Lake-Cook Corridor Suburb-to-Suburb Commuter Demonstration Project

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As employment at suburban activity centers has increased, congestion at these centers has also grown. Fewer options are available for suburb-to-suburb or city-to-suburb commuters than for the typical suburb-to-city commuter. However, in some cases, these employment centers are located near, but not within walking distance of, commuter rail stations that serve the traditional suburb-to-central city trips. The development of the Lake-Cook Road Corridor is consistent with the development of other major suburban activity centers across the country. Construction of a new commuter rail station on the Metra North Line at Lake-Cook Road is scheduled for completion in mid-1995. A Congestion Mitigation/Air Quality demonstration project is described that examined three shuttle-feeder transit alternatives for application within the corridor that would be anchored at the new rail station. The alternatives examined were fixed-route service, van shuttle service, and demand-responsive/taxi service. A two-stage sample plan was used to survey potential demand among approximately 30,000 employees in the corridor. A combination of an analogue model and a modal split model was used to estimate potential transit demand within the corridor. A comparable route performance analysis from major metropolitan areas with significant amounts of suburban employment was used to calibrate these two models. On the basis of this evaluation, a preferred alternative for van shuttle service was recommended and a detailed service plan developed. A joint public-private funding package was developed to provide for implementation of the service.

Commuter rail stations are usually considered to be origin points for work trips to the Chicago central business district (CBD), but they increasingly serve as destination points for reverse commuters (city-to-suburb) and suburb-to-suburb commuters (*1*). Pedestrian access from such stations to close-in employment locations is an important factor in encouraging trips into these stations by commuter rail. Connector bus service to link commuter rail with suburban employment centers is one transit option available to decrease vehicle trips and overall vehicular emissions (*2*). The use of shuttle feeder service that operates from rail stations to employment centers has also been gaining popularity in recent years.

The construction of a new Lake-Cook commuter rail station on the Metra Milwaukee District North Line (Metra) is scheduled for completion in mid-1995. Almost 30,000 employees work within a corridor 0.8 km (0.5 mi) deep along Lake-Cook Road in the villages of Deerfield and Northbrook, Ill. The corridor runs in an east-west direction and is approximately 9 km (5.5 mi), long. The commuter rail line roughly bisects the corridor. Construction of this station near such a large employee population provides an opportunity to establish an employee base of public transportation users in the corridor. However, because of the distances involved, access to and from the station and employee worksites is required. Under a demonstration grant from Congestion Mitigation/Air Quality (CMAQ) funds that were administered jointly by two municipalities, their chambers of commerce, and a transportation management association, three alternative methods of providing shuttle-feeder transit were examined for application within the corridor (*3*). A systematic surveying approach was used to determine employment size and concentrations and to identify employee commute patterns and willingness to change modes. Potential transit demand was determined through the use of two ridership estimation models and was used to evaluate and compare applicable service and delivery characteristics of shuttle-feeder concepts applicable to the corridor. Based on this evaluation, a preferred alternative was recommended and a detailed service plan developed that successfully competed for a subsequent 2-year CMAQ demonstration grant under which the service will be operated. The processes employed and the findings obtained in the initial study are included in this paper.

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SURVEYS

Two sets of surveys were conducted to identify the employment characteristics of the corridor. One focused on developing a data base of employers; the other on employee commute habits.

Employer Survey

The Transportation Management Association (TMA) of Lake-Cook, in cooperation with the Villages of Deerfield and Northbrook, Ill. and their chambers of commerce, developed, distributed, collected, and tabulated an employer data base. The data base verified current employer information such as contact person(s), number of employees, and location and residential ZIP codes of employees. Data from over 440 employers, representing 31,700 employees, were compiled into a data base.

A survey instrument was also developed and sent to the employers to verify employer size and type, working hours, existing modes of transportation that employees take to work, employee characteristics, and, most importantly, employer attitudes toward financial support of a shuttle service.

More than 150 surveys were returned. These surveys represented firms with a total of more than 18,300 employees, or 58 percent of the entire employee population of the corridor. The survey results indicated that 19.8 percent of the employees resided in ZIP code areas located along the Metra. The corridor had a large number of service and office workers. There was also a concentration of employees working in light industry in the Sky Harbor industrial area in Northbrook. Although there was some current support for employee transportation programs such as transit subsidies, prefer-

ential parking, or support for a carpool/vanpool program, most employers were not involved in such programs for their employees. Employers perceived that a shuttle service would improve their employee recruitment and retainment, help reduce employee stress, and improve air quality.

Employee Survey

An employee survey was conducted to develop an information base on the employees in the Lake-Cook area and to determine the market potential for a feeder-shuttle service. Less than two and one-half percent of the total number of businesses in the area have more than 250 employees, but these 29 largest firms employ well over a third of all of the employees in the area. Accordingly, these large employers represent the greatest concentration of employees and would be the greatest beneficiaries of such a service.

Sample Design

The universe list of firms was reviewed and a sample design was developed to achieve a sample size for estimates with 90 percent confidence and an error of ± 0.10 within size class. The strategy was a classic two-stage sample plan of employers and employees for inclusion in the survey. Stage 1 was a sample of employers within the Lake Cook area; Stage 2 was a sample of the employees of those businesses. The employees were surveyed at their place of work in sampled buildings within the TMA area. The sample plan included businesses with 10 or more employees clustered into size classes, with a sample of establishments by size class and a sample of the employees of that establishment.

Sample of Employers

The universe for the survey was determined to be 378 businesses, which represented 27,550 employees. Businesses with between 10 and 25 employees were not initially included in the sample but were added to ensure that the travel behavior characteristics of small firms were addressed in the service planning task.

Sample of Employees

For small employers, those with under 50 employees, a mail-out/mail-back field procedure was developed. Because mail-out/mail back procedures typically result in more attrition than field visits, the effort to ensure adequate response from the smaller businesses was a crucial part of the survey execution.

For large employers (those with 50 or more employees) only a sample of the employees was necessary. The percentage of employees surveyed depended on the size class of the firm. The method used to create the sample of employees was an employer-procured sample.

The employer-procured sample method required the employer to draw a list of all employees whose Social Security numbers or employee numbers (if sequentially assigned) end in random digits specified by the consultant. If a 50 percent sample was required (as was the case for businesses with 50 to 99 employees), the consultant generated five random digits. The employees whose Social Security numbers or employee numbers ended in those specified digits became the sample of employees surveyed. This method has the advantage of ensuring against sample bias (by occupational status, for example), but has the disadvantage of placing a burden of effort on the office manager or contact person at each business.

A presurvey meeting was held with the major employers to ensure their participation in the survey. As a result of this meeting, the major employers agreed to draw the sample using random digits supplied by the consultant. The employers used either employee numbers or Social Security numbers.

Linking the employer sample to the employee sample was necessary to ensure sample integrity for both phases of the survey. The unique number assigned to each employer by the TMA was carried on for the sample firms for the employee survey to link the two data sets. This allowed analysis to be performed on the employee data within the context of the establishment responses within that size-class.

Once the universe of 378 businesses was available with the unique number assigned by the TMA, a sample and a replicate were prepared for use in the field. The sample included the unique number of that establishment; the survey day-of-the-week; the name of the contact person; position, company name, address, and phone number of part-time and full-time employees; and type of business of the firms sampled. The replicate provided alternates to the main sample for cases in which an employer was no longer in business, moved out of the area, or refused to participate. In these cases, the first listing in the size class from the replicate was used in the place of the original sampled firm.

Level of Confidence

The sample size for the survey was determined using Equation 1 for a level of confidence of 90 percent. The 90 percent confidence level is equal to 1.64 standard errors. The sample sizing equation used is:

$$n = \frac{Z^2 * C.V.^2}{E^2} \quad (1)$$

where

n = number of samples required for each size class;
Z = number of standard errors for specified level of confidence;
$C.V.$ = coefficient of variation or ratio of standard error to mean, and
E = relative error.

Given this equation, to decide how many samples would be required, one would need to know the $C.V.$ of the variable mean and specify the level of confidence and the relative error of the mean desired or required. Unfortunately, the $C.V.$ is not typically known until the survey has been analyzed. However, enough workplace surveys have been conducted to know that the $C.V.$ is close to 1.0 overall for estimates of simple variables. Stratification of the sample by size class can reduce that figure significantly. Research in California (Barton-Aschman, unpublished data) has shown it can be as low as 0.5 for work trips. A value of 0.75 was used for sample sizing purposes.

The sample design allowed for just under one-fifth of all establishments to be sampled and 9 percent of all employees, which required that about 3,000 completed employee surveys be obtained.

The precision of the sample design was estimated at ±10 percent at the 90 percent confidence level within size class.

Survey Design

The survey form, shown reduced in Figure 1, was printed front and back on standard letter-sized sheets of lightweight colored stock. Each printed questionnaire was imprinted with a unique serial number, starting with 10,000 and ending with *n*, printed on the top right-hand side. During the pretest of the survey, it was determined that a significant number of the employees of the smaller firms would need to see the survey instrument in Spanish rather than English. Accordingly, a Spanish translation was made of the survey instrument.

A survey date was preassigned to each sampled firm. Within size category, an effort was made to collect an equal number of employee responses for each day of the work week. This was an iterative process in which a day of the week was randomly assigned to each firm and then checked to ensure that no particular day of the week was skewed with too many or too few employees. The sample was sorted by day of the week for use in the field.

Data Expansion

The questionnaires returned in this survey represented a sample of all workers (regular and temporary) who work in the study area on a typical weekday. To accurately interpret the responses, it was necessary to factor the completed returns to represent both individual establishments as well as the entire universe of Lake-Cook commuters.

Data expansion was the process by which the sample of returned questionnaires was expanded to represent all employees in the study area. The factoring process was completed in two stages. First, returned questionnaires were expanded to represent all employees of the firm from which they were gathered; next, the sampled firms were expanded to represent all firms in the study area. This factoring process was stratified by firm size to account for the behavior differences of employees from different-sized companies.

Expansion to Individual Establishments Returned questionnaires from a particular establishment represent travel by all employees at that establishment; therefore, each returned questionnaire was factored to the total employment and to the attendance employment at that establishment. This factor was calculated simply by dividing the number of returned questionnaires for that establishment into the number of employees who were in attendance on survey day to get the attendance factor, and the number of returns into the number of total employees at the establishment to get the employment factor. This resulted in two factors for each establishment, and two new fields were then created on the data base, one for the attendance factor and one for the employment factor. These factors were then posted to the data base for that employer. The sum of employment factor equaled the total employment of the sampled businesses in that stratum or size class. In some cases, attendance was not reported and was estimated from other establishments in the same size category. The average attendance for the similar firms was calculated and applied to those firms missing attendance reports.

Expansion to the Universe To expand the returns to the universe of all employees in the Lake-Cook study area, expansion factors were calculated for each employment size class. As with the expansion to individual establishments, two universe expansion factors were calculated for each size class, one for total employees and one for average weekday attendance.

The total employment for each stratum (from the universe of businesses) becomes the numerator and the total employment of the sampled firms, by class size, becomes the denominator for the total employment factor. The attendance factor was also developed by class size. The average observed attendance by size class was applied to the total employment to estimate the overall attendance in the study area. Then, the sum of observed attendance by size class was divided into the estimated total attendance to determine the universe attendance factor.

These two factors, the universe employment and the attendance employment factors were posted to the data base for all establishments within a size category. When frequencies on the data were run concerning profile questions (the number of males and females, income, occupational status), the employment factors were used to represent the universe of employment in the study area. On the other hand, when statements were made about the amount of activity on a typical day (the number of people arriving by mode, the number of midday trips, etc.), the attendance factors were used to represent the amount of employees on an average weekday.

Returns

The employee return rate overall was extremely good: 62 percent of the employees surveyed returned a usable response. Only one of the targeted firms in the classes with 250 or more employees declined to participate and most of the participating firms involved themselves in the employee subsampling procedures with exemplary commitment. As the size class became smaller, the firm refusals and attrition increased, as was expected, although the employees surveyed still showed a remarkably high response rate.

SERVICE DELIVERY CONCEPT

Information was collected from the employer survey to determine the location of major employment concentrations within the corridor. Additionally, information was collected on the type of business (retail, office, service, etc.), the total number of full-time and part-time employees, and standard work hours. The purpose of identifying employment size and concentrations was to develop an initial grouping of employer clusters. These clusters were refined throughout the service planning process to estimate ridership and to generate route schedules.

The second step in developing potential service concepts was to identify employees' home ZIP codes and the closest intersection to their homes. The purpose of this step was to determine the number and percent of employees who live within a reasonable distance of the Metra. Information on home ZIP code locations was collected in both the employer and employee surveys. The intersection closest to the employee's home was collected in the employee survey. A ZIP code map was used to identify those ZIP codes zones within a reasonable travel time from the Metra line.

Using the results from the above steps and the findings of a search of current practice, three types of service delivery options were

DEERFIELD AND NORTHBROOK

Lake-Cook Transportation Survey

Employee

Thank you in advance for your time and participation in this important survey. The purpose of this survey is to better understand the transportation needs of employees in the Lake-Cook Corridor and in the Deerfield and Northbrook area. Please answer each of the questions below and return this to the person who gave it to you. Your answers will be kept confidential and will only be used to produce statistical data needed to improve transportation services in the area.

1. What is your zip code at *home*?

   ____ ____ ____ ____ ____

2. What is the nearest *major* intersection to your home?

   _____ and _____

3. Do you usually work in the Lake-Cook Road area?

   ☐₁ Yes ☐₂ No

4. Do you work full-time or part-time? (Less than 30 hours each week.)

   ☐₁ Full-time ☐₂ Part-time

5. Did you work in the Lake-Cook Road area yesterday? (or your last regular work day.)

   ☐₁ Yes ☐₂ No

6. What day of the week was that?

   ☐₁ Monday ☐₃ Wednesday ☐₅ Friday
   ☐₂ Tuesday ☐₄ Thursday

7. At what time did you arrive *to* work yesterday?

   _____ : _____ ☐₁ A.M. ☐₂ P.M.
   (hour) (minutes)

8. How many *minutes* did it take you to get from home to work yesterday?

   _____ (minutes)

9. Approximately how many *miles* do you live from your work place in the Lake-Cook Road area?

   _____ (miles)

10. How did you arrive at your work site yesterday?

    ☐₁ Driver of auto, truck, or van (including carpool)
    ☐₂ Passenger of auto, truck, or van (including carpool)
    ☐₃ Public bus (Route No. _____)
    ☐₄ Metra
    ☐₅ Other _____

11. If you arrived at your work site by auto, truck, or van, how many people were in the vehicle (*including yourself*)? No. of people _____

12. If you did *not* drive to work, was an auto available for this trip?

    ☐₁ Yes ☐₂ No

13. If you came by Metra, how did you get *to* the station?

    ☐₁ Drove auto ☐₃ Walked ____ (minutes)
    ☐₂ Dropped off ☐₄ Bus (Route No. _____)
    ☐₅ Other _____

14. If you came by Metra to the Lake-Cook Road area, how did you get *from* the station?

    ☐₁ Drove auto ☐₃ Walked ____ (minutes)
    ☐₂ Dropped off ☐₄ Bus (Route No. _____)
    ☐₅ Other _____

15. At what time did you leave work yesterday?

    _____ : _____ ☐₁ A.M. ☐₂ P.M.
    (hour) (minutes)

16. If a midday shuttle were available to and from Northbrook Court or Deerbrook Mall, would you use it?

    ☐₁ Yes ☐₂ No

    If "yes," how many times per week? _____

17. Do you usually use your own car for trips during work hours?

    ☐₁ Yes ☐₂ No ☐₃ Not applicable

The following questions relate to your travel to work.

18. In your commute to and from work, do you make stops on the way?

	Yes	No	If "yes," how many stops per week
1. To Work	☐₁	☐₂	_____
2. From Work	☐₁	☐₂	_____

19. What factors do you consider when choosing your means of transportation to work? (Check up to three.)

    ☐₁ Travel time
    ☐₂ Cost
    ☐₃ Convenience
    ☐₄ Flexibility
    ☐₅ Comfort and safety
    ☐₆ Reducing pollution/conserving energy
    ☐₇ Ability to make stops enroute

20. What kinds of things do you think would make shuttle bus service attractive in the Lake-Cook Road area?

    ☐₁ Bus shelters
    ☐₂ Crosswalks
    ☐₃ Placement of bus stops close to my building
    ☐₄ Sidewalks
    ☐₅ Other _____

21. If you drive alone to work, what are the *three* most important reasons why you don't regularly use public transportation to commute to the Lake-Cook area?

    ☐₁ Public transportation is not convenient to my home
    ☐₂ Public transportation is not convenient to my work site
    ☐₃ Work late/irregular hours
    ☐₄ Public transportation is too time-consuming
    ☐₅ Cannot get home in an emergency
    ☐₆ Public transportation is too costly
    ☐₇ Other _____

Now we would like to ask you a few questions for statistical purposes only. This information will be grouped for sample verification and travel demand estimation and is completely confidential.

22. What is your age? _____

23. Are you male or female?

    ☐₁ Male ☐₂ Female

24. Which of the following best describes your current job classification?

    ☐₁ Professional/Technical/Clerical
    ☐₂ Managerial/Administrative/Sales
    ☐₃ Skilled Craft
    ☐₄ Laborer
    ☐₅ Service Worker
    ☐₆ Equipment Operator/Trucker
    ☐₇ Other _____

25. What is your annual income?

    ☐₁ Less than $10,000
    ☐₂ $10,000-19,999
    ☐₃ $20,000-29,999
    ☐₄ $30,000-39,999
    ☐₅ $40,000-49,999
    ☐₆ $50,000-59,999
    ☐₇ $60,000 or more

Do you have any comments about transportation in the Lake-Cook Road area?

_____
_____
_____
_____
_____
_____
_____
_____
_____

Thank you for your assistance!

FIGURE 1 Employee survey instrument.

selected for further analysis. The selected options were labeled the fixed-route option, the van option, and the demand-responsive option.

The fixed-route option consisted of three routes (labeled A, B, and C) that would operate on a fixed schedule and routing and would serve three sets of employment clusters located west of the new Metra station. For employment clusters east of the new Metra station, instead of creating a new route, improvements to existing Pace (the bus transit agency for the suburban Chicago area) fixed-Route 626 were proposed. Vehicles for Routes A, B, and C would range from 25- to 40-passenger vehicles.

The van option consisted of seven van routes serving employment clusters along the corridor. The routing of each van would be flexible in transporting employees to their worksites. For example, if Van Route 1, which serves Employer A, did not have any passengers on the van traveling to Employer A in the morning, it would not be required to make a stop but would continue to the next destination. In the p.m. peak period, however, the van would be required to stop at every worksite along the route. Van sizes would range from 6-passenger to 16-passenger vehicles, depending on the ridership estimates.

The demand-responsive option consisted of taxicabs operating as feeders to and from the Metra station. Taxis would be available at the Metra station each morning to provide service to individual worksites. For service back to the Metra station in the afternoon, each employee would be required to make an advance reservation. Depending on how the carrier operates the reservation system, reservations could be required a day in advance, or by a set time each day (e.g., 2:00 p.m.)

TRANSIT RIDERSHIP ESTIMATION

A combination of two models was used to estimate potential transit demand within the corridor. The models used were an analogue model and a modal split model. The models provide estimates of potential patronage based on transit service levels and travel volumes within a corridor. The use of two models provides a range of possible ridership levels and thus affords a more reasonable estimate of patronage. A comparable route performance analysis from major metropolitan areas with significant amounts of suburban employment was used to calibrate these two models.

The analogue model estimates transit demand using productivity factors derived from comparable transit services in the Chicago area, as well as from other large metropolitan areas. For the fixed routes, a factor of 23 passengers per revenue hour was employed. This model is highly sensitive to service levels on a route. Ridership is determined by multiplying estimated revenue hours by the productivity factor. The estimate reflects patronage at about 24 months after implementation. Data for route productivity for selected bus routes in the Lake-Cook corridor and for selected bus rail-feeder routes were obtained from Pace, the bus transit agency serving the suburban area. The number of passengers per revenue hour ranges from just under 26 for routes in the Lake-Cook corridor to just under 18 for a sample of Pace rail feeder/reverse commute routes (*4*).

The modal split model estimates transit demand based on transit trip "capture" rates for the total travel volume within a corridor. The modal split model is also calibrated using experience from Chicago and comparable metropolitan areas. Two levels of modal split were used in this analysis: conservative and optimistic. The conservative estimate is based on experience with similar services in other areas and on average travel patterns. The optimistic estimate is based on ridership expectations for a high level of bus service. For trips operating between suburbs, a transit modal split of 3.4 percent for the conservative level and 5 percent for the optimistic level was assumed. For reverse commute trips—that is, trips with the residential end in the city of Chicago—a modal split of 5.0 was assumed for the conservative level, 7.5 percent for the optimistic level. As with the analogue model, these estimates reflect patronage after about 24 months of operation.

The passenger demand growth curve is shown in Figure 2. The demand curve is based on ridership growth patterns for comparable routes in large metropolitan areas in the United States. Indications are that the Chicago suburban area follows similar patterns. The 100 percent ridership level shown on the curve at 24 months reflects the calibration values for the two models discussed above. At the end of 24 months, a route's ridership is likely to rise about 5 percent beyond the 12-month baseline estimate with the same level of service. Since these employment areas continue to grow, there is also

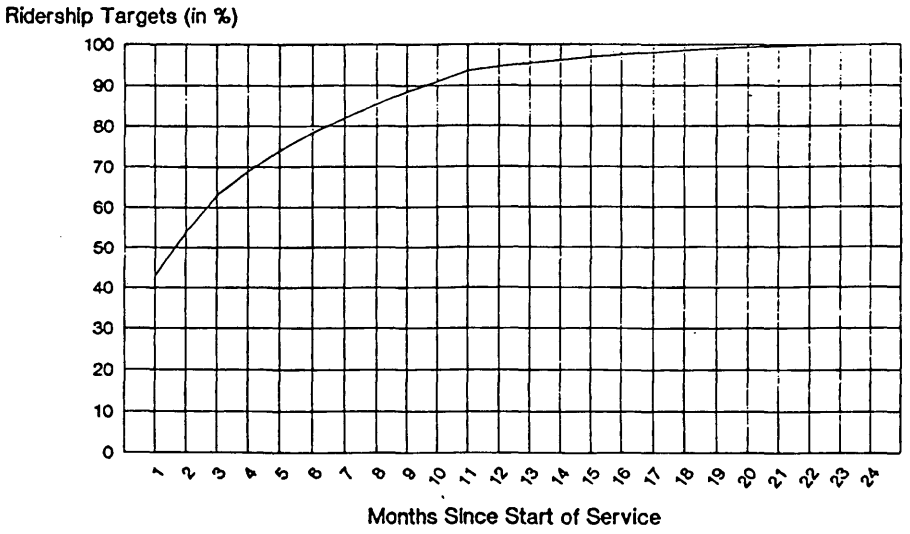

FIGURE 2 Ridership targets for new routes and suburban express routes.

a good potential for additional ridership during the first 2 years attributable to new employees.

The employee survey results provided a base number of employees who may use the shuttle service. From the total number of employees, only 25 percent live within ZIP codes with convenient access to the Metra line. Of that 25 percent, those who typically work in the Lake-Cook corridor, those working full-time, and those starting to work between 6:00 and 9:00 a.m. were accounted for, as shown in Table 1. The mode split rates developed in the ridership estimation methodology were then applied to the employee base, which resulted in 268 to 400 daily employees. Ridership estimates were generated for each of the service delivery options, both for the start-up of service and at the end of the 24-month period based on the ridership growth curve. The derived ridership estimates for the three service delivery options are shown in Tables 2, 3, and 4.

ANALYSIS OF SERVICE DELIVERY OPTIONS

Operational Components

Once the ridership estimates were prepared, each of the service delivery options was analyzed for application in the Lake-Cook corridor based on its operational components. It was determined from the existing Metra schedule that each route should maintain an approximate 20-min round trip travel time to meet the most train times (in both directions). If not, then a second vehicle would be required.

The analysis determined that Fixed-Route A would not maintain a 20-min round trip travel time and would require two vehicles. Fixed-Routes A and B were found to not have adequate ridership to warrant fixed-route service. Fixed-Route C ridership was found to be very close to warranting fixed-route service. Additionally it was determined that, routes and schedules would not have flexibility as each vehicle would have to maintain the routing and schedule published. Under the van option, the analysis determined that all employment clusters would generate adequate ridership to warrant van service, except for one route whose employment cluster is a regional shopping center about 1.6 km (1 mi) east of the Metra station location. All van routes would be able to maintain a 20-min round trip travel time with the exception of Van Route 1, which serves the western end of the corridor. This van route would require two vehicles to maintain the 20-min travel time because of the distance involved and the congestion-induced delay encountered at the west end of the corridor. The analysis showed that vans would have flexibility in morning routes from the station to the worksites and that van service would be easily phased in or removed without adversely affecting many employers or employees.

TABLE 1 Shuttle Service Preliminary Ridership Estimates, Lake-Cook Road Corridor

Employee Base			
Total Corridor Employees			28,800
% of employees living in Metra corridor		25.0%	7,200
% usually work in Lake Cook corridor		95.7%	6,890
% work full-time		98.5%	6,787
% starting work between 6-9 am		90.6%	6,150
% Suburb to Suburb Commuters		40.0%	2,460
% Reverse Commuters		60.0%	3,690
Ridership Estimates			
Mode Split		Conservative	Optimistic
Suburb to Suburb		3.4%	5.0%
Reverse Commute		5.0%	7.5%
Mode Split applied to Employee Base:			
Suburb to Suburb		84	123
Reverse Commute		185	277
	total	268	400
2 Year Ridership Growth Curve:			
Initial	40.0%	107	160
6 mo.	75.0%	201	300
12 mo.	90.0%	241	360
18 mo.	95.0%	255	380
24 mo.	100.0%	268	400

TABLE 2 Preliminary Ridership Estimates, Lake-Cook Road Corridor, Fixed Route Option

Ridership Scenario	Ridership Conservative	Ridership Optimistic
Initial (First 6 mo.) - 40%	107	160

Group	Employees	% of Employees	Fixed Route	AM Peak Ridership (a) Conservative	AM Peak Ridership (a) Optimistic	Passengers per Trip Conservative	Passengers per Trip Optimistic
1	3,208	11.8%	Rt. A	21	32	4	5
2	2,203	8.1%	Rt. A				
3	2,426	8.9%	Rt.B	19	29	3	5
4	2,495	9.2%	Rt.B				
5	7,420	27.3%	Rt.C	29	44	5	7
6	3,687	13.5%	walk				
7	1,270	4.7%	walk				
8	670	2.5%	Pace				
9	3,836	14.1%	Pace				
	27,215	100.0%		70	104		

Ridership Scenario	Ridership Conservative	Ridership Optimistic
Maximum (24 mo.)	268	400

Group	Employees	% of Employees	Fixed Route	AM Peak Ridership (a) Conservative	AM Peak Ridership (a) Optimistic	Passengers per Trip Conservative	Passengers per Trip Optimistic
1	3,208	11.8%	Rt. A	53	80	9	13
2	2,203	8.1%	Rt. A				
3	2,426	8.9%	Rt.B	48	72	8	12
4	2,495	9.2%	Rt.B				
5	7,420	27.3%	Rt.C	73	109	12	18
6	3,687	13.5%	walk				
7	1,270	4.7%	walk				
8	670	2.5%	Pace				
9	3,836	14.1%	Pace				
	27,215	100.0%		175	261		

(a) Schedule Assumptions:
30 min. frequency
6:30-8:30 AM
3:30-6:30 PM
Trips in AM=6
Trips in PM=7

Ridership estimates under the demand-responsive option would be much lower than the fixed-route or van option. This is primarily because of the requirement that employees make reservations for return trips in the afternoon. The analysis showed that the demand-responsive option has the most flexible vehicle requirements.

Cost Estimates

An estimate of annual cost for each of the service delivery options was prepared for each time period (start-up and after 24 months), and for conservative and optimistic ridership levels. The cost estimates also were calculated as annual cost per passenger. Two cost estimates were prepared for the fixed-route option, one using Pace as the service provider and one using a private contractor as the service provider.

The fixed-route option would cost between $287,500 and $362,000 per year, with annual cost per passenger of between $1,110 and $1,650. The van option would cost between $250,000 and $300,000 per year, with a lower annual per passenger costs of $750 to $1,120. The demand-responsive option would have costs ranging from $232,500 to $342,500 per year. The annual costs per passenger would be $2,500 for both the conservative and optimistic ridership levels for the demand-responsive service option.

Recommended Option

Based on the above analyses, the recommended service delivery option was the van option. The van option consists of seven van routes serving employment clusters distributed along the length of the corridor. Preliminary schedules were developed for the van routes for both a.m. and p.m. peak periods. To coordinate with both northbound and southbound Metra train schedules, each van is scheduled to be at the station at approximately 20- to 30-min intervals. All van routes will be operated with one vehicle except for Route 1, which will require two vehicles.

FARE SENSITIVITY ANALYSIS

Although the service will be provided under a demonstration grant for the first 2 years, it was necessary to evaluate the effect that fares

TABLE 3 Preliminary Ridership Estimates, Lake-Cook Road Corridor, Van Option

Ridership Scenario	Ridership Conservative	Ridership Optimistic
Initial (First 6 mo.) - 40%	107	160

Group	Employees	% of Employees	Van Route	AM Peak Ridership (a) Conservative	AM Peak Ridership (a) Optimistic	Passengers per Trip Conservative	Passengers per Trip Optimistic
1	3,208	11.8%	1	13	19	2	3
2	2,203	8.1%	2	9	13	1	2
3	2,426	8.9%	3	10	14	2	2
4	2,495	9.2%	4	10	15	2	2
5	7,420	27.3%	5	29	44	5	7
6	3,687	13.5%	6	14	22	2	4
7	1,270	4.7%	6	5	7	1	1
8	670	2.5%	7	3	4	0	1
9	3,836	14.1%	8	15	23	3	4
	27,215	100.0%		107	160		

Ridership Scenario	Ridership Conservative	Ridership Optimistic
Maximum (24 mo.)	268	400

Group	Employees	% of Employees	Van Route	AM Peak Ridership (a) Conservative	AM Peak Ridership (a) Optimistic	Passengers per Trip Conservative	Passengers per Trip Optimistic
1A	3,208	11.8%	1	32	47	5	8
1B	2,203	8.1%	2	22	32	4	5
2	2,426	8.9%	3	24	36	4	6
3	2,495	9.2%	4	25	37	4	6
4	7,420	27.3%	5	73	109	12	18
5	3,687	13.5%	6	36	54	6	9
6	1,270	4.7%	6	13	19	2	3
7	670	2.5%	7	7	10	1	2
8	3,836	14.1%	8	38	56	6	9
	27,215	100.0%		268	400		

(a) Schedule Assumptions:
30 min. frequency
6:30-8:30 AM
3:30-6:30 PM
Trips in AM=6
Trips in PM=7

would have on the estimated ridership levels because the service will need to be either self-supporting or employer subsidized if it is to continue beyond the initial period. A fare sensitivity analysis was conducted to determine the expected impact on ridership of particular fare levels. This change in ridership levels was calculated using a fare elasticity measure that was determined to have a value of −0.26. This level of elasticity was based on a composite of the following elasticities:

1. Local bus operations in Illinois: −0.28.
2. Households with one to two cars: −0.22.
3. Households with typical suburban incomes: −0.18.
4. Choice riders of transit: −0.31.
5. Standard Simpson-Curtain average: −0.33.

The resulting impact on ridership was calculated for fares of $0.50, $0.85, $1.00, and $2.00 (fare in addition to the Metra rail fare, which ranged from $1.75 to $3.70 each way). A $0.50 fare would cause a ridership decline of about 5 percent; an $0.85 fare would cause a ridership decline of about 9 percent; and a $1.00 fare would cause a ridership decline of about 10 percent. If fares were to cover all of the cost of the service, the fare would range from $1.80 under the low-cost, low-ridership scenario to $1.50 under the high-cost, high-ridership scenario. Using the fare elasticity model, a fare of $1.50 would cause a decline in ridership of about 15 percent, or about 60 daily riders.

EMPLOYER FINANCIAL PARTICIPATION

The TMA conducted follow-up focus groups with major employers to discuss the shuttle service and their willingness to support the service financially. On the basis of the estimated cost and level of service and the initial willingness of the employers to participate financially, the TMA proposed that the major corporations in the Lake-Cook Road corridor provide the initial financial support to cover the 20 percent cost of the local share of the proposed CMAQ grant, or $60,000. Fourteen firms, representing 11,400 employees, agreed to participate financially in the project at an annual estimated cost of $6.00 per employee.

TABLE 4 Preliminary Ridership Estimates, Lake-Cook Road Corridor, Demand Responsive Option

Ridership Scenario	Ridership Conservative	Ridership Optimistic
Initial (First 6 mo.) - 40%	37	56

Group	Employees	% of Employees	DR Vehicle	AM Peak Ridership (a) Conservative	AM Peak Ridership (a) Optimistic	Passengers per Trip Conservative	Passengers per Trip Optimistic
1	3,208	11.8%	1	4	7	na	na
2	2,203	8.1%	2	3	5	na	na
3	2,426	8.9%	3	3	5	na	na
4	2,495	9.2%	4	3	5	na	na
5	7,420	27.3%	5/6	10	15	na	na
6	3,687	13.5%	7	5	8	na	na
7	1,270	4.7%	8	2	3	na	na
8	670	2.5%	9	1	1	na	na
9	3,836	14.1%	10	5	8	na	na
	27,215	100.0%		37	56		

Ridership Scenario	Ridership Conservative	Ridership Optimistic
Maximum (24 mo.)	93	137

Group	Employees	% of Employees	DR Vehicle	AM Peak Ridership (a) Conservative	AM Peak Ridership (a) Optimistic	Passengers per Trip Conservative	Passengers per Trip Optimistic
1	3,208	11.8%	1	11	16	na	na
2	2,203	8.1%	2	8	11	na	na
3	2,426	8.9%	3	8	12	na	na
4	2,495	9.2%	4	9	13	na	na
5	7,420	27.3%	5/6	25	37	na	na
6	3,687	13.5%	7	13	19	na	na
7	1,270	4.7%	8	4	6	na	na
8	670	2.5%	9	2	3	na	na
9	3,836	14.1%	10	13	19	na	na
	27,215	100.0%		93	137		

(a) Schedule Assumptions:
3.4 to 5.0 passengers per vehicle hour
6:30-8:30 AM
3:30-6:30 PM
Vehicles in AM=10
Vehicles in PM=10
Vehicle Hours in AM=20
Vehicle Hours in PM=30

CMAQ FUNDING

After completion of the study, the TMA of Lake-Cook, the Village of Deerfield, and the Northbrook Chamber of Commerce presented the findings to the CMAQ Project Selection Subcommittee. A request was made for $830,280 in FY 94 and FY 95 CMAQ funds for the implementation of the van service and construction of pedestrian improvements to serve an employment cluster in the vicinity of the new rail station. The selection committee approved this request.

IMPLEMENTATION

Implementation of this demonstration project is just under way. The major implementation components include finalizing the service plan and selecting a service provider, monitoring the service, developing a marketing plan, constructing the pedestrian improvement, and evaluating the effectiveness and air quality benefits of the shuttle service and pedestrian improvements.

The development of the marketing plan has been initiated. The TMA is working with Metra Commuter Rail to coordinate a marketing plan to include such elements as

- Developing schedules, timetables, and brochures targeted for shuttle service users;
- Meeting with employers and employees to market the service;
- Developing and implementing a guaranteed ride to the station for employees who miss the van service;
- Providing free passenger tickets to encourage employee use of the shuttle; and
- Conducting on-board survey evaluations of employee usage and satisfaction with the shuttle service.

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