Location, design and operation of future Intermodal rail yards: a survey

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Word count:
Text = 5496
Tables = 6 x 250
Total = 7448

Abstract = 195 words
Abstract

This paper conducts an assessment of desirable traits, including the location, design, and operation, of Intermodal facilities using the information obtained through a structured interviews of stakeholders in the Chicago area with the knowledge of freight transportation. Both descriptive statistics and qualitative assessment are used to extract the information from the records of the interviews. The study revealed that the push toward bigger facilities, likes of Logistics Park - Chicago and Global III, and also the outward migration of the rail yards will likely to continue because the current standard for desirable Intermodal yard seems to be the minimum area of 120 to 200 hectares with a minimum length of 2,100 meters. It is unlikely that a land conversion of such magnitude can happen within the city of Chicago or near-by communities in a foreseeable future. Thus, the railroads most seek for the locations in rural or semi-rural areas. Also, there seems to be differences of opinions regarding the optimal function and design of future Intermodal facilities depending on the backgrounds of the respondents. The implication for the policy makers and planners is that it is ever more important to facilitate the communications among various stakeholders who will be impacted by the location and also the operation of the Intermodal facilities.

Key Words: Urban freight, freight terminal design, Intermodal freight, freight planning
INTRODUCTION

In 1980, a total of 3.1 million containers and trailers were moved by rail Intermodal, the combination of rail and truck transportation (1). In 2003 the Intermodal shipping has grown to 9.78 million containers and units moved (2). While the annual growth rate over the aforementioned period has been robust at about 5.1%, even greater rate of growth will likely to occur in the coming years due to the projected increase in the congestion on the highways and further improvement in the quality of service provided by the railroads (even though the industry have been experiencing workforce shortages recently). In fact, during the first half of 2004, the growth in Intermodal traffic with respect to 2003 level has been over 10% (3), and for the first time in history, Intermodal is now the largest revenue generator for the rail industry (4).

Despite the rapid growth in the Intermodal transportation business, the recent openings of two large Intermodal facilities in the Chicago area are, Logistics Park - Chicago by the Burlington Northern Santa Fe Railroad (BNSF) and Global III by Union Pacific Railroad (UP) have raised some eyebrows as well as questions. Both are large facilities, Logistics Park at 621 acres (expandable to over 800 acres) and Global III at 1200 acres. For a comparison, Table 1 shows the ten busiest Intermodal yards in the Chicago area prior to the opening of those two new facilities (5). Both yards are capable of handling a large volume of containers. The capacities for Logistics Park and Global III are reported at 400,000 and 720,000 annual lifts, respectively (6), (7). However, in relation to the size of the facility, those are not enormous capacities. For example, prior to the opening of the Logistics Park, BNSF’s Corwith yard used to perform about 750,000 lifts annually (8). Thus, the requirement for the greater size may come from greater efficiencies, in time and reliability, at those two new facilities. Aside from their sizes, the choice of the site locations set them apart from the old yards that are located within or near the city of Chicago. Both are located far from the city of Chicago (Logistics Park, located in the city of Joliet, is approximately 35 miles away, and Global III, located in Rochelle, is more than 85 miles away), and each is integrated into the planned industrial/logistics park with distribution, warehousing, and even manufacturing sites. It is reasonable to speculate that the land requirement associated with such a large scale of development has played a role in the selection of remote locations for those new facilities.

Although Intermodal facilities are owned and operated by private businesses, they cannot function without the use of public roads that provide access to other terminals. Locating the facility in a remote location would increase the trip length for the trucks that carry the shipments between rail yards. Also, the location and size of an Intermodal yard have a direct impact on the environmental externalities, noise along the rail tracks in particular. Thus, even though the location choice of the Intermodal rail yards are driven by the market forces from the railroad's perspective, it is prudent to seek inputs from various stakeholders during the decision process. The stakeholders may include the drayage trucking industry, Class II and III rail companies, environmental agencies, and the public.

The main objective of this research is to investigate the current thinking on the desirable traits, in terms of location, design, and operation, of Intermodal yards from the perspectives of various stakeholders including railroads, truckers, public sector, and consultants and developers. Such information will be useful to the cities that are interested in Intermodal terminals as an economic development vehicle to evaluate the potential sites within the municipal boundary. In addition, the comparison of the responses from different stakeholder groups will reveal the differences in priorities and perspectives, and thus, lays a foundation for future discussion and even collaborative decision-making. To gather the information, we interviewed 21 individuals in the Chicago region who are familiar with the basic functions of and also the issues surrounding Intermodal facilities.

INTERMODAL FREIGHT TRANSPORTATION IN THE CHICAGO REGION

In this section, a brief background on the Intermodal transportation in the Chicago area is presented. The information presented in this section may help put this research into useful perspective as well as create a context for further discussion concerning the need for additional Intermodal rail yards in the region.

While Chicago has always held the claim of being the rail capitol of the nation, in today’s market that is even more profoundly true both for total freight and Intermodal traffic. Currently the Chicago region has 29 Intermodal rail yards performing well over 6 million lifts annually, accounting for 32% of total lifts in the nation (9), (10). Everyday, over 37,500 freight railcars go through Chicago. However, the system that plays such a critical role for the economy and quality of life in this country is mired by the idiosyncrasies and constraints that are not obvious to the public and even most of the transportation professionals.

Chicago's rail system was historically created as a means to enforce antitrust laws, and thus purposely devised so the trains coming in from the west for example, would end in Chicago on the west side of the city and their loads then needed to be carried across town to be transferred to another railroad’s rail system and continue east or north or south. Class II and III rail lines used to control these carries, known as steel-wheel transfers. Due to the rail congestion and from a great increase in freight volume along the extensive rail systems, this changed in the 1960’s.
The rise of trucking, not only on the new interstate highway system for long hauls which was one factor in the national decline in railroading in that period, but also in local drayage operations, which became known as "rubber-tire transfers", soon took over these transfers to avoid the long rail delays. Similar shifts are seen at the nation's ports where Class II and III rails had carried freight from the docks to the Class I yards. In Chicago, such rubber-tire transfers now account for an average of between 3,500 and 5,000 trips per day. It must be added that these are only the carries between rail lines. There are local pick-ups and deliveries of about the same equal numbers also entering and leaving the Intermodal rail yards, thus totaling 15,000 daily rubber-tire carries of Intermodal rail freight. With the projected total annual lifts of over 9 million in 2020, the shortage of capacity for both Intermodal facilities and access roads are serious concern. If the addition of two new Intermodal rail yards will be sufficient to cover the expected increase in the demand over the next several decades, there may not be much gain in knowing the various aspects of the development of Intermodal yards as this research intends to do. However, it is likely that more of these giant land use complexes will be added to the system in response to the anticipated demand increase, which may lead to a "sprawl of rail yards" in the region. Thus, exploring the rationale and market forces that have persuaded BNSF and UP to locate their new facilities far from the existing clusters of Intermodal terminals should prove useful.

Public record of the considerations by railroad executives in siting the two recent Intermodal rail yards indicate that some planning principles were involved, but the criteria list was mostly what the railroads needed. When a developer gained the rights to develop the old Army Ammunition Grounds at Joliet, his insight and ability to sell BNSF on the idea of combining their rail service with an industrial park oriented to Intermodal shipping were the significant factors. In that the Joliet area's economic conditions anticipate being greatly improved by such a boost, these market conditions made the considerations even more logical. Thus, market forces prevailed just as they had in many of the older yards around the city, and probably will result in many aspects of this project being successful. However, it does not guarantee that the decision by the railroads and local interests to locate the new facility in Joliet was also beneficial to the public. Part of the answer rests on whether the appropriate markets were involved in these forces. On the other hand, when the UP realized it needed to consolidate and expand some of its Intermodal processes it started looking at existing rail yards in the Western and Cicero Avenue corridor in the heart of Chicago's industrial areas. Due to conflicting interests or poor planning leadership, they were unable to utilize these sites and so started looking elsewhere. Unfortunately, the NIMBY syndrome plagued several additional site considerations, so when a developer was able to "convince" the policy makers in Rochelle and sell the idea to UP, they agreed. However, loading and unloading the trains that far out from the city industry centers means far more truck traffic in long outlying patterns, generating more air pollution as well as congestion.

ASPECTS OF INTERMODAL FACILITY SITE CHOICE, DESIGN, AND OPERATION

Study of Intermodal rail yard proposals have been done in other regions, perhaps most notably in relation to the California Alameda Corridor. In that this Intermodal component was largely the port transfer of containers from ship to rail, the siting and handling issues were quite different from those being faced by the Chicago region. Nevertheless, the boldness of its concept, the comprehensive type considerations and the joining of three rail companies to solve a common problem indicate that concerted planning in the Chicago region could lead to efficiencies for the industry and the region. Typical of the Chicago focus, Li, Ziliaskopoulos, and Waller (20) only discusses the truck traffic component. They point out that one third of Intermodal freight handled in Chicago is passing through, one third is for local delivery and one third is regionally transported. These are quite different statistics from the Alameda region, the Columbus, Ohio study (21), the New York Port (22) or the North Dakota Freight Analysis (23), and many others like them. Each represents a different market condition and different needs. A significant portion of the Chicago condition rests upon its historic development as competing rail companies that purposely did not cooperate or coordinate their planning and location decisions. This created a unique set of problems for Chicago and the freight passing through it.

We began the development of survey instrument by identifying the aspects of the Intermodal facility that need to be considered during the site selection and design processes. There are probably many ways to look at the issues facing Intermodal freight, but we have identified eleven components which should be addressed if future Intermodal rail yard sites are to enhance not only the service, but also the surrounding communities and the region. A brief discussion on each of these factors is provided below.

Size

As shown in Table 1, sizes of existing Intermodal rail yards around Chicago are mostly smaller yards servicing a few large complexes. With the two new Intermodal rail yards, one can expect a change to these yards acting more independently, suggesting larger yards are the future direction. If so, then where to find such extensive properties
does become a limiting factor. If, on the other hand, functions can be planned differently, smaller yards may still be very integral to the regions success.

**General functions**

This topic includes questions of whether an Intermodal rail yard needs to be on the through line rail routes, or could they better join several companies in an off route setting. The relationship of the yards to the connector roads has clearly become a major issue. Most of the freight transportation funding considerations are addressing this issue. Due to the low use of the Chicago Calumet ports, there is seldom consideration of how rail-port yards might be enhanced for the region. Air Intermodal freight is not yet developed, but with Chicago being both the air and rail center of America’s freight, it could be wise to consider these options. Also of general consideration is the nature of rail movements such that day operations versus night operations should be factored into the site considerations.

**Specific functions**

Specific functions of Intermodal rail yard facilities include such aspects as the procedures for receiving trains both to load and unload, unloading the trucks (barges or planes), the emptied train, loading a train, storing and transferring the loaded train, receiving loaded trucks (barges and planes), lining them up for loading onto the train, removing the empty trucks (barges or planes), dispatching trucks once loaded from trains and dealing with the empty containers and chassis.

**Location**

Questions of location for Intermodal rail yards need much wider considerations, including their relationship not only to the main line rails which need to be reconfigured through the region, but to the local community, the city and region, warehousing facilities, specific industries, industrial complexes, and the general industrial concentrations of the region, and the other modes of freight such as ports, airports, and the interstate highway system.

**Integration of functions**

Functions of the Intermodal rail yards are presently isolated for the most part because it simplifies the operation within the yard. Integration of functions could greatly improve this region's functionality to the world. For example, combining rail, road, river and air transport is a possibility here in Chicago. At least the integration of east-west and north-south rail freight movements would bring a significant improvement in travel times. Possibly integrating management functions could also speed up freight handling as already experienced with the central traffic control of rail freight trains with METRA commuter trains. Further consideration of how the hostler, drayage, ramp contractor and troubadour drivers all function on site could impact or be impacted by siting considerations.

**Yard ownership**

Historically, each rail company has owned its own rail yards. That is mostly true for Intermodal rail yard facilities as well, but other models may make community or even regional ownership a better value for the region and the industries served.

**Impact of weather**

In Chicago, weather is always an issue. Many brave men have served the rail industries with little regard to the weather except for the delays and personal sufferings inflicted. In that there are various weather patterns throughout the Chicago area (for example the distance from the Lake Michigan has a significant effect on the snow fall), it might be beneficial to find out how they may influence the siting of Intermodal rail yard facilities.

**Security**

Security has certainly become a major concern in every phase of the countries operations and freight handling is no exception. Site considerations for security of the Intermodal rail yard facility itself is an important first step. But, further considerations of trains leaving and approaching the site, how made-up trains get transferred to through trains, and how to deal with hazardous loads and materials all enter the site question and considerations.

**Utilities**

Although most locations within the region can provide or be adapted to provide required utilities, how these accommodations impact the community and region and the savings or expense of providing them should be forethought rather than afterthought in where Intermodal rail yards are placed. This is even more pertinent with newer technologies which could develop in the operations of these facilities.
Data / Records handling

Data handling and record keeping, not surprisingly, is a big part of freight transportation, and so onsite considerations are one part of the formula. This probably will not greatly influence the siting considerations, but off-site communications, the in-out and worldwide interactions should certainly be taken into account when siting such a large user facility.

Environmental concerns

Environmental concerns should now play a large role in the site selection. Air quality, noise, amount of site run-off and pollutants carried in the run-off are critical issues. Not typical in industrial concerns would be the percent of site coverage and possibilities of naturalization of the less used portions of the site. All could contribute significantly to how and where this industry fits within the region.

SURVEY METHODOLOGY

Survey instrument

In developing the questions from the list of issues discussed in the previous section, it was considered appropriate to include multiple issues in the framework of one question and also to use multiple questions to address one issue. It was further decided that a variety of question formats, including open-ended, Likert scale, yes-no, multiple choice, and rating, would facilitate the interview discussions. So a large variety of questions were drafted and then by selection and rewording, editing and reconsidering, a draft questionnaire was constructed. Then, a set of three test interviews was held, each representing a different stakeholder group. Significant revisions were made to the draft questionnaire based on the inputs obtained from the test interviews. The final questionnaire consisted of 27 questions, each in some way address one or more of the 11 issues listed above. Depending on the breadth and complexity, some of the issues required several questions in order to cover the various aspects associated with it.

Survey process

Considering the technical nature of the issues that this research tried to address and the background and experience that are required to provide meaningful responses, random sampling was not the correct approach for the survey. What we hoped to obtain were informed opinions. As such, the survey process began with the creation of the contact list that include key stakeholders in the Chicago region who possess appropriate background to respond to the survey questions as possible. There are arguably many stakeholder groups that could be included in the survey, but we chose six groups that we considered effectively represented those most influential in or most influenced by the location and design of the Intermodal facilities. Those groups, shown in Table 2, were in fact defined broadly enough to purposely include multiple facets of their constituents. In developing the original contact list, we selected those individuals thought to be the key players in their respective groups. Diversity within the groups was recognized as valuable and membership lists of several interest groups were made available for obtaining contacts. A set of appropriately introduced letters was created and e-mailed to potential participants. Most respondents were personally interviewed using the questionnaire as a guide to the conversation, a technique known as structured interview. The greatest advantage of structured interview over the mail-out survey is that if there was any uncertainty concerning the context or meaning of the questions, clarification could be given easily and instantly, reducing the likelihood of instrument bias. When in-person interviews were not feasible; however, a phone interview was sought and a few responses were obtained in this manner. When these options were not possible, respondents who received the questionnaire as an attachment to their invitation to participate, printed their own copy, filled in their responses and mailed them. In addition to the people who were included in the original list of contacts, a snowball sampling technique, the use of interviewee referrals, generated an additional number of respondents.

In all, 21 responders have responded. Although the original intent was to have a uniform representation of each stakeholder group, certain groups were more difficult to contact and arrange for obtaining responses, notably truckers and community leaders. Therefore, to date, this study is confined to five stakeholder groups with the demographics for each group indicated in Table 2. As shown, the majority is from railroads, followed by five from consulting firms or developers. Three works for government and only one participant from the trucking industry.

ANALYSIS OF RESPONSES

The format of the questionnaire instrument used in this study and the methods of collecting data seem appropriate and successful. Although a total of 27 questions were included in the survey, typically several questions were
designed to address one issue. Therefore, rather than addressing each individual question, the following discussion of
the survey responses is organized into three main issue groups including:

- General perception for the future of the Intermodal transport and general areas where the solution to the capacity
  problems can be found,
- Key design and functional aspects that should be considered when designing a new Intermodal facility, and
- The factors that influence the location choice and also the efficiency of future terminals.

**General perception**

*Most significant change by 2020*

The respondents were asked to list what they consider to be the most significant change in freight traffic in the
Chicago area. The most frequent response was related to the increase in the container and Intermodal traffic, and the
concerns about the lack of capacity to handle those increases. It should be noted that in another question that asked
the respondents to estimate the growth in Intermodal traffic through Chicago, the median response was 10 to 25% by
2010 and 25 to 50% by 2020. These are surprisingly modest figures considering the growth rates for the past few
years that were in 7 to 10% range annually. Thus, while transportation professionals predict relatively modest rate of
growth for the Intermodal traffic in the foreseeable future, there seems to be a great urgency for increasing the
capacity of the Intermodal freight movement through the Chicago area. The natural interpretation of these findings is
that the Chicago system is currently operating at or near the capacity and is not capable of accommodating further
increase in Intermodal traffic, which is in accord with the findings from other studies (8), (12).

*General direction for solving yard capacity problems*

The respondents were asked to indicate how strongly they endorse four different options for increasing Intermodal
freight capacity through Chicago. The options consist of various combinations of three distinct approaches,
increasing the number of yards (new construction), making the yards bigger in size (for both existing and future
facilities), and improving the existing facilities without increase in size. The summary of the responses is shown in
Table 3. The result indicates that adding more and bigger yards is perceived to be the most effective solution.
However, it should also be noted that a surprising number of respondents, including three from the Class I railroads
thought rehabilitating the existing yards was the effective way to increase the system capacity. The consultants and
developers who gave the average score of 7, tend to consider increasing the capacities of the existing facilities is
sufficient to address the capacity shortages.

*Closing of existing Intermodal facilities*

Respondents were asked to respond to the statement "should some of the existing Intermodal yards be closed and
their functions moved to new locations to upgrade the system's performance?" Seventy five percent of the
respondents thought some of the existing Intermodal yards in the region should be closed and replaced by new yards
located elsewhere. It was interesting that many respondents cautioned that the land currently occupied by the yards
should be retained by the railroads and used to perform some functions rather than being sold to developers for
housing. Several argued that there are niche markets that only the small local yards could effectively service, so even
while building more and bigger yards elsewhere for growth, some of the existing facilities would still be vital service
centers. Interestingly, none of the respondents from the government thought closing the existing yards was a good
idea, citing adverse impacts to the local economy associated with the closing of the yards.

*Impact of technology*

With regard to the impact of technology, most of the respondents felt it was likely that technological advance will
affect the design and operation of the Intermodal facilities in near future. The areas such as security, data
management, and container lifting and moving were frequently mentioned the likely target for technological
advancements.

*Function and design*

*Co-location of Intermodal facilities*

In this question, the respondents were asked if they thought locating two or more Intermodal facilities within the
same site or adjacent to each other would expedite transferring of loads between yards. Some respondents were
weary of positioning the Intermodal facilities of different railroads next to each other or even combining them into a
single facility although it is generally considered by the outsiders as an obvious solution to reducing the impacts of
container movements between the yards on trucks (rubber-tire transfers). The reasons for their weariness varied from the concern over the size of the facility required to handle the freight from two railroads to the diminished need for such facilities in the near future due to the improvement in the planning, management and operation of freight trains to eliminate most of the rubber-tire transfers. Overall, about 60% of the respondents agreed co-locating of the Intermodal facilities was viable.

**Diversification of functions**

The respondents were asked to choose the optimum level of diversification for the function of Intermodal facilities. The three choices were; single function (e.g. only piggybacks, or only 40 foot containers), limited mix of functions (e.g. handle different sizes of containers but specialize in one railcar configurations, or vice-versa), and "do it all" (all container types and all railcar configurations). As shown in Table 4, no clear winner emerged. However, further analysis revealed a sharp contrast in perspectives between those “in the business” and those advocating for broader (i.e. social) purposes. None of the consultants/developers chose the single function as a response and all felt giving rail yards greater flexibility would be better. Six of eight responses for the "single function" came from the railroads. In particular, Class I railroad people generally thought Intermodal facilities would work most effectively if it strictly focus on single function even though they did not necessarily think it was a realistic scenario. It was of great interest that this question on several occasions raised the concern that customer service was an important component of future planning and single function facility would be most effective in that respect.

**Minimum and maximum site size**

Most railroad respondents were able to provide specific figures regarding the lower limit on the size of future (they were asked to consider the yards that may be built during the next 10 years) Intermodal yards. All railroad respondents gave the figures between 120 to 200 hectares (300 to 500 acres) with a minimal length of 2,100 meters (7,000 feet), which is the current standard length of trains. One response emphasized that the longer trend in trains on some rails was not tenable for future planning because the current standard is determined by the optimal forces needed to get over the Rocky Mountains. Clearly, those associated with the southern routes felt longer trains could be tolerated.

Meanwhile, nobody stated even in general figures, any limits to how large an Intermodal yard might need to get before it might functionally fail. Almost half of the respondents, 44.4%, felt there was some point, even though they could not specify, at which a yard can be too big. Decreasing return to scale was typically the reason offered, and often that was qualified further by expression of concern for truck traffic congestions that can be generated by an enormous facility. It is also noteworthy that while those in the governmental group felt inadequate knowledge kept them from specifying anything about too small yards, several did have fairly strong resolve that they certainly could be too large.

**Location of Intermodal facility and supporting functions**

**Location of off-site functions**

In this question, the respondents were asked to specify, in their opinion, the effective location to place various off-site functions and facilities that are likely to be associated with Intermodal yards including ramp truck lot and/or container storage facilities, drayage truck terminals, hump or classification rail yards, interchange rail yards, industrial manufacturing sites, industrial warehousing, airports, and ports. Respondents were allowed to choose more than one response even though most did choose only one. The results are summarized in Table 5. While the highest agreement was seen regarding keeping the container storage on-site, a predictable result, some results were somewhat surprising. Strong support for locating industrial warehousing or manufacturing sites close to or even within the Intermodal facility, and at the same time, the lack of support for bringing airports and ports closer to the yards were unexpected. The functions, other than those listed in Table 5, mentioned frequently by the respondents as important to have near or within the terminals were; repair and service facilities for chasses, railcars, containers, trucks, and loading equipments, and fueling stations for railcars and trucks.

**Location choice factors**

The objective of this question was to find out the perceived importance of various factors in the selection of the location for an Intermodal facility. The respondents were asked to rate the importance with 5 being the most and 1 being the least important. Many respondents stated that determining the locations for these large entities did require serious and extensive consideration of many factors. This was supported by the observation, as shown in Table 6, that only 28 out of a total of 128 responses, or 22%, were in the category 1 or 2, indicating most of those factors had some importance in the location choice. The following observations based on the scores, calculated as the sum of the
frequency in each category multiplied by the importance rating, are worthy of noting. Both the size of the site and associated yard functions were recognized as of considerable importance by the respondents in all groups. Also, environmental issues received high score. On the other hand, the factors related to the day-today operation of the facility such as types of freight, container and/or chase types received lowest scores, suggesting those considerations are relevant in the actual design of the terminal, but not for the selection of the site.

**SUMMARY AND CONCLUSION**

The survey results suggest the push toward larger yards, like Logistics Park - Chicago and Global III, and also the outward migration would continue. The current standard seems to be the minimum area of 120 to 200 hectares with a length of 2,100 meters. It is virtually impossible to find within the Chicago city boundary or in most of the suburban communities a site that is as large as 60 to 100 city blocks. However, considering the potential benefit to the region as a whole, it is worthwhile to explore the possibility of rehabilitating existing yards as that option received surprisingly positive responses.

Some of the questions underscored the difficulty for the "outsiders" to conceive a realistic plan for the Intermodal terminal development. Often there was a sharp contrast between the responses from those in the rail industry and those who were not. Some ideas such as multi-functional yard might seem like a straightforward solution to increase the efficiency, but from the railroads' perspective, not necessary so. Often, the outsiders overlook the fact that the rail industry currently is serving mostly market niches that are dominated by only a few or sometimes single customer. It is critical for the railroads to keep those customers satisfied, and the multi-functional yards may not serve that purpose. On the other hand, some questions revealed the tendency of the railroads to neglect the external impacts of their activities. For example, only one of the Class I respondents listed air quality as the environmental concern that deserves a higher level of attention while choosing the site for a new terminal while many listed noise and run-off. Contrastingly, 9 out of 11 respondents who are not associated with the Class I railroads indicated that air quality impacts should receive more attention. From the comments received during the interviews, it became obvious that the Class I railroads tend to consider the air quality impacts associated with the drayage movements by the trucks (rubber-tire transfers) are outside their responsibility and thus should be addressed by the government agencies. Obviously, the options available to the regional and federal authorities to address air quality problem will be limited when the land use decisions are not integrated into the strategy. The implication for the policy makers and planners is that it is ever more important to facilitate the communications among various stakeholders who will be impacted by the location and also the operation of the Intermodal facilities.

While the situations and needs surrounding the movement of freight may vary considerably from region to region, some of the findings from this study should be useful to the transportation professionals in other areas. The findings shed some light onto the priorities and constraints that different stakeholder groups perceive. Although many of the respondents in this study provided some good indicators, it is considered premature to try and formulate an argument specifying a prioritized list of criteria for siting or evaluating potential sites for future Intermodal rail yards. The responses obtained do however affirm that the list of issues are reasonable concerns and should be included in further work to define such a formulation.

**ACKNOWLEDGMENTS**

All responsibility for the contents of the paper lies with the authors.
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TABLE 1: Top Ten Intermodal Transfer Yards In Chicago Region

<table>
<thead>
<tr>
<th>Yard Name</th>
<th>Owner/Operator</th>
<th>Hectares (acres) of yard / Hectares (acres) used as intermodal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global One</td>
<td>Union Pacific</td>
<td>34 (84) / 34 (84)</td>
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<tr>
<td>Global Two</td>
<td>Union Pacific</td>
<td>64 (158) / 64 (158)</td>
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<tr>
<td>Yard Center</td>
<td>Union Pacific</td>
<td>43 (107) / 43 (107)</td>
</tr>
<tr>
<td>Corwith Yard</td>
<td>BNSF</td>
<td>124 (307) / 93 (230)</td>
</tr>
<tr>
<td>Willow Springs</td>
<td>BNSF</td>
<td>143 (352) / 128 (316)</td>
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<tr>
<td>Landers</td>
<td>Norfolk Southern</td>
<td>50 (123) / 50 (123)</td>
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<tr>
<td>Bedford Park</td>
<td>Chessie Seaboard</td>
<td>78 (193) / 78 (193)</td>
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<tr>
<td>63rd Street Yard</td>
<td>Chessie Seaboard</td>
<td>41 (100) / 41 (100)</td>
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<td>Harvey Yard</td>
<td>Canadian National</td>
<td>221 (546) / 133 (328)</td>
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<tr>
<td>Bensenville</td>
<td>Canadian Pacific</td>
<td>174 (429) / 61 (150)</td>
</tr>
</tbody>
</table>

Source: Rast, 1999
### TABLE 2: Breakdown of Respondents by Stakeholder Groups

<table>
<thead>
<tr>
<th>Stakeholder groups</th>
<th>Number</th>
</tr>
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<tbody>
<tr>
<td>Railroads (Class I)</td>
<td>8</td>
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<tr>
<td>Railroads (Class II &amp; III)</td>
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<tr>
<td>Trucking</td>
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<tr>
<td>Government</td>
<td>3</td>
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<tr>
<td>Consultant or developer</td>
<td>5</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>21</strong></td>
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### TABLE 3: Option for Increasing Intermodal Yard Capacity

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<thead>
<tr>
<th>Likert scale*</th>
<th>Increase number and size</th>
<th>Only increase numbers</th>
<th>Only increase size</th>
<th>Only improve existing yards</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Average</td>
<td>1.727</td>
<td>1.273</td>
<td>1.182</td>
<td>1.636</td>
</tr>
</tbody>
</table>

*the strength of agreement increases with the scale (i.e. 10 is the strongest level of agreement)*
TABLE 4: Diversification of functions

<table>
<thead>
<tr>
<th>Choices</th>
<th>Response frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>specialize on one process</td>
<td>8</td>
</tr>
<tr>
<td>keep a limited mix of functions</td>
<td>5</td>
</tr>
<tr>
<td>can &quot;do it all&quot;</td>
<td>6</td>
</tr>
</tbody>
</table>
### TABLE 5: Most effective location of various off-site functions

<table>
<thead>
<tr>
<th>Functions</th>
<th>Response frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nearby</td>
</tr>
<tr>
<td>ramp lot/container storage</td>
<td>6</td>
</tr>
<tr>
<td>drayage truck terminals</td>
<td>10</td>
</tr>
<tr>
<td>hump/classification yard</td>
<td>11</td>
</tr>
<tr>
<td>interchange yards</td>
<td>9</td>
</tr>
<tr>
<td>industrial manufacturing</td>
<td>11</td>
</tr>
<tr>
<td>industrial warehousing</td>
<td>11</td>
</tr>
<tr>
<td>airports</td>
<td>7</td>
</tr>
<tr>
<td>waterway ports</td>
<td>8</td>
</tr>
</tbody>
</table>
TABLE 6: Factors for Site Selection

<table>
<thead>
<tr>
<th>Factors</th>
<th>Response Frequency</th>
<th>Degree of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of Intermodal freight</td>
<td>4 5 2 2 4</td>
<td>54</td>
</tr>
<tr>
<td>Types of Intermodal containers or truck chasse</td>
<td>2 4 6 3 3</td>
<td>53</td>
</tr>
<tr>
<td>Yard size</td>
<td>7 8 3 0 0</td>
<td>76</td>
</tr>
<tr>
<td>Access to associated functions (e.g. truck routes, industries, CBD, etc.)</td>
<td>13 5 1 0 0</td>
<td>88</td>
</tr>
<tr>
<td>Access to labor force</td>
<td>5 3 3 6 2</td>
<td>60</td>
</tr>
<tr>
<td>Local economic impact</td>
<td>3 4 5 4 3</td>
<td>57</td>
</tr>
<tr>
<td>Environmental constraints or opportunities</td>
<td>4 10 2 1 0</td>
<td>68</td>
</tr>
</tbody>
</table>

REFERENCES


3 Another Record Week for Rail Intermodal. [http://www.tomorrowsrailroads.org/media/display_release.cfm?ID=256](http://www.tomorrowsrailroads.org/media/display_release.cfm?ID=256), Accessed July 20, 2004


