7-1999

Pedestrian Infrastructure Improvements: Effects on Transit Use and Perceptions of the Pedestrian Environment in Portland's Roseway Neighborhood

James G. Strathman
Portland State University

Kenneth Dueker
Portland State University

Peter Mye
Portland State University

Joyce A. Felton
Portland State University

Pedestrian Infrastructure Improvements: Effects on Transit Use and Perceptions of the Pedestrian Environment In Portland's Roseway Neighborhood

James G. Strathman
Kenneth J. Dueker
Peter A. Mye
Joyce A. Felton

July 1999

Center for Urban Studies
College of Urban and Public Affairs
Portland State University
Portland, OR 97207
http://www.upa.pdx.edu/CUS/

Table of Contents

Introduction .....

Background .....

Site Selection Process .....

Project Guidelines .....

The Study Area .....
- Location of Improvements .....

Literature Review .....
- The Pedestrian Environment .....
- Design and Pedestrian Activity .....
- Transit Access .....

Research Approach .....
- Survey Design and Administgration .....

Survey Results .....
- Profile of Respondents .....

Analysis of the 1998 Responses .....

Improvement Cross Tabulations .....
- Curb Extensions .....
- Pedestrian Refuge Islands .....
- Sidewalks and Curb Ramps .....
- Bus Shelters .....
- Benches and Landscaping at Bus Stops .....
- Neighborhood Trees and Landscaping .....
- Street Lighting .....

Merged Data Set Findings .....
- Tobit and Logit Analysis .....

Analysis of Transit Rider Count Data .....

Conclusion .....

Works Cited .....

Appendix A 1998 and 1997 Survey Questionaire .....

Appendix B Tri-Met Rider Count Data .....

Introduction

Over the past two years the Pedestrian Transportation Program (PTP) of the City of Portland has been engaged in a project to encourage walking and transit use through targeted infrastructure improvements. These improvements are intended to enhance pedestrian access to transit service by aiding street crossings and providing more amenities at bus stops. Other improvements include landscaping, sidewalks, curb extensions and ramps, and improved street lighting. One of the basic assumptions of this project is that the pedestrian environment is related to transportation choices. This report explores that assumption.

This report presents findings from a two-phase study of the Roseway neighborhood in Portland, Oregon. The intent is to determine whether and how improvements to the pedestrian environment affect transportation choice. The first phase surveyed attitudes and behaviors before improvements. In December 1997 and 1998 residents from the study area were randomly selected and asked to complete a 15-minute telephone interview. Respondents were asked about their transportation choices and their perceptions of the neighborhood's pedestrian environment (Appendix). The 1997 survey yielded 181 complete interviews. In 1998, 178 residents completed the telephone interview.

This paper is organized as follows. First, a background section provides information on the City's Pedestrian Access to Transit project, a description of the project site and improvements, and a literature review. Second, the methods for conducting the survey and analyzing the results are presented. Third, the survey results are presented. Appendices contain a copy of the surveys, site maps, a full set of cross tabulations and regressions generated from the survey responses, and Tri-Met ridership data.

Background

The Pedestrian Access to Transit project is managed by Portland's Pedestrian Transportation Program (PTP). The PTP's policies exist within a framework of state, federal and regional programs seeking to reduce vehicle travel, air pollution, and reliance on single-occupancy vehicles.

The goal of the Pedestrian Access to Transit project is to target infrastructure investments to walking and transit use. It is a logical assumption that safe and pleasant walking environments will encourage walking. Moreover, it follows that because walking is the primary means of access to transit, safe and pleasant walking environments contribute to transit use. However, a variety of complex factors affect perceptions of the pedestrian and transit environments and are not well understood. Thus the PTP engaged in a demonstration project to provide evidence of perceptions and behavior regarding walking and transit use. This project assesses perceptions and behavior before and after improvements to the pedestrian environment.

Site Selection Process

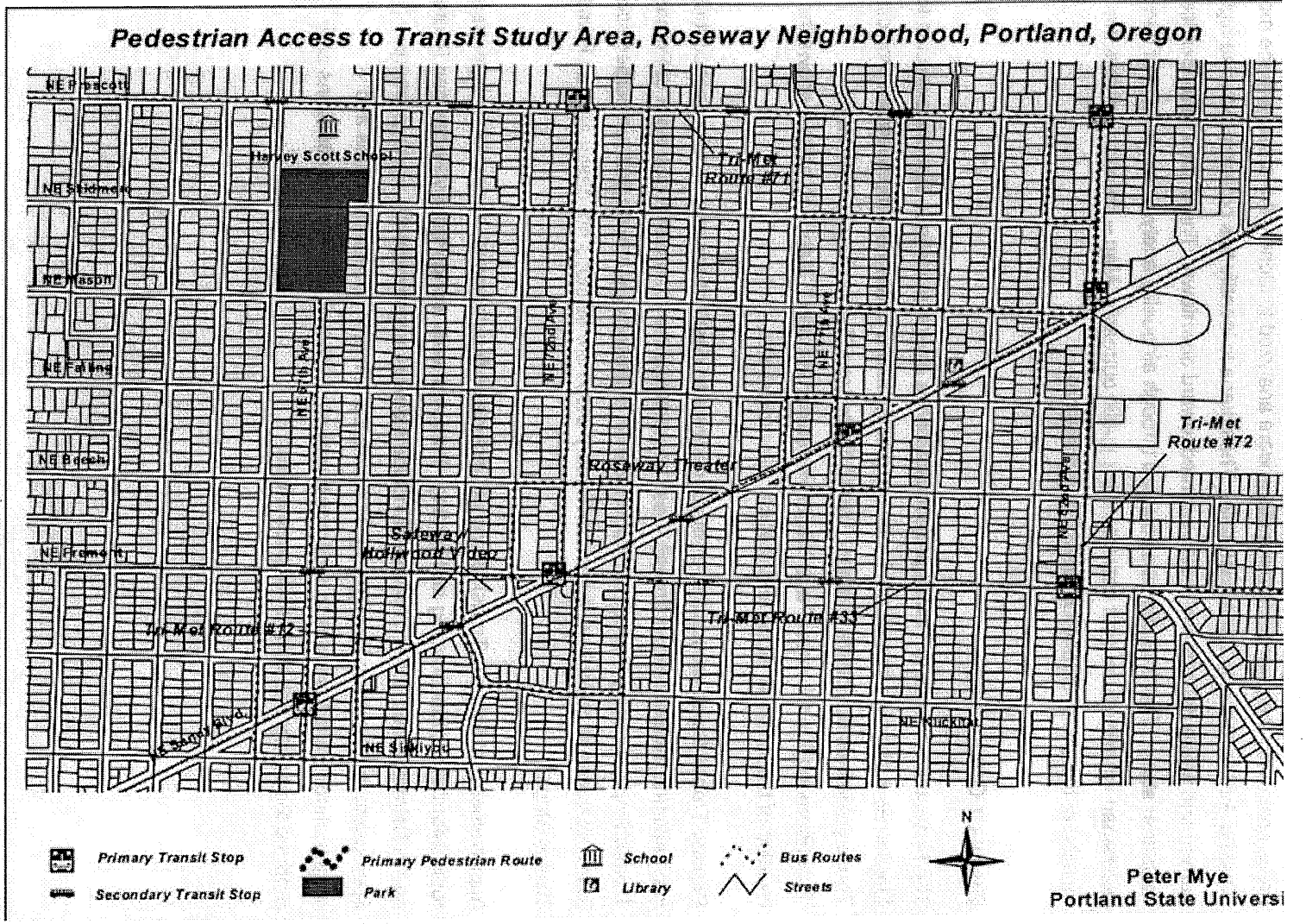
An initial phase screeened potential sites for the demonstration project--areas with relatively low transit use for the level of service provided and with the greatest propensity to increase choice riders (i.e., people who have the means and access to modes other than transit). The screening process incrementally narrowed candidate sites as follows. First, a previously defined Primary Transit Network (PTN) identified the transit routes that form a network around which long-range transportation and land-use planning are to be focused. Next, Tri-Met ridership data were analyzed to identify poor performing PTN routes—those within the lowest quartile of revenue per passenger hour. Next, the poorest performing stops on these routes were identified. The areas containing the poor performing stops were then analyzed to identify the areas with the greatest potential for increases in transit ridership. The criteria to identify this potential included high current and future density, and routes oriented toward downtown. Three sites were identified for further study. The final site was selected through air quality analysis, evaluation of current pedestrian infrastructure, cost estimates and public outreach. The site selected, located in the Roseway neighborhood, is shown in the map on the following page.

Project Guidelines

The Pedestrian Access to Transit project establishes design guidelines that are expected to function as a planning framework for this as well as future pedestrian improvement projects. These guidelines designate "Primary Transit Stops" and "Secondary Transit Stops, "Neighborhood Transit Areas" and "Major Pedestrian Routes."

Primary Transit Stops are located at major origins and destinations and usually near controlled intersections. Neighborhood Transit Areas compromise the area within one block of Primary Transit Stops. Primary Pedestrian Routes are on neighborhood streets that run perpendicular to transit routes at major bus stops. Secondary Stops are all stops not designated as Primary Transit Stops.

Improvements at Primary Transit Stops include curb extensions, pedestrian refuge islands, route information, landscaping and lighting. Improvements along Primary Pedestrian Routes and in Neighborhood Transit Areas include sidewalk improvements, landscaping and lighting. The purpose of major pedestrian routes and neighborhood transit areas is to reinforce transit stops as neighborhood destinations and promote the safety and comfort of pedestrians.


Pedestrian Access to Transit Study Area, Roseway Neighborhood, Portland, Oregon
NE Prescott
Harvey Scott School
NE Skidmore
NE Mason
NE Failing
NE Beech
NE Fremont
NE 33rd Ave
NE 30th Ave
NE 27th Ave
NE 24th Ave
Tri-Met Route #71
Tri-Met Route #72
Roseway Theater
Safeway/ Hollywood Video
Tri-Met Route #72
Tri-Met Route #33
E Burnside
NE Sandy Blvd
NE Fremont
Primary Transit Stop
Secondary Transit Stop
Primary Pedestrian Route
Park
School
Library
Bus Routes
Streets
N
Peter Mye
Portland State Universi

The Study Area

The site chosen for the demonstration project is along Sandy Boulevard in Northeast Portland. The study area is bounded by NE 82nd Avenue on the east, NE Prescott on the north, NE 65th Avenue on the west and, on the south, by NE Fremont between 82nd and 72nd Avenues and Sandy Boulevard between 72nd and 65th Avenues. The surrounding medium density neighborhood consists of predominantly single-family dwellings. The Bungalow-style houses are one-story structures built on small lots. Higher density multiple unit residential structures are located along NE 82nd Avenue and NE Sandy Boulevard. Currently, the mix of retail uses includes a large grocery store and a movie theater, a county library and a video store, and an adult video store and dancing venues.

The study area is bisected diagonally by NE Sandy Boulevard, a U.S. Highway. A streetcar line in the early part of the century, Sandy Boulevard travels through an older portion of the City with a regular grid street pattern. The juxtaposition of the grid and diagonal streets results in complex intersections.

Before the construction of pedestrian improvements residents within the study area enjoyed a relatively well-developed pedestrian infrastructure. Consequently, neighborhood improvements can be characterized as marginally incremental. This is a crucial element in interpreting perceived changes in the pedestrian environment. Also important are the increasing traffic volumes and speeds along Sandy Boulevard, which can effectively mitigate the impacts of improvements along this major transit route. In addition, the variety of land uses along Sandy Boulevard, especially between NE 73rd and 77th Avenues, can act as inhibiting factors for transit use. These land uses include adult video stores and live dancing establishments.

NE 77th Avenue and Prescott

Within the study area, all longitudinal streets have continuous sidewalks, although most do not have curb ramps. The City Pedestrian Master Plan identifies NE 77th, NE 72nd, and NE 67th Avenues as primary pedestrian routes. The majority of latitudinal streets do not have sidewalks and several streets are not paved. Although latitudinal streets lack sidewalks, these streets function as important pedestrian feeders to transit service along Sandy Boulevard, as routes for joggers, and as play areas for children. The edges of the study area, 82nd Avenue, NE Prescott, and NE Fremont between 82nd and 72nd Avenues, have established sidewalk networks. Each of these streets is served by transit. However, the existence of sidewalks

NE Skidmore looking east from NE 67th

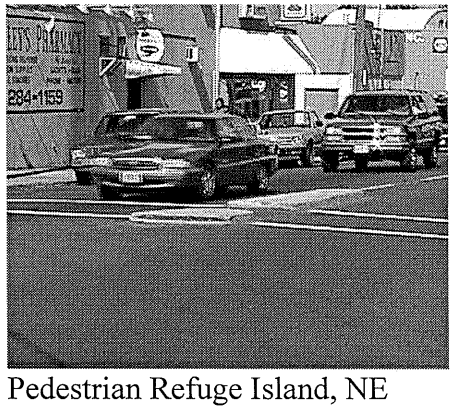
does not ensure a high level of access and mobility. Utility poles along NE Prescott obstruct a significant length of the street. Along the eastern boundary of the site, 82nd Avenue is a busy state highway with a variety of auto-oriented uses, such as service stations, convenience stores and motels.

Curb Extension & Bus Shelter, NE 72nd Avenue and Sandy Boulevard

Location of Improvements

Table 1 summarizes the infrastructure improvements in the study area. **Curb extensions** were built at primary and secondary transit stops along Sandy Boulevard and Prescott Street. Curb extensions were primarily constructed for the placement of bus shelters and other improvements such as refuse bins and signage poles. The extension also provides convenience and security in the form of a shelter and safety through the provision of a shorter street crossing distance and increased visibility. This secondary benefit is enjoyed by all pedestrians, while the primary benefit accrues to the transit user. Shelters, refuse bins, and signage benefit transit users in several ways. The shelter can enhance a transit users' perceptions of security. Regularly tended refuse bins lead to a cleaner and more pleasant bus stop environment. Another important consequence of a curb extension is that the bus remains in traffic. Since the bus does not have to re-enter the flow of traffic, its ability to maintain scheduled service is enhanced.

Improvements to existing **pedestrian refuge islands** and the construction of new islands are exclusive to Sandy Boulevard. Refuge islands were placed at locations with transit stops and at uncontrolled intersections along Sandy Boulevard. The intent of a refuge island is to allow people who move more slowly to wait safely in the center of traffic in negotiating their crossing. Refuge islands are a benefit to a variety of groups in the study area. Seniors, parents with small children, and people with impaired mobility benefit most from refuge islands.

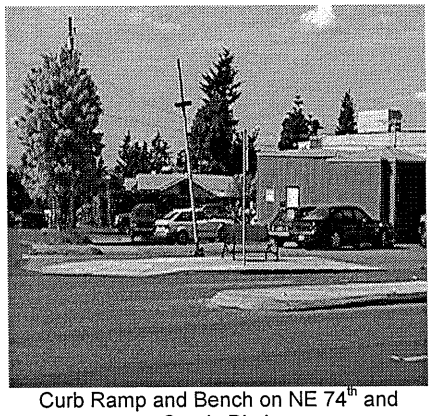


Pedestrian Refuge Island, NE Fremont and Sandy Boulevard

The design of refuge islands is crucial to their success. Pedestrians will clearly feel safer with a true barrier design (i.e. containing refuge island bollards or trees). Tire tracks on unprotected curb-style islands do not enhance pedestrians' perception of a safe crossing.

In 1990, the Americans with Disabilities Act mandated the construction of **curb ramps** to ensure mobility and access to all segments of the population. The intent of curb ramps is the creation of a much safer and more convenient pedestrian environment. New or existing curb ramps are

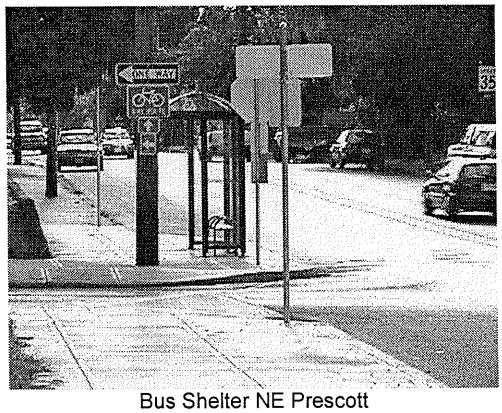
located at every intersection along the boundaries of the study area. The interior streets along the primary pedestrian routes have curb ramps although coverage is not complete.



Curb Ramp and Bench on NE 74th and Sandy Blvd.

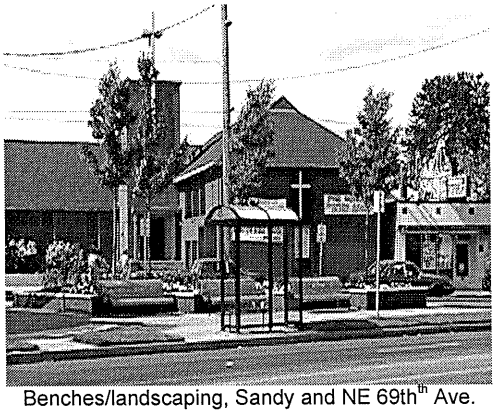
Improvements to **sidewalks** in the study area were minimal. The sidewalk connectivity along the boundaries is close to 100%. However, the majority of interior latitudinal streets remain unimproved. Sidewalk connectivity is a crucial factor in mobility and access. The Land Use Transportation Air Quality study (1993) identified sidewalk connectivity as a significant factor in the creation of a pedestrian friendly environment.

Bus shelters were placed along Sandy Boulevard and along Prescott Street. Curb extensions were constructed to accommodate the placement of shelters. Bus shelters perform a variety of functions. The most important is the protection they afford from inclement weather. Beyond convenience, shelters can affect perceptions of security. In combination with other improvements such as street lighting and "eyes-on-the-street" land use, bus shelters can contribute to a heightened sense of security.



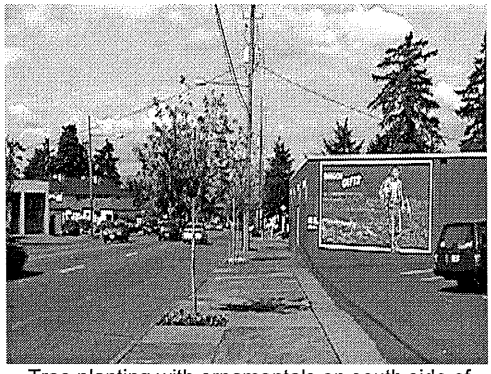
Bus Shelter NE Prescott

Benches were placed along Sandy Boulevard and Prescott Street. In some cases, the benches were placed on curb extensions and, in other cases, along sidewalks. However, benches were not placed near or within bus shelters. It thus follows that they will receive less usage during the rainy season and, given the lack of shade along Sandy Boulevard, in the summer as well.



Benches/landscaping, Sandy and NE 69th Ave.

Landscaping was marginally improved at selected bus stops. The most problematic aspect of landscaping is maintenance. Without regular attention, landscaping can create a negative perception of a bus stop, as weeds overtake ornamentals. Landscaping improvements along Sandy Boulevard are clearly noticeable. The environment along Sandy is intimidating because of the speed and volume of traffic, the complicated intersections and, for several blocks, the character of the land uses. Landscaping improvements between NE 73rd and 77th Avenues directly address these problems.



Tree planting with ornamentals on south side of Sandy at NE 77th Avenue

Because plantings take time to grow and mature, the impacts of landscaping improvements are difficult to judge. Thus, these improvements differ from the others because their near-term benefits are not as tangible.

In terms of security from crime, **street lighting** is one of the most important elements of the pedestrian environment. In the study area, Sandy Boulevard is already lit to city standards. The project's lighting improvements are located along NE 73rd and 75th Avenues one or two blocks north of Sandy.

Table 1: Location of Infrastructure Improvements

Location	Improvement
67th & Sandy	Curb Extension; Bus Shelter at NE Corner
69th & Sandy	Pedestrian Refuge Island
72nd & Sandy	Curb Extension; Pedestrian Refuge Island Re-built; Bus Shelters at SW & NE Corners
74th & Sandy	Pedestrian Refuge Island
77th & Sandy	Curb Extension
79th & Sandy	Pedestrian Refuge Island
82nd Street (Prescott to Sandy)	Retaining Wall; New Sidewalk; Curb Extension; Bus Shelter
72nd & Prescott	Curb Extension; Bus Shelter
77th & Prescott	Curb Extension
82nd & Prescott	Curb Extension
73rd & 75th off Sandy	Street Lighting
Sandy (between NE 73rd and 77th Ave.)	Tree Planting and Landscaping

Literature Review

The literature related to this study can be categorized into two general areas: the pedestrian environment and transit access. The literature concerning the pedestrian environment focuses on design, safety and methods to encourage pedestrian activity. Most of the literature concerning transit focuses on rail-based transit and larger scale relationships, such as density and travel behavior.

The Pedestrian Environment

Much of the work done in the field of pedestrian activity reflects capacity models used for evaluating automobile level of service (Fruin 1971; Pushkarev and Zupan 1977). This body of work offers quantitative measures of pedestrian flow, walking speed and flow density, similar to vehicle capacity measures. As with traffic modeling, these models estimate capacity requirements for pedestrian facilities. While this may be an appropriate method for extremely congested facilities, it is not particularly useful in the neighborhood environment.

Hill (1984) reviewed a broad body of literature on pedestrian activity. His monograph underscores a driving concept in the present report, which is that perceptions of pedestrians must be understood in order to effectively design their functional environment. Hill provides an overview of research done in the social and behavioral sciences that relate to pedestrian activity. He examines walking from many perspectives and recognizes it as a complex human behavior influenced by physical as well as psychological forces.

Khisty (1994) developed performance measures to evaluate pedestrian facilities based on qualitative aspects of the environment, including attractiveness, comfort, convenience, safety, security, system coherence and system continuity. His work provides an important basis for selecting the variables and developing the survey questions used in this study.

Design and Pedestrian Activity

Jane Jacobs (1961), William H. Whyte (1980), Donald Appleyard (1981) and Richard Untermann (1984) have contributed to the understanding of pedestrian activity in cities and how the physical environment affects comfort and safety. Newman (1972), working in the field of public housing, contributed to the understanding of how design and the physical environment affect the sense of security and levels of criminal activity.

Several studies examine street layout and the quality and continuity of pedestrian facilities. Gassaway (1992) focused on Portland's Bridlemile neighborhood in evaluating the adequacy of pedestrian facilities connecting residential areas to transit service and the local elementary school. He concluded that neither pedestrian nor transit planners were paying sufficient attention to the functional inter-relationships of their respective networks.

Moudon, et al. (1997) studied 12 Seattle neighborhoods to determine how pedestrian activity is related to the availability of direct, convenient, safe and continuous walkways. Their study compares areas with high and low levels of sidewalk continuity and connectivity and measures the pedestrian flow to commercial centers. As one would expect, they found a strong positive linkage between connectivity/continuity and pedestrian activity; areas with the high connectivity/continuity had an average of 37 pedestrians per hour, while the areas with low levels averaged 12 pedestrians per hour.

1000 Friends of Oregon (1993) analyzed the pedestrian environment of Portland neighborhoods. This project used ease of crossing, sidewalk continuity, local street connectivity, and topography, to develop a "Pedestrian Environment Factor" (PEF) for use in transportation modeling. This research shows that areas with a higher PEF had fewer automobile trips and more transit trips than low PEF areas.

Sarkar et al (1997) examined the role of traffic calming in pedestrian safety. The physical and psychological aspects of traffic calming designs are intended to manage traffic volume and speed, with the ultimate goal of achieving more equitable use of streets. Sarkar identifies the intended effects of traffic calming designs, and cites research from European cities to support the effects on driver behavior, traffic volume and speed. Traffic calming design can be successful when implemented as part of an area-wide traffic management plan. Sarkar cites accident rate reductions, changes in driver behavior and road conditions as indicators of a growing commitment to safety for pedestrians and bicyclists with traffic calming design. However, the complexity of factors that contribute to unsafe road conditions, the experiences attributed to road conditions by individuals, compliance to existing road rules and suitability of street designs are difficult to disentangle.

Transit Access

In recent years there has been increasing interest in understanding how land use affects transit use. Most studies address macro issues – focusing mainly on population density - rather than micro issues - site design (Pushkarev and Zupan 1977; Meyer and Gomez-Ibanez 1981; Moore and Thorsnes 1994).

Studies of the effect of site design on transit ridership tend to focus on major destinations, such as central business districts or shopping malls, rather than on origins, such as residential neighborhoods (Levinson, 1985). Studies also tend to focus on rail stations rather than bus stops (Loutzenheizer, 1997; Bernick and Cervero, 1997; O'Sullivan and Morrall, 1996).

Replogle and Parcells' (1992) case study provides an extensive review of pedestrian, bicycle and park-and-ride access to transit policies and programs. They conclude that the strategy favored in the United States -- building park-and-ride facilities rather than improving bicycle and pedestrian access to transit -- increases costs, energy consumption, and air pollution. Their report recognizes the importance of the environment near transit stops in fostering bicycle and pedestrian activity, and it recommends that guidelines be developed to encourage

Robert Cervero has written extensively on neighborhoods and designs that support transit use. In *Transit-Supportive Development in the United States: Experiences and Prospects* (Cervero, 1993), he concludes there is little evidence that site-level transit-supportive design has a measurable impact on transit use. He contends that the inability to discover a clear, direct relationship between transit use and land use or site design does not imply that a connection does not exist. Rather, it underscores the complexity of the land use-transit connection and the difficulty of designing experiments to capture the relationship.

Loutzenheizer (1997) studied factors that influence the choice to walk to rail stations. He found that distance, gender, age, ethnicity, and car availability had the greatest influence on the decision to walk. He also found a disparity between how far people thought they walked and how far they actually walked; people tended to over-estimate their walking distances. This underscores the importance of perceptions in travel decision-making.

Research Approach

The research relies on several sources of data and employs alternative statistical methods to evaluate the effects of the infrastructure improvements on transit use, walking, and perceptions of the pedestrian environment. With respect to data, the primary sources are surveys of study area households before and after the improvements. These surveys were designed to recover data on transit use, walking activity, and perceptions of the pedestrian environment in the study area. Another source of data are boarding and alighting counts on bus routes serving the study area. Tri-Met, the transit provider for the Portland region, has equipped about 25% of its bus fleet with Automatic Passenger Counters (APCs), which are capable of recording stop-specific passenger activity data.

Several statistical methods are employed in analyzing the data. Cross tabulations are performed to identify changes in transit and walking activity, as well as patterns of association among personal characteristics, walking frequency and transit use, and perceptions of the neighborhood environment. In addition, several regression techniques are used to provide better control over the complex set of factors that tend to confound analysis of walking and transit use. These techniques include ordinary least squares estimation (applied to the analysis of walking frequency), logit estimation (applied to the analysis of survey respondents' likelihood of using transit), and tobit estimation (applied to the analysis of the frequency of transit use).

Survey Design and Administration

Khisty's (1994) performance measures were used to develop a household telephone survey instrument to recover information about attitudes, awareness and behaviors concerning the pedestrian environment and transit use. The survey was administered before and after the improvements to determine whether changes in environmental perceptions, walking activity, or transit use had occurred. The follow-up survey also asked study area residents if they had noticed the improvements and, if they had, to rank them according to which they thought were most beneficial. The survey instruments are attached in the Appendix.

The survey is divided into three sections: screening questions, the main body, and demographics. Screening questions selected respondents living within the study area, 18+ years of age, and physically able to walk at least a block from their home. All respondents were asked to describe their frequency of and perceptions about walking in the neighborhood. Those who reported having used transit in the past year were asked questions similar to those about walking, but in relation to walking and waiting at bus stops.

The demographic section obtained information on respondent's age, income, gender, tenure in the neighborhood, the nearest cross streets, whether they worked downtown, and the number of vehicles and drivers in the household.

Telephone interviews were conducted in early December 1997 and 1998 for the pre and post-improvement phases of the study, respectively. Answers were recorded into a computer database. Using a reverse directory, all 1173 residential phone listings within the study area were entered into a spreadsheet (telephone numbers marked with a symbol for no phone solicitations were not included). A random number was assigned to each telephone number. The phone numbers were then sorted based on the value of the random number assigned. In 1997, all 1173 numbers were dialed; 530 contacts were made. Of those contacted, 198 declined to be interviewed and the interviewer screened out 150 (non-adults who answered the telephone and were alone at home), leaving 181 completed surveys. In 1998, the procedure was repeated. All numbers were again dialed; 626 contacts were made. Of those contacted, 315 declined to be interviewed and the interviewer screened out another 132, leaving a total of 179 completed surveys.

It is important to note that the time of year likely affected the surveys in two ways. First, the proximity of the holiday season made contact more difficult and, second, inclement weather at that time of year could have reduced the frequency of transit use and discretionary walking.

Survey Results

Profile of Respondents

Tables 2a and 2b present a profile of the 1997 and 1998 survey respondents, while Table 3 compares the respondents' socio-economic characteristics with the 1990 Census. Riders are defined as those who reported having taken the bus within the past year. Walkers are defined as those who reported walking in the neighborhood two or more times a week.

Table 2a indicates that the share of respondents who were transit riders (53%) remained the same over the two-year period. Younger respondents were relatively more likely to use transit, while those over 65 were proportionately represented. Middle-aged respondents were less likely to use transit than either younger or older residents. Men are more likely than women to use transit. Respondents from car-less households were 40 percent more likely to use transit in 1997 and 70 percent more likely in 1998. Conversely, respondents from households owning three or more vehicles were 17 and 3 percent less likely to use transit in 1997 and 1998, respectively. There is no effect of income on transit use among 1997 respondents. Among those responding in 1998, those with lower household incomes (under $30,000) were over 30 percent more likely to use transit, while those with higher incomes (over $50,000) were twenty-one percent less likely to use transit. Generally, respondent who had moved to the neighborhood more recently were more likely to use transit than longer-term residents.

Table 2b indicates that the proportion of respondents who were frequent walkers increased from 60 to 67 percent between 1997 and 1998. There are no age-related distinctions in the likelihood of walking among 1998 respondents, while in the 1997 sample younger respondents are somewhat more likely to be frequent walkers and older respondents are somewhat less likely. There are no income or vehicle ownership-related differences in the likelihood of walking, indicating that recreation, convenience, and health may have been the more relevant determinants of walking activity. Respondents who had lived in the neighborhood more than twenty years were less likely to be frequent walkers, while those who had lived in the neighborhood between 11 and 20 years were most likely to be frequent walkers.

Table 2a: Profile of Survey Respondents, By Transit Usage*

	'97 Sample (n=182)	'98 Sample (n=178)	'97 Rider (n=97)	'97 Non-rider (n=85)	'98 Rider (n=94)	'98 Non-rider (n=84)
Rider	53.3%	52.8%				
Non-rider	46.7%	47.2%				
Frequent Walker	59.9%	67.4%				
Infrequent Walker	39.6%	32.0%				
			Age			
18 to 34	23.6%	20.2%	28.9%	17.6%	25.5%	14.3%
35 to 64	45.6%	60.7%	40.2%	51.8%	55.3%	66.7%
65 and above	28.6%	19.1%	28.9%	28.2%	19.2%	19.0%
			Gender			
Male	41.2%	40.4%	43.3%	38.8%	44.7%	35.7%
Female	58.8%	59.6%	56.7%	61.2%	55.3%	64.3%
			Vehicles			
0	8.2%	10.7%	11.3%	4.7%	18.1%	2.4%
1	33.5%	33.1%	36.1%	30.6%	30.8%	35.7%
2	38.6%	35.4%	36.1%	41.2%	33.0%	38.1%
3+	18.7%	20.8%	15.5%	22.4%	18.1%	23.8%
			Income			
Under $30,000	28.6%	25.8%	27.8%	29.4%	34.0%	16.7%
$30,000 to $50,000	24.7%	39.9%	21.6%	28.2%	36.2%	44.0%
Above $50,000	20.9%	23.0%	19.6%	22.4%	18.1%	28.6%
Refused to Answer	20.3%	7.3%	22.7%	17.6%	6.4%	8.3%
			Tenure			
Under 5 Years	25.3%	34.3%	30.9%	18.8%	36.2%	32.1%
5 to 10 Years	26.9%	22.5%	25.8%	28.2%	22.3%	22.6%
11 to 20 Years	20.9%	18.5%	21.6%	20%	20.2%	16.7%
Over 20 Years	25.3%	24.7%	19.6%	31.8%	21.3%	28.6%

* "Don't know", "No Reply", or "Skip" responses account for discrepancy between category totals and sample size

Table 2b: Profile of Survey Respondents, By Walking Frequency*

	1997 Sample (n=182)	1998 Sample (n=178)	'97 Frequent Walker (n=109)	'97 Infrequent Walker (n=72)	'98 Frequent Walker (n=120)	'98 Infrequent Walker (n=57)
Rider	53.3%	52.8%				
Non-rider	46.7%	47.2%				
Frequent Walker	59.9%	67.4%				
Infrequent Walker	39.6%	32.0%				
Age						
18 to 34	23.6%	20.2%	27.5%	18.1%	20.8%	19.3%
35 to 64	45.6%	60.7%	44.0%	48.6%	60.9%	61.4%
65 and above	28.6%	19.1%	25.7%	31.9%	18.3%	19.3%
Gender						
Male	41.2%	40.4%	44.0%	37.5%	42.5%	36.8%
Female	58.8%	59.6%	56.0%	62.5%	57.5%	63.2%
Vehicles/Household						
0	8.2%	10.7%	9.2%	6.9%	11.7%	8.8%
1	33.5%	33.1%	34.9%	31.9%	30.8%	36.8%
2	38.6%	35.4%	37.6%	38.9%	35.8%	35.1%
3+	18.7%	20.8%	16.5%	22.2%	21.7%	19.3%
Household Income						
Under $30,000	28.6%	25.8%	29.4%	27.8%	29.2%	17.5%
$30,000 to $50,000	24.7%	39.9%	25.7%	23.6%	35.8%	49.1%
Above $50,000	20.9%	23.0%	22.0%	19.4%	25.0%	19.3%
Refused to Answer	20.3%	7.3%	17.4%	23.6%	7.5%	7.0%
Neighborhood Tenure						
Under 5 Years	25.3%	34.3%	27.5%	22.2%	33.3%	36.8%
5 to 10 Years	26.9%	22.5%	28.4%	23.6%	23.3%	21.1%
11 to 20 Years	20.9%	18.5%	24.8%	15.3%	21.7%	12.3%
Over 20 Years	25.3%	24.7%	17.4%	37.5%	21.7%	29.8%

* "Don't know", "No Reply", or "Skip" responses account for discrepancy between category totals and sample size

Demographic characteristics of the respondents compare reasonably well with the corresponding tract characteristics reported in the 1990 Census. As Table 2 indicates, the 1997 sample is slightly older and includes a greater percentage of females than the Census population. Households in both samples also own more cars and enjoy a slightly higher income. In 1998, the sample is more heavily represented by middle-aged and female respondents. However, it must be kept in mind that the Census data are nearly ten years old.

Table 3: Survey Respondents Compared With 1990 Census

	1997 Sample (n=182)	1998 Sample (n=178)	Census Data (1990)
Age			
18 to 34	23.6%	20.2%	34%
35 to 64	45.6%	60.7%	45%
65 and above	28.6%	19.1%	22%
Gender			
Male	41.2%	40.4%	47%
Female	58.8%	59.6%	53%
Vehicles/Household			
0	8.2%	10.7%	12%
1	33.5%	33.1%	40%
2	38.6%	35.4%	35%
3+	18.7%	20.8%	13%
Household Income			
Under $30,000	28.6%	25.8%	55%
$30,000 to $50,000	24.7%	39.9%	32%
Above $50,000	20.9%	23.0%	13%
Refused to Answer	20.3%	7.3%	--

Analysis of the 1998 Responses

This section presents findings on the perceived effects of the improvements on safety, security, and convenience. Awareness and effects of the improvements on perceptions are also explored

in relation to transit use, walking frequency, age, gender, income, vehicle ownership, and neighborhood tenure.

Figure 1 reports the percentage of respondents who noticed each of the infrastructure improvements. Curb extensions, pedestrian refuge islands, sidewalk improvements/curb ramps, and bus shelters received the highest levels of notice. Trees, landscaping and street lighting received the lowest notice levels. Bus stop amenities were noticed by roughly half of the respondents. The level of improvement notice is governed by the magnitude of change. Curb extensions, pedestrian refuge islands, and sidewalks/curb ramps were noticed by nearly 80 percent of the respondents. Bus shelters were noticed by more than half of the respondents, while landscaping improvements were notice by approximately 40 percent. Only 8 percent of the respondents noticed lighting improvements but, as was mentioned earlier, these changes were very marginal.

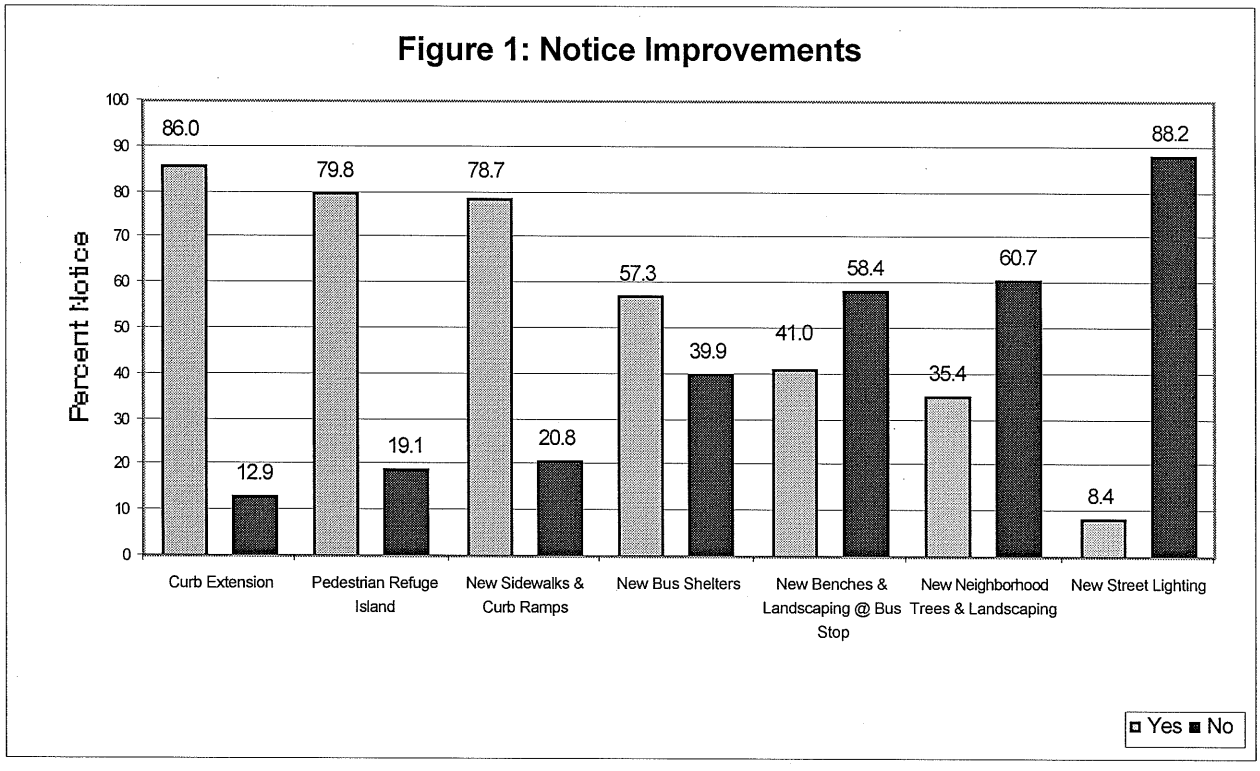
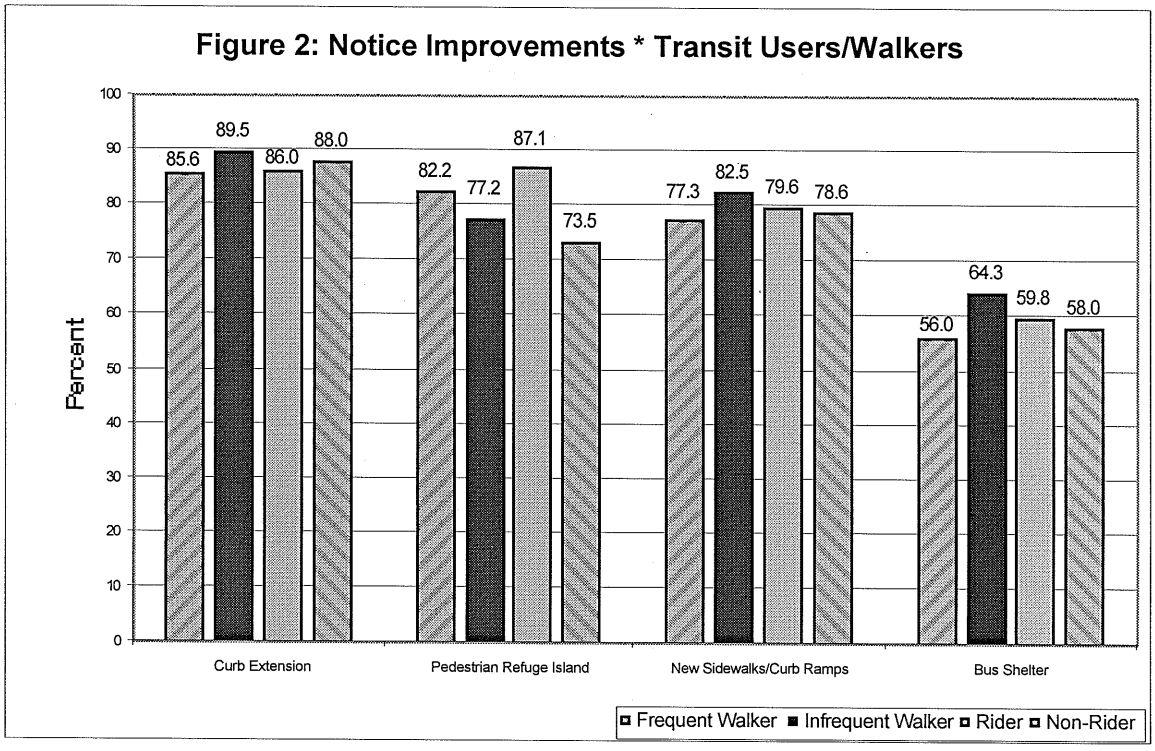


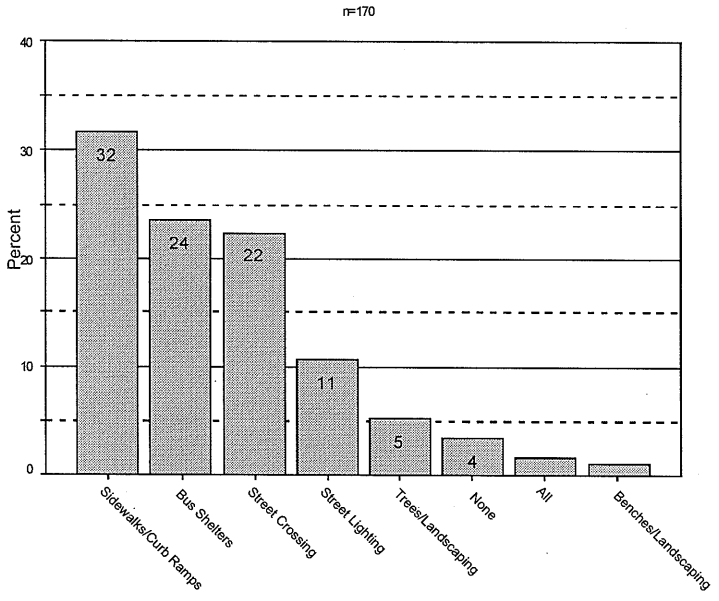
Figure 2 distinguishes the awareness of the most noticed improvements by walking frequency and transit use. Infrequent walkers and non-riders noticed curb extensions slightly more often than walkers and riders. What this most likely indicates is that walkers and transit users perceive the convenience of these improvements, while the others, as motorists notice the effect on traffic

flow, turning, and parking. This pattern is also evident in the awareness of sidewalk/curb ramp improvements. Notice of bus shelters is correlated with curb extensions because the latter were mainly intended to provide space for shelters. A secondary benefit of the shelters and curb extensions is the narrowing of the street crossing distance. Although frequent walkers do not notice this improvement as often as infrequent walkers, it is important to remember that the elderly, who benefit most from shorter street crossings, are infrequent walkers. The same interpretation would also apply to the relatively high level of awareness of infrequent walkers associated with sidewalks, curb ramps and bus shelters. Finally, frequent walkers and transit riders notice refuge islands more often than non-walkers and non-riders.



Respondents also identified what they perceived to be the most beneficial improvements, and their responses are presented in Figure 3. Given that a consequence of curb extensions and pedestrian islands was to jointly make street crossing easier, these two variables were combined for this question and were described as "street crossing improvements." Nearly a third of the respondents identified sidewalks/curb ramps as the most beneficial improvement. One-fourth of

Figure 3: Most Beneficial Improvements



the respondents cited bus shelters as the most beneficial, while one in five favored street crossing improvements most. There is a noticeable drop in the percentage of respondents favoring the remaining improvements. It should be noted that four percent of the respondents thought that none of the improvements were beneficial, while three percent thought that all of the improvements were "most" beneficial.

Figure 4 distinguishes improvement rankings by walking frequency. There are several notable differences in the rankings between frequent and infrequent walkers. For example, 34 percent of frequent walkers cited sidewalks/curb ramps as most beneficial, compared to 26 percent of infrequent walkers. Conversely, while 19 percent of frequent walkers thought street crossing improvements were most beneficial, 30 percent of infrequent walkers thought this improvement was most beneficial. As before, this response is consistent with the notion that the elderly, who walk less frequently, find street crossing aids to be important when they do walk.

Figure 5: Frequency of Walking * Most Beneficial Improvements

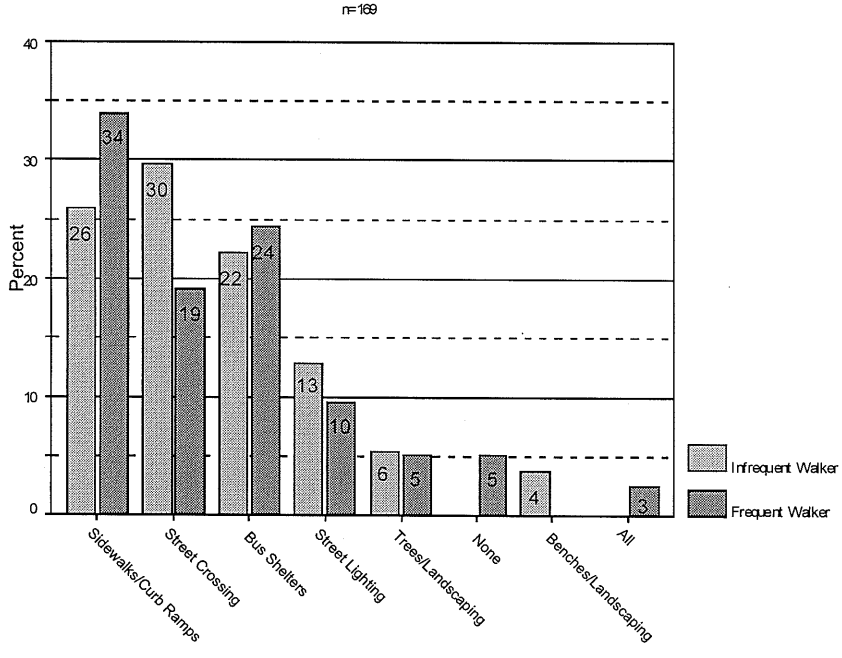


Figure 7: Transit Use * Most Beneficial Improvements

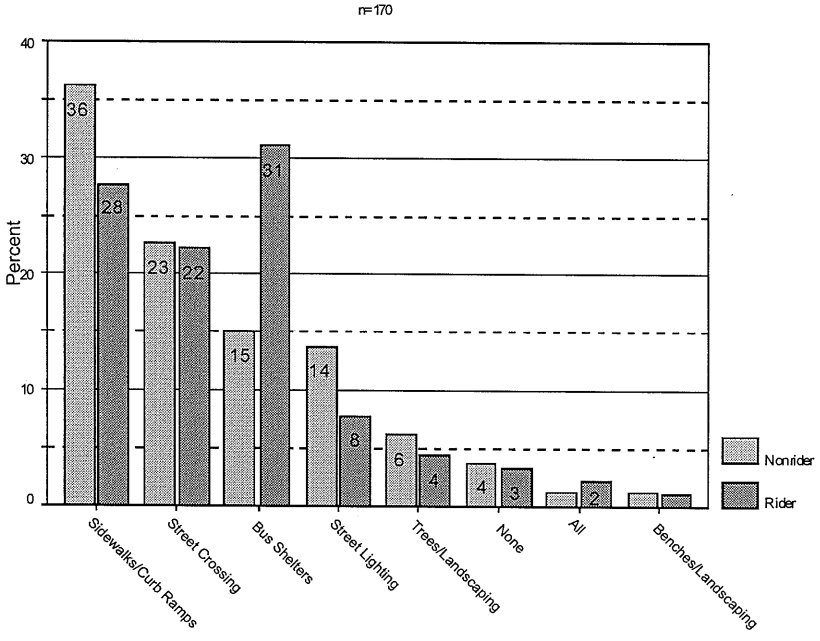


Figure 5 presents improvement rankings distinguished by transit use. As one might expect, the ranking for bus shelters differs most between transit users and non-users. Thirty-one percent of transit users thought shelters were the most beneficial improvement, while just 15 percent of non-users ranked shelters highest. Another difference occurs with sidewalks and curb ramps. Twenty-eight percent of transit users rank these as the most beneficial improvements, compared to 36 percent of non-users. As noted before, this difference implies that transit users are relatively more mobile as pedestrians and benefit comparatively less from curb ramps.

Improvement Cross Tabulations

Respondents who noticed the improvements, were asked if the improvement altered their perception of safety, security, neighborhood attractiveness and convenience. Answers were cross tabulated with frequency of walking, transit use, age, gender, vehicle ownership, household income, and neighborhood tenure. The major findings are presented graphically below. The full set of cross tabulations are attached to the report.

Figure 6 relates the extent to which each of the improvements was noticed to its effect on perceptions of safety, security, convenience and attractiveness. The joint responses can be grouped into three general categories. In the first are improvements that were widely noticed but whose impacts on perceptions of safety, security, or convenience were relatively less likely to be cited. For example, curb extensions and pedestrian refuge islands were noticed by 86 and 80 percent of respondents, respectively. But among those who noticed these improvements, only 58 and 68 percent that they provided added safety from traffic. In the second group are improvements whose awareness and impact were approximately corresponding. For example, 79 percent of those surveyed noticed sidewalk and curb ramp improvements, and 85 percent of

those who noticed these improvements perceived them as providing greater convenience. Bus shelters also fall into this category. In the final category are improvements that were less noticed but, among those who were aware of them, there was a relatively strong perception of their impact. For example, only 8 percent of the respondents noticed the street lighting improvements. But among those who did, 94 percent perceived an improvement in security as a result. Benches, landscaping and tree plantings also elicited similar responses. Given that lighting and landscaping improvements were fairly limited, it was expected that fewer respondents would notice them.

Figure 6: Notice Improvements * Perception of Safety, Security, Convenience, Attractiveness

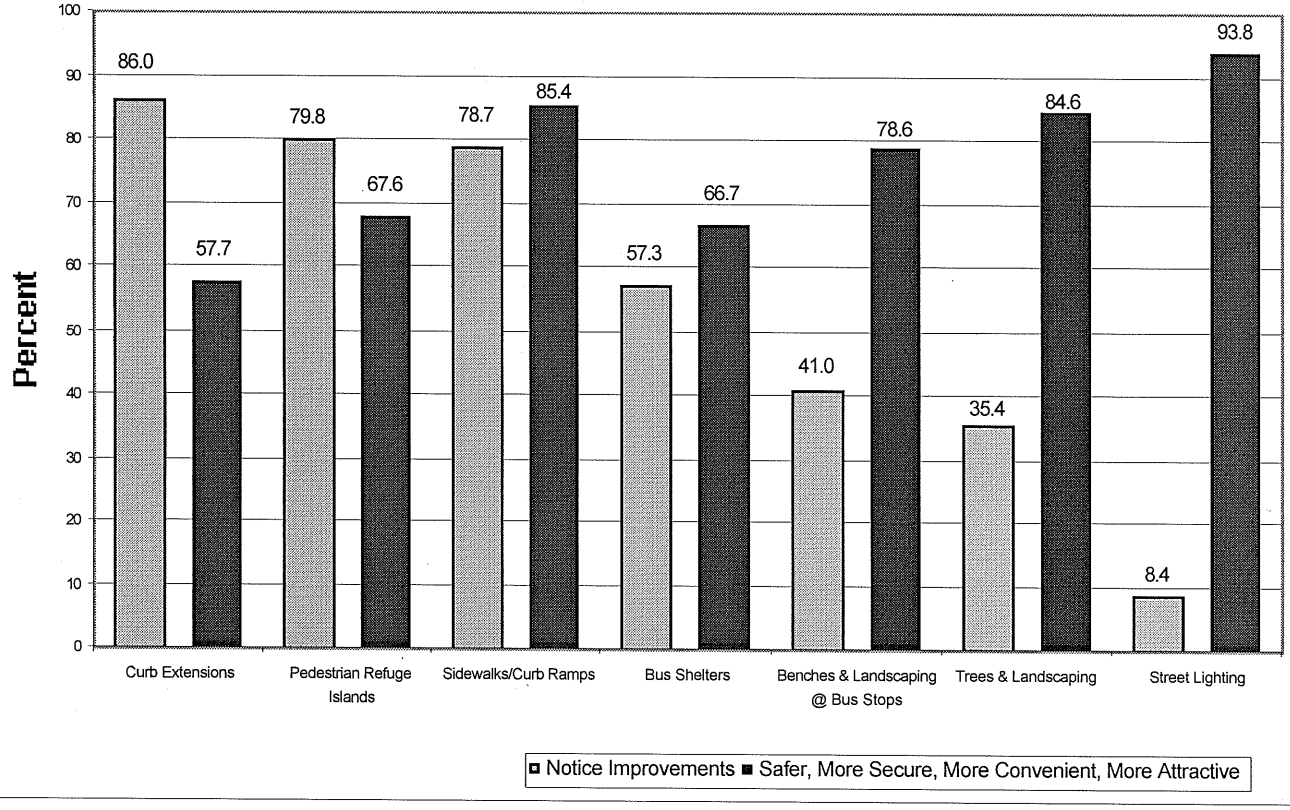
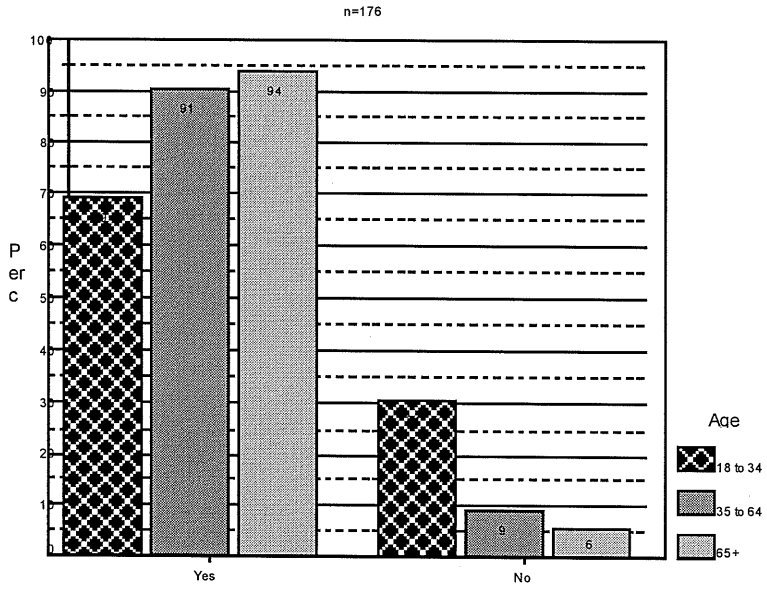


Figure 7 Notice Curb Extensions * Age



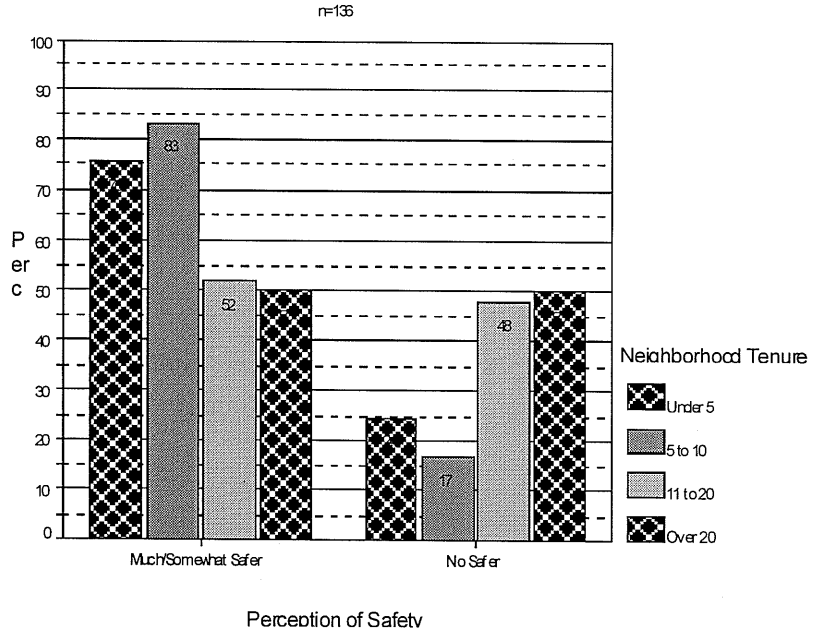
Curb Extensions

Only one of the cross tabulations involving curb extensions yielded statistically significant results. Figure 7 shows an increasing awareness of curb extensions with increases in the age of respondents. Younger respondents are generally more mobile and less intimidated by traffic volume and speed. Older respondents require longer crossing times. Consequently, they notice improvements that minimize crossing distances.

Other cross tabulations involving curb extensions resulted in the following:

- ◊ Women noticed curb extensions slightly more often than men.
- ◊ Awareness of curb extensions decreased with vehicle ownership.
- ◊ Awareness of curb extensions increased with neighborhood tenure.
- ◊ Frequent walkers and transit riders expressed a greater feeling of safety as a result of curb extensions than infrequent walkers and non-riders.

Figure 8 Tenure * Pedestrian Refuge Islands & Safety From Traffic



Pedestrian Refuge Islands

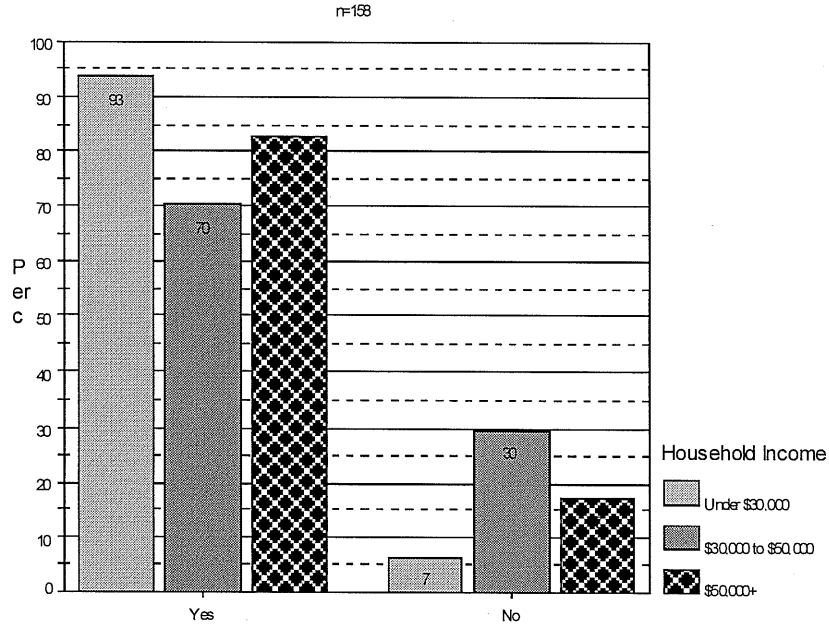
Cross-tabulations of pedestrian refuge islands and safety from traffic produced one significant relationship. Figure 8 illustrates the relationship between neighborhood tenure and perception of safety. Respondents who have lived in the neighborhood less than ten years exhibited a higher perception of

safety than long-time residents. Respondents with longer tenure are usually older. Ostensibly, the islands are a street crossing aid, but this result indicates they are not serving that function.

The other cross tabulations associated with pedestrian refuge islands revealed the following:

- ◊ Perceptions of safety decline noticeably as age increases and, although not significant, supports the tenure-safety relationship in Figure 8.
- ◊ Perceptions of safety increase with income.
- ◊ Frequent walkers and transit riders were more likely to notice and perceive gains in safety from pedestrian refuge islands.
- ◊ Older respondents were more likely to notice refuge islands.
- ◊ Men noticed refuge islands slightly more often than women.
- ◊ Awareness of refuge islands declined with increases in vehicle ownership.

Figure 9 Notice New Sidewalks/Curb Ramps * HH Income



Sidewalks and Curb Ramps

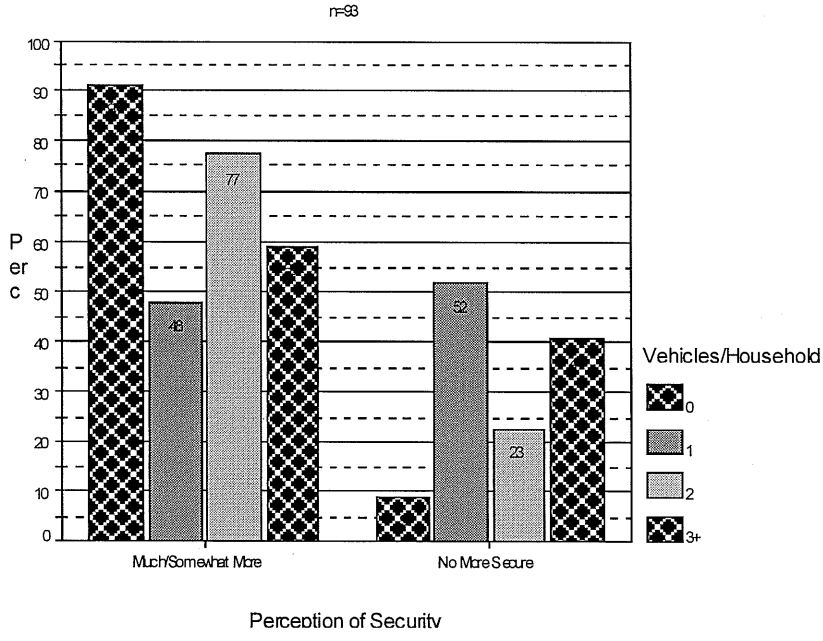
Cross tabulations of sidewalks/curb ramps revealed an inverse relationship between awareness of the improvement and income, as shown in Figure 9. Choice riders and frequent walkers are middle income earners, yet this group exhibits the lowest awareness on the improvement. However, given that curb ramps and sidewalks were the most ubiquitous improvements, they were widely noticed in general.

The remaining cross tabulations for sidewalks and curb ramps revealed the following:

- ◊ Frequent walkers were more likely to notice the improvement.
- ◊ The likelihood of noticing new sidewalks and curb ramps increased with age.
- ◊ Men noticed sidewalks and curb ramps more often than women

- ◊ As vehicle ownership increased, awareness of the improvement decreased, with a spike at the two-car household
- ◊ Awareness of the improvement increased slightly with neighborhood tenure.
- ◊ Frequent walkers and transit users exhibited a slightly greater perception of safety/convenience from this improvement than infrequent walkers and non-riders.
- ◊ People over 65 tended to feel safer as a result of the new sidewalks and curb ramps.
- ◊ Respondents who had lived in the neighborhood between five and twenty years expressed a higher perception of safety/convenience than either new or long-time residents.

Figure 10 Veh/Hh * New Bus Shelters & Security

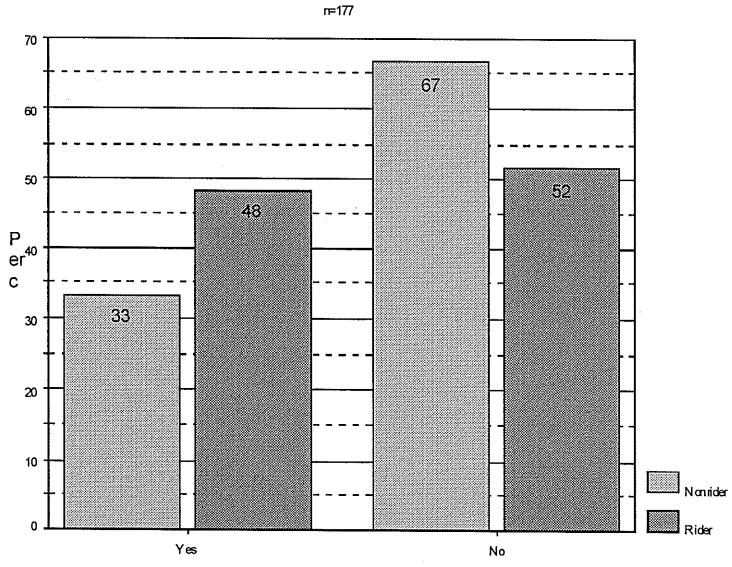


Bus Shelters

Cross-tabulations of the awareness of bus shelter improvements did not yield significant patterns with respect to the key respondent attributes. In terms of perceptions of security, the analysis did find an inverse relationship with vehicle ownership, as shown in Figure 10. Other patterns associated with the bus shelter cross tabulations are presented below.

- ◊ Frequent walkers noticed the new shelters more often than infrequent walkers.
- ◊ Awareness of the shelters was greatest among middle age residents.
- ◊ Infrequent walkers had a stronger perception of security with bus shelters than frequent walkers.
- ◊ As age increased so did the perception of security, with a slight drop for middle-age respondents.
- ◊ Increases in household income were associated with increases in perception of security.
- ◊ The perception of security decreased with tenure.

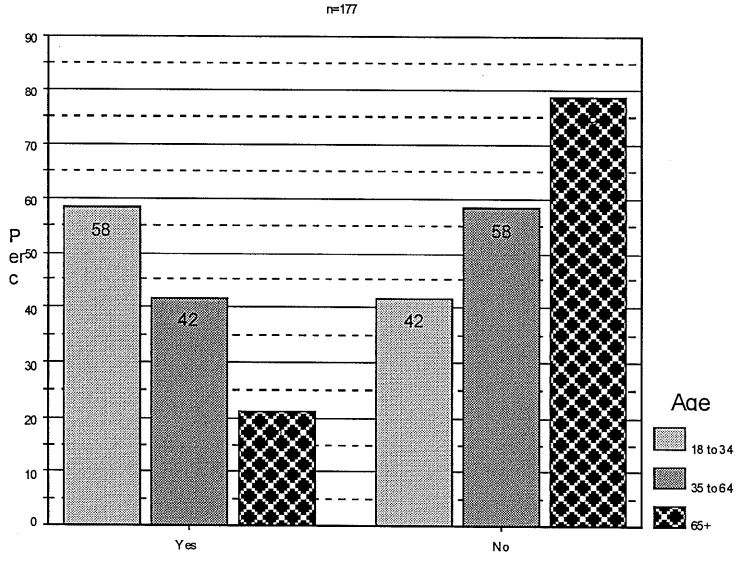
Figure 11 Transit Use * Notice New Benches & Landscaping @ Bus Stops



Benches and Landscaping at Bus Stops

Cross tabulations on this improvement provided several significant results. Figure 11 shows that transit users noticed bus stop improvements more often than non-riders. The graph also points out that less than 50 % of transit users noticed the improvement. This is probably because new benches and landscaping were located at selected stops.

Figure 12 Age * Notice New Benches & Landscaping @ Bus Stops



The cross tabulation on the awareness of new benches and landscaping with respondent age exhibits a direct relationship, shown in Figure 12. Younger respondents notice the improvement more frequently than other age groups and as age increases the level of notice decreases. Frequent walkers and transit users are predominantly younger and are thus more likely to notice the improvements. However, benches tend to be a benefit for older people. Benches and landscaping were placed in a relatively few locations thus leading to lower awareness.

Other cross tabulations revealed the following:

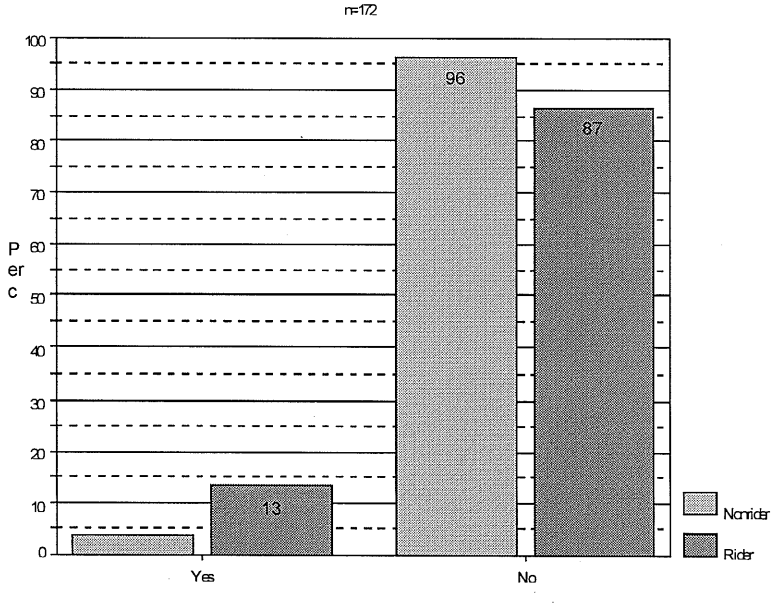
- ◊ Frequent walkers noticed the new benches and landscaping less often then frequent walkers.
- ◊ Awareness of the improvement decreased as household income increased.

- ◊ Residents who had lived in the neighborhood between 11 and 20 years noticed the improvement much more than residents of other tenure categories.
- ◊ As the number of vehicles per household increased the perception of convenience/pleasantness of the improvement decreased.

Neighborhood Trees and Landscaping: Cross tabulations of the awareness of neighborhood trees and landscaping and their impacts on perceptions of convenience and the pleasantness of the pedestrian environment did not yield significant relationships. Patterns in these cross tabs are listed below.

- ◊ Transit users noticed new trees and landscaping more often than non-users, but infrequent walkers were also more likely to notice these improvements than frequent walkers.
- ◊ Awareness of these improvements increased with age.
- ◊ Car-less households were more likely to notice the improvements.
- ◊ Both higher and lower income groups noticed the improvements more frequently than middle income respondents.
- ◊ Awareness of the improvements increased with tenure.

Figure 13 Transit Use * Notice Street Lighting



Street Lighting: Although awareness of street lighting improvements was generally low, cross tabulations resulted in one significant relationship, shown in Figure 13. Transit riders were much more likely to be aware of new street lighting than non-users. This outcome can be understood as a function of both the time of the survey (December) and exposure. Transit users are more likely than non-riders to be out at night, and thus to be more cognizant of the lighting levels in the neighborhood.

Patterns associated with the other cross tabulations of street lighting are summarized below.

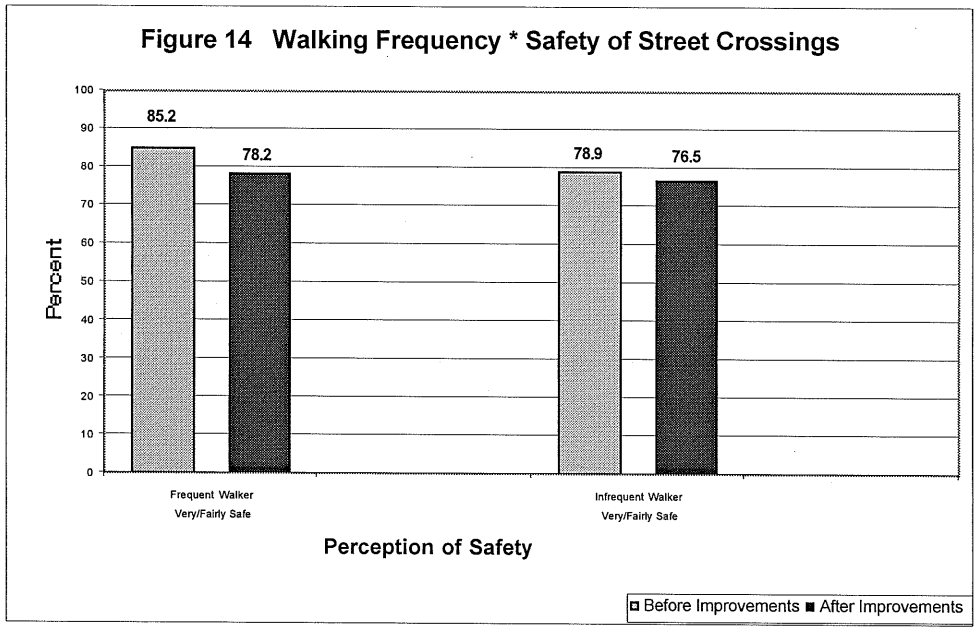
- ◊ Frequent walkers noticed lighting improvements more often than infrequent walkers.

- ◊ As age increased the awareness of new street lighting decreased.
- ◊ Awareness of lighting improvements was inversely related to vehicle ownership.
- ◊ Awareness of new lighting is positively associated with tenure.
- ◊ Frequent walkers felt that lighting improved security.
- ◊ Perceptions of security and respondent age were inversely related.
- ◊ Men tended feel more secure as a result of lighting than women.

Merged Data Set Findings

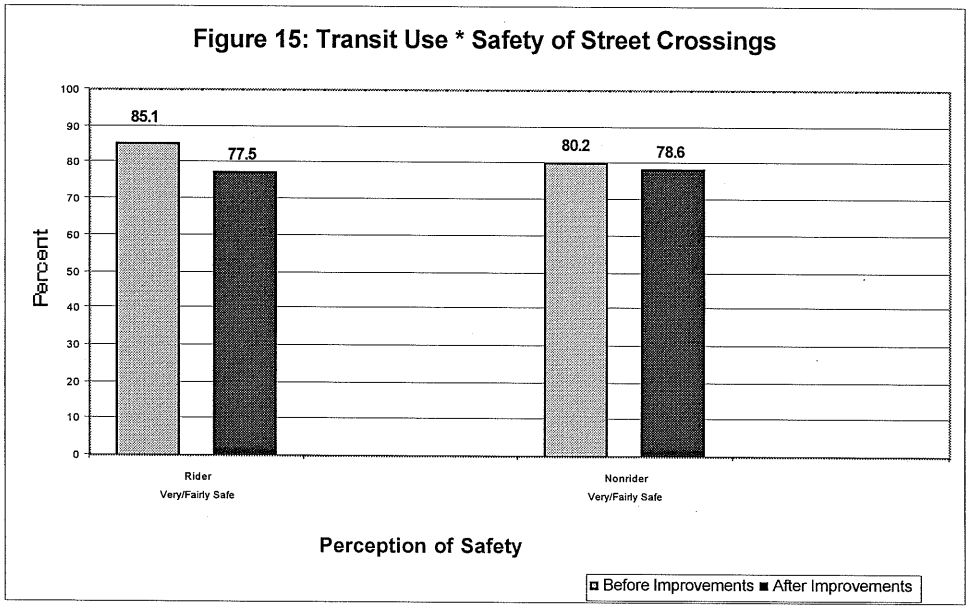
This section analyzes the combined 1997 and 1998 survey data. The analysis includes cross tabulations focusing on safety of street crossings and security from crime. Tobit, ordinary least squares, and logit models are also estimated to more rigorously isolate the effect of the infrastructure improvements on transit use and walking activity.

The initial set of cross tabulations relates safety and security to frequency of walking and transit use. Both before and after the improvements, frequent walkers felt safer crossing the streets in their neighborhood than infrequent walkers, as shown in Figure 14. Before the improvements frequent walkers were 8 percent more likely to feel safe crossing streets than non-walkers. After the improvements this difference shrank to two percent, which is inconsistent with the expectation that the new infrastructure would improve perceptions of safety. The figure also shows that both frequent and infrequent walkers felt less safe after the improvements, which most likely reflects the generally worsening traffic conditions in the study area over the time frame of the surveys.



than non-users

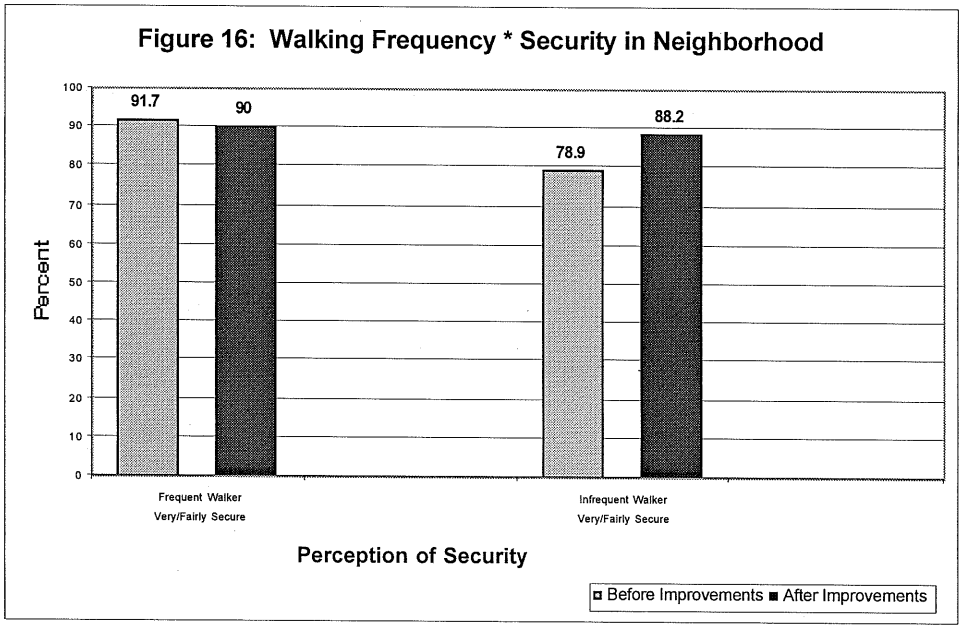
Figure 15 shows that the implied traffic effects are more muted for transit users. Prior to the improvement, transit users were about 6 percent more likely to feel safe crossing streets than non-users. In contrast, non-users reported feeling slightly safer following the improvements.



16

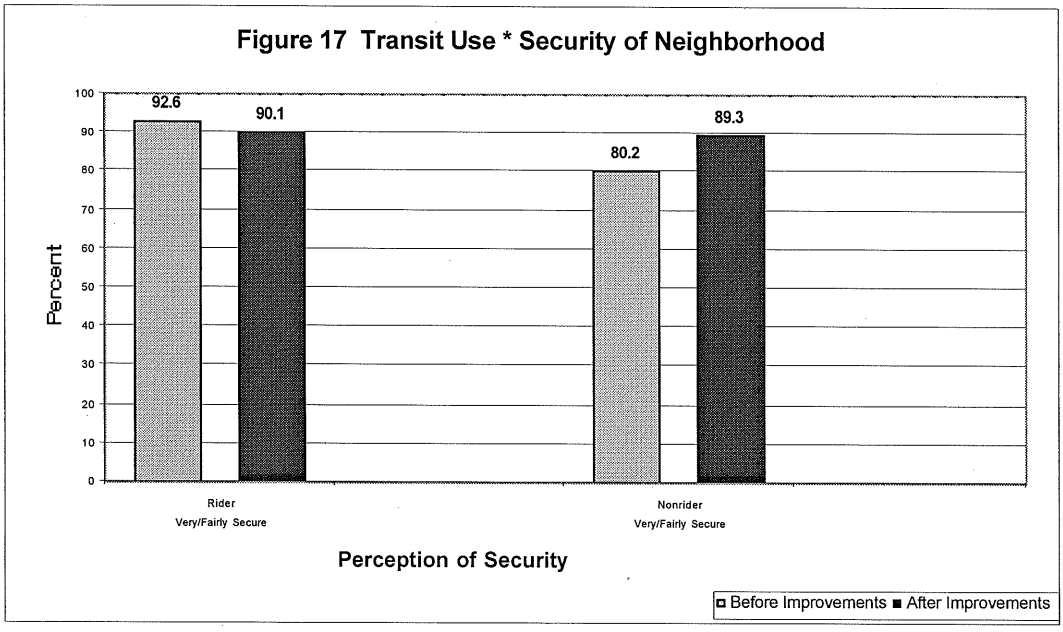
than infrequent walkers

Figure 20 addresses pedestrians' perceptions of security from crime in the neighborhood before and after the improvements. Prior to the improvements, frequent walkers were 16 percent more likely to respond that they felt fairly or very secure in the neighborhood. Following the improvements this differential shrank to two percent.



than non-users

Perceptions of neighborhood security with respect to the level of transit use are shown in Figure 17. Again, the differential perceptions expressed before the improvements (with transit users being 15 percent more likely to say they felt secure in their neighborhood) shrank considerably after the improvements.



Tobit and Logit Analysis

Cross tabulations provide some insight with respect to the impact of the improvements on residents' perceptions of the neighborhood environment and their propensity to walk and use transit. However, it is clear that a number of attributes related to these activities are confounded in this methodology. For example, there is a correspondence between respondents' age and neighborhood tenure, making it difficult to distinguish the effects of each on perceptions and behavior. The same can be said with respect to the effects of income and vehicle ownership. It is in such situations that multi-variate analysis is useful. Multi-variate models impose more rigorous controls on attributes influencing persons' perceptions and choices, and thus enables a better determination of the marginal effect of each.

The type of multi-variate models appropriate for the present analysis must be capable of dealing with either of two characteristics associated with the survey responses. First, the survey data on walking and transit use are censored. That is, while some of the individuals surveyed indicated that they had not walked or had not used transit during the specified time periods, this should not

imply that they never have (or never will) walked or used transit. Second, some of the behavior and perceptions of interest are phenomena characterized by discrete states (e.g., the choice to use or not use transit, or to be aware or unaware of the improvements in the pedestrian infrastructure). The first condition can be accommodated by the use of tobit models, while the second indicates the need for a logit model.

Using tobit and logit models, we examine five issues in this section. The first estimates whether residents' awareness of the improvements had any effect on their frequency of transit use. The second and third estimate whether the frequency and likelihood of using transit changed after the improvements. The fourth estimates whether the frequency of walking changed after the improvements. The final model estimates factors that contributed to residents' likelihood of being aware of selected improvements.

Table 4 reports the tobit model results for the effects of awareness of the improvements and other factors on the monthly number of transit trips. Awareness of two of the improvements – street lighting and curb extension ~~– are estimate to~~ have had a significant effect on transit use. Those who noticed street lighting improvements, for example, ~~are estimated to~~ have taken eight more transit trips than those who hadn't noticed the improvement. Alternatively, it may be inferred that people who used transit more frequently were more likely to notice lighting improvements because some of their trips were more likely to occur at night. Those who noticed curb extensions ~~are estimated to~~ have taken about six fewer transit trips per month. Although the curb extensions were intended to provide space for bus shelters, what this result may indicate is that non-transit users noticed their effects on facilitating street crossing or their effects on traffic flow and turning.

The estimated effects in Table 4 of the other improvements on transit use are positive, but are not statistically significant. The remaining variables are included to provide statistical control, but are of interest in their own right. Respondents over 65, for example, ~~were estimated to~~ take nearly nine more transit trips per month than those under 65. Alternatively, transit use ~~is estimated to~~ decline with increasing tenure in the neighborhood and increases in the number of household vehicles. Respondents who work in downtown Portland ~~were estimated to~~ take eight more trips per month.

Table 4: Tobit Regression of Frequency of Transit Use*
(1998 Data Set)

Independent Variable	Coefficient	T-ratio	Mean (SD)
Respondents 65+ Years Old	8.81	**3.31**	.17 (.37)
Notice Curb Extensions	-5.61	**-2.13**	.87 (.33)
Notice Refuge Islands	4.13	1.88	.8 (.41)
Notice New Sidewalks/Curb Ramps	1.14	.52	.79 (.41)
Notice New Bus Shelters	2.07	1.16	.59 (.49)
Notice New Benches & Landscaping	1.91	1.02	.42 (.5)
Notice New Street Lighting	8.09	**2.96**	.09 (.28)
Neighborhood Tenure	-.60	**-2.85**	14.6 (14.8)
Neighborhood Tenure Squared	.01	**2.19**	429.1 (745.6)
Vehicles Per Household	-1.63	**-2.39**	1.9 (1.3)
Male Respondent	3.02	1.82	.43 (.49)
Works in CBD	7.93	**3.76**	.19 (.39)
Constant	2.70	.75	--
Number of Cases	127		
R^{2**}	.39		

* T-ratios in bold type are significant at the .05 level in a two-tail test.
** In this application the R-square represents the squared correlation between observed and expected values.

Table 5 presents tobit model results comparing transit use before and after the improvements. Controlling for other determinants of transit use, respondents surveyed after the improvements are estimated to take one and a half more transit trips, which represents about a ten percent increase in transit trip-making. This estimate is consistent with the hypothesis that pedestrian

infrastructure improvements contribute to increases in transit use, although the estimate is not statistically significant.

Other noteworthy estimates in Table 5 include (again) the negative effects of vehicle ownership and neighborhood tenure on transit use. Also, it is estimated that men take about three more transit trips per month than women, which is a reversal of traditional transit usage patterns. As others have noted, this has come about as a result of the near-saturation of licensing and vehicle ownership among the adult population. It may also reflect another finding in Table 5, namely perceptions of security from crime. It is estimated that respondents who feel secure from crime take about four more transit trips per month than those who don't feel secure, and this estimate is significant at a slightly lower standard of acceptance.

Table 5: Tobit Regression on Frequency of Transit Use (Merged Data Set)*

Independent Variable	**Coefficient**	**T-ratio**	**Mean (SD)**
Neighborhood Tenure	-.50	**-3.27**	15.1 (15)
Neighborhood Tenure Squared	.008	**2.71**	451.1 (790.3)
Post-Improvement Respondents	1.45	1.09	.44 (.5)
65+ Year Old Respondents	1.61	.86	4.3 (1.2)
Perception of Safety	.18	.10	.8 (.4)
Perception of Security	4.05	1.82	.88 (.33)
Vehicles Per Household	-1.67	**-2.86**	1.8 (1.2)
Male Respondent	3.25	**2.36**	1.6 (.5)
Constant	.96	.34	--
Number of Cases = 307			
R^2 =			

* T-ratios in bold type are significant at the .05 level in a two-tail test.

A second way of estimating the effect of the pedestrian infrastructure improvements is to model the decision of whether or not to use transit at all. Table 6 reports logit model estimates of the

respondents' likelihood of using transit. As with the tobit model, we estimate that the likelihood of using transit increased following the improvements, although not significantly. In this application, we also estimate that perceptions of security from crime have a significant effect on the likelihood of using transit.

Table 6: Logit Regression on Transit Use (Merged Data Set)

Independent Variable	**Coefficient**	**T-ratio**	**Mean (SD)**
Tenure	-.06	* **-2.22**	15.1 (15)
Tenure Squared	.001	1.85	451.1 (790.1)
After Improvements	.32	1.31	.443 (.498)
Elderly (65+) Respondents	.31	.89	.241 (.428)
Feels Safe Crossing Streets	-.041	-.13	.801 (.4)
Feels Secure From Crime	.76	**1.96**	.876 (.33)
Number of Household Vehicles	-.21	**-1.99**	1.84 (1.23)
Male Respondents	.38	1.49	.417 (.494)
Constant	.07	-.132	-
Number of Cases = 307			
$R^2 = .75$			

* T-ratios in bold type are significant at the .05 level in a two-tail test.

Given that the improvements were to the pedestrian infrastructure, it is also relevant to assess whether any changes in walking activity occurred. Table 7 presents tobit model estimates of monthly walking activity. In general, it appears that the infrastructure improvements had a greater impact on walking activity than on transit use. This might be expected because walking represents a direct use of this infrastructure while transit use represents an indirect use. The tobit model results show an increase of about six walking trips per month following the improvements, which is statistically significant. Respondents who feel safe crossing streets are estimated to take five more walking trips per month, while those who feel secure from crime are estimated to take nearly seven more trips per month. To the extent that curb extensions and pedestrian refuge islands contribute to perceived safer street crossings, they have contributed to

an increase in walking activity in the neighborhood. The same can be inferred about the possible effect of street lighting improvements on perceptions of security from crime.

Table 7: Tobit Regression on Walking Frequency (Merged Data Set)

Variable	Coefficient	T-ratio	Mean (SD)
Tenure	-.22	-1.20	15.1 (15)
Tenure^2	.003	.87	452.2 (791.2)
After Improvements	6.25	* **3.76**	.44 (.5)
Elderly (65+) Respondents	.37	.16	.239 (.427)
Feels Safe Crossing Streets	4.90	* **2.26**	.801 (.400)
Feels Secure from Crime	6.67	* **2.51**	.876 (.33)
Number of Household Vehicles	-1.79	***-2.47**	1.84 (1.24)
Male Respondents	2.43	1.42	.42 (.49)
Constant	4.45	1.30	-
Frequency of Walking	-		14.3 (12.8)
Number of cases = 306			
$R^2 = .10$			

* T-ratios in bold type are significant at the .05 level in a two-tail test.

The final application of multi-variate analysis focuses on factors that contributed to respondents' awareness of infrastructure improvements. A logit model was estimated for each of the improvements relating the stated awareness of the improvement to various personal and behavioral characteristics. Generally, these models did not perform well in terms of identifying significant determinants of awareness. Some insight is gained for three of the improvements – bus shelters, benches and landscaping, and street lighting – and these results are presented in Table 8. Regarding bus shelters, the likelihood of noticing the improvement increases significantly with the number of reported transit trips per month. This is not surprising, because frequent transit users benefit directly from this improvement. Awareness of the shelters also increases with tenure in the neighborhood, and this result is less easy to explain. It may be that longer term residents tend to be more likely to notice changes in their neighborhood environment compared to recent residents.

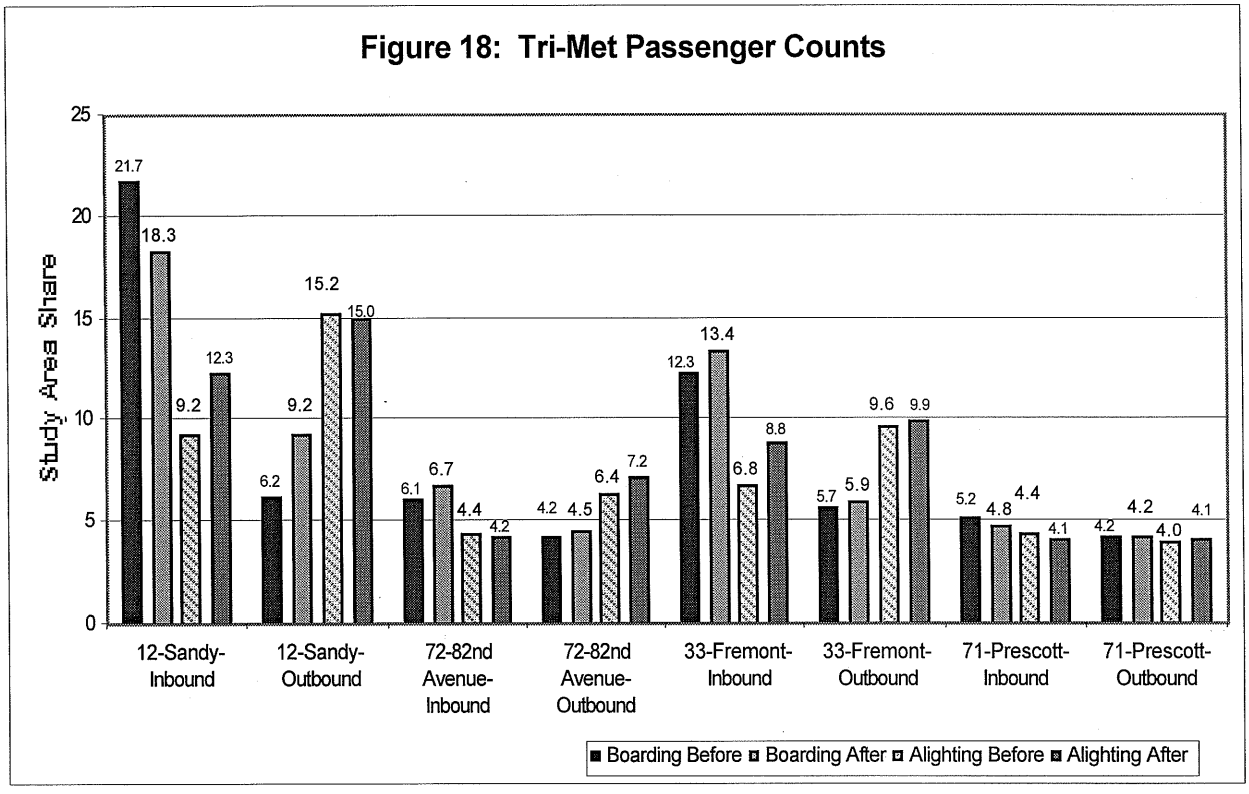
Benches and landscaping were more likely to be noticed by elderly respondents. This cohort would be expected to benefit relatively more from the convenience that benches provide. Finally, awareness of street lighting improvements grew with the frequency of transit use. As mentioned earlier, more frequent transit users are more likely to use this service at night and would thus be expected to notice the improvement.

Table 8 Logit Regression: Awareness of Transit Shelters, Benches/Landscaping at Bus Stops, and Street Lighting

	Bus Shelters		Benches/Landscaping		Street Lighting	
Variable	**B**	**T-ratio**	**B**	**T-ratio**	**B**	**T-ratio**
Elderly (65+) Respondents	-1.05	-1.90	-1.77	* **-2.80**	-.78	-.88
Tenure	.10	**2.32**	.08	1.94	.13	1.53
Tenure^2	-.002	**-2.21**	-.001	-1.65	-.002	-1.16
Frequency of Walking	-.01	-.73	-.01	-.52	.04	1.62
Transit Trips/Month	.08	**2.33**	.03	1.14	.12	**2.82**
Vehicles Per Household	.007	.05	-.20	-1.28	-.15	-.53
Male Respondents	-.01	-.04	-.13	-.36	-.24	-.36
Constant	-.22	-.48	-.40	-.85	-4.43	**-3.86**
Number of cases	160		160		160	
R^2	.78		.78		.10	

Analysis of Transit Rider Count Data

Tri-Met, the regional transit provider, uses Automatic Passenger Counters (APCs) to obtain rider counts on the four bus routes serving the study area, the 12 - Sandy, 33 - Fremont, 71 - Prescott and 72 - 82nd Avenue. Boarding and alighting counts for inbound and outbound buses for the entire route and the portion traversing the study area were recorded before and after the improvements. Figure 18 shows the pattern of passenger activity for each of the routes in each direction. Spring 1998 and 1999 rider counts are used for comparison for all routes except the 12 – Sandy, where equipment changes necessitated the use of Tri-Met's 1994 Passenger Census counts for the baseline.



With four routes, two directions, and two passenger flows, there are 16 points of comparison of transit passenger activity in response to the infrastructure improvements. In ten of these sixteen instances, the share of a route's total passenger activity occurring within the study increased, indicating that the infrastructure improvements had a differentially positive impact on transit use. In five of the sixteen instances, the share of passenger activity within the study area declined, and in the final observation the share was unchanged. Focusing on the 12 Sandy, where most of the improvements occurred, the impacts are mixed. For this route the study area share of in-bound boardings and out-bound alightings declined, while the share of in-bound alightings and out-bound boardings increased. Detailed passenger counts are reported in the Appendix.

Conclusion

This project has sought to document relationships between specific pedestrian infrastructure improvements, people's perceptions of the pedestrian environment, and decisions to walk and use transit. The relationship between people's perceptions of the pedestrian environment and their decisions to walk in their neighborhood or take transit are complex. One of the more compelling findings in this study is the strong relationship between perception of safety and security with walking trips. Perceptions of safety and security had a significant effect on the decision to walk. Numerous accessible destinations exist within the study area, and thus the decision to walk took on a variety of forms. One could walk for recreation, entertainment or exercise, to take care of personal business, to shop, or to access transit. Statistical analysis revealed that walking trips increased over the study period. Furthermore, perceptions of security played a significant role in residents decisions to use transit. Other findings include the expected effects of vehicle ownership and work location in the CBD on transit use.

Infrastructure improvements were not exclusively noticed by regular transit users and frequent walkers. In fact, improvements were well noticed by all respondents. In general, respondents welcomed the improvements and felt they led to a safer, more secure and more pleasing walking environment.

The City is involved in a regional strategy to reduce vehicle miles traveled (VMT), improve air quality and reduce dependence on single occupancy vehicles. Achieving an increase in transit ridership among those who have a choice between taking transit and driving - choice riders - is part of this strategy. Choice riders are ~~most often women and~~ people with higher incomes and access to automobiles. The before and after household survey sample profiles (Tables 2a and 2b) revealed that over 50 % of study area transit users are choice riders. The analysis in this report indicates that the effect of the infrastructure improvements on residents' decisions to use transit was positive, but the strength of the effect was weak. This outcome may not be surprising recognizing the following considerations. First, the pre-existing pedestrian infrastructure in the study area was already fairly well developed, and thus the improvements provided only a marginal change in convenience and safety. Second, improvements in infrastructure leading to and from transit facilities benefit only part of the transit user's journey. The decision to use transit clearly takes neighborhood access and egress into account, but it also considers a variety of other factors associated with waiting at stops, the in-vehicle experience, and the journey segment from the alighting to the destination point.

An important element in the development of pedestrian access to transit rests with the skill of infrastructure designers. The juxtaposition of a diagonal street that carries a large amount of traffic at high speeds (Sandy) is a challenge to pedestrians. Without physical barriers, perceptions of safety will probably not improve. In other respects, the neighborhood has the necessary components for pedestrian mobility and transit use. The area has good pedestrian access to retail stores, including grocery stores. This suggests the importance of land use in encouraging walking for many purchasing needs. The results also raise the question of whether elements that encourage walking for recreational purposes are different from those that encourage purposeful walking such as to work or for shopping. More research would be valuable to better understand those elements.

pedestrian infrastructure can stem the decline in transit use

implications of these negative effects of fewer attractive ⇒ service quality & security

Works Cited

Appleyard, Donald. 1981. *Livable Streets.* Berkeley, CA: University of California Press.

Bernick, Michael and Robert Cervero. 1997. *Transit Villages in the 21st Century*. New York: McGraw-Hill.

Cervero, Robert. 1993. *Transit-Supportive Development in the United States: Experiences and Prospects: Final Report.* Berkeley: National Transit Access Center, Washington, D.C.: Federal Transit Administration.

Cole Publications. 1996. *Cole's Cross Reference Directory*. Portland. Lincoln, NE: Cole Publications.

Fruin, J.J. 1971: Designing For Pedestrians: A Level Of Service Concept. *Highway Research Board No.355*.

Gassaway, Alexander R. 1992. The Adequacy of Walkways for Pedestrian Movement Along Public Roadways in The Suburbs of an American City. *Transportation Research Part A: General*. 26A, 5. 361-80.

Gruen, Victor. 1964. *Heart of Our Cities*. New York: Simon and Scuster.

Hill, Michael R. 1984. *Walking, Crossing Streets, Choosing Pedestrian Routes: A Survey of Recent Insights from the Social/Behavioral Sciences*. University of Nebraska Studies: New Series No. 66. Lincoln, NE: University of Nebraska-Lincoln.

Jacobs, Jane. 1961. *The Death And Life Of Great American Cities*. New York: Random House.

Khisty, C.Jotin. 1994. Evaluation Of Pedestrian Facilities: Beyond The Level-Of-Service Concept, *Transportation Research Record 1438*. Washington, D.C.: National Academy Press.

Levinson, Herbert S. 1985. Streets for People and Transit. *Transportation Quarterly*. 40, 4. 503-20.

Loutzenheiser, Donald R. 1997. *Pedestrian Access to Transit: Model of Walk Trips and Their Design and Urban Form Determinants Around Bay Area Rapid Transit Stations*. Transportation Research Record 1604. 40-49. Washington, D.C.: National Academy Press.

Meyer J. R. and J.A. Gomez-Ibanez. 1981. *Autos, Transit, and Cities*. Cambridge, MA.: Harvard University Press.

Moore, Terry and Paul Thorsnes. 1994. The Transportation/Land Use Connection. PAS Report 448/449. Chicago, IL: American Planning Association.

Moudon, Anne Vernex, Paul M. Hess, Mary Catherine Snyder and Kiril Stanilov. 1997. Effects Of Site Design On Pedestrian Travel In Mixed-Use, Medium-Density Environments. *Transportation Research Record 1578*. 48-55. Washington, D.C.: National Academy Press.

1000 Friends of Oregon, Parson Brinckerhoff Quade and Douglas, Inc., Cambridge Systematics and Calthorpe Associates. 1993. *Making the Land Use Transportation Air Quality Connection (LUTRAQ), Volume 4A: The Pedestrian Environment*. Portland, OR: 1000 Friends of Oregon.

O'Sullivan, Sean and John Morrall. 1996. Walking Distances to and from Light-Rail Transit Stations. *Transportation Research Record 1538*. 19-26. Washington, D.C.: National Academy Press.

Portland Office of Transportation. 1998. *Pedestrian Access to Transit Planning and Design Study.* Portland, OR: City of Portland.

Pushkarev , Boris S. and Jeffrey M. Zupan 1977. *Public Transportation and Land Use.* Bloomington, IN: Indiana University Press.

Replogle, Michael and Harriet Parcells. 1992. *Linking Bicycle/Pedestrian Facilities with Transit.* Washington, D.C.: U.S. Federal Highway Administration

Sarkar, Sheila, A.A. Jan Nederveen, and Albert Pols. 1997. Renewed Commitment to Traffic Calming for Pedestrian Safety. *Transportation Research Record 1578*. 11-19. Washington, D.C.: National Academy Press.

Steiner, Ruth. 199 . Residential Density and Travel Patterns. *Transportation Research Record 1466*. . Washington, D.C.: National Academy Press.

Untermann, Richard K. 1984. *Accommodating the Pedestrian*. New York: Van Nostrand Reinhold.

Whyte, William H. 1980. *The Social Life Of Small Urban Spaces.* Washington, D.C.: Conservation Foundation.

Appendix B
1997 and 1998 Survey Questionnaires

1997 Survey

phone [phone] record # [ ] complete [ ]

[hang] call back [time?] terminated [ ]

esl [esl] esl? [esl?]

Pedestrian Access Questionnaire: Before

Introductio

Hello this is _____from Portland State University's Transportation Studies Center. conducting a survey about how people feel about walking in their neighborhood influences decisions on whether or not to take the bus. We'd like to include your opinion. reassure you that we're not selling anything and your responses will be kept simply want to know how you feel about these issues. The survey will take approximately

Screeners

We want to talk with people who live in northeast

S1. Do you live in northeast Portland between 82nd and 65th? (ADDRESS ON 82nd OR 65t

Yes s1 [s1]

No (THANK AND

S2. Please tell me which of the following age categories you fall

Under 18 s2 [s2]
18-24
25-34
35-54
55-64
65 +
No response

(IF 18 OR UNDER, ASK: IS THERE SOMEONE I CAN TALK TO WHO IS AT LEAST 1
THANK AND

Questionnaire

Q1a. Do you have a health condition that limits or prohibits your ability to walk two blocks?

No (IF NO SKIP TO QUESTION Q2.) q1a1 q1a1

Yes (IF YES, AND IF NECESSARY PROBE TO DETERMINE WHETHER IT LIMITS OR PROHIBITS)

_No response (DO NOT READ)

_Limits q1a2 q1a2

_Prohibits

_No response (DO NOT READ)

Q1b. Is this condition temporary or permanent?

_Temporary (IF PROHIBITS AND TEMPORARY, SKIP TO QUESTION Q5a.)

_Permanent (IF PROHIBITS AND PERMANENT, THANK AND TERMINATE.

_No response (DO NOT READ) q1b q1b

Q2. How many times last week would you say you walked farther than one block from your home?

_Never (IF NEVER, SKIP TO QUESTION Q5a.)

_Once

_Two or three times? q2 q2

_Once or twice a day?

_More than twice a day?

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q3. What was the purpose of your walk(s)? (READ TO PROMPT IF NECESSARY AND RECORD RESPONSES)

_Exercise, Entertainment, Recreation, (Including walking a pet)

_Visiting friends/relatives q3 q3

_Church/Synagogue/Mosque/Temple

_Shopping Q3other Q3other

_Work

_Other (RECORD ALL RESPONSES) q3 other q3 other

_No response (DO NOT READ)

Q4a. We would like to know the specific location you walked to. Can you tell me the cross streets of the places in your neighborhood you walked to? (LIST EACH RESPONSE BY 1).ADDRESS, CROSS STREETS OR NAME AND 2) NUMBER OF TIMES)

LOCATION

q4a1 q4a1

q4a2 q4a2

q4a3 q4a3

Q4b. In the last week, how many times did you go to (READ EACH LOCATION)?

TIMES

_No response (DO NOT READ)

q4b1 q4b1

q4b2 q4b2

q4b3 q4b3

Q5a. Have you ridden the bus in your neighborhood in the last five years?

_Yes
_No (IFNO, SKIPTO QUESTION 8b.)
_No response (DO NOT READ)

q5a q5a

Q5b. Would you say that you ride the bus in your neighborhood more than once a year?

_Yes
_No (IFNO, SKIPTO QUESTION 8b.)

q5b q5b

Q6. How often do you think you rode the bus in your neighborhood last year? Would you say

_Once a month or less
_Two or three times a month
_Once or twice a week
_Almost every day
_Don't know (DONOTREAD)
_No response (DO NOT READ)

q6 q6

Q7. For what purposes do you take the bus? (READ TO PROMPT IF NECESSARY AND RECORD ALL RESPONSES)

_Work/School q7-1
_Shopping q7-2
_Entertainment or Recreation q7-3
_Visiting friends/relatives q7-4
_Church/Synagogue/Mosque/Temple q7-5
_Other (RECORD RESPONSES) q7-6
_No response (DO NOT READ)

q7 other

cod7oth cod7oth

q7 other

Q8a. When you do take the bus, what are the two or three most important reasons you choose to take the bus rather than travel by some other means?

q8a1 q8a1 _____ cod8a1

q8a2 q8a2 _____ cod8a2

q8a3 q8a3 _____ cod8a3

_No response (DO NOTREAD)

Q8b. What do you think are the two or three most important reasons people in your neighborhood choose NOT to take the bus?

q8b1 q8b1 _____ cod8b1 cod8b1

q8b2 q8b2 _____ cod8b2 cod8b2

q8b3 q8b3 _____ cod8b3 cod8b3

_No response (DO NOTREAD)

Now I'd like to ask you about bus stops in your neighborhood. (READIF APPROPRIATE) If you do not ride the bus regularly, please answer the questions if you can.

Q9. What stops or stop in your neighborhood are you most likely to use to catch the bus? (DO NOTREAD, CLARIFY IFNECESSARY RECORD ALL RESPONSES)

#12 on SANDY Go

#33 on FREMONT Go

#71 on PRESCOTT Go

#72 on KILLINGSWORTH-82nd Go

Others

q9i q9i _____ cod9oth1 cod9oth1

q9j q9j _____ cod9oth2 cod9oth2

q9k q9k _____ cod9oth3 cod9oth3

9l. Are there any busy streets you have to cross getting to or from the bus stops you use? (PROBE AND RECORD RESPONSES BELOW)

_Yes q9l q9l

_No

9m. Where do you usually cross that street?

	Street crossed		Location crossed
q9	_Sandy	q9m1 q9m1	q9m2 q9m2 _____
	_Prescott		
	_Fremont		
	_82nd		
	_Other(s)	q9m1 other _____	

I'm going to ask about some factors that might be important to people who use Tri-Met. Please tell me how you feel about each one. (READ IF APPROPRIATE) Even if you do not ride the bus regularly, please answer the questions about how you think you would feel if you were to ride the bus.

Q10. How safe do you feel crossing the street to or from the bus stop? What I mean by safe is safe from traffic. Would you say that you feel (READ LIST)

_Very safe **q10** q10
_Fairly safe
_Neither (DO NOT READ)
_Not very safe or
_Not at all safe?
_No response (DO NOT READ)

Q11a. How about feeling secure? What I mean by secure is secure from criminal activity. How secure do you feel when going to or from the bus stop. Would you say that you feel (READ LIST)

_Very secure **q11a** q11a
_Fairly secure
_Neither (DO NOT READ)
_Not very secure, or
_Not at all secure?
_No response (DO NOT READ)

11b. How about at the bus stop? How secure do you feel at the bus stop? Would you say that you feel (READ LIST)

_Very secure **q11b** q11b
_Fairly secure
_Neither (DO NOT READ)
_Not very secure, or
_Not at all secure?
_No response (DO NOT READ)

Now I have some questions about things that might be important when you're deciding whether or not to take the bus. Please tell me how important these factors are to you when deciding whether or not to take the bus.

Q12. How important is having a shelter? Overall, would you say having a shelter is (READ IF NECESSARY):

_Very important **q12** q12
_Somewhat important
_Neither (DO NOT READ)
_Not very important
_Not at all important
_No response (DO NOT READ)

Q13. How about having seating at the bus stop. Overall, how important is having a place to sit down when deciding whether or not to take the bus? (READ IF NECESSARY):

_Very important **q13** q13
_Somewhat important
_Neither (DO NOT READ)
_Not very important
_Not at all important
_No response (DO NOT READ)

Q14. When deciding whether or not to take the bus, how important is having a bus stop you feel is attractive and in a pleasant environment? Would you say having a pleasant bus stop is (READ IF NECESSARY):

_Very important **q14** q14
_Somewhat important
_Neither (DO NOT READ)
_Not very important
_Not at all important
_No response (DO NOT READ)

Q15. When deciding whether or not to take the bus, how important is the attractiveness of the walk to and from the bus stop? How important is it that the walk to the bus stop, other than the weather, is attractive and enjoyable? (READ IF NECESSARY):

_Very important **q15** q15
_Somewhat important
_Neither (DO NOT READ)
_Not very important
_Not at all important
_No response (DO NOT READ)

Q16. Can you walk on sidewalks all the way to the bus stop you use most often?

_Yes **q16** q16
_No
_Don't know (DO NOT READ)
_No response (DO NOT READ)

Q17a. Is there a shelter at the stop you use most often?

_Yes **q17a** q17a
_No
_Don't know (DO NOT READ)
_No response (DO NOT READ)

Q17b. At the bus stop you use most often how often do you have to walk out into the street to board the bus? Would you say:

_Always q17b q17b
_Usually
_Sometimes
_Never
_Don't know (DO NOT READ)
_No response (DO NOT READ)

Q18. How would you describe the street lighting along the route you take to the bus stop? Would you say it is:

_Well lighted q18 q18
_Adequately lighted
_Poorly lighted
_Not lighted at all
_Don't know (DO NOT READ)
_No response (DO NOT READ)

Q19a. How easy is it for you to cross streets going to or coming from the bus stop? Would you say it is:

_Very easy (SKIP TO QUESTION Q20a.)
_Easy (SKIP TO QUESTION Q20a.) q19a q19a
_Not very easy
_Very hard
_Don't know (DO NOT READ) (SKIP TO QUESTION Q20a.)
_No response (DO NOT READ)

Q19b. Why do you say that?

CLARIFY

q19b q19b _____ cod19b

_____ cod19b

Q20a. Thinking about the route that you walk to the bus stop, how would you rate the attractiveness of that route on a scale of 1 to 5, with 5 being extremely attractive and 1 being extremely unattractive? By attractive I mean what you would consider interesting or beautiful.

Very unattractive				Very attractive	
1	2	3	4	5	Don't Know

_No response (DO NOT READ.) q20a q20a

Q20b. Why do you say that?

CLARIFY

q2 q20b q20b _____ cod20b

_____ cod20b

Q21a. How do you get information about bus schedules? (DO NOT READ. RECORD ALL ANSWERS.)

_Call Tri-Met q21a q21a
_Consult the printed schedule
_Consult a schedule at the bus stop (IF YES SKIP TO Q22)
_Don't worry about the schedule. Just go wait for the next bus
_Other q21b q21b cod21both
_Don't know
_No response (DO NOT READ)

Q21c. Tri-Met posts schedules at some stops. When deciding whether or not to take the bus, how important is having schedule information at the stops you use? Would you say it is:

_Very important q21c q21c
_Somewhat important
_Neither (DO NOT READ)
_Not very important
_Not at all important
_No response (DO NOT READ)

Q22. How safe do you feel crossing the busy streets in your neighborhood? What I mean by safe is safe from traffic. Would you say that you feel (READ LIST)

_Very safe q22 q22
_Fairly safe
_Neither (DO NOT READ)
_Not very safe or
_Not at all safe?
_No response (DO NOT READ)

23. How about feeling secure? What I mean by secure is secure from criminal activity when walking in your neighborhood. Would you say that you feel (READ LIST)

q2 _Very secure q23 q23
_Fairly secure
_Neither (DO NOT READ)
_Not very secure, or
_Not at all secure?
_No response (DO NOT READ)

Q24. Are there places you walk where there are no sidewalks?

_Yes q24 q24
_No
_Don't know (DO NOT READ)
_No response (DO NOT READ)

Q25. How would you describe the street lighting along the routes you walk?

_Well lighted q25 q25
_Adequately lighted
_Poorly lighted
_Not lighted at all
_Don't know (DO NOT READ)
_No response (DO NOT READ)

Q26a. What busy streets do you cross when walking in your neighborhood? (DO NO READ. PROBE AND RECORD RESPONSES BELOW)

STREET CROSSED

_Sandy q26a q26a
_Prescott
_Fremont
_82nd
_Other q26a2 q26a2 _____

Q26b. Where do you usually cross that street?

LOCATION CROSSED q26b q26b _____

Q26c. How easy is it for you to cross the busiest street in your neighborhood?

_Very easy (SKIP TO Q27) q26c q26c
_Easy (SKIP TO Q27)
_Not very easy
_Very hard
_No response (DO NOT READ)(SKIP TO Q27)

Q26d. Why do you say that? q26d q26d _____ cod26d

_____

_____ cod26d

Q27a. Still thinking about the walking in your neighborhood, how would you rate the attractiveness of where you walk on a scale of 1 to 5, with 5 being extremely attractive and 1 being extremely unattractive? By attractive I mean what you would consider interesting or beautiful.

Very unattractive				Very attractive	
1	2	3	4	5	Don't Know

q27a q27a

_No response (DO NOT READ. SKIP TO QUESTION D1.)

Q27b. Why do you say that?

q27b q27b _____ cod27b

q27 _____ cod27b

Demographics

Now, I have a few final questions for statistical purposes only.

D1. How long have you lived in your neighborhood?

_No response (DO NOT READ) years d1 months d1.1

D2. What intersection is closest to where you live? (RECORD CROSS STREETS OR ADDRESS)

_Refused to answer (DO NOT READ) d2 d2

_No response (DO NOT READ)

D3. Do you currently work or go to school in downtown Portland? (DEFINE IF NECESSARY: WEST OF WILLAMETTE RIVER, NORTH AND EAST AND SOUTH OF I-405)

_Yes d3 d3

_No

_No response (DO NOT READ)

D4. Which of the following categories best describes your total household annual income:

_Under 20,000 d4 d4

_20,000 up to 30,000

_30,000 up to 50,000

_50,000 up to 75,000

_Over 75,000

_Refused to answer (DO NOT READ)

_No response (DO NOT READ)

D5. How many registered vehicles does your household own?

_Don't know (DO NOT READ) d5 d5

_No response (DO NOT READ)

D6. How many licensed drivers are there in your household?

_Don't know (DO NOT READ) d6 d6

_No response (DO NOT READ)

D7. DO NOT READ. RECORD BY VOICE:

_Male d7 d7

_Female

THANK YOU VERY MUCH. THATS ALL THE QUESTIONS I HAVE.

1998 Survey

Hello this is _____from Portland State University's Transportation Studies Center. We're conducting a survey about how people feel about walking in their neighborhood and what influences decisions on whether or not to take the bus. We'd like to include your opinion. Let me reassure you that we're not selling anything and your responses will be kept confidential. We simply want to know how you feel about these issues. The survey will take approximately 10-15 minutes. Is now a good time to talk? (IF NOT, CAN I CALL YOU BACK AT A MORE CONVENIENT TIME?)

Screeners

We want to talk with people who live in northeast Portland.

S1. Do you live in northeast Portland between 82nd and 65th? (ADDRESS ON 82nd OR 65th IS "YES")

Yes

No (THANK AND TERMINATE)

S2. Do you live between Prescott and Fremont or Siskiyou Street?

Yes

No (THANK AND TERMINATE)

S3. Please tell me which of the following age categories you fall into:

Under 18
18-24
25-34
35-54
55-64
65 +
No response

(IF 18 OR UNDER, ASK: IS THERE SOMEONE I CAN TALK TO WHO IS AT LEAST 18? IF NO, THANK AND TERMINATE.)

1a. Do you have a health condition that limits or prohibits your personal mobility to less than two blocks?

No (IF NO SKIP TO QUESTION Q2.)

Yes (IF YES, AND IF NECESSARY PROBE TO DETERMINE WHETHER IT LIMITS OR PROHIBITS)

_No response (DO NOT READ)

_Limits

_Prohibits

_No response (DO NOT READ)

Q1b. Is this condition temporary or permanent?

_Temporary (IF PROHIBITS AND TEMPORARY, SKIP TO QUESTION Q9.)

_Permanent (IF PROHIBITS AND PERMANENT, THANK AND TERMINATE.

_No response (DO NOT READ)

Q2. How many times last week would you say you walked farther than one block from your home? (READ TO PROMPT IF NECESSARY.)

_Never (IF NEVER, SKIP TO QUESTION Q9.)

_Once

_Two or three times?

_Once or twice a day?

_More than twice a day?

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q3. What was the purpose of your walk(s)? (READ TO PROMPT IF NECESSARY AND RECORD ALL RESPONSES)

_Exercise, Entertainment, Recreation, (Including walking a pet)

_Visiting friends/relatives

_Church/Synagogue/Mosque/Temple

_Shopping

_Work

_Bus Stop

_Other (RECORD ALL RESPONSES)

_No response (DO NOT READ)

Q4. How safe do you feel crossing the busy streets in your neighborhood? What I mean by safe is safe from traffic. Would you say that you feel: (READ LIST)

_Very Safe

_Fairly Safe

_Neither (NO NOT READ)

_Not Very Safe

_Not Safe At All

_No Response (DO NOT READ)

Q5. Which busy streets do you cross when walking in your neighborhood? (READ TO PROMPT IF NECESSARY AND RECORD ALL RESPONSES.)

_Sandy

_Prescott

_Fremont

_82nd Avenue

_Other

Q7. How about feel secure? What I mean by secure is secur from criminal activity when walking in your neighborhood. Would you say that you feel (READ LIST)

_Very secure

_Fairly secure

_Neither (DO NOT READ)

_Not very secure

_Not at all secure

_No response (DO NOT READ)

Q8. How would you describe the street lighting along the routes you walk?

_Well lit

_Adequately lit

_Poorly lit

_Not lit at all

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Now I am going to ask a few questions about riding the bus.

Q9. Have you ridden the bus in your neighborhood in the last five years?

_Yes

_No (IF NO, SKIP TO QUESTION 12b.)

_No response (DO NOT READ)

Q10. Would you say that you ride the bus in your neighborhood more than once a year?

_Yes

_No (IF NO, SKIP TO QUESTION 12b.)

Q11. How often do you think you rode the bus in your neighborhood last year? Would you say

_Once a month or less

_Two or three times a month

_Once or twice a week

_Almost every day

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q12. For what purposes do you take the bus? (READ TO PROMPT IF NECESSARY AND RECORD ALL RESPONSES)

_Work/School

_Shopping

_Entertainment or Recreation

_Visiting friends/relatives

_Church/Synagogue/Mosque/Temple

_Other (RECORD RESPONSES)

_No response (DO NOT READ)

Q12a. When you do take the bus, what are the two or three most important reasons you choose to take the bus over other means of travel?

_No response (DO NOT READ)

Q12b. What do you think are the two or three most important reasons people in your neighborhood choose NOT to take the bus?

_No response (DO NOT READ)

Now I'd like to ask you about bus stops in your neighborhood. (READ IF APPROPRIATE) If you do not ride the bus regularly, please answer the questions if you can.

Q13. What stops or stop in your neighborhood are you most likely to use to catch the bus? (DO NOT READ. CLARIFY IF NECESSARY. RECORD ALL RESPONSES.)

#12 on SANDY Where do you board the bus?

INBOUND (West toward downtown)
_65th (near Rose City sign, inside triangle)
_67th (near New Best Movie/the Nursery)
_69th (near Safeway)
_70th (near Church of Nazarene)
_72nd (near Hollywood Video)
_74th (near U-Haul)
_77th (vacant lot)
_79th (near Multnomah County Library)
_81st (near Bento place)
_82nd (near Cameo Motel)
_Don't know

OUTBOUND (East)
_65th (at Siskiyou)
_67th (near St. Germaine Cleaners)
_70th (across from Safeway)
_FREMONT (across from Carpet World)
_75th (across from Harley Davidson)
_77th (near Ed's House of Gems)
_79th (across from auto parts store)
_82nd (by 7-11, across fr Cameo Motel)
_Don't know

#33 on FREMONT Where do you board the bus?

INBOUND (West toward downtown) **OUTBOUND (East)**

_67th
_70th (across from Safeway)
_72nd (near Papa Murphy's)
_74th (near Fremont Health Care/Liquor Store)
_77th
_80th
_82nd (near Arby's)
_Don't know

_66th
_67th
_72nd (near Hollywood Video)
_74th (near Pho Hong Restaurant)
_77th (near Lutheran Church)
_80th
_82nd (by Arco Station)
_Don't know

#71 on PRESCOTT Where do you board the bus?

INBOUND (West toward downtown)
_66th
_68th (across from school)
_70th (across from school)
_72nd (near Shur-Fine Foods)
_75th
_78th
_80th
_82nd (near Texaco)
_Don't know

OUTBOUND (East)
_66th (near school)
_68th (near school)
_70th
_72nd (across from Shur Fine Foods)
_75th
_78th
_80th
_82nd (across from Texaco)
_Don't know

#72 (KILLINGSWORTH-82ND) Where do you board the bus?
#72 on 82nd

SOUTHBOUND (Toward Clackamas)
_PRESCOTT (by Texaco)
_SANDY (by Cameo Motel)
_BEECH
_FREMONT (by Arby's)
_KLICKITAT (near Taco House)
_SISKIYOU (near Dairy Queen)
_Don't know

NORTHBOUND (Toward Killingsworth
_SISKIYOU (across from Dairy Queen)
_KLICKITAT
_FREMONT (by Arco)
_BEECH (near Madison Suites Motel)
_SANDY (near 7-11)
_PRESCOTT
_Don't know

Others

Q13l. Are there any busy streets you have to cross getting to or from the bus stops you use?

(PROBE AND RECORD RESPONSES BELOW)

_Yes

_No

Q13m. Where do you usually cross that street?

Street crossed	**Location crossed**
_Sandy	
_Prescott	
_Fremont	
_82nd	
_Other(s)	

I'm going to list some factors that might be important to people when deciding whether or not to walk or ride the bus. Please tell me how important each of these factors is to you. (READ IF APPROPRIATE) Even if you do not walk or ride the bus regularly, please answer the questions about how you think you would feel if you were to walk or ride the bus to a destination.

Q14. Overall, when deciding whether or not to take the bus, how important is it to feel secure at a bus stop? Would you say that you feel (READ LIST)

_Very importnat

_Somewhat important

_Neither (DO NOT READ)

_Not very important

_Not at all important

_No response (DO NOT READ)

Q15. How about having a shelter at a bus stop. Overall, how important is having a shelter? Would you say that it is: (READ LIST)

_Very importnat

_Somewhat important

_Neither (DO NOT READ)

_Not very important

_Not at all important

_No response (DO NOT READ)

Q16. How about having seating at a bus stop. Overall, how importnat is having a place to sit down. Would you say that it is: (READ LIST)

_Very importnat

_Somewhat important

_Neither (DO NOT READ)

_Not very important

_Not at all important

_No response (DO NOT READ)

Q17. How about having a well-designed and landscaped bus stop. Overall, when deciding whether or not to take the bus, how important is having a well-designed and landscaped bus stop? By well-designed and landscaped I mean easy to get on and off the bus and attractive. Would you say that it is: (READ LIST):

_Very importnat

_Somewhat important

_Neither (DO NOT READ)

_Not very important

_Not at all important

_No response (DO NOT READ)

Now I would like to ask specific questions about the walk to the bus stop in your neighborhood that you (would) use most often.

Q18. Can you walk on sidewalks all the way to the bus stop?

_Yes

_No

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q19. How easy is it (would it be) for you to cross the street going to or coming from the bus stop? Would you say that it is:

_Very easy

_Easy

_Not very easy

_Very difficult

_Don't know (NO NOT READ)

_No response (NO NOT READ)

Q20. How would you describe the street lighting along the route you (would) take to the bus stop? Would you say it is:

_Well lighted

_Adequately lighted

_Poorly lighted

_Not lighted at all

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q21. Still thinking about the walk that you (would) take to the bus stop, how would you rate the attractiveness of that route on a scale of 1 to 5, with 5 being extremely attractive and 1 being extremely unattractive? By attractive I mean what you would consider interesting or beautiful.

Very unattractive				Very attractive	
1	2	3	4	5	Don't Know

_No response (DO NOT READ.)

The city recently made improvements in your neighborhood, and I'd like to know how you feel about them. The improvements include: curb extensions at street corners; pedestrian refuge islands in the middle of some streets; new bus shelters; benches and landscaping at bus stops; trees, landscaping, and street lighting along pedestrian routes; and new sidewalks and curb ramps.

I'm going to list these improvements and I want you to tell me if you have noticed them and whether they have made it safer, more secure, more pleasant, or more convenient to walk in your neighborhood.

Q22. First, curb extensions. Have you noticed them?

_Yes (Go to Q22a)

_No (Go to Q23)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q22a. In terms of safety, do you think curb extensions have made walking much safer, somewhat safer, no safer? By safe I mean safe from traffic.

_Much safer

_Somewhat safer

_No safer

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q23. Next, pedestrian refuge islands. Have you noticed them?

_Yes (Go to Q23a)

_No (Go to Q24)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q23a. In terms of safety, do you think pedestrian refuge islands have made walking much safer, somewhat safer, no safer?

_Much safer

_Somewhat safer

_No safer

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q24. Next, new bus shelters. Have you noticed them? Y/N/ Don't know If yes proceed to Q24a, if NO or Don't know proceed to Q25

_Yes (Go to Q24a)

_No (Go to Q25)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q24a. In terms of security, have the new bus shelters made you feel more secure, somewhat more secure, or no more secure? By secure I mean secure from criminal activity.

_More secure

_Somewhat more secure

_No more secure

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q25. Next, new benches and landscaping at bus stops. Have you noticed these bus stop improvements?

_Yes (Go to Q25a)

_No (Go to Q26)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q25a. In terms of convenience, have these bus stop improvements made it much more convenient, somewhat more convenient, or no more convenient to use the bus than before?

_Much more convenient

_Somewhat more convenient

_No more convenient

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q26. Next, trees and landscaping. Have you noticed these improvements?

_Yes (Go to Q26a)

_No (Go to Q27)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q26a. Have these improvements made walking in your neighborhood much more pleasant, somewhat more pleasant, or no more pleasant than before?

_Much more pleasant

_Somewhat more pleasant

_No more pleasant

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q27. Next, new street lights. Have you noticed them?

_Yes (Go to Q27a)

_No (Go to Q28)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q27a. In terms of security and convenience, have the new street lights made walking in your neighborhood much more secure and convenient, somewhat more secure and convenient, or no more secure and convenient?

_Much more secure and convenient

_Somewhat more secure and convenient

_No more secure and convenient

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q28. Finally, new sidewalks and curb ramps. Have you noticed them?

_Yes (Go to Q28a)

_No (Go to Q29)

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q28a. In terms of convenience and safety, have new sidewalks and curb ramps made walking much more convenient and safer, somewhat more convenient and safer, or no more convenient and no safer than before?

_Much more convenient and safer

_Somewhat more convenient and safer

_No more convenient and no safer

_Don't know (DO NOT READ)

_No response (DO NOT READ)

Q29. Which of the improvements that I mentioned have you found most beneficial. (READ LIST IF NECESSARY)

_Safe crossings at intersections

_New sidewalks and curb ramps

_Trees and landscaping along pedestrian routes

_New shelters at bus stop

_Seating at bus stops

_Landscaping at bus stops

Q30. Which of the improvements that I mentioned have you found least beneficial. (READ LIST IF NECESSARY)

_Safe crossings at intersections

_New sidewalks and curb ramps

_Trees and landscaping along pedestrian routes

_New shelters at bus stop

_Seating at bus stops

_Landscaping at bus stops

_None

_All

DEMOGRAPHICS

Now, I have a few final questions for statistical purposes only.

D1. How long have you lived in your neighborhood?

_No response (DO NOT READ) Years_____ Months_____

D2. What intersection is closest to where you live? (RECORD CROSS STREETS OR ADDRESS)

_Refused to answer (DO NOT READ)

_No response (DO NOT READ)

D3. Do you currently work or go to school in downtown Portland? (DEFINE IF NECESSARY: WEST OF WILLAMETTE RIVER, NORTH AND EAST AND SOUTH OF I-405)

_Yes

_No

_No response (DO NOT READ)

D4. Which of the following categories best describes your total household annual income:

_Under 20,000

_20,000 up to 30,000

_30,000 up to 50,000

_50,000 up to 75,000

_Over 75,000

_Refused to answer (DO NOT READ)

_No response (DO NOT READ)

D5. How many registered vehicles does your household own?

_Don't know (DO NOT READ)

_No response (DO NOT READ)

D6. How many licensed drivers are there in your household?

_Don't know (DO NOT READ)

_No response (DO NOT READ)

D7. DO NOT READ. RECORD BY VOICE:

_Male

_Female

THANK YOU VERY MUCH. THAT'S ALL THE QUESTIONS I HAVE.

TRI-MET RIDER COUNT DATA

Tri-Met Route #12 –Sandy Boulevard (Inbound)

Location	1994 Passenger Census Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
Sandy/82nd	124	60	119	91
Sandy/81st	20	6	8	1
Sandy/79th	35	8	32	5
Sandy/77th	30	4	24	5
Sandy/74th	30	13	17	11
Sandy/72nd	49	20	69	31
Sandy/70th	60	20	99	31
Sandy/67th	34	8	27	5
Sandy/64th	48	2	30	5
Sandy/62nd	30	7	29	11
Sandy/59th	39	8	15	5
Sandy/57th	139	20	115	28
Study Area	**639**	**176**	**584**	**229**
Non-Study Area	2,307	1,739	2,604	1628
Total	2,946	1,915	3,188	1857
Percent of Total	**21.7**	**9.2**	**18.3**	**12.3**

Tri-Met Route #12 –Sandy Boulevard (Outbound)

Location	1994 Passenger Census Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
Sandy/57th	39	95	31	131
Sandy/60th	8	24	3	22
Sandy/62nd	9	35	10	36
Sandy/65th	3	24	4	28
Sandy/67th	-	42	5	43
Sandy/70th	22	89	23	116
Sandy/Fremont	19	47	30	60
Sandy/75th	8	38	5	34
Sandy/77th	1	37	6	20
Sandy/79th	1	18	1	35
Sandy/82nd	48	124	128	111
Study Area	**158**	**573**	**246**	**636**
Non-Study Area	2,408	3,195	2,421	3,593
Total	2,566	3,768	2,667	4,229
Percent of Total	**6.2**	**15.2**	**9.2**	**15.0**

Tri-Met Route # 72 – 82nd Avenue/Killingsworth (Inbound)

Location	Spring 1998 Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
82nd/Prescott	79	104	90	120
82nd/Sandy	156	106	190	99
82nd/Beech	39	23	14	18
82nd/Fremont	56	28	120	35
82nd/Klickitat	24	21	27	22
82nd/Siskiyou	58	28	55	19
Study Area	**412**	**310**	**496**	**313**
Non-Study Area	6,387	6,744	3,856	7,180
Total	6,799	7,054	7,352	7,493
Percent of Total	**6.1**	**4.4**	**6.7**	**4.2**

Tri-Met Route # 72 – 82nd Avenue/Killingsworth (Outbound)

Location	Spring 1998 Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
82nd/Siskiyou	18	40	62	73
82nd/Klickitat	15	36	10	37
82nd/Fremont	54	79	57	94
82nd/Beech	12	22	10	39
82nd/Sandy	91	159	95	190
82nd/Prescott	90	85	97	81
Study Area	**280**	**422**	**331**	**514**
Non-Study Area	6,324	6,156	7,004	6,661
Total	6,604	6,578	7,335	7,175
Percent of Total	**4.2**	**6.4**	**4.5**	**7.2**

Tri-Met Route # 33 – Fremont (Inbound)

Location	Spring 1998 Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
Fremont/82nd	58	19	75	20
Fremont/80th	3	1	6	2
Fremont/77th	10	4	13	5
Fremont/74th	8	8	11	11
Fremont/Sandy	29	6	31	11
Fremont/70th	14	8	11	16
Fremont/67th	**14**	5	19	6
Fremont/64th	10	2	14	4
Study Area	**146**	**53**	**180**	**75**
Non-Study Area	1,039	725	1,164	780
Total	1,185	778	1,344	855
Percent of Total	**12.3**	**6.8**	**13.4**	**8.8**

Tri-Met Route # 33 – Fremont (Outbound)

Location	Spring 1998 Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
Fremont/64th	2	10	2	13
Fremont/66th	2	7	1	9
Fremont/67th	12	22	16	35
Fremont/Sandy	10	17	14	24
Fremont/74th	12	12	12	15
Fremont/77th	3	11	3	12
Fremont/80th	**5**	21	4	28
Fremont/82nd	12	37	18	38
Study Area	**58**	**137**	**70**	**174**
Non Study Area	954	1,291	1,123	1,589
Total	1,012	1,428	1,193	1,763
Percent of Total	**5.7**	**9.6**	**5.9**	**9.9**

Tri-Met Route # 71 - Prescott (Inbound)

Location	Spring 1998 Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
Prescott/64th	8	8	3	7
Prescott/66th	10	12	4	21
Prescott/68th	20	9	11	11
Prescott/70th	7	10	3	10
Prescott/72nd	13	18	14	17
Prescott/75th	7	15	2	12
Prescott/78th	2	6	6	7
Prescott/80th	91	67	16	13
Prescott/82nd	37	23	114	46
Study Area	195	168	173	144
Non-Study Area	3,590	3,628	3,424	3,330
Total	3,785	3,796	3,567	3,474
Percent of Total	5.2	4.4	4.8	4.1

Tri-Met Route # 71 - Prescott (Outbound)

Location	Spring 1998 Count		Spring 1999 Count	
	Boardings	Alightings	Boardings	Alightings
Prescott/82nd	66	86	51	107
Prescott/80th	5	1	8	1
Prescott/78th	5	3	10	4
Prescott/75th	13	6	8	3
Prescott/72nd	20	10	23	7
Prescott/70th	6	5	10	5
Prescott/68th	8	14	11	9
Prescott/66th	19	11	9	2
Prescott/64th	6	3	8	3
Study Area	148	139	138	141
Non-Study Area	3,337	3,394	3,145	3,262
Total	3,485	3,433	3,282	3,403
Percent of Total	4.2	4.0	4.2	4.1