REGIONAL TRANSPORTATION AUTHORITY

# ADA Paratransit Requirements

## Final Report

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# Introduction

This report is the third deliverable of the RTA ADA Requirements Project. It builds on two previous deliverables:

- Task 1: A "Summary of Regulatory Requirements," submitted in October 2008, that reviewed requirements for ADA complementary paratransit based on the text of the regulations, FTA compliance reviews and guidance, and court rulings.
- Task 2: A technical memorandum, "Policies Compared to Requirements," submitted in January 2009, that compared current ADA paratransit services operated by Pace in Chicago and the suburbs to the requirements to determine in what ways the service exceeds the requirements, and whether there are any ways in which service falls short of the requirements.

Note that "Chicago" is used loosely here to refer to the CTA service area, which includes large portions of the near suburbs.

This draft report presents results from an analysis of possible cost impacts from changing all those current policies and operating practices of Pace paratransit that exceed or fall short of ADA requirements so that they correspond as closely as possible to the requirements of the ADA. Figure 1 provides a brief summary of how Pace paratransit compares to ADA requirements, and the changes that have been analyzed. The statements about "Comparison to ADA Requirements" in Figure 1 differ in some respects than those previously presented in the Task 2 memorandum, based on additional data that has been received from Pace. The analysis used operations and budget data provided by Pace and eligibility records provided by RTA.

This report is not a formal ADA compliance review, rather its focuses on determining cost impacts of policy changes. As summarized in Figure 1, no serious compliance issues were identified, but several areas were identified where existing policies exceed ADA requirements, so that changes may be possible that would produce cost savings.

These changes are analyzed one at a time in the following sections. For each one, the likely change in trips or vehicle-hours is estimated, and in some cases the change in passenger-miles is estimated if the trips affected are significantly different than the average. A summary of these operational changes is provided at the end of the change analyses. Following that, the trip, vehicle-hour, and passenger-mile changes are translated into financial impacts using Pace's amended 2009 budget as a baseline.

Note that the changes are only analyzed for their cost impacts. Impacts on customers, CTA transit service, or Pace Suburban Bus service have not been analyzed. No recommendations are being made as to whether any of the changes analyzed should be implemented.

## Figure 1. Summary of Changes Analyzed

| Topic | Comparison to ADA Requirements | Change Analyzed |
|---|---|---|
| Origin-to-destination Service | Meets requirements. | None |
| Trip-by-Trip Eligibility | Allowed and encouraged, but used only to a limited extent. | Consistently review trips by people with conditional eligibility to see if they can be made by fixed-route transit or by using feeder service. |
| Feeder Service | Allowed, but not currently used. | |
| Service Area and Hours | Exceeds requirements. Service areas are approximated using maps for routes in operation during time periods. | Exactly apply the service area, based on the routes in operation at the exact time of each trip. |
| Trips between Chicago and Adjacent Suburban Areas | Exceeds requirements. Trips can be made between Chicago and portions of the near suburbs beyond the CTA area without transferring between vehicles or paying a fare surcharge. | For trips that go beyond the CTA service area, either require a transfer between vehicles or charge a fare based on combined CTA and Pace fares. |
| Transfers between Suburban Service Areas | Requirements are not clear. | Discussion only |
| Transfers within Chicago | Allowed, but not currently used in Chicago. | Require transfers for trips between far north and far south service areas, arranged in one phone call. |
| Reservations Hours and Advance notice | Exceeds requirements. Longer hours than required, except in some smaller suburban areas. | Shorten hours when reservations are taken. |
| Trip Time Negotiation | Meets requirements. | None |
| Fares | Exceeds requirements. Paratransit fares in Chicago and the suburbs are lower than allowed. | Raise fares to twice fixed-route adult base fare. |
| Trip Purpose Restrictions | Meets requirements. | None |
| On-time Pickups | Meets requirements. | Discussion only |
| On-time Dropoffs | Standards are under development. | |
| Trip Denials | Meets requirements. | None |
| Trip Lengths | Meets requirements. | None |
| Telephone Access | Wait times are within Pace's minimum standard. | None |
| Subscription Service | Not required by ADA. | Discussion only |
| Taxi Access Program | Not required by ADA. | Eliminate TAP. Discussion only |

# Trip-by-Trip Eligibility and Feeder Service

The ADA regulations state that eligibility may be different for each trip according to whether the individual's disability prevents use of fixed-route transit for that trip. Trip-by-trip eligibility screening would apply to all individuals who have been determined conditionally eligible by RTA. The ADA regulations also permit paratransit service to be provided by means of "feeder" connections to or from fixed-route stations or stops. Trip-by-trip application of conditional eligibility can be closely tied to feeder service. Many individuals who are capable of using fixed-route service for some trips could use it for the remaining trips if they were provided a connection to and from the bus stop or rail station by paratransit. This would include people who cannot walk more than some distance, people who cannot walk where sidewalks are in poor condition, people who cannot cross busy streets, and people who cannot walk or wait outside in cold weather, hot weather, or when there is snow on the ground.

At the time paratransit service was transitioned to Pace, the Chicago Transit Authority conducted a preliminary analysis of eliminating "point to point" service in favor of limiting service to dropoffs at the nearest accessible fixed-route service, i.e. providing only feeder service. That analysis suggested that a cost reduction on the order of one-third might be possible. The following analysis takes advantage of a detailed review of FTA regulations to understand legal restrictions on feeder service, a detailed analysis of the eligibility status of current riders to determine which of them could be required to use feeder service, and a review of the experience of other paratransit operators that have implemented a comprehensive program of trip-by-trip eligibility including feeder service.

The systems that have implemented a comprehensive program of trip-by-trip eligibility, including feeder service, operate in much smaller service areas than Pace paratransit. The most comprehensive programs are in Salt Lake City, Utah, and Tacoma, Washington. Pittsburgh, Pennsylvania has a comprehensive program of trip-by-trip eligibility but makes very limited use of feeder service. The available experience from other cities indicates that on the order of one-third of paratransit eligible individuals could be conditionally eligible, and that these people will take paratransit trips at about one-half the rate of unconditionally eligible people if trip-by-trip review of eligibility is consistently applied, including determining which trips can be made using fixed-route service with or without a feeder leg.

Full application of trip-by-trip eligibility would require considerable groundwork to develop procedures, train staff, and conduct field reviews of conditions at bus stops and along the paths customers would travel to and from stops. To implement feeder service, there would need to be detailed coordination with CTA to ensure that transit system capacity and accessibility issues are addressed, and that passengers are never left stranded. As explained in more detail below, changes to the RTA eligibility process would also be needed.

The potential for use of trip-by-trip eligibility (including feeder service) was analyzed using eligibility records provided by RTA. RTA determines eligibility for the whole region, both in Chicago and the suburbs, without distinction between those who would use Pace Suburban or Chicago paratransit service. The RTA eligibility records show the specific conditions of eligibility for each conditionally eligible person, based on 20 conditional eligibility categories established by RTA. For each of the 7,638 conditionally eligible people in the RTA records, the number of people with each type of condition, or combination of conditions was determined. As of December 31, 2008, 17.1% of all ADA paratransit eligible people were conditionally eligible.

The eight most common conditions are shown in Figure 2. Conditionally eligible individuals have an average of three conditions per person, but 32% of all conditionally eligible people have four or more conditions. The second most common category, "Conditional Variable - Good Day Bad Day - Distance to bus stop/'L' station," means that on a "good day" the person is capable of traveling some limited distance to a bus stop or CTA station. In this case, the person's capabilities on a "bad day" are not necessary determined, though notes in the certification file may provide some information. Most of these individuals have other conditions as well, all of which are based on capabilities on a "good" day.

## Figure 2. Most Common Categories of Conditional Eligibility

| Condition | Percent of Conditionally Eligible | Percent of All ADA Paratransit Eligible |
|---|---|---|
| Conditional Winter Months - Ice/Snow | 74% | 12.6% |
| Conditional Variable - Good Day Bad Day - Distance to bus stop/'L' station | 51% | 8.7% |
| Conditional Path of Travel - Sidewalks - Condition/Absence of sidewalk | 37% | 6.3% |
| Transitional - Curb Cuts | 37% | 6.3% |
| Conditional Path of Travel - Distance to bus stop/'L' station - One block | 31% | 5.4% |
| Conditional Path of Travel - Distance to bus stop/'L' station - Two blocks | 22% | 3.7% |
| Conditional Winter Months - Temperature | 11% | 1.9% |
| Conditional Summer Months | 9% | 1.5% |

Based on the combinations of conditions, we have grouped the conditionally eligible people into four categories for this analysis:

1. **Not candidates.** Not candidates for trip-by-trip eligibility because they can use fixed-route service neither in the summer nor in the winter, often with additional limitations based on other conditions.
2. **Not presently candidates—variable condition.** People whose conditions are variable, and the existing certification specifies only what they can do on a "good day" but not what they can do on a "bad day." Since a person's capabilities cannot be predicted in advance, these people are not presently candidates for trip-by-trip eligibility, but could be in the future, following re-certification, if the process determines capabilities on a bad day. Some of these individuals also have conditions that would require field review to determine eligibility for a specific trip.
3. **Potential candidates with field review, additional eligibility detail, and feeder service.** People whose ability to use fixed-route transit depends on factors such as the presence or condition of sidewalks, seating at bus stops, or the need to cross difficult intersections. Trip-by-trip review could be applied to these individuals after development of a process for conducting field reviews of trip conditions and modification of the eligibility process to provide more detail about the specific features that create a barrier for each person. The trip-by-trip review could place some people on feeder service after appropriate policies and procedures were developed in coordination with CTA and Pace fixed-route operations, including identification of safe dropoff locations.

4. **Currently candidates for trip-by-trip review.** People whose ability to make a trip is not variable and depends only on factors that can be determined without field review, such as temperature, whether a fixed-route transfer would be needed, or the presence of snow and ice.

Figure 3 summarizes the percentage of eligible individuals in each category. For the immediate future, about 3% of ADA paratransit eligible people are candidates for trip-by-trip eligibility review. If they reduce their ADA paratransit trip making by half, there would be a 1.5% reduction in overall paratransit demand.

In the future, 14.6% of ADA paratransit eligible people (Categories 2, 3, and 4) could be candidates for trip-by-trip eligibility review, if: (1) the certification process is revised to provide more detail about specific issues for individuals with path of travel conditions and to determine capabilities on a "bad" day, and if (2) a comprehensive program of field review of paths of travel and feeder service is implemented. If these individuals reduce their ADA paratransit trip making by half, there would be 7.3% reduction in overall paratransit demand. This more comprehensive process would take at least a year and probably closer to two years to implement, and would not reach full impact for four years after the revised eligibility was in place (that is, not before 2015), because that is the frequency of required re-certification.

Implementing this process would require adding permanent staff at Pace to conduct field reviews and make determinations as conditionally eligible people request trips to and from destinations not previously reviewed. Assuming that a person can conduct two field reviews per day, this function would require approximately three full-time staff people, two for the CTA area and one for the suburban area.

## Figure 3. Candidates for Trip-by-Trip Eligibility Review

| Category | Percent of Conditionally Eligible | Percent of All ADA Paratransit Eligible |
|---|---|---|
| 1. Not candidates | 14.4% | 2.5% |
| 2. Not presently candidates—variable condition. | 50.7% | 8.7% |
| 3. Potential candidates with field review, additional eligibility detail, and feeder service | 17.1% | 2.9% |
| 4. Currently candidates for trip-by-trip review | 17.8% | 3.0% |
| Total | 100.0% | 17.1% |

# Service Area and Hours

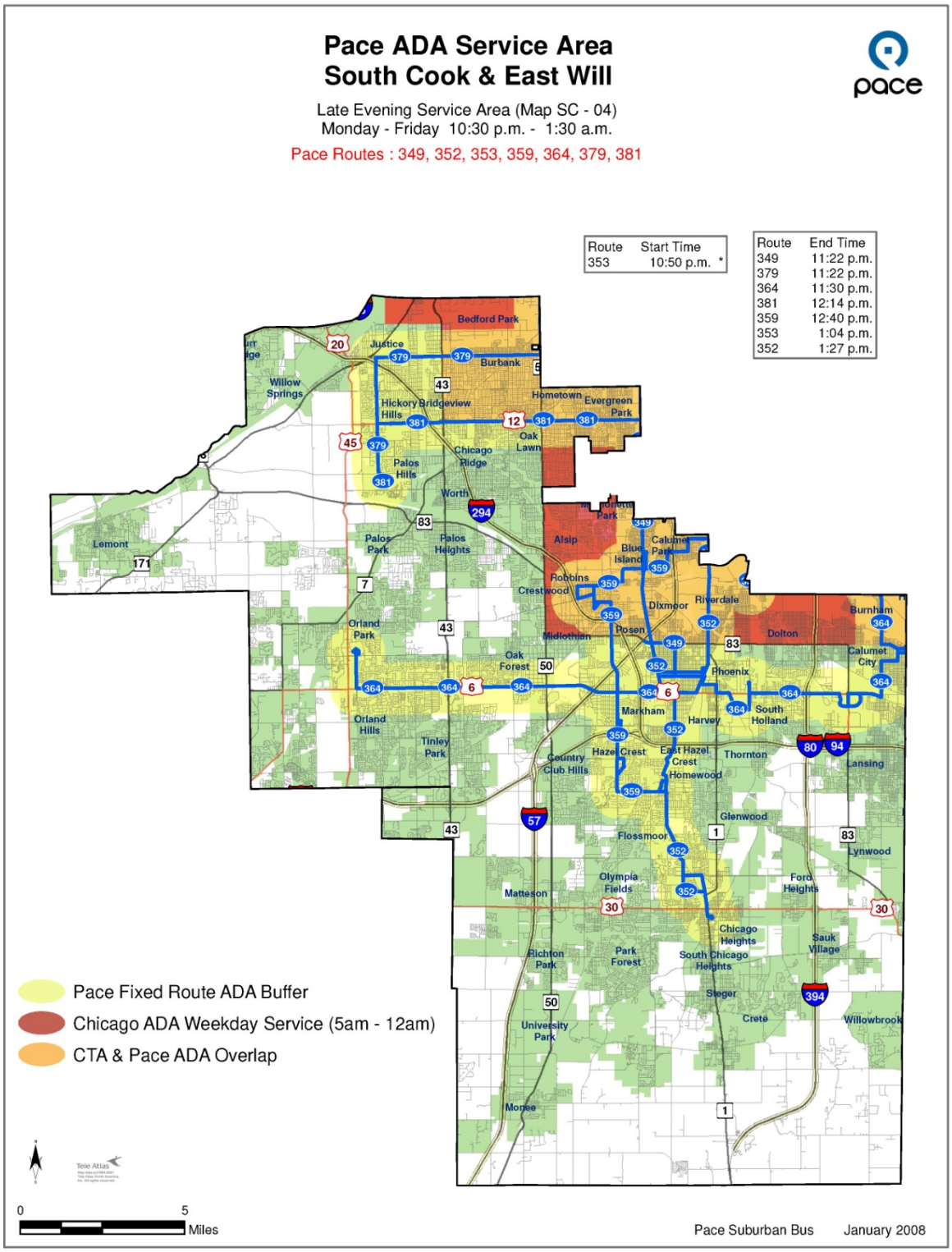
The ADA regulations state that service must be provided to and from locations within three-quarters of a mile of transit routes and stops at times when those routes are being served. This means that, at least in principle, the required service area constantly fluctuates as routes enter and leave service, especially in the morning and evening hours. Pace determines whether a trip is in the required service area using a simplified process based on a series of maps, each of which represents the area with service during a range of hours.

As one example, for its South Cook - East Will suburban service, Pace uses four maps for weekdays, which apply from 4:05 AM to 5:00 AM, from 5:00 AM to 8:00 PM, from 8:00 PM to 10:30 PM, and from 10:30 PM to 1:30 AM. These maps are necessarily approximations and represent the maximum extent of service during each of these time periods. For example, the 10:30 PM to 1:30 AM map for one suburban service area (Figure 4) includes all routes in operation as of 10:30 PM, although some routes begin going out of service as early as 11:22 PM. The Route 349 going out of service at 11:22 PM has little impact, but Route 364 going out of service at 11:30 PM leaves a significant area without bus service, and therefore without an ADA paratransit requirement after 11:30 PM.

In the case of Chicago, Pace paratransit serves some suburban locations that are beyond the required area based strictly on CTA bus and rail service. These locations are served by Pace suburban service, so ADA eligible customers would have the option of scheduling a trip that involves a transfer between Chicago and suburban paratransit. Pace has determined that it is operationally more convenient to serve these trips without a transfer. This issue is treated separately in the next section.

Nelson\Nygaard conducted an analysis to estimate the percentage of trips that are currently provided that would no longer be provided if the ADA service area were determined exactly, rather than using the current time period approximations. For this purpose, Pace supplied records for all of the trips provided in one week (October 19 – 25, 2008) as well geographic files showing the exact location and hours of bus and rail service in the CTA and suburban service areas. A random sample was chosen from trips provided during early morning and late evening hours, including 100 weekday, 100 Saturday, and 100 Sunday trips provided in the Chicago service area; similar samples were chosen for all of suburban service areas combined. The analysis focused on early morning and late evening trips because these times are when routes go in and out of service. As a result, these are the times when exact application of the ADA service area rules would exclude some trips. Cutoff times for “early morning” and “late evening” were established separately for weekdays, Saturdays, and Sundays, according to the times when changes in active service significantly impact the service area.

# Figure 4. South Cook – East Will Late Night Service Area



For each trip in the sample, Nelson\Nygaard determined whether there was Pace or CTA bus or rail service actually in operation, (1) within three-quarters of a mile of the pickup location at the time of the scheduled pickup, and (2) within three-quarters of a mile of the dropoff location at the time of the dropoff.

The results of this analysis, as shown in Figures 5 and 6, are that 0.5% of Chicago paratransit trips and 2.1% of suburban paratransit trips serve locations that do not require service based on an exact application of the ADA service area at the time of the trip. This does not include suburban trips that merely go to an adjoining suburban service area, since service is still required for these trips, though for some of them a transfer could be required. In the case of Chicago, the trips that would no longer be served are about 56% longer than the average Chicago paratransit trip, so required vehicle hours of service could be reduced by as much as 0.8%. In the suburbs, non-required trips are no longer on average than other trips.

## Figure 5. CTA Area Trips Beyond the ADA Service Area

| Type of Day | Percent of Client Trips Provided | Percent that go Beyond the ADA Service Area |
|---|---|---|
| CTA Weekday | 82.82% | 0.22% |
| CTA Saturday | 7.41% | 3.19% |
| CTA Sunday | 9.77% | 1.18% |
| Total CTA | 100.00% | 0.54% |

## Figure 6. Suburban Trips Beyond the ADA Service Area

| Type of Day | Percent of Client Trips Provided | Percent that go Beyond the ADA Service Area |
|---|---|---|
| Suburban Weekday | 92.30% | 1.58% |
| Suburban Saturday | 5.23% | 7.54% |
| Suburban Sunday | 2.47% | 8.41% |
| Total Suburban | 100.00% | 2.06% |

# Trips Between Chicago and Suburbs

For the reasons already discussed, Chicago paratransit service sometimes goes beyond the extent of CTA bus and rail service. In addition, the Chicago service also includes nine points of interest, marked with red dots on Chicago service area maps, some of which are beyond the ADA buffers around CTA routes. Direct service between Chicago and these locations is provided to reduce the need to arrange transfers. Since Pace operates suburban service in the entire area between the CTA area and these points of interest, riders would still be entitled to paratransit service to these locations, but the service would require arranging transfers.

The issue of how to treat the “overlap area” trips affects not just the early and late hours analyzed before, but also the midday trips when the CTA and Pace services areas are at their maximum extent. The number of affected trips was analyzed using the same trip records for the week of October 19 - 25, 2008 used for the service area analysis. All 31,700 client trips provided on weekdays between the hours of 5:00 AM and 10:30 PM were analyzed. This is the time of

maximum CTA service, and there is very little variation in the extent of CTA service during this time. For each trip, the pickup and dropoff locations were compared to the three-quarter mile buffer around CTA bus and rail service. The analysis found 1,219 client trips (3.8% of those analyzed) that began or ended beyond the CTA service area. A similar percentage was assumed for weekend trips during the midday. For early morning and late evening trips, results from the service area analysis of a sample of trips, found that 5.6% of Chicago paratransit trips begin or end beyond the CTA area but within a Pace suburban service area. Overall, about 3.9% of Chicago trips would be subject to a possible transfer requirement.

There are two options for addressing these "overlap" trips: (1) require passengers to transfer between Chicago and suburban paratransit service, with separate fare payment for each leg; (2) continue to provide trips without a transfer between services, but charge a fare based on the comparable fixed-route trips, which would involve a transfer between CTA and Pace Suburban Bus service. The first option is considered here, and the second is considered along with other fare changes in a later section.

If Pace were to begin requiring passengers to transfer, the demand for trips between Chicago and the overlap area would probably drop substantially. Requiring transfers would increase travel time for these trips, since there would probably be some waiting at the transfer point and routing would probably be somewhat less direct. The current travel time for these trips is about 52 minutes on average, from pickup time to dropoff time. This time would increase by at least 20 minutes and probably more.

To our knowledge the elasticity of paratransit demand with respect to travel time has never been estimated. However, there are some results in the literature about transit demand and travel time.[1] The elasticity of transit demand with respect to in-vehicle travel time is in the range of -0.5 to -1.0. Long run elasticity is probably at the high end, while short run elasticity would be toward the low end. It is generally assumed that time spent waiting to transfer has a greater impact on demand that time riding in a vehicle. One study estimated that each minute spent waiting to transfer is equivalent to 1.81 minutes riding in a vehicle.

If the current average travel time of 52 minutes increases to 72 minutes, including 20 minutes spent waiting for a transfer, then the new travel time would be equivalent to perceived travel time of 88 minutes, i.e. (1.8 x 20 minutes) + 52 minutes. This would be an increase in perceived travel time of 69%. Applying the formula for elasticity,[2] a demand decrease between 23% and 41% would be expected, assuming no change in fare. This decrease would apply to linked transfer trips, not individual transfer legs. Since there are twice as many transfer legs as linked transfer trips, the result would be a net *increase* of from 18% to 54% in the number of paratransit boardings. Half of these boardings would occur on Chicago paratransit and half on suburban paratransit.

ADA would permit fares to be charged for both legs of these transfer trips. The impact of this additional charge is estimated to be a demand reduction of 14% to 29%. (The basis for this calculation is explained in the section about fare changes.) The combined impact of the transfers, including charging for both legs would range from a drop of 16% in the number of trips to an increase of 32%. (The lower figure is an increase of 18% due to transfers combined with a

[1] Avishai Ceder, Public Transit Planning and Operation: Theory, Modeling and Practice, Butterworth-Heinemann, 2007, p. 327.
[2] Q2/Q1 = exp(elasticity x ln(P2/P1)), where Q1 and Q2 are the old and new demands, P1 and P2 are the old and new prices (or in this case travel times), "exp" is exponentiation, and "ln" is the natural logarithm.

decrease of 29% due to the fare change. The higher figure is an increase of 54% due to transfers combined with a decrease of 14% due to the fare change.) Since overlap trips comprise about 3.9% of all Chicago trips, the changes would amount to a change of -0.6% to +1.3% compared to total Chicago trips. However, half of the remaining transfer trips would actually occur on Pace paratransit, where they would amount to a much larger percentage change, since suburban service overall carries about one-fourth the ridership of Chicago service. The result would be a change of -2.3% to -1.3% on Chicago service, plus an increase of 6.3% to 9.9% on suburban service. All of these calculations are summarized in Figure 7.

## Figure 7. Impact of Transfers between Chicago and Adjacent Suburban Locations

| Calculation | Low | High |
|---|---|---|
| Percent of Chicago trips to or from overlap areas | 3.9% | |
| Change in linked overlap trips due to transfers | -41% | -23% |
| Change in unlinked overlap trips (boardings) due to transfers | +18% | +54% |
| Change in overlap trips due to charging a fare for both legs | -29% | -14% |
| Overall change in unlinked overlap trips | -16% | +32% |
| Percent change in total Chicago trips (excluding suburban legs) | -2.3% | -1.3% |
| Percent change in total suburban trips | +6.3% | +9.9% |

# Transfers between Suburban Service Areas

Passengers who wish to travel between suburban service areas currently need to arrange each leg of the trip on their own, phoning first the home-end provider and then the destination-end provider. The providers are required to coordinate scheduling the two portions of the trip, so the second provider takes the already-scheduled leg into account in its scheduling process. Since the first vehicle currently waits with the passenger for the transfer to be completed, issues with missed or late transfers can be minimized. Nevertheless, the customer is faced with two waits for telephone service and two opportunities for inconvenient scheduling. Pace staff have indicated that they plan to transition to a more centralized arrangement that will permit booking of transfer trips in one call. The more centralized arrangement would be phased in as new carrier contracts are put in place. FTA guidance is unclear about whether or not any change is needed, so no cost impact is being placed on this item.

# Transfers Within Chicago

ADA allows the use of transfers between paratransit vehicles within a paratransit system as long the resulting linked trip meets the required service criteria, including fare, on-time performance, and travel time. Some provision needs to be made for passengers who cannot wait unattended at a transfer point. Such passengers could be accommodated by having the first vehicle wait with the passenger until the second vehicle arrives, by providing a direct, one-vehicle trip for such individuals on a case-by-case basis, or by some other means. Pace does not presently use transfers within Chicago, but had previously announced a policy under which trips between the far south service zone (Zone 1, south of 71$^{st}$ Street) and the far north service zone (Zone 3, north of Fullerton) would be provided by means of a transfer between the Zone 1 and Zone 3 providers. These transfers were to be arranged by the home-end carrier in one phone call, and vehicles were to wait with passengers as needed based on passenger capabilities. This policy was never

implemented and it is not included in the current Customer Guide. Although the Chicago transfer policy was not implemented, it would be acceptable under ADA rules and might have potential for reducing cost.

The impact of Chicago transfers was analyzed using the one-week trip records from October 2008, as described earlier. From these trip records, it was determined that 3-zone trips (i.e. from Zone 1 to Zone 3 or the reverse) make up 2.0% of Chicago paratransit trips and have an average travel time of 75 minutes. Delays in making the transfer would add at least 20 minutes to each trip. It is estimated that the transfer policy would result in an increase in total Chicago paratransit trips between 0.7% and 1.3%. This estimate was made using the same factors to represent change in demand due to this inconvenience as were used for the analysis of transfers between Chicago and suburban paratransit, and allowing for the fact that there would be two paratransit trips for each remaining 3-zone trip. Total passenger-miles would be approximately unchanged.

A transfer policy could, at least in theory, produce some reduction of vehicle-hours required to provide service. This would happen if the transfer policy let the Zone 1 and 3 providers keep their vehicles within a smaller area most of the time. This gain would be offset by the fact that coordinating transfers would introduce some inefficiencies, and involve boarding delays twice instead of once for each trip. As a result no cost reduction due to transfers is projected due to improved vehicle productivity.

## Reservations Hours

Reservations are taken one day in advance only, which corresponds exactly to the ADA requirements. However, reservations hours in Chicago and most suburban areas are longer than administrative hours, which are usually considered to be 8:00 AM to 5:00 PM. In Chicago reservations are taken from 6:00 AM to 8:00 PM. In all of the suburban portions of Cook County, weekday reservations hours are from 5:30 AM to 9:00 PM, while in DuPage County they are from 6:00 AM to 7:00 PM. It would not violate the ADA regulations to reduce reservations hours to exactly 8:00 AM to 5:00 PM seven days a week.

In the case of Chicago, the current reservations hours are the same as those used previously by CTA when it provided paratransit service. At that time, the availability of paratransit service was restricted and customers had a difficult time getting through on the phone to make a reservation. Early morning reservations hours were, at least in part, a response to this difficulty. Paratransit trip capacity is no longer restricted, and customers are consistently able to reach a customer service agent to reserve a trip.

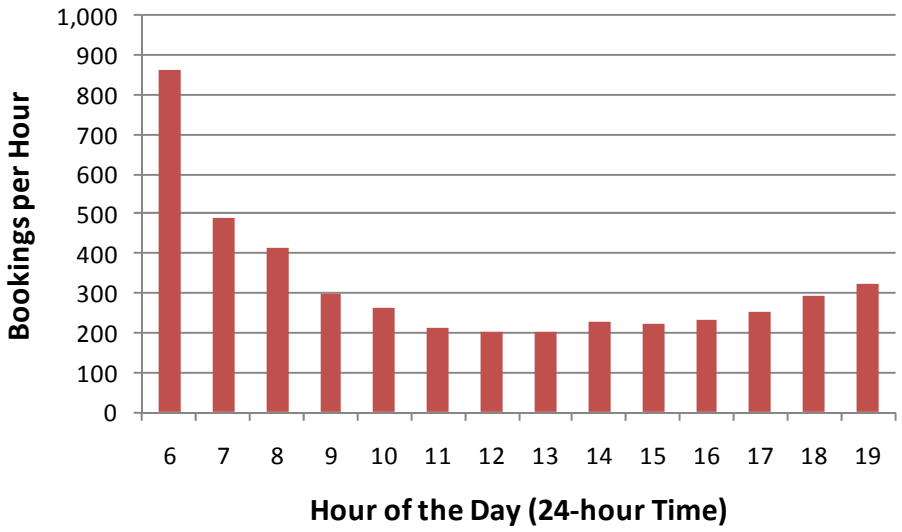
There are two ways that shorter hours could possibly save money: (1) by reducing the labor cost of staffing the phones and taking reservations; and (2) by giving schedulers more time to optimize vehicle schedules after reservations close.

It is not clear that reducing reservations hours would decrease labor costs to take calls, as long as the same number of trips need to be booked for the same number of customers. Reducing reservations hours would mean that call volume per hour would increase. Also, because shorter reservations hours, with only one-day advance booking, would be extremely inconvenient for many customers, there would probably be much sharper peaks in call volume at the beginning and end of the day. While Pace can encourage customers to call at other times, they cannot require them to, and must provide adequate call-taking capacity throughout the hours when reservations are taken. As a result, especially during peak calling hours, the number of call-

takers would need to be substantially increased in order to maintain acceptable hold times. Probably the number of phone lines and scheduling workstations would also need to be increased. We have not been able to review hour-by-hour hold time data, but the available daily statistics indicate that hold times currently are acceptable by Pace's own standards, but could not deteriorate significantly without creating an impermissible capacity constraint.

Using Chicago as an example, reservations are now taken 14 hours per day, and could be reduced to 9 hours. An examination of the numbers of weekday trips booked in each hour of the day (shown in Figure 8), shows a sharp peak at the beginning of the day. Aside from this morning peak, call volume is relatively even from hour to hour. Averaged over the whole day, call volume per hour could be expected to increase by 56%. But, taking into account that peaking would probably increase, call volume during the beginning and end of the day could easily double. Depending on how the providers are able to schedule their call takers, and whether the providers are able to give call takers other tasks to take full advantage of the time whenever call volumes are low, it is possible that the result of shorter reservations hours could be an *increase* in call-taking costs. An analysis at that level of detail would involve delving into the staffing and shift scheduling of each individual provider and comparing this to hour-by-hour call volumes and hold times.

## Figure 8. Chicago Paratransit Bookings by Hour of the Day




It is still possible that shortening reservations hours could save money if schedulers could take advantage of the earlier close of reservations to create more efficient vehicle schedules. For example, if schedules for the next day could be completed by 9:00 PM instead of midnight, then it might be possible to notify drivers about shift changes needed to create more efficient runs or elimination of unneeded runs, allowing the same volume of trips to be served with fewer driver hours. Projecting savings of this type would be an exercise in speculation, and would depend on the details of how each provider manages its driver work force as well as the ability of Pace to renegotiate contract rates. For the sake of discussion only, a figure of 3% savings in operating cost is included in the financial analysis to represent an optimistic estimate of productivity improvement due to an earlier cutoff in reservations hours. In practice, Pace would work with providers of a period of time to attempt to achieve increasing savings.

# Fares

Paratransit fares in Chicago and the suburbs are lower than allowed by the ADA regulations. In Chicago, the current $2.25 fare could be increased to $4.00, which is twice the basic adult CTA fare. In the suburbs, the $3.00 fare in Cook and DuPage counties and the $2.50 fare in Lake, McHenry, Kane, and Will counties could all be raised to $3.50, which is twice the basic adult Pace Suburban Bus fare of $1.75.

In addition to raising the general fare for Chicago paratransit, Pace could raise the fare for trips between the exact ADA-required CTA service area and adjacent Pace suburban locations to correspond to the fact that a fixed-route rider would need to pay both a CTA fare and Pace fare for such a trip. These were described earlier as trips to or from an "overlap" area, since the expanded Chicago service area overlaps with the Pace service area. Using the increased general fares as the starting point, the fare for these trips would go up from $4.00 to $7.50 (that is $4.00 plus $3.50). All of the potential fare increases are summarized in Figure 9.

## Figure 9. Current and Allowed Paratransit Fares

| | Chicago within the CTA Area | Chicago Overlap Trips | DuPage and Cook | Lake, McHenry, Kane, and Will |
|---|---|---|---|---|
| Current Fare | $2.25 | $2.25 | $3.00 | $2.50 |
| Allowed Fare | $4.00 | $7.50 | $3.50 | $3.50 |

A fare increase would bring in additional revenue and would also cause some drop in ridership, at least compared to ridership that would have occurred taking into account the general trend for paratransit ridership to increase in response to improved service and other factors. The ridership response to a fare change is usually estimated using an "elasticity" which measures the percentage change in ridership for each 1% change in fare.[3] Five studies conducted for ADA paratransit systems by HLB Decision Economics have found an average elasticity of -0.36. This would mean that each 1% increase in fares would produce a 0.36% decrease in ridership. The lowest elasticity (in absolute value) found was -0.24 in Philadelphia and the highest was -0.55 in Riverside, California. Some earlier studies found lower elasticities, but these may have been influenced by trip denials and other capacity constraints, which would tend to reduce the effect of fare changes. Also, it is likely that elasticity is higher at higher fare levels. Since paratransit fares have generally been increasing, this too could result in higher elasticities.

Figure 10 shows the result of applying the elasticity estimates to the allowed fare increases in Chicago and the suburban areas. Figure 11 then shows the additional impact on Chicago paratransit demand of implementing the allowed fare for trips to and from the suburban overlap area on top of the general fare increase. The impact of the overlap fare is shown first just for the overlap trips, and then for Chicago paratransit overall, taking into account that overlap trips are about 3.9% of all Chicago paratransit trips.

[3]Mathematically, if P1 and P2 are the old and new prices, and R1 and R2 are the old and new ridership levels, then elasticity = ln(R2/R1) ÷ ln(P2/P1), where "ln" is the natural logarithm. To use the elasticity for prediction, the formula is expressed as R2/R1 = exp(elasticity x ln(P2/P1)), where "exp" is exponentiation.

## Figure 10. Ridership Change Due to a General Paratransit Fare Increase

| Elasticity Estimate | Chicago | Cook and DuPage | Lake, McHenry, Kane, and Will | Combined Suburban |
|---|---|---|---|---|
| High | -27.1% | -8.1% | -16.9% | -9.9% |
| Average | -18.7% | -5.4% | -11.4% | -6.6% |
| Low | -12.9% | -3.6% | -7.8% | -4.5% |

## Figure 11. Ridership Change Due to an Overlap Fare

| Elasticity Estimate | Chicago Overlap Trips | All Chicago Trips |
|---|---|---|
| High | -14.0% | -0.5% |
| Average | -20.3% | -0.8% |
| Low | -29.2% | -1.1% |

# On-Time Performance

Pace considers a pickup on-time if it is no more than 20 minutes after the scheduled time in Chicago and no more than 15 minutes after the scheduled time in the suburbs. Vehicle arrivals before the scheduled time are considered on-time. Pace has a goal of 95% on-time pickups in Chicago and the suburbs, which is sufficient for ADA compliance. There is no specific ADA requirement about early pickups, but FTA has consistently held that passengers must not be pressured to accept early pickups. As long as this policy is observed in practice, early pickups can be considered "on time." In compliance reviews, FTA tends to regard a high percentage of early pickups as evidence of possible pressure on riders.

On-time performance can also be measured with respect to dropoff time. FTA has been very clear that customers with appointment times must be able to book trips based on these appointment times, and that on-time performance at the destination end must be tracked and compared to standards for these trips. Clearly dropoffs should not occur after the appointment time; FTA has also suggested that dropoffs should not occur more than 30 minutes before the appointment time. Some transit operators consider FTA's position regarding dropoff times to be controversial. Pace has begun measuring and monitoring on-time performance for dropoffs and is planning to set objectives for contractors to meet.

Pace's reported on-time performance for pickups has generally been in range of 90% to 95%. Using the week of trip records for October 2008 described earlier, we found that 93.1% of Chicago trips and 95.5% of suburban trips were on-time by Pace's definition. Pace also reports that vehicles arrive more than 10 minutes early 27.0% of the time in Chicago and 26.4% of the time in the suburbs as of late 2008. Whether early arrivals create an on-time performance issue depends on how passengers perceive these cases, and whether drivers attempt to have passengers board early. FTA has not provided definitive guidance about whether any particular level of early arrivals is a compliance issue.

## Subscription Service

Subscription service is not required by ADA. Therefore Pace could, strictly from a legal point of view, eliminate subscription service. However, eliminating or reducing subscription service would not necessarily save any money and could well add to the cost of service. Subscriptions are a convenience for riders who make frequent repeated trips, but they are also operationally useful for Pace, because they avoid the need to take numerous phone reservations, they allow schedules based on the subscriptions to be optimized using a long base of experience, and these schedules provide a useful skeleton framework onto which next-day reservations can be placed. For these reasons, subscriptions are generally considered to contribute to the efficiency of ADA paratransit operations. In fact, FTA frequently suggests that operators consider increasing their use of subscriptions as a way of providing more capacity within limited budgets. The efficiency of subscriptions does depend on the details of how they are used. Key issues regarding subscriptions include the process used for determining who will get a subscription, whether subscription pickup and appointment times are subject to negotiation and adjustment for efficiency reasons, and how no-show policies are applied to subscriptions. Examining these issues would involve a detailed operations review of Pace paratransit that goes far beyond the scope of this requirements analysis.

## Taxi Access Program

The Taxi Access Program (TAP) is a non-ADA service that Pace provides for residents of the city of Chicago. It is not required by ADA and could, again from a strictly legal perspective, be eliminated. Whether eliminating TAP would save money depends on whether trips now made on TAP would then shift to ADA paratransit. According to recent budget data from Pace, the average TAP trip costs roughly $10 in subsidy per ride, after deducting the amounts that customers pay to purchase the TAP rides. By comparison, the average trip on Chicago ADA paratransit costs over $40, again after deducting passenger fares. This means that if more than one-fourth of the trips now made on TAP shifted to ADA paratransit, the net result would be an *increase* in total paratransit operating costs.

An analysis by Nelson\Nygaard for RTA in 2006 indicated that 75% of TAP users at that time did not use ADA paratransit at all. Clearly for some people TAP is a more convenient service that they prefer to paratransit, even though it costs more. TAP offers same-day convenience, including the ability to hail a cab on the street, and a direct ride with no detours for other passengers. This does not rule out the possibility that these customers would begin using paratransit for at least some of their current TAP trips if TAP no longer existed. Pace's experience raising TAP fares may provide some evidence about whether TAP trips shifted to paratransit. We would recommend that Pace conduct additional analysis based on trip records of individual TAP and paratransit customers to determine the extent to which TAP trips are likely to shift to ADA paratransit. On this basis it may be possible to determine whether the most cost-effective policy would be to eliminate, reduce, or even increase the level of TAP service. Since Pace has implemented a card system for TAP in place of coupons, additional data may be available to pinpoint the nature of TAP demand and how it is related to paratransit demand.

# Summary of Changes

The preceding sections estimate percentage changes in numbers of trips or passenger-miles for each of the potential changes in policy or operating practice. These results are summarized in Figure 12. The columns labeled "Low" for Chicago (the CTA service area) and the suburbs represent the possible changes that would result in the lowest estimated total cost of providing service. Similarly, the columns labeled "High" represent the possible changes that would result in the highest estimated total cost of providing service.

The "Cumulative" changes at the bottom of the table indicate the combined effect of applying all of the potential changes, with the exception of change No. 4, required transfers to and from the overlap area between Chicago and suburban service. This policy change is excluded because it will be necessary to choose between it and the alternative policy (No. 7) of charging a higher fare for these same trips without using transfers. The fare change would be a safer option, more quickly implemented, and less risky in terms of possible added service issues and costs. The cumulative changes in the "Low" columns assume that all of the Low changes are combined, and the cumulative changes in the "High" columns assume that all of the High changes are combined.

## Figure 12. Summary of Impacts from Policy Changes

| Change | Chicago | | Suburbs | | Units |
|---|---|---|---|---|---|
| | Low | High | Low | High | |
| 1. Trip-by-Trip Eligibility (See Note 1) | -7.3% | -1.5% | -7.3% | -1.5% | Trips* |
| 2. Service Area and Hours | -0.5% | -0.5% | -2.1% | -2.1% | Trips |
| | -0.8% | -0.8% | -2.1% | -2.1% | Passenger-miles* |
| 3. Transfers within Chicago | 0.7% | 1.3% | | | Trips |
| | 0.0% | 0.0% | | | Passenger-miles* |
| 4. Require a transfer to/from overlap area | -2.3% | -1.3% | 6.3% | 9.9% | Trips |
| | -3.7% | -2.3% | 2.6% | 4.1% | Passenger-miles |
| 5. Reservations Hours (See Note 2) | -3.0% | 0.0% | -3.0% | 0.0% | Vehicle-hours* |
| 6. Fares: General Fare Increase | -27.1% | -12.9% | -9.9% | -4.5% | Trips* |
| 7. Fares: For trips to/from overlap area | -1.1% | -0.5% | | | Trips |
| | -1.8% | -0.9% | | | Passenger-miles* |
| Cumulative (using starred items) | -36.2% | -15.7% | -20.7% | -7.9% | Mixed units |

Notes:
1. The "Low" change for trip-by-trip eligibility would only be achievable by 2015 with full implementation of feeder service, field review of path-of-travel issues, and re-certification of all current conditionally eligible people.
2. The "Low" change for reservations hours, is a hypothetical productivity improvement that may be possible by taking advantage of an earlier reservations cutoff time. This change is included for the sake of discussion only.

The cumulative numbers in Figure 12 represent the overall change in quantity of service that would result if Pace paratransit were modified to correspond as closely as possible to the exact requirements of ADA. These cumulative changes are a mix of units as shown by the asterisks in the "Units" column. For most changes, passenger-miles or vehicle-hours were used as the unit that most closely corresponds to operating costs. Trips were used only for trip-by-trip eligibility (No. 1) and a general fare increase (No. 6).

Note that the cumulative changes are not just the sums of the individual changes, because the changes interact. For example, applying trip-by-trip eligibility would reduce the base number of trips that would be affected by any of the other changes. In general, the percentage changes multiply. For example, if one change produces a 10% reduction, and another change produces a 5% reduction, then their combined impact is a 14.5% reduction, calculated as (90% x 95%) - 100% = -14.5%.

## Impacts on Operating Costs and Revenues

The changes in service quantities have been used to estimate changes in operating costs and fare revenues. For this purpose, Pace's amended budget for 2009 was used as a base. Figure 13 gives key operating cost and revenue figures from the amended budget. For Chicago, costs and revenues for ADA paratransit service and the Taxi Access Program are shown separately. Variable costs for ADA paratransit include payments to the contract providers and, in the case of suburban service, the cost of fuel provided by Pace. Fixed costs include Pace's administrative costs, including contract oversight, administration of the Trapeze scheduling software and computer systems, and agency overhead.

### Figure 13. Amended Paratransit Operating Budget for 2009

($1000s)

| | Chicago | Suburbs | Regional |
|---|---|---|---|
| Operating Cost | | | |
| ADA Paratransit – Variable | $94,497 | $20,510 | $115,007 |
| ADA Paratransit – Fixed | 4,554 | 817 | 8,930* |
| Taxi Access Program | 3,921 | | 3,921 |
| Total Operating Cost | 102,972 | 21,327 | 127,858 |
| Revenue | | | |
| Fares – ADA | $4,517 | $1,581 | $6,098 |
| Fares – TAP | 1,286 | | 1,286 |
| Local Share & RTA Certification | 647 | 331 | 978 |
| Total Revenue | 6,450 | 1,912 | 8,362 |
| | | | |
| Funding Requirement | $96,522 | $19,415 | $119,496 |

*Includes Pace Indirect overhead allocation of $3,559,000

Changes in operating cost, fare revenue, and funding requirements have been estimated from the service quantity changes in Figure 12 and are shown in Figures 14, 15, and 16. The operating cost changes are based on the same starred changes in service quantities used for the cumulative change calculation in Figure 12, applied only to the variable costs in Figure 13. The fare revenue changes are based only on those items that would cause a change in the number of trips. As in Figure 12, the cumulative changes in cost, revenue, and funding requirements are not equal to the sum of the individual changes because of interactions.

## Figure 14. Changes in Operating Cost

($1,000s)

| Change in Policy or Practice | Chicago | | Suburbs | | Regional | |
|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High |
| Trip-by-Trip Eligibility (see Note 1) | -$6,820 | -$1,436 | -$1,452 | -$312 | -$8,272 | -$1,747 |
| Service Area and Hours | -$789 | -$789 | -$422 | -$422 | -$1,211 | -$1,211 |
| Transfers within Chicago | $0 | $0 | | | $0 | $0 |
| Require a transfer to/from overlap area | -$3,484 | -$2,127 | $532 | $841 | -$2,952 | -$1,286 |
| Reservations Hours (see Note 2) | -$2,835 | $0 | -$615 | $0 | -$3,450 | $0 |
| Fares: General Fare Increase | -$25,609 | -$12,190 | -$2,030 | -$923 | -$27,639 | -$13,113 |
| Fares: For trips to/from overlap area | -$1,701 | -$815 | | | -$1,701 | -$815 |
| Cumulative Change in Operating Cost | -$34,192 | -$14,811 | -$4,240 | -$1,618 | -$38,431 | -$16,428 |

## Figure 15. Changes in Fare Revenue

($1,000s)

| Change in Policy or Practice | Chicago | | Suburbs | | Regional | |
|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High |
| Trip-by-Trip Eligibility (see Note 1) | -$331 | -$69 | -$116 | -$24 | -$447 | -$93 |
| Service Area and Hours | -$24 | -$24 | -$33 | -$33 | -$57 | -$57 |
| Transfers within Chicago | $0 | $0 | | | $0 | $0 |
| Require a transfer to/from overlap area | -$102 | -$60 | $99 | $157 | -$3 | $98 |
| Reservations Hours | $0 | $0 | $0 | $0 | $0 | $0 |
| Fares: General Fare Increase | $1,337 | $2,477 | $138 | $241 | $1,475 | $2,719 |
| Fares: For trips to/from overlap area | $42 | $94 | | | $42 | $94 |
| Cumulative Change in Fare Revenue | $950 | $2,501 | -$21 | $177 | $930 | $2,678 |

## Figure 16. Changes in Required Funding

($1,000s)

| Change in Policy or Practice | Chicago | | Suburbs | | Regional | |
|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High |
| Trip-by-Trip Eligibility (see Note 1) | -$6,490 | -$1,367 | -$1,336 | -$288 | -$7,826 | -$1,655 |
| Service Area and Hours | -$765 | -$765 | -$390 | -$390 | -$1,155 | -$1,155 |
| Transfers within Chicago | $0 | $0 | $0 | $0 | $0 | $0 |
| Require a transfer to/from overlap area | -$3,382 | -$2,067 | $433 | $684 | -$2,949 | -$1,383 |
| Reservations Hours (see Note 2) | -$2,835 | $0 | -$615 | $0 | -$3,450 | $0 |
| Fares: General Fare Increase | -$26,946 | -$14,667 | -$2,169 | -$1,164 | -$29,114 | -$15,832 |
| Fares: For trips to/from overlap area | -$1,743 | -$909 | $0 | $0 | -$1,743 | -$909 |
| Cumulative Change in Required Funding | -$35,142 | -$17,312 | -$4,219 | -$1,794 | -$39,361 | -$19,106 |

Notes:

1. The "Low" change for trip-by-trip eligibility would only be achievable by 2015 with full implementation of field review of path-of-travel issues, re-certification of all current conditionally eligible people, and feeder service. The estimate includes the cost of two full-time staff people for Chicago and one for the suburbs for field reviews.
2. The "Low" change for reservations hours, is a hypothetical productivity improvement that may be possible by taking advantage of an earlier reservations cutoff time. This change is included for the sake of discussion only.

By far, the largest reduction in operating cost would come from a general fare increase, which would reduce regional operating cost by $13.1 million to $27.6 million. The ranges shown are the result of uncertainties that were described in the analysis sections. In the case of fares, the ranges reflect uncertainty in estimates of the fare elasticity of demand. Requiring passengers to transfer for trips between Chicago and close-by portions of the suburban service area would produce a cost increase for suburban service (to carry the suburban legs of the resulting trips), but a decrease in cost regionally. As in Figure 12, the alternative of charging a higher fare for these trips, but without a need for passengers to transfer, is used in the cumulative calculation. The low-end cost savings from shorter reservations hours are highly speculative and included for purposes of discussion only. All of the changes together would reduce operating cost regionally by $16.4 million to $38.4 million.

Many of the possible changes would also affect fare revenues, as summarized in Figure 15. The general fare increase by itself would produce substantial increases in revenue, between $1.5 million and $2.7 million regionally. The fare surcharge for overlap trips would increase revenue between $42,000 and $94,000. The other changes would either reduce revenue, because they would reduce the number of trips taken, or would leave it unchanged since they would not affect the number of trips. When the changes that would reduce trips are combined with the fare increases, the net result is still a revenue increase (between $0.9 million and $2.7 million), but less than with the fare increases alone.

Combining the operating cost and revenue changes gives net change in funding requirement, as shown in Figure 16. All of the changes have been applied to the 2009 budget to arrive at hypothetical total operating cost, fare revenue, and funding requirements if all of the changes had in place for all of 2009. The results are shown in Figure 17.

## Figure 17. Total Cost, Revenue, and Funding with All Changes

($1,000s)

| | Chicago+ | | Suburbs | | Region | |
|---|---|---|---|---|---|---|
| | Low | High | Low | High | Low | High |
| Operating Cost | $68,780 | $88,161 | $17,087 | $19,709 | $89,427* | $111,430* |
| Revenue ** | $7,400 | $8,951 | $1,891 | $2,089 | $9,292 | $11,040 |
| Funding Required | $61,380 | $79,210 | $15,196 | $17,621 | $80,135 | $100,390 |

+Including TAP

*Includes Pace Indirect Overhead

**Fares, local share, and RTA certification

# Implementation Timing

For the sake of presentation, the changes have been shown using 2009 operating costs and revenues as a baseline. In fact, many of the changes would take time to implement. The only changes that could actually be implemented during 2009 are the fare increases. More exact application of the ADA service area would require arranging with CTA to receive more frequent updates of route information in formats that are compatible with Pace's paratransit scheduling software, reprogramming some scheduling software, and installing a planned update of the software. A change in reservations hours could be adopted as a policy in 2009, but the carriers would need to increase staffing and might need to increase phone lines and workstations, which would probably stretch the implementation period into 2010. Achieving efficiency savings using the extra scheduling time from an earlier cutoff of reservations would involve experimentation over a period of at least a year. Full implementation of trip-by-trip eligibility, with field review of path of travel issues and feeder service, would not occur until 2015. Even partial implementation of feeder service on a pilot basis would probably take until 2011. Based on these considerations, Figure 18 provides a rough implementation timeline for all of the changes.

Figure 18 gives some indication of phasing or gradual realization of efficiency impacts for certain changes. In other cases, the phrase "In place" indicates that the change has been implemented but the time for the efficiency impact to be fully realized is a matter of speculation. This is particularly the case for fare increases. There is some evidence that customers adjust to higher fares over a period of years.

## Figure 18. Implementation Timeline

| Change in Policy or Practice | 2009 | 2010 | 2011 | 2012 | 2015 |
|---|---|---|---|---|---|
| Trip-by-Trip Eligibility | | Planning | Pilot | Partial | Full impact |
| Service Area and Hours | | Planning | Implemen-tation | In place | In place |
| Require a transfer to/from overlap area | | Late 2010 | In place | In place | In place |
| Reservations Hours | | Some efficiency | Full impact | Full impact | Full impact |
| Fares: General Fare Increase | Late 2009 | In place | In place | In place | In place |
| Fares: For trips to/from overlap area | Late 2009 | In place | In place | In place | In place |