

How the Introduction of the HBLRT Changed the Demand for the Liberty State Park Park-and-Ride Facility

THOMAS MARCHWINSKI

NJ Transit

GREGORY SPITZ

THOMAS ADLER

Resource Systems Group

NJ Transit was faced with the problem of how to increase demand for an underutilized park-and-ride facility that was about to see the introduction of light rail transit (LRT) service.

A study was conducted in 1999 to determine why the Liberty State Park Park-and-Ride (LSPPR) facility was underused, how the introduction of the Hudson–Bergen LRT (HBLRT) would impact LSPPR usage, and what other factors might increase usage of the LSPPR facility. The paper describes how the study was conducted using the “convened groups” method to understand and identify the needs and preferences of travelers in the study area, its recommendations, and the measures that were implemented to attempt to increase the LSPPR facility’s utilization.

The study results indicated LSPPR could be made more attractive and therefore more successful by increasing awareness of the park-and-ride lot and the upcoming LRT service. As seen from the model developed by the study, with competitive pricing and travel times, the LSPPR facility was expected to attract a number of new users.

Since the study was conducted, the HBLRT has been introduced; parking was made free for a period of 8 months to increase awareness of the lot; a pricing scheme was devised, based in large part on the study recommendations; and demand for the LSPPR has risen substantially.

The paper concludes with the lessons learned to make the LSPPR facility a highly utilized and viable park-and-ride facility, and how these lessons might apply to other park and ride facilities serving LRT facilities.

INTRODUCTION

In November 1998, the Liberty State Park Park-and-Ride (LSPPR) lot was opened as part of the yet-to-be-built Hudson–Bergen Light Rail Transit (HBLRT) system. LSPPR was initially served by an express bus that took customers to Exchange Place in Jersey City. The 1,250-space lot was only 2% utilized when express bus service was started and this eventually grew to about 6% utilization over roughly 12 months. However, at only 6% utilization with express bus as the ride mode, the lot was still significantly underutilized during the year prior to the introduction of the light rail transit (LRT) service. Due to the lack of use, and with the opening of the HBLRT system to occur in April 2000, NJ Transit commissioned a study in June 1999 to answer the question, “How can we increase the lot’s utilization, especially with the coming of the HBLRT?”

BACKGROUND OF LSPPR

For the LSPPR facility, there were many things in its favor to make the facility successful—the facility’s location was well planned, with good access to and from the New Jersey (NJ) Turnpike (Figure 1). The LSPPR was also located near the growing Jersey City Waterfront area (JCW), which had strong parking needs. However, the facility was underachieving, so the need for obtaining customer preferences and viewpoints was critical in understanding how to increase demand for the facility.

As mentioned above, the LSPPR facility was opened in November 1998 with express buses running from the lot to Exchange Place. In April 2000, the HBLRT was introduced, providing LRT service from the lot to Exchange Place. The HBLRT then expanded northward with partial service to Newport in November 2000 (full service to Newport opened April 2001) and finally to Hoboken in September 2002, giving a greater reach for those parking at the LSPPR facility. Overall ridership on the HBLRT started well below projections. However, HBLRT ridership did increase steadily and has held these gains. The second “operating stage” of the HBLRT project will ultimately take the system north of Hoboken into Bergen County and is currently under construction.

Another benefit of the LSPPR location is that it is located on the “trunk” part of the HBLRT line. This means its service is twice as frequent as stations on the “branch” lines to West Side Avenue and 34th Street (Figure 2).



FIGURE 1 Immediate area around LSPPR.

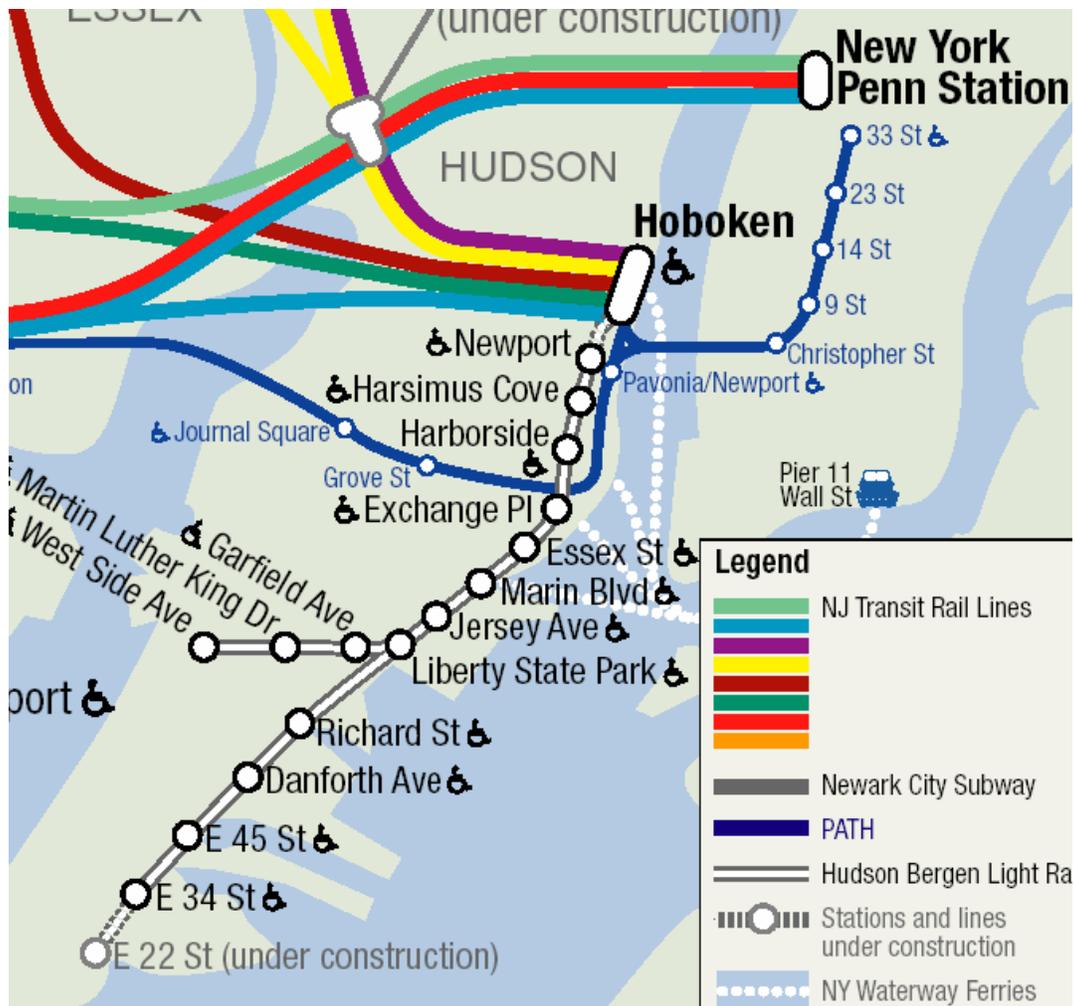


FIGURE 2 HBLRT system map (White Line) with Liberty State Park station at end of trunk line.

Based on a survey of HBLRT riders conducted by NJ Transit in January 2001, it is known that LSPPR draws riders from the larger region, with 72% of its riders coming from outside of the local Hudson County area. Of these riders, the majority are from suburban NJ locations which are at least 10 mi from LSPPR. The impact of these long-distance park-and-riders is that 83% of all LSPPR riders actually use the parking facility. Of the total riders on HBLRT, 31% were former auto-only users to their destination that subsequently diverted to HBLRT; and over half of these riders use the LSPPR facility.

Average household income at LSPPR, from the 2001 survey, was \$97,000 while at all other stations combined on the HBLRT household income was only \$60,000. The high-income LSPPR riders could therefore support the pricing measures that were put into place based on the 1999 study described below in this paper.

The LSPPR functions primarily as a remote shuttle parking lot to the JCW, which is the final destination of 60% of LSPPR patrons. The remaining 40% of LSPPR riders continue on to Manhattan. This split is not surprising, as there are various one-seat rides to Manhattan on the

regional commuter rail system from park-and-ride facilities, while easy one-seat access from a park-and-ride lot to the JCW is found only on the HBLRT and primarily at the LSPPR.

1999 LSPPR STUDY

To answer NJ Transit's question of how to increase the LSPPR facility's utilization, a study was undertaken to better understand the factors which determine demand for the LSPPR facility, from both qualitative and quantitative perspectives. This study's goals were to determine why the LSPPR facility was underused, how the introduction of the HBLRT would impact LSPPR usage, and what other factors might increase use of the LSPPR facility.

To achieve the study goals, research was conducted using the "convened groups" method to understand and identify the needs and preferences of travelers in the study area. Convened groups are somewhat larger than typical focus groups (about 15 people in a convened group as opposed to 10 in a focus group) and engage participants in two primary activities: (1) focus-group-style discussions of the research topics; and (2) a comprehensive survey covering participants' travel needs and preferences, the results of which are used as the basis for quantitative analysis.

For the LSPPR study, three convened groups were held during the evenings of June 14–15, 1999, in the executive board room of the Liberty Science Center, which is adjacent to the LSPPR facility. In total, 44 respondents participated in the three convened groups.

Respondents were recruited by handing out flyers at and around Exchange Place, at toll plaza 14C on the NJ Turnpike, and at the LSPPR facility. Those living in South Jersey City and North Bayonne were recruited using a database of past NJ Transit research study participants. **Table 1** summarizes the methods used for recruiting and the yield from each. The study's purpose was to obtain a general impression of the LSPPR facility from a random sample of potential users, which worked nicely with the convened groups method, as this study did not have the budget to conduct a large study with many respondents.

Eligible respondents included those living parallel to or south of the LSPPR facility who commute to the JCW or New York City (NYC). This recruitment included commuters living in Brooklyn who work at Exchange Place, as the route passing by LSPPR is the most efficient one for some of these commuters. The map below indicates the general study area (**Figure 3**). The black line is an approximate study-area border, and respondents were recruited from west of this line.

TABLE 1 Recruitment Techniques and Results

Recruitment Technique	Location	Flyers Distributed	Recruits	Remarks
Flyer Distribution	NJ Turnpike toll plaza 14C	1000	3	The turnpike's extremely low response rate leads one to presume that, in reality, very few flyers were handed out. The Turnpike did not allow on-site oversight by the study team in order to ensure that flyers were properly distributed.
Flyer Distribution	Exchange Place	800	26	
Flyer Distribution	LSPPR	20	6	
Telephone using database	N/A	N/A	10	

Four primary respondent categories were recruited for the study: (1) drivers to JCW, including those who continue via PATH/FERRY to NYC; (2) park-and-ride customers currently using the LSPPR facility; (3) transit-only users traveling to JCW/NYC destinations; and (4) drivers commuting to NYC.

The first three respondent categories are well represented in the study based on respondent mode, home location, and final destination (Table 2).

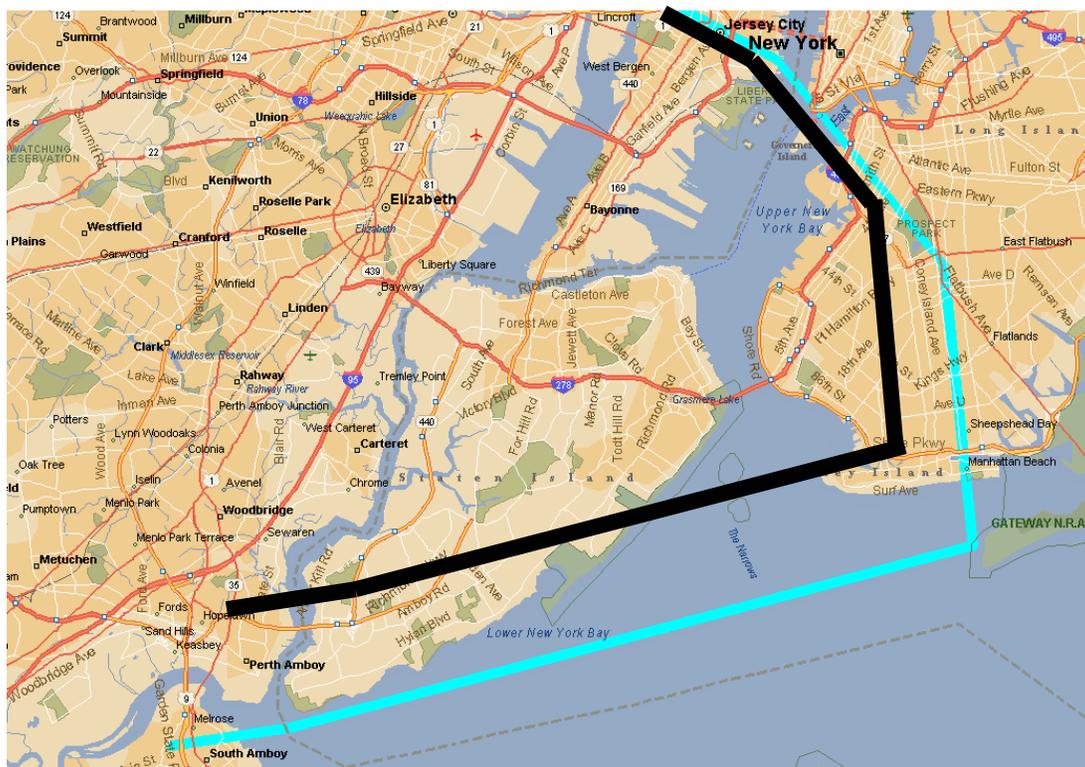


FIGURE 3 General area of LSPPR study participant recruitment.

TABLE 2 Number of Respondents in Each Recruit Category

Destination	Survey Segment						Total
	Drive to JCW		Park-and-Ride at Liberty State Park		Transit		
	Non-local resident	Local Resident	Non-local resident	Local Resident	Non-local resident	Local Resident	
Exchange Place/JCW	10	2	3	2	10	5	32
NYC via PATH	5	3		1	2	1	12
Total	15	5	3	3	12	6	44

QUALITATIVE OBSERVATIONS

Participants in all convened groups generally agreed that parking in the JCW area is expensive, as much as \$200 per month. The price had been increasing and the availability of empty spaces decreasing. Most also felt that continuing development would continue to push parking prices up. All three respondent categories (Drive to JCW, LSPPR users, Transit to JCW/NYC) observed that congestion in the JCW area was the worst of their entire commute and was continuing to increase.

Awareness of the LSPPR was not widespread, with only 40% of respondents aware of the facility. A billboard on the NJ Turnpike advertising the LSPPR was suggested. Most respondents did not know that the lot was open or that there was a bus to transport commuters from LSPPR to JCW. Some commented that the bus service, facing the same congestion as autos, did not provide any incentive for commuters to use LSPPR. Current LSPPR users also mentioned lack of air conditioning on shuttle buses and faulty ticket vending machines making the use of LSPPR less attractive.

Many study participants were aware of the plans for the new LRT line and favored using it because of the benefits it offers: exclusive right of way, faster travel time than auto or bus, and greater frequency than bus. However, there were concerns that the LRT might stop too frequently, like a bus rather than like a train, and that the line might not operate reliably in bad weather. Some participants were also concerned that the parking prices at LSPPR would begin to escalate just as they have in the JCW area.

Current users of LSPPR were generally satisfied with the facility and looked forward to the new LRT for its greater service frequencies and faster travel times due to its exclusive right of way. Participants expressed the desire for full parking/ticketing options: monthly, multitrip tickets, and “combos.”

Some participants thought a parking fee of \$1 per day should be maintained to keep in line with other HBLRT lots while others thought up to \$2 per day would be acceptable, as the LSPPR lot was so close to their Exchange Place destination. A total fee of \$5 per day was considered fair for both parking and a round-trip LRT fare. There was a suggestion that parking be made free to carpools. There was minimal concern about transferring or alighting at Exchange Place, Newport, or the ferry. Several participants expressed the need for excellent security in the lot for personal protection and to protect against stolen or vandalized cars. Current LSPPR users were concerned that there was no active telephone line connected to the security booth or any public telephone available nearby.

QUANTITATIVE RESULTS

Sample Representation

The study sample represented the targeted LSPPR market well. Respondents were overwhelmingly 5-days-per-week commuters (93%). Eighty percent of respondents were aware of the HBLRT, but less than 50% had been aware of LSPPR prior to the session. Eighty-nine percent of respondents were employed full time, spread across a variety of occupations. The average number of vehicles per household was 1.5, while average household size was 2.5. Race was not asked in the survey, but from general observation of the focus groups, a reasonably

diverse sample was achieved. All income levels were reasonably represented in the sample (Figure 4).

Of the 20 respondents driving to JCW, the following reasons were given for why they did not use LSPPR: 45% stated they were unaware of LSPPR; another 15% had either free or reduced parking elsewhere; and 30% thought it was inconvenient or too far from their workplace (Figure 5).

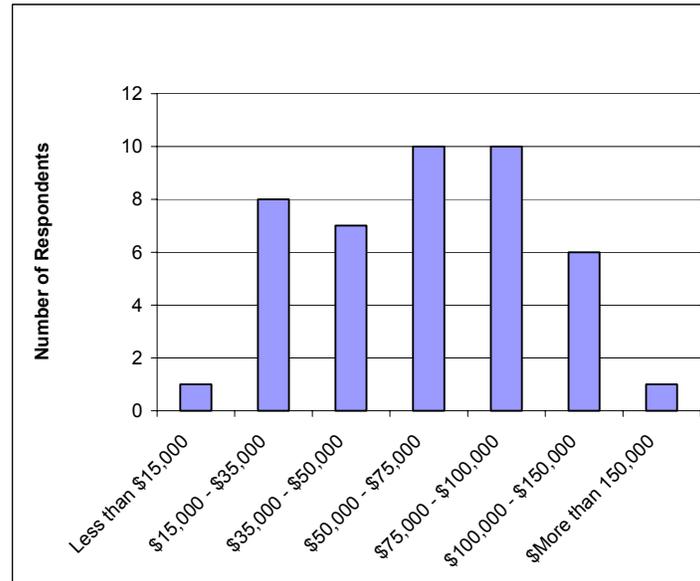


FIGURE 4 Annual household income of respondents.

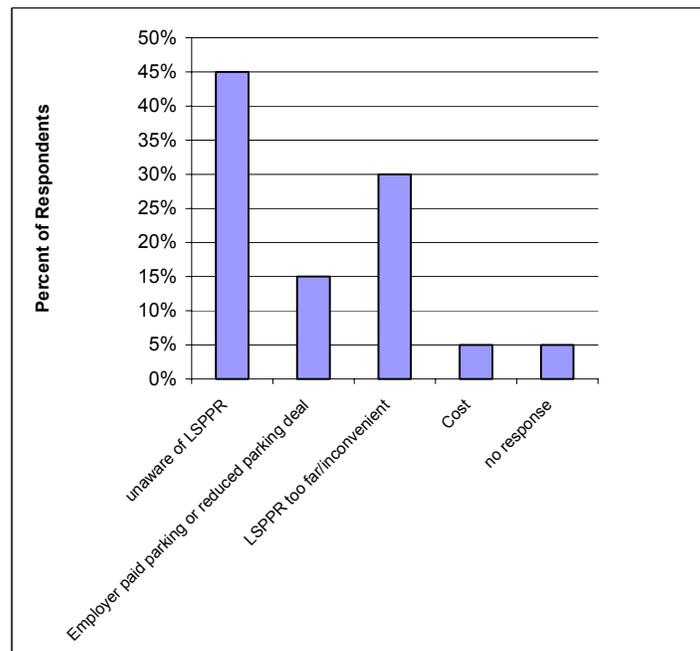


FIGURE 5 Respondent reasons for not currently using LSPPR (drivers to JCW only).

Stated Preference Responses and Mode Choice Model

Survey respondents completed a set of stated preference choice experiments in which they were asked to choose between using their current travel mode versus using the new HBLRT service at the LSPPR facility. Each choice experiment included LRT variables that were customized based on the way the respondent traveled to JCW. As discussed earlier, travelers were categorized into three current travel mode segments:

- Drive to JCW (including people who continue on to NYC by transit);
- Park-and-ride—currently park at LSPPR and take a bus to JCW; and
- Bus—take a bus to JCW (without parking at a park-and-ride lot).

Respondents evaluated the choice alternatives based on travel time, headway (time between LRT arrivals), and travel cost. Levels of the LRT variables varied by travel mode (Table 3).

Figure 6 shows an example of the stated preference experiments presented in the survey to auto users going to JCW. These experiments are analogous to what other survey segments received in their surveys.

The stated preference survey results were used to estimate a multinomial logit mode choice model (Tables 4 and 5). Logit models using choice-based-conjoint stated preference techniques are widely used for modeling travel mode choice (1).

TABLE 3 Stated Preference Levels for LRT Option for Different Respondent Types

	Drive to JCW	Park-and-Ride at Liberty State Park	Bus to JCW
Travel Time	<u>Total TRAVEL TIME (Except Waiting for LRT)</u> 8 min less each way 4 min less each way SAME as your trip now	<u>Total TRAVEL TIME (Except Waiting for LRT)</u> 10 min less each way 5 min less each way 3 min less each way	<u>Total TRAVEL TIME (Except Waiting for LRT)</u> 8 min less each way 4 min less each way SAME as your trip now
Headway	<u>Time Between LRT ARRIVALS</u> LRT arrives every 3 min LRT arrives every 6 min LRT arrives every 9 min	<u>Time Between LRT ARRIVALS</u> LRT arrives every 3 min LRT arrives every 6 min LRT arrives every 9 min	<u>Time Between LRT ARRIVALS</u> LRT arrives every 3 min LRT arrives every 6 min LRT arrives every 9 min
Travel Cost	<u>Total COST for LRT Fare and Parking</u> free \$70/month \$100/month	<u>Total Travel COST for LRT Option (includes parking)</u> travel cost is the SAME \$1/day more (\$20/month MORE) \$3/day more (\$60/month MORE)	<u>Total Travel COST for LRT Option (includes parking)</u> travel cost is the SAME 25¢/day more (\$5/month MORE) \$1/day more (\$20/month MORE)

Which Would You Choose?

Check YES or NO for each of the 9 cases below to indicate whether or not you would use the LRT for that case.

CASE	Total TRAVEL TIME (Except Waiting for LRT)	Time Between LRT ARRIVALS	Total COST for LRT Fare & Parking	Check one box for EACH Case	CASE
1	8 minutes LESS each way	LRT arrives every 6 minutes	\$70/month	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	1
2	4 minutes LESS each way	LRT arrives every 9 minutes	\$100/month	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	2
3	4 minutes LESS each way	LRT arrives every 3 minutes	\$70/month	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	3
4	8 minutes LESS each way	LRT arrives every 3 minutes	\$100/month	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	4
5	4 minutes LESS each way	LRT arrives every 6 minutes	free	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	5
6	SAME travel time as your trip now	LRT arrives every 6 minutes	\$100/month	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	6
7	8 minutes LESS each way	LRT arrives every 9 minutes	free	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	7
8	SAME travel time as your trip now	LRT arrives every 3 minutes	free	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	8
9	SAME travel time as your trip now	LRT arrives every 9 minutes	\$70/month	Would you switch to the LRT? <input type="checkbox"/> YES <input type="checkbox"/> NO	9

FIGURE 6 Stated preference experiments for automobile users going to JCW survey.

TABLE 4 Choice Modeling Results

Variable	Units	Coefficient	T-Stat	Coefficient Lower Confidence Interval (alpha=.05)	Coefficient Upper Confidence Interval (alpha=.05)
Total Travel Time	minutes	-0.158	-4.4	-0.088	-0.229
Total Travel Cost	dollars	-0.660	-7.4	-0.484	-0.835
LRT Headway	minutes	-0.058	-1.3	0.030	-0.146
Current P&R Constant	utils	3.061	3.0	1.014	5.108
Current Bus Constant	utils	4.622	4.6	2.638	6.606
LRT Constant	utils	4.516	4.3	2.451	6.581
Age	years	0.085	3.2	0.033	0.137

TABLE 5 Choice Modeling Results (continued)

Variable	Mode to Jersey City Waterfront			
	Drive	Park & Ride	Bus	LRT
Total Travel Time	X	X	X	X
Total Travel Cost		X	X	X
LRT Headway				X
Current P&R Constant		X		
Current Bus Constant			X	
LRT Constant				X
Age	X			

(Xs show modes to which coefficients apply)

The mode constants in these models can be used to compare the preferences of the transit modes relative to each other, regardless of time and cost. The bus mode constant for current park-and-ride users at Liberty State Park is less than the LRT constant (3.1 versus 4.5), indicating LRT is the preferred mode for this survey segment. However, users going directly to JCW by bus slightly prefer their current bus mode over the LRT mode (4.6 versus 4.5). These results indicate that the introduction of HBLRT would be an additional incentive for the current LSSPR respondents to use the LSPPR facility and provide no disincentive for current bus users.

The model results indicate the sensitivity of survey respondents to travel time, cost, and LRT headway. The value of time implied by the time and cost coefficients is about \$14.50 per hour or 24¢ per minute (in 1999 dollars). The model’s value-of-time indicates people are willing to pay an extra \$2.40 to save 10 min of travel time. Alternatively, they are willing to have travel take an extra 10 min to save \$2.40 on their travel cost. The introduction of LRT was expected to reduce travel time as much as 10 min each way, thus providing a benefit of \$2.40 in value to respondents. In addition, the LSPPR lot could save respondents \$100 or more in direct expenses per month, depending on their parking situation. This money savings clearly creates an incentive for potential LSPPR users.

A variety of income effects were tested in the model and not found to be statistically significant. Of the demographics that were tested (e.g., age, gender, number of household vehicles, vehicles per adult in household, presence of children, and occupation), only age systematically affected mode choice, with older travelers more likely to use auto.

SUGGESTED STRATEGIES FROM STUDY AND WHAT REALLY HAPPENED

The first conclusion from the study was that LSPPR usage could be improved by increasing awareness of the lot and with the upcoming LRT service. It was clear from both the qualitative and quantitative analyses that there were good reasons for potential users to use LSPPR but that respondents were simply unaware of the facility. NJ Transit did conduct a marketing and communication initiative for HBLRT as a whole, which they perform as a matter of course for all major service introductions. While the LSPPR was not targeted directly, potential riders from the LSPPR catchments area were targeted with various marketing materials and campaigns, including print and outdoor advertising (roadside billboards), special events (including a Liberty

Park Science Center event adjacent to the LSPPR facility), and other awareness-generating techniques. These methods were targeted to make people aware of HBLRT service, not the LSPPR facility itself. As noted above, most respondents knew about HBLRT before it had even been put into service. However, not even 50% of respondents knew about the LSPPR facility, which was in operation at the time of the 1999 study.

In fact, upon the opening of HBLRT, the LSPPR facility was still underutilized, and ridership was lower than projections for the entire HBLRT system. As indicated in comments in the focus groups and seen in the empirical results, respondents believed a total daily LSPPR cost of approximately \$5, or \$100 per month, including both parking and LRT fare, was reasonable. It was recommended that NJ Transit stay in a range close to these daily cost numbers when pricing the LSPPR facility for the introduction of HBLRT.

NJ Transit did price the daily HBLRT ticket/LSPPR parking cost as the research suggested—\$5 per day (\$2 per day to park, and \$1.50 per one-way trip on HBLRT). Furthermore, NJ Transit priced the monthly parking and transit pass at \$93, which was less expensive than what the respondents indicated they would be willing to pay (\$100). But the LSPPR was still not being well utilized.

NJ Transit therefore decided in September 2000 (4 months after service began on HBLRT) to implement free parking. Free parking continued for 7 months until April 2001 when the \$5 per day daily parking/LRT cost was reinstated as well as the \$93 monthly cost (about a year after the HBLRT's initial opening). The free parking served to be a good method to generate awareness of the LSPPR facility, as after the free parking was taken away in April 2001, ridership at the LSPPR continued to increase, and this LSPPR increase was greater than the average ridership increase at all other stations in the HBLRT system. Furthermore, the survey conducted by NJ Transit in January 2001, when free parking was still in effect, indicated that 26% of respondents used the HBLRT to avoid expensive parking costs at JCW.

By August 2001, parking at the LSPPR was at 92% of capacity, or about 1,150 spaces out of the 1,250 spaces were used on an average weekday. This was a very significant increase from the opening of LRT service 18 months earlier, when utilization of the LSPPR lot was below 50%.

The LSPPR capacity of 1250 was originally based on land availability and constructability during the construction phase of the project. Actual ridership forecasts in the Final Environmental Impact Statement were substantially higher than the 1,250 capacity for year 2010. Given cost and space limitations it was decided to construct the LSPPR with 1,250 spaces and revisit parking needs after the system had begun operation, as forecasts were based on the year 2010. The revised forecasts completed just before the system opened indicated a need for 2,500 to 3,000 spaces. Current forecasts are for an estimated 3,000 spaces, but not until the year 2020. This longer time frame accounts for reduction in demand due to September 11, 2001, (9/11) and the NYC area's slower growth forecasts resulting from a loss of jobs in lower Manhattan and the recession in general. Preliminary planning for an expanded structured parking garage option for the 3,000 total spaces is underway, including possible joint residential development. Since 2002, LSPPR has operated at 100% capacity for its 1,250 spaces.

Also in April 2001, full LRT service to Newport was started, which expanded the reach of the system to a regional mall, office complex, and connection to Midtown NYC via PATH at the Newport station. This increased reach of destinations from the LSPPR lot (as well as all stations on the HBLRT) served to improve its attractiveness to new users. Since then, HBLRT service has been completed to Hoboken, increasing reach again to a major urban center and transit hub.

It should also be noted that ridership was growing across the HBLRT system during the first 5 months of 2001. However, ridership at stations other than LSPPR was not growing as fast as the LSPPR station ridership. Specifically, LSPPR station ridership increased from 1,200 boardings per day to 1,650 from January 2001 to May 2001, an increase of 38% (over 80% of these boardings were people using the park-and-ride facility at the LSPPR station). The average increase at all other stations on the system was 28% from January 2001 to May 2001. Finally, the JCW was also growing and it has become the major “back office” area for Wall Street. Due to general development patterns as well as the events of 9/11 the JCW area continues to grow, with many firms relocating to the area.

As seen from the model constants, the LRT mode was favored over the previous shuttle and had nearly the same utility to bus users as their current bus mode. It was concluded that with competitive pricing and door-to-door travel time, assuming an awareness of the facility, the LSPPR facility should attract a number of new users with the introduction of HBLRT service. Competitive pricing and travel time became a reality when HBLRT service began.

CONCLUSIONS AND LESSONS LEARNED

The main lessons to creating a successful park-and-ride facility that serves an LRT system are based on both common sense and business sense:

- Potential customers must be aware of the park-and-ride facility in order to use it;
- It can take significant time for awareness of the park-and-ride facility to grow (over 2 years from the time LSPPR was built in late 1998 to August 2001);
- The park-and-ride facility must be priced correctly based on the demand for it and based on competitive alternatives; and
- There needs to be a market for the park-and-ride facility.

In general, system operators must be patient. LSPPR ultimately fit very well into the HBLRT system. However, awareness needed to be generated, HBLRT ridership needed to take form and stabilize, and the HBLRT system also needed to complete its expansion plans north to Hoboken before the LSPPR facility finally reached its potential.

While it is not always possible to conduct market research on underperforming facilities, the example of LSPPR indicates the benefits of such research. Surveying customers about the facility both qualitatively and quantitatively improved NJ Transit’s understanding of the LSPPR to help turn it around. The research showed NJ Transit where they needed to focus their activities, and it gave them a good baseline to understand what parking costs should be and how parking and transit services should be offered.

All these factors eventually came together, and the result is that the LSPPR is a thriving facility that now needs to expand.

REFERENCES

1. Louviere, J., D. Hensher, and J. Swait. *Stated Choice Methods*. Cambridge University Press, Cambridge, Mass., 2000.