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16. Abstract This report presents the results of park-and-ride user surveys, non-user surveys, and traffic surveys performed in the Houston metropolitan area and compares those results to similar surveys performed in the Dallas area as part of previous studies. In addition to obtaining socioeconomic, demographic, and travel information, the surveys were designed to: 1) identify the features of the existing service that are most important in generating ridership; and 2) identify what additional features could be added to the existing service and be most effective in increasing ridership. The findings are intended to be of value both in planning and operating park-and-ride facilities.					
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
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yd ³	cubic yards	0.76	cubic meters	m ³

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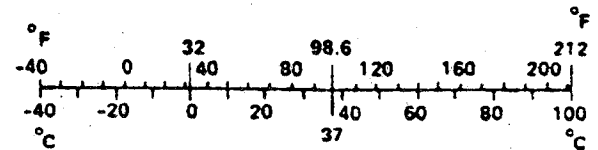
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
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* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10:286.

HOUSTON PARK-AND-RIDE FACILITIES
AN ANALYSIS OF SURVEY DATA

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ABSTRACT

This report presents the results of park-and-ride user surveys, non-user surveys, and traffic surveys performed in the Houston metropolitan area and compares those results to similar surveys performed in the Dallas area as part of previous studies. In addition to obtaining socioeconomic, demographic, and travel information, the surveys were designed to: 1) identify the features of the existing service that are most important in generating ridership; and 2) identify what additional features could be added to the existing service and be most effective in increasing ridership. The findings are intended to be of value both in planning and operating park-and-ride facilities.

ACKNOWLEDGEMENTS

As part of Project 205, Texas Transportation Institute has been evaluating Texas park-and-ride facilities for over 6 years. Last year extensive surveys were performed in the Dallas and Garland areas.

This year surveys were scheduled to be performed at selected lots in the Houston area. In order to significantly expand the number of lots evaluated, the Metropolitan Transit Authority of Harris County provided additional project funding. Beiswenger, Hoch and Associates, Inc., a Houston consulting firm, served as a subcontractor to TTI on the work for MTA. The financial assistance provided by the Metropolitan Transit Authority and the professional services made available by Beiswenger, Hoch and Associates, Inc., are gratefully acknowledged.

IMPLEMENTATION STATEMENT

Project 205 is oriented toward assisting the Department in the planning, implementation, and evaluation of priority treatment projects. Park-and-ride lots are an integral part of these improvements.

Numerous new park-and-ride lots continue to be built in the state, and the Department is frequently involved in planning and funding those improvements. The information in this report should enhance the cost-effectiveness of park-and-ride improvements.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration, the Urban Mass Transportation Administration, the Metropolitan Transit Authority of Harris County, or the State Department of Highways and Public Transportation. This report does not constitute a standard, a specification, or a regulation.

Key Words: Park-and-Ride, Modal Transfer, Transit, Terminal Design, Mass Transportation, Bus Rapid Transit

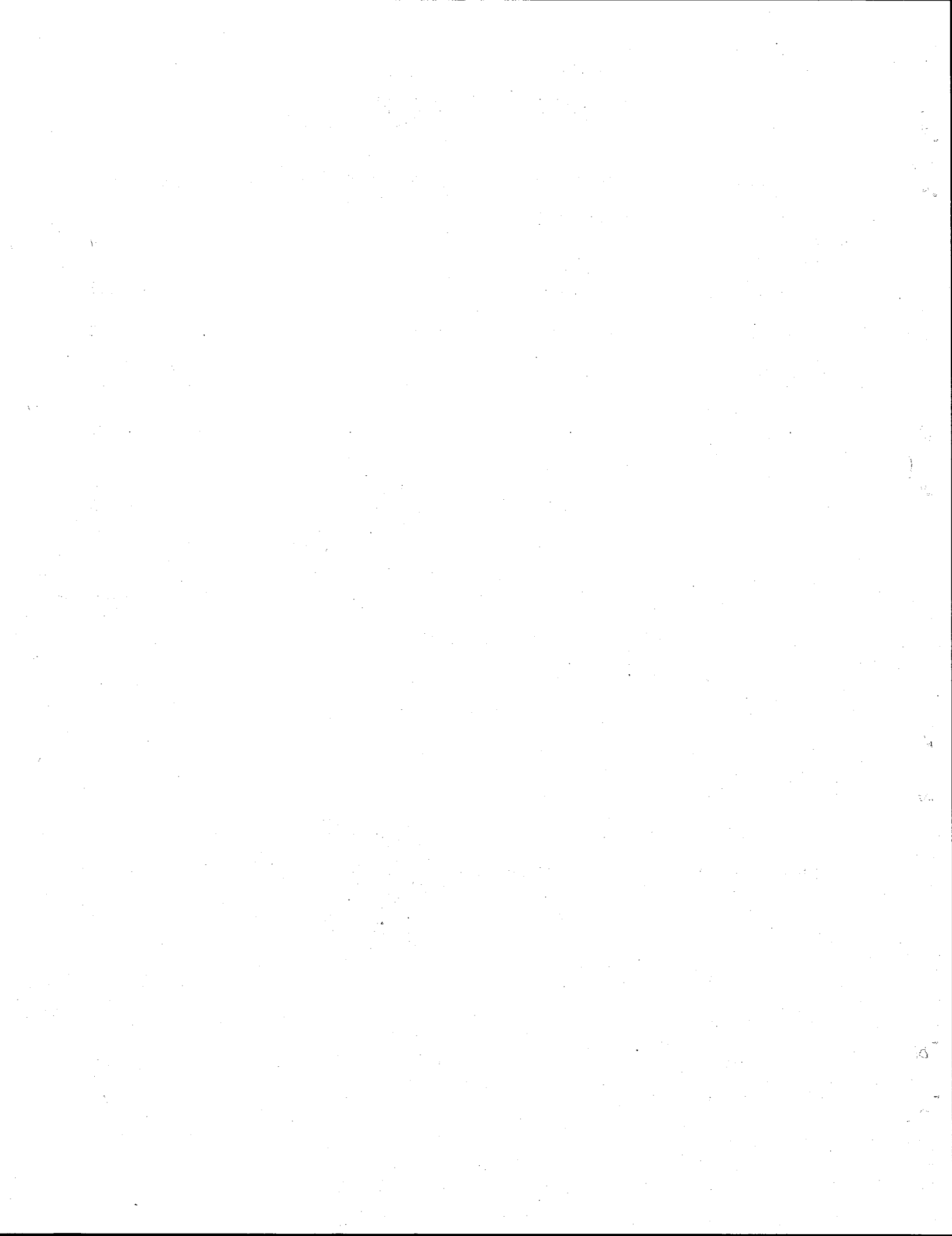


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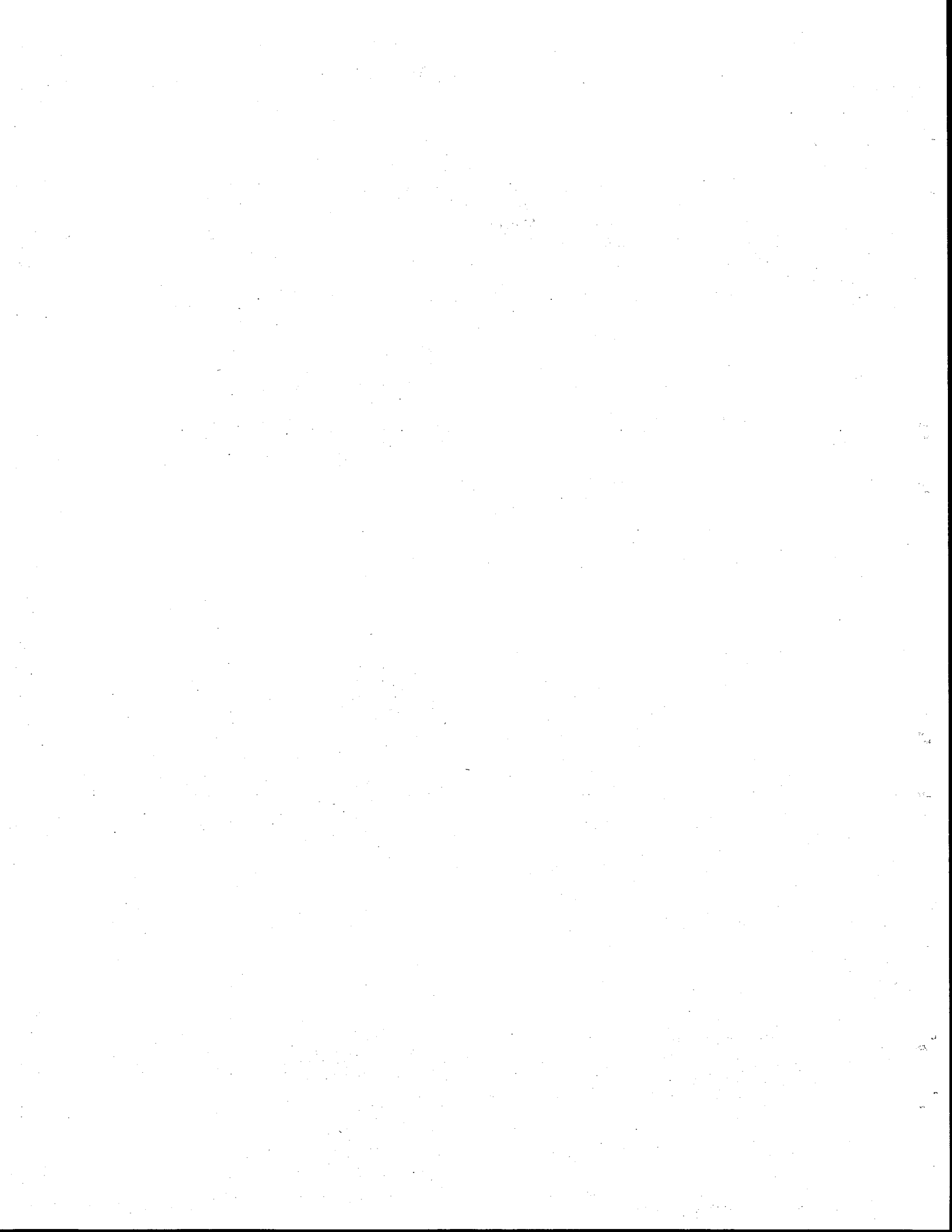
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I. BACKGROUND

Through the Cooperative Research Program with the Texas State Department of Highways and Public Transportation, the Texas Transportation Institute has been involved in extensive evaluations of park-and-ride facilities in Texas. User and non-user surveys were performed in the Dallas area in 1979 (refer to Research Report 205-11¹). In 1980, these surveys were extended into the Houston metropolitan area. The Metropolitan Transit Authority (MTA), in order to significantly expand the overall scope of the Houston park-and-ride surveys, provided supplementary funding. Texas Transportation Institute and Beiswenger, Hoch and Associates, Inc., conducted the study for MTA.

¹"Factors Influencing the Utilization of Park-and-Ride: Dallas/Garland Survey Results," Research Report 205-11, available through State Department of Highways and Public Transportation, Planning and Research Division, Austin, Texas.



II. INTRODUCTION

Park-and-ride is a major element of the transit plan in Houston. By the end of 1981, MTA anticipates having a total of some 10,000 parking spaces available at 14 lots. All but four of those lots will be owned by MTA; those four lots will be leased lots. The types of information collected through these surveys are intended to improve the cost effectiveness of the planning and operation of park-and-ride facilities. Data collected² provide insights into socioeconomic, demographic, and travel patterns of existing and potential park-and-ride users. The surveys are also structured to help identify those features of park-and-ride service that are most important to generating ridership.

This report presents the results of the park-and-ride user surveys, non-user surveys, and park-and-ride lot traffic surveys performed in the Houston area. Those results are compared to similar data collected in the Dallas area as part of previous studies (refer to footnote 1).

DESCRIPTION OF SURVEYS

This study was intended to develop information that would provide guidelines concerning more effective means of planning and operating park-and-ride service. Three separate surveys, park-and-ride user and non-user surveys, as well as a traffic survey at the lots, were performed. The survey instruments are included in Appendix A. The general statistical analysis used is similar to that described in Research Report 205-11.

The surveys were designed to obtain a variety of information, including that highlighted below.

- User Surveys. What features of the existing park-and-ride service were most important to the user in making the decision to utilize park-and-ride?

²During the conduct of this study, data were collected that were used in a statewide evaluation of demand for park-and-ride. That report, which is also available through the State Department of Highways and Public Transportation, is entitled "Guidelines for Estimating Park-and-Ride Demand" (Technical Report 1064-1F).

³Figures are included at the end of the main report.

What are the socioeconomic, demographic, and travel characteristics of the park-and-ride patrons?

- Non-User Survey. What are the non-user travel patterns? For those individuals that live in the area served by the park-and-ride lot and work in the area served by the bus operation, what additional features would need to be incorporated into the park-and-ride service to cause the non-users to choose to use park-and-ride?
- Traffic Survey. Traffic, parking, and passenger data were collected at two locations to assist in developing design variables for park-and-ride lots.

The surveys were undertaken in the Houston metropolitan area. On-board surveys were undertaken at all Houston park-and-ride lots in operation at the time of the survey (Figure 1).³ Non-user surveys were performed in the market areas of five of those lots—namely Westwood, North Shepherd, Kuykendahl, Champions, and Gulf-Sage/Edgebrook. To facilitate corridor park-and-ride and transitway planning in the Gulf Freeway corridor, non-user surveys were also performed in that entire corridor. Traffic data were collected at two lots—Kuykendahl and North Shepherd—in the North Freeway Corridor. The three lots in the North Freeway Corridor—Champions, Kuykendahl, and North Shepherd—are served by the contraflow lane.

User Survey

A more detailed description of the on-board user survey is included in Appendix B. The surveys were conducted at 12 lots (Figure 1). For purposes of analysis, the Beechnut-Sage and Beechnut-Myerland lots are frequently combined since the same buses stop at both of

those lots. All of those lots provide service to downtown Houston; from four of the lots namely North Shepherd, Kuykendahl, Champions, and Kingwood service is also provided to other generators such as the Texas Medical Center, Galleria-Post Oak, and Greenway Plaza.

Approximately 30 percent of the buses serving each of the lots was surveyed in January 1981. For each bus surveyed, a 100 percent ridership sample was taken. Approximately 2,400 survey instruments were completed.

Table 1 shows selected characteristics of the lots surveyed.

Non-User Survey

The non-user survey is described in more detail in Appendix B. The park-and-ride home mail-out was directed to the market area of five Houston park-and-ride lots; these lots are Champions, Kuykendahl, North Shepherd, Gulf Sage/Edgebrook and Westwood Mall (refer to Figure 1). In addition, a home mail-out was performed for the entire Gulf Freeway Corridor; this corridor mail-out was performed largely to assist with ongoing planning for the Gulf Transitway.

The market area associated with each of the lots was identified (more detailed discussion of market areas is included in a subsequent section of this report). An address listing was obtained for those areas, and a random sample of addresses was selected. An initial mail-out and one "follow-up" mail-out were performed to obtain a satisfactory sample size. Just less than 5,000 initial mail-outs were made. An overview of the non-user survey is shown in

Table 2. The market areas into which the home mail-outs were sent are shown in Figures 2 through 5.

Traffic Survey

Considerable data which are desirable for lot design relating to kiss-and-ride patterns, shelter utilization and traffic flow information are not available. As a result, surveys were performed during the week of July 27, 1981, at the North Shepherd and Kuykendahl lots. These are both large lots owned and operated by the Metropolitan Transit Authority. Survey personnel were stationed at these lots during peak periods to collect the data presented in this report.

OVERVIEW OF REPORT CONTENT

The remainder of this report is comprised of the following major sections.

- Users and Non-Users, General Characteristics
 - User Characteristics, Dallas/Garland and Houston
 - Non-User Characteristics, Dallas/Garland and Houston
 - User and Non-User Characteristics, Houston
- Traffic, Parking and Pedestrian Patterns
- Market Area Characteristics
- Major Findings

TABLE 1

**Characteristics of the Park-and-Ride Lots
Surveyed in Houston, January 1981**

Lot	Parking Spaces	Daily Patronage	Bus Trips to CBD		Monthly Fare
			Peak Hour	Morning	
Clear Lake City	325	340	6	10	\$55
Gulf-Sage	225	350	7	10	\$35
Westwood	470	630	8	18	\$45
Champions	280	480	6	10	\$55
North Shepherd	765	900	11	21	\$35
Kuykendahl	1,290	1,200	13	24	\$55
Kingwood	200	350	6	8	\$65
Beechnut-Sage	250	590	3	6	\$25
Beechnut-Myerland	150		3	6	\$25
Alief	300	410	6	11	\$45
Sharpstown	150	245	3	6	\$35
Katy/Mason	170	120	4	5	\$65

TABLE 2

**Summary of Non-User Surveys Mailed
to Households in the Houston Area**

Target Mailing Area	Number of Surveys Mailed	Number of Surveys Returned	Return Rate (percent)
Gulf Freeway Corridor	838	376	45%
Edgebrook Lot	798	339	43%
Champions Lot	800	427	53%
Kuykendahl Lot	800	405	51%
North Shepherd Lot	790	307	39%
Westwood Lot	800	325	41%
TOTAL	4,826	2,179	45%

III. USERS AND NON-USERS, GENERAL CHARACTERISTICS

In both Houston and Dallas, park-and-ride user and non-user surveys were undertaken. The Dallas/Garland survey results are summarized in Research Report 205-11 (refer to footnote 1).

This section of the report is divided into three parts. The first part compares user characteristics in Dallas/Garland and in Houston. The second part compares characteristics of non-users in the two survey cities. The third section compares user and non-user characteristics in Houston; the user and non-user comparison for Dallas/Garland is presented in Research Report 205-11.

For purposes of analysis, the Houston user data are stratified in three manners. A total for all lots surveyed is shown. Also, a breakdown is provided for the three lots serving the contraflow lane (CFL) and the eight lots not associated with contraflow.

USER CHARACTERISTICS, DALLAS/GARLAND AND HOUSTON

Data collected fall into two groupings. The first grouping describes personal characteristics, and the second grouping documents travel characteristics.

Personal Characteristics

Questions concerning age, sex, education, and occupation of park-and-ride users were posed in both study cities.

Age. Responses to the question "What is your age?" are depicted in Figure 6.

Park-and-ride patrons are relatively young. As shown subsequently in this report and in Research Report 205-11, users of park-and-ride are significantly younger than are non-users. Table 3 summarizes additional information concerning age of users. Characteristics of the contraflow and the non-contraflow lot users are essentially identical.

Sex. Table 4 summarizes responses to the question "What is your sex?"

Park-and-ride patrons are predominantly female. Again, as shown subsequently in this

report and in Research Report 205-11, this is significantly different from non-user characteristics. The lots on the contraflow lane attract a slightly higher percentage of males; as shown subsequently, those lots attract a slightly higher percentage of "managerial" personnel.

Education. Figure 7 shows the level of education characteristic of park-and-ride patrons.

Table 5 provides an additional breakdown. Park-and-ride patrons are an educated group, with over 75 percent having at least some college education. Data are similar for all lots surveyed.

Occupation. Data describing the occupation of park-and-ride users are shown in Table 6. Again, data for all lots are generally similar. The high percentage of clerical workers is in agreement with the high percentage of female park-and-ride patrons. Clerical, managerial, and professional occupation categories constitute approximately 90 percent of total park-and-ride patrons.

Transportation Characteristics

In the on-board user surveys, numerous questions were asked that relate to travel patterns. These questions addressed previous mode of travel, park-and-ride destination, mode of arrival at the park-and-ride lot, how long park-and-ride has been used, and the shape of the "watershed" served by the different park-and-ride lots. These "watershed" or market area characteristics are presented in a subsequent section of this report.

Previous Mode of Travel. On the on-board surveys, the question "Before you began using the park-and-ride service, how did you normally make this trip?" was asked. Responses are summarized in Table 7.

Research Report 205-11 noted the unexpectedly high response for the "Did Not Make Trip" alternative. The Houston data show responses similar to the Dallas/Garland data.

Although a latent demand would be expected to exist, it does not seem that 25 percent of total park-and-ride trips would be represented by latent demand. Research Report 205-11 theorized that part of the reason for the

TABLE 3

Age of Park-and-Ride Users, Dallas/Garland and Houston

Age	Dallas/Garland (n = 402)	Houston		
		Total Sample (n = 2298)	CFL Lots (n = 788)	Non-CFL Lots (n = 1510)
50th Percentile	34	30	31	29
85th Percentile	48	45	45	45

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 4

Sex of Park-and-Ride Users, Dallas/Garland and Houston

Sex	Dallas/Garland (n = 408)	Houston		
		Total Sample (n = 2348)	CFL Lots (n = 804)	Non-CFL Lots (n = 1544)
Male	42%	42%	45%	41%
Female	58%	58%	55%	59%

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 5

**Education Level (Last Year of School Completed) of
Park-and-Ride Users, Dallas/Garland and Houston**

Education Level	Dallas/Garland (n = 371)	Houston		
		Total Sample (n = 2222)	CFL Lots (n = 718)	Non-CFL Lots (n = 1504)
50th Percentile	14	15	15	15
85th Percentile	17	17	16	17

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 6

Occupation of Park-and-Ride Users, Dallas/Garland and Houston

Occupation	Dallas/Garland (n = 396)	Houston		
		Total Sample (n = 2254)	CFL Lots (n = 768)	Non-CFL Lots (n = 1486)
Unemployed	0.0%	0.1%	0.3%	0.1%
Housewife	0.5%	0.3%	0.2%	0.4%
Student	2.5%	1.4%	0.4%	2.0%
Retired	1.0%	0.1%	0.1%	0.1%
Private Household Worker	0.0%	0.0%	0.0%	0.0%
Laborers	0.8%	0.0%	0.1%	0.0%
Operatives	1.5%	0.6%	0.4%	0.7%
Service Workers	1.3%	0.4%	0.1%	0.5%
Craftsmen	1.5%	1.0%	1.9%	0.5%
Clerical	39.6%	35.2%	34.7%	35.4%
Sales	4.3%	3.7%	2.7%	4.2%
Managerial	18.7%	17.1%	19.0%	16.0%
Professional	28.3%	40.1%	40.1%	40.1%

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 7

Previous Mode of Travel for Users of Park-and-Ride

Mode	Dallas/Garland (n = 416)	Houston		
		Total Sample (n = 2378)	CFL Lots (n = 803)	Non-CFL Lots (n = 1575)
Drove Self	50%	49%	49%	49%
Carpool/Vanpool	11%	17%	21%	15%
Regular Route Bus	11%	8%	5%	10%
Did Not Make Trip	25%	24%	23%	24%
Other	3%	2%	2%	2%
TOTAL	100%	100%	100%	100%

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 8

Years at Present Address for Park-and-Ride Users

Years at Address	Dallas/Garland (n = 412)	Houston		
		Total Sample (n = 2342)	CFL Lots (n = 799)	Non-CFL Lots (n = 1543)
50th Percentile	1.7	1.4	1.2	1.4
85th Percentile	7.5	6.7	6.7	6.7

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 9

Previous Address of Park-and-Ride Patrons Who Have Resided Less Than Two Years at Their Present Address, Houston

Factor	Total Sample (n = 2342)	CFL Lots (n = 799)	Non-CFL Lots (n = 1543)
Percent of Total Sample Residing Less Than Two Years at Present Address	59%	60%	59%
Previous Address			
Inside Houston Metro Area	44%	36%	48%
Outside Houston, Inside Texas	18%	20%	17%
Outside Texas	38%	44%	35%

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 10

Destinations of Park-and-Ride Users From Lots With Multiple Destination Service, Houston

Lot	Destination			
	CBD	Greenway Plaza	Galleria Post Oak	Texas Medical Center
North Shepherd	83%	—	—	17%
Kuykendahl	96%	2%	2%	—
Champions	88%	9%	3%	—
Kingwood	95%	2%	3%	—

high response to "Did Not Make Trip" might be in the answer to the question "How long have you lived at your present address?" As was the case in Dallas, Houston park-and-ride users have lived at the current address a very short period of time (Figure 8). As shown in Research Report 205-11 and subsequently in this report, users of park-and-ride have lived at their current address for a significantly shorter period of time than have non-users. Table 8 provides a further stratification of those data.

A possibility, given the short length of time at present address for park-and-ride patrons, is that they began using park-and-ride immediately upon moving to the area--thus, they "did not previously make the trip." A further possibility is that many of these individuals moved to Texas from areas that had good transit systems; in fact, the presence of high-level park-and-ride transit service may have been a factor in residential site location for some of these individuals. In the Houston surveys, the following question was posed, "If you have lived at your present address less than two years, in what city and state was your previous address?" Table 9 summarizes responses to that question. In the case of the contraflow lots, over 25 percent of total users (60% x 44%) lived outside of Texas within the past two years.

Park-and-Ride Destination. Of the lots surveyed, in Dallas and Garland, service was provided to downtown Dallas only. For most of the Houston lots, service is only provided to downtown Houston. For those Houston lots providing service to multiple destinations, Table 10 summarizes the destinations served. Even at those locations where service is provided to more than one destination, 85 percent to 95 percent of total patronage is destined to downtown.

Mode of Arrival at Park-and-Ride Lot. On the user survey, "How did you arrive at the lot this morning?" was asked. Responses are shown in Table 11.

One point of interest arises in reviewing the Houston data. Those data suggest that, if the lot is located close to residential areas and is easy to walk to, a significant percentage of walk-in traffic can be generated; this was not generally expected to be the case for Houston lots. As shown in Table 12, a large variation in this percentage exists between Houston lots, but at one location over 20 percent of total patronage walks to the lot.

Length of Using Park-and-Ride Service.

The question, "How long have you used the park-and-ride service?" was asked on the user survey. The responses are shown in Figure 9. The relatively short lengths of utilization are largely a result of the Houston park-and-ride service not being in place for more than three to four years in most instances. The Dallas/Garland lots have operated since the mid-seventies; the survey at those lots was conducted a year earlier than was the Houston survey.

Overview, Personal and Transportation Characteristics

In general, considerable similarity exists between users of park-and-ride in Dallas/Garland and in Houston. User characteristics are summarized in Table 13.

Important Factors and Reasons for Using Park-and-Ride

In both the Houston and Dallas surveys, an attempt was made to identify those aspects of the park-and-ride service that were most important in generating new ridership.

Time/Money Savings. Patrons were asked whether they saved time and/or money by using park-and-ride. Follow-up questions asked the amount of time and/or money savings.

Responses to the question, "Do you save time using park-and-ride?" are shown in Table 14. As would be expected, the contraflow lane allows time savings not associated with lots not having priority treatment. For lots without priority treatment, in both Dallas and Houston the majority of the respondents paid a time penalty by using park-and-ride. The extent of time savings or losses will be influenced by bus headways and the local routing of buses at the activity center; that is, how close to the final destination does the bus stop in relation to where the employee would park his vehicle.

Responses to the question, "Do you save money using park-and-ride?" are shown in Table 15. Responses are nearly identical for all surveys shown in that table. It is apparent that dollar savings are a major reason for using park-and-ride service.

For the Houston lots, Table 16 summarizes the time and dollars savings associated with using park-and-ride. While perceived dollar

TABLE 11

**Mode of Arrival at the Park-and-Ride Lot,
Dallas/Garland and Houston**

Arrival Mode	Dallas/Garland (n = 420)	Houston		
		Total Sample (n = 2384)	CFL Lots (n = 806)	Non CFL Lots (n = 1578)
Drove Alone	66%	68%	72%	66%
Rode With Someone Who Also Uses Park-and-Ride	9	11	15	9
Dropped Off by Someone	20	15	12	16
Motorcycle/Bicycle	1	0	0	0
Walk	—	5	1	8
Other	4	1	0	1

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 12

Percentage of Riders Walking to Park-and-Ride Lots, Houston

Park-and-Ride Lot	Percent of Users Walking to Lot
Sage (I-45S)	7.1%
Bellaire	7.0
West Loop/Sage-Myerland	2.1
Westwood	14.4
Clear Lake	7.8
Alief	22.9
North Shepherd	0.7
Kuykendahl	0.0
Champions	1.3
Kingwood	4.5
Mason Road	2.2

TABLE 13

Overview of Selected User Characteristics
Dallas/Garland and Houston

Characteristic	Dallas/Garland	Houston
Age (Years)		
50th Percentile	34	30
85th Percentile	48	45
Sex		
Male	42%	42%
Female	58%	58%
Years of Education		
50th Percentile	14	15
85th Percentile	17	17
Occupation		
Clerical	40%	35%
Managerial	19%	17%
Professional	28%	40%
Previous Mode of Travel		
Drove Self	50%	49%
Carpool/Vanpool	11%	17%
Regular Route Bus	11%	8%
Did Not Make Trip	25%	24%
Other	3%	2%
Length of Time at Present Address (Years)		
50th Percentile	1.7	1.4
85th Percentile	7.5	6.7

TABLE 14

Responses to the Question "Do you save time using Park-and-Ride?"
Houston and Dallas Lots

Response	Dallas/Garland	Houston		
		Total Sample (n = 2237)	CFL Lots (n = 783)	Non CFL Lots (n = 1454)
Yes	30%	52%	74%	40%
No	70	41	19	53
Same	---	6	7	6
Not Sure	---	1	---	1

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 15

**Responses to the Question "Do you save money using Park-and-Ride?",
Houston and Dallas Lots**

Response	Dallas/Garland	Houston		
		Total Sample (n = 2247)	CFL Lots (n = 781)	Non CFL Lots (n = 1466)
Yes	90%	91%	89%	92%
No	10	5	7	5
Same	—	3	3	2
Not Sure	—	1	1	1

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 16

Time and Dollars Saved/Lost Using Park-and-Ride, Houston Lots

Time/Dollars Saved or Lost	Total Sample	CFL Lots	Non CFL Lots
Dollars Saved (Percent of Sample)	91%	89%	92%
Amount of Dollars Saved (\$/month)			
50th Percentile	\$39	\$39	\$39
85th Percentile	\$75	\$75	\$77
Dollars Lost (Percent of Sample)	5%	7%	5%
Amount of Dollars Lost (\$/month)			
50th Percentile	\$15	\$13	\$16
85th Percentile	\$26	\$23	\$28
Time Saved (Percent of Sample)	52%	74%	40%
Amount of Time (minutes/trip)			
50th Percentile	15	19	14
85th Percentile	28	30	25
Time Lost (Percent of Sample)	41%	19%	53%
Amount of Time (minutes/trip)			
50th Percentile	14	13	14
85th Percentile	25	19	28

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

savings or losses are similar for all lots, as would be expected, the contraflow lots offer greater potential for saving time.

Satisfaction With Service. Users of park-and-ride were asked to rate the general satisfaction with the service provided. In general, these individuals are satisfied with the service. That is a logical expectation since, if they were greatly dissatisfied with the service they probably would not be using park-and-ride. Responses to this question are summarized in Table 17.

Important/Unimportant Features. Both the Dallas and Houston surveys asked users which features of the park-and-ride service were most important to them in deciding to utilize park-and-ride. A list of some 20 features was provided, and each feature was rated on a scale of one (not important) to five (very important).

The responses to this question are shown in Table 18. Very little difference exists between the surveys in the different cities. It is apparent that, in general, patrons enjoy the safety of riding in a bus, desire frequent and reliable bus service and a lot located close to home.

Surprisingly little difference exists between the contraflow and the non-contraflow lots. Although bus travel time relative to auto travel time is rated much higher for the contraflow lots, it is only rated 15th out of 20 possible features. Apparently safe, frequent and reliable service is the most important feature a transit operator can provide to serve the present clientele.

NON-USER CHARACTERISTICS, DALLAS/ GARLAND AND HOUSTON

Characteristics of Dallas individuals that reside in the area served by the park-and-ride lot and work in the activity center served by the bus service are documented in Research Report 205-11. Since park-and-ride service in Dallas focuses on the downtown, that was the only employment center considered.

In Houston, individuals residing in the park-and-ride market areas and working in any of the following six activity centers were considered as non-users—downtown, Galleria-Post Oak, Greenway Plaza, University of Houston, Texas Medical Center and Texas Southern University.

Data showing the responses to these surveys are summarized in Table 19. A summary of some of the more pertinent survey data is presented in this section; both personal and travel characteristics are discussed.

Personal Characteristics

Questions concerning age, sex, education, occupation and years at present address of non park-and-ride users were posed in both study cities.

Age. In both the Dallas and the Houston surveys, the median age of non-users was found to be 39 years. The 85th percentile age in both surveys was 52 to 53 years.

Sex. Table 20 summarizes non-user data relating to sex. Again, characteristics in Houston and Dallas are nearly identical. Approximately 70 percent of the employees at the major activity centers are male.

Education. The surveys asked the question, "How many years of school have you completed?" The responses to this question are shown in Figure 10. As would be expected, employees in the major activity centers tend to be a well-educated group in both study cities. Approximately 80 percent of the persons working in the activity centers have at least some college education.

Occupation. As would be anticipated from the education data shown in Figure 10, non-users are primarily "white collar" employees. Occupation data are summarized in Table 21. About 75 percent of the total employees at the major activity centers have occupations classified as clerical, managerial, or professional. The Dallas and Houston data are similar.

Years at Address. "How many years have you lived at your present address?" was asked in both the Dallas and Houston surveys. While the answers were similar, non-users in Dallas had lived at their present address somewhat longer than Houston residents (Table 22). Non park-and-ride users have resided at their present address for a much longer period of time than have park-and-ride users.

Transportation Characteristics

A series of questions was asked to identify past and present travel patterns. The questions

TABLE 17

Satisfaction with Park-and-Ride Service Provided, Dallas and Houston

Level of Satisfaction	Dallas/Garland (n = 410)	Houston		
		Total Sample (n = 2352)	CFL Lots (n = 806)	Non CFL Lots (n = 1546)
Very Satisfactory	15%	—	—	—
Satisfactory	46	78%	80%	76%
Neutral	10	18	16	20
Unsatisfactory	21	4	4	4
Very Unsatisfactory	8	—	—	—

Note: CFL refers to the three lots serving the contraflow lane on I-45N.

TABLE 18

Relative Importance of Various Park-and-Ride Features to Users of the Park-and-Ride Service, Dallas and Houston

Feature	Rating ¹					
	Houston				Dallas, Total Sample	
	Total Sample	Corridor Without Priority Treatment	Corridor With Priority Treatment	Significant Level ² , Total Sample		
Riding in a safe bus	4.64	4.61	4.69	↑ Most Significant	4.66	
Reliable bus schedule	4.63	4.63	4.62		4.49	
Not having to drive in heavy traffic	4.55	4.47	4.70		4.30	
Frequent bus service	4.55	4.54	4.56	↑ Intermediate Significance	4.52	
Park-and-Ride lot close to home	4.46	4.46	4.45		4.35	
Non-Stop bus service	4.42	4.44	4.38		4.32	
Convenient access to park-and-ride lot	4.42	4.40	4.44		4.35	
Rising cost of gas and auto maintenance	4.41	4.40	4.43		4.36	
Security at park-and-ride lot	4.37	4.31	4.49		4.24	
Bus stop close to place of work	4.31	4.32	4.30		4.18	
Having a seat available on bus	4.28	4.32	4.20		4.30	
Cost of park-and-ride relative to auto	4.27	4.29	4.21		↓ Least Significant	—
Avoiding stress of driving	4.24	4.15	4.40			4.06
Rising cost of parking at work	3.95	3.97	3.93	4.27		
Shelter facility at the lot	3.75	—	3.75	3.84		
Park close to bus loading point	3.74	3.78	3.68	3.80		
Riding in a new bus	3.51	3.61	3.32	2.85		
Off-Peak period bus service	3.48	3.43	3.56	3.43		
Bus relative to auto travel time	3.44	3.23	3.84	2.89		
Bench/Sheeter at bus stop	3.20	—	3.20	2.91		

¹ Each feature was rated on a scale of one (not important) to five (very important).

² To assess statistically significant differences in the responses, a Duncan's multiple range test for variable rank was performed.

TABLE 19

Summary of Responses to Non-User Survey

City/Activity Center	Total Mail Out	Total Return ¹	Households With at Least One Person Working in Activity Center ²
Dallas CBD	2,694	1,719 (64%)	250 (14.5%)
Houston	4,826	2,179 (45%)	792 (36.3%)
CBD (total)	---	---	463 (21.1%)
Gulf Corridor	---	---	108 (15.0%)
North Corridor	---	---	295 (26.0%)
Southwest Corridor	---	---	59 (18.0%)
Galleria (total)	---	---	155 (7.0%)
Gulf Corridor	---	---	27 (3.8%)
North Corridor	---	---	99 (8.7%)
Southwest Corridor	---	---	29 (8.9%)
Greenway Plaza (total)	---	---	55 (2.5%)
Gulf Corridor	---	---	20 (2.8%)
North Corridor	---	---	17 (1.5%)
Southwest Corridor	---	---	18 (5.5%)
University of Houston (total)	---	---	68 (3.1%)
Gulf Corridor	---	---	13 (1.8%)
North Corridor	---	---	36 (3.2%)
Southwest Corridor	---	---	19 (5.8%)
Medical Center (total)	---	---	11 (0.5%)
Gulf Corridor	---	---	7 (1.0%)
North Corridor	---	---	1 (0.0%)
Southwest Corridor	---	---	3 (0.9%)
Texas Southern (total)	---	---	40 (1.8%)
Gulf Corridor	---	---	10 (1.4%)
North Corridor	---	---	21 (1.8%)
Southwest Corridor	---	---	9 (2.8%)

¹Percentage shown is percentage of total mail-outs.

²Percentage shown for activity center totals is percentage of total returns for the city. For the corridors, the percentage shown is the percentage of total returns for that corridor. For example, 15 percent of the Gulf Corridor households have at least one person employed downtown.

TABLE 20

Sex of Non Park-and-Ride Users, Dallas and Houston

Sex	City	
	Dallas (n = 201)	Houston (n = 762)
Male	70%	71%
Female	30%	29%

TABLE 21

Occupation of Non Park-and-Ride Users, Dallas and Houston, Percentage

Occupation	City	
	Dallas (n = 194)	Houston (n = 781)
Unemployed	0.0%	0.0%
Housewife	0.0	0.0
Student	4.1	3.7
Retired	0.0	0.0
Private Household Workers	0.0	0.0
Laborers	0.5	0.1
Operatives	2.1	0.9
Service Workers	2.5	2.2
Craftsmen	4.2	6.1
Clerical	15.4	11.5
Sales	12.4	10.2
Managerial	29.9	31.0
Professional	28.9	34.3

TABLE 22

Length of Time at Present Address, Non Park-and-Ride Users, Dallas and Houston

City	Years at Present Address	
	50th Percentile	85th Percentile
Dallas (n = 201)	5.5	16.0
Houston (n = 697)	4.2	10.0

asked in Houston were not always the same as those asked in Dallas; Dallas data are presented in this section only when those data are comparable to the Houston data. The remaining Dallas data are included in Research Report 205-11.

Mode of Travel. Non-users were asked, "How do you travel to your work or school location?" Responses to this question are summarized in Table 23. The extensive vanpooling program in Houston causes the vanpool/carpool percentage to exceed that of Dallas. For some of the Houston activity centers, the response rate is too low for the results shown to be considered statistically significant.

Modal Split. The home surveys also provide an indication of modal split data for park-and-ride service. Modal splits, as identified through the home mail-outs, are shown in Table 24. Even though the park-and-ride lots in the north corridor are operating at capacity, over 30 percent of total trips to the activity centers, and as much as 37 percent of those trips, are presently being served by vanpools and carpools. As shown subsequently, over 75 percent of those vehicles use the contraflow lane.

Trip Time. In the Houston surveys, the residents working in the major activity centers were asked the time they started their trip and the time they reached their destination. Frequency data for the times at which trips originated and terminated are shown in Figure 11. Figures 12 and 13 show trip lengths expressed in minutes.

Most all trips (75 percent) leave home in the morning between 6:00 a.m. and 8:00 a.m. The majority of trips (60 percent) arrive at their destination between 6:30 a.m. and 8:30 a.m. Average trip length is slightly in excess of 30 minutes.

Use of Contraflow Lane. For the three market areas located along I-45N, the question "If you vanpool or ride the bus, does your trip make use of the contraflow lane?" was asked. Responses to this question are shown in Table 25. The majority of those vehicles do utilize the contraflow lane.

General Knowledge and Attitudes Concerning Transportation

A series of questions was asked concerning attitudes and knowledge relating to transportation service.

Use of Metro. Respondents to the home mail-out were asked how frequently they used the Metro bus service. The responses to this question are summarized in Table 26.

Knowledge of Park-and-Ride Service. A series of questions were asked concerning use and knowledge of the Metro park-and-ride service. The responses are summarized in Tables 27, 28, and 29.

It appears that most non-users are familiar with the park-and-ride service. Approximately 25 percent have used park-and-ride and over 80 percent know the location of the nearest park-and-ride lot. About half of the non-users do not, however, feel they know enough about park-and-ride to confidently begin using that service. Responses from Dallas and Houston are similar.

Auto Availability During Day. Surveys in both cities asked if the respondent needed an automobile available during the day. Individuals perceiving a need for a vehicle during the day do not make good potential park-and-ride patrons. Responses to the question are summarized in Table 30.

Data shown previously suggest that, at least in the North Freeway corridor, park-and-ride plus vanpools serve about 33 percent of trips to the downtown. Based on the data shown in Table 30, it would appear that, of the eligible market, park-and-ride plus vanpool might be serving as much as 66 percent of the total eligible market.

Parking Cost. The Houston surveys asked whether the employer paid all or part of the parking cost at the work location. The responses to this question are shown in Table 31. About 55 percent of the respondents received some assistance in paying their parking cost. While employers may consider this a necessary cost to attract employees to their work location, it also reduces potential money savings that could be realized by using park-and-ride. The alternative would be for the employers to offer similar dollar benefits to apply toward transit fares.

Attitudes Concerning Alternative Improvements

The Houston surveys asked a series of questions concerning provision of facilities and amenities related to park-and-ride. Respondents were asked to assess a rating of one (not supportive) to five (very supportive) to each improvement specified. A summary of these ratings is

TABLE 23

Mode of Travel to Work or School, Non Park-and-Ride Users,
Dallas and Houston

City and Activity Center	Mode					
	Drove Self	Carpool	Vanpool	Local Bus	Carpool/ Vanpool	Other
Dallas (n = 207)	69%	---	---	4%	25%	2%
Houston, total (n = 711)	70	18	9	2	---	1
Downtown (n = 385)	65	19	12	2	---	2
Galleria (n = 154)	76	16	8	0	---	0
Greenway (n = 54)	74	22	0	4	---	0
Medical (n = 11)	91	9	0	0	---	0
TSU (n = 40)	85	8	4	0	---	3
U. of H. (n = 67)	64	21	15	0	---	0

TABLE 24

Modal Split Data for Dallas and Houston Park-and-Ride Facilities,
Travel to Downtown from Lot Market Areas

City and Lot or Corridor	Percent of Travel to Major Activity Centers by	
	Park-and-Ride	Vanpool
Dallas, total	15%	---
Garland North and South	21	---
North Central	8	---
Houston, total (n = 792)	17	10%
From Gulf Corridor	---	8
From North Corridor ¹	23	10
Market Areas		
Champions	23	14
Kuykendahl	22	8
North Shepherd	27	9
From Southwest Corridor ¹	10	8

¹Park-and-ride percentage restricted by spaces available at lots.

TABLE 25

Use of the Contraflow Lane by Vanpool
and Bus Patrons, Houston

Market Areas	Percent of Bus and Van Person Trips Using the Contraflow Lane
North Shepherd (n = 33)	76%
Kuykendahl (n = 61)	84
Champions (n = 64)	91

TABLE 26

Use of Metro Bus Service (n = 774)

Frequency of Use	Percent
Almost Every Day	11
About Once a Week	1
Seldom	10
Never	78

TABLE 27

Frequency of Use of Park-and-Ride Service

City and Market Area	Percentage of Total Respondents That Have Used Park-and-Ride
Houston, Total Sample (n = 783)	25%
North Shepherd	28
Kuykendahl	27
Champions	33
Westwood	32
Edgebrook	18
Dallas (n = 207)	35

TABLE 28

Response to the Question "Do you know enough about the Park-and-Ride service available to confidently begin using it tomorrow?"

City and Market Area	Response		
	Yes	No	Not Sure
Houston, total sample (n = 792)	41%	50%	9%
North Shepherd	44	45	11
Kuykendahl	51	40	9
Champions	53	39	8
Westwood	27	61	12
Edgebrook	29	65	6
Dallas (n = 200)	42	48	10

TABLE 29

Response to the Question "Do you know the location of the Park-and-Ride lot nearest your home?"

City and Market Area	Response		
	Yes	No	Not Sure
Houston, total sample (n = 792)	87%	5%	8%
North Shepherd	92	7	1
Kuykendahl	89	7	4
Champions	93	4	3
Westwood	77	15	8
Edgebrook	89	8	3
Dallas (n = 203)	80	17	3

TABLE 30

Perceived Need for Automobile During the Workday

City and Market Area	Percent of Respondents Needing an Automobile During the Day
Dallas, total	48%
Garland North and South	38
Dallas North Central	58
Houston, total ¹	46
North Shepherd	49
Kuykendahl	49
Champions	42
Westwood	48
Edgebrook	46

¹ Responses for Houston are persons claiming to need a car on a daily basis. An additional 27 percent claimed a need for a car on a "seldom" basis, and 17 percent a need on a "weekly" basis.

TABLE 31

Employer Subsidization of Parking Costs

City and Market Area	Employer's Share of Parking Costs		
	All	Part	None
Houston, total (n = 2364)	42%	13%	45%
North Shepherd	36	20	44
Kuykendahl	42	13	45
Champions	40	17	43
Westwood	46	10	44
Edgebrook	47	9	44

shown in Table 32. The range of responses is not great and cannot be interpreted as being highly supportive or not supportive of any of the potential improvements.

"Important" Aspects of Park-and-Ride

One of the intents of these surveys has been to identify those features that could be added to the park-and-ride service that would be most successful in generating new ridership. A list of alternative improvements was provided to the non-users, and these individuals were asked to rate each improvement based on the likelihood of their using park-and-ride if that improvement was implemented; each improvement was rated on a one to five basis, a one meaning very unlikely and a five meaning very likely. The alternative improvements listed were not identical in the Dallas and Houston surveys. Those potential improvements addressed in the Houston surveys are summarized in Table 33.

As was the case in the Dallas surveys, providing priority treatment to give transit vehicles a travel time advantage appears to be the most successful means of attracting more riders. Some of the features that were important to users, such as schedule reliability and lot location, are not perceived to be that important in attracting new ridership.

COMPARISON OF USER AND NON-USER CHARACTERISTICS, HOUSTON

Characteristics of both users and non-users of park-and-ride for Dallas and Houston have been presented previously. Table 34 summarizes some of these data. Non-users tend to be older and have resided a longer time at their current address. While the majority of park-and-ride patrons are female, the majority of employees at major activity centers are male. Both users and non-users are highly educated; clerical occupations are more prevalent among users.

TABLE 32

General Attitudes of Non Park-and-Ride Users Concerning Provision of Park-and-Ride Facilities, Houston (n = 792)

Statement Relating to Facilities	Rating ¹
Parking lots for carpoolers and vanpoolers to meet	3.2
Parking lots designated for bus patrons	3.2
Security racks and designated areas for bicycles at park-and-ride lots	2.7
Outdoor shelters or benches for bus patrons near work or school	3.2
Conveniently located vending machines and telephones at the park-and-ride lot	2.9

¹The statements were rated on a scale of one to five, a one meaning not supportive and a five meaning very supportive.

TABLE 33

Relative Importance of Various Improvements to Park-and-Ride Service in Generating Additional Ridership

Potential Improvement	Rating ¹				
	Houston				Dallas, Total Sample
	Total Sample	Corridor Without Priority Treatment	Corridor With Priority Treatment	Significance Level ² Total Sample	
If a comfortable temperature was always maintained inside the buses	3.11	3.35	2.95		3.49
If the bus trip took less time than an automobile trip	3.10	3.48	2.83		4.00
If the buses stopped closer to your place of work or school	3.03	3.18	2.92		3.83
If there was always a seat available	3.01	3.28	2.83		3.67
If gasoline availability were to decrease	2.96	3.13	2.84		3.87
If you didn't have to wait more than five minutes for a bus	2.90	3.10	2.76		3.47
If bus service was provided all day	2.89	3.13	2.72		3.69
If traffic congestion became worse	2.86	2.89	2.84		3.16
If the buses arrived and departed at the scheduled time	2.84	3.07	2.69		3.35
If the lot was closer to your home	2.80	2.93	2.71		—
If fare could be paid by monthly ticket or cash	2.79	2.96	2.67		—
If auto access to the lot was more convenient	2.75	2.92	2.64		3.28
If there was better security at the lot	2.73	2.95	2.58	3.59	

¹All improvements were rated on a one to five scale; the higher the rating, the more likely the improvement will generate additional ridership.

²A multiple range test was used to identify statistically significant differences in the means.

TABLE 34

Overview of Selected Personal and Transportation Characteristics,
Users and Non-Users, Houston

Characteristic	Users	Non-Users
Age (years)		
50th percentile	30	39
85th percentile	45	53
Sex		
Male	42%	71%
Female	58%	29%
Years of Education		
50th percentile	15	14
85th percentile	17	17
Occupation		
Clerical	35%	12%
Managerial	17%	31%
Professional	40%	34%
Mode of Travel to Work or School ¹		
Drove Self	49%	70%
Carpool	—	18%
Vanpool	—	9%
Carpool/Vanpool	17%	—
Regular Route Bus	8%	2%
Did Not Make Trip	24%	—
Other	2%	1%
Length of Time at Present Address (years)		
50th percentile	1.4	4.2
85th percentile	6.7	10.0

¹This is the previous mode of travel for park-and-ride users and the current mode of travel for the non-users.

TABLE 35

Peaking Characteristics at Park-and-Ride Lots

Traffic Data	Park-and-Ride Lot	
	North Shepherd	Kuykendahl
Arriving Traffic (vehicles)		
Daily volume	1,296	1,577
Peak hour volume	502 (7:15 - 8:15)	677 (6:45 - 7:45)
Peak 15 minutes	140 (8:00 - 8:15)	201 (7:15 - 7:30)
Peak hour/daily	40%	43%
Peak 15 minutes/peak hour	29%	30%
Exiting Traffic		
Daily volume	1,284	1,563
Peak hour volume	577 (4:45 - 5:45)	643 (5:00 - 6:00)
Peak 15 minutes	194 (5:15 - 5:30)	186 (5:45 - 6:00)
Peak hour/daily	45%	41%
Peak 15 minutes/peak hour	34%	29%

TABLE 36

Parking Space Utilization and Vehicle Type

Parking Data ¹	Park-and-Ride Lot	
	North Shepherd	Kuykendahl
Number of Spaces	765	1,296
Parked Vehicles	786	1,176
% of Spaces Used	103%	91%
Compacts and Subcompacts as a % of Total Vehicles	23%	37%

¹Data shown represent a two-day average value.

IV. TRAFFIC, PARKING, AND PEDESTRIAN PATTERNS

To assist in developing design and operating guidelines for park-and-ride facilities, considerable data were collected at two of the larger park-and-ride lots in Houston, namely North Shepherd and Kuykendahl (Figure 14). The general layout of these two lots is shown in Figures 15 and 16. Data were collected at the North Shepherd lot on Monday and Tuesday, July 27th and 28th. The data at the Kuykendahl lot were collected on Wednesday and Thursday, July 29th and 30th.

The remainder of this section is presented in the following order:

- Vehicle entrance/exit patterns
- Kiss-and-ride characteristics
- Patron arrival patterns/accumulation
- Other significant data

VEHICLE ENTRANCE/EXIT PATTERNS

Vehicle arrival and exit patterns at the two park-and-ride facilities are shown in Figures 17 and 18. Peaking data are summarized in Table 35. As a general guideline, it appears that about 40 percent of daily directional traffic occurs in the peak hour and that 30 percent of peak-hour traffic occurs in the peak 15 minutes.

The number of vehicles arriving at these lots effectively utilized the available capacity (Table 36). Roughly 25 to 35 percent of the vehicles at the lots were either compacts or sub-compacts.

KISS-AND-RIDE CHARACTERISTICS

A significant number of park-and-ride patrons use kiss-and-ride as their means of arrival at the park-and-ride facility. Serving this group of patrons is a significant concern in lot design since separate parking areas are generally developed to serve this clientele.

Percent of Total Patronage

The counts taken at the park-and-ride

facilities substantiate findings from the on-board surveys. Kiss-and-ride patronage represents approximately 15 to 20 percent of total patronage (Table 37).

Patrons Per Kiss-and-Ride Vehicle

The average kiss-and-ride vehicle delivers between 1.1 and 1.2 park-and-ride patrons to the lot (Table 38).

Dwell Time

Average dwell time per vehicle in the evening is a critical design variable in determining the number of kiss-and-ride spaces to provide. A summary of dwell time data is provided in Table 39. A design dwell time in the range of 7.5 minutes appears appropriate. That value can be used in conjunction with figures presented in Research Report 205-3 entitled "Design Guidelines for Park-and-Ride Facilities" to determine kiss-and-ride space requirements for large park-and-ride facilities.

Arrival patterns and vehicle accumulation by five minute increments for both of the study lots are shown in Figures 19 and 20. Distribution of dwell times is shown in Figures 21 and 22.

Kiss-and-Ride Patron Accumulation

For many kiss-and-ride patrons, their pick-up vehicle in the evening is waiting when they exit the park-and-ride bus. Other kiss-and-ride patrons wait at the shelter for their ride. Data collected at the two lots suggest that 10 to 20 percent of total kiss-and-ride patronage represents the maximum number of kiss-and-ride patrons awaiting a ride (Figure 23) in the evening.

PATRON ARRIVAL PATTERNS/ ACCUMULATION

Patron accumulation at the shelter in the morning is a critical value in shelter design. Both park-and-ride lots operate during peak periods with relatively short headways (three to ten minutes) which tend to keep patron accumulation at the shelter to a minimum.

TABLE 37

**Kiss-and-Ride Patrons as a Percent of Total Patrons,
6:30 a.m. to 8:30 a.m.**

Patronage Data ¹	Park-and-Ride Lot	
	North Shepherd	Kuykendahl
Total Boarding Patrons	925	1,228
Kiss-and-Ride Patrons	170	179
Kiss-and-Ride as a % of Total Patrons	18%	15%

¹Data shown represent a two-day average value.

TABLE 38

Park-and-Ride Patrons Per Arriving Kiss-and-Ride Vehicle

Occupancy Data ¹	Park-and-Ride Lot	
	North Shepherd	Kuykendahl
One Patron (%)	87%	92%
Two Patrons (%)	12%	7%
Three or More Patrons (%)	1%	1%
Average, Patrons Per Kiss-and-Ride Vehicle	1.15	1.10

¹Data shown represent a two-day average value.

TABLE 39

Average Dwell Time Per Kiss-and-Ride Vehicle, p.m. Peak Period

Lot and Date	Total Kiss-and-Ride Vehicles	Average Dwell Time (minimum)
North Shepherd		
7/27/81	134	7.4
7/28/81	135	5.3
Kuykendahl		
7/29/81	146	7.2
7/30/81	137	7.3

Figures 24 and 25 show patron arrival patterns and accumulation at the shelter areas. Table 40 shows average values that might be used as design guidelines. In general, at least four square feet of shelter space should be provided per person.

OTHER SIGNIFICANT DATA

Both parking lots provide spaces specifi-

cally designated for use by handicapped persons.

Handicapped Parking

Handicapped parking is located close to the park-and-ride shelter at both lots. While these spaces are generally utilized, they generally are not utilized by handicapped persons. Table 41 summarizes these data. Approximately one handicapped person per day uses the designated spaces at each of the two lots.

TABLE 40

Accumulation of Patrons at the Shelter

Patronage and Accumulation ¹	Park-and-Ride Lot ²	
	North Shepherd	Kuykendahl
Peak Period Ridership (6:30 - 8:30)	925	1,228
Peak Hour Ridership	625	856
Maximum Accumulation at Shelter	83	54
Accumulation as a % of:		
Peak-Period Ridership	9%	4%
Peak Hour Ridership	13%	6%

¹Data shown represent a two-day average.

²Frequent bus service is provided at both lots, but frequency at Kuykendahl is greater. From 6:00 to 8:00 a.m., 35 buses depart Kuykendahl and 24 depart North Shepherd.

TABLE 41

Usage of Designated Handicapped Parking Spaces

Park-and-Ride Lot and Date	Number of Handicapped Spaces	Number of Spaces Used	Number of Spaces Used by Non-Handicapped Persons
North Shepherd			
7/27/81	10 ¹	9	8
7/28/81	10 ¹	6	5
Kuykendahl			
7/29/81	9	1	0
7/30/81	9	2	1

¹One space occupied by a trash receptacle.

V. MARKET AREA CHARACTERISTICS

As part of the on-board surveys, the origin of the trip, by zip code, was asked. This information was used to attempt to define the market area, or watershed, for park-and-ride service.

The variation in the survey data suggests that the market area is not the same shape for all park-and-ride lots. Factors such as the location of adjacent park-and-ride lots and accessibility appear to influence the market area. As a broad generalization for the Houston area, the "typical" market area might be defined as

being parabolic in shape, with a vertex 0.5 to 1.0 mile downstream of the lot, an axis seven miles in length following the major artery of the lot, and a chord of eight miles in length (Figure 26).

Virtually all users of the park-and-ride service reside within seven miles of the lot. These data are shown in Table 42.

Figures 27, 28, and 29 summarize market area data by corridor and lot.

VI. MAJOR FINDINGS

The data collected in Houston greatly expand the available information on park-and-ride facilities in Texas. As a general observation, it is surprising how similar the data collected in Dallas and Houston are, especially in light of the priority treatment on the North Freeway in Houston that provides three lots with a distinctly different service feature from the other lots surveyed.

Park-and-ride has to be considered a success in Houston; the majority of the lots are operating at or above capacity after being in operation for a relatively short period of time. It is apparent that a latent demand exists in the Houston area for high-quality transit service.

MODAL SPLIT

Modal split values for Houston lots are impressive. Of those trips originating in the market areas of the North Freeway lots and terminating in downtown, approximately 25 percent are being served by park-and-ride. Since all lots in that corridor are at capacity, it is not known how high this percentage might be if more lot capacity and bus service were available. An additional 10 to 15 percent of total trips are served by vanpools; thus, about one-third of total trips are being served by either buses or vans.

This is particularly significant in light of the fact that park-and-ride cannot effectively serve those individuals who perceive a need to have an auto available during the day. While the perception of this need can be influenced by increasing energy and parking costs, at present about half of the individuals working in the major activity centers perceive a need to have an auto available on a daily basis. Thus, park-and-ride may be serving two-thirds of the eligible market.

Park-and-ride is serving a large volume of new trips; about 25 percent of the persons using park-and-ride did not make the trip prior to provision of park-and-ride service. Some of this is no doubt a latent demand that, with the new service offered, began to make trips that otherwise would not be made. It also appears, however, that many users of park-and-ride began using the service immediately after moving to

the park-and-ride market area. The park-and-ride service may even have been a factor in residential site location.

EMPLOYMENT AT MAJOR ACTIVITY CENTERS

The home mail-out surveys identified the number of households in the various mail-out areas having at least one member employed in one of six major activity centers—downtown, Greenway Plaza, Galleria-Post Oak, Texas Medical Center, Texas Southern University, and the University of Houston. The responses indicated that 36 percent of the households surveyed had at least one member employed at those locations.

The responses varied by corridor. For example, 15 percent of households in the Gulf Corridor had a member employed in downtown, while 18 percent of the households in the Southwest Corridor and 26 percent of the households in the North Corridor had a member employed at that location.

CHARACTERISTICS OF PARK-AND-RIDE USERS AND NON-USERS

The user and non-user characteristics, as determined in both the Dallas and Houston surveys, are very similar. The user group is younger, has a larger percentage of females, and has lived at the present address a shorter period of time than the non-user group. Both groups have similar educational backgrounds and are relatively highly educated. The user segment has a higher percentage of clerical personnel, while the non-user group has a higher percentage of managerial personnel.

TIME/COST ASPECTS OF PARK-AND-RIDE

Virtually all park-and-ride patrons perceive that they are saving money by using park-and-ride. In Houston, users feel they are saving about \$40 per month, or just less than \$1 per one-way trip.

With the exception of the service using the contraflow lane, most park-and-ride users

TABLE 42

Distance Park-and-Ride Patrons Live From the Lot

Lot	Percent Living Within		
	5 miles	7 miles	10 miles
Clear Lake City	80	99	100
Gulf/Sage	47	92	94
Westwood	86	92	96
Champions	95	97	98
North Shepherd	88	94	100
Kuykendahl	63	100	100
Kingwood	86	89	89
Beechnut/West Loop	62	84	92
Alief	89	93	96
Sharpstown/Bellaire	92	92	96
Katy/Mason	26	98	100
Average (Non-Weighted)	74	94	96

pay a time penalty to use park-and-ride. Over 70 percent of Dallas users claimed to lose time, while 53 percent of the Houston patrons that do not use the contraflow lane claimed to lose time. For those persons perceiving a time loss, the average loss was about 15 minutes.

Priority treatment (i.e., the contraflow lane) provides the "best of both worlds." While realizing a dollar savings of about \$40 per month, 74 percent of those users also realize a time savings averaging almost 20 minutes per trip. While the data are not sufficient to conclusively quantify the impact of priority treatment on modal split, it does appear that priority treatment increases modal split (for further discussion, refer to Technical Report 1064-IF entitled "Guidelines for Estimating Park-and-Ride Demand").

IMPORTANT/UNIMPORTANT FEATURES OF PARK-AND-RIDE

A major thrust of this research has been to identify the features of park-and-ride that were most important to users in making their decision to use park-and-ride; also, the surveys were designed to determine what new features of park-and-ride could be added to cause non-users to consider using park-and-ride transit service. These features are summarized in Table 43.

It appears that frequent, reliable, and safe bus service is the most important feature to users, while provision of priority treatment to provide a travel time advantage for buses may be the most effective means of attracting new riders.

MARKETING IMPLICATIONS

At those locations where lots are already at capacity, it is hard to justify additional marketing until more spaces are available. While about 30 percent of non-users have used park-and-ride at some time and about 75 percent

know the location of the lot closest to their home, only about 25 to 50 percent feel they know enough about the service available to begin to confidently use that service. Marketing could be an effective tool in educating that group as to how to use park-and-ride service.

TRAFFIC PATTERNS

Due to the severe peaking characteristics associated with park-and-ride, large lots can cause congestion problems on adjacent streets. About 40 percent of daily directional travel occurs during the peak hour, and about 30 percent of peak hour traffic occurs in the peak 15 minutes.

KISS AND RIDE PATRONAGE

Kiss-and-ride patrons represent 10 to 20 percent of total patronage. The "average" kiss-and-ride vehicle delivers 1.1 to 1.2 riders to the lot. Vehicle dwell time in the afternoon, a key variable in design, averaged 7.5 minutes at the two large lots surveyed. About 10 to 20 percent of total kiss-and-ride patronage can be expected to accumulate at the shelter in the afternoon while waiting for a ride home.

In the morning, about 5 to 15 percent of total peak-hour park-and-ride patronage accumulates at the shelter waiting to board a bus.

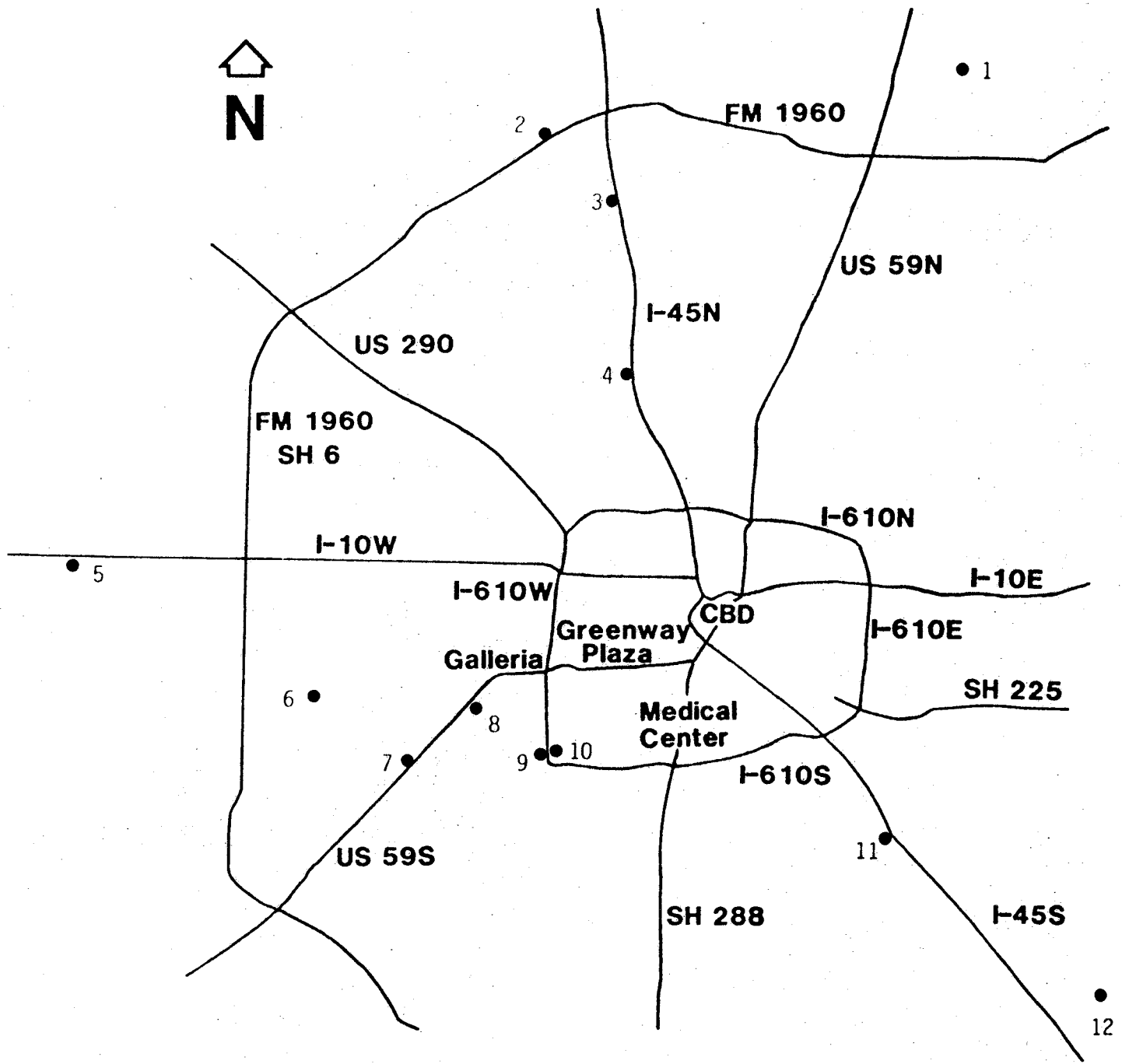
SHAPE OF MARKET AREAS

While many factors will influence the shape of a park-and-ride market area, a "typical" market area in Houston might be defined as being parabolic in shape with a vertex 0.5 to 1.0 mile downstream of the lot, an axis seven miles in length following the major artery serving the lot, and a chord of eight miles in length. About 75 percent of total patrons live within five miles of the lot, and about 95 percent live within seven miles of the lot.

TABLE 43

Important and Unimportant Features of Park-and-Ride Service

Survey Group	Important Features	Unimportant Features
Users	<ul style="list-style-type: none"> ● Safe bus trip ● Reliable bus service ● Not having to drive in heavy traffic ● Frequent bus service ● Lot close to home 	<ul style="list-style-type: none"> ● Shelter at bus stop ● Bus relative to auto travel time ● Bus service during off-peak ● Riding in a new, modern bus ● Parking close to bus loading area
Non-Users	<ul style="list-style-type: none"> ● Temperature in bus ● Bus relative to auto travel time 	<ul style="list-style-type: none"> ● Better security at lot ● Better access to lot ● Fare paid by cash or monthly ticket ● Lot closer to home



Houston Area Park-and-Ride Lots

- | | |
|-------------------|-------------------------------|
| 1. Kingwood | 7. Westwood |
| 2. Champions | 8. Sharpstown |
| 3. Kuykendahl | 9. West Loop - Beechnut |
| 4. North Shepherd | 10. West Loop - Sage |
| 5. Mason | 11. Edgebrook (formerly Sage) |
| 6. Alief | 12. Clear Lake |

FIGURE 1

Location of Park-and-Ride Lots in Houston

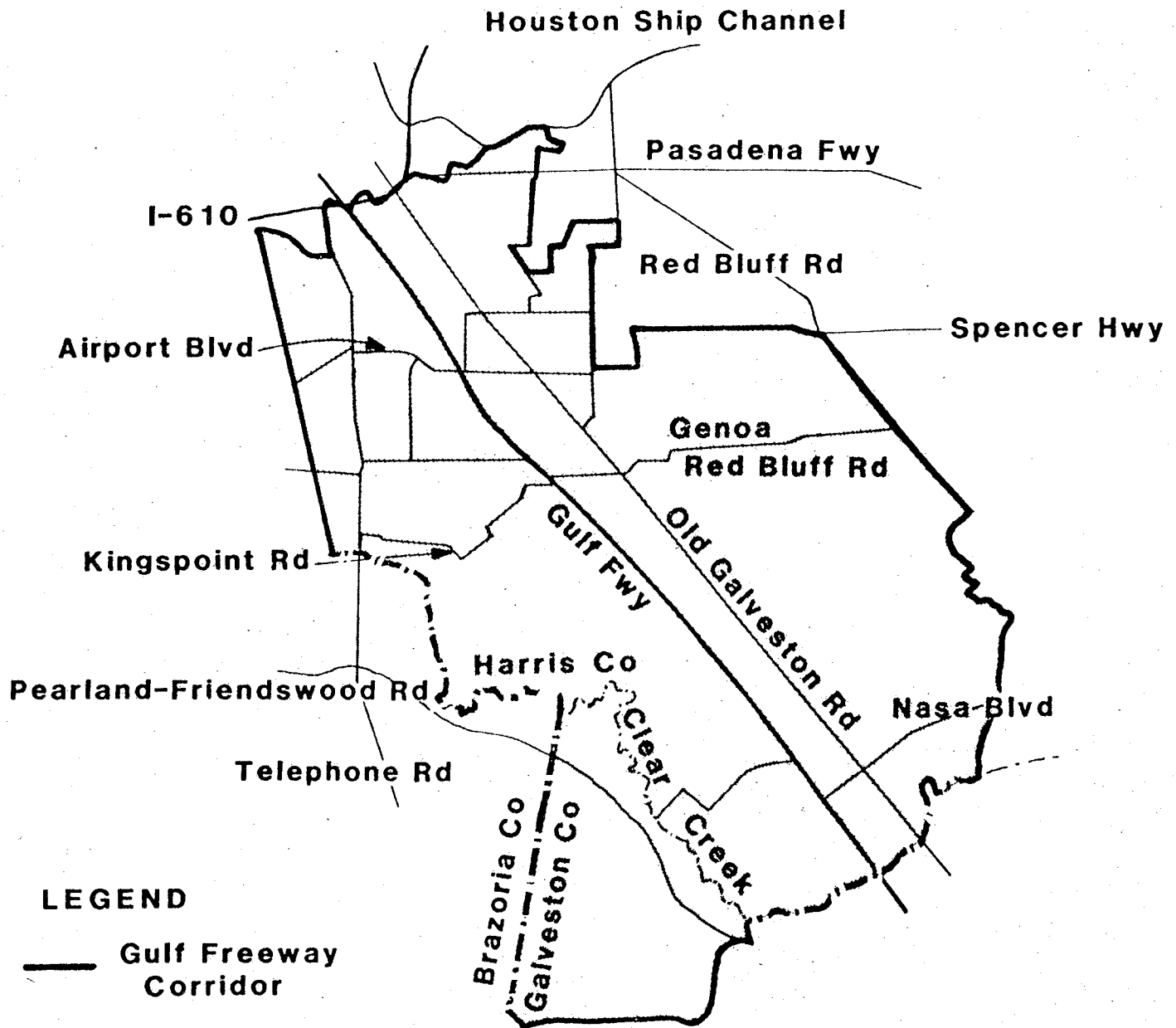


FIGURE 2

Gulf Corridor Market Area

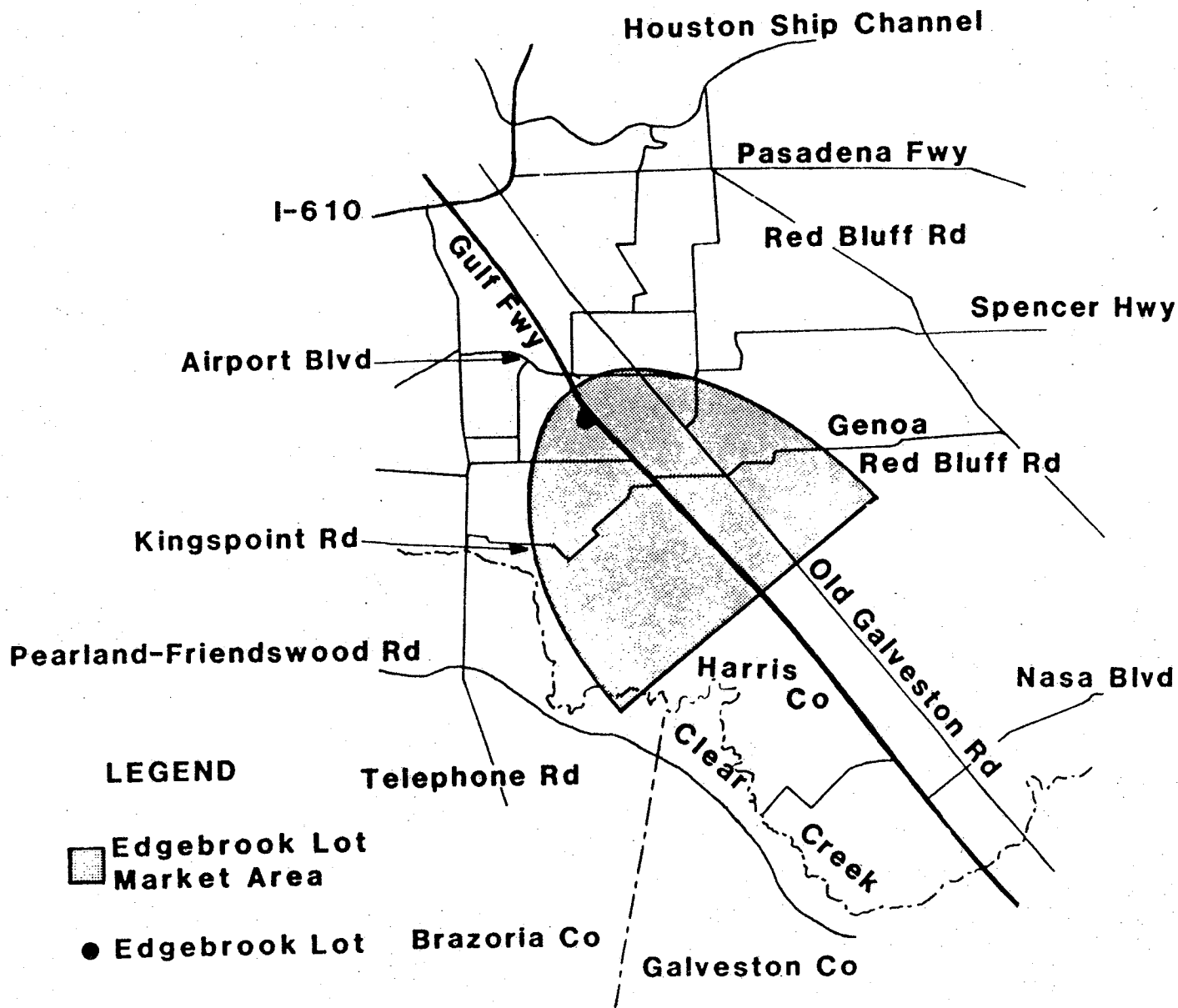
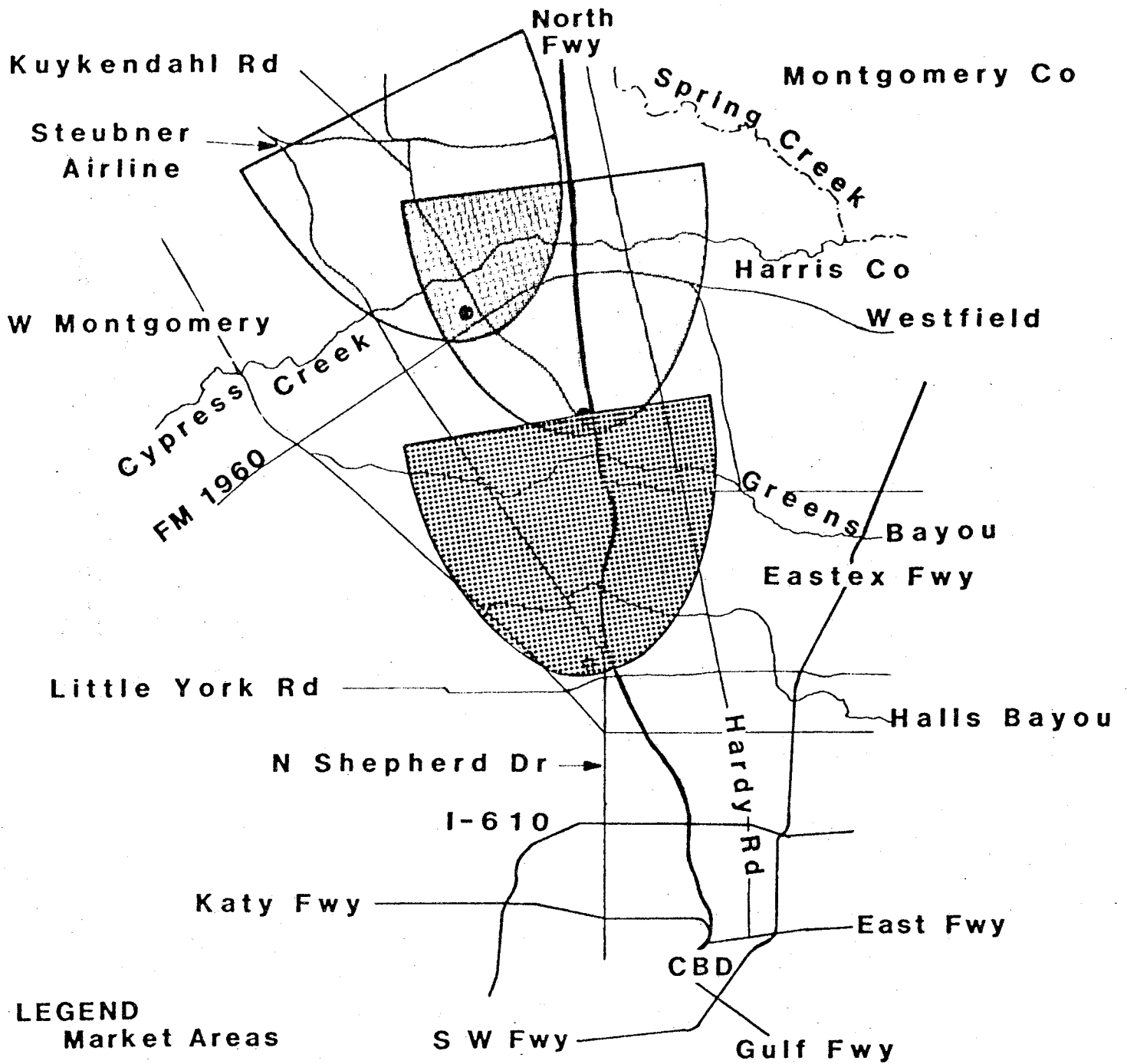


FIGURE 3

Edgebrook Lot Market Area



LEGEND

Market Areas

North Shepherd

Kuykendahl

Champions

• Park-and-Ride Lot

FIGURE 4

North Freeway Park-and-Ride Lot Market Areas,
Champions, Kuykendahl, and North Shepherd

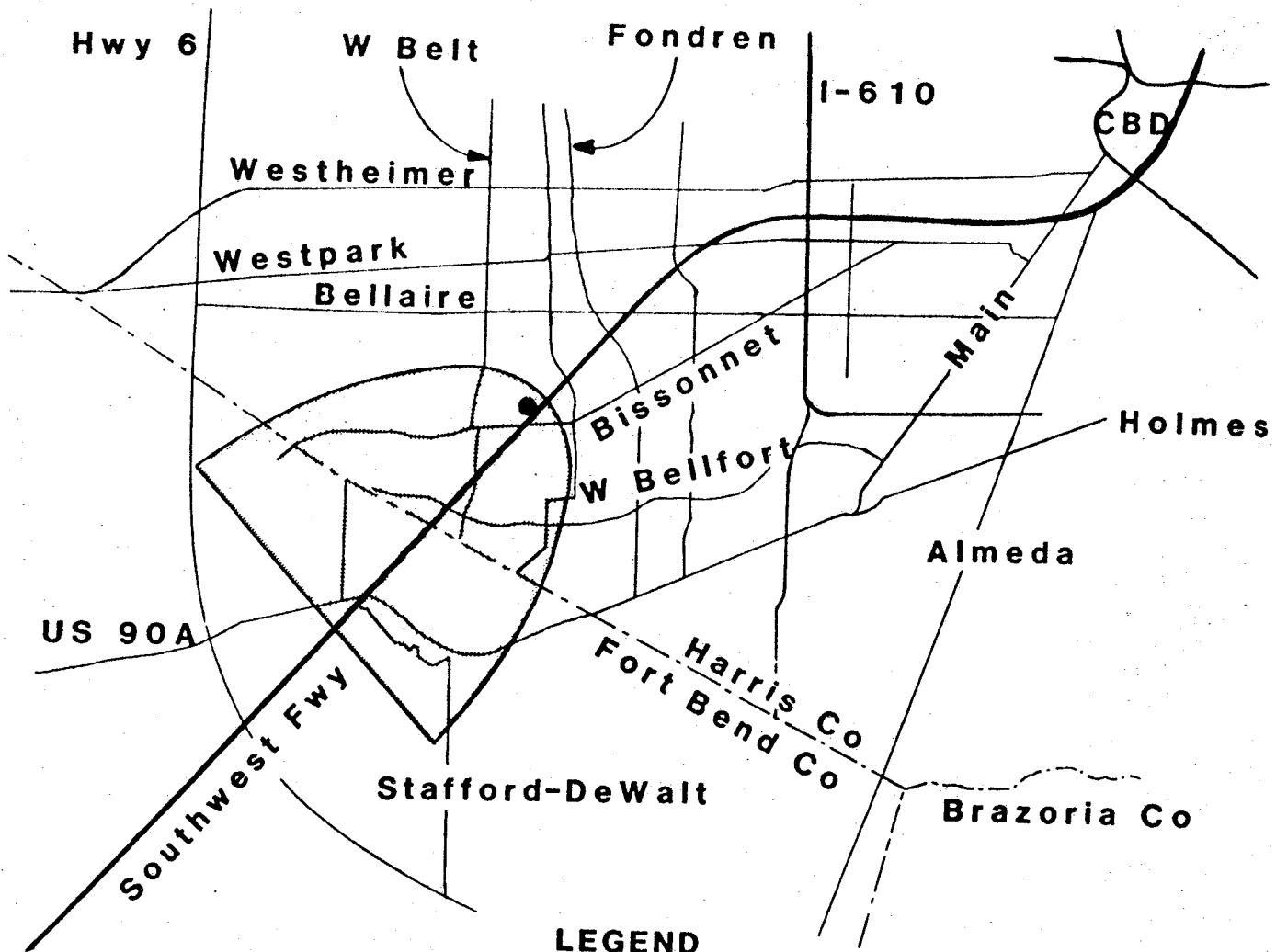


FIGURE 5
Westwood Park-and-Ride Lot Market Area

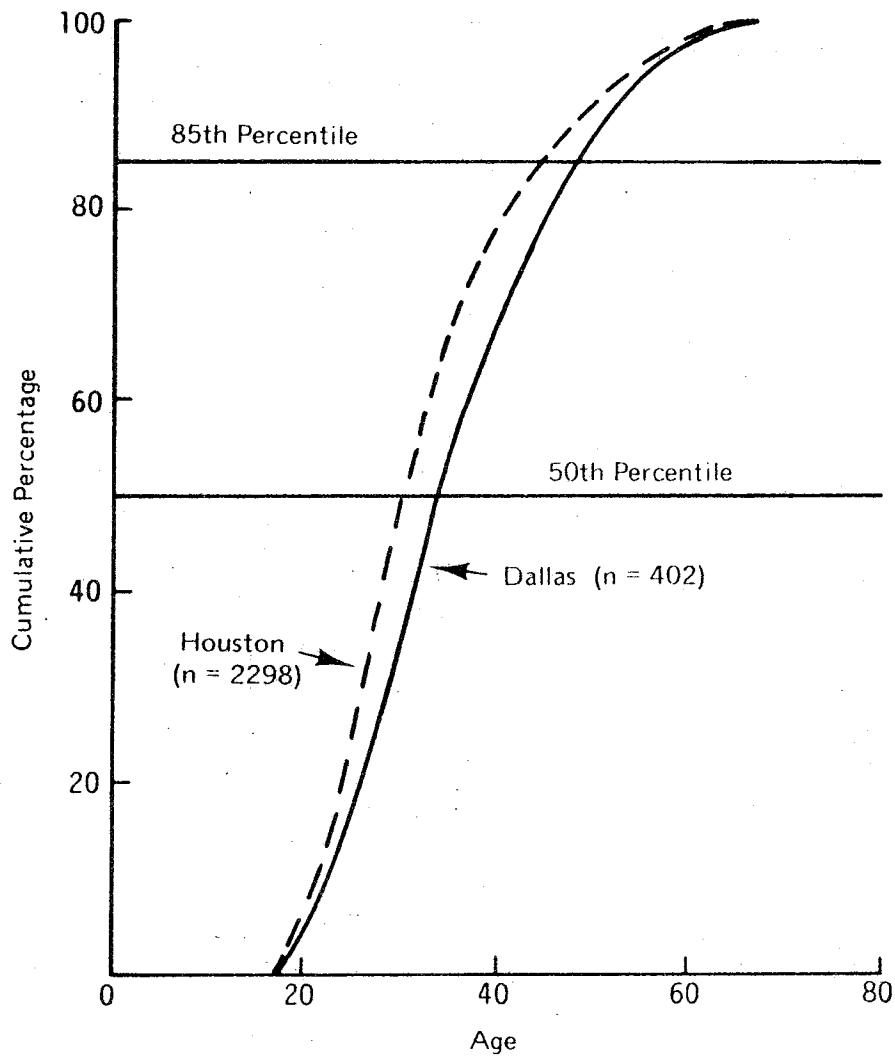


FIGURE 6
Age of Park-and-Ride Users, Cumulative Frequency Distribution

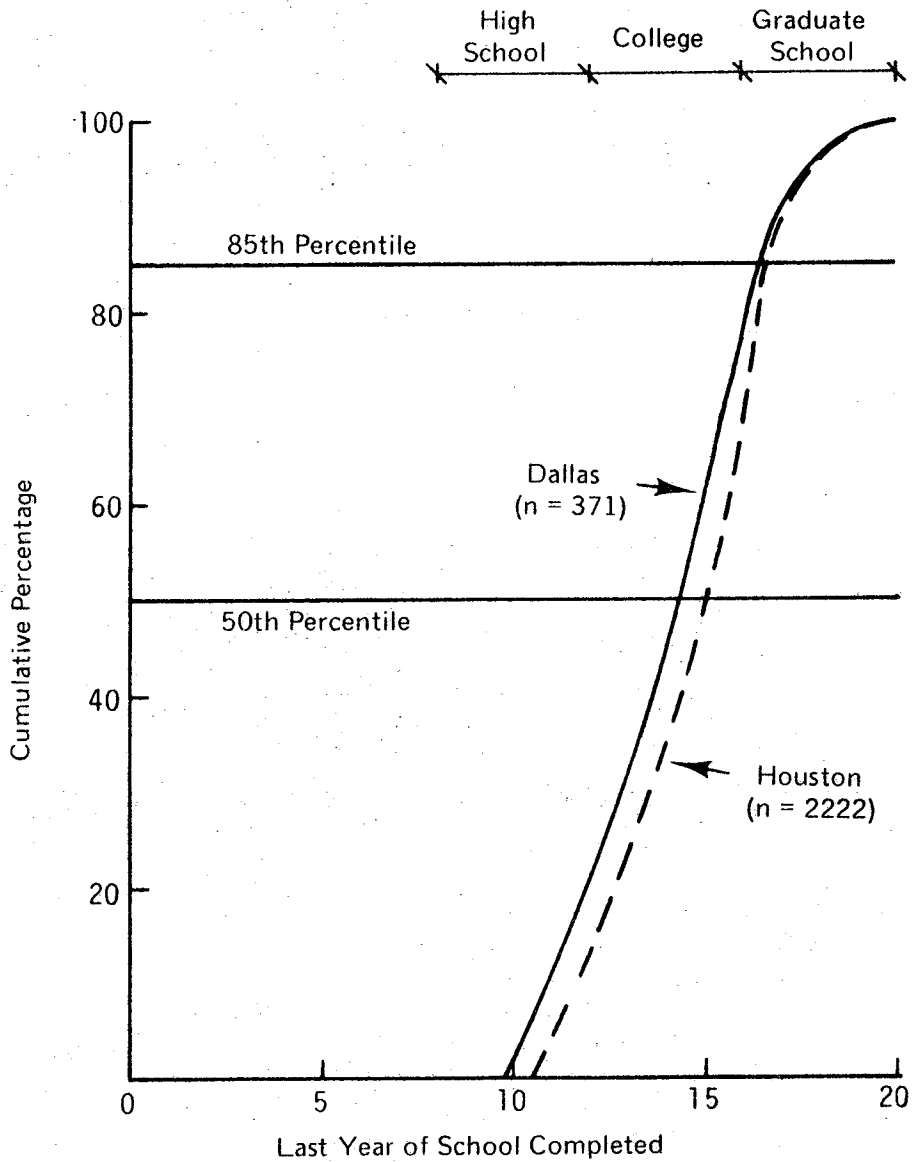


FIGURE 7

Education Level of Park-and-Ride Users,
Cumulative Frequency Distribution

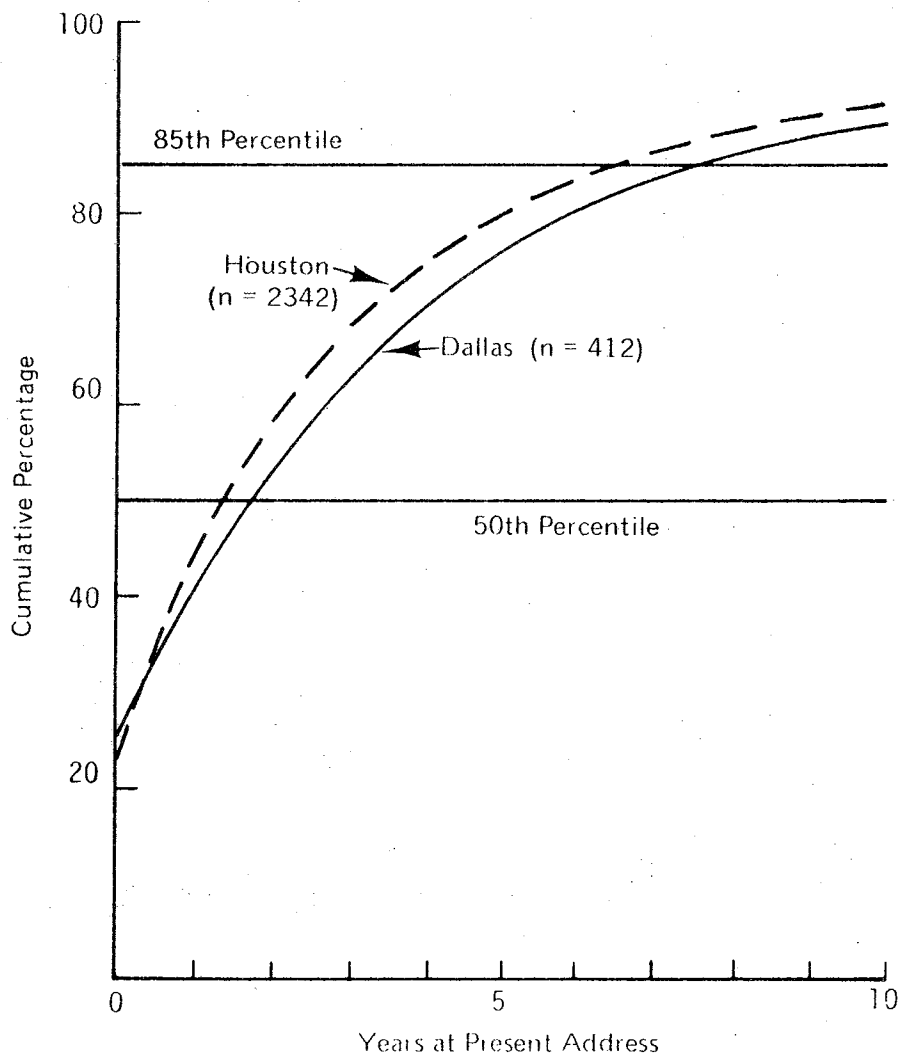


FIGURE 8

**Years at Present Address for Park-and-Ride Users,
Dallas/Garland and Houston**

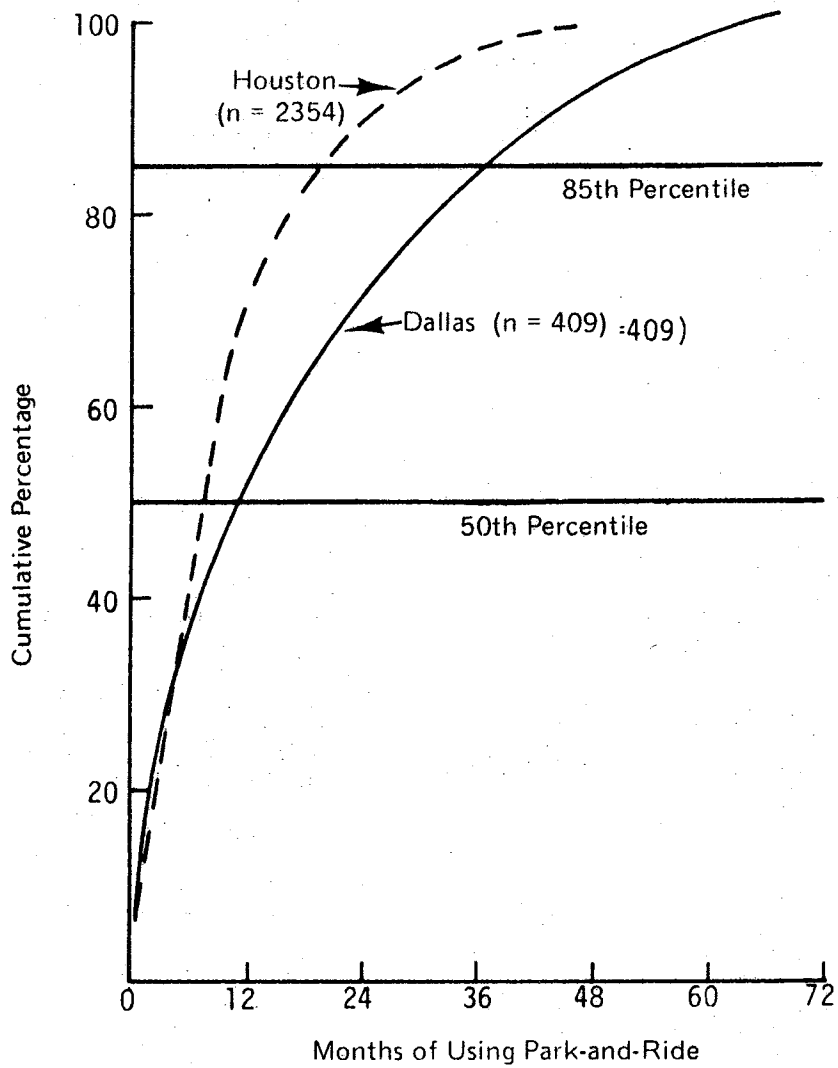


FIGURE 9

**Length of Utilization of Park-and-Ride Service,
Dallas/Garland and Houston**

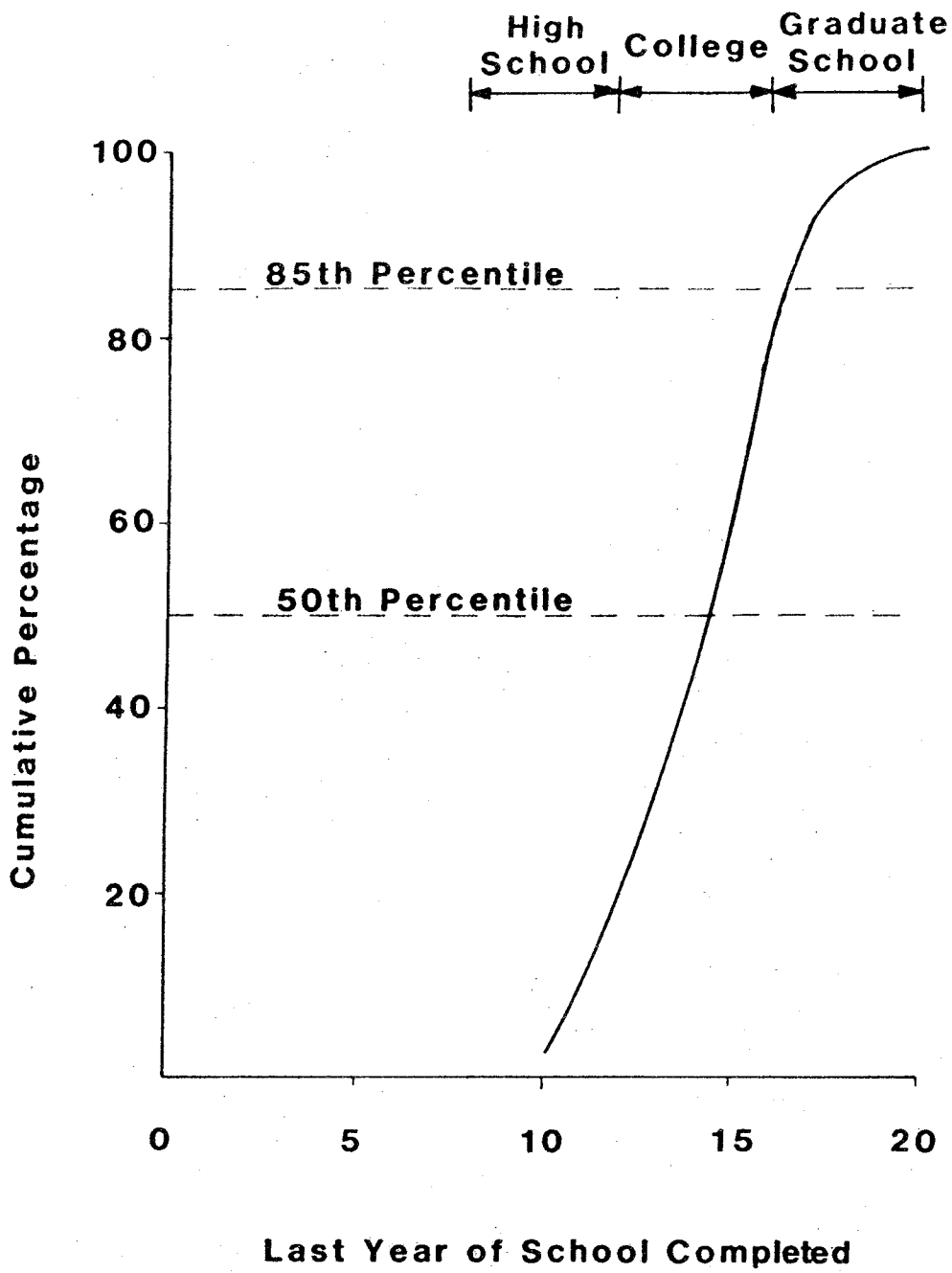


FIGURE 10

Education Level of Non-Park-and-Ride Users, Dallas and Houston

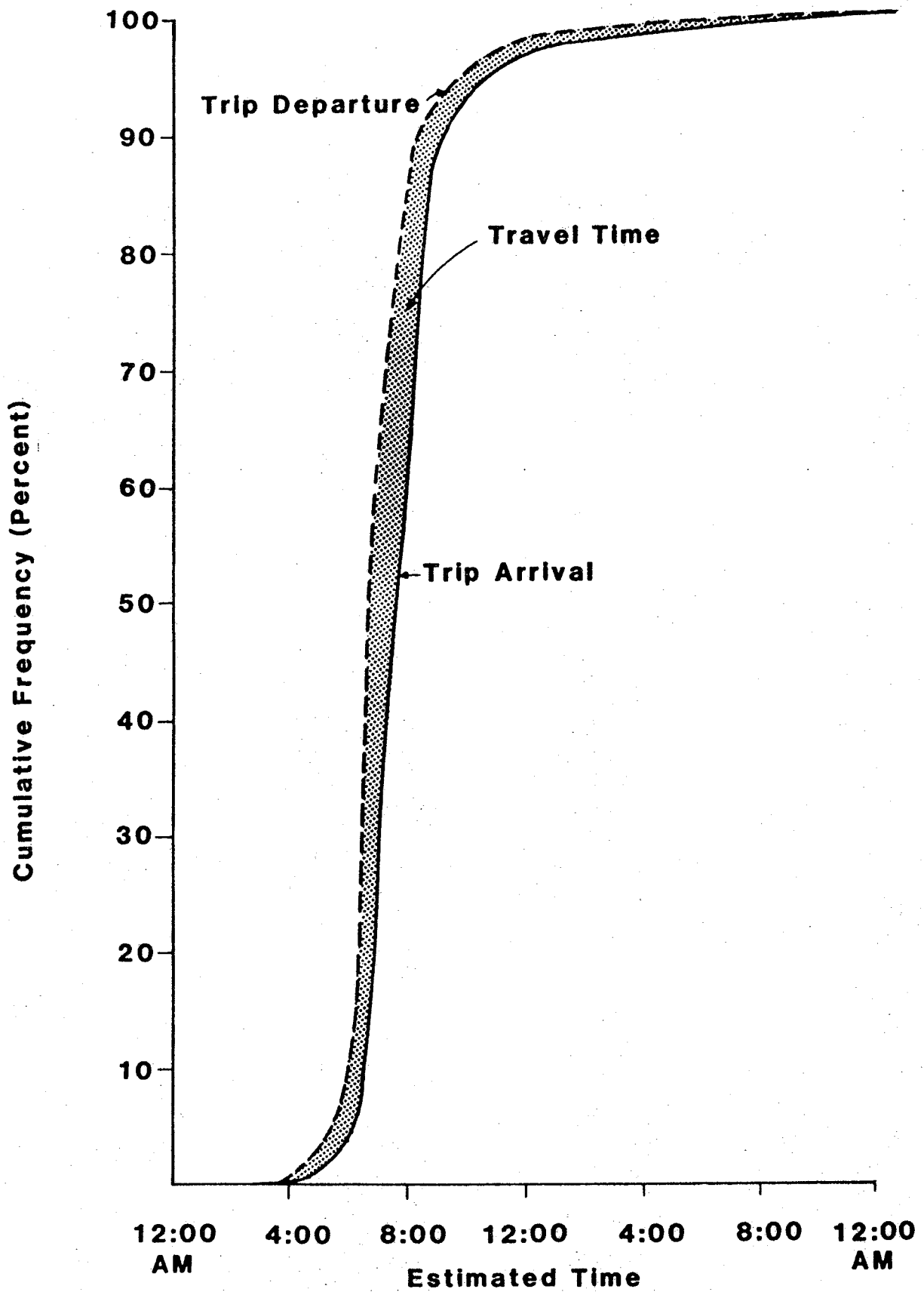


FIGURE 11

Estimated Time of Departure and Arrival for Work and School Trips, Houston

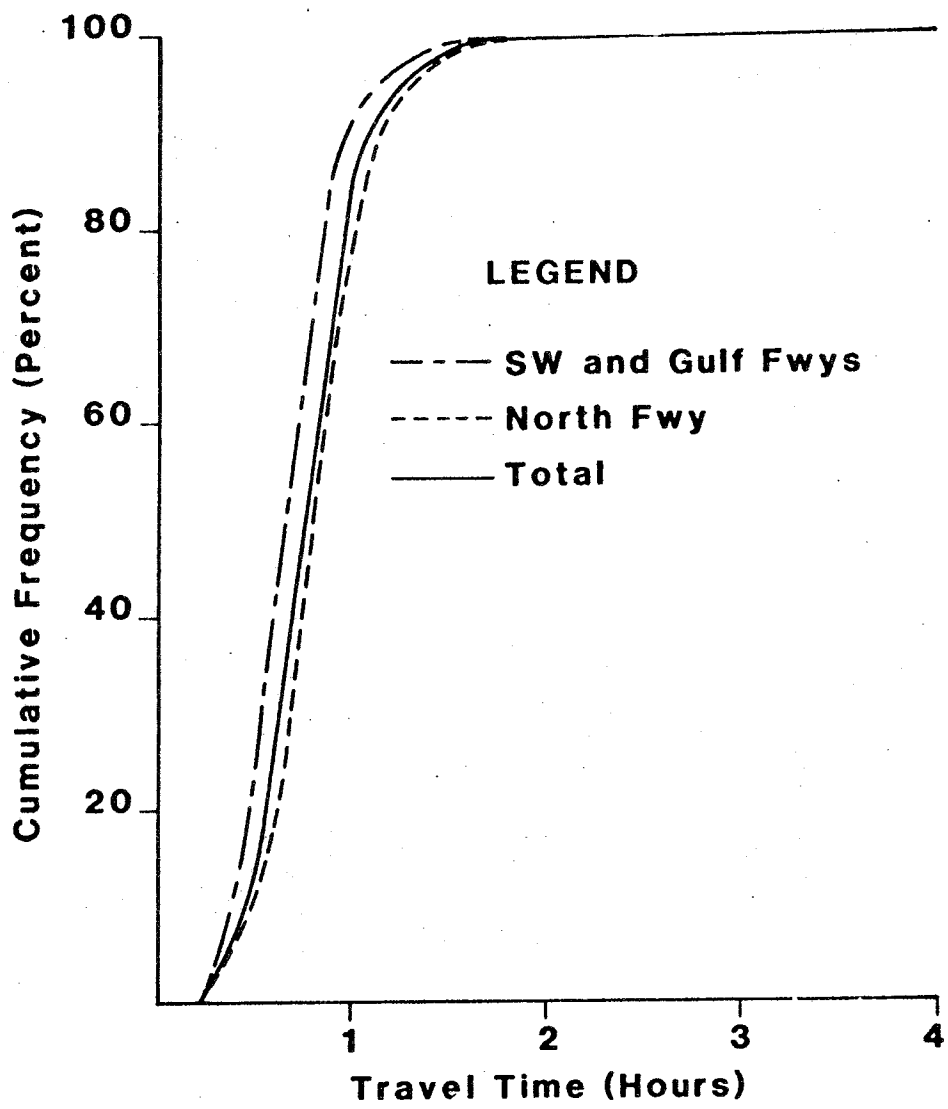


FIGURE 12

Travel Time to Work or School, All Study Corridors, Houston

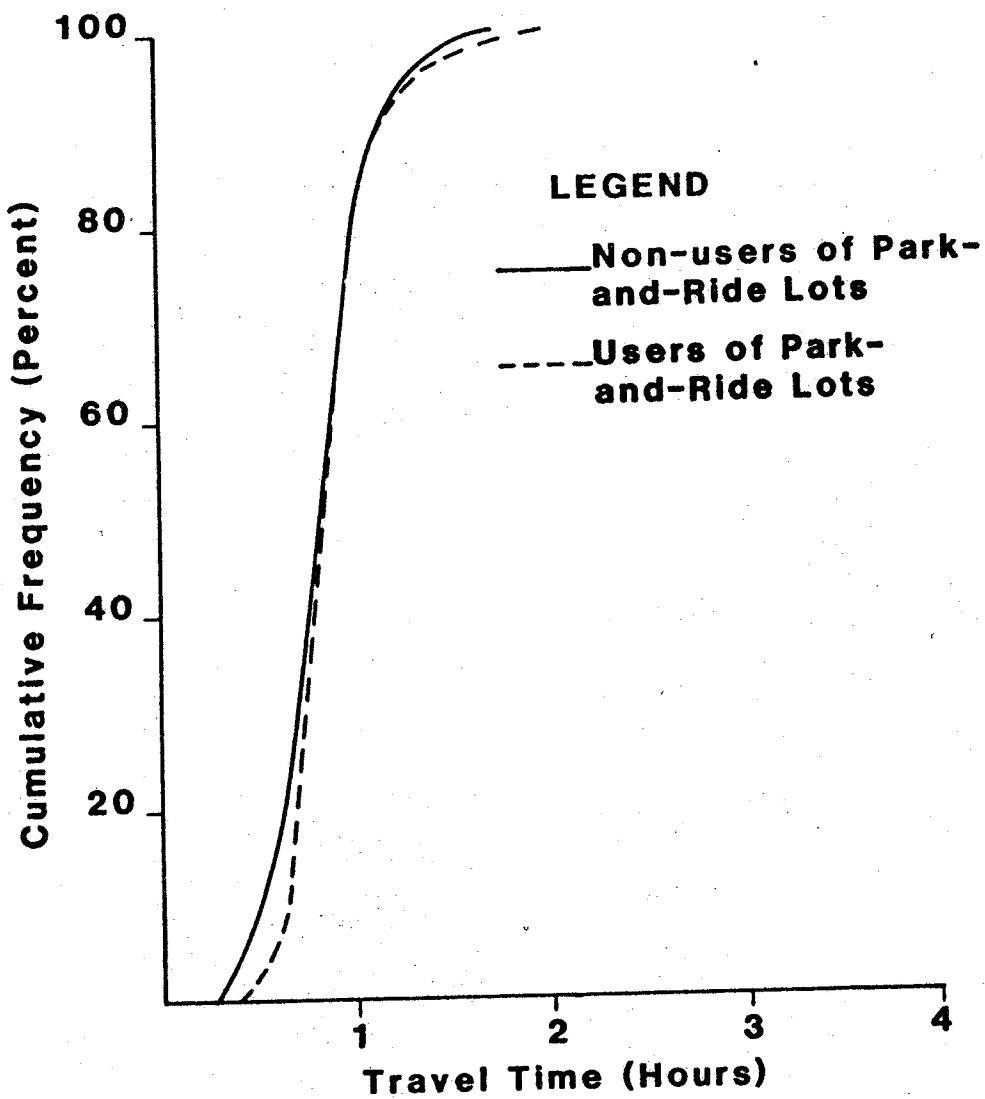
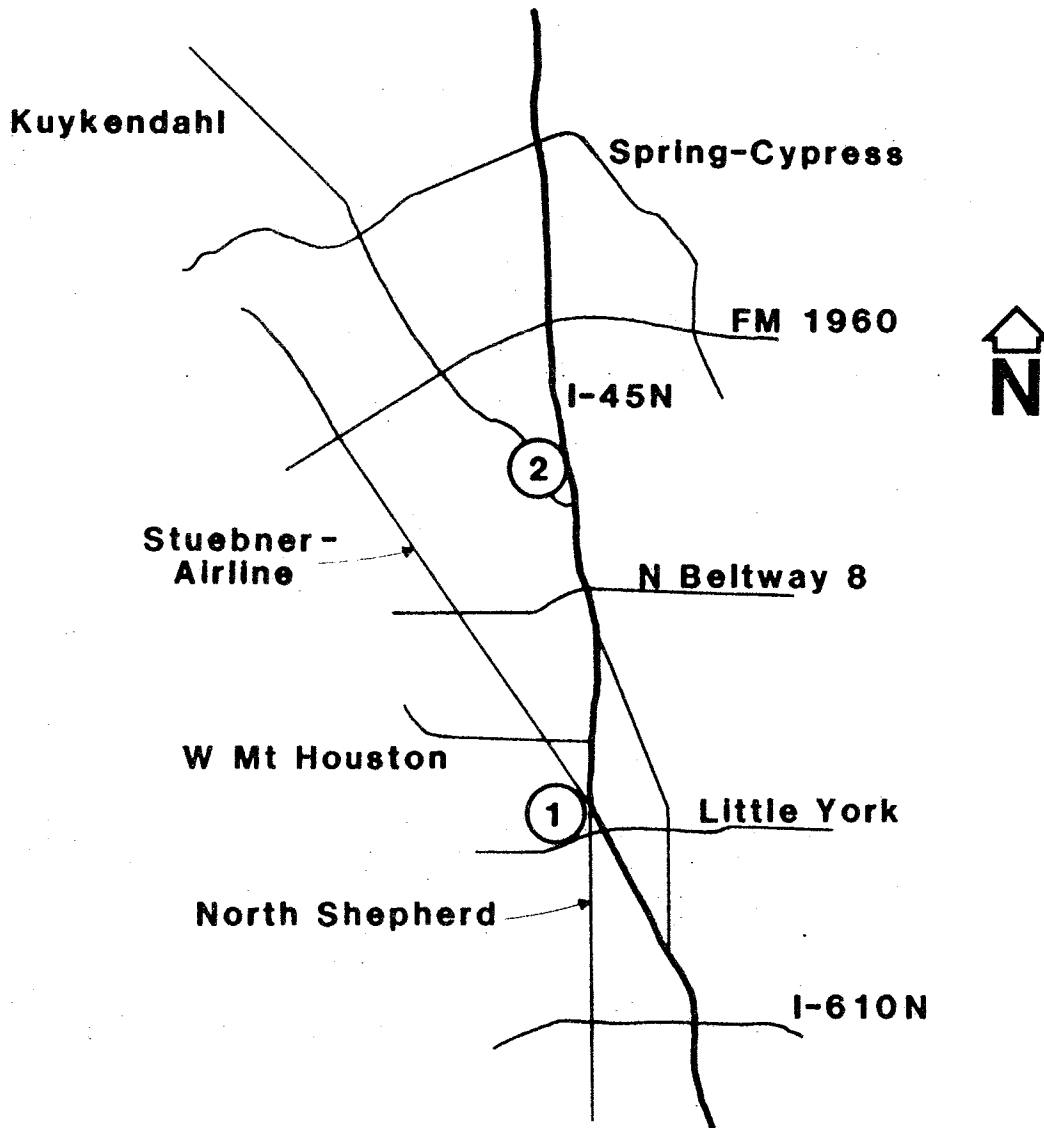


FIGURE 13

Travel Time to Work of School, North Freeway Corridor, Users and Non-Users



① North Shepherd Lot

② Kuykendahl Lot

FIGURE 14

Location of Park-and-Ride Lots Surveyed in the North Freeway Corridor

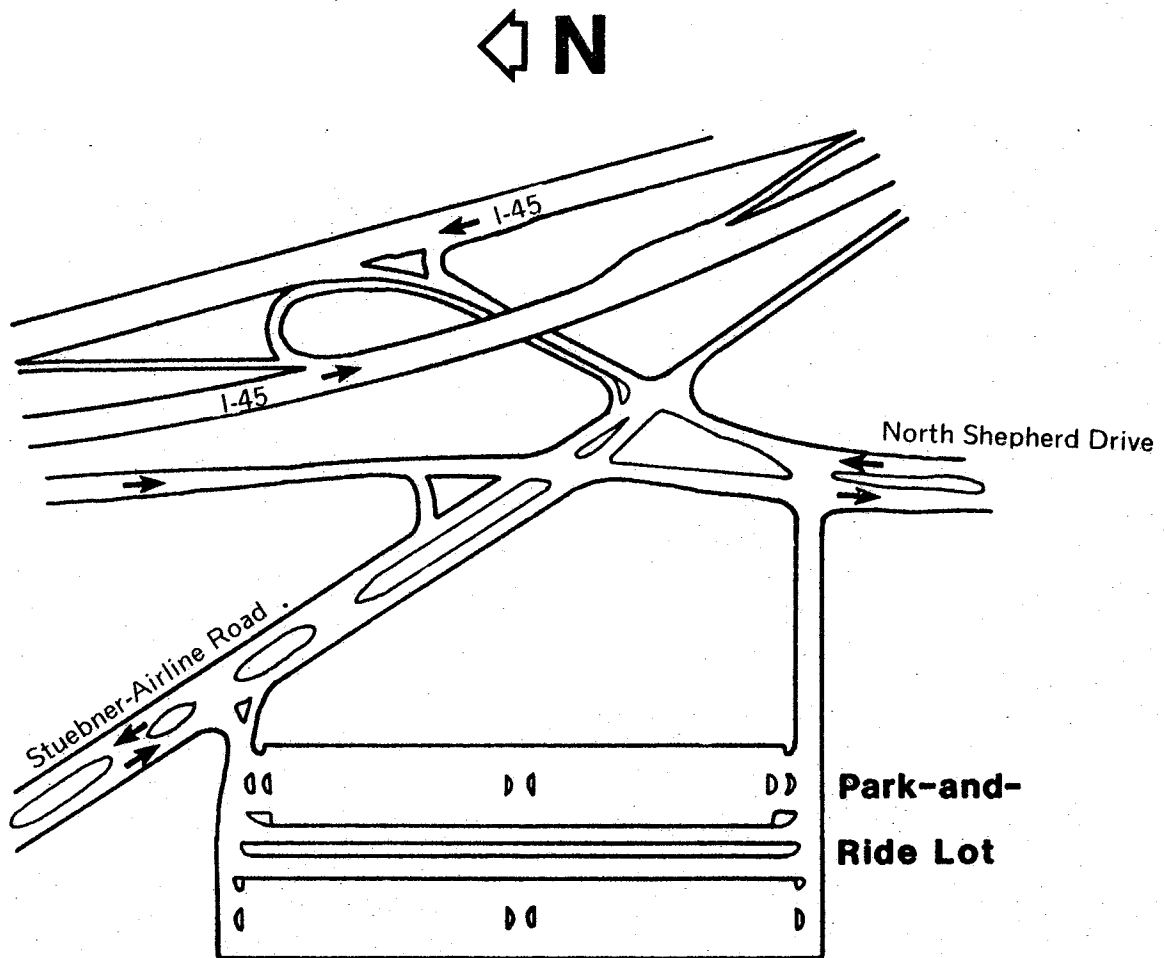
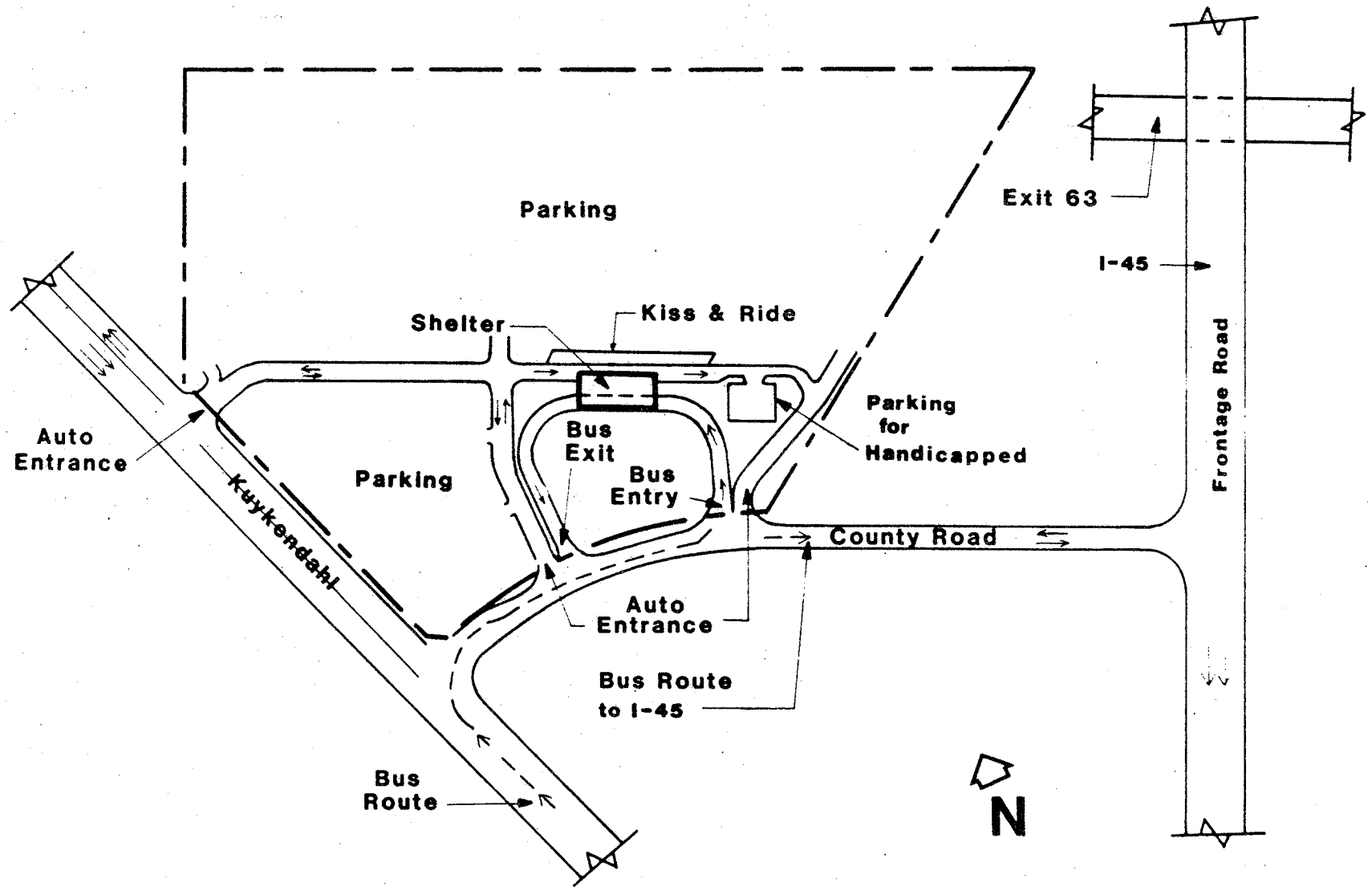


FIGURE 15

Layout of North Shepherd Park-and-Ride Lot



50

FIGURE 16

Layout of Kuykendahl Park-and-Ride Lot

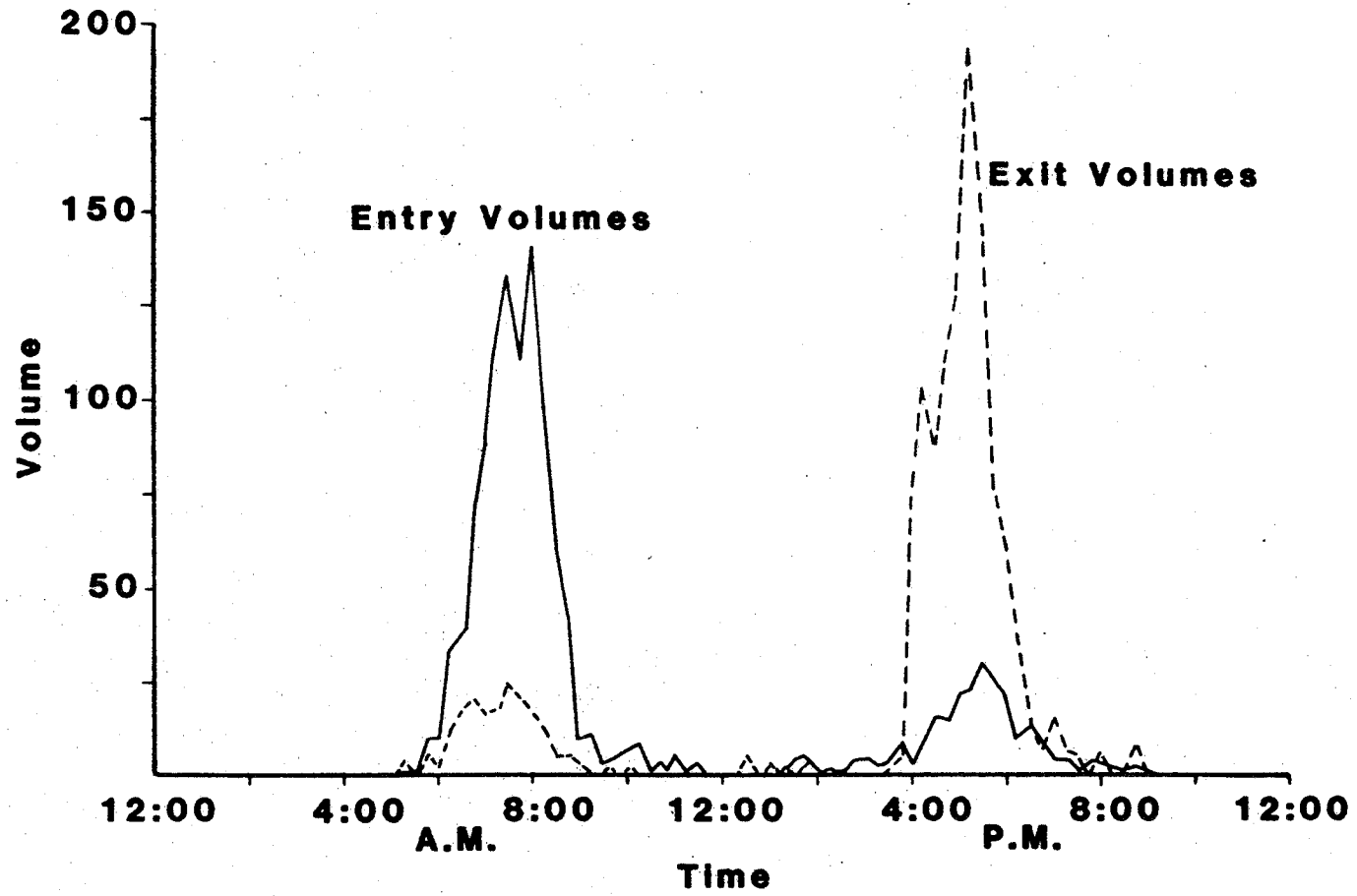


FIGURE 17

Vehicle Arrival and Departure Patterns, North Shepherd Lot

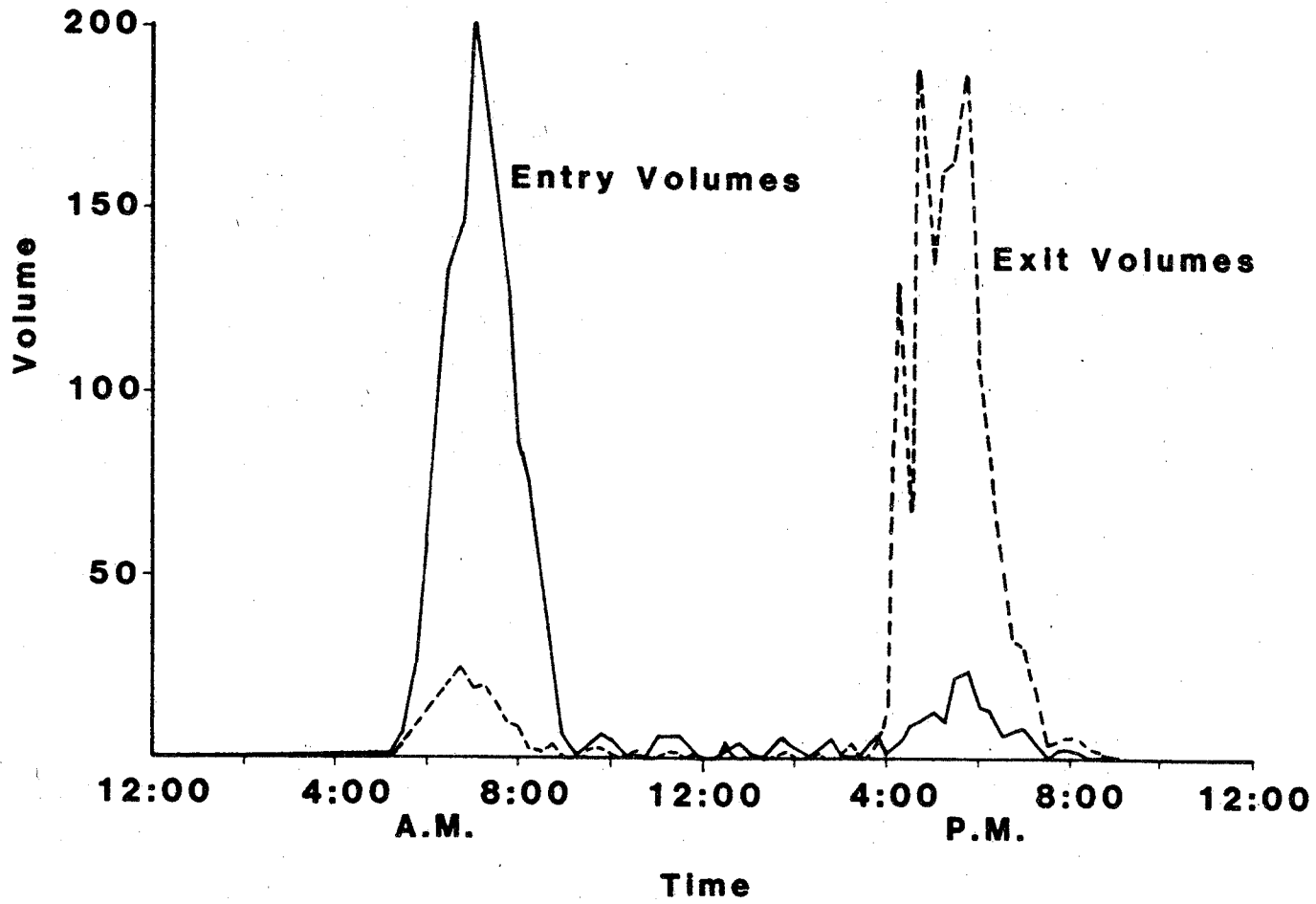


FIGURE 18

Vehicle Arrival and Departure Patterns, Kuykendahl Lot

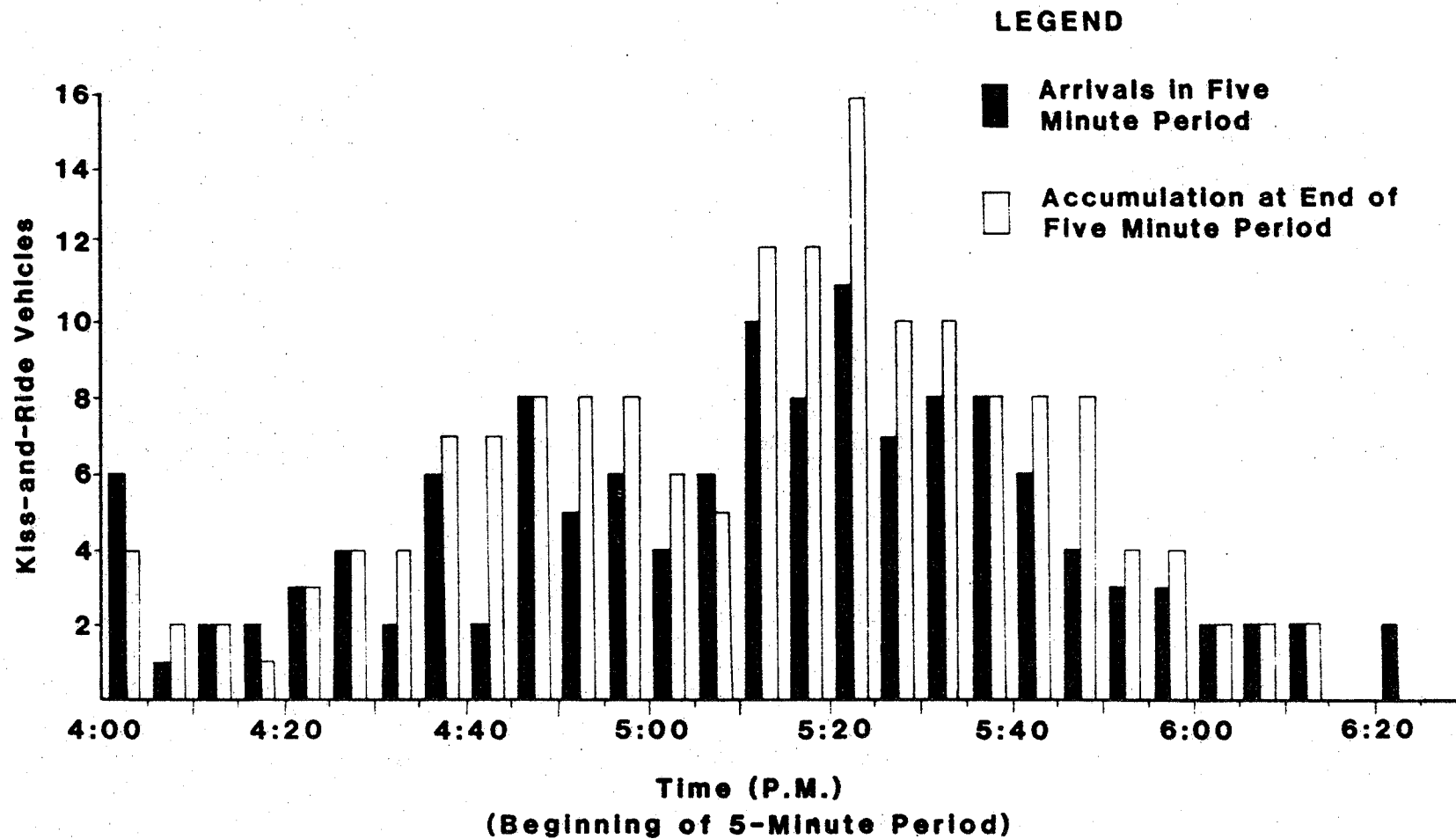


FIGURE 19

Kiss-and-Ride Vehicle Arrival and Departure Patterns, North Shepherd Lot

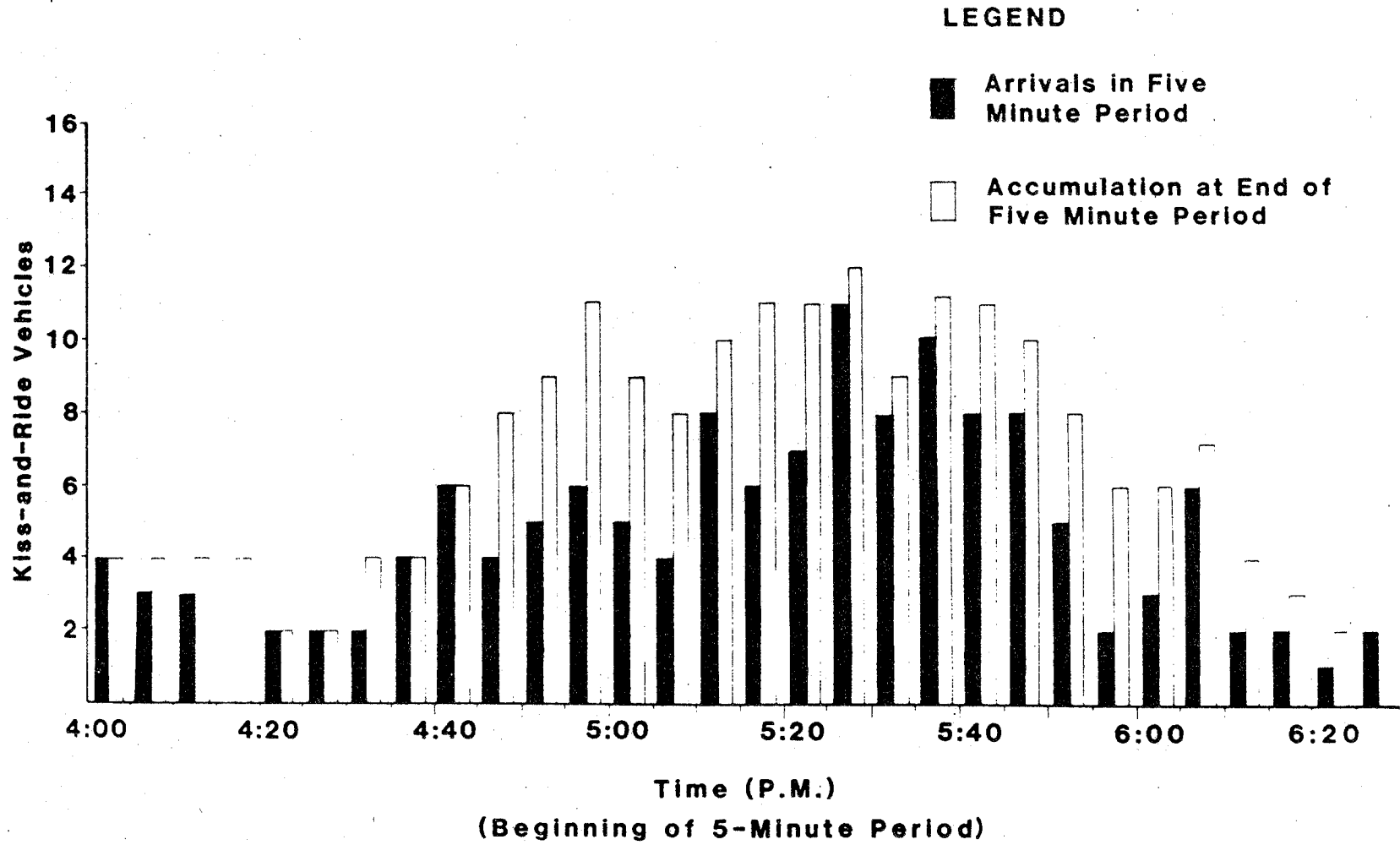


FIGURE 20

Kiss-and-Ride Vehicle Arrival and Departure Patterns, Kuykendahl Lot

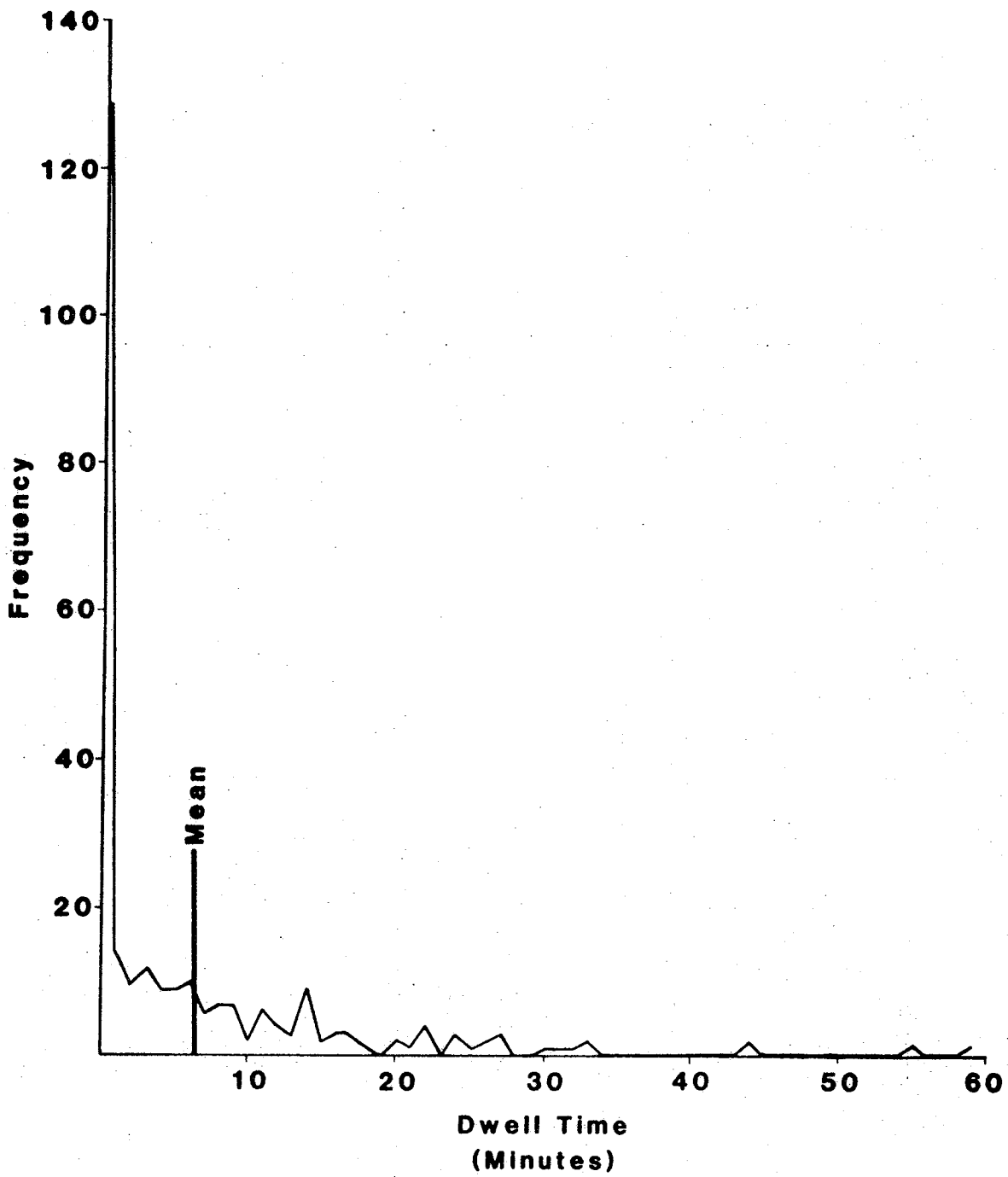


FIGURE 21

Distribution of Kiss-and-Ride Dwell Times, North Shepherd Lot

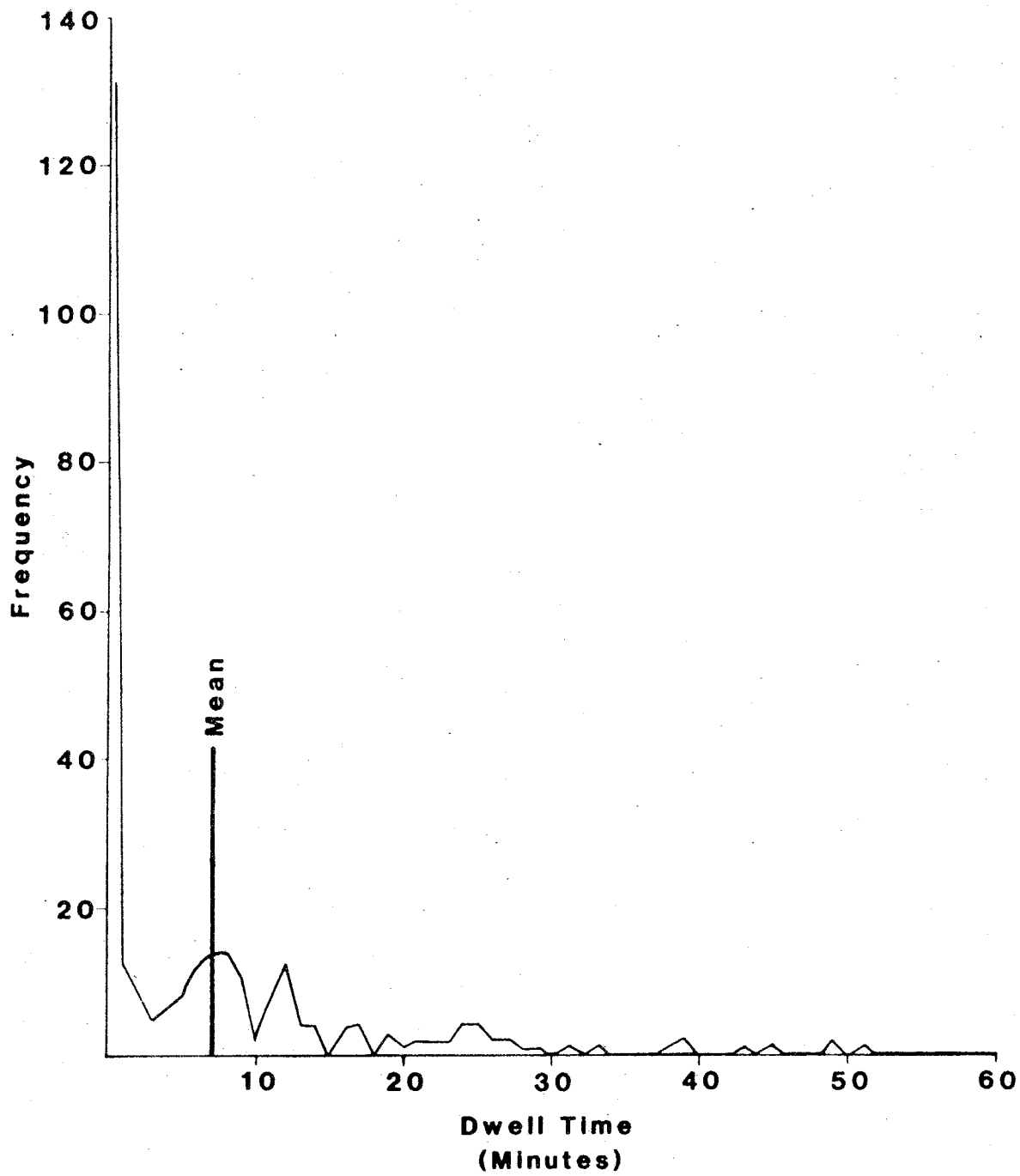


FIGURE 22

Distribution of Kiss-and-Ride Dwell Times, Kuykendahl Lot

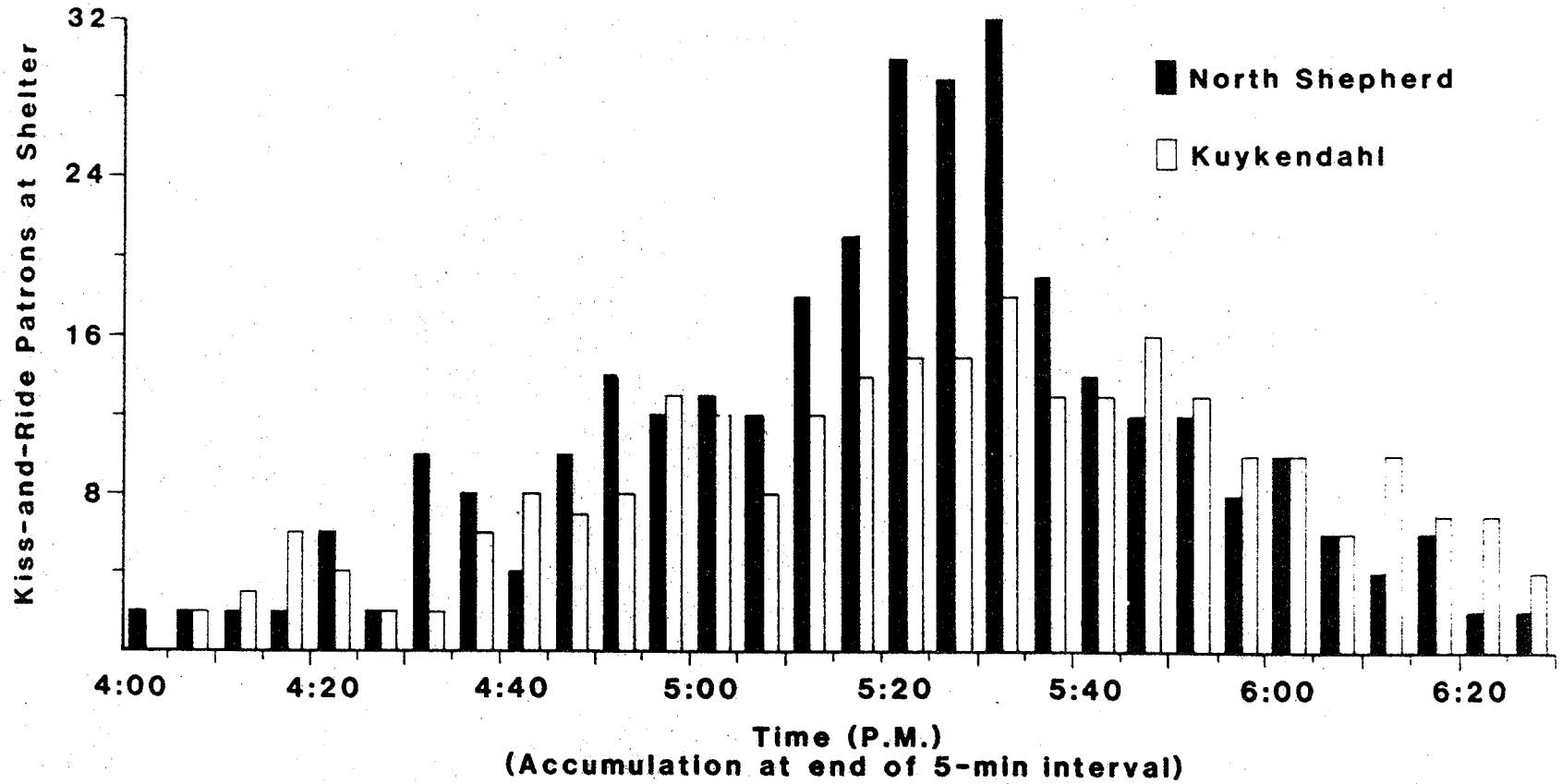


FIGURE 23

Number of Kiss-and-Ride Patrons Waiting at Shelter
for a Ride, Afternoon Peak Period

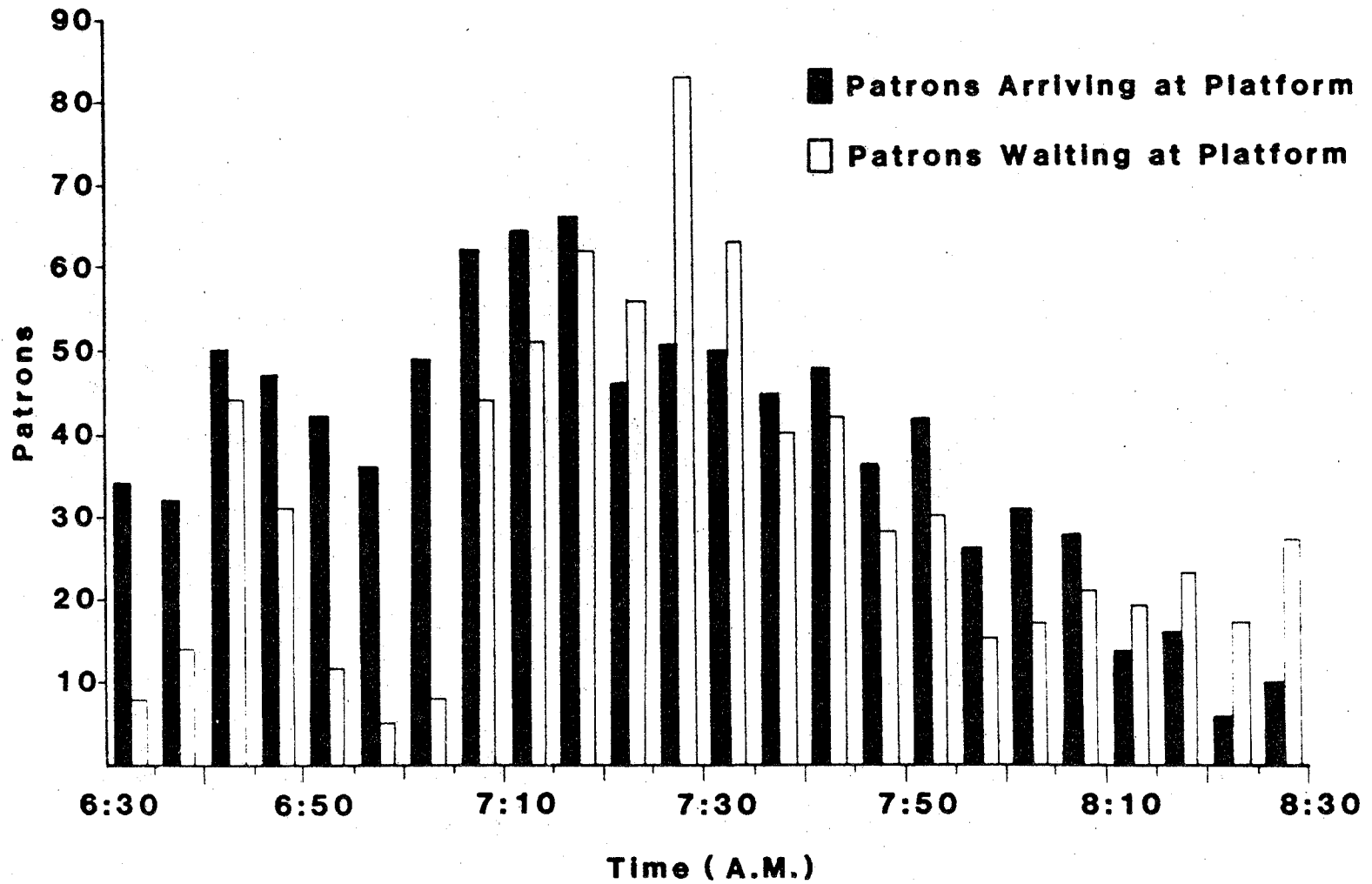


FIGURE 24

Patron Arrival and Accumulation at the Shelter, North Shepherd Lot

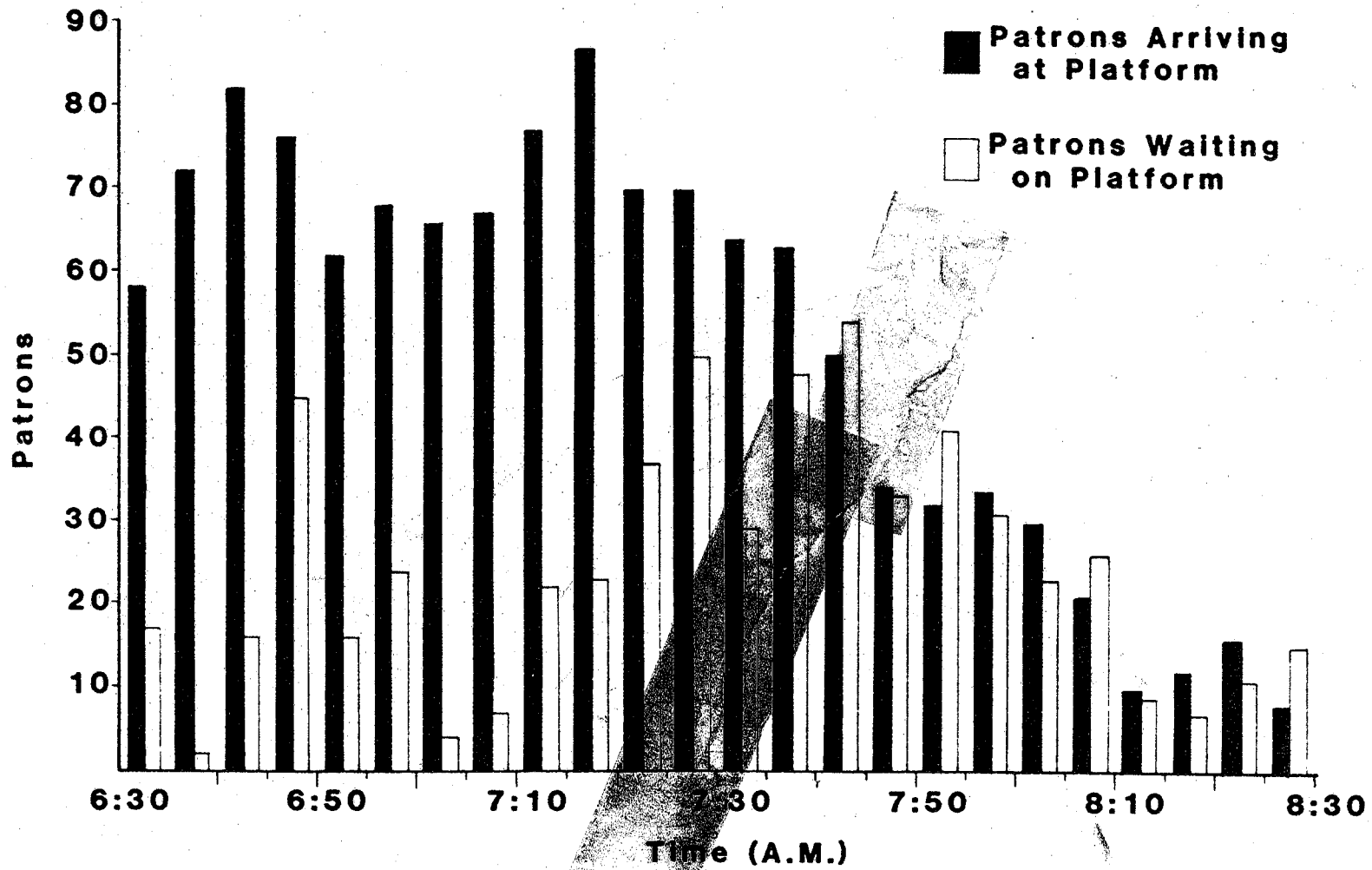


FIGURE 25

Patron Arrival and Accumulation at the Shelter, Kuykendahl Lot

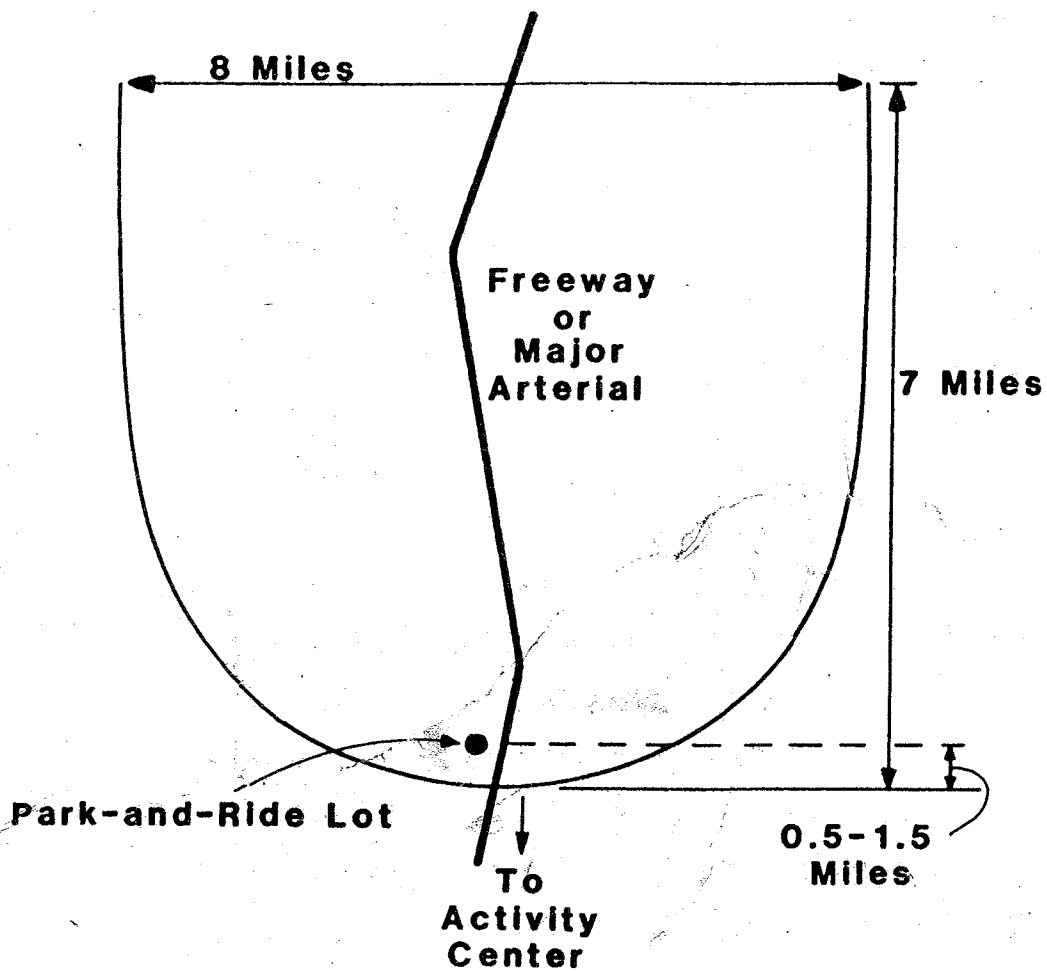


FIGURE 26

General Shape of "Typical" Park-and-Ride Market Area
for Houston Lots

Gulf Freeway Park-and-Ride Lots

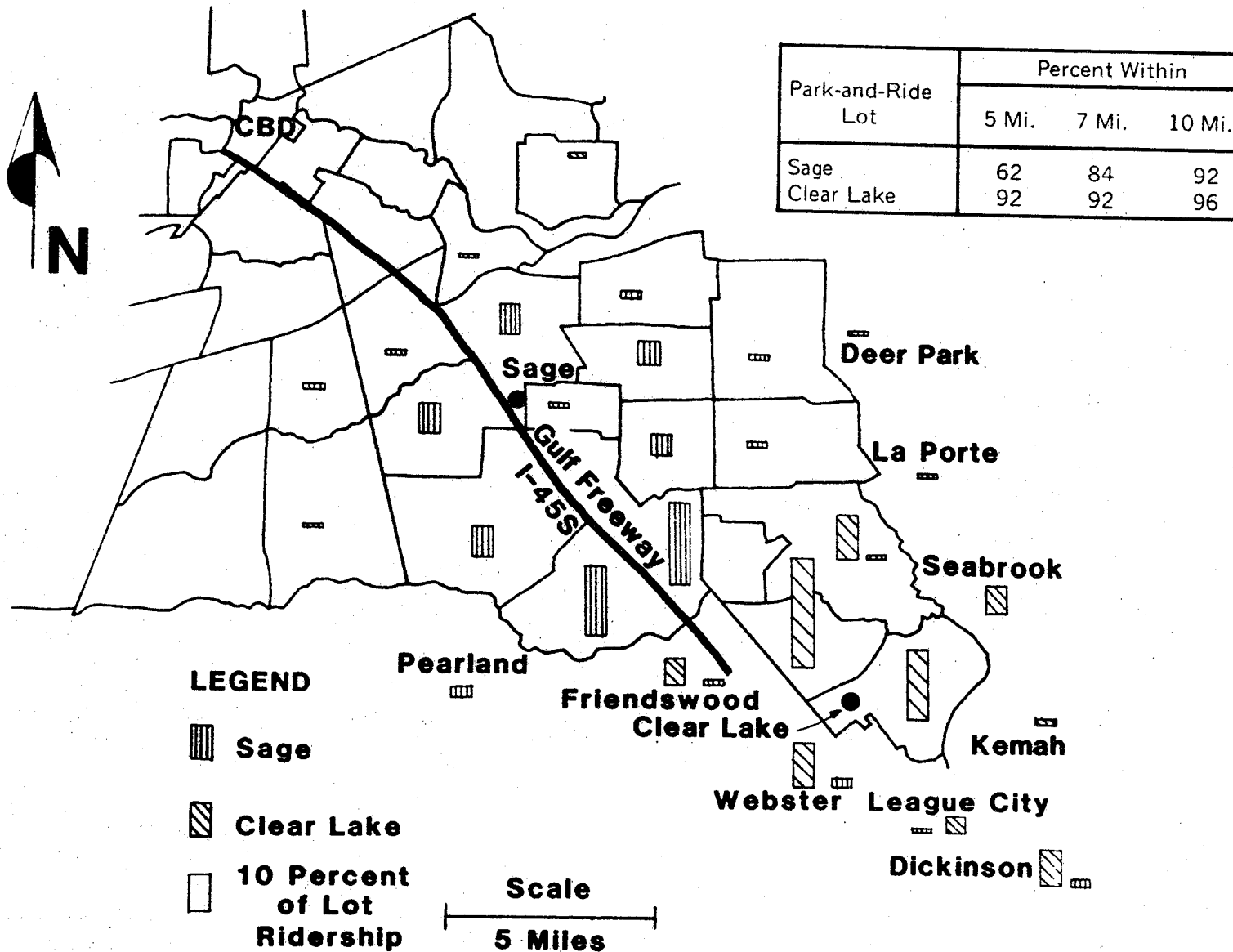


FIGURE 28

Gulf Freeway Corridor, Park-and-Ride Lot Market Characteristics

North Freeway Park-and-Ride Lots

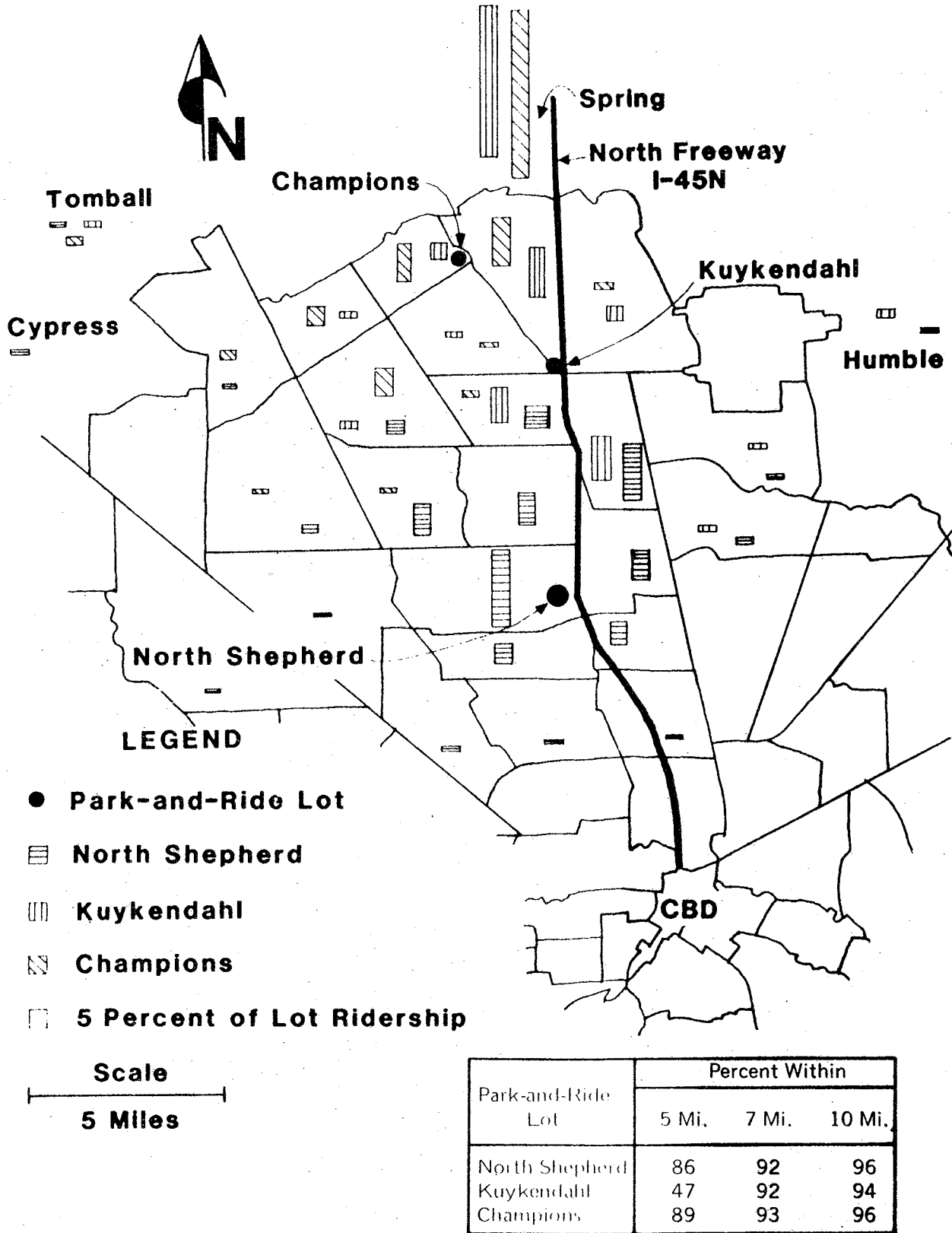


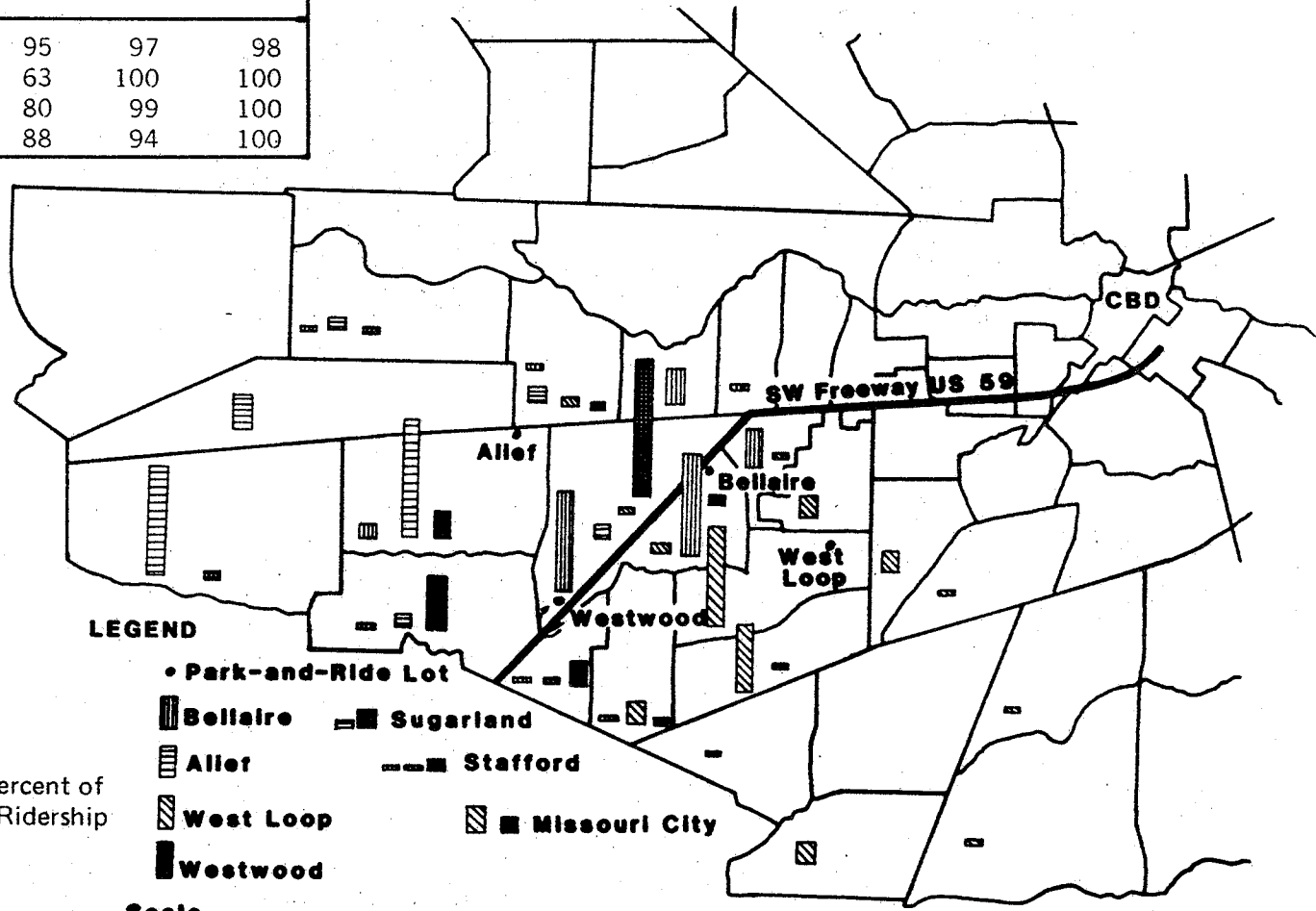
FIGURE 27

North Freeway Corridor, Park-and-Ride Lot Market Characteristics

Southwest Freeway Park-and-Ride Lots

Park-and-Ride Lot	Percent Within		
	5 Mi.	7 Mi.	10 Mi.
Bellaire	95	97	98
Westwood	63	100	100
West Loop	80	99	100
Alief	88	94	100

63



LEGEND

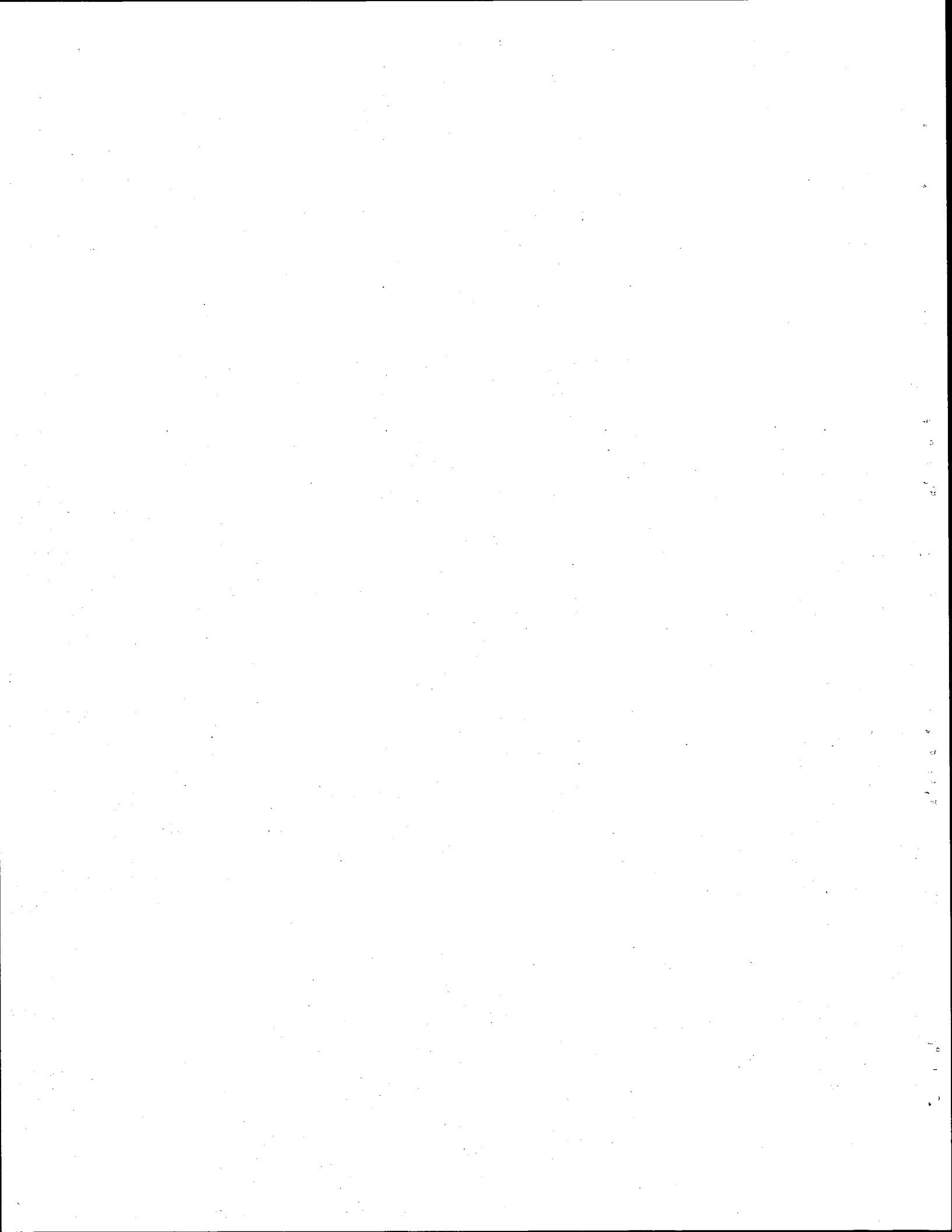
- Park-and-Ride Lot
- ▨ Bellaire
- ▧ Alief
- ▩ West Loop
- ▬ Westwood
- ▩ Sugarland
- ▨ Stafford
- ▧ Missouri City

▭ 10 Percent of Lot Ridership

Scale
5 Miles

FIGURE 29

Southwest Freeway Corridor, Park-and-Ride Lot Market Characteristics



APPENDIX A
SURVEY INSTRUMENTS

Survey instruments were used for both the on-board and the home mail-out surveys. While there were slight differences in survey forms between different lots and market areas, the survey instruments used were all generally similar. Representative user and non-user surveys are included in the Appendix.

(Example On-Board Survey)

A number of different factors can be important in causing people to use Park & Ride service. Please answer by circling the number which best explains how important the following features are to you in your decision to use Park & Ride.

In your decision to use Park & Ride, how important is . . .	Not Important	Neutral	Very Important
Cost of Park & Ride relative to auto travel cost	1	2	3 4 5
Not having to drive in heavy traffic congestion	1	2	3 4 5
The rising cost of gasoline and automobile maintenance	1	2	3 4 5
The rising cost of parking at your place of work	1	2	3 4 5
Avoiding the stress associated with driving to and from work	1	2	3 4 5
The bus travel time relative to auto travel time	1	2	3 4 5
A reliable bus schedule	1	2	3 4 5
Having non-stop bus service to your destination	1	2	3 4 5
Frequent bus service during peak periods	1	2	3 4 5
Bus service being available during off-peak periods	1	2	3 4 5
A bus stop close to your place of work	1	2	3 4 5
Riding in a new, modern bus	1	2	3 4 5
Riding in a safe bus	1	2	3 4 5
Always having a seat on the bus	1	2	3 4 5
Having a Park & Ride lot close to your home	1	2	3 4 5
Convenient access to the Park & Ride lot	1	2	3 4 5
Security at the Park & Ride lot	1	2	3 4 5
Being able to park your car close to the bus loading point	1	2	3 4 5

14. What is your age? _____ 15. What is your sex? _____ Male _____ Female
16. What is your current occupation, in as specific terms as possible. (Specify if retired, unemployed, student, or housewife.) _____
17. What is the highest level of school you have completed? _____
18. In what city do you live? _____
19. What is the zip code of your home address? _____
20. How long have you lived at your present address? _____ Years
21. If you have lived at your present address less than 2 years, in what city and state was your previous address? City _____ State _____

COMMENTS

(Example Home Mail-Out Survey)



COMMISSION

A. SAM WALDROP, CHAIRMAN
DEWITT C. GREER
RAY A. BARNHART

STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

AUSTIN, TEXAS 78763

ENGINEER-DIRECTOR
M. G. GOODE

Cooperating Agencies:

Metropolitan Transit Authority
Federal Highway Administration

IN REPLY REFER TO
FILE NO.

Dear Resident:

A limited number of households in your area are being asked to participate in a study undertaken by the Texas Transportation Institute, Texas A&M University System. The purpose of this study is to obtain information about your household's use of the Gulf Freeway traffic corridor for work or school trips.

Since we have included only a small number of households in this survey, your participation is essential to insure the success of the project. We wish to thank you for your cooperation in this undertaking. It will be appreciated if you will answer the following question:

Do you, or any other household members, work or attend school in downtown Houston, The University of Houston, Texas Southern University, Texas Medical Center/Rice, Greenway Plaza, or the Galleria/Post Oak Area? Yes No

If "NO", please return this letter and the attached survey in the enclosed, postage-paid envelope.

If "YES", please have a household member who works or attends school in one of the activity centers listed above complete the attached survey form.

We are grateful for your participation in this study. Please complete the requested information and return it in the enclosed envelope at your earliest convenience. Your participation will assist in the design and implementation of various transportation improvements in the vicinity of the Gulf Freeway.

Sincerely,

Phillip L. Wilson
State Planning Engineer, Transportation

PARK & RIDE HOUSEHOLD SURVEY

Undertaken by the Texas Transportation Institute, Texas A&M University
in cooperation with the Texas State Department of Highways and Public Transportation
and the U.S. Department of Transportation, Federal Highway Administration

This questionnaire is designed to be easy to complete and should take no more than 5-10 minutes of your time. All answers will remain confidential. Please return this form in the enclosed postage paid envelope at your earliest convenience.

1. At which location do you work or attend school?

Downtown Houston University of Houston Texas Southern University
 Greenway Plaza Texas Medical Center/Rice Galleria/Post Oak Area

2. How many days per week do you travel to this location? _____

3. How many others in your household work/or attend school at one of these locations? _____

3a. At which locations do they work or attend school? _____

4. What time do you leave your house for work or school? _____

5. What time do you arrive at work or school? _____

6. If you use the Gulf Freeway for your trip, where do you enter the freeway?

Choate Rd., FM 1959 South Belt
 Scarsdale Blvd., FM 2553 Monroe (SH 3)
 Fuqua Bellfort (Howard)
 Alameda-Genoa (S. Shaver) Broadway (Park Place)
 Edgebrook Dr. (Clearwood) Other, specify _____
 Airport Blvd. (College)

7. How do you travel to your work or school location? Drive Alone Carpool
 Vanpool METRO Local Bus Park & Ride Bus Other

8. How often do you ride a METRO bus?

Almost Every Day About Once a Week Seldom Never

9. Have you ever used METRO Park & Ride service? Yes No

10. Do you know the location of the Park & Ride lot nearest your home?

Yes No Not Sure

11. Do you know enough about the Park & Ride service provided by METRO to "confidently" start using it tomorrow? Yes No Not Sure

12. Do you need to have your car available during the day?

Almost every day About once a week Seldom Never

13. How many years have you lived at your present address? _____

13a. If less than 2 years, in what city and state did you previously live?

CITY _____ STATE _____

(Example Home Mail-Out Survey)

14. The following is a list of possible improvements which could be made to Park & Ride service. Please circle the number which best explains how likely you would be to use Park & Ride if the particular improvement were made.

HOW LIKELY WOULD YOU BE TO USE PARK & Ride

	Very Unlikely				No Difference
If the buses arrived and departed at the scheduled time	1	2	3	4	4
If you didn't have to wait more than 5 minutes for a bus	1	2	3	4	4
If the Park & Ride lot was closer to your home	1	2	3	4	4
If the buses stopped closer to your place of work or school	1	2	3	4	4
If traffic congestion on the Gulf Freeway became worse	1	2	3	4	4
If the availability of gasoline were to decrease	1	2	3	4	4
If the bus trip took less time than an automobile trip	1	2	3	4	4
If there was always a seat available on the bus	1	2	3	4	4
If a comfortable temperature was always maintained inside the buses	1	2	3	4	4
If auto access to and from the Park & Ride lot was more convenient	1	2	3	4	4
If bus service to the Park & Ride lot was provided all day	1	2	3	4	4
If there was better security and police patrol at the Park & Ride lot	1	2	3	4	4
If the daily bus fare could be paid by either a monthly ticket or cash	1	2	3	4	4

15. In addition to METRO bus service, consideration is being given to other transportation improvements in the vicinity of the Gulf Freeway. Please circle the number which best explains your support for the following:

	Not Supportive				Indifferent	Very Supportive
Parking lots for carpoolers and vanpoolers to meet	1	2	3	4	5	5
Parking lots designated for bus patrons	1	2	3	4	5	5
Security racks and designated areas for bicycles at park & ride lots	1	2	3	4	5	5
Outdoor benches and chairs for bus patrons near work or school	1	2	3	4	5	5
Conveniently located vending machines and telephones at the Park & Ride lot	1	2	3	4	5	5

16. Does your employer pay for "all" or "part" of your parking expense?

Yes (Pays All) Yes (Pays Part) No

17a. If Yes, would you be more likely to use Park & Ride bus service if your employer did not provide or pay for parking? Yes No Not Sure

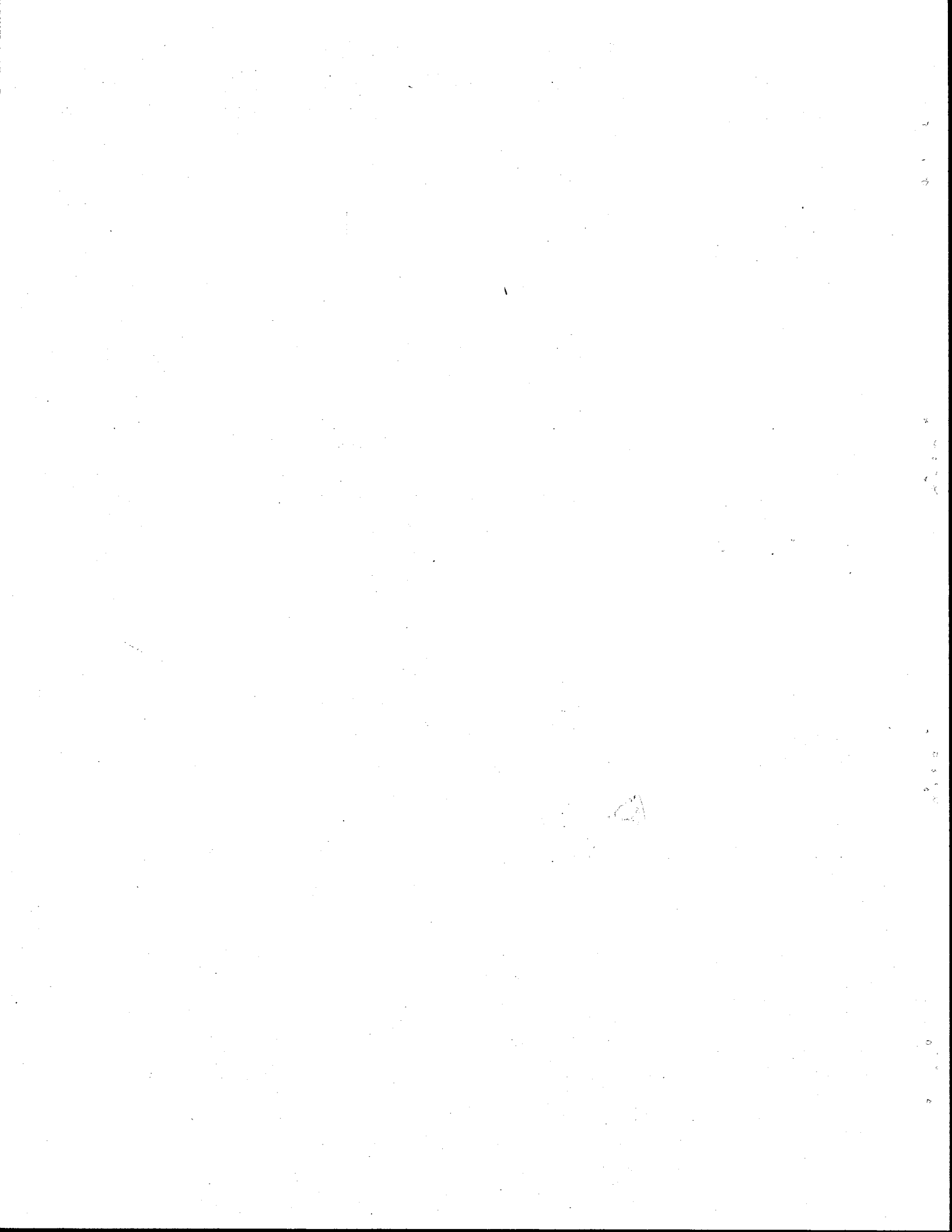
17. What is your current occupation (please be specific)? _____

18. How many years of school have you completed? _____ 19. AGE _____

20. SEX: Male Female

THANK YOU FOR YOUR TIME AND ASSISTANCE!

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APPENDIX B

SURVEY PROCEDURES

Most of the data presented in this report were obtained through either the on-board (user) survey or the home mail-out (non-user) survey. The survey instruments are shown in Appendix A. Lot locations and geographical areas for the home mail-out are shown in the main body of the report, Figures 1 through 5.

Sample selection is discussed in Research Report 205-11. The general procedures used in that study were duplicated in the Houston area surveys.

On-Board Survey

The surveys were conducted on about 30 percent of the buses departing each park-and-ride lot during the morning. On those buses sampled, 100 percent of patrons filled out the surveys. The number of surveys completed, by lot, is shown in Table B-1.

Home Mail-Out Survey

The target survey areas as well as the number of surveys mailed and returned from each survey area are discussed in the main body of this report. An initial mail-out plus one "follow-up" mail-out was undertaken.

The target survey areas were identified using results from the on-board survey. These market areas were related to the trade zones shown in Cole's Directory. Based on work performed in Dallas (Research Report 205-11), approximately 800 addresses were selected at random from each market area. The addresses formed the basis for the home mail-out.

TABLE B-1

Completed On-Board Surveys Per Lot, Houston

Lot	Number of Surveys Completed
Gulf Sage	226
Bellaire	158
West Loop (Two Lots)	331
Westwood	383
Clear Lake City	141
Alief	141
North Shepherd	302
Kuykendahl	348
Champions	158
Kingwood	155
Katy/Mason	45
TOTAL	2,388