Mexico 2
United States - SPECIFY STATES: (51-54)

____

____

____

Overseas - SPECIFY PORTS OF EXIT: (55-57)

____

____

____

C. What percent of these products s are exported to Canada, Mexico, or some other country?

__________% (58-60)

D. IF ANY ARE EXPORTED, ASK: What percent is shipped to -- READ LIST.

Canada ....__________% (64-66)
Mexico ....__________% (67-69)
Other ports of exit:
(61-63)
______________..........__________% (70-72)
______________..........__________% (73-75)
______________..........__________% (76-78)

MUST TOTAL ANSWER AT "C": [ ]

____ (1-4) 5 (5)

E. What percent of the products that you ship in truckload size from Minnesota and Western Wisconsin come from each of the following sources -- READ LIST AND THEN GO BACK OVER THE LIST, ONE AT A TIME:

From a plant ....__________% (9-11)

From a warehouse or
distribution center ....__________% (12-14)

or From some other type of location: (15-17) B
(6-8)
______________..........__________% (18-20)
______________..........__________% (21-23)

MUST TOTAL TO [100%]

4-F. How frequently do you ship these products -- **READ LIST:**

Daily 1
More often than once a week........ 2
Once a week 3 (24)
2 or 3 times a month........................ 4
Once a month 5
or Less often 6

G. What is the average transportation rate for these products, excluding any ocean freight charges?

$________________ per Ton 1
(25-27) Pound........... 2 (28)
Mile 3
Other: ________________ 4

H. What is your preferred length of truck, trailer, or container for shipments of these products?

________________ (29-30)

I. What percent of these outbound products would you classify as high, average, or low value? By high value I mean $100,000 or more for a 48 foot size shipment. Low value is $30,000 or below.

High.................... __________% (30-33)
Average............. __________% (34-36)
Low .... __________% (37-39)

MUST TOTAL TO 100%

J. Is the time sensitivity of your major outbound products -- **READ LIST:**

Overnight 1
Too meet a schedule on-time 2
Too meet a schedule consistently or reliably ... 3 (40)
Some other time sensitivity................................. 4
or is it not time sensitive 5

K. Who chooses the shipping method and routes for your major outbound products that are shipped from Minnesota or Western Wisconsin-- **READ LIST: (YOU MAY HAVE MORE THAN ONE ANSWER.)**

You 1
Your supplier 2 (41)
or A third party 3

4-L. **IF A THIRD PARTY IS USED, ASK:**

What percent is decided by a third party?

____________________% (42-44)

What is the name of this third party? **DO NOT READ LIST.**

American President (APL or APDS) 1
Alliance Shipping 2

Commerce Express 4
CSXI 5 (45)
Dart Intermodal 6
GST 7
Global Transportation 8
Hub City 9
Intermodal Sales Corporation 0
Intermodal Transport (ITCO) X
Norman G. Jensen .... Y
King Shipping 1
Mark VII 2
McCann's Transportation Company 3
Midwest Gateway 4
Midwest Shippers 5 (46)
Rail Van 6
Riss 7
C.H. Robinson 8
Twin Modal 9
Other:
____________________ 0 (47-49)
____
____

5. **REFER TO PAGE 12, Q.1-B. IF RAIL INTERMODAL IS USED, CONTINUE BELOW. IF NOT, SKIP TO NEXT SECTION.**

A. For shipments of these commodities that move by rail intermodal, which intermodal terminals are used closest to the point of origination? **DO NOT READ LIST.**

RAILROAD (50)		CITY (55)	
Canadian Pacific/Soo Line	1	Minneapolis	1
Burlington Northern	2	St. Paul	2
Other: (51-54)		(56-59)	
__________	3	__________	3
__________	4	__________	4
__________	5	__________	5

5-B. And which intermodal terminals are used at the <u>point of destination</u>?

RAILROAD (60-68)	**CITY** (69-77)
______________________	__________________
______________________	__________________
______________________	__________________
______________________	__________________
______________________	__________________
______________________	__________________

C. What is the relative cost of shipping these outbound materials by truck as compared with rail intermodal? Is truck shipment -- **READ LIST:**

Much more expensive 1
Somewhat more expensive 2
About the same 3
Somewhat less expensive 4 (78)
or Much less expensive than rail intermodal shipping ... 5
DO NOT READ: Don't Know X

D. If you needed to increase the <u>size</u> of your outbound shipments, would that increase your use of intermodal service?

Yes 1
No 2 (79)
Don't Know 3

E. If the method of <u>packaging</u> major outbound products was improved, would that increase your use of intermodal service?

Yes 1
No 2 (80)
Don't Know 3

6. CONTINUE WITH NEXT SECTION.

___ (1-4) 6 (5)

ASKED OF EVERYONE

1-A. Which of the following improvements in rail intermodal service in the Minneapolis - St. Paul area might increase your use of this service in the future.

The first item is – **READ LIST, ONE AT A TIME:**

More frequent rail service 1

Improved reliability of rail service 2

Reduced rail transit time 3

Reduced intermodal terminal time at the origin for inbound shipments 4

Reduced intermodal terminal time at the destination for outbound shipments 5 (7)

Reduced intermediate terminal time at transfer points such as Chicago 6

Reduced intermodal terminal time in the Twin Cities 7

Additional terminal capacity in the Twin Cities 8

Improved drayage service from the railroad to your location 9

Reduced transit time from the railroad terminal to your location 0

Increased equipment free time for unloading 1

Improved availability of trailers or containers 2

Improved availability of electronic services to trace shipments 3

Improved availability of electronic services to access rates 4

Improved availability of services to book freight 5 (8)

Improved availability of services to process claims 6

Improved availability of services for EDI or Electronic Data Interchange 7

Reduction in relative cost of rail intermodal service 8

Reduction in packaging costs needed for damage prevention 9

1-B. Are there any other factors or technological improvements that would increase your use of rail intermodal service? **PROBE AND CLARIFY.** (9-12)

2-A. If rail intermodal services to and from the Minneapolis - St. Paul area were improved by providing additional terminal capacity and service, would your company consider expanding your use of rail intermodal?

Yes 1
No 2 (13)
Don't Know 3

B. If improvements in intermodal service in the Minneapolis - St. Paul area were available, do you think your company might consider expansion such as by adding plant or warehouse capacity at some point in the future?

Yes 1
No 2 (14)
Don't Know 3

C. If your business situation changed so that your shipping volume <u>increased</u>, would that increase your use of intermodal service?

Yes 1
No 2 (15)
Don't Know 3

3. How do you expect the North American Free Trade Agreement to impact your business? (16-20)

4-A. In the next year or two, what is the outlook for your company's business activities at your Minnesota and Western Wisconsin facilities? Do you expect some growth, no growth, or a decline?

(21)

Some growth ..... 1 → What % growth do you expect per year?________ (22-23)

No growth 2

A decline .... 3 → What % decline do you expect per year?________ (24-25)

B. Going beyond that period, over the next 3 to 5 years, what is the outlook for your company's business activities at your Minnesota and Western Wisconsin facilities? Do you expect some growth, no growth, or a decline?

(26)

Some growth ..... 1 → What % growth do you expect per year?________ (27-28)

No growth 2

A decline .... 3 → What % decline do you expect per year?________ (29-30)

5. IF GROWTH IS EXPECTED AT "A" OR "B" ABOVE, CONTINUE BELOW:

A. In which of your geographic markets do you think growth will occur? (31-35)

____

____

B. From which geographic locations will you obtain inbound commodities to accommodate that growth in production? (36-40)

____

____

____

____

C. Is investment in increased plant capacity likely to be required to accommodate growth?

Yes 1

No 2 (41)

Don't Know 3

6. SKIP TO BOX ON COVER PAGE.

TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY
MAJOR PRODUCTS AND GOODS MOVED BY SURVEY RESPONDENTS

Major Products	Major Inbound Commodities	Major Outbound Products
Tapes, medical supplies, chemicals, and film	Raw material or semi-finished goods for the manufacture of tape and other finished goods*	Finished goods, such as tape and chemicals*
Insulation	Insulation and steel	Insulation and steel
Windows and doors	Lumber*	Windows and doors*
Foods, such as turkey, ham, and beef	Raw meat; packaging materials, such as boxes and bags	Foods, such as turkey, ham and beef
Horticultural products - trees, shrubs, and plants	Lawn furniture and bark chips*	Perishable products, such as shrubs, trees and plants
Consumer electronics	Consumer electronics*	Consumer electronics
Design engineering for the manufacturing of milling equipment	No answer	Flour milling and beer brewing equipment*
Double-pane windows	Sheets of glass	Glass windows*
Rolls of paper for printing industries	Clay, kraft, wood and various chemicals, such as alum and sulfuric acid	Printing paper in rolls*
Furniture and electronics	Furniture and electronics*	Electronics, computer accessories, games, toys, and exercise equipment*
Stock for printing checks	Paper products	Blank checks and related paper items
Clothing, household items, appliances and furniture	Clothing, household items, appliances, and furniture*	Clothing, household items, appliances, and furniture*

TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY
MAJOR PRODUCTS AND GOODS MOVED BY SURVEY RESPONDENTS

Major Products	Major Inbound Commodities	Major Outbound Products
Foodstuffs of every type	Salt, paper, foodstuffs*	Foodstuffs of every type
Finished vehicles	Auto parts*	Finished vehicles
Deodorants, shampoo, conditioner, razors, blades (personal care)	Alcohol, empty bottles, caps, raw materials	Deodorant, shampoo, conditioner, razors, blades (personal care)*
Microwave food products, such as popcorn and french fries	Corn and oil	Microwave foods, such as popcorn, and french fries
Food handling equipment	Manufacturing goods - primarily raw materials to finish products	Food handling equipment
Adhesive sealant coatings and cleaning compounds	Resins, waxes, emulsions and acids, and packaging materials	Adhesive sealant coatings and cleaning compounds*
Soybean oil, meal, and flour	Crude soybean oil and soybeans	Soybean oil, meal, and flour
Controls	Controls	Sub-assemblies and controls
Animal feed	Feed ingredients - animal feed products	Feed ingredients - ingredients for animal feed production
IBM AS-400 Computer System	Computer frames and packaging for finished computer products	Finished goods - fully assembled computers
Printed material, such as printed continuous forms and third class mailers	No answer	Printed material, such as printed continuous forms

TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY
MAJOR PRODUCTS AND GOODS MOVED BY SURVEY RESPONDENTS

Major Products	Major Inbound Commodities	Major Outbound Products
Flour and pizza crusts; food products for restaurants.	Canned goods and vegetables*	Variety of food products for restaurants
Household goods	Household goods*	Household goods*
Bird food ingredients	Grains and seeds	Bird food ingredients*
Corrugated boxes; corrugated products; plastic products, and material handling equipment, such as two-wheeled carts	Paper; manufactured parts, such as two wheeled hand carts; and office equipment, such as office racks or office partitions*	Office equipment, such as vertical file hangers; graphics furniture, such as cabinets for blueprints; plastic products, such as ice cream pails and diaper pails, and material handling products, such as two-wheeled carts and four-wheel flat trucks
Plastic laminated casework (laminated plastic cabinets for institutional settings, such as schools and hospitals)	No answer	Plastic laminated casework (laminated plastic cabinets for institutional settings, such as schools and hospitals)
Roofing and insulation	Insulation	Building materials; roofing materials; insulation materials
Envelopes	Paper	Envelopes
Cereal	Wheat, sugar and flour	Cereal
Disposable medical devices, such as catheters	Packaging film and corrugated paper	Disposable medical devices, such as catheters*
Steel and steel tubing	All steel	Class 50 steel tubing
Soft drinks, such as Coca-Cola; syrups; Mendota Springs water; and food products, such as HI-C and Welch's Grape Juice	Corrugated products and packaging material, such as 12-pack cartons, cases and boxes; Glass or plastic bottles; and cans	Soft drinks, such as Coca-Cola; syrups; Mendota Springs water; and food products, such as HI-C and Welch's Grape Juice.

TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY
MAJOR PRODUCTS AND GOODS MOVED BY SURVEY RESPONDENTS

Major Products	Major Inbound Commodities	Major Outbound Products
Pork products	Cardboard and plastics (for packaging)	Fresh pork*
Pre-recorded video and audio	Pre-recorded video and audio*	Pre-recorded video and audio*
Skid steer loaders and accessories	Engines; dumper bodies and parts*	Skid-loaders*
Bakery flour	Grain; packaging materials; various flour enrichments	Bakery flour and by-products*
Generating sets	All raw materials used in the manufacture of generating sets, such as steel, engines, wire and castings*	Generating sets*
Paper towels, bath tissue, facial tissue, napkins and diapers	Scrap paper; paper material for diapers	Paper towels, bath tissue, facial tissue, napkins, and diapers
Fine papers; dimension lumber	Raw materials*	Fine papers; wood products*
Shampoo and toilet preparations (hair spray, conditioner, mousse, gel, etc.)	Chemicals; plastic containers	Hair care products like shampoo, conditioner, hair spray
Aluminum ingot	Scrap aluminum	Aluminum ingot
Beer	No answer	Beer
Groceries	Canned goods*	Groceries
Silk screen ceramic cups	Ceramic cups (not silk screened)*	Ceramic cups (silk screened)
All retail products: clothing, household goods, furniture and appliances	All retail products*	All retail products: clothing, household goods, furniture and appliances

TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY
MAJOR PRODUCTS AND GOODS MOVED BY SURVEY RESPONDENTS

Major Products	Major Inbound Commodities	Major Outbound Products
Temperature control equipment	Aluminum and engines*	Refrigeration and heating/cooling equipment*
Outdoor beautification equipment: lawn mowers, snow blowers, recycling and trash equipment	Work-in-process, raw materials, steel castings, paint and tires*	Outdoor beautification equipment: lawn mowers, snow blowers, recycling and trash equipment*
Pharmaceuticals (medicines)	Bulk chemicals: potassium chloride powder and hydrogenated vegetable oil; plastic bottles	Pharmaceuticals (medicines)
Lumber, plywood and building products	Lumber, plywood and particle board*	Lumber, plywood and wafer board
Household freezers	Appliance parts	Household appliances such as freezers*
Recycled boxboard, corrugating medium and folding cartons	Boxboard, machine spare parts, inks and glues	Recycled boxboard and folding cartons
Equipment for the performing arts: sound modules, risers, acoustical shells and chairs	Insulation, wood and steel	Equipment for the performing arts: sound modules, risers, acoustical shells and chairs
Law and text books	Paper*	Books

*These include goods moved by rail intermodal.

Appendix C

Summary of Market Research Telephone Study of Traffic Managers

APPENDIX C

SUMMARY OF MARKET RESEARCH TELEPHONE SURVEY OF TRAFFIC MANAGERS

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APPENDIX C

SUMMARY OF MARKET RESEARCH TELEPHONE SURVEY OF TRAFFIC MANAGERS

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TWIN CITIES REGION INTERMODAL TERMINAL NEEDS STUDY
SUMMARY OF TRAFFIC MANAGERS SURVEY

More than 80 Twin City region companies were contacted by N.K. Friedrichs & Associates, Inc. (NKF) and invited to complete a 30-45 minute telephone interview concerning freight movement characteristics and opinions on rail freight intermodal services. 55 companies completed interviews, two of which subsequently were determined to be outside the study scope as they are located closer to other intermodal facilities which they used and do not use either Twin City facilities.

OVERVIEW OF FREIGHT ACTIVITY

1. **Do you receive or ship freight in truckload size quantities?**

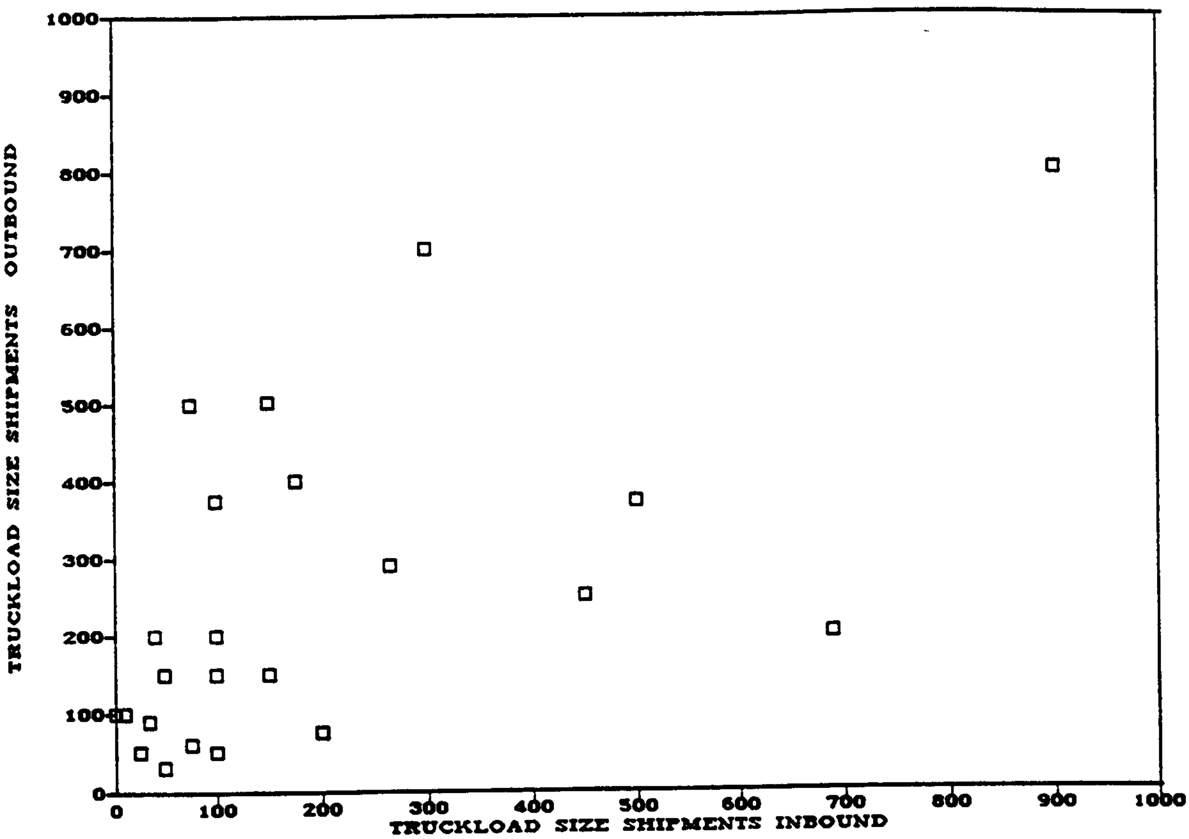
About a dozen of the more than 80 firms contacted did not ship or receive in truckload size quantities. In addition, in response to Question # 2, five other contacted firms averaged less than one truckload (either inbound or outbound) a day, which was a threshold level for participation. Interviews with four traffic managers could not be completed because they were on extended leave without replacement during the time the interviews were being conducted. Several other firms never responded to requests for interviews and eight firms refused to participate as a matter of corporate policy.

2. **How many truckload size shipments do you receive in a typical week and how many do you ship in a typical week?**

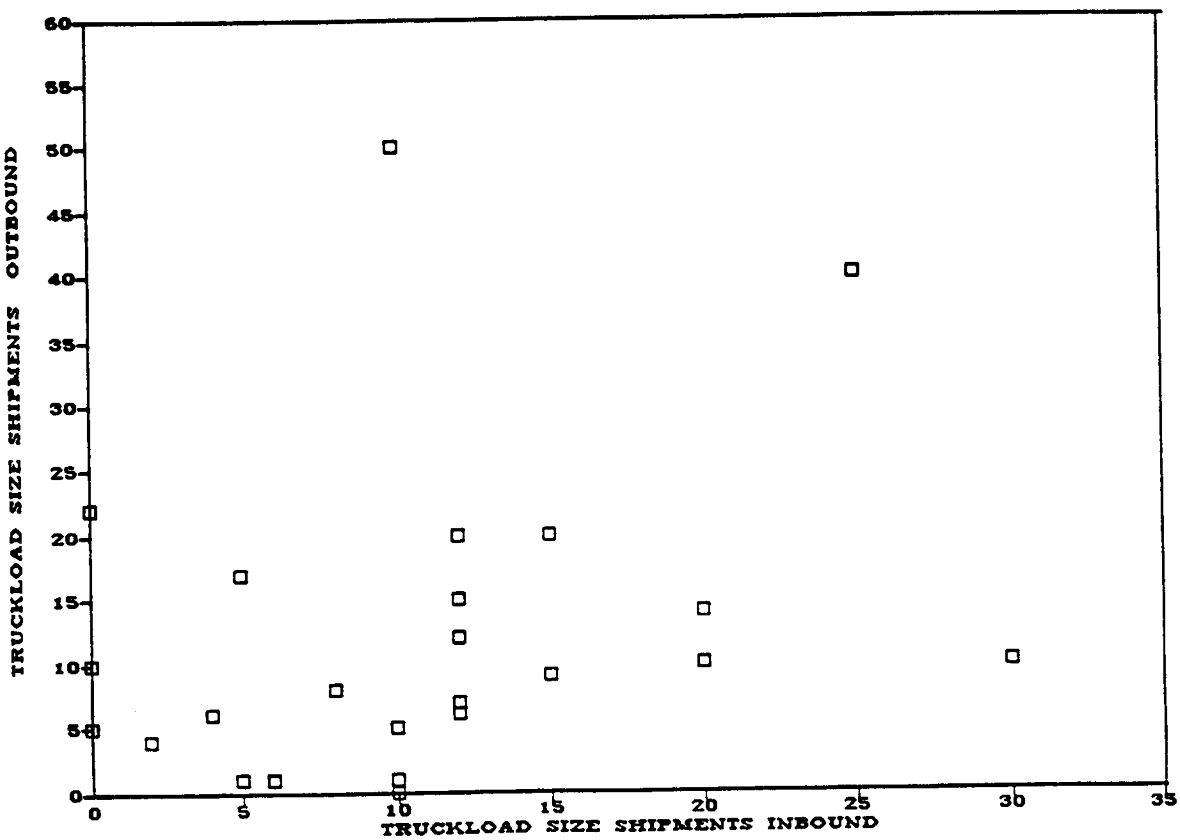
Weekly volume averaged 217 total truckload size shipments a week per respondent (95 inbound and 122 outbound) and ranged from the minimum of 5 to a maximum of 1,700 truckload sized shipments. Figure 1 illustrates the diversity of volumes handled by survey respondents. Since over half the

FIGURE 1

WEEKLY TRAFFIC LEVELS OF RESPONDENTS
A. MINIMUM 66 TOTAL LOADS WEEKLY



B. MAXIMUM 65 TOTAL LOADS WEEKLY



respondents have relatively small volumes, the figure is in two parts separating the smallest companies (maximum of 65 total loads a week). Among the larger companies, 19 of 25 used rail intermodal services. Among the 28 companies with 65 or fewer shipments a week, 11 used intermodal.

3A. Is your business primarily manufacturing, warehousing, wholesaling, retailing or some other type?

The majority of firms surveyed are in manufacturing (75 percent). For non-users of intermodal, 91 percent are in manufacturing whereas 63 percent of users were manufacturers. The proportion of users and non-users in the total sample are not significantly different for manufacturing firms and, to a lesser extent, for wholesalers. For retailing, however, 88 percent of the firms surveyed are users and for warehousing (and distributing) companies 80 percent.

3B. What are the major products that your company manufactures or distributes?

The varied responses to this question are presented in Appendix One to this summary. Note that a company's participation in the survey is not confidential but its specific responses, which were evaluated only by the consultant, are confidential.

4A. When dealing with truckload size quantities, how many freight handling locations do you have in Minnesota and Western Wisconsin?

Respondents reported a total of 100 sites handling this type of freight with 70 sites noted by intermodal users. Almost two-thirds of respondents used only one location for this freight and four-fifths used two or less. About the same number of intermodal users as non-users were in these groups. About one fifth of the respondents used more than two locations for truckload size freight movements and all but one of these were intermodal users.

4BC. In what direction is that location (or most of these locations) from the Minneapolis/St. Paul metro area?

Respondents indicated that almost three of five truckload freight handling locations are in the metro area. Over a quarter are south and the remaining one third are distributed in decreasing order among sites north, west and east of the metro area. Among intermodal users, 37 sites were in the Twin Cities Metropolitan Area and 33 were outside. More than three of five respondents who are intermodal users have Minneapolis zip codes (553-4) and less than two in five have St. Paul zip codes (550-1).

4DE. What is the mileage between your company's freight handling facilities in Minnesota and Western Wisconsin and the Burlington Northern Hub/Soo Line Hub?

The average distance from all locations cited was 45 miles to both railroad terminals. Among intermodal users, the average distance cited was 45 miles to Shoreham and 47 miles to Midway Hub. Reported mileages ranged from one mile to a maximum of 225 to Shoreham and 235 to Midway. Non-user average mileages were 43 and 44 miles to Shoreham and Midway respectively. The maximum distance specified by non-users was 120 miles.

5. Approximately how many full time employees does your company have in Minnesota and Western Wisconsin?

Survey respondents included companies over a very wide range of sizes as measured by full time employment with the average size being about 1,500. The average size of companies using intermodal was almost 2,000 whereas non-user companies averaged less than 800 employees. Based on this sample, as company size increased, so did the proportion of users. For companies with at least 500 employees, more than two of three respondents used intermodal. For companies with 1,000 or more employees, more than four out of five used intermodal. Only one of 12 companies with at least 2,000 employees did not use intermodal.

6. **How important are freight services to your company's competitiveness?**

As expected, traffic managers are extremely sensitive to the role freight transportation plays in their companies competitiveness. For both users and non-users, 91 percent of respondents indicated freight service is very or extremely important. A higher proportion of users (three in five) were in the "extremely important" category than were non-users (one in two).

7. **Who are your major truckload carriers?**

Truckload carriers used by respondents are too numerous to enumerate as over 100 companies were reported. Many respondents listed all types of trucking companies used (including LTL carriers) in addition to the major national and regional truckload segment companies. Five companies were cited eight or more times by the 55 respondents: Schneider(10), J.B. Hunt(9), North Star(8) and Transport America(8). Ten respondents also have their own private truck operations, including eight intermodal users.

8. **Do your major suppliers and customers have access to rail intermodal service? Do your major truckload carriers use intermodal?**

More than one in four intermodal user reported that a major supplier or customer did not have access to intermodal service. About as many non-users said their suppliers have access to rail intermodal as said they did not have access.

One of five intermodal user did not know if its major supplier had access to rail intermodal. One in five non-users did not know about availability of intermodal service for their major suppliers and one in six had no knowledge about services available to major customers.

Three of four non-users reported their major truckload carrier did not use intermodal. One in three intermodal user said its major truckload carrier did not use rail intermodal. A very small five percent reported that they did not know whether their major truckload carriers used intermodal.

9A. **Do any of your inbound or outbound shipments move by rail intermodal?**

Three in five survey participants reported using rail intermodal. One third of the users (one in five of the respondents) used intermodal for both inbound and outbound freight and two-thirds used intermodal in only one direction. Two in five users (about one in four respondents) were only inbound intermodal users and one in five used intermodal only outbound. In one instance, a respondent did not make any intermodal arrangements (a supplier did) and did not participate in the inbound part of the survey. It should be noted that these results cannot be expanded to the universe of study region companies as the survey design was not based on a random sample but a representative sample of known or possible intermodal users.

Total weekly use of Twin Cities intermodal facilities by truckload shipment size respondents average 823 units (335 trailers and 488 containers). This represents an estimated one quarter of the Twin Cities intermodal volume, exclusive of non-truckload size shipments handled by carriers such as United Parcel Service, U.S. Postal Service and LTL trucking com3anies.

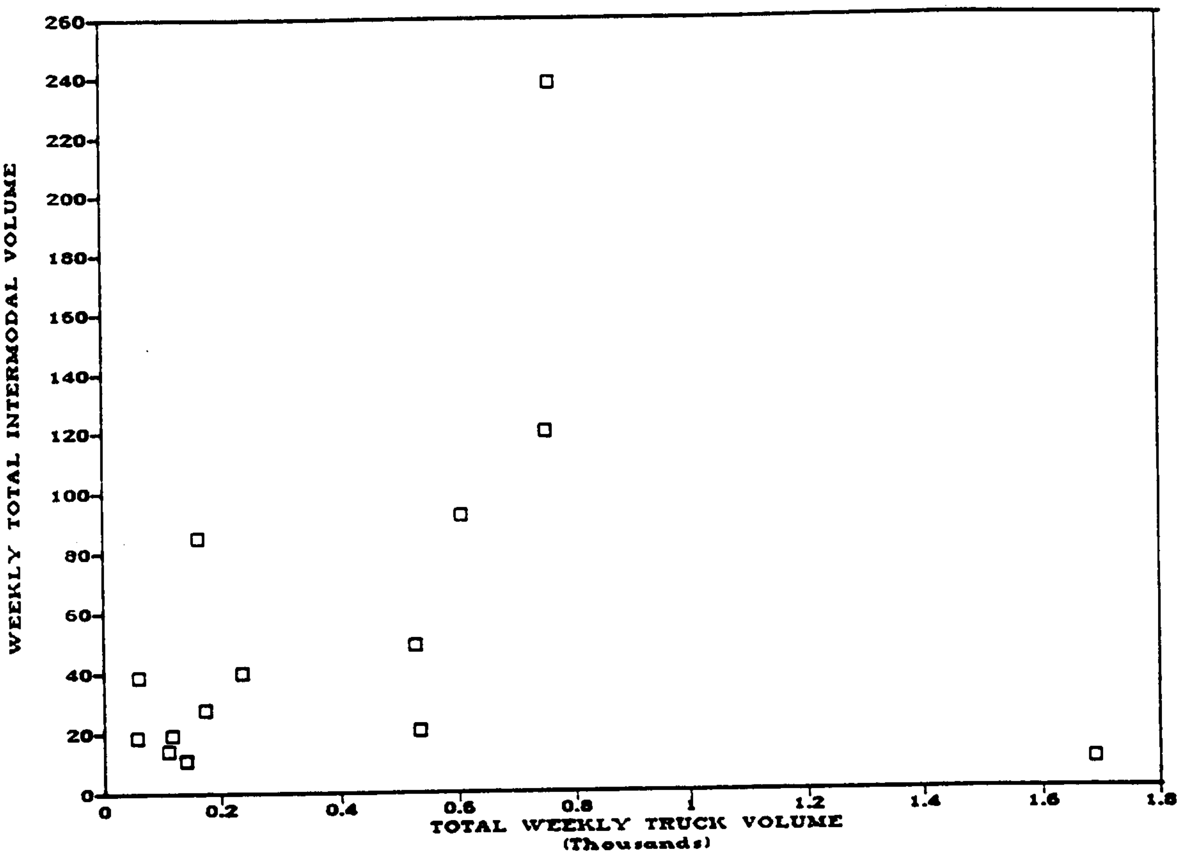
The sample of respondents included a very wide range of usage of rail intermodal services. The largest user averaged 238 intermodal units a week and five users averaged less than one unit a week. Figure 2 illustrates the diversity of size of users contrasting intermodal and truck usage on an average weekly basis. Note that these averages usually are not integers as they are derived from annual estimates.

23 companies indicated they did not use intermodal at all; however, it seems that some of these may have freight moving intermodal but they have contracted out the movement. In five of these cases, respondents had no knowledge of transportation arranged by suppliers. In two other cases, a third party handled part or all of outbound traffic. Since the respondent had contracted out that part of its business, he could not confirm use of

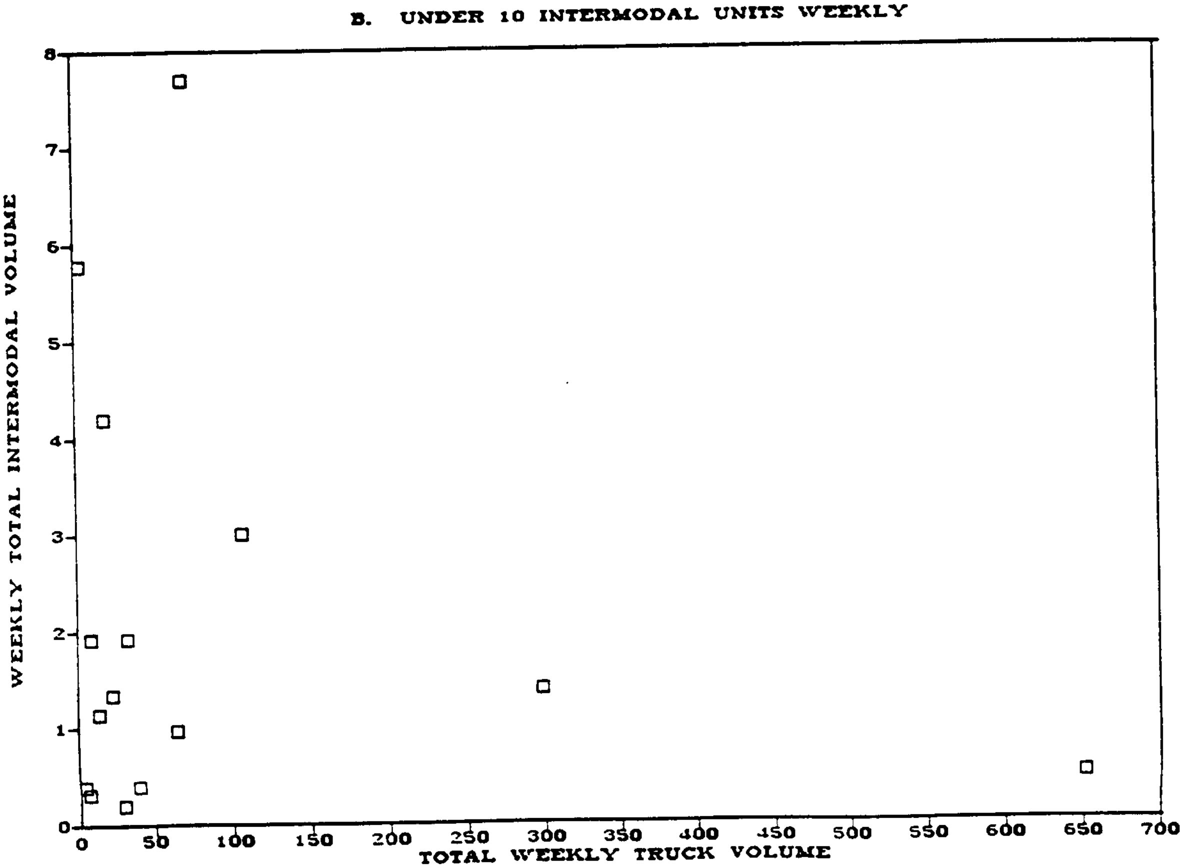
FIGURE 2

WEEKLY TRAFFIC OF INTERMODAL USERS

A. MINIMUM 10 INTERMODAL UNITS WEEKLY



B. UNDER 10 INTERMODAL UNITS WEEKLY



intermodal. One respondent reported export traffic moving in containers handled by a well known user of rail intermodal which likely did move intermodal.

9B. **Is your rail intermodal volume greater in 1994 than in 1993.**

Almost 40 percent of intermodal users reported that volume had increased in 1994, about one third experienced no change and over one quarter had intermodal volume decline. Companies with increased volume ranged from the largest users to among the smallest.

More than half of users with increased volume reported growth in demand. A few increased rail intermodal because of supply problems with trucking service. One respondent (the largest user located outside the metropolitan area) attributed increased use of rail intermodal to improvement in rail service reliability as well as more reliable drayage service.

Although not part of the NKF survey, significant increases in intermodal use occurred in some non-truckload segments. For example, United Parcel intermodal business has increased more than 50 percent in 1994.

INBOUND AND OUTBOUND FREIGHT

1. **How many shipments of truckload size inbound freight do you receive and ship in a 12 month period. How many of these shipments move solely by truck and how many by rail intermodal?**

53 respondents reported almost 260,000 shipments inbound and 294,000 outbound on an annual basis. Truck accounted for 92 percent of the total in each direction. It is estimated that inbound intermodal volumes account for over 27 percent of all such traffic and that the outbound volumes for over 25 percent of current intermodal truckload segment traffic. Intermodal volumes for the 30 users amounted to over 20,000 loads inbound and almost 23,000 outbound. This inbound/outbound mix is 47/53 percent and, thus, the sample results vary only slightly from the estimated current mix of rail intermodal traffic.

2A. **How many intermodal movements are in a trailer and how many in a container?**

Survey respondents reported that trailers accounted for about 40 percent of all inbound and 42 percent of all outbound loads, rates well below the mix for all traffic handled in the Twin Cities. Although this suggest that the sample did not provide a representative mix of trailer and container loads, it is clear that the non-truckload segment (United Parcel etc.) has a very high share of trailers and that the truckload segment represented by the survey sample would have a below average trailer mix.

2B. **What is the length of most common size trailer and container?**

Almost three-quarters of trailers are 48 feet in length and the same ratio of containers are 40 feet in length. Just over ten percent of trailers reported are 53 feet in length which is in sharp contrast to the finding discussed below that over one third of users prefer 53 foot equipment.

2C. How many rail intermodal containers move through a port?

Intermodal users reported that 96 percent of inbound containers moved through a port as did 97 percent of outbound containers, a total of over 24,500 containers. This represents a significant proportion of international freight moving by rail to and from the Twin Cities. The balance of container flows was over 800 containers which is not representative of the large volume of domestic containers moving to and from the Twin Cities.

2D. Which major steamship companies handle your rail intermodal freight?

Many major steamship companies were identified by respondents with no one carrier having a predominant share.

3. Which railroads handle your intermodal freight?

Burlington Northern was cited by four of five respondents as handling inbound freight and by nine of ten as handling outbound intermodal freight. Three of five respondents said Canadian Pacific moved their inbound freight as did one of every two responses concerning outbound traffic.

4A. What are the major inbound and outbound commodities moved by truck or rail intermodal?

Responses are presented in Appendix One.

4B. What are the major origination and destination points?

40 states were cited by survey respondents as origins and destinations with 33 the source of inbound freight and 37 states destinations for outbound products. Illinois, California, Minnesota and Wisconsin were cited most frequently with the last three cited the same number of times. California was destination and Illinois the most frequently cited origin. Iowa, the major Northeastern states and Texas were cited by at least half the respondents.

About one in five users said Canada was either a major point of origin or a major destination. Only one inbound user and one non-user cited Mexico but one in five did for outbound traffic. Overseas countries were major originating points for 30 percent of the respondents. The difference in the proportion of users and non-users is most significant for Canada and overseas originations. Of the respondents who cited Canada as a major origin, 82 percent are intermodal users; of those who mentioned overseas origins, 93 percent are users. Major destinations outside the United States (that is, Canada, Mexico, and overseas) are of equal importance contrary to inbound freight where Mexico has a small share.

4C. What percent are imported and what percent exported?

Only one in ten non-users of intermodal imported compared with one in three intermodal users. Just over one in five non-users exported whereas over 40 percent of rail intermodal users exported.

One in five of the intermodal users imported a small amount (five percent or less) of their inbound freight. A few depended on imports for half their inbound freight and one user imported 100 percent of its freight. Another one quarter of rail intermodal users imported a significant portion of inbound materials in the range of 20 to 30 percent. The two non-users did not import significant amounts.

Intermodal users exported significantly higher shares of their production than did non-users. All but one non-user exported 10 percent or less and the other exported 15 percent. Almost half of the intermodal users exported 15 percent or more of their production up to 50 percent for two users.

4D. What percent are imported and what percent exported from Canada and Mexico?

The intermodal user importing 100 percent imports from Canada. For two other users, Canada was a significant source of materials at 10 and 20 percent of total truckload size inbound freight. The few survey respondents importing from Mexico did so at small level of about five percent of total inbound freight.

Exports to Canada and Mexico from the Twin Cities area did not exceed five percent for any respondent.

4E. What percent of inbound freight is shipped from a plant, warehouse and port and what percent of outbound freight is shipped from a plant and a warehouse?

Plants are the most common source of inbound and outbound freight for both users and non-users in terms of the number of respondents. Warehouses or distribution centers are the next most frequent. Six of seven intermodal users and four of five non-users had at least half their inbound shipments originate at a plant. One in four respondents said 100 percent of the commodities received in truckload size come from plants. Two users and three non-users received all inbound freight from a warehouse or distribution center. Two users received all but a small percent from ports.

On the outbound side, seven of ten intermodal users shipped 80 percent or more of outbound freight from a plant as did four of five non-users. About one user in four shipped almost exclusively from a warehouse or distribution center as did two non-users. Of 40 respondents, 32 said that 100 percent of their outbound goods are shipped from a plant. This represents 80 percent of the non-users and 73 percent of the users. Of 20 respondents, 11 said 100 percent of their goods come from warehouses (33 percent of non-users and 64 percent of users).

4F. How frequently do you receive and ship these commodities?

Three in four companies responded that shipments were received daily and one in five reported more than once a week. The proportion of users was greater than non-users in the 'Daily' and Once a week' categories and lower in the 'more than once a week' category.

Outbound shipments were made on a daily basis at a higher rate than inbound. Four in five companies reported daily shipments, 61 percent of the non-users and 91 percent of the users.

4-H What is the preferred length of equipment for inbound and outbound?

The preferred length of equipment for inbound shipments is 48 and 53 feet. For non-users both these lengths are equally preferred, for users 47 percent prefer 48 foot equipment and 40 percent 53 foot. On the outbound side, both users and non-users prefer 48 feet with 53 foot equipment somewhat less in demand.

4I. What percent of these commodities would you classify as high, average or low value goods? By high value I mean $100,000 or more for a 48 foot size shipment. Low value is $30,000 or below.

Seven of ten non-users reported moving low value goods inbound whereas the rate was over one in three for intermodal users. Over two in five users reported that their inbound goods were average value and only one in five non-users were in this category. No non-users reported moving predominantly high value goods inbound as did one in ten intermodal users.

With outbound freight, intermodal users seem to have a lower percentage of low value goods than non-users and a higher percentage of average value goods. Non-users had a relatively higher share of high value shipments (three of five) than intermodal users (one in five).

4J. What is the time sensitivity of your major commodities?

Most respondents (82 percent) indicated that goods needed to be on-time or moved consistently or reliably. With regard to both inbound and outbound flows, intermodal users were almost evenly divided between these categories with reliability being selected slightly more frequently than timeliness. Non-users selected goods being on-time more frequently than they selected reliability and by larger margins than is the case with users. For non-users the most important criterion is to be on time (51 percent) whereas for users consistency is most important (47 percent).

4K. Who chooses the shipping method and routes?

For inbound freight, 42 of 50 respondents said they are responsible for these choices. Recognizing multiple choices were reported, 25 respondents indicated that suppliers decide. Only two out of fifty respondents mentioned a third party. The relative responses of users and non-users were almost identical. In the great majority of outbound cases, the firm makes these decisions.

5B. Which intermodal terminals are used?

Survey respondents included 22 companies using intermodal for inbound freight. Four of five companies used Midway and three of five used Shoreham. Two of five used both facilities.

Of the 21 respondents providing information on use of intermodal for outbound freight, two did not use a Twin Cities facility. One, located on I-90 in southwest Minnesota, used facilities in Omaha and Chicago. Another respondent was a customer of BN's Dilworth facility. Nine of ten respondents used Midway and six of ten used Shoreham for outbound intermodal movements. Almost one of every two users of a Twin City facility used both terminals.

5C. What is the relative cost of moving these materials by truck as compared with rail intermodal?

Half of all inbound users of intermodal reported the service was more expensive than truck with all but one indicating somewhat more expensive (as opposed to much more). About one in five indicated the costs were about the same and one in five inbound user said intermodal costs were somewhat less expensive than truck. More than three in five outbound users of rail intermodal said the service was more expensive than truck with most (52 percent) reporting a somewhat more expensive service. In the final part of the survey (discussed below), respondents showed their sensitivity to the question of cost, as 72 percent indicated that a reduction in the relative cost of rail would increase intermodal use.

5DE. **Would increased shipment size or improved packaging increase your use of intermodal service?**

These possible incentives to increase use of intermodal do not appear to affect most users. Only one in five affirmative responses were elicited by these possibilities.

USAGE FACTORS AND GROWTH PROJECTIONS

1A. Which of 19 suggested improvements in rail intermodal service might increase your use of this service in the future?

Survey participants were offered 19 improvements in rail intermodal service to evaluate to determine the likely impact on intermodal usage. As shown in Table 1, those individual factors may be organized as six usage groups (listed in order of importance to respondents) concerning rail service, intermodal terminals, intermodal equipment, costs, drayage service and electronic services. Responses of survey participants were tallied to rank both the usage factor groups and the individual improvements. Unweighted raw rankings were computed based on the number of times an improvement was cited as possibly leading to increased use of intermodal by the respondent. In addition, responses were weighted first by total shipping and receiving volume and then by giving added weight to intermodal volume. Table 1 shows the relative rankings of each factor group for the unweighted and weighted scores. Unweighted scores were computed for the individual user subgroups, for non-users and for all responses combined.

Table 2 shows the rankings of the individual improvements. The 5 top choices for users in descending order were reduced rail transit time, reduced intermediate terminal time-Chicago, improved availability -trailers/containers, improved reliability of rail, and reduction in the relative cost of rail . For non-users, the five top choices were improved reliability of rail, reduced rail transit time, reduced terminal time at destination, reduced terminal time in the Twin Cities, and reduced drayage transit time. For users the least important improvements are improved electronic services, reduction in packaging costs and reduced drayage transit time. For non-users the least important improvements are reduction in packaging cost, improved electronic services, more frequent

TABLE 1

RANKING OF USAGE FACTOR GROUPS

	WEIGHTED VALUES* ---BY VOLUME--- TOTAL	TOT+INTML	UNWEIGHTED RANKINGS: INTERMODAL USERS: INB & OUTB	ONLY INB	ONLY OUTB	NONUSERS	TOTAL RESPONSES
A. FACTORS RELATED TO RAIL LINEHAUL SERVICE:	3	3	4	5	5	7	4
1 MORE FREQUENT RAIL SERVICE							
2 IMPROVED RELIABILITY OF RAIL							
3 REDUCED RAIL TRANSIT TIME							
B. FACTORS RELATED TO RAIL INTERMODAL TERMINALS:	8	7	8	8	8	8	8
4 REDUCED TERMINAL TIME AT THE ORIGIN							
5 REDUCED TERMINAL TIME AT THE DESTINATION							
6 REDUCED INTERMEDIATE TERMINAL TIME-CHICAGO							
7 REDUCED TERMINAL TIME IN THE TWIN CITIES							
8 ADDITIONAL TERMINAL CAPACITY - TWIN CITIES							
D. FACTORS RELATED TO SUPPLY OF INTERMODAL EQUIPMENT:	9	9	6	10	9	10	7
11 INCREASED EQUIPMENT FREE UNLOADING TIME							
12 IMPROVED AVAILABILITY-TRAILERS/CONTAINERS							
F. FACTORS RELATED TO COSTS:	12	14	12	12	9	9	11
18 REDUCTION IN RELATIVE COST OF RAIL							
19 REDUCTION IN PKGING COSTS TO PREVENT DAMAGE							
C. FACTORS RELATED TO DRAYAGE SERVICE:	12	14	17	6	16	6	11
9 IMPROVED DRAYAGE SERVICE							
10 REDUCED DRAYAGE TRANSIT TIME							
E. FACTORS RELATED TO ELECTRONIC SERVICES:	15	15	14	16	14	16	16
13 IMPROVED ELECTRONIC SERVICES-TRACING							
14 -ACCESS RATES							
15 -BOOK FREIGHT							
16 -PROCESS CLAIMS							
17 IMPROVED AVAILABILITY OF SERVICES FOR EDI							
* VALUE OF WEIGHTS=	1	10					

TABLE 2

RANKING OF INDIVIDUAL USAGE FACTORS

RANKING OF INDIVIDUAL IMPROVEMENTS:	WEIGHTED VALUES* ---BY VOLUME--- TOTAL	TOT+INTML	UNWEIGHTED RANKINGS: INTERMODAL USERS: INB & OUTB	ONLY INB	ONLY OUTB	NONUSERS	TOTAL RESPONSES
1 MORE FREQUENT RAIL SERVICE	6	5	4.5	9.5	6	18	10
2 IMPROVED RELIABILITY OF RAIL	2	4	4.5	3	5	2	2
3 REDUCED RAIL TRANSIT TIME	1	1	2	1	2.5	2	1
4 REDUCED TERMINAL TIME AT THE ORIGIN	5	8	9.5	9.5	9	10	8.5
5 REDUCED TERMINAL TIME AT THE DESTINATION	9	6	6.5	6	9	2	5.5
6 REDUCED INTERMEDIATE TERMINAL TIME-CHICAGO	3	2	2	6	2.5	8.5	3.5
7 REDUCED TERMINAL TIME IN THE TWIN CITIES	8	7	12.5	3	9	4.5	7
8 ADDITIONAL TERMINAL CAPACITY - TWIN CITIES	16	10	9.5	17.5	9	15.5	14
9 IMPROVED DRAYAGE SERVICE	12	13	15	3	14.5	6.5	8.5
10 REDUCED DRAYAGE TRANSIT TIME	11	14	18.5	9.5	18	4.5	12.5
11 INCREASED EQUIPMENT FREE UNLOADING TIME	13	15	9.5	13	14.5	12	11
12 IMPROVED AVAILABILITY-TRAILERS/CONTAINERS	4	3	2	6	2.5	8.5	3.5
13 IMPROVED ELECTRONIC SERVICES-TRACING	10	11	12.5	13	14.5	12	12.5
14 -ACCESS RATES	19	19	18.5	17.5	9	18	19
15 -BOOK FREIGHT	14	16	9.5	17.5	14.5	18	15.5
16 -PROCESS CLAIMS	18	12	16.5	17.5	14.5	15.5	18
17 IMPROVED AVAILABILITY OF SERVICES FOR EDI	15	17	14	15	19	14	17
18 REDUCTION IN RELATIVE COST OF RAIL	7	9	6.5	9.5	2.5	6.5	5.6
19 REDUCTION IN PKGING COSTS TO PREVENT DAMAGE	17	18	16.5	15	14.5	12	15.5
* VALUE OF WEIGHTS-	1	10					

rail service, increased equipment free unloading time, and additional terminal capacity in the Twin Cities.

1B. Are there any other factors which would increase your use of rail intermodal service?

Survey participants were asked an open ended question to invite a full expression of their opinions on rail intermodal service. The following unedited responses (grouped by category) were submitted by Twin Cities traffic managers:

Terminals

> The concern we have is the size of the terminal hubs in Minnesota and the ability of the railroads to expand their capacity. The cost of our drayage would increase if the railroads and the terminal hubs can't expand their capacity.
>
> Increase the man-power at the rail facilities. There's not enough people to handle the outbound or inbound shipments. You've got people waiting for hours to get equipment in and out of the facility.
>
> Our biggest problem is distance. Our locations are too far away from the terminals in the Twin Cities to make good use of rail intermodal service. It would be too expensive for us to use rail intermodal service, especially when you compare how much more it would cost us, as opposed to a company located in the Twin Cities.
>
> Elimination of the two-rail move. That refers to moving a trailer from St. Paul to maybe Chicago and actually changing the trailer there, and actually putting it onto a new train. The best thing for us to do would be to truck it to Chicago, and then put it onto the train. Any time you use more than one train company, it's a waste of time. If they're looking to do construction of a new intermodal hub, it would be a big mistake unless they get more direct rail services.

Equipment

> If they would increase the size of the trailers to 53 feet, that would increase my usage of rail intermodal.
>
> Greater availability of flatbed trailer equipment (flatainers).

The biggest problems are the condition and the availability of the equipment. Many of the trailers are 15 years old and don't look like they have been repaired in the last 5 years.

I would like to see more availability of containers and trailers. Also, the equipment free time should be longer (about 7 days).

I would like to see the elimination of the chassis system that Burlington Northern has.

Service

There is a problem with the speed and service with rail intermodal - it is not consistent and fast enough. We would like to see predictable schedules - for example, if you turn something over at Point A; it should get to Point B at the same time every time.

We need consistent, reliable service all the time. We need consistent transit time. We don't want a shipment to arrive in 2 days one time and 5 days another time. We need shipments to arrive consistently in, say, 3 days all the time.

Reduction in service time (it now takes 7-10 days by rail to California and 5 days by rail to Pennsylvania and New Jersey). We need to get shipments to these locations in less than 2 1/2 days.

Maybe the railroad companies should make a provision to provide people to assist us in unloading, like the trucking companies do.

With our business, we have to use trucking. Either deliveries have to be made overnight or they have to be delivered on the same day. Intermodal rail service doesn't work for us; we need to meet specific schedules consistently and we cannot have our product stand around - we can't risk freezing in the winter or overheating in the summer.

We wouldn't have any use for rail intermodal service, unless we were to pick up a substantial amount of business for the West Coast, such as the California area. Presently, we ship every short distances and the time sensitivity requires us to use truck. Rail intermodal would not be effective or efficient for our present business.

Financial

Reduction in rates - right now rail shipment is between $50 and $150 higher than by truck. Lack of equipment - if we wanted to use more rail intermodal, we couldn't because there is never enough equipment available.

They should increase their terms of payment. If the transit time is seven days, make the terms of payment (to offset our costs) about eight weeks.

Loss & Damage

They need to do something about the damage situation. When you ship rail intermodal, you need to block and brace the load, or you will get damage. The damage is caused from the railroad humping. Thus, there is the additional cost of having to block and brace loads. Also, it's almost impossible to collect from railroads for damaged goods, unless the container or the trailer is damaged (they want to see exterior damage). When you ship by truck, generally your claim for damaged goods will be honored, without them having to see exterior damage. If the goods are damaged, they will honor your claim.

They need to develop a method for improved handling of perishables - right now, we just cannot trust the system to handle our perishable products.

I would be happy if they would stop damaging my products. We are in the retail consumer electronics business - we sell TV's and computers. Rail intermodal is too unreliable as far as damage to may products is concerned.

2A. **If rail intermodal services to and from the Minneapolis - St. Paul area were improved by providing additional terminal capacity and service, would your company consider expanding your use of rail intermodal?**

Additional terminal capacity in the Twin Cities area would mean increased intermodal use by 16 of 32 of users and 8 of 23 of non-users. Respondents were not asked to indicate possible use by direction.

2B. If improvements in intermodal service in Minneapolis - St. Paul area were available, do you think your company might consider expansion such as by adding plant or warehouse capacity at some point in the future?

For both users and non-users growth is not driven by intermodal transportation means, as 84 percent responded no to this question.

2C. If your business situation changed so that your shipping volume increased, would that increase your use of rail intermodal?

More than half of the users indicated intermodal would increase in this case and almost two of five non-users indicated they would use intermodal.

4A. In the next year or two, what is the outlook for your company's business activities?

Both users and non-users are optimistic about the future with 93 percent responding that there will be some growth. Non-users are slightly more optimistic with none predicting a decline. An unweighted short term average annual increase of almost 9 percent was provided by respondents with a number of increases offered in the range of 20 to 30 percent.

For users, 81 percent of the respondents believe the growth rate will be 10 percent or less with the mode at 10 percent (27 percent choose 10 percent as their expected growth rate). For non-users, 87 percent believe the growth rate will be 10 percent or less however, here, the distribution is bimodal with modes at 5 percent and 10 percent.

4B. Going beyond that period, over the next 3 to 5 years, what is the outlook for your company's business activities?

Again both users and non-users are bullish, but users are slightly more optimistic in this case than non-users. Together 94 percent indicate that there will be some growth. An average growth rate of over 7 percent over the three to five year range was provided by respondents.

10 percent of non-users expect a 25 percent growth rate. For users the most common expected growth rates are 2 percent and 5 percent. 88 percent of users and 85 percent of non-users expect growth rates of 10 percent or less.

When the expected growth rates of intermodal users are applied to their 1994 intermodal volume, intermodal volume for these users would increase 33 percent to over 57,000 units. This was developed as follows.

Forecasts of intermodal freight volume for 1995-1999 were made by applying the respondents' expected growth rates to their reported 1994 volumes and summing over all firms. When growth rates were not available, zero growth was assumed and the 1994 volume was used. Note that three firms did not report any growth rates. Of these one firm has high intermodal freight volume. Another five firms reported growth rates for either the short term or the medium range. This second group also included a high volume firm.

Using the above described method intermodal volume was projected to grow from 42,790 in 1994 to 57,115 in 1999 for the firms surveyed, a growth of 14,325 units. The average annual growth rate for this period is approximately 7%. For the first two years of the forecast the average annual growth rate is slightly above 7%, and for the last three years it is below 6%.

5AB. **In which source locations and markets will growth occur?**

Geographically, the major areas in the U.S. where growth is expected are the Midwest, the north east, and the west coast in descending order. A large number of firms with high volumes of intermodal freight expect growth in the Midwestern region and none made reference to the south east. Only four firms, of which two were high volume firms, mentioned international markets.

As for sources of inbound commodities to accommodate the expected growth, the main regions cited are the north east, the south east, the Midwest, and the west coast in descending order. Large volume firms also picked these regions as their major sources of commodities, however, the west coast and the Midwest had highest rank. No western states were mentioned by either group. International markets were mentioned by three firms, none of which were high volume firms.

Note that one large volume respondent did not answer questions regarding locations of expected growth or commodity sources. Also, the answers of four firms as to the locations of expected growth were too general to be taken into account in the analysis. Of these four firms three were high intermodal volume firms. As for the location of commodity sources, one large volume firm's response was too broad to be considered.

When the size of surveyed firms in terms of intermodal freight volume is taken into account, the regions most expected to exhibit growth become Wisconsin, Minnesota, South Dakota, Arizona, and Nevada. The significance of the international market also increases with Japan, Canada, and Mexico as the main partners. California, Washington, and the northeastern states are predicted to be the main sources of commodities to meet the growth.

5C. **Is investment in increased plant capacity likely to be required to accommodate growth?**

64 percent of respondents indicate that increased plant capacity will be needed. The percentage of 'yes' answers is slightly higher for non-users than for users (67 percent and 63 percent respectively).

Appendix D

TRANSEARCH Model Forecast
Tonnage Outbound

TRANSEARCH MODEL FORECAST
TONNAGE OUTBOUND FROM THE TWIN CITIES BEA

DESTINATION	BEA	YEAR	RAIL INTERMODAL	TRUCKING TRUCKLOAD	TRUCKING LTL	TRUCKING PRIVATE
BOSTON MA						
	4	1992	4,036	76,269	17,860	139,686
	4	1997	5,096	94,370	22,083	153,337
	4	2002	6,306	115,850	26,884	169,750
NEW YORK NY						
	12	1992	9,927	160,336	55,276	90,057
	12	1997	12,530	188,369	71,115	132,356
	12	2002	15,741	227,569	87,456	193,318
PHILADELPHIA PA						
	18	1992	22,187	87,023	28,645	47,549
	18	1997	28,032	101,602	36,846	59,614
	18	2002	34,610	122,664	45,623	75,034
BALTIMORE MD						
	19	1992	1,149	21,101	10,503	30,619
	19	1997	1,451	25,025	13,004	40,828
	19	2002	1,795	30,341	16,176	50,719
NORFOLK VA						
	23	1992	13,849	4,933	5,272	9,948
	23	1997	16,939	5,812	6,793	12,048
	23	2002	20,533	7,113	8,340	14,303
ATLANTA GA						
	36	1992	12,492	85,743	20,597	23,217
	36	1997	15,642	109,724	25,932	29,307
	36	2002	19,254	138,534	32,029	36,775
JACKSONVILLE FL						
	41	1992	8,154	22,556	3,402	10,314
	41	1997	10,268	27,406	4,244	12,995
	41	2002	12,669	31,870	5,204	15,335
MIAMI FL						
	43	1992	11,648	51,852	9,422	26,003
	43	1997	14,708	62,966	11,654	32,676
	43	2002	18,199	72,455	14,252	38,333
MOBILE AL						
	47	1992	1,250	6,475	2,053	1,709
	47	1997	1,578	7,493	2,583	2,182
	47	2002	1,953	8,704	3,168	2,725
BIRMINGHAM AL						
	49	1992	9,282	17,978	6,527	4,084
	49	1997	11,721	21,540	8,273	5,169
	49	2002	14,502	25,100	10,239	6,330

TRANSEARCH MODEL FORECAST
TONNAGE OUTBOUND FROM THE TWIN CITIES BEA

DESTINATION	BEA	YEAR	RAIL INTERMODAL	TRUCKING TRUCKLOAD	TRUCKING LTL	TRUCKING PRIVATE
MEMPHIS TN						
	55	1992	3,923	28,174	12,171	13,215
	55	1997	5,014	35,123	15,655	16,780
	55	2002	6,181	42,756	19,744	20,853
DETROIT MI						
	71	1992	10,995	159,987	13,120	71,925
	71	1997	13,884	204,194	16,955	89,481
	71	2002	17,178	249,283	21,313	110,252
CHICAGO IL						
	83	1992	455,271	949,503	19,362	345,384
	83	1997	575,872	1,153,373	25,231	432,801
	83	2002	712,005	1,420,918	31,624	542,181
MILWAUKEE WI						
	89	1992	4,536	201,339	3,320	620,444
	89	1997	5,728	317,854	3,954	901,761
	89	2002	7,087	477,017	4,894	1,365,673
GREEN BAY WI						
	94	1992	0	119,418	2,092	290,420
	94	1997	0	182,483	2,581	423,071
	94	2002	0	264,375	3,255	640,802
KANSAS CITY MO						
	105	1992	25,882	104,546	7,785	39,693
	105	1997	29,763	123,320	10,018	49,158
	105	2002	34,665	150,729	12,536	59,880
ST LOUIS MO						
	107	1992	16,247	236,343	10,668	104,885
	107	1997	20,412	276,887	13,740	124,783
	107	2002	25,140	332,685	17,222	147,029
NEW ORLEANS LA						
	113	1992	10,754	6,821	6,207	4,140
	113	1997	13,579	7,810	7,817	4,427
	113	2002	16,802	9,329	9,608	5,053
HOUSTON TX						
	122	1992	11,417	49,311	15,457	30,980
	122	1997	14,417	64,746	19,649	40,023
	122	2002	17,838	82,893	24,224	48,366
DALLAS TX						
	125	1992	20,949	61,093	21,856	41,452
	125	1997	26,074	79,569	27,840	53,864
	125	2002	32,199	102,284	34,210	65,165

TRANSEARCH MODEL FORECAST
TONNAGE OUTBOUND FROM THE TWIN CITIES BEA

DESTINATION	BEA	YEAR	RAIL INTERMODAL	TRUCKING: TRUCKLOAD	TRUCKING: LTL	TRUCKING: PRIVATE
PHOENIX AZ						
	162	1992	12,116	95,998	5,001	82,257
	162	1997	15,198	106,744	6,027	99,528
	162	2002	18,921	119,113	7,203	114,080
SEATTLE WA						
	171	1992	203,506	74,409	9,743	136,955
	171	1997	256,457	90,513	12,437	230,278
	171	2002	317,500	114,246	15,815	364,778
PORTLAND OR						
	172	1992	77,710	24,806	5,991	77,845
	172	1997	97,899	27,878	7,730	127,066
	172	2002	121,324	33,006	9,789	195,436
SAN FRANCISCO CA						
	176	1992	3,092	60,956	11,534	25,705
	176	1997	3,895	75,199	14,628	33,642
	176	2002	5,294	93,587	18,106	41,907
SACRAMENTO CA						
	177	1992	7,445	13,205	1,778	5,364
	177	1997	9,401	16,611	2,336	7,047
	177	2002	11,632	20,742	2,944	8,805
LOS ANGELES CA						
	180	1992	37,878	132,414	27,574	63,811
	180	1997	48,019	166,857	35,165	83,860
	180	2002	60,562	209,123	43,660	104,504
SAN DIEGO CA						
	181	1992	1,073	17,588	3,008	7,456
	181	1997	1,355	21,820	3,893	9,731
	181	2002	1,676	27,152	4,863	12,129

Source: Reebie Associates

Appendix E

TRANSEARCH Model Forecast
Tonnage Inbound

TRANSEARCH MODEL FORECAST
TONNAGE INBOUND TO THE TWIN CITIES BEA

ORIGIN	BEA	YEAR	RAIL INTERMODAL	TRUCKING TRUCKLOAD	TRUCKING LTL	TRUCKING PRIVATE
BOSTON MA						
	4	1992	0	34,323	16,585	24,426
	4	1997	0	41,683	20,016	28,256
	4	2002	0	49,788	23,301	32,187
NEW YORK NY						
	12	1992	0	219,717	55,590	61,335
	12	1997	0	264,021	68,037	75,365
	12	2002	0	310,550	78,195	91,770
PHILADELPHIA PA						
	18	1992	0	157,334	31,418	99,374
	18	1997	0	181,542	38,421	146,951
	18	2002	0	205,515	44,162	202,726
BALTIMORE MD						
	19	1992	0	60,836	7,892	5,121
	19	1997	0	69,004	9,477	5,833
	19	2002	0	76,675	11,052	6,724
NORFOLK VA						
	23	1992	3,320	9,898	1,922	4,305
	23	1997	3,905	11,074	2,414	5,877
	23	2002	4,477	13,105	2,804	8,240
ATLANTA GA						
	36	1992	6,283	349,068	20,871	157,361
	36	1997	7,796	409,139	30,923	247,864
	36	2002	9,437	469,884	38,551	309,348
JACKSONVILLE FL						
	41	1992	1,912	7,601	886	2,047
	41	1997	2,347	9,058	1,483	2,651
	41	2002	2,814	10,497	1,788	3,565
MOBILE AL						
	47	1992	2,771	82,166	5,251	39,584
	47	1997	3,341	126,805	6,362	61,337
	47	2002	4,574	154,857	8,675	74,368
BIRMINGHAM AL						
	49	1992	10,578	54,165	8,898	26,242
	49	1997	13,015	77,439	11,127	38,065
	49	2002	16,289	93,930	13,686	46,896

TRANSEARCH MODEL FORECAST
TONNAGE INBOUND TO THE TWIN CITIES BEA

ORIGIN	BEA	YEAR	RAIL INTERMODAL	--------TRUCKING-------- TRUCKLOAD	LTL	PRIVATE
MEMPHIS TN						
	55	1992	15,622	55,649	34,935	22,694
	55	1997	19,451	70,521	45,424	26,951
	55	2002	23,318	87,369	55,590	31,881
DETROIT MI						
	71	1992	3,720	88,337	13,950	29,228
	71	1997	4,316	104,792	19,463	36,806
	71	2002	4,894	116,538	22,548	41,994
CHICAGO IL						
	83	1992	591,876	523,905	32,175	279,593
	83	1997	692,617	606,340	37,997	341,725
	83	2002	797,338	705,502	44,149	401,528
MILWAUKEE WI						
	89	1992	16,782	446,841	5,980	287,930
	89	1997	20,732	543,423	7,629	352,222
	89	2002	25,026	663,027	9,131	417,998
GREEN BAY WI						
	94	1992	12,212	415,536	2,945	267,878
	94	1997	15,087	492,040	3,905	314,667
	94	2002	18,211	622,554	5,565	361,515
KANSAS CITY MO						
	105	1992	62,167	100,866	10,500	506,119
	105	1997	71,473	111,378	13,073	528,635
	105	2002	81,759	135,981	15,530	696,190
ST LOUIS MO						
	107	1992	15,741	126,862	21,759	92,209
	107	1997	19,386	149,555	26,499	119,477
	107	2002	23,594	171,139	31,412	155,083
NEW ORLEANS LA						
	113	1992	8,321	10,624	2,838	1,091
	113	1997	10,129	11,945	3,419	1,366
	113	2002	13,826	13,248	4,136	1,616
HOUSTON TX						
	122	1992	10,005	118,468	14,918	70,400
	122	1997	12,657	153,217	19,272	100,445
	122	2002	15,620	171,508	23,900	126,145
DALLAS TX						
	125	1992	5,425	145,945	30,347	154,363
	125	1997	6,863	180,567	38,193	207,512
	125	2002	8,469	216,050	47,464	257,300

TRANSEARCH MODEL FORECAST
TONNAGE INBOUND TO THE TWIN CITIES BEA

ORIGIN	BEA	YEAR	RAIL INTERMODAL	--------TRUCKING--------- TRUCKLOAD	LTL	PRIVATE
SEATTLE WA						
	171	1992	144,023	15,033	5,590	21,757
	171	1997	179,211	18,021	7,047	27,364
	171	2002	218,256	22,339	7,932	33,082
PORTLAND OR						
	172	1992	53,976	59,010	3,726	9,128
	172	1997	63,785	69,144	4,621	10,953
	172	2002	74,141	78,091	5,443	13,246
EUGENE OR						
	173	1992	3,851	22,726	342	3,462
	173	1997	4,684	26,872	422	4,154
	173	2002	5,575	30,694	500	5,428
LOS ANGELES CA						
	180	1992	329,099	91,940	23,664	18,728
	180	1997	365,512	107,355	29,255	20,905
	180	2002	433,661	128,747	34,907	24,863

Source: Reebie Associates

APPENDIX F

Alternative Scenario Forecasts

MARKET DIMENSIONS - LOW GROWTH

	CORRIDORS	THOUSANDS OF TONS 1992	2002	2012	ANNUAL GROWTH
INBOUND	SHORT HAUL	3,474	3,845	4,254	1.1%
	CALIFORNIA	509	573	645	1.3%
	TEXAS	618	713	822	1.5%
	NORTHEAST	1,002	1,137	1,290	1.3%
	SOUTHEAST	953	1,108	1,287	1.6%
	MONTREAL	329	365	406	1.1%
	NORTHWEST	388	432	482	1.2%
	ALL LANES	7,272	8,172	9,187	1.2%
OUTBOUND	SHORT HAUL	3,468	4,098	4,841	1.8%
	CALIFORNIA	668	755	852	1.3%
	TEXAS	311	361	420	1.6%
	NORTHEAST	1,329	1,507	1,709	1.3%
	SOUTHEAST	469	533	606	1.4%
	MONTREAL	585	633	686	0.8%
	NORTHWEST	671	796	943	1.9%
	ALL LANES	7,502	8,684	10,058	1.6%
	BOTH FLOWS	14,774	16,856	19,245	1.4%

RAIL INTERMODAL VOLUMES - LOW GROWTH

	CORRIDORS	THOUSANDS OF TONS 1994	1997	2002	2012
INBOUND	SHORT HAUL	482	496	519	567
	CALIFORNIA	525	553	576	621
	TEXAS	96	130	136	148
	NORTHEAST	109	200	204	212
	SOUTHEAST	120	166	171	180
	MONTREAL	28	29	30	33
	NORTHWEST	337	353	369	403
	ALL LANES	1,696	1,926	2,005	2,163
OUTBOUND	SHORT HAUL	478	492	515	562
	CALIFORNIA	137	180	186	199
	TEXAS	88	126	131	141
	NORTHEAST	343	463	470	484
	SOUTHEAST	149	195	200	211
	MONTREAL	253	254	256	260
	NORTHWEST	392	416	436	475
	ALL LANES	1,840	2,126	2,194	2,332
	BOTH FLOWS	3,536	4,052	4,199	4,495

MARKET DIMENSIONS - MEDIUM GROWTH

	CORRIDORS	1992	2002	2012	ANNUAL GROWTH
		THOUSANDS OF TONS			
INBOUND	SHORT HAUL	3,474	4,290	5,298	2.1%
	CALIFORNIA	509	652	835	2.5%
	TEXAS	618	836	1,132	3.1%
	NORTHEAST	1,002	1,307	1,705	2.7%
	SOUTHEAST	953	1,312	1,805	3.2%
	MONTREAL	329	410	512	2.2%
	NORTHWEST	388	487	611	2.3%
	ALL LANES	7,272	9,294	11,898	2.5%
OUTBOUND	SHORT HAUL	3,468	4,954	7,076	3.6%
	CALIFORNIA	668	863	1,114	2.6%
	TEXAS	311	427	588	3.2%
	NORTHEAST	1,329	1,732	2,256	2.7%
	SOUTHEAST	469	614	803	2.7%
	MONTREAL	585	690	814	1.7%
	NORTHWEST	671	966	1,390	3.7%
	ALL LANES	7,502	10,246	14,041	3.1%
	BOTH FLOWS	14,774	19,540	25,939	2.8%

RAIL INTERMODAL VOLUMES - MEDIUM GROWTH

	CORRIDORS	1994	1997	2002	2012
		THOUSANDS OF TONS			
INBOUND	SHORT HAUL	482	496	551	680
	CALIFORNIA	525	553	626	801
	TEXAS	96	130	151	204
	NORTHEAST	109	200	228	298
	SOUTHEAST	120	166	195	268
	MONTREAL	28	29	32	40
	NORTHWEST	337	353	395	496
	ALL LANES	1,696	1,926	2,178	2,789
OUTBOUND	SHORT HAUL	478	492	588	839
	CALIFORNIA	137	180	205	264
	TEXAS	88	126	148	203
	NORTHEAST	343	463	528	688
	SOUTHEAST	149	195	223	292
	MONTREAL	253	254	276	326
	NORTHWEST	392	416	499	718
	ALL LANES	1,840	2,126	2,466	3,330
	BOTH FLOWS	3,536	4,052	4,644	6,118

MARKET DIMENSIONS - HIGH GROWTH

	CORRIDORS	THOUSANDS OF TONS 1992	2002	2012	ANNUAL GROWTH
INBOUND	SHORT HAUL	3,474	4,956	6,120	4.3%
	CALIFORNIA	509	764	978	5.0%
	TEXAS	618	997	1,350	6.1%
	NORTHEAST	1,002	1,542	2,012	5.4%
	SOUTHEAST	953	1,572	2,163	6.5%
	MONTREAL	329	476	594	4.5%
	NORTHWEST	388	566	711	4.6%
	ALL LANES	7,272	10,873	13,928	5.0%
OUTBOUND	SHORT HAUL	3,468	5,986	8,550	7.3%
	CALIFORNIA	668	1,014	1,310	5.2%
	TEXAS	311	512	704	6.5%
	NORTHEAST	1,329	2,042	2,660	5.4%
	SOUTHEAST	469	725	948	5.4%
	MONTREAL	585	780	921	3.3%
	NORTHWEST	671	1,169	1,681	7.4%
	ALL LANES	7,502	12,228	16,773	6.3%
	BOTH FLOWS	14,774	23,100	30,701	5.6%

RAIL INTERMODAL VOLUMES - HIGH GROWTH

	CORRIDORS	THOUSANDS OF TONS 1994	1997	2002	2012
INBOUND	SHORT HAUL	482	553	673	1,021
	CALIFORNIA	525	552	596	783
	TEXAS	96	116	150	337
	NORTHEAST	109	155	231	664
	SOUTHEAST	120	163	236	714
	MONTREAL	28	32	40	61
	NORTHWEST	337	364	410	569
	ALL LANES	1,696	1,936	2,335	4,150
OUTBOUND	SHORT HAUL	478	612	836	1,686
	CALIFORNIA	137	383	791	1,048
	TEXAS	88	84	77	176
	NORTHEAST	343	329	306	878
	SOUTHEAST	149	134	109	313
	MONTREAL	253	282	330	458
	NORTHWEST	392	562	846	1,345
	ALL LANES	1,840	2,386	3,295	5,903
	BOTH FLOWS	3,536	4,321	5,630	10,052

Appendix G

Corridor Analysis

CORRIDOR ANALYSIS

The analysis of freight flows and development of forecasts revolved around growth opportunities in six long haul intermodal corridors serving Twin Cities markets (listed in order of estimated current intermodal tonnage): Northwest, California, Northeast, Southeast, Montreal and Texas. The characteristics of each of these markets are as follows.

Northwest. This corridor, which includes all BEAs in the Pacific Northwest, is the largest of the six long haul corridors. Its volume is about three quarters of the volume of the short haul market encompassing all BEAs within 600 miles of Twin Cities. Intermodal is strong in this corridor as it handles about two thirds of all eastbound tonnage and over half all westbound tonnage. Truckload carriage moves only a quarter of the traffic eastbound and just over half that amount westbound. Private trucking moves about a third of westbound tonnage in this corridor.

Improvements of the type hypothesized in this scenario are assumed to allow intermodal's share to increase 10 percent westbound in the first five years after improvements are implemented and another 5 percent in the last five years of the planning period. Reebie projects a loss of market share for intermodal eastbound by 2002 of about 25 percent. However, given the strong disposition of Reebie to hypothesize strong truck growth, this is discounted and westbound shares of Northwest corridor tonnage is assumed to grow at the same rate as the eastbound traffic.

California. This corridor, which includes long haul BEAs along both central and southern routes to California, as well as all BEAs in the state, has an unusual characteristic in that rail intermodal has over 70 percent of eastbound truck and rail intermodal traffic but between 15 and 20 percent of such westbound tonnage. ICC Waybill Sample data show outbound Twin Cities tonnage in the California corridor at about one fifth the inbound volume, a characteristic persistent in all years for which data were developed for use in the study. The TRANSEARCH model estimates that almost half the westbound tonnage moves truckload and over a quarter in private truck. Reebie's forecast for 2002 shifts these shares only slightly.

Survey data suggest a low westbound share for intermodal is a data anomaly. (A possible explanation is that this outbound intermodal freight may not be represented in the ICC/Reebie sample because of railroad rebilling practices). Almost half the intermodal users (accounting for almost all outbound intermodal freight identified by respondents) indicated California was a major destination. Three of the top ten shippers are in this group as are eight of the top twenty. Among non-users reporting California as a major destination only one major shipper was represented, the tenth largest. These shippers and receivers anticipate benefiting from improved intermodal service between the Twin Cities and California in 1995 with the initiation of service via Union Pacific.

After calibrating the data base and allocating 10 percent of outbound Chicago traffic to this corridor, California ranks as the largest of the six long haul inbound corridors. It is the second smallest outbound corridor in terms of intermodal tonnage. The flow model used in the study estimates that eastbound volume in the California corridor is 50 percent greater than such traffic in the Northwest corridor. Westbound, however, the Northwest's tonnage is three times that of California corridor traffic.

In the high growth scenario, it seems appropriate to assume that westbound traffic in this corridor would benefit from system improvements and, beginning after 2002, about double its current market share over modest levels in the next five years and repeat that performance over the last five years of the planning period. Thus, westbound California intermodal tonnage would reach about 30 percent of the market in 2007 and 45 percent by 2012. Already high eastbound levels would increase to the 80 percent level but at a gradual rate over the planning period.

Northeast. This corridor, which consists of all states on the eastern seaboard, is the second largest long haul outbound corridor (after eliminating the Chicago effect) and ranks fourth among intermodal inbound corridors. Allocating about 20 percent of Chicago traffic as moving beyond Chicago in this corridor, results in rail intermodal moving about a quarter of eastbound traffic and about 10 percent of westbound tonnage. Reebie estimates that truckload carriers handle about 55 percent of the westbound freight and about 40 percent of eastbound business with private trucking moving about a quarter of the freight in this corridor.

In the high growth scenario, it is assumed that this corridor will not see significant improvement until the second decade of the planning period but that intermodal freight's market share will improve sharply thereafter reaching a third of the market in each direction by the end of the planning period.

Southeast. This corridor, which consists of southeast BEAs ranks third among long haul inbound corridors and fourth among outbound flows from the Twin Cities. Total market tonnage inbound to the Twin Cities is comparable to tonnage from the Northeast but outbound tonnage to the Southeast is only one third of the Northeast corridor level. It is assumed that 18 percent of eastbound Chicago traffic and 20 percent of westbound Chicago traffic moved in this corridor. Not withstanding these significant percentages, the volumes moving by truck in this corridor are almost as great as those in the Northeast corridor and rail intermodal's shares are modest at about 10 percent of the heavier northbound flow and 25 percent of southbound tonnage.

For the high growth scenario, it is estimated that intermodal market shares in this corridor will be comparable to those for the Northeast.

Montreal. Estimates of volumes for the Montreal corridor are based on 1991 CP Rail flow data published in the Detroit Tunnel study prepared by Transmode and a calibration of model estimates with known lift volumes. Based on those data, Montreal corridor flow volumes are assumed (for base year modeling purposes) to be correlated with Northeast volumes as follows: westbound Montreal tonnage is assumed to be 40 percent of Northeast corridor volume and eastbound 150 percent. The latter assumption, which seems to be an anomaly, stems from the result of model calibration to develop model tonnage estimates which approximated current volume totals.

Montreal volume is assumed to grow at the same rate as the Twin Cities economy in all scenarios.

Texas. This corridor consists of BEAs in Texas, Louisiana, Arkansas and Oklahoma. After adjusting for the Chicago effect, Texas ranks fifth among the six long haul inbound intermodal flows and last among outbound ones. Rail intermodal has modest modal shares in the 10 to 15 percent range in the northbound direction and in the range of 20 to 25 percent southbound. According to Reebie, truckload carriers handle over 40 percent of northbound traffic in this corridor and private carriers over a third. Southbound truckload handles over a third of the business and private trucking one quarter. As with the California corridor, Texas markets anticipate benefiting from improved intermodal service via Union Pacific beginning in 1995.

In the high growth scenario, it is assumed that traffic in this corridor would benefit from system improvements. By 2002, tonnage moving rail intermodal in the Texas corridor is assumed to reach a 25 percent market share and gain another 5 percent in the following decade. In addition to shifts in market share, this corridor is assumed to experience modest additional growth (1 percent in each of the first five years and 2 percent a yea thereafter), related to evolving increases in trade involving Mexico stemming from implementation of NAFTA and assumed improvements in the average standard of living.