NJ TRANSIT Process for Evaluating Capital Projects

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In June 1987 NJ TRANSIT proposed a $1.3 billion plan for rail and bus improvements that would handle projected growth in trans-Hudson commuting traffic. To evaluate projects, NJ TRANSIT used standard financial cost/benefit analysis techniques and considered the major impact of transportation investments on New Jersey's growing economy. Among the concerns commonly faced by a public agency is the weighing of the public policy benefits of an investment along with its cost-effectiveness and efficiency.

NJ TRANSIT was faced with the task of selecting, among many capital investment initiatives, the set of projects that would best meet transit travel needs in New Jersey. The main problems to be addressed by the agency were the growth in trans-Hudson travel and the capacity limits of the current transportation system. The ability to increase rail capacity to Penn Station New York (PSNY) and bus capacity through the Lincoln Tunnel to the Port Authority Bus Terminal (PABT) formed the cornerstone of the planning effort. Capacity for each transit mode was upgraded—increasing the number of peak hour buses to the PABT by approximately 200, relieving currently overcrowded approaches to the Lincoln Tunnel, and increasing the number of peak hour trains into PSNY from 20 to 30. These upgrades would make it possible to handle projected trans-Hudson growth, as well as opening the door for consideration of several rail project options (*1*).

The list of rail projects was comprehensive, addressing each of the Trans-Hudson transportation corridors and in some cases including alternative ways of handling the same transit market. NJ TRANSIT organized these options according to geography, as New Jersey's growth patterns differ by area, and the range of potential transit improvements in each travel corridor varies (see Figures 1 and 2). The methods used to evaluate these rail projects played a key role in the organization's decision-making.

From the beginning, NJ TRANSIT realized that its evaluation must include quantitative assessments of transportation effectiveness and efficiency. Qualitative measures would assess the impact of a project on state development, policy concerns, and external issues such as the environment, coordination with other regional transportation agencies, and risk factors. These concerns, common to public sector decision-making, involve balancing the public policy benefits of an investment with measures of cost-effectiveness and efficiency. In the private sector the basis for decision is much more clearly defined—maximum profit must be made. In the public sector, however, social, political, and environmental priorities may prevail (*2*).

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In developing an annual capital program, NJ TRANSIT understood the importance of including qualitative judgments as to a project's net worth in the decision-making. Proposed projects are analyzed as to both their financial and nonmonetary costs and benefits (*3*). However, the annual capital program, which encompasses mostly routine capital replacement and major rehabilitation, does not include regional initiatives aimed at capturing new markets. NJ TRANSIT found it necessary to expand the evaluation criteria used in its annual capital process to make regional investment decisions. Key policy concerns were the effect of a project on local economic development, private bus operators, auto congestion, and intrastate mobility. In addition, NJ TRANSIT analyzed a set of alternatives for not just a single transportation corridor, but for an entire network of geographic corridors combined into one conceptual corridor of trans-Hudson travel. The variety of individual projects competing for selection demanded full examination of the regional impacts of each project, rather than merely its financial costs and benefits (*4*).

It was important that the evaluation provide a method to judge each project fairly and consistently compared to other projects under consideration. The objective of the evaluation was to select projects that, taken together, could solve the needs of trans-Hudson travelers and make the most use of possible new transportation capacity into New York.

PROJECT OPTIONS

NJ TRANSIT grouped the project options into four geographic travel corridors: Bergen County, Morris and Essex Counties, Newark District, and Monmouth and Ocean Counties. A brief description of the project options follows.

Bergen County

West Shore Connection to New York Penn Station, West Shore Transfer, West Shore to Hoboken

The West Shore options involve restoring passenger rail service on the West Shore rail line in Bergen County, New Jersey, and Rockland County, New York. The West Shore corridor currently has the largest share of trans-Hudson auto commuting of the trans-Hudson corridors. The connection option would provide direct one-seat rail service to New York Penn Station by constructing new connecting track at Secaucus between the West Shore Line and the Northeast Corridor, while the transfer option would involve a passenger transfer

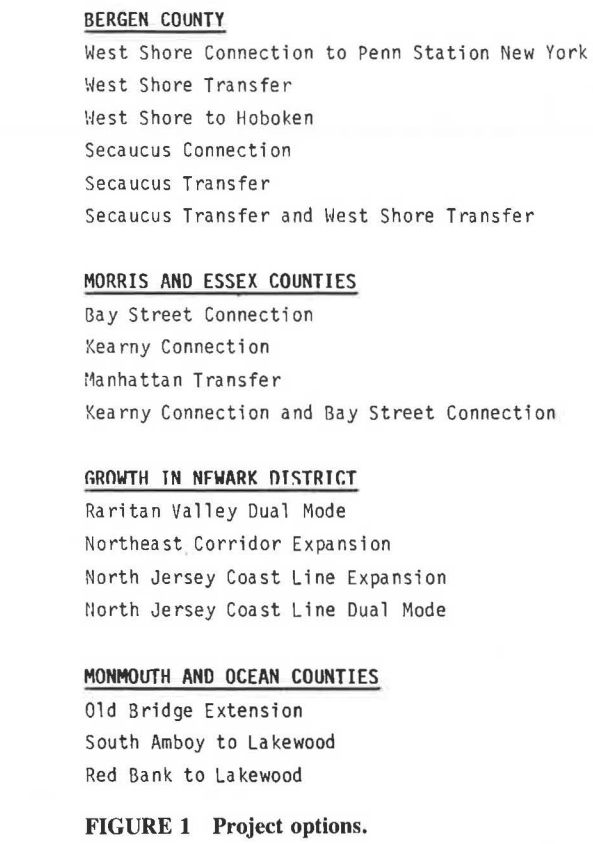

FIGURE 1 Project options.

station at Secaucus. The transfer station would allow passengers to travel to New York Penn Station with one transfer as well as to connect to other lines that use the Northeast Corridor. The West Shore to Hoboken option involves connecting the West Shore line to the Bergen County line, which terminates in Hoboken. A bus shuttle would operate from Hoboken to midtown Manhattan, or passengers could transfer to PATH trains or the planned Hoboken ferry for final connections to lower Manhattan.

Secaucus Connection/Transfer

The Secaucus connection and transfer projects also attempt to deal with the high auto use in the Bergen County area by providing rail service to midtown Manhattan that does not currently exist. The connection option would involve direct connecting track from the Main, Bergen, and Pascack Valley lines to the Northeast Corridor. The transfer option would involve a passenger transfer station at Secaucus.

Morris and Essex Counties

Bay Street Connection

The Bay Street connection would consolidate two relatively weak rail lines, the Boonton Line and the Montclair Branch, reducing costs for operation and capital maintenance.

Kearny Connection and Manhattan Transfer

The Kearny connection would provide direct rail access to midtown Manhattan through construction of a track connection between the Morris and Essex lines and the Northeast Corridor. It would also link the Newark Broad Street station directly with New York Penn Station, further supporting growth and redevelopment in downtown Newark. The Manhattan transfer is a transfer alternative to the Kearny connection.

Newark District

Raritan Valley Dual Mode and North Jersey Coast Line Dual Mode

These two projects call for dual power diesel-electric locomotives that would provide a one-seat, no-transfer ride to New York Penn Station for the passengers currently riding these lines.

Northeast Corridor and North Jersey Coast Line Expansion

These projects involve trains, new stations, additional parking, and train yard expansions to accommodate rail ridership growth on the Northeast Corridor and North Jersey Coast Line.

Monmouth and Ocean Counties

The Old Bridge Extension, South Amboy to Lakewood, and Red Bank to Lakewood projects would bring new rail service to the rapidly growing market in central New Jersey. The options involve branch lines off the North Jersey Coast Line that take advantage of existing rail right-of-ways.

EVALUATION CRITERIA

A list of evaluation criteria was prepared with the help of representatives from departments in corporate headquarters and the Bus and Rail subsidiaries through NJ TRANSIT's Strategic Planning and Policy Committee. The criteria were chosen to address the concerns of three major constituencies defined as the operator (NJ TRANSIT); users (passengers); and non-users (auto users, government, other operating agencies, community organizations, etc.) By focusing on these three different constituencies, NJ TRANSIT achieved a broad perspective in selecting its criteria. NJ TRANSIT concerns emphasized the need for cost-effective, financially feasible, low-risk solutions; passenger concerns emphasized the importance of travel benefits; and non-user concerns directed attention to issues such as relief of traffic congestion, economic development, and providing transit services to new markets.

The proposed list of criteria was examined next in light of the data available for each project. NJ TRANSIT possessed a mode-split ridership model that provided much of the data required to calculate travel benefits and ridership changes for

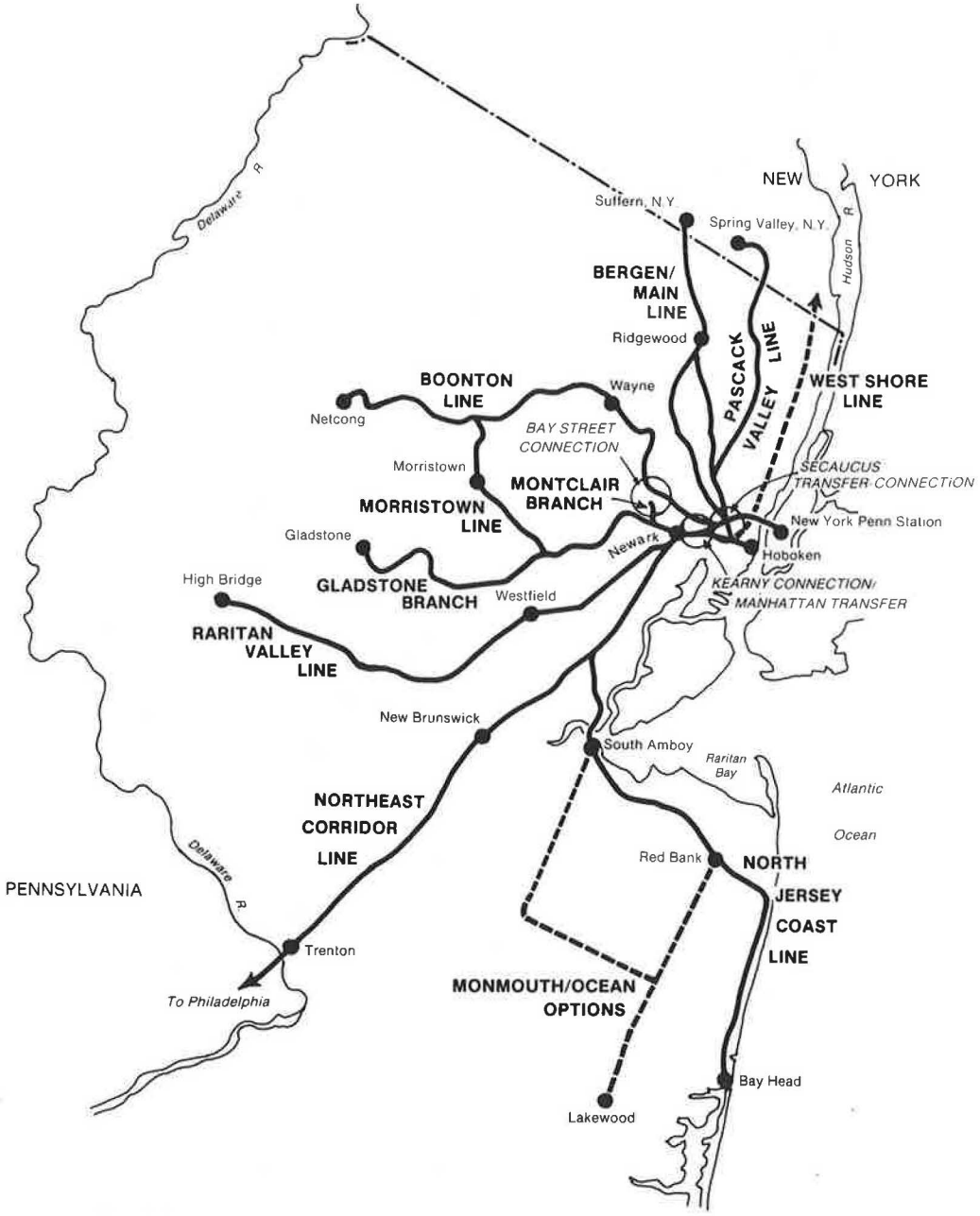

FIGURE 2 NJ TRANSIT rail system—proposed rail projects.

each project alternative. The model also provided revenue estimates of projects based on ridership projections. Preliminary estimates of capital costs for each project were based on engineering studies, and operating costs were based on the ridership and service plan for the project. Thus, most of the data required to calculate the criteria were available. Two areas that could not easily be addressed with hard quantitative data were environmental impacts and economic development. Consequently, these areas were included in the evaluation process as qualitative rather than quantitative indicators. A list of the quantitative criteria used, together with their definitions, is included as Table 1. The criteria were grouped into the following three categories:

Financial Analysis

The costs and benefits of a project as an economic investment and its effect on the operating efficiency of the system. The criteria are rate of return, net present value, farebox recovery, deficit per new passenger.

User Benefits

The travelers who would benefit from an investment and quantification of their benefits as travel time savings, transfer savings, and rider trip costs. Criteria are total transit riders,

TABLE 1 EVALUATION CRITERIA DEFINITIONS

CRITERIA	DEFINITION
A. FINANCIAL ANALYSIS	
(1) Return on Investment	The present value of the net operating costs (operating costs minus revenue) divided by the present value of capital costs.
(2) Net Present Value	The present value of the net operating costs minus the present value of capital costs.
(3) Farebox Recovery	Passenger revenue divided by the direct cost of providing service at the mode level.
(4) Deficit/New Passenger	The net cost of providing service before the investment minus the net cost of providing service after the investment divided by the additional number of passengers carried.
B. USER BENEFITS	
(1) Total Riders	The number of transit passengers who would be affected by an investment in a given corridor.
(2) % Change in Riders	The transit ridership for the corridor gained as a result of the capital investment divided by the ridership in the corridor without the capital investment.
(3) Peak Riders Benefitted	The number of transit passengers who would use the new transit option in the corridor.
(4) New Riders By 1995	The number of new riders attracted to the transit mode as a result of the capital investment. New riders do not include existing direct rail riders.
(5) Change in Total Travel Time	The change in total travel time for the corridor.
(6) Change in Trip Cost	The percentage change in total trip cost for the corridor compared to the total trip cost in the corridor without the capital investment.
(7) Directness	The percentage change in number and type of transfers for all passengers in the corridor compared to the number and type of transfers in the corridor without the capital investment. Rail/PATH transfers are given a different weight than Rail/Rail, Auto/PATH, and Auto/Bus transfers.
C. REGIONAL IMPACTS	
(1) Peak Period Diverted Auto Trips	The total number of trans-Hudson auto trips diverted during the peak period.
(2) New Jersey Growth	The number of new trips generated by making the capital investment divided by the number of total additional trans-Hudson New Jersey trips expected by forecasted growth in New Jersey population and labor force.
(3) Transit Market Share	The increase in the percentage of peak period trans-Hudson transit trips in the corridor.
(4) Private Bus Impact	Ridership impact on private bus.

change in riders, peak riders benefited, new riders, change in travel time, change in transfers, change in trip cost.

Regional Impacts

The relationship of the project to the regional transportation network. Criteria are peak period diverted autos, private bus diversions, transit market share, New Jersey growth.

Besides these criteria, a series of non-quantifiable factors were developed. One set of factors, under the heading "risk," dealt with the complexity and uncertainty of project construction and operation. Eight factors were listed and each project was scored according to the number of risk factors involved and the degree of risk it presented. These judgments were made by the NJ TRANSIT planning and engineering staffs with help from consultants working on the various projects.

Matters of concern to NJ TRANSIT at the policy level were grouped under the heading "qualitative factors" and dealt with the way in which the proposed project would influence development, increase intrastate mobility, affect other transit providers, and elicit funding contributions. Nine factors were listed and, as with the risk factors, each project was scored on its ability to address these factors. The risk and qualitative factors are as follows:

1. Risk factors

- depends on dual-mode technology (locomotives that can operate with either diesel or electric power)
- requires rail yard expansion
- requires relocation
- adversely impacts private carriers
- involves other agencies (Amtrak, Conrail, etc.)
- difficult to provide parking
- long time to complete
- potential environmental barriers
- construction complexity, and
- operational complexity.

2. Qualitative factors

- supports urban development
- supports Meadowlands growth
- supports Waterfront development and Waterfront transitway
- creates transit opportunities to the Sports Complex and new baseball stadium
- interconnects New Jersey rail lines
- addresses problems in high auto-oriented areas
- minimizes impact on private bus operators
- attracts private funding participation, and
- attracts New York State contribution.

The evaluation criteria shown in Figure 3 would allow the different strengths and weaknesses of the projects to be presented in a comprehensive and consistent manner.

DATA COLLECTION AND ANALYSIS

To calculate the set of criteria indicators, each project was compared to a Transportation System Management (TSM) alternative in the same transportation corridor. A TSM option represents the best that can be achieved for mobility within the existing transportation infrastructure. Data on project costs and benefits were measured as an increment from the baseline condition defined by the TSM alternative. A consistent process was used to estimate the capital and operating costs for each project, based on its peak period ridership. The capital costs for many of the projects were preliminary, as engineering and design work was not complete. Operating costs (also preliminary) were used to compare projects and satisfactorily indicated the relative costs of the projects.

Each project was modeled and again compared to a TSM alternative to develop data on changes to ridership, revenue, travel time, transfers, and user costs. These data were collected in spreadsheets used to calculate the 15 quantitative criteria. Risk assessments as well as qualitative assessments were also developed for each project alternative.

In two cases criteria values were calculated for two projects together—the Secaucus transfer with West Shore transfer and the Kearny connection with Bay Street connection. In both cases, it was technically feasible to implement the two projects together. Market overlap existed between the Secaucus Transfer and West Shore projects to the extent that the market size of

Financial Analysis Factors

- Return on Investment
- Net Present Value
- Farebox Recovery
- Deficit/New Passenger

User Benefit Factors

- Total Transit Riders in Corridor
- % Change in Total Transit Riders
- Riders Benefited by Project
- New Riders Attracted to Project
- Change in Travel Time
- Change in Quantity and Quality of Transfers
- Change in Trip Cost

Regional Impact Factors

- Peak Period Diverted Autos
- Private Bus Diversions
- Transit Market Share
- New Jersey Growth

Risk Factors

- Dual Mode Dependent
- Difficult to Provide Parking
- Requires Yard Expansion
- Requires Relocations
- Adverse Private Carrier Impacts
- Other Agency Involvement (Amtrak, Conrail, etc.)
- Time to Complete
- Environmental Issues
- Construction Complexity
- Operational Complexity

Qualitative Factors

- Private Bus Impact
- Inter-connects New Jersey
- Addresses Northern Suburbs
- Urban Development
- Meadowlands Potential
- Serves Waterfront
- Private/Public Participation
- Baseball Stadium
- New York Contribution

FIGURE 3 Evaluation criteria.

both projects together would be less than the sum of the two projects individually. Also, capital and operating costs overlapped to a considerable degree. In the case of Kearny/Bay Street, the two projects had a synergistic effect on each other so that a stronger market draw resulted when the projects were considered together.

A database was created for the 17 rail options (15 individual projects and two combination projects) listed in Figure 1, composed of 15 quantitative criteria, a risk rating, and a qualitative rating. The next task was to combine this information in a way that allowed NJ TRANSIT to judge which projects provided the best benefits to New Jersey for the capital dollars spent.

METHODOLOGY FOR DEVELOPING PROJECT RANKINGS

As the evaluation criteria span a wide range of factors, it was probable that a project would not perform equally well in each criteria group. A project having the potential to attract many new riders and save travel time might also be very risky. NJ TRANSIT wanted a way to combine the various elements considered in the evaluation criteria systematically. The goal to develop an objective basis for ranking the projects, considering all the evaluation criteria.

To do this a two-step process was followed. First, for each category—financial analysis, user benefits, regional impacts, risk, qualitative factors—a score was calculated for the overall performance of a project within that category. For example, in the financial analysis category, where the four evaluation criteria are rate of return, net present value, farebox recovery, and deficit per new passenger, a project's performance for each criterion was converted to a statistically standard normal value. (The normalized value was calculated as the difference between the actual value of the indicator and the mean value of the indicator for the projects divided by the standard deviation of the indicator for the projects.) The criteria could then be represented in equivalent units and added to create a composite score for performance in the financial analysis category. For each of the five categories, projects were ranked from highest performance to lowest performance, based on the values of the composite category indicator.

By grouping the criteria into categories and developing standardized values for each category, the large list of criteria was reduced to five representative scores. These scores provided a way to compare performance among the different categories, even though there was a different number of criteria in each category and overlap of criteria within a category. For example, the user benefits category had seven criteria compared to four in the financial analysis category, and four of those seven criteria dealt specifically with ridership changes.

The second step in the evaluation process involved standardizing the five composite values derived for each category and combining them to get an overall rating of each project's performance considering *all* categories. In this process, six different weighting methods were followed—first, all categories were given equal weights, and for the other five, each category in turn was weighted by two while the other four categories were weighted by one (see Table 2). In this way, it was possible to consider any one of the categories as more important than the others and see the effect that had on the rank order of the projects.

The evaluation process tended to show better performance overall for projects that addressed a larger commuter shed. This phenomenon did not exist in the financial analysis category, which compared revenues from ridership to costs incurred, but did occur in the user benefits and regional impacts categories. Both these categories dealt with the ridership that a project was able to attract. If a project attracted a large number of riders, it performed well. (The risk and qualitative factors categories did not deal specifically with ridership and, therefore, did not reflect this tendency.) Because of the emphasis on ridership, combinations of projects performed better than single projects. This aspect of the evaluation process upheld NJ TRANSIT's overriding objective—to increase trans-Hudson transit ridership and capacity.

RESULTS

Figure 4 lists the project rankings for each evaluation category and a list of the combined categories weighted equally. Characteristics of projects in each list are summarized as follows.

Financial Analysis

The projects that performed well have low incremental operating costs compared to the additional revenue generated, as

TABLE 2 WEIGHTS BY CATEGORY

Weighting Methods	Financial Analysis	User Benefits	Regional Impacts	Risk	Qualitative
1	1	1	1	1	1
2	2	1	1	1	1
3	1	2	1	1	1
4	1	1	2	1	1
5	1	1	1	2	1
6	1	1	1	1	2

FINANCIAL ANALYSIS	USER BENEFITS	REGIONAL IMPACTS	RISK	QUALITATIVE FACTORS
NJCL Expansion	West Shore - PSNY	Sec Trans/WS Trans	NEC Expansion	Sec Trans/WS Trans
NEC Expansion	NEC Expansion	Secaucus Connection	NJCL Expansion	Secaucus Transfer
Bay St Connection	West Shore Transfer	West Shore - PSNY	Kearny Connection	West Shore Transfer
Kearny/Bay Street	Secaucus Connection	Secaucus Transfer	Kearny/Bay Street	Secaucus Connection
Kearny Connection	NJCL Expansion	West Shore Transfer	Manhattan Transfer	West Shore - PSNY
Secaucus Connection	Sec Trans/WS Trans	NEC Expansion	Bay St Connection	Kearny/Bay Street
Red Bank to Lakewood	Kearny/Bay Street	Kearny/Bay Street	Red Bank to Lakewood	Kearny Connection
NJCL Dual Mode	Rar Valley Dual Mode	NJCL Expansion	Old Bridge Extension	West Shore to Hoboken
Amboy to Lakewood	Kearny Connection	West Shore to Hoboken	Rar Valley Dual Mode	Bay St Connection
Manhattan Transfer	West Shore to Hoboken	Amboy to Lakewood	NJCL Dual Mode	Manhattan Transfer
Secaucus Transfer	Manhattan Transfer	Old Bridge Extension	West Shore to Hoboken	NEC Expansion
Old Bridge Extension	Secaucus Transfer	Kearny Connection	West Shore Transfer	NJCL Dual Mode
West Shore - PSNY	NJCL Dual Mode	Manhattan Transfer	Secaucus Transfer	Rar Valley Dual Mode
Sec Trans/WS Trans	Red Bank to Lakewood	Rar Valley Dual Mode	Amboy to Lakewood	NJCL Expansion
West Shore Transfer	Bay St Connection	Red Bank to Lakewood	Sec Trans/WS Trans	Old Bridge Extension
West Shore to Hoboken	Amboy to Lakewood	NJCL Dual Model	West Shore - PSNY	Red Bank to Lakewood
Rar Valley Dual Mode	Old Bridge Extension	Bay St Connection	Secaucus Connection	Amboy to Lakewood

FIVE CATEGORIES WEIGHTED EQUALLY

NEC Expansion
NJCL Expansion
Kearny/Bay Street
Sec Trans/WS Trans
West Shore - PSNY
Secaucus Connection
West Shore Transfer
Secaucus Transfer
Kearny Connnection
Bay St Connection
Manhattan Transfer
West Shore to Hoboken
Red Bank to Lakewood
NJCL Dual Mode
Rar Valley Dual Mode
Amboy to Lakewood
Old Bridge Extension

FIGURE 4 Evaluation criteria project ranking.

well as relatively low capital costs. The poor performers had either very high capital costs without a good rate of return on the capital investment, or created large incremental increases in the operating costs of the railroad.

User Benefits

The highest-ranking projects have strong potential to attract new riders as well as benefit a large proportion of existing riders, improve corridor travel times, and reduce the transfer burden.

Regional Impacts

The strong performers in this category create relatively large auto diversions, improve the transit market share in the region, and accommodate projected growth in the region. Poor performers primarily benefit existing riders rather than new riders and, therefore, have little regional impact.

Risk

The least risky projects are those that would be easiest to implement considering operations, construction, and potential external barriers.

Qualitative Factors

The high-performing projects provide interconnectivity among the rail lines to allow for greater intra-New Jersey mobility, provide transit service in growing development and redeveloping areas in northern New Jersey such as Newark, the Meadowlands, and the Waterfront, and provide a transit alternative to the northern suburbs that currently rely heavily on autos for trans-Hudson travel.

Combination of Five Categories

When all five categories were weighted equally the project ranking was as follows:

- Northeast Corridor Expansion
- North Jersey Coast Line Expansion
- Kearny Connection and Bay Street Connection at Montclair (combined project)
- Secaucus Transfer and West Shore Transfer (combined project)
- West Shore Connection to New York Penn Station
- Secaucus Connection
- West Shore Transfer
- Secaucus Transfer
- Kearny Connection
- Bay Street Connection

- Manhattan Transfer
- West Shore to Hoboken
- Red Bank to Lakewood
- NJCL Dual Mode
- Raritan Valley Dual Mode
- Amboy to Lakewood
- Old Bridge Extension

The four projects that topped this list became the NJ TRANSIT staff recommendation known as the "preferred package" of projects. This group of projects has relatively low risk, performs well financially, addresses policy concerns, benefits a large proportion of riders, and penetrates markets where transit usage is currently low. The prerequisite for these projects is the upgrading of rail system capacity to New York Penn Station.

Three of the projects in the preferred package were the top ranking financial projects, but the Secaucus Transfer/West Shore Transfer project was also included. While this combined project did not rank high financially, it was strong in the regional impacts/qualitative factors categories and performed above average in the user benefits category. The project that ranked the highest in user benefits, West Shore Connection to New York Penn Station, was not included in the preferred package because of its high capital costs and high risk factors. For similar reasons two projects that ranked high on regional impacts, Secaucus Connection and West Shore Connection to New York Penn Station, were eliminated from the preferred package. The selected projects are all low risk except the Secaucus Transfer/West Shore Transfer project, which is lower in risk than the competing options in the North Jersey/Bergen County area.

Sensitivity Analysis

Various weighting methods were conducted to test the stability of the project ranking. The different weighting patterns enabled the evaluation process to consider the differing outlooks that might be adopted by decision-makers. For example, a fiscal conservative might consider the financial analysis category as crucial, while a more service-oriented person might look at the user benefits category, or a cautious person might concentrate on risk.

This sensitivity analysis indicated that there was stability in the top-ranking projects if viewed from different perspectives, especially for the two service expansion projects (Northeast Corridor and North Jersey Coast Line) and the Kearny/Bay Street Connection combination project. Weighting regional impacts, risk, and qualitative factors twice keeps the same preferred package of projects at the top of the list. The ranking changes that occurred when the financial analysis and user benefits categories were weighted by two involved the Secaucus Transfer/West Shore Transfer combined project and either the Secaucus Connection or West Shore Connection to New York Penn Station. Both the connection projects present significant risks to NJ TRANSIT because of the more complex engineering required to construct them, compared to their transfer alternatives and because both require dual-mode locomotives to operate.

NJ TRANSIT is particularly concerned about choosing any option that requires dual-mode locomotives. Currently, no dual-mode equipment that meets NJ TRANSIT requirements exists. Moreover, the New York City Fire Department has objected to operating dual-mode equipment through the tunnels under the Hudson River (diesel locomotives are currently prohibited from operating in the tunnels and in New York Penn Station). NJ TRANSIT is currently developing a prototype locomotive, but until it has been tested and accepted, NJ TRANSIT does not want its planning program to depend on the unknown technology of dual-mode locomotives. If the projects requiring dual-mode locomotives were eliminated from the project list, the preferred package of projects comes out at the top of the ranking for all six weighting scenarios.

To test the importance of the qualitative criteria in the evaluation process, rankings were prepared based only on the quantitative criteria. West Shore Connection to New York Penn Station and Secaucus Connection again rose to the top of the list, replacing the two combination projects. The effect of considering projects in combination was also tested. When only the 15 individual projects were ranked, the Secaucus Connection and West Shore Connection projects performed better than the individual Secaucus Transfer and West Shore Transfer projects in all the weighting schemes that double-weighted the quantitative criteria categories (financial, user benefits, regional impacts). If either the risk or qualitative categories were weighted by two the individual projects, Secaucus Transfer and West Shore Transfer, did rank above the two alternative connection options. These tests indicated the importance of the qualitative criteria in NJ TRANSIT's decision making process.

One final note—the three Monmouth/Ocean options appeared on the bottom half of the ranking list for all of the weighting schemes. Nevertheless, a Monmouth/Ocean option is considered by NJ TRANSIT as worth advancing to address overall needs in each of New Jersey's transit corridors and to prepare to handle a rapidly expanding market.

NJ TRANSIT EVALUATION RESULTS COMPARED TO PRIVATE SECTOR DECISION-MAKING

It is worth examining the results achieved through NJ TRANSIT's evaluation process compared to what might have resulted if a strict adoption of private sector cost/benefit analysis were followed.

The private sector relies on measures that compare the revenue generated by a project over its proposed life to the costs of the project to determine whether it will yield a net positive gain for the investor. Measures commonly used for this analysis include net present value, return on investment, internal rate of return, and payback period. NJ TRANSIT incorporated two of these indicators into its evaluation process—net present value and return on investment. Net present value is generally held to be the method that provides the best ranking of capital investments (*5*). As H. Wohl and C. Hendrickson state in *Transportation Investment and Pricing Principles* (*6*): "Economists almost universally find the net present value method superior to all others, both because it is simple and because it is unambiguous in indicating which alternative has the highest economic potential."

Not surprisingly for public transit projects, none of the projects considered by NJ TRANSIT produced a positive cash flow; all would have been rejected in a strict private sector

analysis. The project ranking produced by the net present value analysis differed substantially from rankings that included the combination of criteria. As revenues could not offset capital costs, the projects that ranked the highest for net present value tended to be those that were low in capital costs, i.e., "small" projects. Two of the NJ TRANSIT preferred projects—the service expansion projects on the North Jersey Coast Line and Northeast Corridor—did rank second and fourth respectively on the net present value ranking. These are both low capital cost projects.

The return on investment ranking produced a somewhat different project ordering. Projects that had significant ridership growth (and therefore generated revenue) ranked higher than they had on the net present value ranking. Three of the NJ TRANSIT preferred projects—North Jersey Coast Line Expansion, Northeast Corridor Expansion, and Kearny/Bay Street—were ranked one, three, and four respectively.

Of the projects chosen by NJ TRANSIT, the Secaucus Transfer/West Shore Transfer, which appeared on the bottom half of both lists, had the greatest regional impact and strongest ridership draw. If this project had not been chosen, the regional transportation problem of trans-Hudson travel congestion would not have been completely solved, nor would NJ TRANSIT's objective in investing in the transportation system have been achieved.

This comparison highlights two important points. First, since public transit projects are not profitable and do not pass the threshold criteria for private investment endorsement, other public policy factors *must* be considered. Second, these other public policy factors can be pivotal in the decision-making process.

CONCLUSION

It is clear that the qualitative factors selected by NJ TRANSIT played a significant part in shaping the final decision. NJ TRANSIT was unwilling to ignore the risk elements involved in actually constructing and operating a project. In addition, economic growth and development in New Jersey made it imperative for NJ TRANSIT to consider the broader impact of transportation investments on the regional economy.

The evaluation and analysis process undertaken indicates that the projects selected are strong performers, especially if a strategy of avoiding unnecessary risk is adopted. The evaluation process was conceptually simple, an attribute which helped decision-makers learn the results of technical analyses in a way they were able to use.

Examining the projects from different perspectives (financial, risk, etc.) raised issues that were important to discuss before decisions could be made. Introducing qualitative factors into a framework allowed them to be combined with harder quantitative data, which enabled the projects to be evaluated objectively, from a broad perspective. The ability to demonstrate stability among the rank order of projects under different weighting scenarios was particularly useful in the decision-making process. The projects selected represent a good choice both from an economic viewpoint, and in terms of the transportation benefits they bestow on the region.

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