
Scan of Recent Travel Surveys

June 1996

TMIIP

**Travel
Model
Improvement
Program**

Department of Transportation
Federal Highway Administration
Federal Transit Administration
Office of the Secretary

Environmental Protection Agency

Department of Energy



U.S. Department of
Transportation



U.S. Environmental
Protection Agency

Travel Model Improvement Program

The Department of Transportation, in cooperation with the Environmental Protection Agency and the Department of Energy, has embarked on a research program to respond to the requirements of the Clean Air Act Amendments of 1990 and the Intermodal Surface Transportation Efficiency Act of 1991. This program addresses the linkage of transportation to air quality, energy, economic growth, land use and the overall quality of life. The program addresses both analytic tools and the integration of these tools into the planning process to better support decision makers. The program has the following objectives:

1. To increase the ability of existing travel forecasting procedures to respond to emerging issues including; environmental concerns, growth management, and lifestyle along with traditional transportation issues,
2. To redesign the travel forecasting process to reflect changes in behavior, to respond to greater information needs placed on the forecasting process and to take advantage of changes in data collection technology, and
3. To integrate the forecasting techniques into the decision making process, providing better understanding of the effects of transportation improvements and allowing decisionmakers in state governments, local governments, transit operators, metropolitan planning organizations and environmental agencies the capability of making improved transportation decisions.

This program was funded through the Travel Model Improvement Program.

Further information about the Travel Model Improvement Program may be obtained by writing to:

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Federal Highway Administration
U.S. Department of Transportation
400 Seventh Street, SW
Washington, D.C. 20590

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**Final Report
June 1996**

**Prepared by
Cambridge Systematics, Inc.**

**Prepared for
US Department of Transportation
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Preface

This report was prepared by Cambridge Systematics, Inc. under contract to the U.S. Federal Highway Administration (FHWA) as part of the Travel Model Improvement Program (TMIP). The TMIP is a cooperative effort of the U.S. Department of Transportation (DOT), Environmental Protection Agency (EPA), and Department of Energy (DOE). DOT participants, in addition to the Federal Highway Administration, include the Federal Transit Administration and the Office of the Secretary.

A specific objective of this scan of recent travel surveys is to facilitate the exchange of information among agencies and individuals having an interest in the design and conduct of household and other types of travel surveys. In this regard, special appreciation is extended to those people and organizations, as listed in Appendix A, who contributed information for inclusion in this report. This participation is critical to accomplishing this desired exchange of information. Principal contributors to this report from the Federal Highway Administration are Christopher Fleet, Elaine Murakami, and Fred Ducca. Cambridge Systematics staff responsible for conducting this scan of recent travel surveys include Tom Buffkin, Tom Rossi, John Suhrbier, Kevin Tierney, Steve Decker, Doug Sallman, and Chris Porter.

The information contained in this report complements the companion *Travel Survey Manual*, also published as part of the Travel Model Improvement Program. The *Travel Survey Manual* is a reference document describing accepted practices and recent advancements for the most common types of travel surveys.

To keep information on recent and planned travel surveys up to date, agencies are encouraged to submit new information as it becomes available to the TMIP clearinghouse. This material can be in summary form, but examples of survey documents, detailed descriptions, and related support materials also are encouraged. Information should be submitted to the:

Metropolitan Planning Division (HEP-20)	Telephone: (202) 366-4079
ATTN. TMIP Project Staff	Fax: (202) 366-3713
U.S. Federal Highway Administration	E-mail: jeverett@intergate.dot.gov
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Information on travel surveys is available in electronic form on the TMIP World Wide Web site (<http://tmip.tamu.edu>). This site also is accessible by selecting the Travel Demand Forecasting button in the National Transportation Library portion of DOT's Bureau of Transportation Statistics web site (<http://www.bts.gov>). A search function is included enabling a user to search the library in a variety of different ways. Individuals are encouraged to register within the Communications Center on the TMIP web site and to use this Center as a means of identifying other organizations and individuals who may be involved in designing, conducting, or analyzing similar types of travel surveys.

Questions and requests for information on TMIP reports and activities are encouraged.

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1.0 Introduction

1.0 Introduction

■ 1.1 Objectives

The purpose of Track D of the Travel Model Improvement Program (TMIP) is to identify, design, and develop improved data collection procedures that will meet decision makers' current and future needs. In support of this objective, this report identifies recent travel surveys conducted by metropolitan planning organizations (MPOs) and selected states.

Four purposes have guided the development of this summary:

- To determine the general state-of-the-practice of travel surveys within this country;
- To identify the types of surveys being conducted, and the frequency of data collection;
- To compare United States survey practices to travel survey procedures being used in other countries, and
- To assess the degree to which emerging state-of-the-art survey techniques are being introduced into practice.

Nine types of surveys are examined¹:

1. Household;
2. Vehicle intercept and external station;
3. Panel or longitudinal;
4. Stated preference;
5. Visitor;
6. Transit on-board;
7. Commercial vehicle;
8. Workplace; and
9. Special generator.

¹ Each of these surveys types is described in detail in the companion, *Travel Survey Manual*, prepared by Cambridge Systematics, Inc. and Barton-Aschman Associates, Inc. for the U.S. Department of Transportation and published in 1996 as part of the Travel Model Improvement Program. The *Travel Survey Manual* also discusses the overall survey process, including survey design, sampling, precision and accuracy, management and quality control, and geocoding.

The overall results are summarized in the main body of this report, with more specific information on individual survey efforts provided as a series of appendices.

The most striking finding is the dramatic increase of survey and data collection activity in recent years compared to the early 1980s. More surveys are being conducted; a broader range of survey types are being used; and new forms of data collection practices are being introduced. This, in turn, is permitting updated and dramatically improved travel demand model systems to be developed.

The provisions for metropolitan area and statewide planning contained in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) certainly are one reason for this resurgence of travel survey activity. Another reason for this recent increase in travel survey efforts is that the databases used to develop travel demand models simply have become too old to still be considered representative of current conditions. For those MPOs reporting household travel survey activity between 1990 and 1995, half had not carried out a survey for 12 or more years, and one quarter had not carried out a survey for over 20 years.

■ 1.2 Approach

The information contained in this report was gathered from telephone conversations conducted during the Fall of 1994 with representatives of over 50 Metropolitan Planning Organizations (MPOs) throughout the country. This information then was verified and updated during the first three months of 1996. A listing of the MPOs contacted, including the name of the contact person, is provided as Appendix A. Questions were asked about any comprehensive data collection efforts that had been carried out by the MPO to gather travel demand modeling inputs. While the MPOs contacted were selected so as to be generally representative of data collection practices, these results are not meant to be either statistically random or comprehensive. As MPO size decreases, the number of MPOs contacted becomes sparser. The information gathered nonetheless provides a broad picture of the number and types of travel surveys that are being carried out throughout the country.

This report represents an update of a study conducted by Chuck Purvis in 1989-90². The Purvis review provides information on travel surveys conducted by MPOs between 1978 and 1980 and on surveys planned for 1989-92. The study summarizes survey efforts by the 20 largest U.S. metropolitan areas plus 18 additional metropolitan areas with over 430,000 population.

A more in-depth effort to examine specific types of household surveys is being carried out for the National Cooperative Highway Research Program by Professor Peter Stopher of Louisiana State University. This NCHRP effort, being performed as part of their 20-5

² Purvis, Charles L. *Survey of Travel Surveys II*. Transportation Research Record 1271, Transportation Research Board, Washington, D.C., 1990

series of synthesis special projects, is a comprehensive look at the many details involved in carrying out household surveys. The effort reported on in this report contrasts with the NCHRP data collection effort in that a broader range of travel surveys are examined, attempting to quickly and generally find out what types of data collection efforts have been going on around the country.

Work performed for the U.S. Federal Transit Administration by Chris Porter, Laura Melendy, and Elizabeth Deakin of the Institute of Urban and Regional Development at the University of California at Berkeley also is closely related to this report³. Land use and travel survey data existing within 35 of the largest Metropolitan Planning Organizations are tabulated. Particular attention in the FTA report is given to the characteristics of land use data files, the degree to which geographic information systems are being used, and the methods through which land use forecasts are developed.

Research recently completed by the Texas Transportation Institute, *Urban Travel in Texas: An Evaluation of Travel Surveys*, also may be of interest⁴. This report compares the findings from five types of travel surveys -- household, workplace, special generator, commercial vehicles and external station surveys -- conducted during 1990 and 1991 in San Antonio, Amarillo, Brownsville, Tyler and Sherman-Denison, Texas.

For purposes of this analysis, MPOs are grouped according to the population of the geographic area they serve in order to examine trends that may vary by size of urban area. Metropolitan areas with populations greater than two million are labeled as Group 1; areas with populations from 750,000 to two million are labeled Group 2; and areas with populations less than 750,000 are labeled Group 3. All MPOs in Group 1 responded to the survey.

Travel survey activities carried out since 1990 by metropolitan planning organizations of various sizes, as well as selected statewide efforts, are tabulated in Table 1.1 and summarized in Figures 1.1 and 1.2. While all MPOs in Group 1 responded to the survey, data for Groups 2 and 3 should not be considered statistically representative of urban areas in these groups. Table 1.2 provides a breakdown of which MPOs have performed which types of surveys.

All of the large Group 1 MPOs have carried out some type of travel survey recently. Medium-sized and small urban areas, Groups 2 and 3, have also carried out a broad range of travel survey types, but not as intensively as the larger metropolitan areas. With some exceptions, the resurgence of data collection activities appears to have been initiated on the largest urban areas. Nevertheless, there appears to be a growing recognition among

³ Porter, Chris with Laura Melendy and Elizabeth Deakin, *Land Use and Travel Survey Data: A Survey of the Metropolitan Planning Organizations of the 35 largest U.S. Metropolitan Areas*, performed for the U.S. Federal Transit Administration by the Institute of Urban and Regional Development, University of California, Berkeley, CA, October 1995.

⁴ Pearson, David F., Arthur F. Gumble and Mansour Salami, *Urban Travel in Texas: An Evaluation of Travel Surveys*, Research Report 1099-3F prepared by the Texas Transportation Institute for the Texas Department of Transportation, Austin, Texas, January 1996.

Table 1.1 Travel Surveys Since 1990 by Size and Type of Organization

Survey Type	Urban Area			All MPOs Surveyed	Statewide
	Group 1 >2,000,000 Population	Group 2 750,000 - 2,000,000 Population	Group 3 750,000 - 2,000,000 Population		
MPOs Contacted	21	21	21	63	8
Household	19	14	15	48	4
External	11	9	11	31	5
Transit OnBoard	16	11	7	34	N/A
Workplace	7	3	7	17	--
Special Generator	6	1	4	11	--
Commercial Vehicle	6	2	7	15	--
Total Surveys	65	40	51	156	9
No Surveys	0	3	2	5	N/A

Figure 1.1 Number of Travel Surveys Conducted Since 1990
By Size and Type of Organization

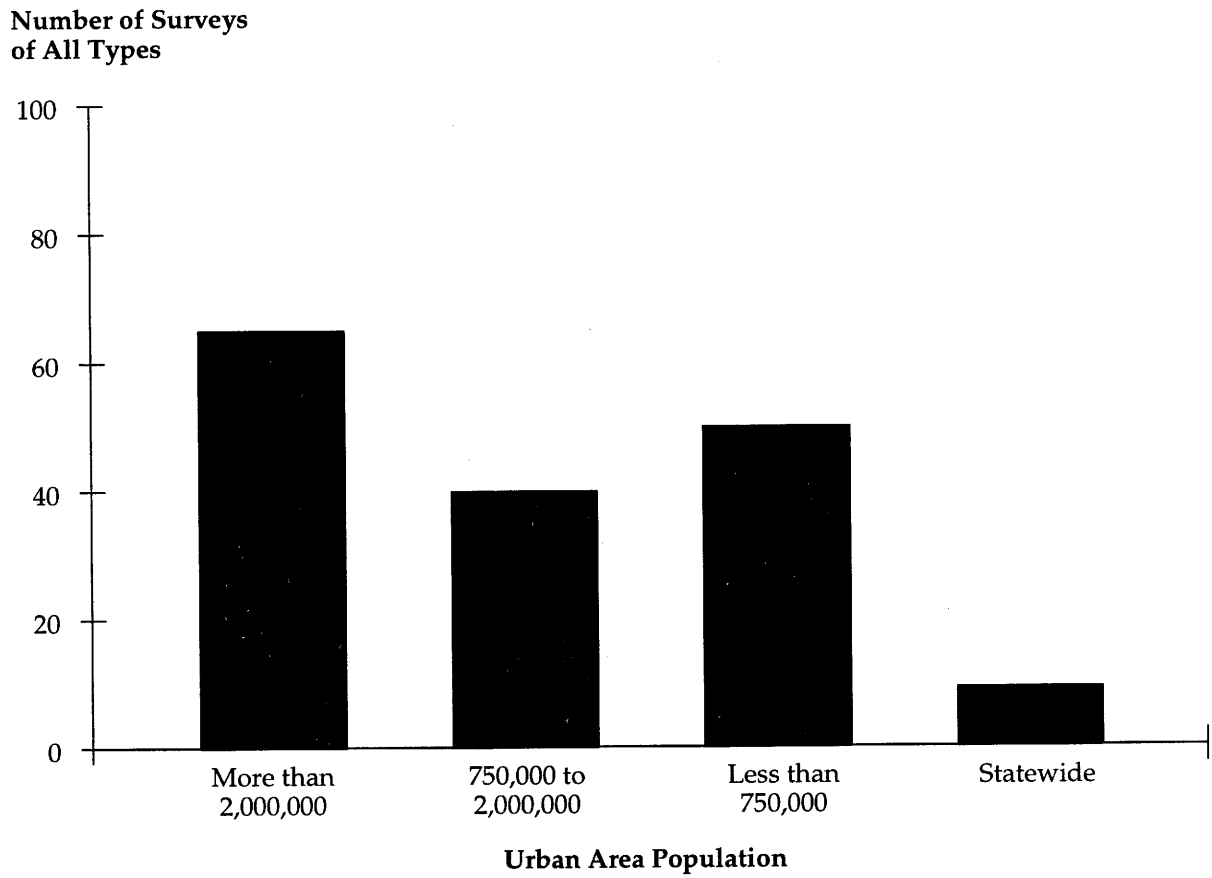
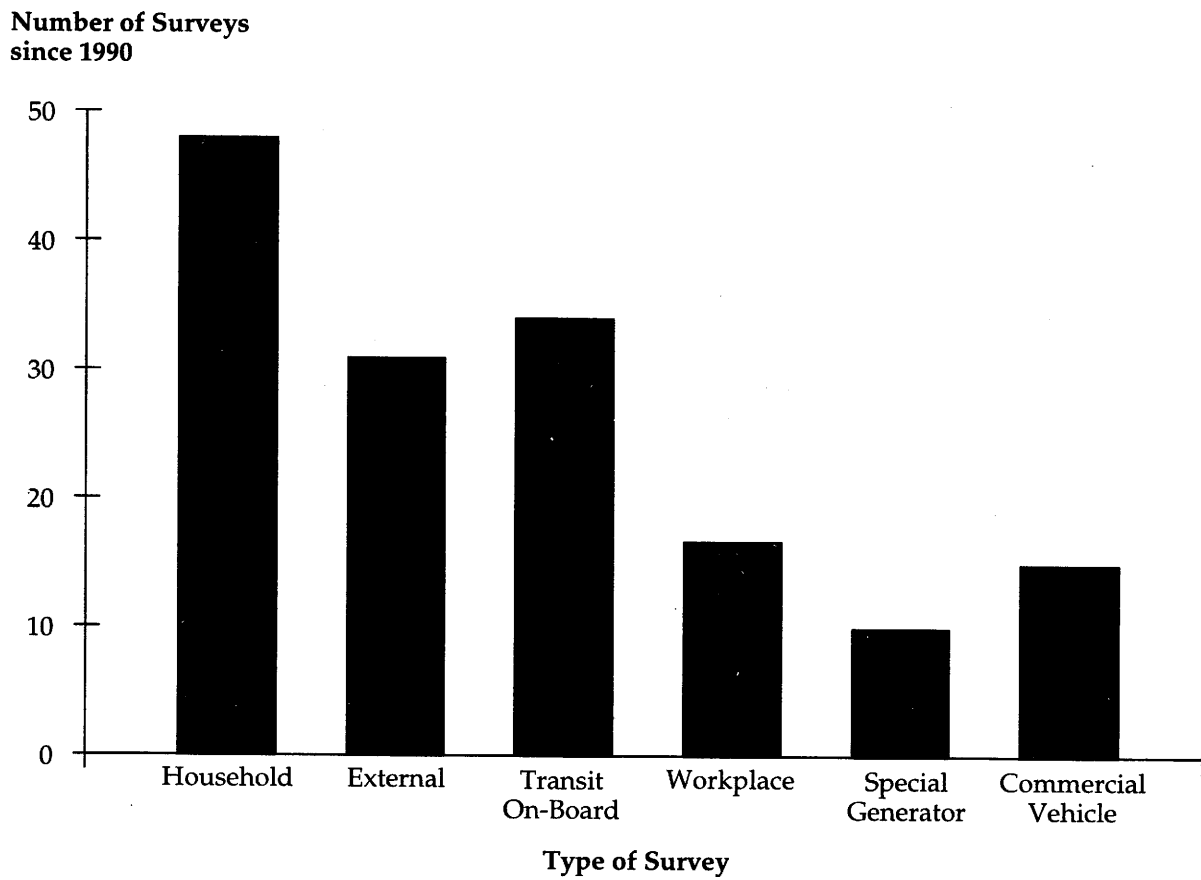


Figure 1.2 Types of Urban Area Travel Surveys Conducted Since 1990



many smaller urban areas of the need to collect data on travel behavior for modeling purposes.

Minneapolis-St. Paul, Houston, and Portland, OR are examples of urban areas that have employed a comprehensive data collection program where a household travel survey has been augmented by auxiliary surveys and data collection efforts. The result is a well-rounded data collection program where different types of travel surveys are used in a carefully coordinated manner to support a travel demand forecasting process. Such comprehensive data collection efforts are valuable, both as models and as sources of information activities, for other MPOs that may not have yet undertaken similar travel survey activities.

Of particular note is the introduction of statewide surveys that have been carried out in recent years in support of statewide planning efforts. Statewide travel models are becoming increasingly common as states around the country, both large and small, are finding such models useful. Travel models covering an entire state require statewide data collection efforts. Though not all have undertaken statewide travel model development efforts, several states including California, Florida, Indiana, New Hampshire, Ohio, and Oregon have undertaken data collection efforts using household and/or external travel surveys. Other states are considering such efforts.

Table 1.2 Metropolitan Planning Organization and State Travel Surveys Since 1990

Urban Area	Type of Survey							Other
	Household	External	Transit On-Board	Work Place	Special Generator	Commercial Vehicle		
Albuquerque	Yes		Yes					
Amarillo	Yes	Yes		Yes	Yes	Yes	Yes	
Atlanta	Yes	Yes	Yes	Yes			Yes	
Baltimore	Yes	Yes						
Boise	Yes		Yes					
Boston	Yes	Yes	Yes					
Brownsville	Yes	Yes		Yes		Yes		
Buffalo	Yes	Yes	Yes					
Charleston, WV	Yes	Yes	Yes					Attitudinal survey
Charlotte			Yes					
Chicago	Yes		Yes					Travel Time
Cincinnati	Yes	Planned 1997	Yes					
Cleveland	Yes		Yes	Yes				
Columbus		Yes	Yes					CBD Tripmaking
Dallas-Ft. Worth	Yes	Yes	Yes	Yes				Stated Preference
Denver	Planned Spring 1997		Yes					Boulder Household Survey
Des Moines	Yes	Yes	Yes	Yes				
Detroit	Yes	Yes	Yes			Yes	Yes	
El Paso	Yes			Yes	Yes			
Fort Collins	Yes							
Harrisburg	Yes	Yes				Yes		
Hartford								No recent surveys
Houston	Yes	Yes	Yes	Yes	Yes		Yes	
Indianapolis	Yes	Yes						
Jackson, MS		Yes						
Kansas City	Yes		Yes	Yes				Travel Time, Vehicle Occupancy

**Table 1.2 Metropolitan Planning Organization and State Travel Surveys Since 1990
(cont.)**

Urban Area	Type of Survey						Other
	Household	External	Transit On-Board	Work Place	Special Generator	Commercial Vehicle	
Little Rock	Yes	Yes			Yes		Travel Time, Vehicle Occupancy
Los Angeles	Yes		Yes		Yes		
Louisville	Yes	Yes	Yes				
Miami	Yes	Yes	Yes				Use of Lojack device
Milwaukee	Yes	Yes	Yes			Yes	
Minneapolis-St. Paul	Yes	Yes	Yes	Yes	Yes		Counts, Vehicle Classification, Speed
New Haven							No recent surveys
New Orleans			Yes				Visitor
New York	Yes						1990 NPTS Oversampling
Norfolk	Yes						
Orlando		Yes					
Philadelphia	Planning	Yes	Yes			Yes	Travel Time
Phoenix			Yes		Yes	Yes	Travel Time, Vehicle Occupancy, Parking
Pittsburgh	Yes						Stated Preference
Portland, OR	Yes						
Raleigh-Durham	Yes						
Reno	Yes	Yes	Yes				Visitor
Sacramento	Yes		Yes				Vehicle Classification
Salt Lake City	Yes						
San Antonio	Yes	Yes		Yes	Yes	Yes	
San Diego	Yes	Yes					Want Truck, Tourist
San Francisco	Yes	Yes	Yes	Yes	Yes	Yes	Revealed and Stated Preference
San Juan	Yes	Yes	Yes	Yes			
Seattle	Panel		Yes				
Sherman-Denison, TX	Yes	Yes		Yes		Yes	

**Table 1.2 Metropolitan Planning Organization and State Travel Surveys Since 1990
(cont.)**

Urban Area	Type of Survey						
	Household	External	Transit On-Board	Work Place	Special Generator	Commercial Vehicle	Other
Steam Boat Springs		Yes					
St. Louis	Yes		Yes				
Tampa-St. Petersburg	Yes					Yes	
Toledo							No recent surveys
Tucson	Yes			Yes			
Tyler, TX	Yes	Yes		Yes	Yes	Yes	
Washington, D.C.	Yes	Yes	Yes	Planned	Yes		
Wichita							No recent surveys

Statewide Surveys

State	Type of Survey						
	Household	External	Transit On-Board	Work Place	Special Generator	Commercial Vehicle	Other
California	Yes	Yes					
Florida		Yes					
Georgia		Yes					
Indiana	Yes						
New Hampshire	Yes						
Ohio		Yes					
Oregon	Yes						
Vermont	Yes						

2.0 Household Surveys

2.0 Household Surveys

■ 2.1 Recent Examples

Household surveys are the most commonly used survey method for collecting travel data. They involve contacting households by telephone, mail, or in person, and asking about the travel behavior of all of the members of the household over a one- or two-day period.¹

All but two of the large MPOs have carried out household surveys since 1990 (the two remaining MPOs in this group, Philadelphia and Phoenix, carried out surveys between 1986 and 1989.) About two-thirds of the smaller (Groups 2 and 3) MPOs surveyed have carried out household surveys since 1990. Some MPOs in these groups were contacted specifically because it was known that they had conducted a survey so the sample probably overstates the actual proportion of MPOs which have carried out such surveys. Overall, the largest MPOs have apparently been the most diligent about conducting surveys, due to available resources and to the greater extent of problems confronting large urban areas. It also appears that new survey efforts and practices generally are first introduced into the largest MPOs, and then gradually spread over time into smaller urban areas. In particular, a select few of the larger MPOs have been at the forefront of revising and expanding both the nature and the scope of household surveys.

A tabular summary of the household surveys reviewed for this report is provided in Appendix B, with individual summaries for each urban area contained in Appendix C.

The sample size of each household survey is given in Table 2.1, along with the year of the survey and approximate cost. Samples in the size range of 2,000 to 3,000 are most common for the larger metropolitan areas. Medium and smaller urban areas typically have samples that are in the range of 1,000 to 2,000 households. A few metropolitan areas, such as Los Angeles and Milwaukee, have undertaken surveys using a much larger sample size. This larger sample size permits a greater stratification of submarkets without losing statistical significance.

¹See Chapter 6 of the *Travel Survey Manual* for information on the design and conduct of household travel and activity surveys.

Table 2.1 Recent Household Surveys

MPO Group	Urban Area	Year	Sample Size	Approximate Cost (\$) ¹
Group 1 (> 2,000,000 population)	Atlanta	1991	2,400	225,000
	Baltimore	1993	2,700	400,000
	Boston	1991	3,800	360,000
	Chicago	1990	19,314	750,000
	Cleveland	1994	1,600	
	Dallas/Fort Worth	1996	6,000	750,000
	Detroit	1994	7,400	800,000
	Houston	1994	2,443	275,000
	Los Angeles	1991	16,086	1,300,000
	Miami	1993	2,650	150,000
	Minneapolis-St. Paul	1990	9,746	
	New York	planned 1996	12,000	
	Philadelphia	none ²		
	Phoenix	none ²		
	Pittsburgh	1990	450	33,000
	San Diego	1995	2,049	217,000
	San Francisco	1990	10,900	900,000
	Seattle	panel ³	1,700	
	St. Louis	1990	1,400	150,000
	Tampa	1991	1,800	
Washington, DC	1994	4,800	585,000	
Group 2 (750,000 - 2,000,000 population) ⁴	Buffalo	1993	2,700	180,000
	Cincinnati	1995	3,000	225,000
	Denver	planned 1997	6,000	760,000 ⁵
	Kansas City	1991	1,221	80,000 ⁶
	Indianapolis	1990	1,000	
	Louisville	1990	2,643	170,000
	Milwaukee	1991	17,500	1,200,000
	Norfolk	1994	2,500	
	Portland, OR	1994/1995	4,485	
	Raleigh-Durham	1994	2,000	270,000
	Sacramento	1991	4,000	380,000
	Salt Lake City	1993	3,082	300,000
	San Antonio	1990	2,643	N/A
	San Juan	1990	1,610	200,000

Table 2.1 Recent Household Surveys (cont.)

MPO Group	Urban Area	Year	Sample Size	Approximate Cost (\$)
Group 3 (< 750,000 population) ⁴	Albuquerque	1992	2,000	130,000
	Amarillo	1990	2,590	
	Boise	1994	1,500	
	Brownsville, TX	1990	1,411	
	Charleston, WV	1993	1,500	
	Des Moines	1991	1,139	
	El Paso	1994	2,510	
	Fort Collins	1995	1,000	68,000
	Harrisburg	1992	1,161	
	Honolulu	1996	4,000	
	Little Rock	1993	856	48,000
	Reno	1991	1,050	
	Sherman-Denison, TX	1991	2,289	
	Tucson	1993	1,913	215,000
	Tyler, TX	1991	2,646	

¹ Approximate cost corresponds, in most cases, to the cost of consultant services.

² These MPOs have not carried out household surveys since 1990.

³ Seattle has been carrying out panel surveys (see Chapter 4) of households since 1989.

⁴ MPOs listed in these groups are only those MPOs that have carried out household surveys since 1990.

⁵ This includes \$600,000 for the cost of a 5,000-household survey and \$160,000 for the cost of an additional 1,000-household transit on-board survey to obtain household travel data.

⁶ This figure does not include an additional \$20-30,000 of internal staff time.

■ 2.2 Variations in Survey Administration Methods

When household travel surveys first began to be carried out, the practice was for interviewers to personally go to people's houses to ask the questions. While this method is the most accurate means of getting household data, it is also both time consuming and expensive. For nearly all household surveys today, survey participants are recruited by telephone. In most cases, results are also retrieved by telephone although several MPOs have opted to have results returned by mail. Three times more MPOs in Group 1 use telephone retrieval than mail retrieval, while about twice as many MPOs in Groups 2 and 3 use phone retrieval rather than mail retrieval (cf., Appendix B). Of the MPOs surveyed that collect results over the telephone, about half have requested that respondents also send their diary forms back by mail, mostly so that the survey staff can refer to the forms for clarification as necessary. Table 2.2 provides a list of MPOs and the particular kind of survey administration procedures employed.

Recent survey efforts have included some innovative administration techniques. Denver and San Francisco are experimenting with administering household travel surveys to on-board transit users. These on-board surveys are used as a supplement to telephone recruiting, in order to over-sample transit riders. In addition, MPOs increasingly are beginning to use some sort of CATI (computer aided telephone interview) technology to collect household survey data. CATI allows responses to be verified for consistency and permits more complex surveys to be conducted by incorporating more elaborate branching than is possible in manual surveys. CATI also facilitates automatic geocoding as the respondent is answering the interviewer's questions. One example of the use of CATI technology is Baltimore's inclusion of geocoding as soon as a respondent identifies the location of an activity.

Another variable of interest is the time of year during which the survey was conducted. Roughly 80 percent of MPOs conducted their surveys at least partially during the Spring season and over half were conducted entirely during Spring; most of the rest were conducted partially or entirely during Fall. In only a few cases did the survey period include Summer or Winter months. Spring and Fall correspond with the most common traffic data collection periods and also represent time periods when schools are in session and respondents are least likely to be on vacation. Nevertheless, given the increasing interest in air quality, some agencies are now concerned about the importance of travel data in Summer or Winter, periods when air quality problems are most acute.

Further results from this analysis of recently conducted household travel surveys suggest the following points:

- Most MPOs did not use incentives as a means of encouraging people to participate in a survey. Among the twelve areas that did, incentives included small amounts of money (\$1-\$5), maps of the metropolitan area, and lottery tickets.
- Almost all MPOs hired an outside consultant to administer the survey.
- The cost of a typical travel survey is consistently on the order of \$100 per household.

Table 2.2 Methods of Household Travel Surveys

Urban Area Size	Urban Area	Recruitment Method	Retrieval Method	Survey Forms Returned?	Type of Diary	Incentive
Group 1 (>2,000,000 population)	Atlanta	phone	phone	No	Travel (1-day)	None
	Baltimore	phone	phone	No	Travel (1-day)	None
	Boston	phone	mail	Yes	Activity (1-day)	Lottery ticket
	Chicago	mail	mail	Yes	Travel (1-day)	None
	Cleveland	phone	phone	Yes	Activity (1-day)	\$2.00 per person
	Dallas/Ft Worth	phone	phone/mail	Yes	Activity (1-day)	None
	Detroit	phone	phone	No	Activity (1-day)	None
	Houston	phone	phone	Yes	Activity (1-day)	None
	Los Angeles	phone	phone	No	Activity (1-day)	None
	Miami	phone	mail	Yes	Travel (1-day)	\$2.00
	Minneapolis - St. Paul	phone	phone	No	Travel (1-day)	None
	New York (1994)	phone	phone	Yes	Travel (2-day)	\$5.00 per wave
	New York (1996)	phone	phone	No	Activity (1-day)	None
	New York (1989)	phone	phone	No	Travel (1-day recall)	None
	Pittsburgh	phone	phone	Yes	Travel (1-day)	Yes
	San Diego	phone	phone	No	Travel	None
	San Francisco (1990)	phone	phone	No	Travel (1, 3 or 5 days)	\$5.00 for 3 or 5 day survey
	San Francisco (1996)	phone/transit	phone/mail	Yes	Time Use (2-day)	\$2.00 per person
	Seattle	phone (panel)	mail	Yes	Activity (2-day)	No
	St. Louis	phone	phone	Yes	Travel (1-day)	Map
Tampa	mail	mail	Yes	Travel (1-day)	Map	
Washington, D.C.	phone	phone	No	Travel (1-day)	Map	

Table 2.2 Methods of Household Travel Surveys (cont.)

Urban Area Size	Urban Area	Recruitment Method	Retrieval Method	Survey Forms Returned?	Type of Diary	Incentive	
Group 2 (750,000 to 2,000,000 population)	Buffalo	phone	mail	Yes	Travel (1-day)	None	
	Cincinnati	phone	phone	No	Activity (1-day)	None	
	Denver	phone/transit	phone	Not yet decided	Activity (1-day)	Not yet decided	
	Indianapolis	phone	phone		Travel (1-day)	None	
	Kansas City	phone	mail	Yes	Travel (1-day)	\$1, \$2, gifts	
	Louisville						
	Milwaukee	phone/home	phone/home	Yes	Travel (1-day)	None	
	Portland OR	phone	phone	Yes	Time-Use (2-day)	None	
	Raleigh-Durham	phone/transit	phone		Time-Use (2-day)	None	
	Sacramento	phone	phone	No	Travel (1-day)	\$1.00	
	Salt Lake City	phone	mail	Yes	Activity (1-day)	None	
	San Antonio	phone	phone	Yes	Travel (1-day)	None	
	San Juan	home	phone/home	No	Travel (2-day)	Lottery for prizes	
	Group 3 (<750,000 population)	Albuquerque	phone	mail	Yes	Travel (1-day)	None
		Amarillo	phone	phone	Yes	Travel (1-day)	None
Boise		phone	phone	No	Activity (1-day)	None	
Brownsville, TX		phone	phone	Yes	Travel (1-day)	None	
Charleston, WV							
Des Moines		mail	mail	Yes	Travel (1-day)	\$100 drawing	
El Paso		phone	phone	Yes	Travel (1-day)	None	
Fort Collins		mail	mail	Yes	Travel (1-day)	None	
Harrisburg		mail	mail	Yes	Travel (1-day)	None	
Honolulu		phone	phone	No	Activity (1-day)	pen	
Little Rock		phone	mail	Yes	Travel (1-day)	None	
Reno							
Sherman-Denison, TX		phone	mail	Yes	Travel (1-day)	None	
Tucson		phone	phone	No	Travel (1-day)	None	
Tyler, TX		phone	mail	Yes	Travel (1-day)	None	

Table 2.2 Methods of Household Travel Surveys (cont.)

Urban Area Size	Urban Area	Recruitment Method	Retrieval Method	Survey Forms Returned?	Type of Diary	Incentive
State	California	phone	phone	No	Travel (1-day)	\$1.00
	Indiana	phone	phone	No	Travel (1- and 14-day)	None
	New Hampshire	phone	phone	No	Activity (1-day)	None
	Oregon	phone	phone	Yes	Activity (2-day)	None
	Vermont	mail	mail	Yes	Travel (1-day)	None

■ 2.3 Variations in Survey Type and Content

In addition to variations in survey administration methods, there are numerous variations possible in the types of data that are collected in a household travel survey. These variations depend on the specific data needs of the travel model to be developed and the unique transportation issues facing the metropolitan area. For example, if an area is in non-attainment of air quality standards, it may be desirable to collect data on vehicle make, age, and mileage accumulation so that improved emissions modeling can be carried out. If an important issue for the MPO is to mitigate congestion by encouraging the use of non-motorized means of transportation, the household survey can include questions about bicycle and walking trips. Other variables of interest include whether households record data for one day or for multiple days, whether weekends are included, and whether data are collected for infants and young children.

Another important issue in survey design is whether respondents are surveyed about trips or about activities. The traditional *trip-based* survey gathers information on people's trips over some time period, including the trip purpose, using either diary or recall methods. More recently, *activity-based* surveys have come into widespread use. These surveys gather essentially the same information as trip-based surveys, but they ask people to record all the activities to which they needed to travel rather than all the trips they took. Activity-based surveys have been found to be more successful at jogging respondents' memories and gathering complete information about trips. A third type of survey, the *time-use* survey, is a more recent phenomenon. The time-use survey gathers information on all activities in which respondents participate during a set time period, whether at home or elsewhere. Unlike the so-called activity-based survey, the time-use is a true "activity" survey in the sense that it supports modeling of household activity patterns rather than just the modeling of trip-making.

Examining this sample of household travel surveys, the following points are suggested:

- *Activity-based* surveys are commonly being used in place of *trip-based* surveys as a means of collecting more accurate and complete details on trips and trip purposes.
- A few MPOs, including Portland and other Oregon urban areas, San Francisco, and Raleigh-Durham, are experimenting with *time-use* surveys in order to support modeling of household activity patterns. Other MPOs and states have considered time-use surveys but have rejected them based on privacy concerns or because of their complexity. Consequently, the degree to which time-use surveys will be routinely accepted is not yet clear.
- Most household surveys have asked for information regarding only weekday travel. Households are usually assigned one or two days between Monday and Friday, although in a few cases, responses have been limited to mid-week days.
- A few MPOs have asked for some weekend data. In Portland, OR, respondents were asked to complete activity and travel diaries for two consecutive one-day periods, with

household assignments allocated so as to cover the full seven days of the week. A person, therefore, could be asked to respond for the two weekend days, or for one weekend and one week day. The importance of weekend data collection appears to be growing as agencies realize a need to analyze special conditions and examine variations in travel behavior over the entire week.

- Most surveys have asked households to record travel information only for a 24-hour period, although some have asked for 48-hour data in order to examine day-to-day fluctuation in trip-making patterns.
- Interest in the issue of non-motorized trips appears to be growing rapidly. For surveys for which details were available, over 75 percent of those conducted since 1994 asked for information on non-motorized trips, compared to only 30 percent of surveys conducted between 1990 and 1993.
- Most surveys asked for trip or activity information only for household members at least five years old. A number of more recent studies, though, have asked for trip information for every member of the household regardless of age, including Portland, OR, Cincinnati, San Francisco, Honolulu, Tucson, and New Hampshire.
- About half of the MPOs collected information related to air quality concerns such as the age and make of vehicles used for specific trips.

■ 2.4 Frequency of Household Surveys

The average time between household travel surveys carried out by the MPOs contacted was 14 years, with some MPOs surveying as frequently as every five or six years. There has been a significant increase in the use of household surveys in the last five years, as shown in Table 2.3 and illustrated in Figure 2.1 for the two larger population groups of MPOs. During the ten years between 1980 and 1989, thirteen of the 21 largest MPOs surveyed households to collect travel data; nineteen of these MPOs conducted household surveys during the first half of this decade. Household survey collection also appears to have increased substantially in medium and smaller urban areas during the 1990s.

Regions may be grouped into general categories based on the frequency of their surveys (Figure 2.2; see Appendix B, Table B.1 for the dates of earlier surveys). These categories are similar to those noted in the 1990 Purvis study, although some regions would now fall into different categories due to the strong increase in survey activity in the last five years. For those regions which have conducted household travel surveys recently, the general patterns of survey administration have been:

1. A ten-year census cycle. Four regions (Atlanta, Chicago, Minneapolis-St. Paul, and San Francisco) conducted surveys within two years of both 1980 and 1990, coincident with the U.S. census.

-
2. A ten-year off-census cycle. Six regions (Baltimore, Dallas-Ft. Worth, Denver, Houston, Portland, OR, and San Diego) conducted surveys both in the mid-1980s and mid-1990s.
 3. Frequent (less than eight years between surveys). Milwaukee, New York, Phoenix, Baltimore, and Washington, D.C. have conducted consecutive surveys within six or seven years since the mid-1980s (San Francisco also fits into this category, as a survey is planned for early 1996). Prior to the latest surveys, however, most of these regions had not conducted a major household survey since the 1960s.
 4. Ongoing/tracking surveys. Seattle has been conducting an ongoing panel survey, in which the same group of people is surveyed repeatedly. MPOs in Dallas-Fort Worth, Houston, and San Francisco, as well as the New York Metropolitan Transit Authority, have also implemented surveys which are designed as the first wave of a panel study. Interest in longitudinal survey designs such as panel studies appears to be increasing among MPOs, as these can give insight into how people's travel behavior changes over time.
 5. Infrequent (more than 13 years between surveys). Six regions (Cincinnati, Cleveland, Detroit, Honolulu, Los Angeles, and Tucson) had last conducted surveys about 15 years before their most recent survey. A number of other regions had not conducted a survey since the 1960s or early 1970s. At least eight had never carried out a household survey; these tended to be small to medium-size urban areas.

Table 2.3 Household Surveys Carried Out by Type and Size of Organization

MPO Size	1980 to 1989	1990 to Present
Large (Group 1) (>2 million)	13	19
Medium (Group 2) (750,000 - 2 million)	4	14
Small (Group 3) (<750,000)	2	15
Statewide	0	5
Total	19	53

Figure 2.1 Household Surveys
By Urban Area Size and Time Period

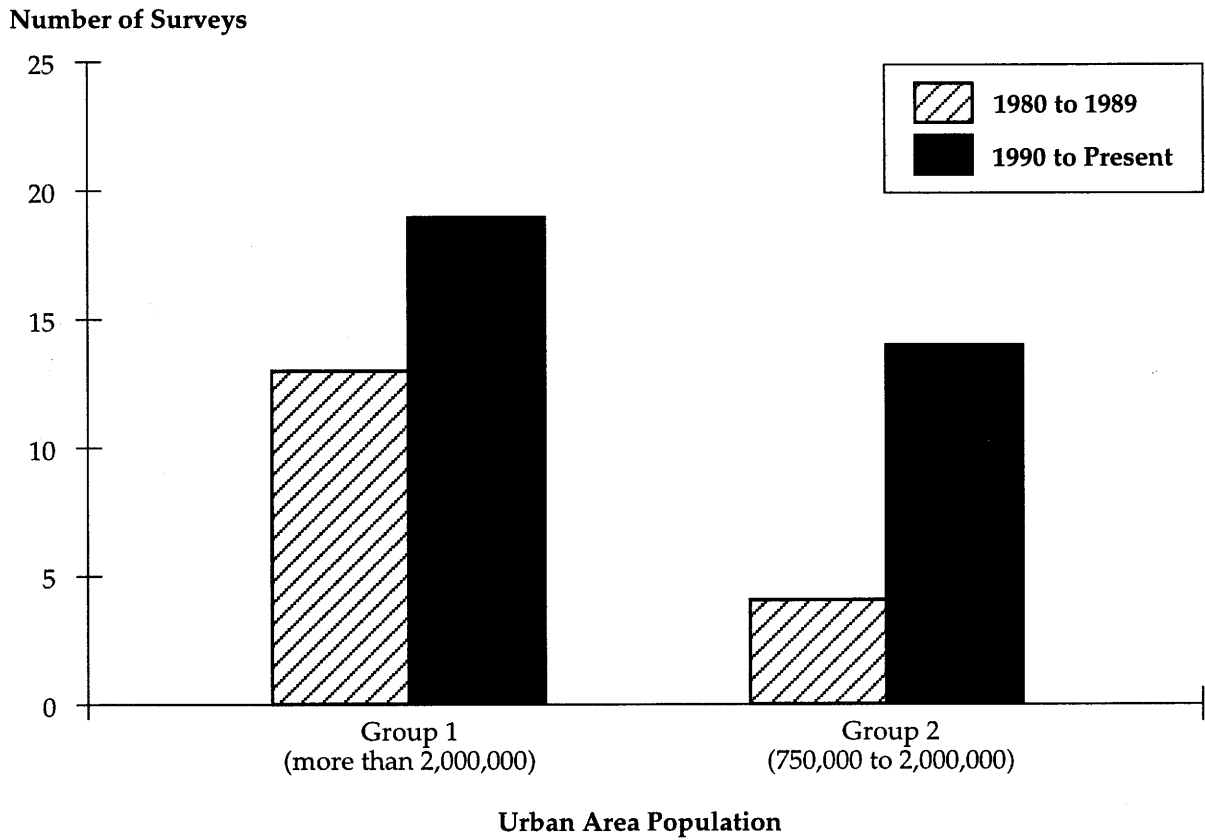
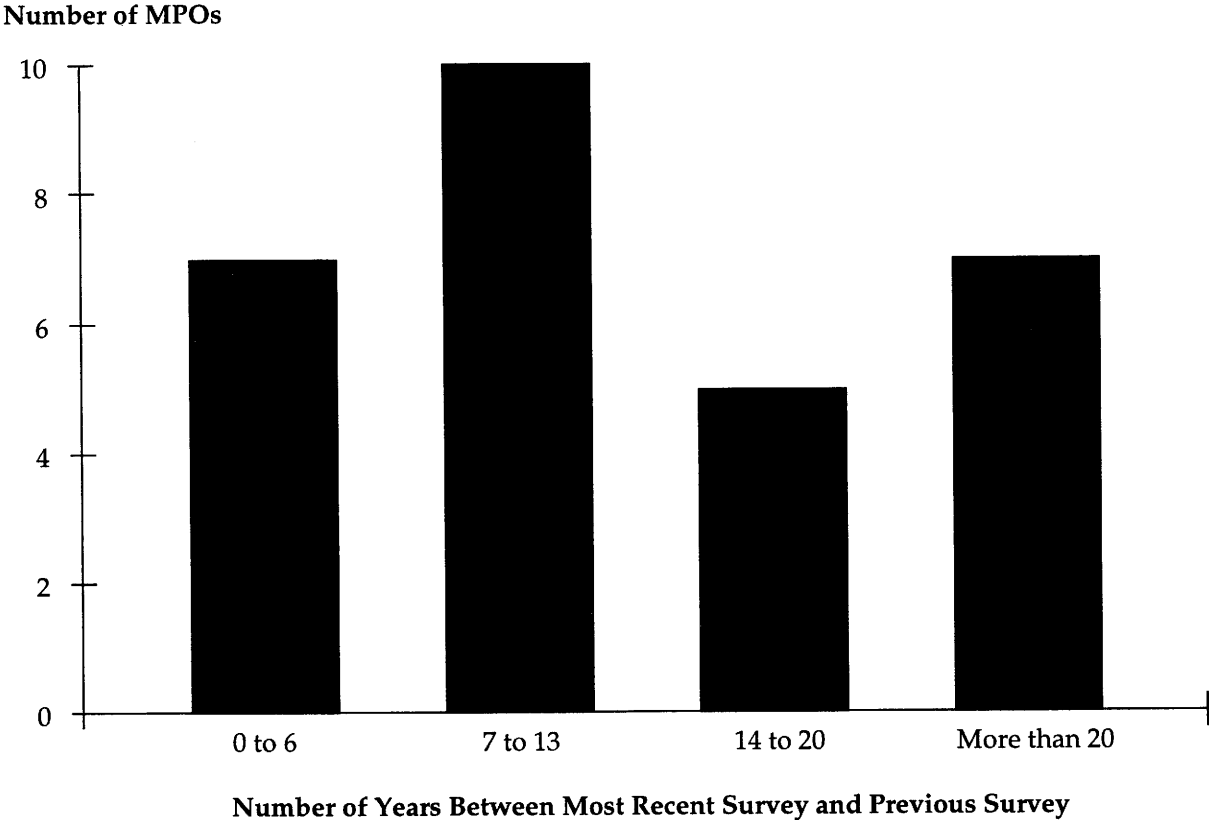


Figure 2.2 Length of Time Between Household Surveys



3.0 External Surveys

3.0 Vehicle Intercept and External Station Surveys

■ 3.1 Recent Examples

Vehicle intercept and external surveys, also called cordon line surveys, involve identifying a subset of vehicles using a particular roadway and then collecting information about the trip for which that roadway is being used.¹ Intercept or external surveys are another means of collecting travel data, especially for travel entering urban areas.

This type of survey has become a very popular means of gathering travel behavior data. Only three MPOs reported carrying out external surveys prior to 1990. Since that year, 31 MPOs and five states have carried out this type of survey, as tabulated in Table 3.1. Summaries of these urban areas and state surveys are contained in Appendix D.

Table 3.1 The Use of External Surveys by MPOs and States

Group 1 > 2,000,000 population	Group 2 750,000 to 2,000,000 Population	Group 3 < 750,000 Population	Statewide
Atlanta	Buffalo	Amarillo	California
Baltimore	Cincinnati	Brownsville, TX	Florida
Boston	Columbus	Charleston, WV	Ohio
Dallas-Fort Worth	Indianapolis	Des Moines	Oregon
Detroit	Louisville	Fort Collins	Georgia
Houston	Milwaukee	Harrisburg	New Hampshire
Minneapolis - St. Paul	Orlando	Jackson	Vermont
San Diego	San Antonio	Little Rock	
San Francisco	San Juan	Reno	
Washington, DC	Tampa-St. Petersburg	Sherman-Denison, TX	
		Tyler, TX	

¹ See Chapter 7 of the *Travel Survey Manual* for additional information on vehicle intercept and external station surveys.

■ 3.2 Procedures for Survey Administration

Two primary methods are used in collecting travel data in an intercept survey, with variations existing on each of these methods. The first method is to stop cars at an external station. When this method is used, drivers can be either interviewed while the vehicle is stopped, or handed a survey form to be filled out and returned by mail. The states of Georgia and New Hampshire have used handheld computers to record roadside interviewee responses. The second method of administering this type of survey is to record the license plate numbers of a sample of vehicles passing an external station, converting these license plate numbers into addresses, and then mailing a survey form to the address. License plate recording is usually done manually, but recent experiments in using portable computers, video cameras, and machine vision technology have been carried out with some success. The procedure used to administer an external survey by MPOs carrying out such surveys is summarized in Table 3.2.

Table 3.2 Number of MPOs Using Various External Survey Methods

Survey Method	Number of MPOs
Vehicles Stopped	
Interviewed	9
Handed Postcards	4
Both Interviews and Postcards	3
Total	16
Licenses Recorded	
Manually	4
Using Technology	4
Total	8

4.0 Other Types of Travel Surveys

4.0 Other Types of Travel Surveys

A number of other types of surveys can be used to supplement the information provided by traditional household and external travel surveys. Two newer types of surveys that are receiving considerable current attention for use in travel demand analyses are:

- Panel surveys; and
- Stated preference surveys.

Other specialized and more traditional types of travel surveys that can be used to obtain additional data for particular travel markets include:

- Visitor surveys;
- Transit on-board surveys;
- Commercial vehicle surveys;
- Workplace surveys; and
- Special generator surveys.

As with household surveys, there also has been an increased use in recent years of these other types of travel surveys.

■ 4.1 Panel Surveys

In a panel survey, the same respondents are interviewed about their travel behavior over a period of time, usually every one to three years. A panel survey, therefore, provides time series or longitudinal information for a given set of households or individuals rather than simply cross-sectional data for a single point in time.¹ Changes in travel patterns in response to socioeconomic and transportation changes are more easily detected in a panel survey than in a traditional household survey. Procedures normally are taken in a panel survey to account for people moving out of the area or simply dropping out of the survey. Panel surveys, historically, have been used more extensively outside the United States than in this country. Domestically, Seattle has the longest history in using a panel survey. Other urban areas, such as San Francisco and New York are either beginning to implement panel surveys or are only in the first round of interviews. Other MPOs, such as Houston, are considering implementing panel surveys. Portland, OR has conducted three recent home interview surveys (1977, 1985, and 1994), thereby providing three relatively

¹ Longitudinal surveys are described as part of Chapter 13, Emerging Use of New Types of Survey Data, of the *Travel Survey Manual*.

recent “waves” of information. The sampling for the Portland surveys, though, was not explicitly designed to solicit information from the same set of households. The Portland surveys, therefore, are a repeated cross-sectional survey, and not a true panel survey.

■ 4.2 Stated Preference Surveys

In a stated preference survey, individuals are asked to state how they would likely respond to a given set of new transportation conditions.² Stated preference surveys, therefore, are in contrast to the more common and traditional revealed preference surveys. Stated preference surveys have been extensively used in private sector market research, and more recently for transportation purposes within Europe. In this country, they currently are being used to evaluate user responses to alternative new transportation technologies, especially electric vehicles, intelligent transportation systems (ITS), and congestion pricing. Stated preference surveys also have been used in the U.S. to evaluate new transit services or higher tolls.

Stated preference surveys sometimes are carried out as a part of a household or panel survey, but also can be conducted independently of any other type of survey. Portland, OR, and the State of New Hampshire conducted a series of stated preference surveys in conjunction with their household surveys. Dallas is planning to conduct a stated preference survey as part of its travel demand forecasting process. San Francisco has used a combined stated preference/revealed preference methodology in its most recent survey, conducted as part of a planned congestion pricing experiment on the San Francisco-Oakland Bay Bridge.

■ 4.3 Visitor Surveys

Visitor surveys are useful in areas where tourist travel represents a significant number of trips being made.³ Two examples of places that recently have carried out visitor surveys are New Orleans and Tampa. In some surveys, visitors are intercepted at hotels, while in other cases they are interviewed at locations where they congregate, such as an information center or major destination.

²See Chapter 13 of the *Travel Survey Manual* for a more detailed discussion of stated preference surveys.

³Issues associated with the design and conduct of visitor surveys are described in Chapter 11 of the *Travel Survey Manual*. See Chapter 13 of the *Travel Survey Manual* for a more detailed discussion of stated preference surveys.

■ 4.4 Transit On-Board Surveys

Transit on-board surveys involve survey personnel riding transit vehicles and handing out small post-card sized survey forms to passengers as they board.⁴ These forms generally are then collected as passengers leave the vehicle, but the survey also can be administered with the forms being mailed back. The questions asked can include where passengers boarded the transit vehicle, where they intend to get off, the purpose of their trip, etc. Some on-board surveys ask about the mode of access to the transit service, and some ask about passenger attitudes toward the service.

Transit agencies tend to have lead responsibility for carrying out on-board surveys. Since this assessment of recent travel survey experience involved contacting MPOs, the data obtained on the use of transit on-board surveys in these urban areas may not be complete. Transit authorities, however, frequently cooperate with MPOs in carrying out on-board surveys of their passengers to gather data for regional travel demand models. This is the case for the surveys reported here.

Of the MPOs contacted, 34 reported that they have carried out an on-board transit survey since 1990. A selection of these surveys is listed in Table 4.1 and summarized in Appendix E. In most cases, the data collected were used either in whole or in part to support a regional travel demand modeling effort. Five MPOs indicated that they included attitudinal questions, and six used the mailback approach for collecting data. The number of responses varies in size, with a high of 35,000 collected in the San Francisco survey.

■ 4.5 Commercial Vehicle Surveys

Fifteen of the MPOs contacted have undertaken surveys of commercial vehicles since 1990, as listed in Table 4.2 and summarized in Appendix F.⁵ Some of these surveys have involved only trucks, while others have also included taxicabs. Houston has carried out one of the more extensive surveys of commercial vehicles, although Chicago, Phoenix, and San Francisco also have conducted large surveys of commercial vehicles. In Houston, about 40 percent of the truck operators in the area and about 30 percent of the taxi and limousine operators were recruited. This resulted in 500 truck and 300 taxi and limo survey responses.

⁴ Transit on-board surveys are discussed in Chapter 8 of the *Travel Survey Manual*.

⁵ The design and conduct of commercial vehicle surveys are described in Chapter 9 of the *Travel Survey Manual*.

Table 4.1 Transit On-Board Surveys¹

Urban Area	Year	Attitudinal Questions	Used for Modeling	Mailback	Responses	Other Surveys	Incentive
Atlanta	1989		Yes	Yes	8,775		
Albuquerque	1990	Yes	Yes				
Boise	1991	Yes	No				
Boston	Varies						No
Buffalo	1995	No	Yes	Yes	12,500		No
Cincinnati	1995	No	Yes	No	8,767	Park & Ride Lot Surveys	Yes
Denver	1996		Yes		500		
Detroit	1995	Yes	Yes	Yes	9,729		\$100.00 Raffle
Honolulu	1991		Yes	Yes			
Lake Tahoe	1991 and 1993		Yes	No	1,441		
Milwaukee	1991		Yes		12,000		No
Minneapolis-St. Paul	1990						
New Hampshire	1994	No	Yes	Yes			No
Orange County, CA	1990 - 1994					Park & Ride Lot Surveys	
Philadelphia	1991	Yes	Yes	Yes	9,400	Station-based	
Phoenix	1995-96	Yes	Yes	Yes	13,000		

Table 4.1 Transit On-Board Surveys¹ (cont.)

Urban Area	Year	Attitudinal Questions	Used for Modeling	Mailback	Responses	Other Surveys	Incentive
Sacramento	1995				20,000		
San Diego	1995	Yes	Yes	No	43,000		
San Francisco ²	1992				35,000	Station-based	Vacation
Seattle	1992 -1993		To extent possible.		40 - 50%		

¹ Partial listings; several transit authorities indicated that they survey selected routes every year.

² Survey conducted by Bay Area Rapid Transit District (BART).

Table 4.2 Commercial Vehicle Surveys

Urban Area	Year of Survey	Number of Responses	Survey Method	Other
Amarillo	1990	444	Travel log, survey form	
Atlanta	1996	1,000	Travel log, mail-back	Some on-site retrieval
Brownsville	1990	404	Travel log, survey form	
Detroit	1994		Interview	At weigh stations
El Paso	1994	188	Telephone interview	
Harrisburg	1992	240	Interview	At weigh station
Houston	1994	900	Mail and telephone	
Milwaukee	1992	2,500	Mail out/mail back	
Phoenix	1991	720 0.5% sample of all commercial vehicles	Diary mailed, telephone retrieval	Included US mail trucks

Table 4.2 Commercial Vehicle Surveys (cont.)

MPO	Year of Survey	Number of Responses	Survey Method	Other
Philadelphia	1991	2,500	Interview / mail back	
San Antonio	1990	400	Trip logs	
San Francisco	1991	10,200	2,200 telephone-mail-out-mail back; 8,000 roadside interview	
Sherman-Denison, TX	1991	141	Telephone	
Tampa/St. Petersburg	1991 - 1992		Truck count/land use method	
Tyler, TX	1991	81	Telephone	
PRE-1990 Commercial Vehicle Survey				
Chicago	1986	3,500	Mail out/mail back	

■ 4.6 Workplace Surveys

Seventeen MPOs of those contacted indicated that they have carried out workplace surveys, with a selection of these surveys listed in Table 4.3 and described in Appendix G. These surveys usually involve a package of survey instruments: for the employer, for the employees, and for visitors to the site.⁶ In most cases, employers agree to be responsible for distributing and collecting employee survey forms. Workplace surveys also usually involve a count of vehicles by type (personal auto, truck, etc.) on the day the survey is carried out.

In a workplace survey, employers can be asked about the types of transportation policies that are in place (i.e., flex-time, transit subsidy, carpooling incentives, etc.) with Des Moines being an example of such a practice. In Houston, the survey distinguished between whether an employer was in a free-standing building or in a non-free standing one. This approach is based on the results of a study carried out by the Texas Transportation Institute (TTI) in the Beaumont-Port Arthur area. The TTI study suggests that home-based non-work and non-home-based trip attraction rates for non-freestanding workplaces can be as much as 43 percent lower than freestanding workplaces. (Pearson, D.)

The number of employers involved and the number of survey responses from employees vary depending on the scope and purpose of the survey. In Kansas City, 47 employers participated in a downtown workplace survey which resulted in 4,604 survey responses from employees. In Dallas and Minneapolis, around 250 employers from throughout each metropolitan area were recruited to participate.

In discussing workplace surveys, it is important to note that employer-based transportation data are being collected in many urban areas as a part of Employee Commute Option (ECO) and other forms of employment-site travel management programs. These data, however, typically are not yet being used in travel demand modeling.

■ 4.7 Special Generator Surveys

Eleven MPOs of those contacted specifically indicated use of special generator surveys to support their use of travel demand modeling:

- Amarillo
- Houston

⁶ See Chapter 10 of the *Travel Survey Manual* for additional information on workplace and establishment surveys.

Table 4.3 Workplace and Establishment Surveys¹

Urban Area	Year	Number of Employers	Types of Surveys	Stratification	Other
Amarillo	1990	170	Employees Visitors	Area Type and Industry Type	
Brownsville, TX	1990	74	Employees Visitors	Area Type and Industry Type	
Dallas-Ft. Worth	1994	278	Employees Visitors	Area type Establishment type Number of employees	
Des Moines		79 employers 14,000 responses			Incentive: Drawing for \$100
Houston	1994 - 1995	350	Employers Employees Visitors Delivery Truck		
Kansas City	1993	47 employers 4604 responses			
Minneapolis-St. Paul		250	Employees Visitors	Geographic rings Employment class Number of employees	
San Antonio	1990	282	Employee Visitors	Industry Type Geographic areas	

Table 4.3 Workplace and Establishment Surveys (cont.)

MPO	Year	Number of Employers	Types of Surveys	Stratification	Other
San Francisco	1995		Employees		Employers with 100+ employees
Sherman-Denison, TX	1991	217	Employees Visitors	Area Type and Industry Type	
Tucson	Annually since 1989	Up to 228	Employees	Major Employers (100+ FTE's)	Mandated by local Travel Reduction Ordinances (TRO)
Tyler, TX	1991	179	Employees Visitors	Area Type and Industry Type	
Washington, D.C.	1996	15	Employees		

¹ Partial listing.

-
- Los Angeles
 - Minneapolis - St. Paul
 - Washington, DC
 - El Paso
 - San Antonio
 - San Francisco
 - Tyler, TX
 - Phoenix
 - Little Rock

In addition, the Kentuckiana Regional Planning and Development Agency in Louisville conducted a study to document local trip generation rates for selected land uses. Some of the data obtained in this study are applicable to travel modeling.

Airports are most frequently targeted as the special generator of traffic. Other types of development that have been surveyed are shopping malls, sports complexes, and regional recreation facilities. Some of these special generator surveys have only involved traffic counts and classification by time of day, while others involved interviewing users of the facility.

5.0 Travel Survey Practice Outside the United States

5.0 Travel Survey Practice Outside the United States

Many innovations in travel surveys have been first applied outside the United States, often in Europe and Australia. They then have been subsequently applied within this country after a base of proven experience has developed. For example, experience with both stated preference and household activity surveys has evolved in this manner. It is instructive, therefore, to examine current travel survey practices outside the United States.

Travel survey work outside the United States, as in this country, focuses primarily on household travel surveys. Such surveys have been carried out recently not only in industrialized countries such as Germany and Australia, but also in countries such as Chile and Turkey. However, a review conducted by Axhausen of recent household travel surveys conducted in Europe and Australia provides useful insights into the possible future directions of such surveys conducted in this country.¹

There is still considerable debate within the United States as to whether to use a trip-based or an activity-based approach to household surveys. Axhausen reports that stage-based (recording unlinked trips) and half-tour (recording all trips and activities while going to the furthest point from home as one half-tour) approaches have been increasingly used abroad with success. In Germany and Switzerland, activity-chain based modeling approaches have been used. Such approaches are only now beginning to be introduced within this country, as evidenced by recent work in Boise, Idaho.

Europeans, according to Axhausen, are reviving the practice of collecting extensive parking data. "The recent recognition of the special importance of parking and parking costs on mode choice has resulted in an increasing amount of detail about parking in current travel diaries. This is a return to the beginnings of travel diary, when parking detail was prominent."

Axhausen also points out that although it has become common practice to ask about the number of people in a vehicle for a given trip, "it is surprising that the cost implications of these additional persons are not established." Axhausen also recommends that household travel surveys need to collect better information on telecommunications links that may exist within a household. These include the existence of additional telephone lines, a computer modem, message pager, mobile phone, etc. These telecommunication capabilities, are becoming increasingly important in how they affect travel behavior.

As far as finding out employment information from respondents, Axhausen suggests that new definitions will become necessary "as the definitions of work are changing and as

¹ Axhausen, Kay. *Travel Diaries: An Annotated Catalogue*: University of London, Centre for Transport Studies, May 1994.

many persons are engaged in multiple commitments which become relevant to transport modeling.”

Certain desired travel model input data are sometimes obtained differently in other countries than in the United States. For example, in Germany questions about household income usually are not asked directly. Instead, other questions are asked that suggest household income based on socio-demographic characteristics of the household members, the type and tenure of housing, and the level of education.

6.0 Conclusions

6.0 Conclusions

The findings of this analysis of recent travel surveys can be summarized into the following observations:

1. There was a major slowdown, starting in the 1970s and accelerating in the early 1980s, in virtually all forms of data collection to support urban area travel demand forecasting. Little new travel data were collected, and consequently there was only limited interest in developing improved data collection procedures.
2. Starting in the mid to late 1980s, there has been a gradual resurgence of activity by Metropolitan Planning Organizations in the collection of new travel data. These recent data collection activities were in part a response to a recognition that existing databases had become increasingly obsolete and no longer represented either current travel patterns or current socioeconomic and demographic conditions. New data collection activities undertaken in the 1990s, including the conduct of statewide travel surveys, have been motivated in large part by metropolitan and statewide planning provisions contained in the Intermodal Surface Transportation Efficiency Act of 1991 as well as by the Clean Air Amendments of 1990.
3. The resurgence of interest in travel-related data collection has been led by the metropolitan planning organizations representing larger metropolitan areas, those having a population in excess of 2 million persons. Increasingly though, new travel surveys are now also being conducted in medium-size and smaller urban areas, as well as at the statewide level.
4. The primary focus of recent and current travel surveys has been the household travel survey. There also, however, has been an increase in the use of other survey types. Most frequently, these include vehicle intercept and external station surveys and transit on-board surveys, but the number of commercial vehicle surveys, workplace surveys, visitor surveys, and special generator surveys has increased as well. These other forms of travel surveys are being used to supplement the data collected from the household travel survey. Travel surveys, thus, are now becoming a comprehensive set of interrelated survey activities rather than relying primarily on a single data source to support the development and application of a set of travel demand models.
5. This renewed activity in travel surveys has been accompanied by a refinement in the manner in which household and other types of surveys are being conducted. The in-home interview has now been replaced by use of sophisticated combinations of telephone and mail approaches.

These refinements in survey administration also include:

- The use of more sophisticated and stratified samples in order to analyze potentially important travel sub-markets;
 - The use of computer-assisted surveys that permit more elaborate survey branching and, therefore, the collection of greater amounts of information with greater reliability, lower cost, and less time; and
 - The geocoding of data and, therefore, the introduction of geographic information systems (GIS) as the underlying data management foundation for future travel demand systems.
6. There has been a broadening of survey scope. This includes the collection of additional data on vehicle characteristics, the inclusion of walking and bicycling as potentially important modes of travel, and the use of activity-based surveys.
 7. Fundamentally new types of travel surveys are now receiving considerable interest and are likely to be increasingly used in the future. In addition to activity-based surveys, these include panel surveys, stated preference surveys, and even the use of traditional market research focus groups. These represent the current leading edge of travel survey techniques. Panel surveys, in which essentially the same sample is repeatedly surveyed periodically over time, permit the development of time-series or longitudinal data that are useful in examining responses to transportation policies and to changing economic conditions. Panel and stated preference surveys are being used both independently from and as a supplement to more traditional forms of travel surveys.
 8. Increasing emphasis in travel surveys is being placed on the interrelationships among all trips that may be taken by individuals, regardless of purpose, time of day, or even day of week. This shift of interest is a response both to the increasingly complex forms of trip chaining that are now occurring and to the potential of in-home activities, including various forms of telecommunications, to substitute for activities requirements travel. Time-use surveys document the linking of household and individual activities and facilitate the development of travel demand models that are based on the household or individual rather than the traffic analysis zone as the fundamental unit of analysis.
 9. Transportation planning increasingly is oriented to managing the efficient use of existing transportation infrastructure, and the introduction of new technologies such as intelligent transportation systems and electric and other forms of alternatively fueled vehicles. Stated preference surveys and market research focus groups permit a more in-depth examination of individual reactions to fundamentally new transportation technologies and policies than do traditional revealed preference surveys. The use of computer-assisted surveying, particularly the introduction of multi-media capabilities, is permitting far more sophisticated and realistic stated-preference surveys to be conducted than has been possible in the past.
 10. While considerable innovation in the practice of travel surveys has taken place in recent years, it is not likely that a new equilibrium or plateau has yet been reached.

Just the opposite, in fact, may be the case. An examination of emerging survey practices outside the United States and current trends in the development of multi-media, networked computer systems both indicate that the changes that will occur in travel surveys over the next decade are likely to be far more dramatic than the changes that have taken place in the last few years and that are now occurring:

- Geographic information systems are likely to become the standard approach to managing, manipulating, and displaying all forms of transportation related information;
- Activity patterns involving all forms of telecommunications as well as transportation will be analyzed; and
- Travel demand modeling systems are likely to become increasingly disaggregate in their orientation, focusing more on individuals, households, vehicles, and trips of all types and length; a shift from the present aggregate perspective of traffic analysis zones and travel volumes.

It is important that this full-range of travel survey enhancements be accompanied by training so that new technological approaches can be effectively and efficiently implemented by other metropolitan areas and states, especially medium-size and smaller urban areas. Guidelines and training in the application of these emerging forms of travel surveys would be especially helpful to all urban area and state transportation agencies, but especially to those agencies that do not possess the personnel and financial resources necessary to develop this expertise on their own. This training includes the demonstration of emerging computer-based survey approaches.

This technical assistance also should include the support of a clearinghouse containing information on travel surveys that either have been conducted or are being planned by Metropolitan Planning Organizations and state departments of transportation. While the results of this current analysis and other assessments of recent survey experience continue to be documented in the traditional research report format, this clearinghouse ultimately should be electronically-based so that updates can immediately become accessible to the full range of potential users.

This analysis of recent travel surveys indicates that the changes in data collection practices now taking place are motivated by the desire to support enhanced travel demand model systems. Consequently, the introduction of a new generation of travel demand analysis capabilities such as are being developed under Track C of the Travel Model Improvement Program will require the simultaneous introduction of a new generation of travel survey practices. The challenge for the Track D Data Research Program of the Travel Model Improvement Program is to both assist in the introduction of today's leading edge survey practices and leverage emerging computer system capabilities that will permit the introduction of still newer travel survey approaches.

Appendix A

Agency Contacts

Table A.1 Agency Contacts

Urban Area	Agency Name	Abbreviation	Contact	Phone
Albuquerque	Middle Rio Grande Council of Governments	MRGCOG	Barry Ives	(505) 247-1750
Amarillo	Texas Transportation Institute	TTI	David Pearson	(409) 845-3326
Atlanta	Atlanta Regional Commission	ARC	Patti Schropp	(404) 364-2500
Baltimore	Baltimore Metropolitan Council	BMC	Gene Bandy	(410) 330-1750
Boise	Ada Planning Association	APA	Erv Olen	(208) 345-5274
Boston	Central Transportation Planning Staff	CTPS	Ian Harrington	(617) 973-7100
Buffalo	Niagara Frontier Transportation Committee	NFTC	Tim Trabold	(716) 856-2026
Charleston, WV	Regional Intergovernmental Council			(304) 354-8191
Charlotte	University of North Carolina at Charlotte		David Hartgen	(704) 547-4308
Charlotte	Charlotte Department of Transportation		Terry Lathrop	(704) 336-2261
Chicago	Chicago Area Transportation Study	CATS	Ed Christopher/ Andy Plummer	(312) 793-3467 (312) 793-3470
Cincinnati	Ohio-Kentucky-Indiana Regional Council of Governments	OKI COG	Cheng-I Tsai	(513) 621-6300
Cleveland	Northeast Ohio Area Coordinating Agency	NOACA	Eugenia Pogany	(216) 241-2414
Columbus	Mid-Ohio Regional Planning Commission	MORPC	Robert Lawler	(614) 228-2663
Dallas/Ft. Worth	North Central TX Council of Governments	NCTCOG	Ken Cervenka	(817) 695-9266
Denver	Denver Regional Council of Governments	DRCOG	Erik Sabina	(303) 455-1000
Des Moines	Des Moines Area Metropolitan Planning Organization		Kevin Gilchrist	(515) 237-1316
Detroit	Southeast Michigan Council of Governments	SEMCOG	Alex Bourgeau	(313) 961-4266
El Paso	Texas DOT Regional Office	TxDOT	Judy Ramsey	(915) 774-4200
Fort Collins	North Front Range Transp. & Air Qual. Council	NFRT&AQC	Kathleen Reavis	(303) 221-6608
Harrisburg	Tri-County Regional Planning Commission	TCRPC	Dave Royer	(717) 234-2639
Hartford	Capitol Region Council of Governments	CRCOG	Tom Maziarz	(203) 522-2217
Honolulu	Oahu Metropolitan Planning Organization	OMPO	Gordon Lum	(808) 587-2015
Houston	Houston-Galveston Area Council	HGAC	Gerry Bobo	(713) 993-4571
Indianapolis	City of Indianapolis		Laurie Miser	(317) 327-5151
Jackson	Central Mississippi Planning and Development District		Larry Smith	(601) 981-1514
Kansas City	Mid America Regional Council	MARC	Steve Noble	(816) 474-4240
Lake Tahoe	Tahoe Regional Planning Agency	TRPA		(702) 588-6782

Table A.1 Agency Contacts (cont.)

Urban Area	Agency Name	Abbreviation	Contact	Phone
Little Rock	Central Arkansas Regional Transportation Study	CARTS	John Hoffpauer	(501) 372-3300
Los Angeles	Southern California Association of Governments	SCAG	Murray Goldman	(213) 236-1847
Louisville	Kentuckiana Reg. Planning & Develop. Agency	KIPDA	Norman Nezelkewicz	(502) 266-6084
Miami	Metro Dade	MPO	Frank Baron	(305) 375-4507
Milwaukee	Southeastern WI Reg. Planning Commission	SEWRPC	Ken Yunker	(414) 547-6721
Minneapolis-St Paul	Metropolitan Council		Mark Filipi	(612) 229-2725
New Haven	South Central Reg. Council of Governments			(203) 234-7555
New Orleans	Louisiana State University		Peter Stopher	(504) 388-8898
New Orleans	Regional Planning Commission	RPC	Jim Harvey	(504) 568-6611
New York	New York Metropolitan Transportation Council	NYMTC	Ray Ruggieri	(212) 938-3305
Norfolk	Hampton Roads Planning District Commission		Dwight Farmer	(804) 420-8300
Ohio DOT	Ohio Department of Transportation	ODOT	Chuck Gebhardt	(614) 466-7825
Orlando	Florida Department of Transportation	FDOT	Susan Sadighi	(407) 623-1085
Philadelphia	Delaware Valley Regional Planning Commission	DVRPC	Tom Walker	(215) 592-1800
Phoenix	Maricopa Association of Governments	MAG	Ken Howell	(602) 506-4117
Pittsburgh	Southwestern PA Reg. Planning Commission	SPRPC	Ted Treadway	(412) 391-5590
Portland, OR	Metropolitan Service District	METRO	Keith Lawton/ Jean Sumida	(503) 797-1700
Providence	Rhode Island Department of Administration		Joe Schall	(401) 277-2694
Raleigh-Durham	Triangle Transit Authority		Joe Huegy	(919) 406-1710
Reno	Washoe County Regional Transp. Commission			(702) 348-0400
Sacramento	Sacramento Area Council of Governments	SACOG	Gordon Garry	(916) 457-2264
Salt Lake City	Wasatch Front Regional Council	WFRC	Mick Crandall	(801) 292-4469
San Antonio	San Antonio-Bexar County Metropolitan Planning Organization		Dan Hebner	(210) 227-8651
San Diego	San Diego Association of Governments	SANDAG	Bill McFarland	(619) 595-5300
San Francisco	Metropolitan Transportation Commission	MTC	Chuck Purvis/ Kuo-Ann Chiao	(510) 464-7731

Table A.1 Agency Contacts (cont.)

Urban Area	Agency Name	Abbreviation	Contact	Phone
San Juan	San Juan Metropolitan Planning Organization			(809) 723-3760
Seattle	Puget Sound Regional Council	PSRC	Neil Kilgren	(206) 464-7964
St. Louis	East-West Gateway Coordinating Council		Martin Altman	(314) 421-4220
Tampa-St Petersburg	Florida DOT District 7 Office	FDOT	Danny Lamb	(813) 975-6437
Toledo	Toledo Metro. Area Council of Governments	TMACOG	William Knight	(419) 241-9155
Tucson	Pima Association of Governments/AZ DOT	PAGTPD/ADOT	Rita Hiderbrand/ Richard B. Corbitt	(602) 628-5315
Washington, D.C.	Metropolitan Wash. Council of Governments	MetroWashCOG	Bob Griffiths	(202) 962-3200

Appendix B

Tabular Summary of Recent Household Travel Surveys

Table B.1 Household Travel Surveys Since 1990: Administration Methods

Urban Area	Year	Estimated 1992 Population	Sample Size	Season	Hired Consult.	Recruitment Method	Retrieval Method	Survey Forms Returned?	Incentive	Cost (\$)	Year of Previous Survey
Group 1 MPOs (>2,000,000 population)											
Atlanta	1991	3,143,000	2,400		Yes	phone	phone	No	None	225,000	1980
Baltimore	1993	2,434,000	2,700	Fall	Yes	phone	phone		None	400,000	1987
Boston	1991	3,211,000	3,800	Spring	Yes	phone	mail	Yes	Lottery ticket	360,000	1963
Chicago	1990	7,561,000	19,314		No	mail	mail	Yes	None		1979
Cleveland	1994	2,221,000	1,600		Yes	phone	phone			Part of 450,000	1978
Dallas/Fort Worth	1996	4,215,000	6,000	Spring	Yes	phone	phone/ mail	Yes	\$2.00 per person	750,000	1984
Detroit	1994	4,308,000	7,400	Spring	Yes	phone	phone	No	None	800,000	1980
Houston	1994	3,530,000	2,443	Fall-Winter-Spring	Yes	phone	phone	Yes	None	275,000	1984
Los Angeles	1991	15,048,000	16,086		Yes	phone	phone	No	None		1976
Miami	1993	3,309,000	2,650		Yes	phone	mail	Yes	\$2.00	150,000	
Minneapolis-St. Paul	1990	2,618,000	9,746	Summer	Yes	phone	phone	No	None		1982
New York (NYCTA)	1994-present	19,670,000	2,000		Yes	phone	phone	Yes	\$5.00 per wave		
New York (NYMTC)	Planned 1996	19,670,000	12,000	Fall	Yes	phone	phone	No	None		
New York (MTA)	1989	19,670,000	20,500		Yes	phone	phone	No	None		1963-1964
Pittsburgh	1990	2,406,000	450		Yes	phone	mail	Yes	Yes	33,000	
San Diego	1995	2,601,000	2,049	Spring	Yes	phone	phone	No	None	217,000	1986
San Francisco	1990	6,179,000	10,900		Yes	phone	phone	No	\$5.00/HH (multi-day)	900,000	1981
San Francisco	1996	6,179,000	3,800	Winter-Spring	Yes	phone/ transit	phone/ mail	Yes	TBD		1990
Seattle	ongoing	2,124,000	1,700		Yes	phone (panel)	phone	Yes	\$2.00 per person		
St. Louis	1990	2,519,000	1,400	Spring	Yes	phone	phone	Yes	No	180,000	1965-1966
Tampa	1991	2,107,000	1,800		Yes	mail	mail	Yes	Map		
Washington, D.C.	1994	4,360,000	4,800		Yes	phone	phone	No		585,000	1988

Table B.1 Household Travel Surveys Since 1990: Administration Methods (cont.)

Urban Area	Year	Estimated 1992 Population	Sample Size	Season	Hired Consult.	Recruitment Method	Retrieval Method	Survey Forms Returned?	Incentive	Cost	Year of Previous Survey
Group 2 MPOs (750,000-2,000,000 population)											
Buffalo	1993	1,194,000	2,700	Spring	Yes	phone	mail	Yes	None	Part of 180,000	1973
Cincinnati	1995	1,845,000	3,000	Fall	Yes	phone	phone	No	None	225,000	1978
Denver	Planned 1997	1,715,000	>5,000	Spring	Yes	phone/transit	phone	TBD	TBD	760,000	1985
Indianapolis	1990	915,000	1,000		Yes	phone	phone	Yes			1964
Kansas City	1991	1,617,000	1,221	Fall	Yes	phone	mail	Yes	\$1, \$2, gifts	80,000	
Louisville	1990	968,000	2,643	Spring-Summer						170,000	1964
Milwaukee	1991	1,810,000	17,000		No	phone/home	phone/home	Yes	None	1.2M	1984-1985
Norfolk	1994	1,400,000	2,500		Yes						
Portland, OR	1994/1995	1,605,000	4,451	Spring and Fall	Yes	phone	phone	Yes	None	600,000	1984-1985
Raleigh-Durham	1994	909,000	2,000		Yes	phone/transit	phone	Yes	None	270,000	
Sacramento	1991	1,563,000	4,000	Spring	Yes	phone	phone	No	\$1.00	380,000	
Salt Lake City	1993	1,128,000	3,082	Spring	Yes	phone	mail	Yes	None	300,000	
San Antonio	1990	1,379,000	2,643	Winter-Spring		phone	phone	Yes			1969
San Juan	1990	1,328,000	1,610	Fall-Winter	Yes	home	phone/home	No	Lottery for prizes	200,000	
Group 3 MPOs (<750,000 population)											
Albuquerque	1992	616,000	2,000		Yes	phone	mail	Yes	None	130,000	1962
Amarillo	1990	161,000	2,590			phone	phone	Yes			
Boise	1994	320,000	1,500	Spring	Yes	phone	phone	No	None		1960s
Brownsville	1990	106,000	1,411			phone	phone	Yes			
Charleston, WV	1993	253,000	1,500		Yes					Part of 120,000	
Des Moines	1991	406,000	1,139		Yes	mail	mail	Yes	\$100 drawing		

Table B.1 Household Travel Surveys Since 1990: Administration Methods (cont.)

Urban Area	Year	Estimated 1992 Population	Sample Size	Season	Hired Consult.	Recruitment Method	Retrieval Method	Survey Forms Returned?	Incentive	Cost	Year of Previous Survey
Group 3 MPOs (<750,000 population, cont.)											
El Paso	1994	628,000	2,510	Winter-Spring-Summer	Yes	phone	phone	Yes	None		
Fort Collins	1995		1,000	Spring	Yes	mail	mail	Yes	None	68,000	
Harrisburg	1992	601,000	1,161								
Honolulu	1996		4,000	Winter	Yes	phone	phone	No	Pen		1982
Little Rock	1993	526,000	856	Fall	Yes	phone	mail	Yes	None	48,000	1984
Reno	1991	269,000	1,050		Yes					Part of 165,000	
Sherman-Denison, TX	1991	<100,000	2,289			phone	mail	Yes			
Tucson	1993	690,000	1,913		Yes	phone	phone		None	215,000	1977
Tyler, TX	1991	<100,000	2,646			phone	mail	Yes			
Statewide Efforts											
California	1991		13,500		Yes	phone	phone	No	\$1.00		
Indiana	1995		1,000	Fall	Yes	phone	phone	No	None	75,000	
New Hampshire	1995		2,000		Yes	phone	phone	No	None		None
Oregon	1995		10,000		Yes	phone	phone	Yes	None		
Vermont	1994		2,425		Yes	mail	mail	Yes	None		

Table B.2 Household Travel Surveys Since 1990: Type and Content

Urban Area	Type of Diary	Days of Week	Non-Motorized Trips Included?	Vehicle Data?	Age of Respondents	Notes
Group 1 MPOs (>2,000,000 population)						
Atlanta	Travel (1-day)	Weekdays	No	No	5+	Gulf War delayed survey
Baltimore	Travel (1-day)	Weekdays	No	No	5+	On-line geocoding techniques used.
Boston	Activity (1-day)	Weekdays	No	No	5+	Hard copies available
Chicago	Travel (1-day)	Thursday	No	No	14+	Self administered
Cleveland	Activity (1-day)	Weekdays	Yes	Yes		Designed as the first wave of a panel survey.
Dallas-Fort Worth	Activity (1-day)	Weekdays	No	No	5+	Designed as the first wave of a panel survey.
Detroit	Activity (1-day)	Weekdays	No	No	5+	Designed as the first wave of a panel survey.
Houston	Activity (1-day)	Weekdays	No	Yes	5+	Designed as the first wave of a panel survey.
Los Angeles	Activity (1-day)	Weekdays	No	No		No auto occupancy for passengers; no parking cost info for non-drivers
Miami	Travel (1-day)	Weekdays	No	No		Survey also looked at effects of Hurricane.
Minneapolis	Travel (1-day)	Weekdays	No	No	5+	Day-care trips; auto occupancy problem for <5 years old
New York (1994)	Travel (2-day)	Weekdays	Yes	No		Ongoing panel survey.
New York (1996)	Activity (1-day)	All (14% on weekend)	Yes	No		
New York (1989)	Travel (1-day recall)	Weekdays	No			
Pittsburgh	Travel (1-day)	Weekdays	Yes	Yes		
San Diego	Travel (1-day)	Weekdays	Yes	Yes		
San Francisco (1990)	Travel (1.5-day)	Weekdays	Yes	Yes	5+	Included 1,000 3-day and 500 5-day diaries.
San Francisco (1996)	Time-Use (2-day)	All	Yes	Yes	All	Designed as the first wave of a panel survey; combined RP/SP methodology.
Seattle	Activity (2-day)	Weekdays	Yes	Yes	All	Ongoing panel. Many attitudinal questions.
St. Louis	Travel (1-day)	Weekdays	No	No	No	
Tampa	Travel (1-day)	Tuesday-Thursday	No	No		Extensive public relations. SP questions.
Washington, D.C.	Travel (1-day)	Weekdays	No	No		Pre-notification letters.

Table B.2 Household Travel Surveys Since 1990: Type and Content (cont.)

Urban Area	Type of Diary	Days of Week	Non-Motorized Trips Included?	Vehicle Data?	Age of Respondents	Notes
Group 2 MPOs (750,000 - 2,000,000 population)						
Buffalo	Travel (1-day)	Tuesday-Thursday	No		5+	Special minority community efforts.
Cincinnati	Activity (1-day)	Weekdays	No	Yes	All	Will include additional on-board surveys of transit riders
Denver	Activity (1-day)		Yes			Add-on to 1990 NPTS
Indianapolis	Travel (1-day)	All	Yes	Yes	5+	Used St. Louis survey materials extensively.
Kansas City	Travel (1-day)			Yes		
Louisville		Weekdays			All	
Milwaukee	Travel (1-day)		No			Part of study for third crossing of Hampton Roads.
Norfolk						
Portland, OR	Activity (2-day)	All	Yes	Yes	All	First wave of a panel survey. SP questions.
Raleigh-Durham	Activity (2-day)	All	Yes	Yes		Considered non-phone homes, but too costly.
Sacramento	Travel (1-day)	Primarily weekdays	No	Yes		Built off statewide survey effort.
Salt Lake City	Activity (1-day)		Yes	No		
San Antonio	Travel (1-day)			No		
San Juan	Travel (2-day)	All	Yes		5+	Sample includes 110 home interviews for households not having a telephone
Group 3 MPOs (<750,000 population)						
Albuquerque	Travel (1-day)					
Amarillo	Travel (1-day)					
Boise	Activity (1-day)		No			
Brownsville	Travel (1-day)					
Charleston, WV						
Des Moines	Travel (1-day)		No	No		
El Paso	Travel (1-day)	Weekdays	Yes	Yes	5+	
Fort Collins	Travel (1-day)	Tues.-Thurs., Sat.-Sun.	Yes	No	5+	

Table B.2 Household Travel Surveys Since 1990: Type and Content (cont.)

Urban Area	Type of Diary	Days of Week	Non-Motorized Trips Included?	Vehicle Data?	Age of Respondents	Notes
Group 3 MPOs (<750,000 population, cont.)						
Harrisburg	Travel (1-day)					
Honolulu	Activity (1-day)	Weekdays	Yes	Yes	All	
Little Rock	Travel (1-day)		No	No		
Reno						
Sherman-Denison, TX	Travel (1-day)					
Tucson	Travel (1-day)	Weekdays, Saturday	Yes	Yes	All	
Tyler, TX	Travel (1-day)					
Statewide Efforts						
California	Travel (1-day)		No			
Indiana	Travel (1- and 14-day)	Weekdays (exc. 14-day)	No	Yes	5+	
New Hampshire	Activity (1-day)	Weekdays	Yes	Yes	All	Stated Preference and Revealed Preference
Oregon	Activity (2-day)	All	Yes	Yes	All	
Vermont	Travel (1-day)		No	No		

Appendix C

*Summary of Recent Household Travel/Activity Surveys
by Urban Area and State*

Summary of Recent Household Travel/Activity Surveys by Urban Area and State

This appendix provides an overview of household travel and activity surveys that have recently been and are soon to be conducted in the United States. This summary, though, is not intended to be an exhaustive listing of all household travel and activity surveys conducted by those organizations responsible for conducting travel surveys (e.g., State DOTs, MPOs, individual municipalities, transit agencies, private developers, etc.). Instead, this appendix provides an overview of many of the major survey efforts that have been conducted or that are planned.

■ Albuquerque, NM

The Middle Rio Grande Council of Governments, the MPO for the Albuquerque region, hired a consultant to conduct a household survey as part of a complete travel model update in 1992. Notable features of this survey are the inclusion of walk and bicycle trips in the travel diaries, and the use of GIS in checking the survey data. GIS allowed Albuquerque to discover that there was a locational bias in the telephone numbers called. All the listed phone numbers were from one area and the unlisted numbers from another.

After being recruited by telephone, households completed and mailed back travel diaries and a household socioeconomic survey. Households were not given any incentive to participate in the survey. Survey administrators used follow-up telephone calls to clarify the returned diaries and surveys where necessary.

Approximately 2,000 completed surveys were collected at an estimated cost of \$130,000. The sample was stratified by income, geographic location, and whether the phone number was listed. Because of budget constraints, an external survey was not conducted. However, the geographic area of the survey was widened to include those outlying areas that would be considered external generators within the travel model system.

■ Atlanta, GA

The Atlanta Regional Commission (ARC) conducted a household travel survey in 1991. Using the phone-mail-phone approach, 2,400 households were surveyed. Consultants

designed the survey instrument and performed the survey work for a cost of \$225,000 while ARC staff geocoded the origins and destinations of the households and trip segments.

■ Baltimore, MD

The Baltimore Regional Council of Governments conducted a household travel survey in the Fall of 1993. Households were recruited by telephone, assigned a survey date and mailed a trip diary form. The survey responses were then collected over the telephone a day or two after the survey travel day. Approximately two-thirds of the households contacted agreed to participate in the survey and approximately two-thirds of those who agreed to participate completed the data collection interview.

A notable feature of this effort was the use of on-line geocoding for the recording of survey responses. About 80 percent of the region had been geocoded at the time of the survey for the purposes of the emergency response system. The geocoding system allowed for very specific and accurate responses. For example, if a respondent responded they went to a McDonald's restaurant, a list of all the McDonald's locations would appear on the interviewer's screen.

All types of trips were recorded, including bicycle and walk trips for all household members five years of age and older. The survey travel days were Monday through Friday; no weekend trip information was collected. The agency anticipates that the survey data will be expanded using the household size and vehicle make information, and used to update the regional travel model. While mode split information was collected, the agency feels that an onboard survey will be required to collect additional data.

The agency paid a market research firm just under \$300,000 to conduct the survey. About \$100,000 in agency staff time was used for developing the survey, geocoding the remaining areas in the region, and analyzing the survey data.

■ Boise, ID

A household survey effort was completed in the Spring of 1994 by the Ada County Planning Association as part of the Bench/Valley Transportation Study in Boise. A consultant was contracted to design and conduct the household survey as part of the regional travel model update effort. This was the first household travel survey conducted in the region since the mid-1960s and the city has undergone tremendous growth since that time. In addition to travel information, a substantial amount of household and person information was collected from each household, which may be used to evaluate non-travel characteristics within Ada County.

A sample of 1,500 households was anticipated to be collected from the countywide region through random-digit telephone dialing. An initial interview was conducted to secure household participation in the survey, to obtain non-travel information about each household and the persons in the household, to identify a travel day for the household, and to schedule the trip diary callback interview. The interviewer then mailed a package to each participating household that included an explanation of the survey, trip diary cards for each household member, and directions to fill out the diaries. A trip diary callback interview was conducted at the scheduled times to obtain the travel information recorded on the trip diaries by each household member. Additional travel information, not recorded on the trip diaries, was also obtained. The responses collected were coded directly into a computer database using a Computer Aided Telephone Interview (CATI) system.

A pretest of the initial screener interview, trip diary, and the callback interview was conducted several months before the actual survey. This pretest was used to refine the survey methods and materials. As a result of the pretest, the wording of several questions was changed to reduce ambiguity and several questions were eliminated from the questionnaire. The trip diaries collected detailed travel information for all members of the household age five or above. Notable features of this survey include the disaggregation of pedestrian/walk trips into five different categories in order to properly classify these trips.

■ Boston, MA

The Central Transportation Planning Staff (CTPS) of Boston conducted a household travel survey in the Spring of 1991. The sample was stratified by household size, vehicle availability, and geographic area. Approximately 3,800 households, or 0.25 percent of the total households in the area, responded to the survey. A coupon redeemable for \$1 lottery tickets was used as an incentive to participate.

Households were recruited by telephone and instructed to fill out trip diaries for every household member over five years of age. The trip diaries were then mailed back when completed. Households were contacted again by telephone only to clarify written information on the trip diaries. Households were not asked about vehicle age or make, nor did they record weekend travel.

CTPS encountered a few problems during the course of the survey. For one, households were asked about the number of vehicles available during the telephone recruitment stage but this question was left off the trip diary forms. Also, due to confusion about the survey instrument instructions, some households did not submit trip diaries for each household member. However, having access to the written diary forms proved useful for correcting such discrepancies.

After expanding the data based on household size and number of vehicles, the number of transit trips was found to be overestimated. The agency speculates that this result may be due to transit riders being more likely to fill out travel surveys completely.

A consultant was paid approximately \$360,000 to conduct this survey.

■ Buffalo, NY

The Niagara Frontier Transportation Committee (NFTC) conducted a household travel survey in the Spring of 1993. The sampling design was intended to match the 1990 Census in combinations of household size and vehicle availability. Households in seven metropolitan zones were asked about household size and vehicle availability during the telephone recruitment stage of the survey to determine eligibility. After being assigned a specific travel day, participating households were mailed diaries which were then returned by mail. Very few follow-up telephone calls were required to clarify trip diary information. This procedure netted 2,703 usable household returns out of the nearly 460,000 households in the metropolitan region.

A consultant was hired for \$9,683 to establish the sampling framework. The total survey cost including staff time (\$36,725), temporary workers (\$15,238), and additional consulting work (\$119,240) was \$180,000. The temporary workers geocoded the survey forms and made follow-up telephone calls whenever necessary.

A special effort was made to reach out to the minority community. A minority neighborhood community service center recruited people to come to the center for travel behavior interviews. However, only six out of the 35 households requested for participation in this effort appeared for the test run so the NFTC concluded that this approach was not cost-effective.

One phenomenon which arose from this effort was that single-person households without vehicles tended not to return their trip diaries. These delinquent respondents were interviewed directly by telephone. In some cases, these respondents were elderly people who had not traveled outside their homes on the appointed day. The follow-up procedures were found to be useful for identifying such cases.

In the Fall of 1993, a supplemental travel diary survey was carried out on the seven college and university campuses within the metropolitan region. Students residing on campus were not recruited during the household travel survey conducted in the Spring. The trip diaries were to record off-campus travel; however, only 200 survey forms out of 10,000 distributed were returned. This data set will be used for anecdotal purposes but is not suitable for travel model estimation purposes.

■ California Statewide

The California Department of Transportation conducted a household travel survey in 1991. The data collected updates information gathered between 1976 and 1980. The updated travel survey contains information on trip generation rates, mode of travel

distributions, trip length data, vehicle occupancy rates, and a variety of other socioeconomic and travel-related data for both regional and inter-regional trips. The information will be used to refine regional and statewide travel model estimates and forecasts.

Approximately 13,500 household interviews were conducted throughout the state to collect weekday travel data. An additional 900 surveys were collected to update information on weekend travel information. The households were randomly chosen from 16 regions designed to represent all of the state's urban centers as well as rural areas. Survey participants then filled out trip diaries on their selected travel day and responses were collected during a follow-up telephone interview. Responses were entered using a Computer Assisted Telephone Interview (CATI) system to minimize data entry errors and respondent inconsistencies. Also, due to the diverse nature of the California population, interviews were conducted in a variety of languages including English, Spanish, Korean, Vietnamese, as well as Cantonese and Mandarin Chinese.

■ Chicago, IL

The Chicago Area Transportation Study (CATS) conducted a household travel survey of the six-county metropolitan region during the period from 1988 to 1991. The metropolitan region was divided into nine separate regions with each region being surveyed at different times during the four year time period of the survey effort. The survey was completed in-house using CATS staff with the assistance of a review panel consisting of academics. Data collected in the survey are being used for travel forecasting, descriptive analysis, and special studies.

The survey collected usable responses from over 19,000 households using a self administered mailback approach. This survey was completed for a fraction of the resources used in previous surveys which utilized field workers to conduct in-home interviews. Households sampled in the survey were randomly recruited using electric meter addresses. Trip diaries were mailed out to households agreeing to participate. On the given travel day (Thursday for all regions), trip diaries were to be completed for all members of the household age 14 and older. Trip diaries were then mailed back. The trip diaries solicited the respondent's telephone number for follow-up interviews, if necessary. Approximately 24 percent of the households sampled responded to the survey. Reminder letters were used to encourage participation among late respondents.

Notable features of this survey effort were the software developed by CATS to screen out inconsistencies and invalid data as the survey responses were entered into a computer, and the focus on non-work travel.

Additionally, CATS is currently collecting travel time and speed information on major network segments for model verification purposes. The segments are stratified by functional class and measurements are made using the floating car method.

■ Cincinnati, OH

The Ohio-Kentucky-Indiana Regional Council of Governments, the MPO for the Greater Cincinnati Area, conducted a household travel/activity survey in 1995 as part of a complete travel demand forecasting model update and a major investment study.

The household was the basic interview unit, for which four types of data were collected: household data, person data, activity data and trip data. Respondents were asked to report their activities for a 24-hour period on an assigned travel/activity diary day. The travel/activity diary days were assigned on weekdays from October 4, 1995 to November 30, 1995, excluding dates from November 21 through November 24. The diary data were retrieved from all household members regardless of age.

A random digit-dial telephone sample of the region was developed. The regional sample was a probability sample proportional to 1990 county household counts with an over-sample for the major investment study area.

After being recruited by telephone, each household was mailed the appropriate number of travel/activity diaries, along with an assigned travel/activity recording day. The full/travel/activity information for each household was collected over the phone in the evening following the assigned travel/activity recording day. All O-D data from interviews completed during the previous evening were geocoded the following day. If there were insufficient or inaccurate data to allow geocoding of origin or destination points of a trip segment, the respondent would be called back to clarify the information. Households were not given any incentive to participate in the survey.

Three thousand surveys were collected at a cost of \$225,000.

■ Des Moines, IA

The Iowa Department of Transportation (IDOT) contracted with a consultant to conduct a household travel survey in 1991. Households were selected randomly and mailed out survey materials. Survey respondents filled out information about the household and completed trip diaries for their selected day of travel. These materials were then mailed back. Follow-up telephone calls were used to clarify survey responses where necessary. Over 1,100 usable responses were collected as part of the survey effort. A drawing for \$100 was used as an incentive to participate in the survey.

■ Dallas/Ft. Worth, TX

The North Central Texas Council of Governments (NCTCOG) is conducting a household survey in the Spring of 1996, which is part of a regional travel survey program that has

included a 1994 external travel survey, a 1994 workplace survey, travel time studies, and traffic counts. The total amount budgeted for all survey efforts in calendar years 1994, 1995, and 1996 is approximately \$1.8 million, with \$750,000 of this allocated to a consultant contract for administration of the household survey. The last household survey for the region was conducted in 1984.

An extensive household survey pretest was conducted in 1994-1995, and included the examination of mailback versus telephone retrieval of diaries, one-day versus two-day activity diaries, cash versus gift incentives per person, booklet versus log formats, and "one page per activity" versus "two pages per activity" booklet formats. The findings of the pretest led to a redesign of the survey instrument to a simplified "time use" format, in which respondents are asked to identify the start times for everything they do outside the home, either an activity (or activities) at a place, or travel between places. All questions have been placed on the instruments, so that the forms can be used for either phone or mailback retrieval.

The main phone-mail-phone survey procedure includes pre-notification letters to households with listed phone numbers and a two dollar bill attached to each diary that is mailed to a recruited household. The final data set, which includes some sample enrichment through transit intercepts, is anticipated to include one-day diaries for over 5,000 "complete" households. A supplemental stated preference survey of selected individuals obtained from retrieved households will also be conducted to address local issues of road pricing and mode choice. All geocoding will be performed by NCTCOG staff.

■ Denver, CO

The Denver Regional Council of Governments (DRCOG) is planning a series of travel surveys in the Spring of 1997. These include a one-day activity-based household travel survey and transit onboard surveys. The data collected will be used in a major recalibration effort of the regional model. Much of the survey work is being contracted out to a consultant.

The household survey will recruit 5,000 households by telephone, with retrieval of survey results also by telephone. About 1,000 additional households will be surveyed via an on-board transit methodology, in order to over-sample transit-dependent households. The entire effort is expected to cost \$760,000, with the telephone survey accounting for \$600,000 and the transit on-board survey for \$160,000.

■ Detroit, MI

The Southeast Michigan Council of Governments (SEMCOG) conducted their latest household survey in 1994, covering the entire Detroit metropolitan region. A traditional telephone-mail-telephone approach was used to gather approximately 7,400 responses.

The cost of the survey was \$800,000, or approximately \$110 per surveyed household. Trip data collected included mode, origin, destination and vehicle occupancy. The survey, however, did not collect any information on vehicle make. Household data collected included housing structure type, household size, income, and vehicles available. Person data collected included age, gender, and detailed employment data. Two counties in the SEMCOG region have developed their own travel models. The survey was designed to be more comprehensive in these counties in order to fulfill their needs.

Data from the household and other current travel surveys are being geocoded to, at a minimum, SEMCOG traffic analysis zones. When appropriate, data also will be geocoded to regional sub-model zones and to MDOT statewide zones.

SEMCOG conducted their previous household survey in 1980. Survey responses were collected from 2,500 households. The survey utilized a trip diary and home interview approach to collect socioeconomic and trip-making behavior during the survey week.

■ Fort Collins, CO

The North Front Range Regional Council of Governments conducted a trip-based household survey in the Spring of 1995. This survey encompassed four areas within the North Front Range including Fort Collins, Greeley, Loveland, and smaller towns and unincorporated areas of several counties. For the entire region, 1,000 surveys were completed, approximately 250 in each of the four areas. The survey will be used to re-estimate trip generation and trip distribution elements of the regional travel model. The survey is also intended to maintain consistency with the upcoming travel surveys to be conducted by the Denver Regional Council of Governments.

Recruitment was initially done by mail. Follow-up telephone recruitment calls were made to those households initially agreeing to, but not completing, the survey. Trip diaries were returned, and follow-up telephone calls were used to clarify survey responses. No incentive was given to participate in the survey.

Both weekday and weekend data were collected, with 800 respondents assigned a weekday between Tuesday and Thursday and 200 assigned either Saturday or Sunday. Data were collected on non-motorized trips but not on vehicle make, model, or year. The survey was administered to each household member over five years of age.

The survey was completed at a cost of \$68,000. The agency envisions conducting elements of this survey every five years as part of an overall regional data collection program. This program will include vehicle intercept surveys, traffic counts, etc., taken every year or two years if resources are available.

■ Honolulu, HI

The Oahu Metropolitan Planning Agency conducted a household survey from January through March 1996. About 4,000 households were asked to complete a one-day activity diary for a specified weekday. Recruitment and retrieval were performed by telephone, and survey forms were not returned. A pen was offered as an incentive for completing the survey. Data on non-motorized travel and vehicle data were collected, and vehicles were associated with trips to the extent possible. Activity information was collected for all household members, regardless of age. The information collected will be used to update regional travel model parameters.

The Oahu Metropolitan Planning Agency previously completed a comprehensive household travel survey in 1982. Combined with data from simultaneous transit onboard and special generator surveys, the information was used to update the island's regional travel model. Households were recruited for the survey using a telephone interview. The actual trip diaries were then mailed out, completed, and mailed back. Both socioeconomic and travel behavior data was collected. The sample was stratified by the number of household members and the number of vehicles available. The survey resulted in approximately 1,400 completed surveys.

■ Houston, TX

A survey of the eight-county Houston/Galveston Area Council (HGAC) region was conducted from September 1994 to May 1995. The consultant contract value to complete the household travel survey was approximately \$275,000.

Households were mailed activity diary forms and the information was retrieved using Computer Aided Telephone Interviewing (CATI) techniques. The number of completed surveys was 2,443. The sample was stratified by five categories of households and five categories of income. Each household was assigned one 24-hour period in which all members five years and older were asked to record their travel activities. An attempt was made to keep the surveyed travel days evenly distributed across Monday through Friday. The last household survey conducted was in 1984. HGAC is planning to draw household samples from this survey to develop a panel survey.

■ Indiana Statewide

The Indiana Department of Transportation conducted a statewide household travel survey as part of its statewide travel model development project. The survey was completed in the Fall of 1995. The survey included a diary of long trips taken over a 2-week period as well as the standard one-day travel diary. Recruitment and retrieval were both conducted by telephone. No incentive was used, and respondents were not asked to return

survey forms. The cost of the effort was approximately \$75,000. The survey collected vehicle data but not information on non-motorized trips.

■ Indianapolis

In 1990, the City of Indianapolis contracted to sample 1,000 Indianapolis area households as an add-on to the 1990 Nationwide Personal Transportation Survey (NPTS). The last home interview survey in the region had been completed in 1964; the 1990 add-on survey was conducted in order to provide current travel data for modeling efforts.

The survey collected both general socio-economic household information and information on trips by all modes (including bicycling and walking) for all household members 5 and older. As with the NPTS, data were collected on all trips taken within a 24-hour period as well as on trips of at least 75 miles taken within the previous two weeks.

■ Kansas City, MO

The Kansas City household travel survey was conducted in the Fall of 1991. The sample was stratified by income and household size. Households were recruited by randomly generated telephone numbers and mailed a survey form to complete and mail back. Participation was encouraged with \$1 and \$2 incentives and with rewards such as pens and stickers. Over 1,200 completed household surveys were returned. The respondents were asked to record all travel outside of the home. With the average household size between two and three persons, these surveys described a total of 14,006 trips.

Following response retrieval, responses were geocoded using Dyme files. The consultant contract value for administering the survey was \$50,000 and the contract value for data analysis was \$30,000.

■ Little Rock, AR

A household travel survey of the Little Rock region was completed in 1993. Households were recruited by telephone and then sent household questionnaires and trip diary forms. The sample was stratified by household size and vehicle availability but not by geographic location because of the small sample size. After recording trips on their assigned travel day, the survey respondents returned the forms by mail. Although no incentives were used, some households did receive reminder calls to return their survey forms. Completed survey forms were received from 856 households. The data will be used mainly for clarifying trip rates but also will be adequate for calculating trip length information. The cost of this survey effort was approximately \$48,000.

Additionally, vehicle occupancy, travel time, and traffic movement data were collected for specific corridors and the central business district. A planned workplace study was canceled due to lack of funds.

■ Los Angeles, CA

The Southern California Association of Governments (SCAG) conducted a household travel survey in 1991 in conjunction with a statewide effort undertaken by the California Department of Transportation (Caltrans). This survey was intended to update information collected in previous surveys conducted in 1967, 1976, and 1983. Of approximately 36,000 households contacted, 84 percent were recruited to participate. About 30,000 households were interviewed using a phone-mail-phone format, and 16,000 or 45 percent of these eventually returned completed surveys. All counties in the metropolitan region were sampled with the exception of lightly populated desert areas. The sample was stratified by 57 geographic areas, household sizes, and vehicles available per household. Survey data expansion used these same variables. Trip diaries from all five weekdays were collected for the study week. The survey data was used to update SCAG's regional travel model.

Several shortcomings in the survey data have been identified. For example, only drivers were asked to give auto parking costs. Auto passengers and transit riders were not asked what their auto parking costs would have been had they driven. This type of information would have been valuable in determining an individual's willingness to pay for parking. In addition, specific origin and destination locations were not recorded, providing some ambiguity in the coding process. Finally, the expanded data tended to underestimate transit trips (e.g., areas where few transit trips occur were oversampled).

SCAG previously conducted a household survey in 1983 in order to update home-to-work trip model parameters of its regional travel model. A telephone survey was used to collect 777 completed interviews. This random sample was then combined with choice based data obtained from transit onboard surveys.

■ Milwaukee, WI

In 1991, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) completed a series of travel surveys. These surveys were completed in-house and included household, external, truck, and transit onboard surveys. The total cost of all four surveys was approximately \$1 million.

The household survey yielded about 17,000 completed forms, which represented about 2.5 percent of the households in the seven-county SEWRPC region. The survey was conducted by recruiting individuals first by letter, then with follow-up contacts by telephone or personal contact in the case of individuals without telephones. A one-day trip diary

form was delivered in-person to those individuals who agreed to participate in the study. An in-person follow-up interview was then completed for each household to collect the trip diaries, complete the survey, and clarify any inconsistencies. Approximately two-thirds of the surveys were conducted in this manner. The remaining trip diaries were collected using a telephone-mail-telephone approach. Approval and funding for the survey were obtained in mid-summer 1991 under the condition that the survey be completed by mid-November. The departure from the home interview survey procedure was due to the need to complete the survey by this deadline. The survey was completed without using any incentives.

■ Minneapolis-St. Paul, MN

In the Summer of 1990, the Metropolitan Council of the Twin Cities conducted a series of surveys to roughly correspond with the collection of 1990 Census data. Included as part of these surveys was a household travel survey. The traditional telephone-mail-telephone approach was used to recruit individuals and collect information following the completion of the travel diaries. The survey work was subcontracted out to a local firm and resulted in 9,746 completed surveys.

A problem was encountered when the wording of one question resulted in ambiguous answers regarding vehicle occupancies. One notable innovative approach included questions specifically regarding trips made for child day-care purposes. No incentives were used as part of the survey. In addition, several other count type surveys such as truck counts, vehicle classification counts, and speed surveys were undertaken to support these survey efforts.

■ New Hampshire Statewide

The New Hampshire Department of Transportation recently conducted a household survey for the purpose of developing a statewide travel model system. The survey consisted of both a revealed preference (RP) and stated preference (SP) component and was conducted in late Summer 1994 and Spring 1995. The RP sample was stratified by the state's planning regions, with 2,857 total households participating. The SP survey included about 500 respondents and targeted specific markets, including commuters to Boston and transit users. The total cost for the consultants was approximately \$250,000.

Recruitment and retrieval were done by telephone, with the assistance of a Computer Aided Telephone Interview (CATI) system. Respondents were not asked to return the survey forms. The survey was a one-day activity-based survey, including household members of all ages.

■ New York City, NY

The New York Metropolitan Transportation Commission (NYMTC) currently is planning some extensive household survey work to be conducted in late 1996 or early 1997. NYMTC has contracted with a consultant to design and conduct a household activity survey. Currently, the survey instrument is being pretested. The data obtained will be used in the development of the first ever regional travel model for the New York metropolitan region.

A sample size of 12,000 households is planned. This sample size is based on the available resources and is designed to provide the most responses for the given resources. An estimated cost of approximately \$100 per completed survey is anticipated. NYMTC will be surveying households within its boundaries as well as households in the adjacent metropolitan regions in New Jersey and Connecticut. In all, the area to be surveyed covers 22 separate counties.

Individual households will be recruited by telephone. Daily log forms will then be mailed to each. The log forms will not be mailed back, but instead the information will be collected via follow-up telephone contact. This telephone contact will allow for thorough questioning of responses in order to clarify any entries in the log forms.

The data will be expanded based on the number of households in each sample stratification (i.e., each telephone exchange). Data to be collected include mode split, vehicle occupancy, vehicle type and make, and in-home activity information. For each trip segment, origin and destination locations will be recorded.

Part of the contract that the consultant is working on involves reviewing NYMTC data needs and recommending other survey requirements. Possibilities include a taxi survey and trip attraction survey.

The New York Metropolitan Transit Authority (MTA) has also conducted household survey efforts in the New York region. In 1995, the MTA conducted a two-day activity survey of 2,000 households. The survey was designed to be the first wave of an ongoing panel study. Households were recruited and results retrieved by telephone, and households were asked to mail back their completed survey forms.

NYMTC previously conducted a telephone home interview survey of approximately 20,500 households during the spring of 1989. An intercept survey of subway riders was completed later that year. The total cost of all this survey work was approximately \$3 million.

■ Philadelphia, PA

The Delaware Valley Regional Planning Commission (DVRPC) last completed a household travel survey in 1988. The survey was conducted by a consultant at a cost of

\$260,000. The design, analysis, and application were completed by DVRPC staff. The survey collected responses from 2,500 households.

DVRPC and a consultant are currently conducting a 1,700 mile time/speed survey as part of a travel simulation model validation procedure. A new household travel survey is in the early planning stages.

■ Phoenix, AZ

The Maricopa Association of Governments (MAG) conducted a household travel survey from October 1988 to February 1989. Approximately 3,000 households were sampled at a consultant cost of \$170,000. MAG carried out the geocoding in-house at a significant but unspecified cost. Information from the mailout trip diaries were collected via follow-up phone interviews. Trip diaries were completed for all household members age five and older, for weekday travel only. The previous household survey was carried out in 1981.

■ Pittsburgh, PA

The Southwestern Pennsylvania Regional Planning Commission conducted a household survey in 1990. The survey was intended to update trip production rates for use in the regional travel model. The survey sampled over 400 households which were stratified by household size and automobiles per household. A consultant was contracted to select and recruit survey participants. The survey mailout and retrieval were handled by SPRPC's staff. The survey was completed for an approximate cost of \$33,000.

■ Portland, OR

Several MPOs in Oregon joined together and hired a consultant to conduct household travel surveys throughout the state. These household surveys were completed in the Spring and Summer of 1994 and the Fall and Winter of 1995. The total cost of the survey effort was \$1.2 million for a sample of 10,000 households. Of these households, 4,451 were located in the Portland metropolitan region. The share of the cost for the Portland region was approximately \$600,000, exclusive of additional cleaning, tabulation, and model development. The last comparable regional survey effort was in 1985.

The survey uses the telephone-mail-telephone approach. A Computer Aided Telephone Interview (CATI) system was used for recruitment phone calls and when gathering basic household information. This computer program automatically checks for errors or inconsistencies in the respondent's answers during the interview and prompts the interviewer

to ask for clarification when necessary. The actual activity/travel diary data was recorded with pencil and paper by the interviewers over the phone.

Respondents were asked to report on two consecutive days of activities; all seven days of the week were included in the sample. Activity/travel diaries were requested for all household members regardless of age (parents were instructed to assist in completing diaries for children under 12). The activity-based approach to the survey has turned up greater numbers of pedestrian, bicycle, and transit trips than previously found by trip-based surveys. The regional MPO, Portland Metro, plans to use the data to shift to an activity-based travel demand forecasting system. Metro also plans to geocode activity locations to an accuracy of 200 feet.

The Portland MPO wanted to obtain as much information as possible about walk, bike, and transit trips, so these types of trips were oversampled. The Portland area sample was enriched by intercepting users of light rail park-and-ride lots. The Portland Metro area was also stratified geographically based on different urban design and transit accessibility characteristics, including pedestrian friendliness, land use mix, urban vs. non-urban, and proximity to a light rail corridor. Extensive vehicle use information was collected. Respondents were also asked about the cost of parking at their non-home destinations, even if they did not drive, in order to provide information on the fees that people are willing to pay for parking. The survey also gathered very specific information about the linkages of trips (i.e., asking specific locations of access and egress to transit).

■ Raleigh-Durham, NC

The Triangle Transit Agency completed a household travel survey for the metropolitan region in 1995, collaborating with the MPO and the North Carolina Department of Transportation to conduct this effort. The transit agency has a very limited staff, and therefore contracted out all aspects of the survey implementation. The total cost of the survey was approximately \$270,000. Their target was 2,000 households; 1,600 of which were recruited randomly from listed and non-listed telephone numbers, and 400 of which were transit intercept households (i.e., recruited at bus stops). They are including these transit intercept households in the survey design to insure the adequate collection of transit information. Triangle Transit worked with the other three transit providers in the region regarding obtaining these transit intercept samples.

After being recruited, the transit intercept respondents participated in the same way as the randomly recruited respondents. The respondents were mailed activity diary forms and assigned two days on which to record their activities. These two days were any two consecutive days except the Saturday/Sunday combination. The responses were then retrieved via a follow-up telephone interview. The telephone interviewers entered the responses using a Computer-Aided Telephone Interview (CATI) system to minimize errors and inconsistencies.

Before the survey effort began, a Peer Review Panel was formed to provide guidance to the Triangle Transit Agency. This was headed by Eric Pas, a professor at Duke University

and member of the TRB Travel Forecasting Committee. The panel included other survey specialists such as Keith Lawton, Elaine Murakami, and Chuck Purvis. The panel strongly recommended an activity-based rather than the trip-based survey format. Before administering this survey, focus groups were formed to comment on the diary form itself. The focus group participants were instructed to be critical of the diary form, and were able to provide feedback that resulted in modifications to the form.

Information such as odometer reading, age, and make of the vehicle was collected in the survey. Some of this information will be used for air quality modeling. Originally, the survey design considered contacting non-telephone households. However, the Triad area (Winston-Salem and Environs) attempted to do this also, and found that they could make only two contacts in the period of two days. From that experience, it was decided to abandon the effort in the Raleigh-Durham area. Additionally, no incentives were used to encourage participation in the survey.

■ Sacramento, CA

In the Spring of 1991, Caltrans carried out a statewide household travel survey which obtained 15,000 responses statewide. As part of this survey effort, 1,000 sample households were obtained in the Sacramento metropolitan region. The Sacramento Area Council of Governments then contracted with the same consultant who completed the statewide work for an additional 3,000 samples. The consultant used the same survey approach and instrument to obtain the additional samples. This additional survey was completed at a cost of approximately \$95-\$100 per completed survey. About 2,200 responses were usable for mode-choice modeling.

The survey utilized a telephone-mail-telephone approach and included a Computer Aided Telephone Interview (CATI) system during the follow-up interview. A \$1 incentive was used to encourage participation in the survey. The information obtained in these surveys was used to recalibrate the regional travel model.

■ St. Louis, MO

In the Spring of 1990, the East-West Gateway Coordinating Council (EWGCC) hired a consultant to conduct a household travel activity survey. The survey only investigated activities outside of the home for weekdays (Tuesday, Wednesday, or Thursday) and the data collected was used to enhance regional travel model trip generation components. The sample size was approximately 1,400 households. The survey was completed for a cost of \$150,000 plus an additional \$30,000 for in-house staff and materials. It was carried out between September and November 1990.

Recruiting was conducted by telephone and trip-making logs were distributed by mail. A reminder call was made the night before the survey was to take place. The survey

responses were retrieved via a follow-up telephone interview. The survey logs were mailed back for back-up purposes. Travel information for all members of a household was sought. Trips on all modes were recorded and specific questions were asked regarding vehicle occupancies. Questions about vehicle age or make were not included as part of this survey. No incentives were used to encourage people to participate in the survey. EWGCC is currently discussing additional data needs with both the Missouri and Illinois Departments of Transportation. The previous household survey for the St. Louis area was carried out in 1967.

■ Salt Lake City, UT

The Wasatch Front Regional Council (WFRC) worked closely with the adjacent Provo, Utah MPO to conduct a household travel survey. This survey was completed in the Spring of 1993 and collected approximately 3,000 total surveys from the two regions. The cost of this survey was estimated at about \$100 per survey. Individual households were recruited to participate in the survey by telephone. The survey questionnaires and activity diaries were then mailed out to participants and mailed back when completed. Although no incentives were used to encourage participation, WFRC found it relatively easy to recruit individuals for the survey.

■ San Antonio, TX

The San Antonio-Bexar County Metropolitan Planning Organization conducted a regional home travel survey in 1990. The survey was one of five surveys (household, external, workplace, special generator, and truck) conducted as part of the San Antonio - Bexar County Travel Study, at a total cost of \$865,000. Of 3,125 households recruited for the household survey, 2,643 participated. Households were recruited by telephone; results were obtained by telephone, and households were asked to mail back their survey forms (28 percent of households did so). In order to obtain statistically valid samples for households at all levels of vehicle availability, zero-vehicle households were oversampled. This was done by identifying and over-sampling low-income zip codes and census tracts with a high incidence of zero-vehicle households.

Size, vehicle availability, and income data were collected for each household, and employment, age, and travel data were collected for each person in the household. Each household member was asked to keep a one-day trip log, including the location, purpose, mode, and time of arrival and departure of each trip. The trip log also asked for automobile occupancy, parking cost, transit fare, and means of access to the bus stop.

■ San Diego, CA

The San Diego Association of Governments (SANDAG) completed a household travel survey between March and June of 1995. This survey updated information obtained during their past survey efforts in 1966, 1977, and 1986. The data collected from the survey are being used for three primary purposes: to calibrate regional transportation and air quality models; to serve as a comprehensive data base for short-range transportation system management projects; and to monitor trends in travel behavior in the region.

The survey used a standard telephone-mail-telephone approach, the same as was used in SANDOG's previous survey effort. The sample size was 2,049 households. The total consultant cost to SANDAG was \$217,000; the consultant completed all aspects of the survey, including the geocoding and documentation. The survey was trip-based and included detailed information about walk and bicycle trips. The survey also included questions about vehicle age and make for air quality modeling purposes. Employed respondents were asked several questions related to transportation demand management issues, such as whether they were offered flex-time, a compressed work schedule, or a transit or parking subsidy.

SANDAG is in the process of identifying additional survey needs. Possible future surveys include a commercial vehicle study and a study of tourist travel behaviors.

■ San Francisco, CA

The San Francisco Bay Area Metropolitan Transportation Commission (MTC) conducted household travel surveys in 1965, 1981, and 1990. The 1981 survey used a traditional telephone-mail-telephone approach to collect information from over 7,200 households. A modified version of a Caltrans survey was used to maximize the coordination of data between the two surveys. The survey was used in estimating a full set of auto ownership, trip generation, trip distribution, and mode choice models.

MTC conducted their most recent household travel survey in 1990. The survey, conducted by a consultant, was intended to update travel information obtained in the previous MTC travel surveys. The survey consisted of a sample of 10,900 households in the nine-county MTC region. This survey sample size was estimated to provide an accuracy of plus or minus five percent for total regional trips. The regional sampling rate was estimated at 0.44 percent. Of the total sample, 9,400 households were asked to report one-day travel activities, while the remaining 1,500 households provided multiple-weekday travel diaries. A \$5.00 per household incentive was provided for multi-day households. Unlike the 1981 survey, no households were surveyed regarding their weekend travel patterns. Survey information was obtained using a telephone-mail-telephone approach. For all samples, detailed household, person, and trip information was collected.

The MTC is conducting a survey of approximately 3,800 households during January through June 1996. This work is part of the planning process for the San Francisco-

Oakland Bay Bridge Congestion Pricing Demonstration Project. The survey is intended as the first wave in a multi-wave panel study, and will provide baseline information about travel behavior in the Bay Area before the addition of a peak period toll premium. The revealed preference portion of the survey is a telephone survey with a mail-out/mailback/telephone retrieval using a two-day (weekday and weekend) time use diary. Data are being collected for household members of all ages. The stated preference portion of the survey is a telephone survey with mailout and telephone retrieval. The consultant cost for this survey effort is \$520,000.

■ San Juan, PR

San Juan last conducted a household travel survey in 1990. The survey was completed by a consultant as part of additional survey work including vehicle intercept and external, transit on-board, and workplace surveys. The cost for all surveys, including the household survey, was approximately \$500,000. The household survey sample consisted of 1,610 households obtained by home-based recruiting; results for 1,500 households were retrieved by telephone, and results for 110 households without telephones were retrieved using home interviews. Respondents were not asked to return survey forms. The total cost of the household survey effort was approximately \$200,000 of the \$500,000 total survey cost.

The survey consisted of a two-day trip diary, including some weekend days, for each household member at least five years old. A variety of motorized and non-motorized modes were included; anything which transported a person at least 500 feet was counted as a mode. The consultant noted that reported trip rates were lower for the second day, and that this has been a consistent problem for household surveys in which they have been involved. The elimination of records for which the first day fell on a weekend left only 1,100 valid observations for weekday travel.

As an incentive to participate, households were given the chance to win a television, microwave, and washer/dryer. While this helped increase participation, some households were initially attracted by the lottery and then failed to complete the survey because of the work involved.

■ Seattle, WA

The Puget Sound Regional Council (PSRC) uses a continuing panel survey to obtain travel behavior information in the region. This panel survey approach allows PSRC to track travel behavior changes through time. The first survey, completed in 1989, resulted in 1,712 completed surveys. The fourth wave, completed in October 1993, included 937 of the original 1,712 households and had a total of 1,906 surveys completed. Additional households were recruited by random telephone contact to replace households that had

fallen out from one wave to the next. This wave was completed for a consultant cost of \$80,000. PSRC completed the fifth wave of panel surveys in 1995.

The surveys consist of a two-day travel diary with an attitude survey (for four of the five waves). A \$2 incentive is provided to every member of the household over 15 years of age to encourage participation.

■ Tampa/St. Petersburg, FL

The Florida Department of Transportation (FDOT) conducted a household travel survey in 1991 in conjunction with the local MPOs of the Tampa region (each of the four counties in the metropolitan area has its own MPO). The survey used the mailout/mailback approach. A consultant was contracted to complete the survey and develop a stratified sampling strategy based on the characteristics outlined. The District 7 FDOT was concerned about getting a good sampling of retirees, so lifestyle questions were included to help identify these individuals. Otherwise, the sample was stratified by income and geographic location.

Using this sampling method, the consultant generated a list of 4,400 addresses. Prior to sending any survey materials to the households, District 7 made a big public relations push to alert population about the survey. The media picked up on this and was able to provide some free publicity. Packages were then mailed out to the identified households. These packages included household questionnaires, trip diary forms, a letter from the District Secretary, and a map of the Tampa region. The map was intended to help the respondents identify trips locations, and serve as an incentive for participating in the survey. Survey recipients were asked to record all of their trips on the Tuesday, Wednesday, or Thursday following the day that they received the package. FDOT included a toll free telephone number in the package so that any questions could be quickly answered. Reminder cards were sent to any address that had not responded within three weeks of the initial mailing. Non-participants were identified by tracking the serial numbers on the survey packages. If no response was received within two weeks from the time reminder cards were sent, a new package of material was sent. A third package was sent to those households who had not responded within four weeks of the second package being sent.

The total number of completed surveys was approximately 1,800. FDOT credited much of the success of this survey to the toll free telephone number for people to call for information, and the positive public relations campaigns before and after the survey. About 40 percent of the survey packages also included an additional travel mode preference questionnaire which outlined scenarios (e.g., change in express bus route) and asked the respondents how this would change their travel behavior.

■ Tucson, AZ

The Pima Association of Governments (PAG), the MPO for the Tucson metropolitan region, conducted a household travel survey in 1993, in conjunction with major enhancements of the travel demand models. The survey was completed by a consultant at a cost of \$215,000. The travel survey included 1,913 of the 262,129 households in the study area (0.73 percent), with the sample stratified by household size and income. Both weekday and Saturday travel were surveyed. Substantial data to support air quality, trip reduction, and other planning studies were collected.

A public information effort was made prior to household recruitment. Press releases and electronic media were successful in getting general notice of the upcoming survey to the public.

The survey was carried out by first recruiting households by phone, and then mailing a travel survey packet, which included an explanatory cover letter, travel diaries for each household member, instructions for filling out the travel diaries, a travel date reminder card, a toll-free help number, and a household information form.

Individual(s) in the surveyed households recorded their travel in the provided travel diaries, and then were called by a survey interviewer. The interviewer entered data on household characteristics, characteristics of the individual(s) responding to the survey, and travel information for the specified 24-hour period. Because of the importance of income information to the travel demand modeling process, special efforts were made to get a high response rate to this question. Of the surveyed households, 92 percent or 1,753 households included income information.

MPO staff participated in geocoding of the workplace locations, as well as serving as another point of contact for questions or comments from surveyed individuals.

The sample of households surveyed yielded an error rate less than four percent at a 90 percent confidence level, with a coefficient of variation of 0.93. The survey was considered a distinct success, and has yielded the anticipated multiple benefits.

Appendix D

Summary of Recent Vehicle Intercept and External Surveys by Urban Area and State

Summary of Recent Vehicle Intercept and External Surveys by Urban Area and State

This appendix provides an overview of vehicle intercept and external surveys that have recently been and are soon to be conducted in the United States. This appendix, however, is not intended to be an exhaustive listing of all vehicle intercept and external surveys that have been completed in recent years. Instead, this appendix is intended to provide an overview of many of the major survey efforts that have been conducted by state departments of transportation (DOTs) and metropolitan planning organizations (MPOs).

■ Atlanta, GA

The Atlanta Regional Commission (ARC) implemented an external travel survey in the Fall of 1994. The survey plan called for motorists to be surveyed at 35 sites for a 12-hour period. Cars were stopped and handed a mail-back survey at high-volume sites or interviewed at low-volume sites. Consultant costs for this survey were \$200,000. Additional resources will be expended by ARC for staff time, and by the Georgia Department of Transportation for survey site security.

■ Baltimore, MD

In June of 1994, an external survey was conducted by the Baltimore Regional Council of Governments during the morning peak period on Interstate 83 at the Pennsylvania state line. Observations were also conducted on three smaller nearby roadways.

The "carousel" method was used to record license plates of vehicles on the Interstate for recruitment purposes. Under this method, observation cars drive in the traffic flow at a slightly slower than average speed. A passenger observer in each observation car records vehicle license plates and vehicle occupancy information. About fourteen such observation cars were sent out to record license plates in the inbound direction. The observers were able to record about 50 percent of the passing traffic while moving at about 50 mph. The agency adopted this approach because of safety concerns and to avoid the need for coordination with the police and highway departments.

Short questionnaires, including questions about origin and destination and trip purpose, were mailed to the addresses matching the vehicle license plates. At the smaller roadway locations, traffic was stopped and the questionnaires were handed out for mailback.

A consultant was retained for license plate matching and mailing at a cost of \$20,000. Agency costs were estimated at \$10,000 for staff time, additional fuel costs, and intern labor costs.

■ Boston, MA

The Central Transportation Planning Staff (CTPS) carried out an external survey in the Spring and Fall of 1991. Video cameras were used to record license plate numbers at 49 locations and survey form postcards were mailed to the matched addresses. The survey forms contained typical travel-related questions about origin-destination, trip purpose, and travel time.

Of the 406,000 vehicles that entered the region during the survey, 113,000 were identified and the matched addresses were mailed postcards. 29,000 completed surveys were returned. After discarding approximately 11 percent of the returned surveys due to invalid responses, about 26,000 valid responses remained.

■ Buffalo, NY

The Niagara Frontier Transportation Committee (NFTC) conducted three external survey efforts in 1990 under three separate contracts, including a survey of international border crossings, a survey at county lines, and a survey of the New York State Thruway.

The international border with Canada constitutes one boundary of the metropolitan region. NFTC worked very closely with Canadian authorities in developing regional travel models and gathering data. Basic origin-destination information was gathered from vehicles that were stopped at the four international border crossing bridges. More extensive information was collected from commercial vehicles, including the vehicle type and the commodity being carried.

The other set of boundaries of the metropolitan region are the county lines. These were surveyed by NFTC at 25 stations. Again, vehicles were stopped and the drivers were interviewed about their origins and destinations.

The New York State Thruway passes through the metropolitan region but NFTC was not given permission to stop traffic on the interstate highway. Instead, drivers were handed survey postcards at toll booths. While the overall response rate was rather low, commercial vehicles responded at a fairly high rate.

■ Dallas / Ft. Worth, TX

Data collection for an external travel survey was completed by the North Central Texas Council of Governments (NCTCOG) during March and April of 1994. More than 28,000 drivers were interviewed at 38 sites where roadways exit the metropolitan region. The surveys were administered on Tuesdays, Wednesdays, and Thursdays between 7 a.m. and 7 p.m. The data collected included time of arrival, vehicle classification, vehicle occupancy, trip origin, trip purpose (for both the previous stop and the next stop), time of departure from last stop, fuel type, vehicle year, and mileage. The cost for a consultant to complete survey design and administration was \$220,000. All geocoding was performed by NCTCOG staff. The last external travel survey for the region was conducted in 1964.

■ Des Moines, IA

The Iowa Department of Transportation (IDOT) carried out an external survey in 1991 along Interstate 235 for purposes of updating the Des Moines travel model. The survey was completed in conjunction with a household travel survey. Vehicles were stopped at 32 exit ramp locations and handed post cards to mail back. Travelers were asked for the location they entered I-235, the trip origin, the trip destination, and vehicle occupancy, among other questions. A \$100 drawing was used as an incentive for people to participate.

■ Detroit, MI

The Southeast Michigan Council of Governments worked with the Michigan Department of Transportation to conduct an external vehicle survey in 1995. The primary method was by roadside interview. The interviews were conducted when weather permitted and where the design of the route allowed for safe interviewing. As a back-up method, roadside spotters were used to manually record license plate numbers. The license numbers were then converted into address information and a survey was mailed to that address. A total of 45 external stations in the SEMCOG region were surveyed. An additional 47 stations will be surveyed to supplement the models of two SEMCOG counties.

The SEMCOG external stations were surveyed in the Spring and Fall of 1995 as a supplement to the household survey done in 1994. The additional surveying at the county level external stations will be completed in the Spring of 1996.

All surveying was done on Tuesdays, Wednesdays and Thursdays from 6:00 a.m. to 8:00 p.m. The only age identifier available is that the respondent is over 16 years of age, the legal driving age in the State of Michigan. The previous external travel survey performed in the Southeast Michigan region was conducted in 1965. A cost estimate is not available, as work for the survey is being done by SEMCOG staff, MDOT staff and vendors.

■ Fort Collins, CO

Vehicle intercept surveys were conducted in the Spring of 1995 to help update the regional travel model and to identify the magnitude of North Front Range travel to and from the City of Denver. These surveys were designed in conjunction with a household survey which was conducted in the North Front Range area. In addition to external stations, locations were established to identify inter-regional trip making between the cities of Loveland, Greeley, and Fort Collins.

■ Houston, TX

A vehicle intercept travel survey was conducted during the Fall of 1994 by the Houston/Galveston Area Council. Vehicle counts were conducted at 79 locations while 24 locations were included in the intercept survey. The surveys were accomplished by narrowing the traffic to one lane and pulling out random groups of cars for interviews. A total of 13,679 surveys were collected. Preliminary analysis indicates that a very high percentage (90+ percent) of these are usable surveys. There was some difficulty in obtaining the cooperation of district highway and police officers. The contract value for this effort was \$192,000.

■ Indianapolis, IN

In 1990, the City of Indianapolis hired a consultant to conduct an external station survey of the Indianapolis area (the last such survey had been performed in 1964). After running into legal concerns with a roadside interview methodology, the City conducted a license plate match/telephone survey in 1993. While the telephone follow-up portion also met with problems due to some negative public reaction, over 700 surveys were ultimately completed. The City was able to obtain further information on external travel by matching license plates with addresses. A mailback survey was also considered but not implemented, due to a poor history of success elsewhere.

■ Jackson, MS

The Central Mississippi Planning and Development District conducted an external travel survey in October of 1993 as part of the update of its transportation plan. Mail-back postcards were passed out at 12 survey locations. About 5,000 useable responses were returned. The data collected included information about origin and destination, the routes used by respondents, trip making rates, and type of vehicle.

■ Little Rock, AR

An external survey was conducted in the Little Rock area in 1993. Outbound traffic was stopped at 18 locations and drivers were interviewed about origins and destinations and the time they began their trip. In addition, air quality-related information such as odometer readings, vehicle makes, and model years was collected. The survey also collected vehicle classification data manually and using traffic counters.

■ Milwaukee, WI

This external survey was conducted in 1991 by the Southeast Wisconsin Regional Council of Governments (SEWRCOG). The external survey utilized an intercept approach featuring a mail-back questionnaire. Approximately 80 percent of the traffic using the selected roads was stopped and given questionnaires. Approximately 40,000 completed survey forms were mailed back, representing about 30 percent of the forms handed out. Out of 175,000 forms handed out, fewer than ten complaints were received about the intercept survey method and the resulting traffic delays.

■ Minneapolis-St. Paul, MN

The Metropolitan Council of the Twin Cities conducted an external vehicle intercept survey in 1990. Traffic was stopped and interviewed at selected external sites in order to gather origin and destination information. The interviewers were able to survey approximately 50 percent of the vehicles crossing the external stations. These data were then expanded based on traffic counts obtained at these locations on the same survey day.

■ Ohio Statewide

The Ohio Department of Transportation (ODOT) is currently involved in a cooperative statewide origin and destination survey effort, working with Metropolitan Planning Organizations (MPOs) and some adjacent states. The survey is a multi-year, multi-MPO area series of surveys begun early in 1995. Because the majority of MPO study areas have not been surveyed for over 30 years, ODOT decided to undertake a statewide survey effort to update the urban area travel demand models and to investigate the feasibility of creating a statewide model utilizing the data collected. A consulting firm was hired to conduct the surveys. The 1995 effort involved six MPOs: Akron, Dayton, Columbus, Newark, Springfield, and Toledo. Seven MPOs are planned for the 1996 series, including Canton, Cincinnati, Cleveland, Lima, Mansfield, Steubenville and Youngstown. The

remaining urban areas and the remaining state cordon line are planned for the following year.

The 1995 Survey involved 316 survey locations at a total cost of \$1.2 million. An additional 28 survey locations in the Toledo urban area were conducted for ODOT and the Toledo MPO by the Michigan Department of Transportation. An agreement was made between the two state agencies involved to assist in processing each other's license plate data for out of state addresses and to provide each other with origin-destination survey data. The cooperation of the West Virginia Department of Transportation and the Kentucky Transportation Cabinet also aided Ohio in obtaining address information from license plate surveys. Where MPO cordon lines are coincident, survey data are collected once and shared by both study areas in order to keep costs to a minimum.

The 1996 surveys planned will consist of approximately 270 locations. The 1995 methodology will be employed with minor revisions for the 1996 round of surveys.

A three-tiered approach is being used to conduct the surveys. A combination of roadside interview, postcard handout, license plate video/address match and mail, and truck interview methods are being employed. Personal interviews are conducted where traffic volumes do not cause more than 5 minute delays to traveling motorists. Where volumes during peak periods would cause delays exceeding 5 minutes, the crews switch to postcard handout. At locations where traffic cannot be stopped for either interviews or postcards without exceeding the 5 minute limit, license plates are recorded for postcard mail out/mail back. Where license plate recording is used, origin-destination data cannot be obtained from trucks in the traffic stream; therefore, interview stations are set up at truck stops and rest areas. All trucks are directed through the stations to be interviewed. Trucks are waved through without being interviewed when excessive queues develop.

■ Oregon Statewide

In 1994, the Oregon Department of Transportation conducted a series of vehicle intercept origin and destination surveys at various locations throughout the state. The data collected in these surveys will be used for statewide modeling efforts as well as for specific projects.

The surveys were conducted by a consultant and included a combination of survey distribution techniques. Roadside handout of surveys was utilized at low-volume locations while video identification and survey mailout was completed on interstate and other high-volume locations. No incentives were used to encourage participation in the survey effort.

The survey form asked respondents several standard questions including origin and destination, trip purpose, and vehicle occupancy questions. At one specific location, a mode choice question was included to indicate if the traveler had chosen to cross a river via the highway bridge or by ferry. There were some complaints from the public about traffic tie-ups in locations where traffic was stopped to distribute surveys.

■ Philadelphia, PA

A regional cordon line traffic survey was implemented to collect current information on traffic volumes and patterns generated by vehicles entering and exiting the region. Traffic was surveyed at 26 stations around the perimeter of the region during the Fall of 1988 and spring of 1989. In roadside interviews, questions were asked about trip origin and destination, purpose, and highways used, as well as vehicle type, registration, and occupancy. A total of 26,918 interviews were conducted during both peak and off-peak time periods, primarily by DVRPC staff.

In 1990, DVRPC surveyed motorists crossing Delaware River bridges, as part of an assessment of the ability of two corridors in New Jersey to support proposed rail service. A total of 5,900 responses were received. As part of the I-95 Intermobility Project, DVRPC conducted a roadside survey of almost 6,800 motorists in 1991, in order to determine travel patterns and attitudes toward alternative modes.

■ San Antonio, TX

The San Antonio – Bexar County Metropolitan Planning Organization conducted an external survey between March and May of 1990, concurrent with four other travel surveys. The MPO, in conjunction with the Texas State Department of Highways and Public Transportation (SDHPT), established 18 survey sites near the border of Bexar County. After pilot-testing both postcard and personal interview surveys, the MPO and SDHPT decided to use personal interviews at all sites. Surveys were conducted of outbound traffic on Mondays through Thursdays. Approximately 13,500 total surveys were completed.

■ San Francisco, CA

The Metropolitan Transportation Commission (MTC), working with the Association of Monterey Bay Area Governments and CalTrans, conducted a cordon survey in October 1994. License plates were videotaped and then matched with the addresses from the State Department of Motor Vehicles. Postcards (40,000) were mailed out to those addresses, and 6,917 were returned.

■ Tampa / St. Petersburg, FL

The Florida Department of Transportation (FDOT) used both still photography and spotters equipped with binoculars to record the license plate numbers of vehicles crossing 18 cordon locations during the afternoon peak period. As with the household travel survey,

the external survey was accompanied by a publicity campaign to let people know why the survey was being conducted. However, this publicity campaign did not disclose the actual survey locations.

FDOT felt that it was very important to get the survey forms out as quickly as possible. In order to do this, license plate numbers were read off the negatives (rather than developing the photographs), and converted into addresses by midnight of the day they were observed. FDOT estimated that 75 percent of the survey forms reached the intended drivers within 48 hours of the observation. The survey package sent to individuals provided respondents with a toll-free telephone number to call and included a letter explaining the specifics of the survey. The survey instrument included questions about household composition origins and destinations, trip purpose, and auto occupancies.

This was not a true external survey because some of the cordon lines were county lines internal to the four-county Tampa metropolitan area. In total, about 10,000 surveys were mailed out, and about 4,400 were returned.

■ Washington D.C.

The Metropolitan Washington Council of Governments (MWCOC) conducted an external survey in 1995-96. Vehicles crossing the external cordons were identified by spotters using laptop computers to record license plate numbers. MWCOC worked out agreements with the Departments of Motor Vehicles of the District of Columbia, Virginia, Maryland, West Virginia, and Pennsylvania to convert this electronic license plate data quickly into addresses so that survey forms could be distributed with a minimum of delay. A smaller area external survey completed several years ago revealed that when it took longer to distribute the surveys, the response rate was lower. MWCOC was pleased with the response rate of 30 percent and felt that the quick mail out of surveys and use of a real stamp instead of a metered stamp contributed to the success of the survey. MWCOC considered using video cameras for license plate identification, but decided against this method because of the cost and time required to convert the license plate numbers into addresses. The survey took about 15 months to complete because of the large number of sites. Most of the external survey work was completed using in-house staff with temporary employees being contracted as necessary. MWCOC spent about \$200,000 on data collection and about \$50,000 on data processing. No incentives were used to encourage people to return the survey forms.

The survey forms asked for origin and destination, trip purpose, vehicle occupancy, number of vehicles available to the household, and in some cases, which bridge persons are using. The external survey had three other components: 1) an external to external survey, 2) a license plate classification survey, and 3) a vehicle classification and occupancy survey. These additional components, along with ADT data from the various highway departments, will be used in the regional travel model validation efforts.

The external to external (X to X) surveys were conducted in early October 1995 and were intended to obtain better information on those trips that are just passing through the D.C.

area. The survey was completed by positioning spotters (all on the same day) at the major inbound and outbound roadways that external to external trips are likely to use. These surveyors recorded license plate numbers with "out-of-area" (non-DC, VA, MD, WV, PA) plates. The inbound and outbound plate numbers were then matched to determine how many vehicles are passing through the area. The Automobile Association of America provided assistance in identifying what routes people would likely take if making trips through the Washington D.C. area.

The license plate classification survey included recording all the license plates and tallying vehicles from each state. The vehicle classification and occupancy survey included manually recording the vehicle type and the number of people in each vehicle. Volume counts were completed at the same time and are being used to expand this data.

Appendix E

*Summary of Recent Transit On-Board Surveys
by Urban Area*

Summary of Recent Transit On-board Surveys by Urban Area

This appendix provides an overview of transit on-board surveys that have recently been and are soon to be conducted in the United States. This appendix is not intended to be an exhaustive listing of all transit in-bound surveys, but rather to provide examples of efforts undertaken by metropolitan planning organizations for (MPOs) for some of the nation's larger metropolitan areas. In addition to survey work by MPOs, local transit agencies frequently undertake on-board survey work of their own. Compilation of these efforts, however, is beyond the scope of this effort.

■ Albuquerque, NM

In 1990, the Middle Rio Grande Council of Governments (MRGCOG) collaborated with the Albuquerque Transit Authority and the state DOT on a transit on-board survey. The survey, conducted during the morning peak-period, included attitudinal questions about service reliability, safety, and cleanliness.

■ Boise, ID

In 1991, the Ada Planning Association conducted a transit on-board survey of its regional transit provider. The survey was intended to gather attitudinal information about transit usage and non-usage. The survey collected total daily usage estimates and origin and destination information, but was not intended for use in travel demand model estimation.

■ Boston, MA

The Central Transportation Planning Staff (CTPS) has periodically surveyed transit passengers on various modes including commuter rail, rapid transit, bus, and commuter ferry.

Commuter ferry passengers were surveyed in the Spring of 1988, Spring of 1990, and June of 1993. Travel behavior data obtained during the 1990 survey was used to develop a new schedule. The 1993 survey was notable for its method and response rate (approximately

80 percent). For this survey, passengers were given a map of the area on which their final destinations were marked. This helped to accurately identify locations for coding purposes.

■ Buffalo, NY

In the Spring of 1995, the Niagara Frontier Transportation Committee (NFTC) conducted a transit on-board survey of the regional transit provider's bus and rail operations. The survey, conducted during all hours of transit service operation, collected total daily usage estimates and origin and destination information for use in development and calibration of a travel demand estimation model.

■ Cincinnati, OH

The Ohio-Kentucky-Indiana Regional Council of Governments, the MPO for the Greater Cincinnati Area, conducted a transit on-board survey in 1995 as part of a complete travel demand forecasting model update. Data collected included trip purpose, trip origin/destination, transit access mode, trip timing, and household demographics. The survey was conducted between May 13 and June 11, 1995. Data were collected from a total of 265 bus runs selected so as to be representative of total system ridership.

The survey questionnaires were self-administered. Riders on sampled bus runs on each route were handed a form and asked to complete the brief survey while on-board buses. During the survey period, a total of 22,054 surveys were handed out to bus riders, and 8,767 completed questionnaires were returned. A total of 8,438 questionnaires were completed with sufficient information to be utilized in the study. Entry of the respondent's name in a drawing was promised in return for a completed questionnaire. The data were collected at a cost of \$160,000.

■ Denver, CO

The Denver Regional Council of Governments (DRCOG) is planning a series of travel surveys in Spring 1997. The surveys planned include a household travel survey of on-board transit users, which is designed to compliment data collected in a telephone household travel survey. The combined information will be used in a major recalibration effort of the regional travel model. Much of the survey work is expected to be contracted out to a consultant.

■ Detroit, MI

SEMCOG, the Southeast Michigan Council of Governments, in cooperation with the Detroit Department of Transportation (D-DOT), hired a consultant to perform an on-board survey of passengers on fixed bus routes operated by D-DOT. The On-Board Bus Survey for Detroit was performed in October, 1995.

The on-board survey data provide origin and destination data for use in predicting bus rider travel patterns of D-DOT bus passengers. The collected data will support both SEMCOG transportation modeling requirements and D-DOT service planning/alternatives analysis requirements.

The objectives of the survey were to collect:

- origins, destinations and other trip characteristics of passengers;
- a socioeconomic profile of the passengers; and
- attitudes and opinions of passengers about the bus service.

Survey data were collected primarily on weekdays, although some weekend samples also were collected. SEMCOG's anticipated applications of the survey include, at a minimum, the development and calibration of an updated set of mode choice models. SEMCOG's mode choice models were originally developed using individual trip-maker observations from the 1965 TALUS travel survey and subsequently modified using 1980 survey data.

■ Honolulu, HI

A transit on-board survey was most recently conducted in 1991 for the Oahu Metropolitan Planning Organization. The survey was designed to collect data to be used for both short-term service planning and the refinement of regional travel models. The survey instrument was distributed to all boarding passengers above the age of six. When completed, the surveys were collected by survey personnel on the bus. These survey personnel were also responsible for collecting accurate counts of all boardings and alightings.

The questionnaire contained questions in both English and Japanese. Respondents were encouraged to fill out the survey on the bus although the survey was designed with an address and postage so that it could be mailed back at a later time. Of the 64,584 questionnaires distributed during the course of the survey, 19,699 were returned partially or fully completed.

A consultant was retained to conduct a transit on-board survey in 1986. This survey was intended to provide the basis for the development of improvement plans and marketing programs for different transit providers. The surveys were distributed to passengers on all routes of the transit system and resulted in over 11,000 completed questionnaires. The

survey collected information on origins and destinations, trip purposes, and demographic profiles of the bus users. This survey was collected during the fall in order to capture school transit trips. The survey was combined with a small random telephone survey of user and non-user attitudes towards the transit system.

A 1982 transit on-board survey was designed by the Oahu Metropolitan Planning Agency to supplement the household travel survey that was conducted simultaneously to update the regional travel model. The survey provided data on additional transit trips for the mode-split model. This was based on the expectation that the household travel survey would provide too few transit trips to allow sufficient accuracy for modeling purposes. The survey was designed to collect detailed data on the origin and destination, mode of access and egress, number of transfers, fare paid, trip purpose, access to a vehicle for the trip, and socioeconomic variables.

■ Houston, TX

On-board transit surveys were conducted on the METRO bus system in 1994 for Galveston Island Transit, which includes local routes and the parking shuttle for the University of Texas Medical Branch, and for the Woodlands Express (Brazos Transit), which consists of one park and ride route with stops in the CBD, Medical Center and Greenway Plaza. The surveys were conducted both on weekdays and weekends (if running). During the pretest, incentives in the form of free ride tokens were tested. Incentives were not used in the actual surveys because of the numerous negatives identified in the pretest.

Language barriers were considered for both the large Hispanic and Asian communities. The final survey instrument was made available in both English and Spanish, but Asian versions were discarded as the number of different dialects and languages was too numerous. While age was considered, many elderly had sight difficulties, and children below the age of 10 usually were unable to complete a survey. Teenagers and adults with small children also were not inclined to participate. While METRO conducts on-board transit surveys every two years, Galveston Island Transit and Brazos Transit had not conducted such surveys previously. There were 36,000 surveys collected on the METRO system, 23,936 of which were weekday surveys. There were 1,184 surveys collected on Galveston Island Transit of which 797 were weekday. There were 672 surveys collected on Brazos Transit's Woodlands Express, which operates only on weekdays.

■ Lake Tahoe, CA

The Tahoe Regional Planning Agency (TRPA) last conducted a transit on-board survey in July 1991. The survey was conducted on the STAGE bus system in South Lake Tahoe, California. The survey was conducted by having survey personnel on the bus hand out questionnaires to passengers as they boarded the bus and collect the completed

questionnaires as the passengers departed the bus. This method was chosen because the response rate is higher than that normally observed for a mailback survey. The survey was handed out to all passengers above the age of twelve. The survey collected 1,441 responses representing a total response rate of 62 percent. The survey design, implementation, and data analysis were completed by a consultant for TRPA.

In 1993, TRPA conducted an additional transit on-board survey for the bus system in the northern portion of the Lake (Tahoe City). Both surveys were used to update the trip distribution element of the regional travel model.

■ Los Angeles, CA

The Los Angeles County Transit Authority surveys all its bus routes annually. These are carried out for system monitoring and expansion purposes but the data have been used for modeling purposes as well.

The Orange County Transportation Authority (OCTA) conducted a transit on-board survey during the years 1990 through 1994, and had planned to conduct another in 1995. The Authority has also conducted specific commuter rail, express bus, and park-and-ride surveys in the past. The information collected has been used in regional travel model calibration efforts as well as for specific major investment studies.

A survey was conducted at 28 park-and-ride lots within Orange County in 1991. Questionnaires (with self-addressed, stamped envelopes attached) were placed on the windshields of automobiles parked in the surveyed lots. Respondents were asked several general questions about themselves and their travel characteristics as well as their specific origin and destination for their particular trip. Of the 1,125 questionnaires distributed, 550 were returned, representing a 49 percent response rate. In order to obtain more information from individuals using express bus service from the park-and-ride lots, a supplemental questionnaire was printed on the back of the survey form. Of the 550 total questionnaires, 150 were completed by express bus riders who responded to the additional questions.

In 1989, staff from the OCTA surveyed the peak-hour trains traveling between San Diego and Los Angeles. Surveys distributed on two Amtrak trains gathered demographic data, origins and destinations, travel modes, and other information. The collected surveys served as an important planning document for the 1990 start-up of commuter rail service in the Los Angeles region. As a follow-up to the 1989 survey, OCTA distributed questionnaires to boarding passengers on commuter rail trains in 1990. This survey effort collected over 780 responses.

A transit on-board survey was conducted by the Southern California Association of Governments (SCAG) in 1983 in an effort to update home-to-work trip parameters. This choice-based sample was used in conjunction with a random sample obtained in the household travel survey. This combination of surveys provided a more cost effective

approach than simply relying on a random-based sample. The surveys were primarily used to obtain data on auto access to transit.

■ Milwaukee, WI

A transit on-board survey was conducted on all five transit systems serving the southeastern region of Wisconsin in 1991 by the Southeastern Wisconsin Regional Planning Commission (SEWRPC). These five transit systems had a total fleet size of 600 buses. The transit on-board survey was used because of the lack of transit information that could be obtained from the household travel survey being conducted simultaneously. The survey resulted in about 12,000 completed surveys. This was only a sample of the riders as SEWRPC did not survey all routes or runs. No incentive was provided for completing the survey.

■ Minneapolis-St. Paul, MN

A limited on-board transit survey was completed in 1990 by the Metropolitan Council of the Twin Cities to update the data collected in a larger on-board survey conducted in 1988. In this more recent survey, only passengers on routes that were either added or changed significantly were surveyed. This covered about 25 percent of the routes.

■ Philadelphia, PA

As part of an assessment of proposed rail service in New Jersey, The Delaware Valley Regional Planning Commission (DVRPC) conducted an on-board survey of NJ TRANSIT bus passengers and a station-based survey of PATCO rail passengers in 1990. More than 4,300 responses were received. The 1991 I-95 Intermobility Project included a 1991 survey of 5,100 SEPTA and Amtrak rail passengers.

■ Sacramento, CA

The Sacramento Area Council of Governments conducted a transit on-board survey in the Spring of 1995. This survey was completed in-house at a cost of approximately \$150,000. This cost represents all stages of the survey through preliminary analysis. There are eight transit providers in the region and the survey was designed to collect responses from every route. Transit patrons were handed a form as they boarded the bus and asked to fill it out before alighting. About 25,000 completed survey forms were obtained from the

survey effort, which is the first transit on-board survey of this scale to be conducted in the region. No incentives were used to promote participation in the study.

■ San Diego, CA

In the Fall of 1995, the San Diego Association of Governments (SANDAG) conducted a transit on-board survey, collecting about 43,000 usable responses. It was a hand-out/hand-back format, including a few attitudinal questions regarding transit service in the region. SANDAG conducted its previous transit on-board survey in 1985. This work was combined with information collected in the 1986 household travel survey and was used in a major regional travel model recalibration effort.

■ San Francisco, CA

The Bay Area Rapid Transit District (BART) conducted a large scale on-board survey in 1992. The passenger profile survey was the first general survey of BART patrons since 1987 and was significantly larger in scope than any other previous BART survey efforts. Approximately 70,000 surveys were distributed on BART trains over a two-day period. The survey identified current trip, travel, and socioeconomic characteristics of BART patrons.

The 1992 survey was conducted using a station-based approach. Questionnaires were distributed to passengers immediately after they entered each BART station. Approximately 35,000 completed surveys were returned for a response rate of over 50 percent. In addition to English versions, Spanish and Chinese language versions of the surveys were also distributed. A drawing for a vacation was used as an incentive for completing the questionnaire.

Other transit agencies in the Bay Area that have conducted transit on-board surveys in recent years include AC Transit (1993), CalTrain Commuter Rail (1994), SamTrans (1992) and Santa Clara County Transit District (1992).

■ Seattle, WA

A series of on-board transit rider surveys were completed during the 1992 to 1993 period, with earlier surveys conducted from 1982 to 1985 by six transit operators in cooperation with the Puget Sound Regional Council. These surveys were conducted primarily to provide a database for route and service planning. However, care has been taken to standardize the data collection procedures to the extent possible to gain maximum use of the data for regional travel demand analysis.

Surveys were distributed to boarding passengers on each of the transit and ferry systems and collected upon departure. Response rates for the surveys averaged between 40 and 50 percent. Data collected included socioeconomic profile of riders, purpose of travel, time-of-day of travel, mode of arrival and departure, and the distance walked at the origin and destination trip end.

■ Other Transit On-board Surveys

Transit agencies in the following metropolitan areas have indicated that they have carried out transit on-board surveys, but details about these surveys were not collected as part of the current analysis:

- Chicago, IL;
- Cleveland, OH;
- Dallas, TX;
- Des Moines, IA;
- Houston, TX;
- Kansas City, MO;
- Louisville, KY;
- New Orleans, LA;
- Phoenix, AZ; and
- San Juan, PR.

Appendix F

*Summary of Recent Commercial Vehicle Surveys
by Urban Area*

Summary of Recent Commercial Vehicle Surveys by Urban Area

This appendix provides an overview of commercial vehicle surveys that have recently been and are soon to be conducted in the United States. This appendix is not intended to be an exhaustive listing of all commercial vehicle surveys, but many of the major survey efforts that have been conducted by state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) are described.

■ Atlanta, GA

A commercial vehicle survey is being conducted in Atlanta in the Spring of 1996. This is being conducted in coordination with several other surveys including a bicycle/pedestrian survey and a work attraction survey. The survey is being administered via a mail-out/mail-back travel log with some on-site retrieval. About 1,000 responses are expected.

■ Chicago, IL

A commercial vehicle survey was conducted in Chicago in 1986. This survey effort was able to net over 3,500 completed surveys using a mailout-mailback approach. The collected responses were used in the development of a truck travel model and used to estimate the effects of tolls on truck movements. This survey effort was completed for a cost of approximately \$200,000.

■ Detroit, MI

The Southeast Michigan Council of Governments (SEMCOG) worked with the Michigan Department of Transportation (MDOT) to conduct an external station survey of commercial vehicles at both southeast Michigan and statewide locations. SEMCOG's portion of the survey was conducted in the Summer and early Fall of 1994 at weigh stations at or near five external stations.

Although 24 hour surveying in both directions was planned, some stations did not have lights which made night interviewing a problem. Temporary lights were used whenever possible. Surveying was conducted from Monday through Thursday evening.

Data collected and methods used included:

- Vehicle type: determined by interviewer according to axle configuration and body type (a straight truck, single or multiple trailer);
- Occupancy: determined by interviewer;
- Boxed or Containerized: driver asked whether load is boxed or containerized as part of commodity-carried classification;
- Origins: driver asked for full address of most recent stop and initial trip origin;
- Destinations: driver asked for full address of next stop and of final destination;
- Commodity: driver asked what commodity was being carried and interviewer classified the load according to 35 different categories;
- Trip frequency: driver asked how often the trip is made according to certain categories;
- Home base: driver asked where the vehicle is based/stored;
- Michigan road used: driver asked what roads within the state would be used to make trip;
- Total weight: weight recorded while vehicle was being surveyed; and
- Load weight: estimated by subtracting the estimated vehicle weight (based on axle configuration) from total weight.

SEMCOG is planning to conduct a new commercial vehicle survey in 1996.

■ El Paso, TX

The Texas Department of Transportation and the El Paso Metropolitan Planning Organization cooperated to conduct a commercial vehicle survey in 1994. The survey was able to collect 188 completed surveys using a telephone interview approach. The survey was conducted for a cost of approximately \$65,000 which included sample design, survey design, data collection, coding, survey analysis, and model development.

■ Houston, TX

A commercial vehicle survey was conducted during the months of August, September, and October, 1994. This survey consisted of two distinct elements: a commercial truck survey and a commercial passenger carrier survey. The commercial truck survey was confined to those vehicles with six or more tires and a gross vehicle weight of 8,500 pounds or more, and primarily used for commercial purposes. Using the vehicle registration list consisting of 40,182 commercial vehicles registered in the Houston urban area, 2,487 businesses were contacted. The resulting sample of 658 vehicles was surveyed during the week, and 46 vehicles were surveyed on the weekend. There were 173 commercial passenger carriers contacted which resulted in 411 weekday carriers surveyed and five carriers surveyed on weekends.

The data are currently being analyzed and expanded and will eventually be used in developing a truck travel model for the region. The data collection, coding, and reporting tasks were completed for a cost of \$150,000.

The commercial vehicles were surveyed for occupancy, fuel type, cargo type, year of vehicle and trip origin/destination locations and purposes. The STCC cargo codes were collapsed into 20 categories and these consolidated codes were then used on all surveys. Commercial vehicles also were interviewed as part of external station, workplace and special generator surveys. A rather large cumulative sample of commercial vehicles is anticipated with O-D, purpose and cargo-type information after all analysis is completed. No commercial vehicle survey has ever been performed in this region before.

■ Milwaukee, WI

A truck survey was completed in the Milwaukee area in 1992. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) used truck registration information from the State Department of Motor Vehicles to identify truck owners. Trip diaries were then mailed out to these owners which asked for information about origins and destinations, cargo, and industry. Approximately, 2,500 completed surveys were obtained. Some operators were concerned about the confidentiality of the survey, specifically the information that may be available to competitors. This issue was resolved by meeting with trucking officials to assure them of the confidentiality of the survey. As with other Milwaukee surveys conducted at the same time, no incentive was provided for completing the survey.

■ New York and New Jersey

A commercial vehicle survey was conducted during the 1992 to 1994 period by a partnership of the New Jersey Department of Transportation, the New York Metropolitan

Transportation Council, and the Port Authority of New York and New Jersey. The survey effort was able to collect approximately 14,500 completed surveys by conducting roadside interviews at 18 toll plaza locations. The total cost of the survey was approximately \$312,000.

■ Philadelphia, PA

A truck survey was included as part of the 1991 I-95 Intermobility Project. The survey was designed to collect data on existing traffic patterns and to aid in the design and evaluation of proposed highway improvements and corridor strategies. Both roadside interviews and mailback questionnaires distributed at terminals were used to administer the survey. A total of 2,500 responses were received.

■ Phoenix, AZ

A consultant was contracted in 1991 to complete a commercial vehicle survey to estimate truck models within Maricopa County. Using DMV registrations, a sample of approximately 720 commercial vehicle owners were identified and participated in the survey. A notable aspect of this survey was the inclusion of postal vehicles that would have been omitted using standard sampling techniques of locally registered vehicles. The survey utilized a mailout diary and follow-up telephone interview. The survey represents a 0.5 percent sample of all commercial vehicles based in Maricopa County. The total cost of the survey effort was \$90,000 which included data collection, data coding, and model development.

■ San Antonio, TX

The San Antonio - Bexar County Metropolitan Planning Organization conducted a truck survey in 1990 as part of a workplace travel survey. Approximately 3,800 employers were contacted by telephone; survey forms were mailed to participants, and data were obtained from approximately 400 truck drivers. Drivers were asked to record trip data over a 24-hour period. A similar truck survey with 1,160 respondents was completed in 1969.

■ San Francisco, CA

The California Department of Transportation conducted a commercial vehicle survey in the San Francisco Bay Area in 1991. The study focused on the I-880 corridor in Alameda County, but collected surveys were used to produce a database and truck travel model for the entire nine-county Bay Area. The survey effort used a variety of approaches to gather information on truck movements. A combined telephone-mailout-mailback approach was used to collect approximately 2,200 responses. These data were combined with over 8,000 responses collected through roadside interviews. The survey data was supplemented with information obtained from employer surveys and interviews with terminal operators at the Port of Oakland.

■ Tampa/St. Petersburg, FL

The Florida Department of Transportation (FDOT) completed a truck attraction survey as part of its 1991/1992 survey effort in the Tampa Bay region. To complete this survey, FDOT cordoned off discrete zones that had been previously identified as truck destinations. The cordon locations were situated to minimize the impact of trucks traveling through the zones. Spotters were located at the entry points to these zones. These spotters counted the number and type of trucks traveling into and out of the zone from 6:30 a.m. to 6:30 p.m. The designated zones contained a variety of land uses including industrial, commercial-office, commercial-shopping, institutional, and residential. Information on different activities occurring in each zone was also collected, such as employment, number of dwelling units/hotel rooms, and number of students. The land use zone information collected was then used to extrapolate truck activity for other similar zones in the region.

Appendix G

*Summary of Recent Workplace and Establishment
Surveys by Urban Area*

Summary of Recent Workplace and Establishment Surveys by Urban Area

This appendix summarizes workplace and establishment surveys that have recently been and are soon to be conducted in the United States. This appendix is not intended to be an exhaustive listing of all workplace and establishment surveys. Instead, the material represents an overview of selected survey efforts that have been conducted by state departments of transportation (DOTs) and metropolitan planning organizations (MPOs).

■ Dallas/Ft. Worth, TX

The North Central Texas Council of Governments (NCTCOG) conducted a workplace survey in September, October, and November of 1994. The work included 20,000 visitor interviews and the collection of 7,000 completed employee forms for 278 establishments in the Dallas-Fort Worth Metropolitan Area. A stratified random sample of workplaces was obtained from a Dun & Bradstreet database, in which all workplaces were grouped into three industry types, five area types, and four employment size categories. Surveys were conducted on weekdays from 6 a.m. to midnight. The cost for a consultant to complete survey design and administration was \$400,000. All geocoding was performed by NCTCOG staff. The previous workplace survey for the region was conducted in 1984.

■ Des Moines, IA

The Des Moines Area Metropolitan Planning Organization completed a workplace survey of employers with 250 or more employees. Seventy-nine employers participated. About 30 percent of the employees participated in generating 14,000 responses. A \$100 drawing was used to encourage employee participation.

The employers provided data on company transportation policies such as flex time, transit subsidies, and carpooling incentives. The employers then distributed surveys to their employees which asked for job descriptions, work shifts, residential locations, time of arrival at work, route, and travel mode. Attitudinal questions about mode and route choice also were included on the employee surveys.

■ Houston, TX

A series of workplace surveys were conducted over an eight month period from May, 1994 through January, 1995 with breaks in June through August and the month of December. There were 291 employment sites surveyed. The set of surveys consisted of an employer general information survey, an employee survey, a visitor intercept survey, a commercial vehicle survey for delivery vehicles and perimeter vehicle and person counts.

The Houston MPO utilizes a unique set of employment categories that relate to trip-making characteristics. These are retail, office, industrial, medical, education and government. The initial 330 sites were randomly selected from the 1990 Dun & Bradstreet Employer file. This sample was stratified by the six categories of employment and the four area types of CBD, Urban, Suburban, and Rural. The sample was further cross-classified by freestanding and non-freestanding sites. It should be pointed out that the area type category classified three areas as central business districts: the downtown area of Houston, the Medical Center, and the Galleria-Post Oak area. Each of these areas have similar CBD characteristics.

One problem encountered was that many area employers recently had participated in a closely related Employer Trip Reduction Survey for Clean Air Act purposes and were reluctant to participate in another similar survey. Data from the workplace survey will be used to update the regional travel model. The workplace survey consultant contract is valued at \$372,000.

■ Kansas City, MO

A 1993 "Downtown/Midtown" survey was conducted in an area of about 30 blocks in the central business district. Forty-seven companies participated in the survey and 47 percent of their employees returned a total of 4,604 completed surveys. The surveys asked for residential location, length of time at that location, and whether the respondent had moved since being employed at that work site. The survey also contained questions about off-peak trips, lunch time trips, trip chaining behavior, child care trips, the adequacy of nighttime lighting in the area, and the possibility of telecommuting. A similar survey was carried out in a suburban office park location of Kansas City (Johnson County, Kansas) in 1989.

■ Minneapolis-St. Paul, MN

Approximately 250 establishments were surveyed in 1990 to determine the travel patterns of employees and visitors. The survey was stratified in three ways: 1) geographic rings; 2) employment class (retail, service, basic); and 3) size (number of employees).

■ San Antonio, TX

The San Antonio - Bexar County Metropolitan Planning Organization conducted a workplace survey in 1990, in conjunction with four other travel surveys. Two hundred eighty-two workplaces were surveyed; the sample was taken from Texas Employment Commission data and stratified by establishment type, establishment size, and area type (CBD, urban, residential, etc.) The survey included four components: a general site characteristics survey, an employee travel survey, a non-employee travel survey, and a 24-hour traffic or person count and truck count. Employees were requested to fill out a trip log, while visitors were intercepted by interviewers and asked about trip habits.

■ San Francisco, CA

The Bay Area Air Quality Management District conducted an employee travel behavior survey in the Spring of 1995. The intent of the survey was to update and aid in the development of a citywide travel demand database.

■ Tucson, AZ

The Pima Association of Governments has conducted an ordinance-required travel survey every year since 1989. All major employers with 100 or more employees are surveyed. In 1995, 228 workplaces and 99,000 employees were surveyed with a response rate of approximately 84 percent. The survey provided information on mode of travel to workplace, miles to workplace, minutes to workplace, arrival and departure times, attitudinal questions, and demographic questions.

The employer's surveys are due within a 90 day window of notification, with employers notified from January through October. The workplace survey is conducted using an employee's work week.

■ Washington D.C.

MWCOG is planning a workplace survey for the Spring of 1996. This survey work is being contracted to a consultant. It is estimated that this survey will be completed for about \$100,000. Fifteen sites are to be surveyed in the CBD, outlying business districts, and suburban office centers. Employees will be surveyed regarding journey-to-work and midday trips.

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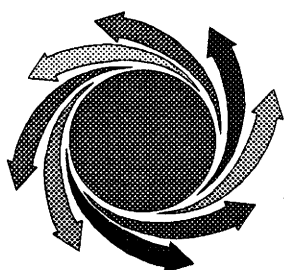
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