Transit Performance Monitoring System (TPMS) Results

Summary Report
Phases I and II

prepared for
American Public Transit Association

in cooperation with and funded by
Federal Transit Administration

in association with
M. Davis and Company
NuStats International
Dr. Peter Furth

February 2002

McCollom Management Consulting

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Executive Summary

This report presents the results of a project to implement a transit performance monitoring system (TPMS). The TPMS was designed to collect data on transit customers through the use of on-board surveys. The long-term goal of the TPMS initiative is to standardize the collection of data and, thereby, provide a basic, but comprehensive analysis of the performance and benefits of transit service.

The TPMS project was funded through a cooperative agreement between the Federal Transit Administration (FTA) and the American Public Transit Association (APTA). FTA funded the project to obtain information —the characteristics of passengers, their trip purposes, and the benefits of these trips — that would provide an objective and meaningful portrayal of the performance of transit in serving communities' transportation needs. APTA and FTA managed the project to develop an approach that local transit systems could use to assess the performance and identify the benefits of transit service.

The project has involved two rounds or phases of surveys. The Phase 1 surveys were conducted at nine transit systems between 1996 and 1998. The Phase 2 surveys were conducted at 11 transit systems in 2000. The results from 14 surveys were analyzed in each phase since some systems conducted individual bus and rail surveys. Buffalo was the only system that participated in both Phases 1 and 2.

The Phase 1 systems were:

- Austin, Texas
- Buffalo, New York (Bus and Rail)
- Chicago, Illinois (Bus and Rail)
- Grand Rapids, Michigan
- Kenosha, Wisconsin
- Lincoln, Nebraska
- Pittsburgh, Pennsylvania (Bus and Rail)
- Portland, Oregon (Bus and Rail)
- Sacramento, California (Bus and Rail)

The Phase 2 systems were:

- Buffalo, New York (Bus & Rail)
- Cleveland, Ohio (Bus & Rail)
- Corpus Christi, Texas
- Huntington, West Virginia
- Juneau, Alaska
- Louisville, Kentucky
- Montgomery County, Maryland (Suburban Bus)
- North San Diego, California (Suburban Bus)
- Phoenix, Arizona
- Prince George's County, Maryland (Suburban Bus)
- Washington DC (Bus & Rail)

BACKGROUND

In 1993, FTA funded research to develop and test a plan for collecting data on transit benefits that could be implemented by transit systems at minimal cost. The resulting data collection concept was named the **Transit Performance Monitoring System (TPMS).** The TPMS relies on self-administered on-board surveys since data on benefits only can be collected using passenger surveys.

FTA agreed to fund a test of the TPMS concept at the Port Authority of Allegheny County (PAT) in Pittsburgh. In an effort to reduce costs, the TPMS surveys were distributed in coordination with the existing National Transit Database (NTD) data collection activities using existing transit agency staff. The test trial

was conducted from September 1993 through September 1994. Based on the results of the PAT trial, FTA decided to implement the TPMS concept. It entered into a cooperative agreement with APTA to further develop and implement the TPMS.

Initially, the concept was tested at nine transit systems between 1996 and 1998 (herein called "Phase 1") and the surveys were distributed in coordination with the existing NTD data collection activities. Later, the concept was tested at 11 systems in 2000 (herein called "Phase 2") and the surveys were distributed in a concentrated time period ranging from to one to several days.

During Phase 1, a telephone sampling approach was tested that relied on a geographic information system (GIS) for selecting telephone numbers. It was hoped that survey efficiency — number of calls made to reach a transit customer — could be improved by selecting phone numbers of residences within walking distances of transit lines. The test was conducted in Kenosha, Wisconsin during the month of March 1998.
McCollom Management Consulting has been the contractor for the TPMS project. McCollom Management Consulting sub-contractors were M. Davis and Company, NuStats International, and Dr. Peter Furth. M. Davis and Company and NuStats International supported the transit systems in the design and implementation of the on-board surveys. M. Davis and Company also conducted the telephone survey of Kenosha residents. Dr. Peter Furth provided technical guidance on sampling issues.

IMPLEMENTATION

The TPMS was implemented in six tasks:

- **Select Participating Transit Systems.** The transit systems were selected based on two factors — geographical location and system size that have been successfully used in other studies.

- **Finalize Standard Survey Questions.** The survey design was based on the questions used in the Pittsburgh trial, suggestions received from the Pittsburgh surveyors, and requirements outlined in the APTA RFP. One of the design guidelines was to minimize the number of questions to increase response rate and to provide an opportunity for the participating transit systems to add their own questions to the survey. Eleven core questions were included on the survey questionnaire.

- **Develop Individual System Implementation Plans.** The Phase 1 and Phase 2 participating transit systems were offered the opportunity to add questions to the survey questionnaire. Most of the transit systems added several questions to the standard TPMS questions. The systems in Phase 1 were also offered the opportunity to have Dr. Peter Furth review their sampling plan to: 1) insure that it meets NTD sampling requirements; and 2) assess if the plan could be streamlined using a different sampling techniques such as clustering by route. Six transit systems had their sampling plans reviewed.

- **Conduct Surveyor Training**. In Phase 1, personnel from M. Davis and Company and NuStats International conducted on-site training that ranged from one to two days in length, depending on local needs. Most of the transit systems took advantage of the training. In Phase 2, transit system staff conducted the surveyor training with guidance from McCollom Management Consulting.

- **Conduct Survey and Process Results.** In Phase 1, the participating transit systems were responsible for conducting the survey according to the implementation plans prepared by McCollom Management Consulting. The surveys were conducted beginning in Pittsburgh in the summer of 1996 and ending in Buffalo and Lincoln in the summer of 1998. Most of the transit systems completed their surveys within one year. In Phase 2, the surveys were conducted on most systems from early May through mid-July of 2000.

SURVEY RESULTS

The objective of the TPMS project is to provide a basic, but comprehensive analysis of: 1) transit user characteristics, 2) the performance of transit in serving community needs, and 3) the benefits that people receive from transit service. A summary of the results of the surveys collected in the third phase are presented in the next two sections — Key Passenger Characteristics and Key Policy Topics.

Key Passenger Characteristics

- **Gender**. Women tended to use transit more often than do men at most of the participating transit systems. On average, women consumed 55.2% of total public transportation trips.

- **Age**. Almost two-thirds (65 percent) of the public transportation users were of working age.

- **Household Income.** Most transit trips were made by users living in low-income households. On average, about half of transit trips were made by people living in households with annual incomes less than $20,000 per year. Low-income users (under $20,000) represented a larger percentage of users at small transit systems (63.3 percent) than in medium (50.6 percent) and large (41.0 percent) systems. This relationship likely reflects the tendency of larger systems, and particularly rail systems in larger metropolitan areas, to attract choice riders — people with cars available — who typically have moderate to high incomes. Areas with large transit systems generally have problems with road congestion and public transportation often is a competitive alternative to the automobile.

- **Trip Frequency**. Most transit trips were made by riders who use public transportation frequently. About 70 percent of transit trips sampled at the participating transit systems trips were made by customers who ride transit five days a week or more.

- **Duration of Transit Use.** Most transit trips were made by relatively new riders. On average, 38.1 percent of transit trips were made by customers who had been making the surveyed transit trip for one year or less. An additional 28.6 percent of trips were made by users who had been riding for one to four years. This duration of use profile suggests that there is constant turnover in the transit customer base.

- **Trip Purpose**. Work, shopping, and school (college and other) account for 75 percent of all trips. The largest portion of transit trips were made for work (50.3 percent).

  There are differences in the share of work trips by size of system. Work trips were a greater percentage of transit trips in large systems (57.0 percent) than in medium (48.6 percent) and small systems (39.4 percent).

- **Car Availability.** About one-third (32.9 percent) of the transit trips at the average transit system are made by *choice* riders, i.e., riders who had an automobile available for making their trip, but chose to use transit instead. On average, more transit trips were made by choice riders in medium (36.9 percent) and large (35.5 percent) systems than in small systems (22.6 percent). Large suburban systems (23.6 percent choice riders) were more like the small systems in this statistic. These results suggest that the level of road congestion and parking cost and availability influence transit ridership. Areas with congested roads, high parking costs and limited parking availability are likely to have higher levels of transit ridership than areas where the reverse is true.

Access/Egress Mode-Home End. Walking is the most popular access/egress mode for the home end of trips. Walking to and from transit service was the access/egress mode from home on 70.3 percent of the transit trips sampled. However, there were significant differences by system size. Eighty six percent of the riders at small systems walked to and from transit service with few riders using their automobiles. If the transfer riders are excluded from the analysis, virtually all users in small areas accessed transit by walking from their homes. At medium and large systems, over 65 percent of users walked to transit and an additional 12 - 14 percent drove or were dropped off by car. While only 6.2 percent of bus trips were made by people who used a car to access or egress from transit, 27.3 percent of rail transit trips were made by people accessing or egressing transit from cars.

- **Access/Egress Mode-Non-Home End.** The results for the non-home end access/egress mode are similar to those for the home end, but do not vary as much by system size or mode. Walking is the most popular mode — almost three-quarters of riders walk to and from transit service from the non-home end of their trip. Another 21 percent were riders at the non-home end of a trip were transferring to or from another transit vehicle. If the transfer riders are excluded, virtually every user accessed transit from the non-home end of his trip by walking.

- **Trip Alternatives**. Almost half of the passengers surveyed reported that if transit service had not been available they would have made their trip by automobile, either as a driver or as a passenger. These responses suggest that transit plays a strong role in reducing traffic congestion. The percentages of users who reported that they would make their trip by automobile also were higher at large transit systems and on rail systems, probably because automobile availability is higher for riders of these systems

  Transit service at the participating systems also provided basic mobility for some transit users. One in every five transit riders reported that they would not have made their trip if transit service had not been not available.

Key Policy Topics

- **People Served in the Community**. Transit systems serve more *different* individuals in the community than is suggested by the average daily ridership, because there is "turnover" from one day to the next in the actual individuals riding transit. Using the concept of sampling, it may be concluded that a rider who reports that he uses transit once a week on a system that operates 6 days a week actually represents a total of 6 *different* individuals, each of whom rides on transit only one day of the week.

  On average, the ratio of the number of *different* people using transit to the average number of daily transit trips is 3.06. There is no apparent trend in this figure by system size, but rail systems appear to have a slightly higher factor (3.45) than do bus systems (3.13).

  This ratio of different people served in a community to the number of daily trips is high because a large percentage of transit users are infrequent riders. On average, only 29.8 percent of transit trips were made by riders who used transit less than 5 days per week. However, when these trips are converted to people, these infrequent riders represent 70.0 percent of all persons using transit. Thus, the experiences of infrequent riders are likely to have a strong effect on how transit service is perceived.

  Key Policy Objectives. Surrogate measures of three public policy objectives — congestion management, and location efficiency — can be developed using cross tabulations of the user characteristics *trip purpose*, *automobile availability*, and *trip alternative*. It is important to recognize

that these policy objectives are not mutually exclusive and overlap. Mobility is, perhaps, the most fundamental reason for offering transit service. Riders who have no car available accounted for 67.1 percent of total transit trips. As system size increases, the percentage of riders using transit for these purposes decreases. This decrease reflects the higher percentage of users who have an automobile available in larger systems.

Another reason for the public funding of transit service is to encourage people with automobiles to use transit to help manage road congestion. On average, 55.8 percent of all transit trips helped take drivers off the road while traveling to work, generally during time of peak road congestion. Over half (51.2 percent) of the riders in phase three were in "location efficient" areas where they chose to use transit even though they could have made their trip in a private vehicle.

IMPLEMENTATION PROBLEMS

Problems were encountered during the project including:

- Changes in commitment to participate in the project,
- Compliance with survey sampling plans,
- Surveyor "burn-out," and
- Passenger "burn-out"

It was concluded that the Phase 1 sampling approach, which required ongoing surveying, in conjunction with the NTD data collection process, was the principal cause of the problems with survey sampling plan compliance and with surveyor and passenger burn-out. Therefore, in Phase 2, the transit systems conducted the surveys during concentrated time periods. However, the problems related to system commitment still remained.

KENOSHA TELEPHONE TEST

During Phase 1, a telephone sampling approach was tested that relied on a geographic information system (GIS) for selecting telephone numbers. It was hoped that survey efficiency — number of calls made to reach a transit customer — could be improved by selecting phone numbers of residences within walking distances of transit lines.

A telephone sampling test was conducted in Kenosha, Wisconsin during the month of March 1998. The objective of the test was to test how many calls it would take to obtain 50 completed interviews using the same questions as used in the TPMS survey questionnaire.

The surveyors randomly called Kenosha residents between the hours of 6:30 PM and 9:00 PM on weekdays and 9:00 AM to 3:00 PM on Saturdays. Telephone numbers were selected for residences with ¼ mile walking distance of the bus routes using a telephone GIS database.

The results from the Kenosha telephone test suggested that using an on-board survey was still a more effective method for collection passenger information. The estimated cost per completed interview using the telephone method was $30 compared with $15 to $20 per completed questionnaire collected through an onboard survey.

However, the Kenosha telephone test was successful in improving the survey efficiency in identifying

transit user from the general population. The use of the GIS database to generate the telephone number database more than doubled the "hit rate" that would have been achieved by randomly selecting transit users (5.3 percent compared with 12.1 percent).

Introduction

This report presents the results of a project to implement a transit performance monitoring system (TPMS). The TPMS was designed to collect data on transit customers through an ongoing, systematic program of on-board surveys. The long-term goal of the TPMS initiative is to standardize the collection of data and, thereby, provide a basic, but comprehensive analysis of the performance and benefits of transit service.

The TPMS project was funded through a cooperative agreement between the Federal Transit Administration (FTA) and the American Public Transit Association (APTA). FTA funded the project to obtain information — characteristics of passengers, their trip purposes, and the benefits of these trips — that would provide an objective and meaningful portrayal of the performance of transit in serving communities' transportation needs. FTA and APTA managed the project to develop an approach that local transit systems could use to assess the performance and identify the benefits of transit service.

At this point, the project has had two phases of surveys. The Phase 1 surveys were conducted at nine transit systems between 1996 and 1998. The Phase 2 surveys were conducted at 11 transit systems in 2000. The results from 14 surveys were analyzed in each phase since some systems conducted individual bus and rail surveys. Buffalo was the only system that participated in both Phases 1 and 2.

The Phase 1 system-modes were:

- Austin, Texas
- Buffalo, New York (Bus and Rail)
- Chicago, Illinois (Bus and Rail)
- Grand Rapids, Michigan
- Kenosha, Wisconsin
- Lincoln, Nebraska
- Pittsburgh, Pennsylvania (Bus and Rail)
- Portland, Oregon (Bus and Rail)
- Sacramento, California (Bus and Rail)

The Phase 2 system-modes were:

- Buffalo, New York (Bus & Rail)
- Cleveland, Ohio (Bus & Rail)
- Corpus Christi, Texas
- Huntington, West Virginia
- Juneau, Alaska
- Louisville, Kentucky
- Montgomery County, Maryland (Suburban Bus)
- North San Diego, California (Suburban Bus)
- Phoenix, Arizona
- Prince George's County, Maryland (Suburban Bus)
- Washington DC (Bus & Rail)

This report is divided into the following chapters:

- **TPMS Approach** provides a summary of the background of TPMS and the approach taken.
- **Implementation** describes the approach used in the implementation tests.
- **Survey Results** presents selected results of the surveys, with the combined data from Phase 1 and Phase 2. These results include key passenger characteristics such as trip purpose, access and egress modes, trip frequency, age, income, and gender. Also a targeted analysis of two important policy

topics: 1) people served in the community versus passenger boardings; and 2) key policy functions served as defined by trip purpose and automobile availability.

- **Implementation Problems** discusses problems encountered during the conduct of the surveys.
- **Kenosha Telephone Test** summarizes the telephone sampling test that was conducted in Kenosha, Wisconsin during the month of March 1998.

The appendix of the report contains:

- **Appendix A** is a sample of the survey instructions provided to the participating systems.

TPMS Approach

This project evolved from previous research efforts funded and managed by FTA's Office of Budget and Policy. This chapter provides a summary of the previous research efforts and an overview of the TPMS project.

BACKGROUND AND PREVIOUS RESEARCH EFFORTS

In the early 1990s, FTA's Office of Budget and Policy became concerned that its reporting of transit performance to the public and to Congress was incomplete and did not provide a complete picture of the benefits provided by public transportation. Most of its reports relied on national aggregate measures, such as passengers and operating costs, which were reported to the National Transit Database. However, public transportation is provided by more than 600 individual transit systems of varying sizes and organizational structures that are trying address different local needs. Therefore, it seemed appropriate to collect and report data on how public transportation was meeting local needs in different types of communities. It was also felt that decision makers and the public would be able to relate better to statistics from transit systems that operated in areas similar to their own communities rather than to aggregate national statistics.

FTA's first research effort was the preparation of case studies of eight transit systems. The case studies focused primarily on traditional measures of performance by route service type (e.g., local, express, crosstown).
Key results of the case studies were included in an FTA report to Congress entitled *Public Transportation in the United States: Performance and Condition*, June 1992. The complete analysis was documented in the report *To Classify Transit Services: Eight Case Studies* and was printed by FTA for national distribution.

Efforts also were made in the case studies to identify basic functions provided by these systems (e.g., basic mobility, commuting to work). Since passenger survey data were limited and, in most cases, unavailable, assumptions were made about the basic functions served by different types of bus routes. For example, it was assumed that suburban express routes primarily served work commuters with middle-to-high incomes while inner city local routes were assumed to serve all trip purposes for low-to-middle income city residents.

FTA recognized that the assumption, that only one basic function and only one type of rider is served by a route type, was a key weakness in this approach. Experience suggested the opposite — that bus routes serve multiple functions and different types of riders. Therefore, FTA next initiated research on how data could be collected routinely on the needs that transit serves as a way to address this weakness.

In 1993, FTA funded research to develop and test a plan for collecting data on transit benefits that could be implemented by transit systems at minimal cost. The resulting data collection concept was named the **Transit Performance Monitoring System (TPMS)**. The TPMS relied on self-administered on-board surveys, an effective and statistically valid way of collecting data on transit ridership. In an effort to reduce costs, the TPMS surveys were distributed in coordination with the existing National Transit Database (Section 15) data collection activities using existing transit agency staff.

FTA agreed to fund a trial test of the TPMS concept at the Port Authority of Allegheny County (PAT) in Pittsburgh. This test trial was successfully conducted from September 1993 through September 1994. The response rate of almost 50 percent was much higher than the 28 percent response rate achieved in a 1988 on-board survey. The survey processing went smoothly and over 10,000 survey cards were analyzed.

During the time of the PAT test trial, FTA also funded the preparation of a report on transit service in San Diego that could serve as a template for reporting the results of future TPMS surveys. San Diego was chosen as the test metropolitan area because on-board surveys had been conducted there in 1985 and 1990.

The San Diego report focused on the public policy objectives of public transportation service and the types of markets accommodated by transit service. Drawing on a blend of on-board survey results and operational data, the public policy objectives for transit — low-cost mobility, congestion management, and livable communities — were examined.

The report also provided supporting material for the discussion of the public policy objectives. A profile of user characteristics and subsidy levels for key characteristics such as household income and automobile availability was presented.

FTA/APTA TPMS PROJECT

Based on the results of the PAT trial and the development of the San Diego report, FTA decided to implement the TPMS concept. It entered into a cooperative agreement with APTA to further develop and implement the TPMS at 12 to 15 transit systems.

Before issuing the Request-for-Proposals (RFP) for this project, APTA solicited comments from several APTA committees on the TPMS. The committees provided valuable input to the development of the RFP (request for proposal) including the concerns that the TPMS be systematic and useful to the local planning efforts of participating transit systems.

In the first phase of the FTA/APTA cooperative agreement, the PAT approach was tried. Onboard surveys were collected in coordination with the ride checks (on/off counts) needed to collect data for the annual National Transit Database reports. The surveys were distributed over a 12-month period. Nine systems were involved in the first phase testing in 1997 and 1998. The TPMS project team worked closely with the nine systems in designing the survey, printing the questionnaires, and processing the results.

A more traditional approach was taken in the second TPMS phase in which 11 systems participated in 1999 and 2000. In this phase, surveys were conducted in concentrated periods during the spring and the fall. This concentrated approach was adopted to make it easier for transit systems to commit to undertaking a survey and to avoid surveyor and passenger fatigue with the survey process. The data collected during these concentrated periods were considered to be representative of transit customers because the passengers who ride on transit in the spring and fall are believed by professional transit analysts to reflect the profile of "typical" transit users and, therefore, the benefits that transit service provides.

During Phase 1, a telephone sampling approach was tested that relied on a geographic information system (GIS) for selecting telephone numbers. It was hoped that survey efficiency — number of calls made to reach a transit customer — could be improved by selecting phone numbers of residences within walking distances of transit lines.

McCollom Management Consulting has been the contractor for the TPMS project. McCollom Management Consulting sub-contractors were M. Davis and Company, NuStats International, and Dr. Peter Furth. M. Davis and Company and NuStats International supported the transit systems in the design and implementation of the on-board surveys. M. Davis and Company also conducted the telephone survey of Kenosha residents. Dr. Peter Furth provided technical guidance on sampling issues.

Implementation

The objectives of the Phase 1 stage of the project were to design a standard survey instrument and to test it at 12 to 15 transit system including both rail and bus modes. Phase 1 was implemented in two phases. In Phase 1, the survey instrument was designed and tested at four transit systems. Based on the results from Phase 1, the survey instrument was revised and then tested further at additional transit systems.

The two-phased approach to Phase 1 was used because it offered two potential advantages:

- The survey could be tested and revised before being used in the broader implementation; and
- A track record of success could be established with the initial four transit systems that could be used to encourage other transit systems to participate.

The objectives of Phase 2 of the project were to apply the TPMS standard survey questions at and additional 14 transit system-modes.

The implementation work for both Phases was divided into six tasks:

- Select Participating Transit Systems
- Finalize Standard Survey Questions
- Develop Individual System Implementation Plans
- Conduct Surveyor Training
- Conduct Survey and Process Results

SELECT PARTICIPATING TRANSIT SYSTEMS

It was important that the transit systems be representative of the transit industry. The transit systems were selected (Exhibit 1) based on three factors — geographical location, system size and system type — that have been successfully used in other studies.

- **Geographical location.** The country was divided into three areas — East, Midwest, and West.
- **System size (service area population).** Three size categories were used — under 500,000 persons, 500,001 to 1,250,000 persons, and over 1,250,000 persons.
- **System type.** Both bus and rail systems were included. But, for Phase 2, an additional system type, "Large Suburban", was added to assure representation of this newly emerging transit sector.

Exhibit 1
Participating Transit Systems
(Phase 1 = Non-Italics; Phase 2=*Italics*)

Service Area Population	Region		
	West	**Midwest**	**East**
Less than 500,000	*Juneau, Alaska* *Corpus Christi, Texas*	Grand Rapids, Michigan Kenosha, Wisconsin Lincoln, Nebraska	*Huntington, West Virginia*
500,001 to 1,250,000	Austin, Texas Portland, Oregon (Bus and Rail) Sacramento, California	*Louisville, Kentucky*	*Buffalo, New York* *(Bus and Rail)*
Over 1,250,000	*Phoenix, Arizona* *North San Diego, California* *(Large Suburban)**	Chicago, Illinois (Bus and Rail) *Cleveland, Ohio* *(Bus and Rail)*	Pittsburgh, Pennsylvania (Bus and Rail) *Washington, DC* *(Bus and Rail)* *Prince George's County, Maryland* *(Large Suburban)** *Montgomery County, Maryland* *(Large Suburban) **

** "Large Suburban" systems are categorized with the service area population of the entire metropolitan area. In the survey results, they are shown in a separate category – "Large Suburban".*

FINALIZE STANDARD SURVEY QUESTIONS

The standard TPMS survey questions were tested and finalized in Phase 1 and further applied in Phase 2. One of the design guidelines was to minimize the number of questions to increase response rate and to provide an opportunity for the participating transit systems to add their own questions to the survey.

Develop Survey Questionnaire

Eleven core questions were included on the survey questionnaire (Exhibit 2). The rationale for these questions was as follows:

- Questions 1, 3, and 15 are used to determine trip purpose, automobile availability, and income. The responses to these questions are used to define the functions or benefits provided to the customer such as congestion management, low cost mobility, and livable communities. These functions or benefits are discussed in the chapter entitled ***Survey Results.***

Exhibit 2
GCRTA (Cleveland) Questionnaire
Questions

REGISTER HERE TO WIN A FREE MONTHLY PASS!

Name: _____ Ph.( ) _____

Home address: _____

City, State: _____ Zip: _____

ABOUT THIS TRIP

1. **Where did you come from before you got on this bus/rapid service?**
   - ☐ Work
   - ☐ College
   - ☐ Home
   - ☐ Other school
   - ☐ Shopping
   - ☐ Medical services
   - ☐ Social, church, or personal business
   - ☐ Other: _____

2. **How did you get to this bus/rapid service?**
   - ☐ Walked
   - ☐ Drove my car
   - ☐ Dropped off by someone
   - ☐ Rode my bicycle
   - ☐ Rode an RTA bus (Route: _____)
   - ☐ Rode another bus (Route: _____)
   - ☐ RTA Rapid / Red, Blue, or Green Line / Waterfront
   - ☐ Rode with someone who parked

3. **Where are you going now?**
   - ☐ Work
   - ☐ College
   - ☐ Home
   - ☐ Other school
   - ☐ Shopping
   - ☐ Medical services
   - ☐ Social, church, or personal business
   - ☐ Other: _____

4. **When you get off this vehicle, how will you get to your final destination?**
   - ☐ Walk
   - ☐ Drive my car
   - ☐ Get picked up by someone
   - ☐ Ride my bicycle
   - ☐ Ride an RTA bus (Route: _____)
   - ☐ Ride another bus (Route: _____)
   - ☐ RTA Rapid / Red, Blue, or Green Line / Waterfront
   - ☐ Ride with someone who parked

5. **How many days a week, do you usually make this trip?**
   - ☐ 7 days a week
   - ☐ 2 days a week
   - ☐ 6 days a week
   - ☐ 1 day a week
   - ☐ 5 days a week
   - ☐ Twice a month
   - ☐ 4 days a week
   - ☐ Once a month
   - ☐ 3 days a week
   - ☐ First time riding

6. **How long have you been using the bus to make this trip?**
   - ☐ Less than a month
   - ☐ 1 - 6 months
   - ☐ 7 - 11 months
   - ☐ 1 - 2 years
   - ☐ 3 - 4 years
   - ☐ More than 4 years

7. **Do you have a car or other personal vehicle that you could have used to make this trip?**
   - ☐ Yes
   - ☐ No

8. **How many vehicles are in your household?**
   - ☐ None ☐ One ☐ Two ☐ Three ☐ Four or more

9. **If this bus/rapid service was not available, how would you make this trip?**
   - ☐ Use my car
   - ☐ Use a taxi
   - ☐ Walk
   - ☐ Bicycle
   - ☐ Ride with a friend
   - ☐ I would not make this trip

ABOUT YOURSELF

10. **I am . . .** ☐ Male ☐ Female

11. **I am . . .**
    - ☐ African-American
    - ☐ Asian
    - ☐ Hispanic
    - ☐ White
    - ☐ Other: _____

12. **My age is . . .**
    - ☐ Under 15
    - ☐ 15 to 18
    - ☐ 19 to 24
    - ☐ 25 to 34
    - ☐ 35 to 49
    - ☐ 50 to 64
    - ☐ 65 or more

13. **Do you have an ADA card issued by RTA?**
    - ☐ Yes
    - ☐ No

14. **Do you have a Handicapped Parking Permit?**
    - ☐ Yes
    - ☐ No

15. **What is your total household income?**
    - ☐ Under $10,000
    - ☐ $10,000 - $19,999
    - ☐ $20,000 - $29,999
    - ☐ $30,000 - $39,999
    - ☐ $40,000 - $49,999
    - ☐ $50,000 - $69,999
    - ☐ $60,000 - $79,999
    - ☐ $80,000 or greater

WHAT DO YOU THINK?

16. **Please rank your satisfaction with RTA's performance in the following areas. (5 is very satisfied and 1 is very dissatisfied)**

	Very Satisfied				Very Dissatisfied
Courteous drivers	5	4	3	2	1
Bus/rapid on-time	5	4	3	2	1
Clean RTA bus/rapid	5	4	3	2	1
Dependable service	5	4	3	2	1
Adequate shelters	5	4	3	2	1
Convenient routes	5	4	3	2	1
Convenient schedules	5	4	3	2	1
Overall performance	5	4	3	2	1
Clean shelters	5	4	3	2	1
Crime level at RTA stops	5	4	3	2	1
Crime level on RTA vehicles	5	4	3	2	1

- Question 5 addresses trip frequency and also is used to estimate the number of people in the community that use transit service. For example, each response of one day a week might be given a weight of 7.0 to estimate the number of people using transit service one day a week.

- Question 6 is used to assess the degree of turnover in transit ridership.

- Questions 7 and 9 help assess the level of added mobility that transit provides to customers.

- Questions 2 and 4 provide information on access and egress modes.

- Questions 10 and 12 are used to examine the survey responses in terms of age and gender.

The surveys had a limited number of TPMS questions to encourage a large passenger response since most passengers could complete the survey while they were on the transit vehicle. This also allowed the participating transit systems to add questions on topics of local interest. For example, Questions 8 (number of vehicles), 11 (race/ethnicity), 13 (ADA card), 14 (handicapped parking permit) and 16 (satisfaction with service) were added by the Cleveland transit system (Exhibit 2).

The TPMS questionnaire also included instructions to the transit customers and a business reply mailer for returning the survey by mail (Exhibit 3). The wording of the *Dear Customer* introduction was based on experience gained from the Phase 1 tests.

Develop Sampling Strategy

The sampling strategy used in Phase 1 involved distributing the questionnaires in coordination with the existing National Transit Database (NTD) data collection activities. As discussed in the *IMPLEMENTATION PROBLEMS* section, this approach produced surveyor and passenger "burn-out".

For Phase 2, the surveys were conducted in concentrated time periods, not spread out throughout the year as with the NTD data collection process. Spring (before school lets out) and fall (after school returns) were seen as most representative, although not all transit systems were able to keep survey during one of these periods due to other considerations.

It was agreed that sampling plans for the participating transit systems would be based on a precision level of ± 5 percent precision at the 95 percent confidence level. This accuracy level would be applied to system level estimates of the questionnaire results.

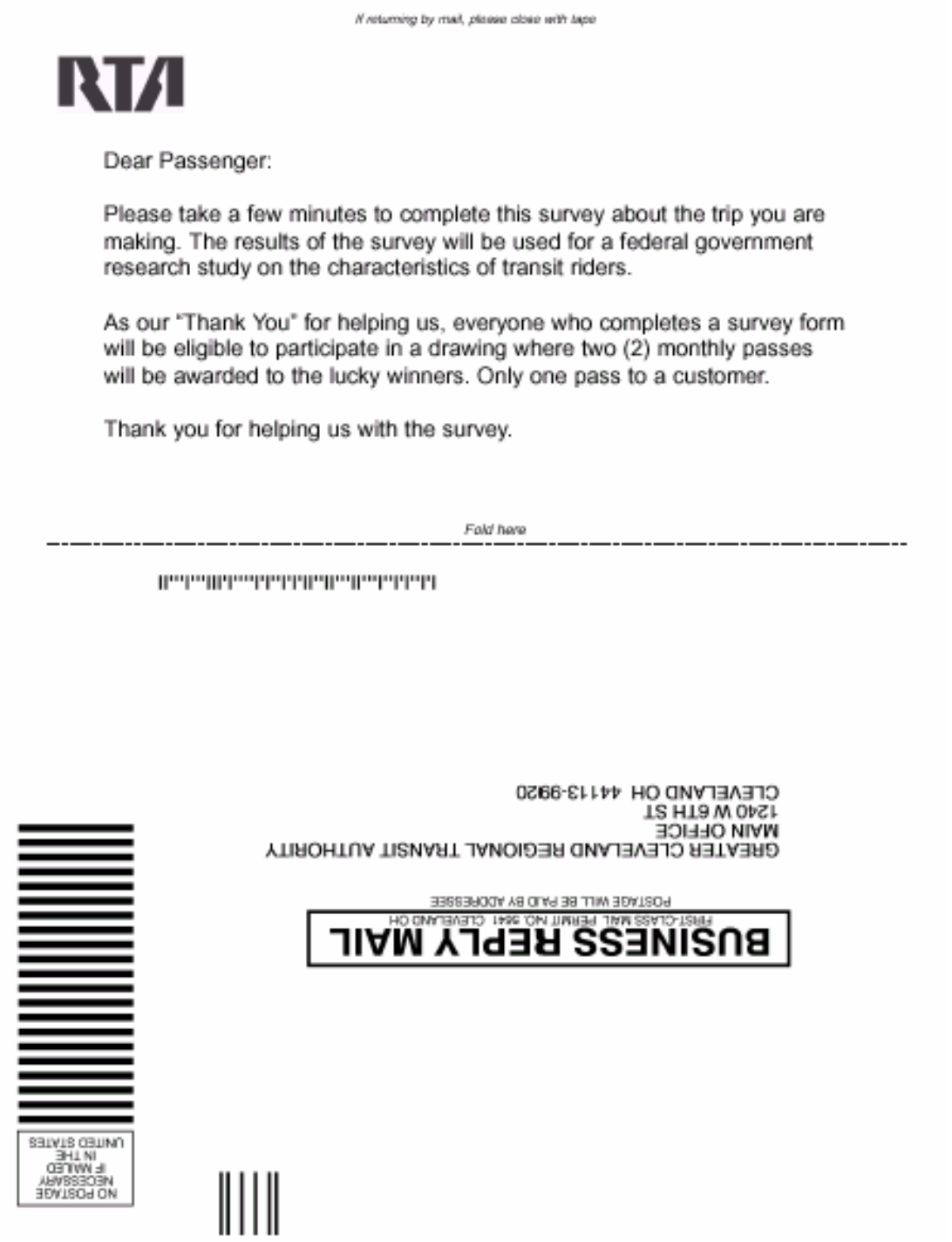
DEVELOP INDIVIDUAL SYSTEM IMPLEMENTATION PLANS

The purpose of this task was to develop the system plans for implementing the TPMS survey questionnaire. The work involved obtaining the agreement of the transit systems to participate, reviewing and revising NTD sampling plans, adding local questions to the survey questionnaire, and documenting the implementation plans.

Obtain Agreement to Participate

APTA formally invited the transit systems to participate. The invitation letters included the following terms:

Exhibit 3
GCRTA (Cleveland) Questionnaire
***Dear Passenger* Instructions**



If returning by mail, please close with tape

RTA

Dear Passenger:

Please take a few minutes to complete this survey about the trip you are making. The results of the survey will be used for a federal government research study on the characteristics of transit riders.

As our "Thank You" for helping us, everyone who completes a survey form will be eligible to participate in a drawing where two (2) monthly passes will be awarded to the lucky winners. Only one pass to a customer.

Thank you for helping us with the survey.

Fold here

GREATER CLEVELAND REGIONAL TRANSIT AUTHORITY
MAIN OFFICE
1240 W 6TH ST
CLEVELAND OH 44113-9920

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 9641 CLEVELAND OH
POSTAGE WILL BE PAID BY ADDRESSEE

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

- The participating transit systems agreed to conduct the survey in accordance with a system implementation plan developed by the McCollom Management Consulting team.

- The participating transit systems agreed to bear the costs of actually conducting the survey.

- APTA agreed to fund the costs of preparing and printing the survey instrument.

- APTA agreed to have the McCollom Management Consulting team process the survey returns.

APTA received written commitments to participate in the TPMS project from the general managers of the invited systems. However, due to local circumstances, four transit systems — Albany, Blacksburg, Lakeland and Memphis — declined to participate later in the project. The Albany transit system had problems coordinating the TPMS surveys with its implementation of automatic passenger counters. The Blacksburg and Lakeland transit systems were unable to secure surveying personnel. Memphis was unable to participate due to changes in local priorities.

Review and Revise Sampling Plans

All participating transit systems were offered the opportunity to have Dr. Peter Furth review their sampling plan to assess if the plan could be streamlined using a different sampling approach such as clustering by route types. In Phase 1, because the surveys were performed in conjunction with the NTD passenger data collection, this assistance was most important to insure that the plans met NTD sampling requirements. Ten of the Phase 1 transit systems used the assistance of Dr. Furth. For Phase 2, since it was not done in conjunction with the NTD data collection, the sampling plans were much simpler and only one system (North San Diego) used the assistance of Dr. Furth.

Add Local Questions

The participating transit systems were offered the opportunity to add questions to the survey questionnaire. The only restriction was that the questions had to fit within the space confines of the 8½ x 11 survey card. The systems were offered this opportunity to make the survey questionnaires useful for local planning efforts, an APTA project objective. It also was done to encourage systems to participate in the TPMS project.

Most of the transit systems added several questions to the standard TPMS questions. Added questions, for example, focused on handicapped access, quality of service and amenity issues. Several systems incorporated the TPMS questions into larger surveys that they were conducting. The Washington D.C. system (bus and rail) already had plans to do a telephone survey of users and so the additional TPMS questions were administered via telephone rather than on-board.

Participating transit systems were offered the opportunity to have consultant assistance with their questionnaire design and to ensure the delivery of the resulting data to the TPMS contractor. All the participating systems used the assistance of either M. Davis and Company or NuStats International for these tasks. Washington DC, Montgomery County, and Prince George's County also used NuStats to conduct their surveys.

CONDUCT SURVEYOR TRAINING

Experience has shown that proper training generally insures a good survey response rate. For Phase 1, the training was performed by M. Davis and Company and NuStats International. For Phase 2, the participating transit agencies conducted their own surveyor training. As part of the training, they used the detailed surveyor instructions (Appendix A).

The proper use of the trip log (Exhibit 4) was a major focus of the training. The trip log is the document that ties the questionnaires, which are serially numbered, to specific transit vehicle trips. The trip log must be pre-printed with the route number, direction, and trip number.

The surveyor was required to fill out his/her name, the date of the survey, and the operator's badge number or name or the number of the transit vehicle. This process insures that the surveyor actually rides the sampled trip.

The most important items are the serial number of the first card handed out on the trip and the serial number of the next available survey card at the end of the trip. This information ties a survey questionnaire to a specific trip. Since the surveyors are instructed to hand out a questionnaire to every boarding passenger, this information also provides a count of passenger boardings for each trip.

CONDUCT SURVEY AND PROCESS RESULTS

The major ongoing work in the TPMS project was conducting the surveys and processing the results. The participating transit systems were responsible for the actual conduct of the survey according to their implementation plans.

As shown in Exhibit 5, the time frames for the surveys were quite different for Phase 1 and Phase 2. Since Phase 1 was done in conjunction with the NTD data collection, the surveys were spread over long periods in 1997 and 1998.

For Phase 2, a more concentrated time period approach was adopted. It was desired to perform the Phase 2 surveys during "typical" transit usage months, which are generally considered to be spring (before school lets out) or fall (after school returns). About half of the Phase 2 systems met this goal. The remaining systems had at least part of their survey period during the summer (when school is out) or winter (which is not thought to be typical). While the Buffalo surveys were conducted in the winter, ridership was considered typical since there no severe weather during the surveys.

The participating transit systems were responsible for collecting the completed survey questionnaire. They also were required to check the corresponding trip logs to insure that:

- All entries are complete and correct;
- The last serial number on trip *I* is the first serial number on trip *I+1;* and
- The operator's badge number or name, or the number of the transit vehicle to determine if the trips on the correct transit vehicle were surveyed.

Exhibit 4
Pittsburgh Rail Trip Log Sheet

Vehicle Number		**Date**	
Surveyor		**Day of Week**	
Route Number		**Weather**	
Direction			
Top Questionnaire at the Beginning of Trip		**Top Questionnaire at the End of Trip**	
Time Leaving First Stop		**Time Arriving Last Stop**	

Stop	Top Questionnaire Number Leaving Stop	Stop Name	Passengers Less Than 12 Years Old Boarding at the Stop
1		*Beginning of Trip*	*0*
2			
3			
4			
5			
6			
7			
8			
9			

Exhibit 5 TPMS Survey Starting and Ending Dates		
System	**Start Date**	**End Date**
Phase 1 Systems		
Austin	10/26/1996	5/10/1998
Buffalo	5/27/1997	7/30/1998
Chicago	5/1/1997	12/31/1997
Grand Rapids	6/16/1997	3/14/1998
Kenosha	2/13/1997	12/24/1997
Lincoln	8/29/1997	7/14/1998
Pittsburgh	7/22/1996	7/30/1997
Portland	7/1/1997	3/5/1998
Sacramento	9/4/1996	3/4/1998
Phase 2 Systems		
Buffalo	11/17/1999	2/17/2000
Cleveland	6/3/2000	7/17/2000
Corpus Christi	8/7/2000	8/10/2000
Huntington	5/2000	5/2000
Juneau	6/21/2000	6/25/2000
Louisville	5/19/2000	7/18/2000
Montgomery County	5/8/2000	6/19/2000
North San Diego	6/21/2000	6/24/2000
Phoenix	6/12/2000	7/1/2000
Prince George's County	5/10/2000	6/19/2000
Washington DC	5/2000	6/2000

The survey questionnaires and the corresponding trips logs were sent to NuStats International for processing. NuStats entered the data into separate data files for each transit system. McCollom Management Consulting analyzed the results for all systems and prepared the data files for use by APTA and FTA and for this report.

Survey Results

The objective of the TPMS project is to provide a basic, but comprehensive analysis of the characteristics of transit riders, the performance of transit in serving these riders, and public policy benefits of transit service. This chapter presents selected results of the surveys in two sections:

- **Key Passenger Characteristics** which covers factors such as trip purpose, access and egress modes, trip frequency, age, income, and gender, and

- **Key Policy Topics** which focuses on two important issues: 1) people served in the community versus passenger boardings; and 2) key policy functions served as defined by trip purpose and automobile availability

The information shown in this "Survey Results" section uses the combined data from both Phase 1 and Phase 2 surveys. Data were collected from 19 transit systems (Exhibit 6). The data represented 26 modal surveys since data were obtained from bus and modes operated by the multi-modal systems in Buffalo, Chicago, Cleveland, Pittsburgh, Portland, Sacramento, and Washington, DC. Surveys were conducted in Buffalo in both phases. This report only includes the Buffalo results from the second phase to insure that the Buffalo results were not over-represented in the system averages.

The results are presented in several ways:

- Individual modes (26 systems),
- System size — small (6), medium (8), large (9), and large suburban (3), and
- Mode — bus and rail only for multi-modal systems (7).

SURVEY CONSIDERATIONS

Three features of the TPMS survey should be considered in the evaluation of the survey results:

- Survey return rate
- Question completion rate
- Percentage of young riders

Survey Return Rate

Survey return rates varied from a low of 16.4 percent to a high of 86.0 percent (Exhibit 7). All samples represent an adequate response rate and are sufficient for most of the proportions estimated from the sample (e.g., proportion of passengers making a work trip) to be accurate with a tolerance of +/- 5 percent, at the 95 percent confidence level.

Question Completion Rate

Partially completed surveys were accepted if the respondent answered at least eight questions. The completion rates for most TPMS questions (Exhibit 7) were very high and the vast majority was above 95 percent.

Exhibit 6
Categories of Transit Systems Used to Present Survey Results

System	Mode		Peak Vehicles[1]	Service Area Population[1]	System Size			
	Bus	Rail			Small	Medium	Large	Large Suburban
Phase 1 Systems								
Austin, TX	X		145	604,621		X		
Chicago, IL	X		1,551	3,708,773			X	
Chicago, IL		X	938	3,708,773			X	
Grand Rapids, MI	X		60	398,680	X			
Kenosha, WI	X		34	84,200	X			
Lincoln, NE	X		49	191,972	X			
Pittsburgh, PA	X		756	1,523,198			X	
Pittsburgh, PA		X	38	1,523,198			X	
Portland, OR	X		515	988,284		X		
Portland, OR		X	25	988,284		X		
Sacramento, CA	X		168	931,146		X		
Sacramento, CA		X	32	931,146		X		
Phase 2 Systems								
Buffalo, NY	X		621	1,182,165		X		
Buffalo, NY		X	24	1,182,165		X		
Cleveland, OH	X		621	1,412,140			X	
Cleveland, OH		X	54	1,412,140			X	
Corpus Christi, TX	X		58	315,000	X			
Huntington, WV	X		21	86,354	X			
Juneau, AK	X		9	30,396	X			
Lousiville, KY	X		222	754,956		X		
Montgomery County, MD	X		234	810,000				X
North San Diego, CA	X		132	805,900				X
Phoenix, AZ	X		330	1,350,000			X	
Prince George's County, MD	X							X
Washington, DC	X		1,131	3,009,547			X	
Washington, DC		X	626	3,009,547			X	
Totals	**19**	**7**			**6**	**8**	**9**	**3**

[1] Phase 1: 1997 National Transit Database. Phase 2: 1999 National Transit Database.
Peak Vehicles = Vehicles Operated in Maximum Service

The only exception was completion rate for the question on household income. The response rate ranged between 57 percent and 92 percent — between five and fifteen percentage points lower than the completion rates for the other questions. This was expected since transit customers, and respondents in general, often are reluctant to report their household income.

Exhibit 7
Respondent Survey and Question Completion Rates

System	Mode	Surveys		Question Completion Rate for Returned, Usable Surveys								
		Number Returned	Percent Returned	Gender	Age	Household Income	Trip Frequency	Duration of Transit Use	Trip Purpose [1]	Car Availability	Access/Egress Modes [2]	Trip Alternative
Phase 1 Systems												
Austin, TX	Bus	1,464	19.6%	97.6%	97.7%	90.8%	99.0%	98.0%	98.6%	96.4%	95.6%	94.7%
Chicago, IL	Bus	811	62.1%	95.6%	94.6%	88.3%	99.6%	97.2%	97.9%	96.1%	93.1%	93.2%
Chicago, IL	Rail	1,200	69.2%	98.3%	97.4%	90.3%	99.3%	98.6%	98.8%	98.3%	97.2%	95.2%
Grand Rapids, MI	Rail	1,046	64.8%	94.8%	96.6%	84.4%	99.2%	98.3%	98.6%	97.8%	93.5%	96.3%
Kenosha, WI	Bus	1,421	85.8%	98.8%	96.4%	81.4%	98.2%	98.9%	98.7%	98.8%	97.0%	98.4%
Lincoln, NE	Bus	935	68.3%	97.1%	98.3%	87.8%	98.8%	98.3%	98.8%	98.8%	96.5%	95.3%
Pittsburgh, PA	Bus	6,226	49.2%	98.6%	99.3%	88.4%	99.3%	99.2%	99.3%	98.1%	99.5%	94.9%
Pittsburgh, PA	Rail	2,067	46.5%	99.3%	99.7%	86.3%	99.0%	99.0%	99.8%	98.8%	99.7%	97.8%
Portland, OR	Bus	3,478	70.3%	95.8%	96.0%	87.8%	98.4%	96.7%	98.3%	97.1%	94.1%	94.2%
Portland, OR	Rail	7,107	73.6%	96.2%	98.0%	87.3%	97.7%	96.1%	98.0%	96.6%	94.2%	94.9%
Sacramento, CA	Bus	1,310	55.8%	96.4%	98.4%	85.5%	99.1%	99.1%	94.3%	97.1%	98.9%	94.3%
Sacramento, CA	Rail	3,128	58.2%	96.5%	98.2%	88.1%	98.5%	98.1%	93.0%	97.4%	99.0%	95.5%
Phase 2 Systems												
Buffalo, NY	Bus	659	27.5%	99.1%	96.8%	92.3%	97.4%	99.1%	93.4%	98.9%	77.1%	84.2%
Buffalo, NY	Rail	515	31.7%	98.4%	96.5%	90.3%	97.3%	98.6%	93.2%	96.6%	67.2%	85.6%
Cleveland, OH	Bus	809	26.8%	98.4%	97.8%	90.2%	99.3%	98.6%	97.2%	99.3%	93.7%	96.5%
Cleveland, OH	Rail	1,057	59.4%	98.9%	97.7%	90.2%	98.8%	97.7%	96.4%	99.1%	93.1%	97.1%
Corpus Christi, TX	Bus	885	34.2%	99.5%	98.8%	92.5%	99.4%	99.0%	99.1%	94.6%	95.5%	98.6%
Huntington, WV	Bus	756	41.7%	97.1%	97.6%	90.2%	98.8%	99.3%	92.2%	99.7%	95.0%	98.3%
Juneau, AK	Bus	728	28.3%	98.9%	98.0%	89.2%	98.7%	98.4%	97.8%	95.1%	95.7%	98.1%
Lousiville, KY	Bus	935	56.8%	98.1%	98.4%	84.9%	99.3%	99.4%	91.7%	91.6%	94.4%	99.2%
Montgomery County, MD	Bus	7,447	33.0%	93.7%	97.7%	60.2%	97.8%	98.1%	82.1%	92.4%	98.2%	97.8%
North San Diego, CA	Bus	1,520	50.7%	96.9%	95.8%	88.3%	99.3%	97.8%	92.8%	83.9%	94.9%	97.0%
Phoenix, AZ	Bus	536	16.4%	98.9%	99.1%	92.7%	98.7%	98.9%	95.9%	94.6%	98.3%	98.9%
Prince George's County, MD	Bus	1,589	38.8%	93.1%	97.5%	58.9%	97.7%	96.2%	78.9%	93.1%	98.5%	97.9%
Washington, DC	Bus	22,965	NA	87.9%	93.2%	56.9%	91.8%	89.7%	81.0%	83.0%	93.1%	90.6%
Washington, DC	Rail	596	NA	100.0%	98.0%	76.0%	99.0%	99.3%	99.0%	100.0%	100.0%	92.6%

[1] Trip Purpose determined from the answers to two questions

[2] Lowest completion rate presented for Access/Egress Modes that were dermined from the answers to three questions.

NA = Not Available

Percentage of Young Riders

The surveyors at the participating systems were instructed to count all children 12 years of age or younger, but not to give them survey questionnaires. By the counts, the percentages of users who were children ranged from about 2 percent in Lincoln to about 18 percent in Juneau (Exhibit 8).

The absence of survey data from children affects the survey results in three ways:

- The age distribution is older without the children,

- The percentage of people making work trips is higher since children travel for non-work purposes, and

- The percentage of people with no automobile available is probably understated.

KEY PASSENGER CHARACTERISTICS

This section presents direct tabulations of the TPMS questions. The survey responses were summarized for the following key passenger characteristics:

The survey responses were summarized for the following key passenger characteristics:

- Gender
- Age
- Household Income
- Trip Frequency
- Duration of Transit Use
- Trip Purpose
- Car Availability
- Access/Egress Modes
- Trip Alternative

Gender

Women tend to use transit more often than do men at most of the participating transit systems (Exhibit 9). Women also constitute a slightly larger percentage of bus users (59.2 percent) than of rail users (51.9 percent). There were no significant differences in transit use by gender by system size.

Exhibit 8
Percent Transit Users 12 Years of Age or Younger

System	Mode	Percent
Phase 1 Systems		
Austin, TX	Bus	2.8
Chicago, IL	Bus	8.9
Chicago, IL	Rail	2.7
Grand Rapids, MI	Bus	2.7
Kenosha, WI	Bus	15.5
Lincoln, NE	Bus	1.6
Pittsburgh, PA	Bus	6.0
Pittsburgh , PA	Rail	6.0
Portland , OR	Bus	7.1
Portland , OR	Rail	7.6
Sacramento, CA	Bus	10.3
Sacramento, CA	Rail	4.1
Phase 2 Systems		
Buffalo, NY	Bus	10.3
Buffalo, NY	Rail	3.2
Cleveland, OH	Bus	NA
Cleveland, OH	Rail	NA
Corpus Christi, TX	Bus	NA
Huntington, WV	Bus	NA
Juneau, AK	Bus	17.5
Louisville, KY	Bus	NA
Montgomery County, MD	Bus	12.3
North San Diego, CA	Bus	11.1
Phoenix, AZ	Bus	6.0
Prince George's County,	Bus	12.4
Washington DC	Bus	NA
Washington DC	Rail	NA

NA = Not Available

Exhibit 9
Direct Survey Results
Gender

Gender	All Systems	Size Of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Male	44.8%	45.3%	46.7%	43.3%	43.2%	40.8%	48.1%
Female	55.2%	54.7%	53.3%	56.7%	56.8%	59.2%	51.9%

Age

The survey respondents are concentrated in working ages between the ages of 25 and 64 (Exhibit 10). About 65 percent of users were in these working age groups.

Exhibit 10
Direct Survey Results
Age

Age	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Under 15	3.0%	6.4%	2.7%	1.4%	1.8%	2.1%	1.8%
15 to 24	26.2%	30.3%	26.6%	23.9%	30.4%	25.3%	22.5%
25 to 34	20.1%	16.1%	20.1%	22.2%	22.0%	21.2%	21.7%
35 to 49	31.8%	27.3%	31.8%	34.1%	30.0%	31.5%	36.3%
50 to 64	13.3%	12.7%	13.8%	13.3%	11.6%	14.0%	12.8%
65 or more	5.6%	7.4%	5.1%	5.1%	4.3%	5.8%	5.0%

There was a slightly higher concentration of transit users under 15 years of age in small systems than in medium and large systems. This may reflect higher use of transit for commuting to school in these communities as is shown in the discussion of responses to trip purpose.

Household Income

Most transit trips are made by users living in low income households. On average, about half of transit trips are made by people living in households with household incomes less than $20,000 per year (Exhibit 11).

Exhibit 11
Direct Survey Results
Household Income

Household Income	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Under $20,000	49.1%	63.3%	50.6%	40.9%	41.0%	50.7%	35.5%
$20,000-$39,999	28.7%	23.9%	29.4%	30.6%	32.1%	30.7%	28.7%
$40,000-$59,999	11.1%	8.2%	11.1%	12.4%	10.8%	10.8%	15.2%
$60,000-$79,999	5.1%	2.5%	4.4%	6.9%	7.8%	4.4%	7.9%
$80,000 or greater	6.1%	2.0%	4.4%	9.2%	8.3%	3.5%	12.7%

Low-income users (under $20,000) represent a larger percentage of transit trips at small transit systems (63.3 percent) than they do in medium (50.6 percent) and large (40.9 percent), and large suburban (41.0 percent) systems. This relationship may reflect the greater ability of larger systems to attract choice riders — people

with cars available — who typically have moderate to high incomes.

In multi-modal systems, low- income users make up a much larger percentage of bus trips (50.7 percent) than of rail users (35.5 percent). This relationship also may reflect the greater ability of rail systems to attract choice riders — people with cars available — who typically have moderate to high incomes.

Trip Frequency

Most transit trips are made by frequent riders. About 70 percent of the transit trips at participating transit systems trips were made by customers who ride transit five days a week or more (Exhibit 12). Conversely, about 30 percent of trips were made by riders who ride transit 4 days per week or fewer. A higher percentage of bus riders use transit 5 days a week or more (30.7 percent) than rail riders (23.1 percent).

Exhibit 12
Direct Survey Results
Trip Frequency

Trip Frequency	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
More than 5 days/week	29.3%	35.4%	28.8%	26.6%	23.3%	30.7%	23.1%
5 days/week	40.9%	32.8%	40.2%	45.5%	43.1%	40.9%	48.2%
4 days/week	6.7%	8.5%	6.8%	5.8%	5.6%	6.0%	6.0%
3 days/week	6.3%	7.1%	6.1%	6.1%	8.1%	6.1%	5.4%
2 days/week	5.5%	5.9%	6.1%	4.8%	5.9%	5.2%	5.1%
1 day/week	4.3%	3.9%	4.3%	4.6%	6.2%	4.1%	4.1%
Twice a month	3.2%	3.5%	3.3%	3.0%	3.5%	3.2%	3.3%
Once a month	3.8%	2.9%	4.5%	3.7%	4.3%	3.6%	4.8%

Duration of Transit Use

Most transit trips are made by riders, who have been using transit for a short time. On average, about 28.6 percent of transit trips were made by riders who had been using transit for six month or less (Exhibit 13). An additional 9.5 percent of the trips surveyed were made by riders who had been using transit for seven to 12 months. This duration of use profile suggests that there is constant turnover in the transit customer base.

Trip Purpose

The trip purpose for transit users was determined using the results of two questions — *Where are you coming from?* and *Where are you going to?* Trip purpose was defined to include all trip purposes except traveling to or from home using the following two-step method:

Exhibit 13
Direct Survey Results
Years Using Transit to Make the Survey Trip

Years Using Transit	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Less than a month	9.7%	11.8%	9.8%	8.6%	12.7%	8.3%	8.1%
1-6 months	18.9%	21.1%	19.4%	17.6%	23.4%	16.3%	15.8%
7-12 months	9.5%	9.5%	9.3%	9.6%	12.4%	9.1%	8.2%
1-2 years	15.0%	15.1%	14.1%	15.4%	17.2%	13.9%	14.6%
2-4 years	13.6%	12.8%	14.8%	13.1%	14.4%	14.0%	14.2%
More than 4 years	33.4%	29.7%	32.6%	35.7%	19.7%	38.4%	39.1%

- The answer to the question *Where are you going to?* was used if the answer was not *Home*.
- If the answer was *Home*, then the response to the question *Where are you coming from?* was used.

Work trips are by far the major reason for transit trips. Work trips account for about half of all transit trips (Exhibit 14). The dominance of work trips holds true regardless of system size or mode operated. This finding is consistent with the trip frequency results since work trips are often called non-discretionary, repetitive trips that are made five days per week.

Exhibit 14
Direct Survey Results
Trip Purpose

Trip Purpose	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Work	50.3%	39.4%	48.6%	57.0%	54.9%	50.9%	54.6%
Shopping	12.9%	15.8%	12.4%	11.7%	13.8%	13.7%	9.9%
College	4.9%	6.4%	5.8%	3.6%	2.3%	5.0%	4.9%
Other School	6.8%	12.4%	6.2%	4.4%	6.1%	5.1%	4.4%
Medical Services	4.1%	5.3%	4.3%	3.4%	3.6%	4.1%	3.4%
Social, Church, or Personal Business	13.9%	15.5%	11.2%	14.8%	17.4%	12.7%	12.0%
Other	7.1%	5.3%	11.6%	5.1%	2.0%	8.5%	10.9%

There are differences in the balance of work and school trips by size of system. Work trips account for a greater percentage of transit trips in large systems (57.0 percent and 54.9 percent) than in medium (48.6 percent) and in small systems (39.4 percent). The percentage of school trips generally decreases by system

size, except for an increase in "other school" trips on large suburban systems, perhaps reflecting ridership to suburban community colleges.

Automobile Availability

About one-third (32.9 percent) of the transit trips at the participating systems were made by *choice* riders — riders who had an automobile available for making their trip, but chose to use transit instead (Exhibit 15). Survey results indicate that there are generally more choice riders in medium (36.9 percent) and large (35.5 percent) systems than in small systems (22.6 percent). These results suggest that urban factors such as parking cost and limited availability and road congestion may be important reasons why more people with automobiles choose to ride transit in medium and large systems.

There also are higher percentages of choice riders on rail systems (53.0 percent) than on bus systems (28.8 percent). This dramatic difference may be attributable to the speed advantages that rail services offer over automobiles due to road congestion in the larger urban areas served by rail.

Exhibit 15
Direct Survey Results
Automobile Availability

Automobile Availability	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Yes	32.9%	22.6%	36.9%	35.5%	23.6%	28.8%	53.0%
No	67.1%	77.4%	63.1%	64.5%	76.4%	71.2%	47.0%

Home Access/Egress Mode

The home access/egress mode for transit trips was determined using the results of four questions:

- *Where are you coming from?*
- *How did you get to this bus service?*
- *Where are you going to?*
- *How did you get to your final destination?*

Home access/egress mode was determined using the following two-step method:

- The answer to the question — *How did you get to your final destination?*— was used if the answer to the question *Where are you going to?* was *Home*.

- If the answer was not *Home*, then the response to the question — *How did you get to this bus service?* — was used unless the response to question — *Where are you coming from?* — was not *Home*.

Walking is the most popular way of traveling between transit and home both when starting a transit trip (access) and leaving a transit trip (egress). Seventy percent of all passengers surveyed reported that they had walked to transit either to start or to end a transit trip (Exhibit 16).

Exhibit 16 Direct Survey Results Home Access/Egress Mode							
		Size of System				Multi-Modal Systems	
Mode	All Systems	Small	Medium	Large	Large Suburban	Bus	Rail
Walked	70.3%	86.0%	65.5%	65.7%	73.0%	74.9%	47.5%
Drove Car	8.1%	1.3%	9.1%	10.8%	3.7%	3.4%	22.0%
Dropped Off	2.9%	1.6%	3.0%	3.4%	3.1%	2.2%	4.6%
Rode Bicycle	0.6%	0.3%	0.8%	0.7%	0.6%	0.3%	0.7%
Rode Bus/Train	17.7%	10.6%	21.2%	18.9%	19.1%	18.7%	24.5%
Rode with Parker	0.5%	0.2%	0.5%	0.6%	0.5%	0.6%	0.7%

However, while walking is still the dominant way of getting between transit and in all systems regardless of size, fewer people walk between transit and home as system size increases. Sixty-six percent of transit trips in medium and large systems are made by users who reported walking between transit and home. This decline in the number of passengers walking between transit and home is driven by increases in car usage and transfer trips from other modes. When transfer trips (rode bus/train) are excluded from the analysis, the decline in walling access/egress is still apparent — small (96.1 percent), medium (82.1 percent), and large (81.0 percent).

Car access is important for rail service as over one quarter of rail users drives a car or is dropped off at rail service. This result is consistent with the high automobile availability of rail customers.

Non-Home Access/Egress Mode

The non-home access/egress mode (getting to and from transit at places other than home) was determined like the home access/egress mode using the results of the four questions. Non-home access/egress mode was determined using the following two steps:

- The answer to the question — *How did you get to your final destination?* — was used if the answer to the question *Where are you going to?* was not *Home*.

- If the answer was *Home,* then the response to the question — *How did you get to this bus service?* — was used unless the response to the question — *Where are you coming from?*— was *Home*.

The results overall are similar to those for home access/egress mode but do not vary so much by system size or mode. Walking is the most popular mode — almost three-quarters of riders walk to and from transit service from the non-home end of their trip (Exhibit 17). Another 21 percent are riders transferring from another transit vehicle. If the transfer trips are excluded, most trips were made by users who walked at the non-home end of their trips.

Exhibit 17 Direct Survey Results Non-Home Access/Egress Mode							
		Size of System				Multi-Modal Systems	
Mode	All Systems	Small	Medium	Large	Large Suburban	Bus	Rail
Walked	72.2%	76.2%	71.8%	70.5%	67.1%	71.7%	70.2%
Drove Car	2.5%	0.9%	2.9%	2.9%	2.8%	1.4%	5.1%
Dropped Off	2.5%	2.6%	2.3%	2.6%	3.6%	1.9%	2.3%
Rode Bicycle	1.1%	2.0%	1.0%	0.8%	0.7%	0.5%	0.8%
Rode Bus/Train	21.3%	17.7%	21.7%	22.9%	25.2%	24.3%	21.2%
Rode with Parker	0.3%	0.4%	0.4%	0.2%	0.4%	0.3%	0.3%

Trip Alternative

If transit service were not available, most passengers would have made their trip by automobile either as the driver or as the passenger (Exhibit 18). These responses suggest the strong role that transit plays in reducing traffic congestion. The percent of users who would make their trip by automobile is higher at medium and large transit systems and on rail probably because automobile availability is higher for these choice users. Large suburban system riders, however, are more like small system users in this regard.

Transit service at the participating systems also provided basic mobility to some passengers. One of every five transit riders surveyed stated that they would not have made their trip if transit service had not been available.

Exhibit 18 Direct Survey Results Trip Alternative							
		Size of System				Multi-Modal Systems	
Mode	All Systems	Small	Medium	Large	Large Suburban	Bus	Rail
Car	24.0%	12.8%	26.4%	27.9%	14.5%	19.9%	44.0%
Walk	17.7%	26.8%	18.2%	12.8%	16.7%	16.5%	10.1%
Ride with someone	21.6%	22.8%	22.2%	20.6%	22.9%	24.1%	17.3%
Taxi	11.6%	11.7%	7.5%	14.3%	20.6%	12.9%	7.3%
Bicycle	3.7%	4.5%	5.0%	2.6%	2.4%	3.3%	3.0%
Not Make Trip	21.4%	21.5%	20.7%	21.7%	22.8%	23.3%	18.3%

MAJOR POLICY TOPICS

This section presents the results of special analysis of two important policy topics:

- People served in the community; and
- Key policy objectives served as defined by trip purpose, automobile availability, and trip alternative.

People Served in the Community

Transit systems serve more people in the community that is suggested by the daily ridership, because there is daily "turnover" in the individuals riding. The people that ride on one day are not all the same people that ride on another day. From the concept of sampling, it may be concluded that a rider who reports using transit once a week on a transit system that operates six days a week actually represents a total of six *different* individuals, each of whom ride on only one day of the week. Extending this concept to all frequencies used in the survey yields the factors shown in Exhibit 19, which may be used to convert frequency of use to an estimate of number of different individual users. For example, a person who said that they rode five days a week is estimated to represents 1.2 different people on a transit system that operates six days of the week and 1.4 different people on a transit system that operates on seven –days of the week.

This approach was used to estimate the ratio of the number of *different* individuals using transit to the average number of daily transit trips. The conversion factors in Exhibit 19 were applied to the frequency results for each modal survey.

Exhibit 19
Trip Frequency/People Conversion Factors

	Days Operated	
Trip Frequency	**Six Days**	**Seven Days**
7 days a week		1.00
6 days a week	1.00	1.17
5 days a week	1.20	1.40
4 days a week	1.50	1.75
3 days a week	2.00	2.33
2 days a week	3.00	3.50
1 day a week	6.00	7.00
Twice a month	12.00	14.00
Once a month	24.00	28.00

The average ratio of the number of *different* individuals using transit to the average number of daily transit trips is 3.06 (Exhibit 20). There is no apparent trend in this figure by system size, but rail systems appear to have a higher factor (3.45) than do bus systems (3.13).

The ratio of different individuals served in a community to the number of daily trips is high because a large percentage of transit users are infrequent riders. On average, only 29.8 percent of transit trips are made by people who use transit less than 5 days per week, however, when these trips are converted to a number of distinct individuals using the multipliers in Exhibit 19, these infrequent riders represent 70.0 percent of all

persons using transit. Thus, the experiences of infrequent riders may have a large affect on the perception of transit service in a community.

Exhibit 20
People Served in the Community

	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
People Served/Phase Trips	3.06	2.68	3.34	3.07	3.17	3.13	3.45

Exhibit 21
Transit Usage by Infrequent Transit Riders
(Less Than 5 Days per Week)

	All Systems	Size of System				Multi-Modal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Percent of Transit Trips	29.8%	31.8%	31.1%	28.0%	33.6%	28.3%	28.7%
Percent of Total Riders	70.0%	68.3%	72.1%	69.5%	75.7%	69.9%	70.6%

Key Policy Objectives

Surrogate measures of three public policy objectives can be developed using cross tabulations of the user characteristics *trip purpose, automobile availability,* and *trip alternative.* The three objectives are:

- **Mobility.** This policy objective can be measured by determining the percentage of riders who do not have an automobile available and who are using transit for work, school, shopping, or other trips. Transit service provides these riders with basic mobility.

- **Congestion Management.** This policy objective can be gauged by determining the percentage of riders who: 1) have an automobile available for trip making but choose to use transit; or 2) ride transit to and from work and do not have an automobile available, but would have made their trip by other means if transit service had not been not available. These riders, by favoring and using transit, reduce the level of overall road congestion in the urban area.

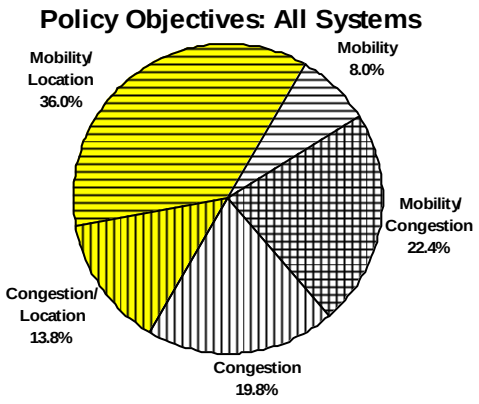
- **Location Efficiency.** This objective can be measured by determining the percentage of users who select transit service for non-work school, shopping, and other types of trips, regardless of whether a car was available. These riders choose to use transit because of its convenience.

The assignment of the cross tabulation results to the three policy objectives is presented in Exhibit 22.

Exhibit 22
Key Policy Objectives Categories

Car Availability/Trip Purpose/Trip Alternative	All Systems	Size of System				MultiModal Systems	
		Small	Medium	Large	Large Suburban	Bus	Rail
Combined Mobility/Location EfficiencyObjectives							
No Car/Non-Work/Make Trip	25.0%	34.3%	24.1%	19.7%	24.5%	25.5%	16.8%
No Car/Non-Work/ No Make Trip	10.8%	11.4%	12.6%	8.9%	10.8%	13.5%	8.3%
Total Mobility/Location	**35.8%**	**45.7%**	**36.7%**	**28.6%**	**35.3%**	**39.0%**	**25.1%**
"Pure" Mobility Objective							
No Car/Work/No Make Trip	8.5%	6.8%	7.2%	10.1%	10.2%	9.6%	6.8%
Total "Pure" Mobility	**8.5%**	**6.8%**	**7.2%**	**10.1%**	**10.2%**	**9.6%**	**6.8%**
Combined Mobility/Congestion Management Objectives							
No Car/Work/Make Trip	22.3%	24.6%	18.7%	21.0%	31.7%	22.7%	13.5%
Total Mobility/Congestion	**22.3%**	**24.6%**	**18.7%**	**21.0%**	**31.7%**	**22.7%**	**13.5%**
"Pure" Congestion Management Objective							
Car/Work/Make Trip	18.7%	10.1%	20.2%	25.6%	11.5%	16.4%	32.9%
Car/Work/ No Make Trip	1.0%	0.6%	0.8%	1.3%	1.2%	0.9%	1.3%
Total "Pure" Congestion	**19.7%**	**10.7%**	**21.0%**	**26.9%**	**12.7%**	**17.3%**	**34.2%**
Combined Congestion Management/Location Efficiency Objectives							
Car/Non-Work/Make Trip	12.4%	11.0%	15.0%	12.2%	8.8%	10.4%	18.5%
Car/Non-Work/ No Make Trip	1.3%	1.1%	1.4%	1.2%	1.4%	1.0%	1.8%
Total Congestion/Location	**13.7%**	**12.1%**	**16.4%**	**13.4%**	**10.2%**	**11.4%**	**20.3%**

There are three "overlap" areas in which trips serve two policy objectives or do "double-duty"— mobility/location efficiency, mobility/congestion management, and congestion management/location efficiency. Together, these overlap areas represent on average over two-thirds (71.8 percent) of the public transportation trips.



Mobility is, perhaps, the most fundamental reason for offering transit service. Not surprisingly, mobility is associated with the largest share of transit trips. Riders who had no car available and were using transit for work, school, shopping, and other types of trips accounted for 66.6 percent of total transit trips (Exhibit 23). As system size increases, the percentage of trips related to mobility decreased, except in the case of large suburban systems, which had similar results to small systems.

The inverse relationship between the percentages of trips made providing users with basic mobility and transit system size may reflect the higher percentage of users who have an automobile available in larger communities. A higher percentage of trips surveyed in larger areas were made by passengers who chose transit instead of an automobile. From this finding, it can be inferred that, for these passengers, transit is offering a service that is competitive with or superior to the automobile.

Exhibit 23
Key Policy Objectives Results

Objective ("Pure" or Combined) from Exhibit 22	All Systems	Size of System				MultiModal System	
		Small	Medium	Large	Large Suburban	Bus	Rail
Mobility							
Mobility/Location Efficiency	35.8%	45.7%	36.7%	28.6%	35.3%	39.0%	25.1%
"Pure" Mobility	8.5%	6.8%	7.2%	10.1%	10.2%	9.6%	6.8%
Mobility/Congestion Management	22.3%	24.6%	18.7%	21.0%	31.7%	22.7%	13.5%
Total Mobility	**66.6%**	**77.1%**	**62.6%**	**59.7%**	**77.2%**	**71.3%**	**45.4%**
Congestion Management							
Mobility/Congestion Management	22.3%	24.6%	18.7%	21.0%	31.7%	22.7%	13.5%
"Pure" Congestion Management	19.7%	10.7%	21.0%	26.9%	12.7%	17.3%	34.2%
Congestion Mgmt/Location Effic.	13.7%	12.1%	16.4%	13.4%	10.2%	11.4%	20.3%
Total Congestion Management	**55.7%**	**47.4%**	**56.1%**	**61.3%**	**54.6%**	**51.4%**	**68.0%**
Location Efficiency							
Mobility/Location Efficiency	35.8%	45.7%	36.7%	28.6%	35.3%	39.0%	25.1%
Congestion Mgmt/Location Effic.	13.7%	12.1%	16.4%	13.4%	10.2%	11.4%	20.3%
Total Location Efficiency	**49.5%**	**57.8%**	**53.1%**	**42.0%**	**45.5%**	**50.4%**	**45.4%**
Totals Inlcuding Objective Overlaps							
Total Mobility/Location	**171.8%**	**182.3%**	**171.8%**	**163.0%**	**177.3%**	**173.1%**	**158.8%**

Another reason for funding public transit is to encourage people with automobiles to use transit during periods of heavy road congestion. This public policy objective has gained increasing acceptance over time as the nation's highways have become clogged both in peak and off-peak periods. On average, 55.7 percent of the policy benefits of public transportation were associated with managing congestion. Larger shares of riders are associated with this policy objective on larger systems and on rail services of multi-modal systems.

Many people consider the location efficiency objective to be less important than those associated with mobility and congestion. However, the survey results show that the percentage of trips related to location efficiency was significant at 49.5 percent. System size and mode does not appear to affect the percentage of trips related to location efficiency meaning that ease of access to public transportation is the same regardless of the type of community.

Implementation Problems

The TPMS was designed to collect data on transit customers through an ongoing, systematic program of on-board surveys. In an effort to reduce costs, the TPMS surveys were distributed in coordination with the existing National Transit Database (Section 15) data collection activities using existing transit agency staff.

This chapter presents problems encountered during the conduct of the case studies with emphasis on those that relate to the development of a recurring data collection program. These problems include:

- Changes in commitment to participate in the project,
- Compliance with survey sampling plans,
- Surveyor "burn-out," and
- Passenger "burn-out."

CHANGES IN SYSTEM COMMITMENT

APTA invited 12 transit systems to participate in the first phase of the TPMS project. To insure management cooperation and budget commitment (e.g., surveyors) APTA required written commitments from the general managers before the transit systems were accepted into the TPMS project. APTA received written commitments from all 12 general managers.

Nonetheless, three transit systems — Albany, Blacksburg, and Lakeland — declined to participate later in the project. The reasons for project withdrawal varied:

- The transit system in Albany apparently did not understand that the TPMS survey would be conducted in coordination with the manual collection of data for the National Transit Database (NTD). The Albany system was beginning its implementation of automatic passenger counters, which would collect the NTD data automatically and, therefore, did not offer the opportunity to conduct the TPMS concurrently. When the Albany management realized this conflict, it offered to conduct the TPMS survey separately. The MMC team provided the transit system with printed survey questionnaires and provided on-site survey training, but the Albany system never conducted the survey.

- The transit system in Blacksburg was unable to secure surveying personnel. It had hoped to use students at the local university. The MMC team did not develop an implementation plan or print survey questionnaires for Blacksburg.

- The transit system in Lakeland also was unable to secure surveying personnel. It had hoped to use senior citizens, but had problems recruiting them. The McCollom Management Consulting team developed an implementation plan, printed survey questionnaires, and provided on-site survey training for Lakeland.

In addition, the Austin transit system also suspended surveying as a result of changes in management. The transit system began surveying in the fall of 1996, but suspended surveying for almost one year before

completing the surveys in the winter of 1997/1998. Between 1996 and 1998, Austin had two permanent and two acting general managers.

Similar problems occurred in second phase of the TPMS project. In this phase, it was planned that the surveys would be conducted in concentrated time periods in the spring or fall seasons of the year. About half of the systems met this goal. The remaining systems had at least part of their survey period during the summer (when school is out) or winter (which is not thought to be typical).

COMPLIANCE WITH SURVEY SAMPLING PLANS

Most transit systems in the first phase followed closely the sampling plans that were outlined in their implementation plans. However, about half the transit systems had gaps in their execution of the sampling plans. In some systems, surveyors were pulled off the TPMS to work on other special survey projects. For example, the transit system in Sacramento stopped surveying for about a month in the spring of 1997 to conduct annual ridership counts.

In small systems, a single person often was assigned to conduct the TPMS surveys. For example, in Kenosha, surveying was suspended for about three months when the assigned surveyor was off work with an extended illness.

Fortunately, the surveying gaps did not affect the survey results because conservative (low) response rates were used to develop the sampling plans. Much higher survey response rates occurred and, therefore, the desired numbers of responses were obtained. The survey gaps also did not introduce any noticeable bias in the survey results.

Also, discussions with managers at several participating systems suggested that other needs are always present and that surveying gaps will always occur in an ongoing sampling effort. The experience in the second phase also showed that even concentrated survey efforts can be derailed by more pressing system demands

SURVEYOR “BURN-OUT”

Surveyor “burn-out” was reported as a problem at the transit system in Pittsburgh and Buffalo. Although the staff was very dedicated, the constant strain of handing out questionnaires took its toll. Sick leave usage for bruised shoulders, sore backs, and aching arms increased among the Pittsburgh surveyors. Although the Buffalo staff also was very dedicated, some surveyors requested that they not be assigned survey duty because of either physical concerns or the strain of dealing with passengers.

The Pittsburgh experience is important because the Pittsburgh surveyors conducted TPMS surveys for over two years, first as part of the testing of the TPMS prototype and then as one of the nine systems in the TPMS project.. This experience is suggestive of what might happen if the TPMS approach was used over several years. It also is supported by the strain that began to occur in Buffalo.

In spite of surveying strain, the Pittsburgh surveyors were very supportive of the conduct of TPMS surveys. When asked for suggestions, they said that they could more easily implement the survey if the effort was concentrated over a short, two-to-three week period instead of spread throughout the year.

PASSENGER "BURN-OUT"

Passenger "burn-out" was reported as a problem in Buffalo and Pittsburgh. In Buffalo, some customers became annoyed by the surveying. These passengers tended to be light rail passengers who, because of the small number of light rail cars operating, had a greater chance of receiving a survey than bus passengers.

In Pittsburgh, it appeared that frequent surveying was the problem. The TPMS survey was the second year-long survey conducted by PAT for TPMS. In addition, PAT conducted an intensive customer opinion survey every day during the spring of 1996. More riders were questioning the need to complete the survey. Incidents of verbal intimidation occurred more frequently and two traffic surveyors were physically threatened while handing out survey questionnaires.

When asked for recommendations, surveyors and managers at the Buffalo and Pittsburgh systems suggested that the TPMS survey be concentrated over a short, two-to-three week period instead of spread throughout the year.

CONCLUSION

The major implementation problems were the ongoing survey approach used in the first phase and transit system commitment. For some transit systems, it was difficult to maintain a long-term commitment to the ongoing survey approach. Other needs made it difficult to comply with survey sampling plans. When these obstacles were overcome, continued surveying produced both surveyor "burn-out" and passenger "burn-out." Therefore, a more concentrated survey approach might yield better results for the TPMS project.

Transit system commitment also remains a significant implementation problem. While concentrating the surveys in a short time frame in the second phase made it easier for transit systems to make survey commitments, nonetheless only half of the transit systems conducted the surveys on-time.

Kenosha Telephone Test

A telephone survey is another method for collecting information on transit customers. It is not as widely used as on-board surveys because of the costs involved in identifying transit customers. Transit customers typically are a small portion of the general population, often less than ten percent. When a telephone survey is conducted, typically 10 to 40 random phone calls must be made before a transit user is reached. The cost of this searching for transit users has made telephone surveys more expensive per completed survey than traditional onboard transit surveys.

A telephone sampling approach was tested in this project that relied on a geographic information system (GIS) for selecting telephone numbers. It was hoped that survey efficiency — number of calls made to reach a transit customer — could be improved by selecting phone numbers of residences within walking distances of transit lines.

This chapter summarizes the telephone sampling test that was conducted in Kenosha, Wisconsin during the month of March 1998. The survey approach is first outlined and is followed by a discussion of the test results.

APPROACH

The telephone survey was conducted by M. Davis and Company, a McCollom Management Consulting sub-contractor. The objective of the test was to determine how many calls it would take to obtain 50 completed interviews using the same questions from the TPMS survey questionnaire.

The M. Davis surveyors randomly called Kenosha residents between the hours of 6:30 PM and 9:00 PM on weekdays and 9:00 AM to 3:00 PM on Saturdays. If no answer was received, the surveyors made up to two follow-up calls to the same number.

The surveyors used two screening questions to identify transit users:

- First, the surveyors eliminated any households that had a person who was an employee of the transit system in Kenosha.

- Second, the surveyors only interviewed people who used transit in the past year. If several people in the household rode transit in the past year, the person who made the most recent trip was interviewed.

The database of telephone numbers was prepared by the Transportation Technology Initiative (TTI). TTI is a public-private partnership of Bridgewater (Massachusetts) State College and the Viggen Corporation. TTI was formed to deploy the latest Intelligent Transportation System (ITS) technology and concepts. Among its projects, TTI is under contract with FTA to develop and maintain a national GIS database on the Internet of all transit routes operated throughout the country.

TTI used the GIS database to prepare a telephone number database for the Kenosha telephone test. TTI identified the areas within ¼ mile walking distance of the bus routes in Kenosha. It then used these areas in conjunction with a telephone GIS database to select telephone numbers for the Kenosha telephone test.

RESULTS

The results from the Kenosha telephone test suggested that the on-board survey was still a more effective method for collection passenger information. To obtain 47 completed interviews, the M. Davis surveyors made 1,957 calls or about 42 calls per completed interview. The calls included call backs, no answers, busy signals, and refusals.

M. Davis estimated that the cost per completed interview was $30. This was $10 to $15 more expensive than the cost of a typical on-board survey which can range from $15 to $20 per completed questionnaire.

However, the Kenosha telephone test was successful in improving the survey efficiency when compared to the incidence of transit users in the general population. From the on-board survey it is estimated that 5.3 percent of the residents in the Kenosha service area are transit users. The percent of people who said that they were transit users in the telephone survey was 12.1 percent (47 completions ÷ 389 people who agreed to answer questions). Therefore, the use of the GIS database to generate the telephone number database more than doubled the "hit rate" for randomly selecting transit users (5.3 percent versus 12.1 percent).

APPENDIX A: SAMPLE SURVEYOR INSTRUCTIONS (KENOSHA)

Kenosha Transit On-Board Customer Survey
Surveyor Requirements and Expectations

1. You are the most important individual for securing a high level of participation from bus customers. You should be polite and helpful to passengers at all times.

2. You represent Kenosha Transit while you work on this project. You should be neat and well-groomed in appearance. Please observe all rules for eating, drinking and smoking while on Kenosha Transit vehicles.

3. The results of the survey will be used for a federal government research study on the characteristics of transit riders. Please insure that the customers are aware that the results of the survey will not be used to increase or eliminate Kenosha Transit service.

4. Please complete each survey assignment. Successfully completing an assignment means that you surveyed each assigned trip and correctly filled out the Trip Log.

Your Survey Kit

Your survey kit will contain the following items:

Questionnaires

You should have enough questionnaires for the entire assignment. ***Remember to record the questionnaire numbers on your Work Assignment Log.*** Place questionnaires sideways in your questionnaire dispenser (clipped on your clipboard) with the serial number on the left. The lowest serial number should be on the top of the stack.

Work Assignment Return Envelope

You will have one envelope for each work assignment. At the end of the work assignment, remember to put all returned, refused, and blank distributed questionnaires from that work assignment into the envelope together with the completed ***Work Assignment Log***, and sign your name on the envelope.

Work Assignment Log

You will have one ***Work Assignment Log*** attached outside of each ***Work Assignment Return Envelope***. Before each work assignment, you will take out the ***Work Assignment Log*** and put it on your clipboard.

At the beginning of each assignment, you will need to fill out:

- The driver's name,
- The bus number,
- Your name (surveyor),
- The date,
- The day of week, and
- The weather.

At the beginning of each trip, you will need to fill out:

- The serial number of the first questionnaire,
- The route number,
- The direction of trip (e.g., inbound, outbound),
- Bus location at starting point (intersecting streets or key generator (e.g., shopping center)), and
- Departure time at starting point (when bus goes into revenue (passenger-carrying) service).

When the trip reaches the end of the line, you will need to fill out:

- The top serial number of the questionnaires in your dispenser,

- Bus location at ending point (intersecting streets or key generator (e.g., shopping center)).
- Arrival time at ending point (when bus reaches the end of the line), and
- Number of passengers less than approximately 12 years of age who boarded during the trip.

Questionnaire Dispenser and Clipboard

Before each work assignment, you should attach the ***Work Assignment Log*** and ***Questionnaire Dispenser*** to the clipboard, and put questionnaires into the dispenser. This way, you will be able to hand out questionnaires and tally passengers less than approximately 12 years of age at the same time. ***It is extremely important that questionnaires be handed out in numerical order*** — so make sure you double check to pull out the next lowest bundle of questionnaires when filling up the dispenser.

Questionnaire and Pencils Return Box

You will put up the ***Questionnaire and Pencils Return Box*** when you first board the bus. The box should be hung on the handrail in the rear stairwell. At the end of the work assignment on that bus, empty and remove the ***Questionnaire and Pencils Return Box*** by putting the questionnaires in the ***Work Assignment Return Envelope*** and box in your canvas bag.

Survey Today Sign

This sign should be attached to the fare box on the side of the fare box facing the stairwell. You can use your Velcro to attach the sign.

Instructions

At the start of the work assignment....

1. Arrive at the scheduled time and place.

2. Board the bus.

3. Introduce yourself to the driver.

4. Make sure that it is the right run number.

5. Put up your ***Questionnaire and Pencils Return Box*** in the rear stairwell. Put up your ***Survey Today*** sign on the farebox facing the stairwell.

6. Take the seat directly behind the driver.

7. Get out your ***Work Assignment Log*** and ***Questionnaire Dispenser*** and clip them to the clipboard. Put questionnaires into the dispenser. Double check that the questionnaires are in ***exact sequential order*** with the lowest number on top.

8. Write down the driver's name, bus number, your name, the date, the day of week, and the weather (e.g., clear, cloudy, rain, snow).

At the start of the trip....

9. Write down the number of the first questionnaire that you will hand out.

10. Write down on the ***Work Assignment Log***:

    - the route number,
    - the direction of trip (e.g., inbound, outbound),
    - bus location at starting point (intersecting streets or key generator (e.g., shopping center)), and
    - departure time at starting point(when bus is in-service).

11. When you pick up the first passenger, politely with a smile say, *Please fill out this questionnaire and return it to me before your exit the bus/train. Thank you*, as you hand them a questionnaire and a pencil.

12. If they take it, say *Thank You* and offer the next person a questionnaire.

13. If they refuse, take it back, put an *R* on the questionnaire, and put it under your arm. Move on to the next person who gets on the bus.

14. Use only one questionnaire per boarding passenger.

15. Do not hand out questionnaires to passengers who appear to be less than 12 years old.

Instead, keep a count of the passengers who are less than 12 years old. ***Use your own judgment about the ages of the children.*** Give a survey to any child who requests a survey if they could be 12 years of age or older.

16. Use questionnaires in exact sequence.

At the end of the trip....

17. Write down on the ***Work Assignment Log*** the number of the ***top questionnaire in your dispenser.***

18. Collect all of the questionnaires from the ***Questionnaire and Pencils Return Box***, and check all seats for questionnaires that may be lying aPhase the bus. Put a *R* on any questionnaire that was discarded incomplete by a passenger;

19. Put all questionnaires that have been distributed for that trip in the ***Work Assignment Return Envelope*** (this includes any completes, partials, and refusals that are from that trip). If the passenger takes the questionnaire with him or her, that's fine. Postage has been provided on the questionnaire so it can be mailed back.

20. Write down on the ***Work Assignment Log***:

    - Bus location at ending point (intersecting streets or key generator (e.g., shopping center)).
    - Arrival time at ending point (when bus reaches the end of the line), and
    - Number of passengers less than 12 years of age who boarded during the trip.

21. Check to be sure that the ***Work Assignment Log*** is completely filled out.

22. Repeat steps 9 through 21 for each trip on the ***Work Assignment Log***.

At the end of the work assignment (or leaving a bus)....

23. Make one last look through the bus to collect any remaining surveys.

24. Remove the ***Questionnaire and Pencil Return Box***, and ***Survey Today*** sign. Place these items into your canvas bag.

25. Return to office to have your ***Work Assignment Log*** checked and receive your work assignment for the next survey day.

Five Important Rules

To Insure Correct Surveying Results

RULE #1

Use questionnaires in the exact sequence. Work downward through each bundle, and give (or try to give) each boarding passenger a questionnaire.

RULE #2

Use exactly one questionnaire per boarding passenger.

Do not hand out questionnaires to passengers who are less than 12 years old. Instead, keep a count of the passengers who are less than 12 years old. ***Use your own judgment about the ages of the children.*** Give a survey to any child who requests a survey if they could be 12 years of age or older.

The number of questionnaires used must be exactly equal to the number of boardings of people 12 years of age and older.

Each questionnaire must fall into one of four categories:

1. Retrieved by the surveyor as a complete;
2. Marked with an *R* because the passenger refused to take or complete it;
3. Retrieved and marked with an *R* by the surveyor after being discarded incomplete by a passenger; or
4. Taken home by passenger to complete and mail in.

Do not use a questionnaire twice, even if it is a blank refusal.

RULE #3

Smile and say to *each and every passenger:*

Please fill out this questionnaire and return it to me before your exit the bus/train. Thank you.

Be friendly, it makes all the difference!

RULE #4

Record exact questionnaire sequences used, tally number of boarding passengers who are less than 12 years old, and fill in the ***Work Assignment Log***.

Follow the simple ***Work Assignment Log*** instructions each time.

RULE #5

Retrieve and pack materials after each work assignment.

Please remember that there is one envelope for each assignment. All materials should fit within each ***Work Assignment Return Envelope***.

Work Assignment Log

Driver's Name _____ **Date** _____

Bus Number _____ **Day of Week** _____

Surveyor _____ **Weather** _____

Trip	Top Questionnaire Number		Route Number	Direction of Trip	Starting Point		Ending Point		Passengers Less Than 12 Years Old
	Starting	End			Location	Time	Location	Time	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									