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ATTITUDES, OPINIONS, AND EXPECTATIONS OF BUSINESSMEN IN A PLANNED FREEWAY CORRIDOR

in cooperation with the
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RESEARCH REPORT 148-2
STUDY 2-1-71-148
HIGHWAY DECISION MAKING

ATTITUDES, OPINIONS, AND EXPECTATIONS OF BUSINESSMEN IN A PLANNED FREEWAY CORRIDOR

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PREFACE

The authors wish to thank those who have helped with the study. Special acknowledgment is due to several persons who supported the research. Mr. Marcus Yancey of the Texas Highway Department and Mr. Howard McCann of the Federal Highway Administration have provided valuable assistance and general guidance. Mr. William McClure and Mr. Dexter Jones in the Houston Urban Office of the Texas Highway Department have made many useful suggestions and contributions. Mrs. Jeanene Hart typed and prepared the report for publication.

This report is one of a series issued under Research Study 2-1-71-148, which has as its overall objective the development of a comprehensive decision framework that will permit the incorporation of social, economic, and environmental factors in the decision-making process involving highway locations and highway improvements. Research Report 148-1, Experiences and Opinions of Residents Along Elevated, Depressed, and On-Grade Freeway Sections in Houston, Texas, was previously published as a part of Study 2-1-71-148.

The opinions, findings, and conclusions presented in this publication are those of the authors and not necessarily those of the Texas Highway Department or the Federal Highway Administration.

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ABSTRACT

This report presents the results of a survey conducted in an area in Houston, Texas, that has been designated a freeway corridor. The survey focuses upon the attitudes, opinions, and expectations of persons who own or operate businesses that lie within the corridor.

The data are analyzed with regard to the following topics: businessmen's knowledge and sources of information about freeway developments; causative factors in the formation of pro vs. con attitudes toward the freeway; businessmen's opinions regarding elements in freeway location and design; and businessmen's decision-making and expectations with respect to freeway developments.

Key Words: Urban, businessmen, socio-economic impacts, expectations, attitudes.

SUMMARY OF FINDINGS

This report presents the results of a survey of businessmen who own or operate firms in an area for which a freeway is being planned. The study has the following objectives: (1) determine the actions taken and sources used by businessmen in obtaining information about a freeway project; (2) examine the pro vs. con division of attitudes about having the freeway in the area; (3) identify the preferences of businessmen regarding elements of freeway location and design; and (4) analyze the relationship between freeway developments, business decision-making, and businessmen's expectations about the freeway's effects upon themselves and the rest of the local community.

The data were obtained from a survey sample (175 of 1710 businesses) of firms in Houston's Harrisburg Corridor, which is being planned for the location of the downtown extension of State Highway 225.

Briefly summarized, the primary findings of the study are:

(1) A majority of respondents was aware that a freeway was being planned. Even though pro-freeway and anti-freeway groups had been active in the Harrisburg area, the respondents' knowledge of these organizations was limited, and their attendance at meetings held by these groups was minimal. Few businessmen had attended either the official Texas Highway Department public hearing or the meetings held by the Harrisburg Freeway Study Team. In their efforts to obtain information about the freeway, the respondents tended to rely on passive media, e.g., personal conversations, newspapers, letters, and radio/TV.

(2) The division of pro vs. con attitudes about the freeway was 135 in favor, 21 in opposition, and 19 with no opinion. Those opposed were owner/operators of small (less than 10 employees) businesses, had a customer clientele that resided in the study area, and owned or operated retail and service firms. There was some tendency for businessmen who resided in the study area to be opposed to the freeway. Also, the opponents tended to think that the freeway would decrease their sales volumes, and that if their businesses were taken by right-of-way proceedings, relocation in the study area would be difficult to accomplish. Regarding race/national origin backgrounds, Mexican-American businessmen most often tended to oppose the freeway. Flexibility in attitude (measured by a "No Opinion" response) was related to the elapsed time since first learning of the freeway. The shorter the elapsed time, the greater was the flexibility. Attitudinal bias was indicated among the respondents who had not heard of the proposed freeway. These persons tended to be biased in favor of the freeway. Other bias was present in the respondents' evaluations of the pro/con opinions of other businessmen and the area's residents. Businessmen who personally favored (opposed) the project tended to overestimate the extent to which other businessmen and residents favored (opposed) the project.

(3) The analysis of preferences for the location of the freeway within the corridor revealed that no majority preference existed, a large number had no preference at all, and the reasons given for preferring one location (e.g., south of Canal Street) were not different from the reasons given for preferring another location (e.g., north of Canal Street). Type of business, location of business, and the respondents' residential locations (in or out

of the study area) were not strongly related to freeway locational preferences. The respondents' opinions about design elements revealed that the presence of frontage roads was overwhelmingly preferred to the absence of frontage roads. Respondents' preferences for a certain design elevation (on-grade, elevated, depressed) were not independent of their preferred proximity to a freeway. Particularly, those who preferred to be within three blocks of a freeway also preferred the on-grade design. For the spacing of on/off ramps and crossovers, a large number had no opinion. Those having opinions preferred spacing distances of six blocks or less.

(4) The effects of a freeway are distributed through time, beginning with the initial planning and culminating in freeway operations. The respondents indicated that, as of the present time, the freeway developments had caused only minimal impact upon their business decisions. With respect to future freeway-related decisions, 70 percent thought that the freeway would have no impact upon them, while ten percent of the respondents firmly expected to make business decisions in response to future freeway developments. Responding to a hypothetical situation in which their businesses were presumed to have been taken in right-of-way proceedings, over 40 percent of the respondents stated they would relocate in the Harrisburg Corridor. Their preferences for relocating in the area were positively related to their perceptions of the availability of alternate sites. In evaluating the expected freeway impacts upon the neighborhood, the respondents anticipated detrimental effects from motor vehicle noise and exhaust emissions. They were generally agreed that the freeway would improve citywide and neighborhood travel and

the neighborhood's appearance. They expected rising land and property values accompanied by changes in land usage from single-family residential to higher density apartments and from general residential to more commercial and industrial.

IMPLEMENTATION STATEMENT

The results in this report present some tentative conclusions and some useful hypotheses for consideration in the highway planning process. Effective communication between the highway agency and interested groups is of great importance in increasing the total net benefits generated by a new freeway. Interested groups can give information to the highway agency that may facilitate its planning and decision-making. The attitudes, opinions, and expectations of businessmen analyzed here are a part of such information. The focus upon businessmen in a planned corridor does not imply that freeway impacts upon corridor residents are of lesser importance. Instead, what is provided are other viewpoints (the businessmen's) with their accompanying set of values and aspirations. Such viewpoints provide additional information that can be useful in identifying more fully the trade-offs involved in the planning, location, and design of urban freeways.

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INTRODUCTION

Purpose of the Study

With the emergence of public concern about the non-user effects of urban freeways, highway agencies increasingly are in need of information from the people whose everyday lives may be closely connected with activities in a freeway corridor. Most research efforts have centered on residents whose neighborhoods lay in freeway corridors. Such an emphasis is understandable since the non-user effects of a freeway probably are concentrated among the residents. There is, however, another group that is likely to experience substantial non-user effects from a nearby freeway. That group is composed of the businessmen who have establishments in the freeway corridor. Although residents and businessmen in the same neighborhood undoubtedly share some common interests, their activities and aspirations may be sufficiently diverse to cause them to evaluate differently the effects of a freeway upon the neighborhood. Thus, the opinions and expectations of businessmen represent a source of information that may aid the highway agency in a more comprehensive identification and evaluation of urban freeway effects.

The purpose of this study is to examine the attitudes, opinions, and expectations of businessmen who own or operate establishments in an urban area that has been proposed for a freeway's location. Within this purpose, several, more specific objectives are sought. Some of these objectives are: (1) identify the sources and activities used by businessmen in obtaining information about a freeway project; (2) identify some of the variables that explain the favor vs. oppose division of attitudes regarding the freeway;

(3) identify the elements of freeway location and design for which businessmen are likely to have preferences; (4) examine the relationship between freeway developments and business decision-making; and (5) examine businessmen's expectations about the freeway's effects upon themselves and the rest of the neighborhood.

The data analyses and interpretations reported herein rely heavily upon the use of the Chi-square (χ^2) test to detect significant differences. The χ^2 test of two-way classifications shows whether observed frequencies differ significantly from expected frequencies. If the computed χ^2 value exceeds the critical χ^2 value (for some level of probability, e.g., $\chi^2_{.95}$), then the observed differences are too great to be attributable to the occurrence of chance alone. For two-way classifications, such a result suggests that the classifications are not independent of each other; consequently, inferences of causality can be made to explain the results. For the data in this report, the χ^2 results are reported in footnotes to the tabular data. The inferences are presented in the text.

This is the second in a series of surveys planned under a research study entitled "Social, Economic, and Environmental Factors in Highway Decision Making" conducted for the Texas Highway Department in cooperation with the Federal Highway Administration.

The Study Area and Its Freeway Developments

The area selected for study is located in Houston, Texas, in an essentially residential neighborhood for which a freeway is currently being planned. As shown in Figure 1, both natural (Buffalo Bayou) and man-made (Missouri Pacific Railroad and Missouri-Kansas-Texas Railroad) features form the boundaries of this corridor, known as the Harrisburg Corridor.

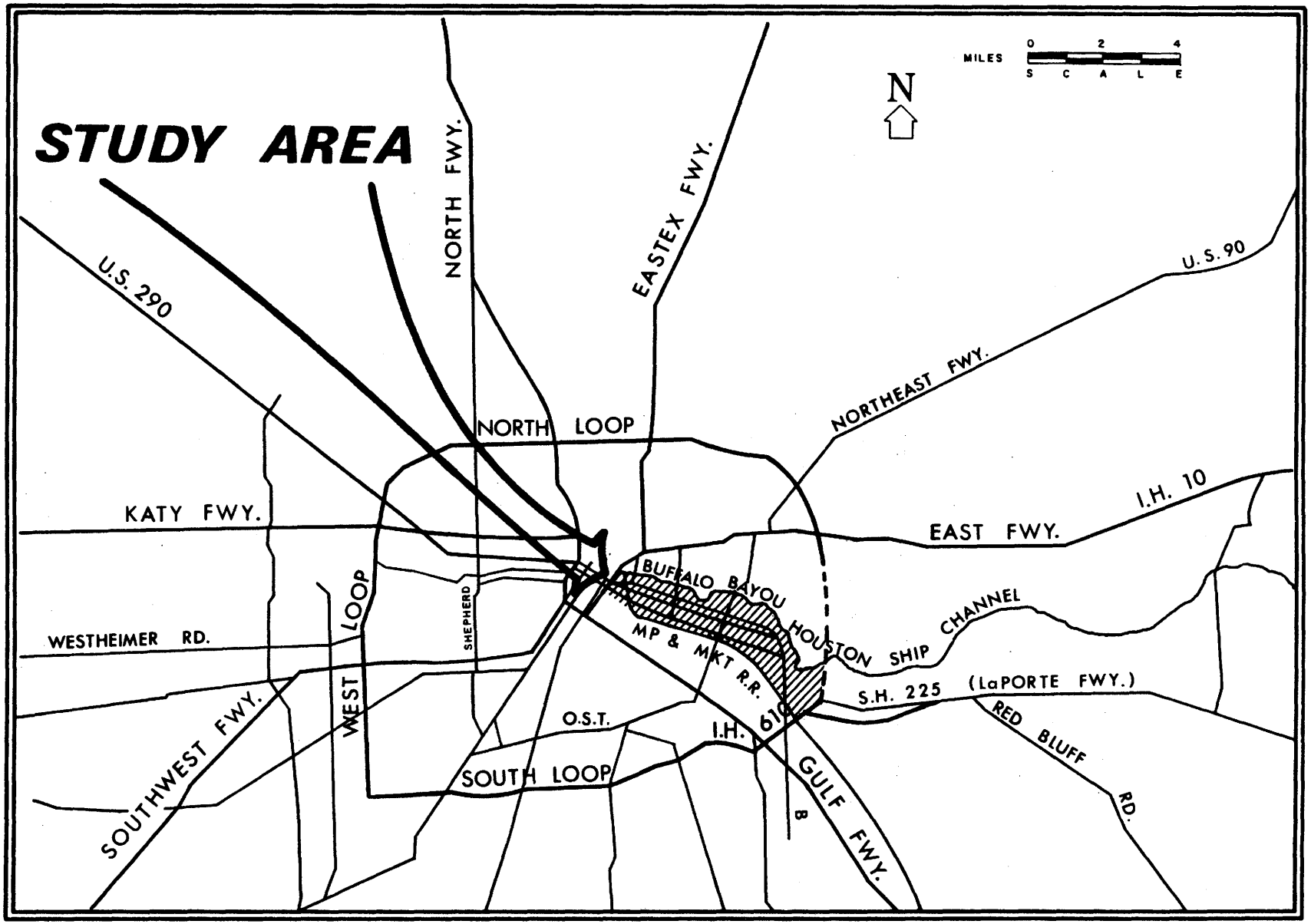

Figure 1. Map of Houston showing the location of the study area.

This area is an old residential section of the city. Commercial establishments are numerous along the major streets or thoroughfares serving the area. Many industrial firms are located along Buffalo Bayou, the Houston Ship Channel, Industrial Boulevard, and the streets on the fringes of the area. These firms, especially those of the wholesale and warehouse type, have become much more numerous during the last decade. Many old residences have been removed to make way for the new structures that house these firms.[1]

About 10 years ago, City of Houston and Harris County officials began studying the feasibility of constructing a freeway through the above area to connect State Highway 225 or the LaPorte Freeway with downtown Houston and relieve traffic congestion on the Gulf Freeway. In 1963, Harris County officials published a study that showed a proposed route (Corridor A in Figure 2) between Harrisburg Boulevard and Canal Street in the southern half of the study area. This route became known as the "original" route. Several years passed before further action was taken. Then in 1969, county officials asked the Texas Highway Department (THD) to make a study and recommend alternative corridors for the proposed freeway. In March, 1970, the THD held a public hearing and presented a map that showed three alternative corridors for the freeway (see Figure 2). One of the proposed corridors followed the "original" route, that is, Corridor A. Another proposed corridor (Corridor B) lay north of the original route between Canal Street and Navigation Boulevard. The third one (Corridor C) lay south of the "original" route and followed no particular street. In fact, it was not

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[1] Table B-4 provides interviewer observations such as the land use changes in the area as well as the number and quality of the business and residential buildings near the sample businesses.

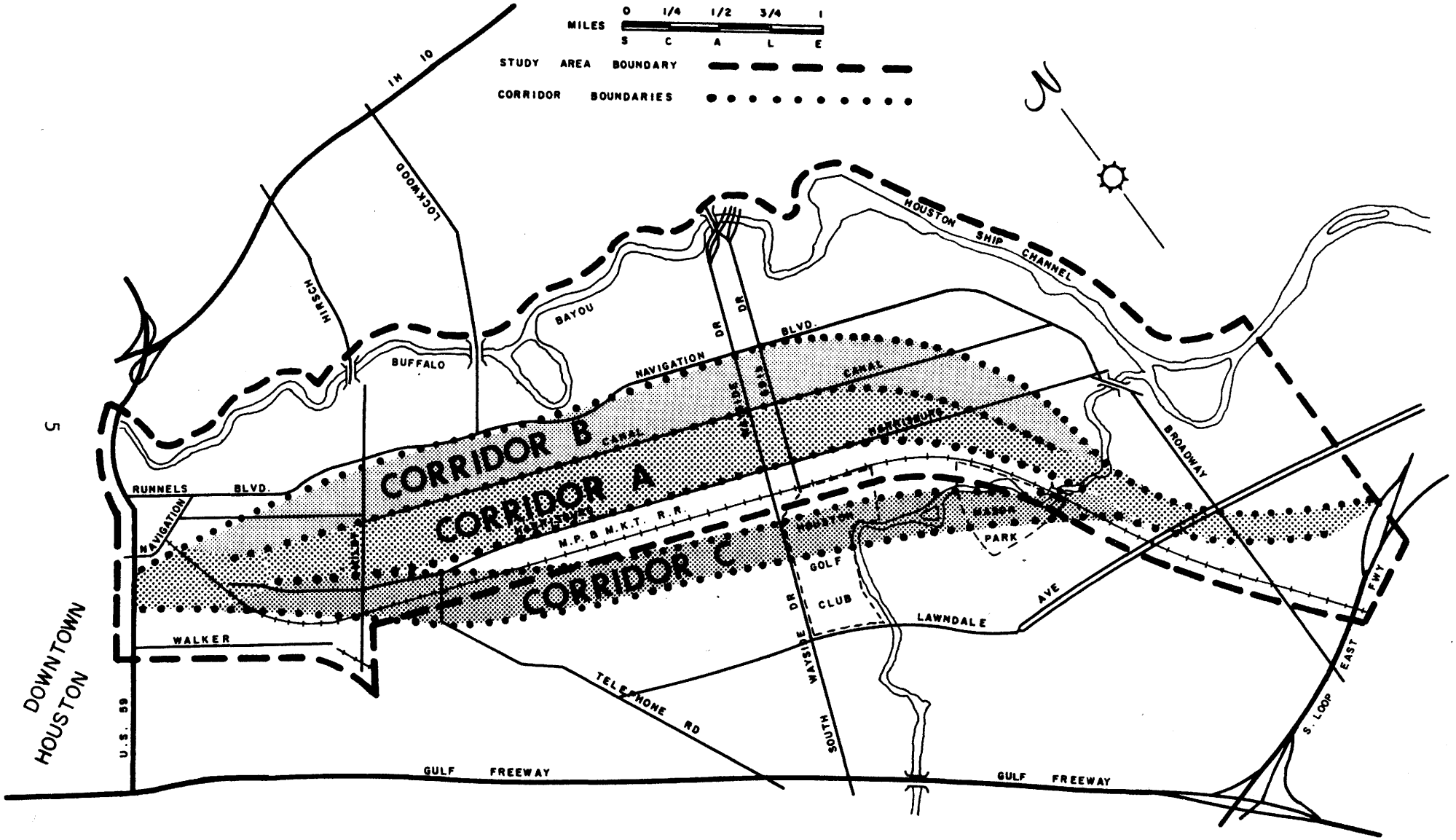
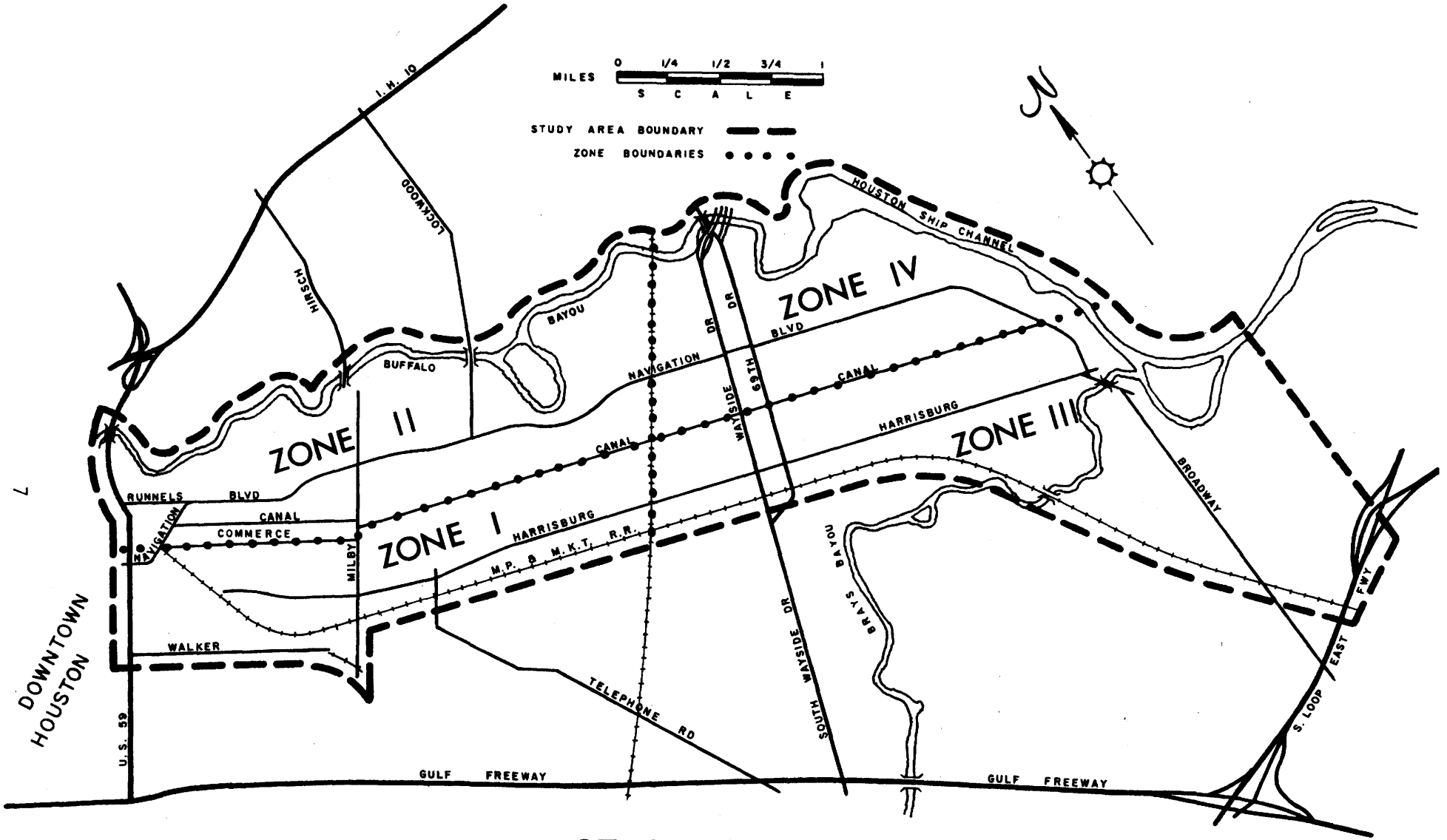


Figure 2. Map of the study area showing the location of three alternative corridors for the proposed Harrisburg Freeway.

aligned with a major street most of the way, and it crossed the Houston Golf Club property and Mason Park.

Shortly after the corridor public hearing, a group of the local residents (including some businessmen), held a meeting protesting the construction of a freeway through the Harrisburg area. Officials of the THD were invited to attend the meeting. In July, 1970, the THD appointed an interdisciplinary team, composed of an economist, urban sociologist, and several THD engineers. The THD asked this team to study the problem and make recommendations concerning whether to build the proposed freeway, and, if so, to recommend a route to follow. Some of the protesting residents suggested that a route following Buffalo Bayou might be acceptable. This team has held several public meetings with residents and businessmen of the area. At the present, it is not known what the team's recommendation will be concerning the proposed freeway. But even if a decision to build is reached soon, officials of the THD say that a period of 8 to 12 years will lapse before a freeway can be opened to traffic.

The study area boundaries, which define an area approximately 1½ miles wide and 4-5 miles long, were determined with the aid of the above mentioned Harrisburg Freeway Location and Design Team. Since Corridor C was ruled out as a possible route, the south boundary of the study area was set at the M.P. and M.K.T. Railroad, (also called the G.H.&H. Railroad). Also, since Corridor A was considered long before any other and was revealed and discussed publicly, the study area was divided into zones, as shown in Figure 3. Thus, the data collected from the businesses could be divided by zones to detect differences in actions, opinions, and preferences of the businessmen in regard to the proposed freeway. Zones 1 and 3 data would represent Corridor A and Zones 2 and 4 would represent Corridor B or others on the north side of the study area.



STUDY AREA

Figure 3. Map of the study area divided into zones, through which the proposed Harrisburg Freeway may pass

CHARACTERISTICS OF BUSINESSMEN AND BUSINESSES

This section presents some of the personal characteristics of the respondents and descriptive characteristics of their businesses that are useful in evaluating the survey data. The characteristics of a group not only aid in its description but also may provide explanatory linkages in the analysis of the group's opinions and attitudes.

As shown in Table B-3, 88 percent of the respondents were males. The median age and educational levels were in the 40-49 year and 9-12 year classes, respectively. Since the Harrisburg area is undergoing a change in racial composition from predominantly Anglo to predominantly Mexican-American, the racial characteristics of the businessmen are examined in detail.

The racial/national origin composition of the sample was 133 Anglos, 34 Mexican-Americans, 4 Blacks, and 4 of other races or national origins.[2] The data in Table 1 show the relationship between race/national origin and selected other characteristics. Non-Anglo businessmen tended to be owner/operators of retail establishments. Their presence in wholesale or manufacturing activities was minimal, as over 97 percent of wholesale/manufacturers were Anglos. A significant difference also was revealed between race/national origin and location of residence. About 50 percent of the non-Anglo businessmen were residents in the study area compared with less than 15 percent for the Anglos. The last two parts of Table 1 show that non-Anglos most often were operating businesses that were small (had less than five employees) and heavily dependent upon a clientele that lived in the study

[2] See Appendix A and Table A-1 for a description of the sampling procedure.

Table 1

Selected Characteristics of Respondents and Businesses, by Race/National Origin

Characteristic	Race/National Origin		
	Anglo	Non-Anglo	Total
	----------Number----------		
Type of Business:[1]			
Retail	43	30	73
Service	48	11	59
Wholesale/Mfg.	42	1	43
Residential Location:[2]			
Within Study Area	24	23	47
Outside Study Area	109	19	128
Percentage of Customers in Study Area:[3]			
Less than 26 percent	79	4	83
26-50	14	6	20
50 percent or more	40	32	72
Size of Business:[4]			
Less than 5 employees	42	31	73
5-19	53	10	63
20 or more employees	38	1	39
All Respondents	133	42	175

[1] $\chi^2 = 23.70$; $\chi^2_{.99} = 9.21$; 2 d.f.

[2] $\chi^2 = 20.08$; $\chi^2_{.99} = 6.64$; 1 d.f.

[3] $\chi^2 = 27.79$; $\chi^2_{.99} = 9.21$; 2 d.f.

[4] $\chi^2 = 25.75$; $\chi^2_{.99} = 9.21$ 2 d.f.

area. The larger businesses and those serving customers from outside the study areas were owned or operated by Anglos.

In addition to the demographic variables other characteristics used to describe the study area community include: business location; length of time at present location; firm mobility within the study area; and length of time the respondents had been with their firms. These characteristics, listed in Table 2, show a fairly even geographic distribution of firms with respect to zone locations. About one-half of the firms were located in Zones 2 and 4, which lie north of Canal Street (see Figure 3). The east (zones 3 and 4) and west (Zones 1 and 2) portions each had one-half of the businesses.

Firms in the study area tended to be stable, both temporally and geographically. Almost 60 percent of the businesses had been in their present location at least 10 years, and 136 firms (almost 80 percent) had not moved since they first located in the study area. Not only were the businesses fairly stable, but the businessmen had been with their firms a relatively long time. About 60 percent of the respondents had been with their firms at least 10 years.

The final set of characteristics to be discussed in this section describes some of the transportation activities of the respondents and their firms.[3] In travel to and from work, 93 percent of the employers and their employees used private motor vehicles. Shipments of goods by motor vehicles was characteristic of all the businesses, and over 80 percent of them shipped all their goods by motor vehicle.

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[3]Additional characteristics are given in Appendix B.

Table 2

Selected Characteristics of Respondents and Businesses, by Type of Business

Characteristics	Type of Business			
	Retail	Service	Wholesale/Mfg.	Total
	----------Number----------			
Business Location:[1]				
Zone 1	16	15	10	41
Zone 2	15	15	16	46
Zone 3	25	15	11	51
Zone 4	17	14	6	37
Time at Present Location:				
Less than 1 year	9	4	1	14
1-4	14	7	6	27
5-9	11	12	7	30
10 or more years	39	35	29	103
Moved within Study Area:				
Yes	16	12	11	39
No	57	47	32	136
Respondents' Time with Firm:				
Less than 5 years	24	14	8	46
5-9	15	5	5	25
10 or more years	34	40	30	104
All Respondents	73	59	43	175

[1] See Figure 3 .

The direction and length of work trips to and from the study area are indicated by the data in Table 3. The residences of the 128 businessmen who did not live in the study area were fairly evenly distributed around the study area (see Figure 4) with respect to direction and distance. More than 60 percent of them lived at least seven miles away from the study area.

The distribution of the employees of the sample firms was similar to the patterns for their employers. In both cases, however, the distances travelled in the work trip suggest that a freeway in the Harrisburg Corridor would have, other things being equal, a potential for creating user benefits to those working in the study area.

Table 3

Geographical Relationship Between Businessmen's and Employees' Residences and the Study Area

Direction/Distance	Place of Residence	
	Businessmen	Employees
	------Percent--------	
Direction from Study Area:		
West	28	29
East	24	19
South	31	22
North	17	30
Distance from Study Area:		
Less than 3 miles	13	8
4-6	23	27
7-9	24	30
10-12	13	11
13-15	17	13
16 or more miles	10	11
Total Number[1]	(128)	(2874)

[1]A total of 47 businessmen and 517 employees were identified as study area residents and not included in these totals.

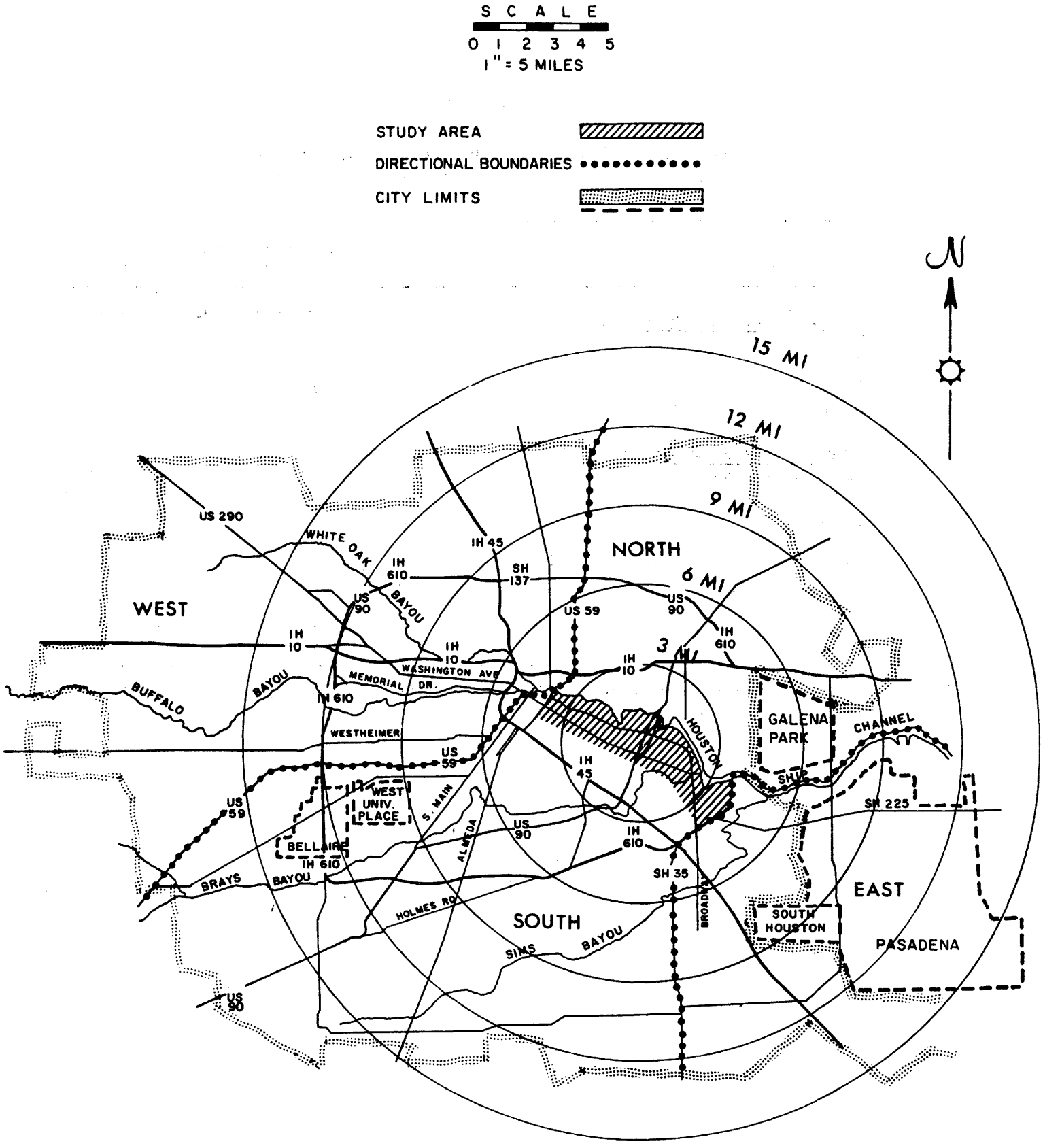

Figure 4. Map of Metropolitan Houston showing directional boundaries and distance bands from the Harrisburg Study Area.

KNOWLEDGE AND INFORMATION ABOUT THE PROPOSED FREEWAY

The public's evaluation of a proposed freeway project is partially a result of the information it obtains about the project. While it may not be possible to predict whether a particular attitude toward a freeway project will result from the public's exposure to a given package of information, it is of some importance that the highway agency be cognizant of the alternative sources of information. Much of this is elemental since the highway agency itself is required to present certain information in the two-stage public hearing process. Also, additional meetings and communications are oftentimes offered to the public in an attempt by the highway agency to extend and clarify any issues raised that weren't satisfactorily completed at the public hearings.

In addition to the information issued by the highway agency, other sources of project-related information include the news media, citizen and business organizations, and person-to-person contact. In terms of providing easy accessibility to information, the impact upon the public is related to the manner in which the information is offered. For example, while a public hearing is open to attendance by all of the citizenry, a televised report of the hearing will probably have a wider impact than the hearing itself.

Businessmen in the Harrisburg corridor were questioned about their sources of information about the proposed freeway. The data in Table 4 show that person-to-person contacts were the primary source of freeway related information. This was particularly noticeable among businessmen engaged in retail and service activities, in which customer contact is a predominant

Table 4

Information Source, Knowledge of Proposed Freeway, and Attendance at Meetings, by Type of Business

	Type of Business			
	Retail	Service	Wholesale/Mfg.	Total
	----------Number----------			
Information Source[1]:				
Individual contact	43	35	16	94
Newspapers	29	26	23	78
THD letters	20	9	6	35
Radio/TV	11	14	6	31
Public meeting	7	9	8	24
THD Hearings	5	6	6	17
Other	4	4	3	11
None	9	6	6	21
All Responses	128	109	74	311
First Learned of Freeway:				
Less than 1 year ago	20	12	14	46
1-2 years ago	15	15	5	35
3-4 years ago	10	6	2	18
5-9 years ago	12	8	12	32
10 or more years ago	6	11	4	21
Didn't know of freeway	9	6	6	21
Couldn't recall	1	1	0	2
All Respondents	73	59	43	175
Have Knowledge of Freeway Related Organizations:				
MDDT of THD	25	20	18	63
Supporting Organizations	8	4	10	22
Opposing Organizations	6	4	4	14
All Respondents	39	28	32	99
Attendance at Public Meetings of Related Organizations:				
MDDT of THD	7	6	6	19
Supporting Organizations	3	3	7	13
Opposing Organizations	2	0	0	2
All Respondents	12	9	13	34

[1]Most businessmen mentioned more than one source of information.

feature of doing business. Printed materials (newspapers and letters from the Texas Highway Department) and radio/TV programs were ranked below person-to-person contacts but above meetings and hearings as sources of information. This is not surprising since attendance at meetings requires an active effort while reading a newspaper or watching a newscast is a relatively easy, passive activity.

Given the length of time the project has been under consideration and the various sources of information about the project, only 21 businessmen had not heard of the proposed freeway, while another 21 had heard of it at least ten years ago. Importantly, almost one-half of the businessmen had first learned of the freeway within the last two years.[4]

A more detailed examination was made to determine the extent of the respondents' knowledge of and participation in meetings held by both highway officials and citizen/businessmen groups. Of the 154 businessmen who knew something about the freeway proposal, only 36 had knowledge of groups that had been organized in support of or in opposition to the freeway. As active participants in meetings held by these groups, only 15 respondents had attended at least one meeting.[5] In regard to the existence of the multi-discipline

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[4]Since over one-half of the businessmen either had no knowledge or had only recently learned of the freeway, their decision-making probably had been influenced little by the proposed freeway. This will be examined more closely later in the report.

[5]Of the few who knew of supporting or opposing organizations, the majority did not know how large a membership they had. Of 10 who estimated the size of the supporting organizations, eight said there were 200 or more members. Of six who estimated the size of opposing organizations, four said that they had 200 or more members. Of those that knew of opposing or supporting organizations, the majority of them thought that the supporting groups represented the general thinking of businessmen. On the other hand, one third of them thought that the opposing groups represented the general thinking of residents in the area.

design team (MDDT) of the Texas Highway Department, 63 businessmen knew of the MDDT. Of these 63, 19 had been present at one or more of the public meetings held by the MDDT.

In general, the respondents were aware that a freeway was being proposed for location in the Harrisburg corridor. Their knowledge of freeway related organizations was limited; their attendance at meetings held by these organizations was even more limited. To obtain information about the freeway, the respondents tended to rely on passive media, e.g., personal conversations, newspapers, letters, and radio/TV.

PRO VS. CON ATTITUDES ABOUT THE PROPOSED FREEWAY

Given their knowledge about a proposed freeway, businessmen form attitudes and opinions about the desirability of having a freeway in their area. One of the objectives of this study is to examine and identify some of the variables that might explain a division of attitudes (pro vs. con) regarding a proposed freeway.

Beginning with a broad, general inquiry about the desirability of having a freeway, the survey results were analyzed according to certain respondent characteristics. Over three-fourths of the businessmen thought the proposed freeway should be constructed, while only 21 (or 12 percent) were opposed to the freeway. The data in Table 5 show some interesting relationships among the pro and con respondents.

For example, most of the opposition to the freeway came from relatively small (less than 10 employees) business firms. Furthermore, the geographical distribution of customers tended to be a significant factor in explaining the differences in opinion among those favoring and opposing the freeway. A majority of those in opposition to the freeway had a customer clientele that was primarily located in the study area. With respect to the type of business, opposition to the freeway came largely from the retail and service sectors; only three businessmen in wholesale/manufacturing were opposed to the construction of the freeway.

Since residents in the proposed freeway corridor are likely to be affected by the project, the attitudes of resident businessmen (those living in the study area) were compared to the attitudes of those respondents who lived

Table 5

Opinions Concerning Whether the Freeway Should Be Built, by Selected Business Characteristics

Characteristic	Attitude Toward Freeway			
	Favor	Oppose	No Opinion	Total
	----------Number----------			
Size of Business[1]:				
Less than 10 employees	73	17	13	103
10 or more employees	62	4	6	72
Percentage of Customers in Study Area[2]:				
10-25	71	2	10	83
26-50	15	3	2	20
51-75	19	2	0	21
76-100	26	13	5	44
Type of Business				
Retail	54	11	8	73
Service	44	7	8	59
Wholesale/Manufacturing	37	3	3	43
All Respondents	135	21	19	175

[1] $\chi^2 = 6.17$; $\chi^2_{.95} = 5.99$; 2 d.f.

[2] $\chi^2 = 23.76$; $\chi^2_{.99} = 16.81$; 6 d.f.

outside the study area. The data indicate that the percentage of resident businessmen who opposed the freeway (19 percent) was twice as large as the

Place of Residence	Attitude Toward Freeway			
	Favor	Oppose	No Opinion	Total
	----------Number----------			
Inside Study Area	34	9	4	47
Outside Study Area	101	12	15	128
All Respondents	135	21	19	175

percentage of non-resident businessmen in opposition to the freeway (9 percent). Apparently, attitudes of businessmen about the proposed freeway partially reflected the extent to which their personal, non-business activities were expected to be affected by the project.

There are, however, other indications that businessmen's attitudes about a proposed freeway are based primarily upon the effects that such a freeway would have upon their businesses. Some of these have already been discussed, e.g., small retail or service businesses with localized clientele may lose customers via residential displacement and relocation caused by freeway construction. This tendency was corroborated by the respondents' expectations about the freeway's effect on their sales. As indicated by the following data, the preponderence of businessmen (124 of 175) either expected no change

Expected Effect Upon Dollar Volume of Sales	Attitude Toward Freeway			
	Favor	Oppose	No Opinion	Total
	----------Number----------			
Expected Increase	30	3	1	34
Expected Decrease	11	5	1	17
Expected No Change	72	6	15	93
No Opinion	22	7	2	31
All Respondents	135	21	19	175

in sales or had no opinion about the freeway's likely effect upon sales. Of those who expected some change in sales, their attitude about the freeway seemed to be related to the direction in which they thought sales would be changed. Thus, less than 10 percent of those who expected an increase in sales were opposed to the freeway; otherwise, almost 30 percent of those businessmen who thought their sales would decrease were opposed to the freeway.

The possibility of having to relocate their businesses was probably a factor in the businessmen's pro or con position with respect to the freeway. The expected ease of relocation within the study area, as indicated below,

Suitable Relocation Site Within Study Area	Attitude Toward Freeway			
	Favor	Oppose	No Opinion	Total
	----------Number----------			
Exists	73	7	11	91
Doesn't Exist	34	11	5	50
Not Known	28	3	3	34
All Respondents	135	21	19	175

$\chi^2 = 12.68$; $\chi^2_{.95} = 9.49$; 4 d.f.

showed that less than 10 percent of the 91 respondents who thought they could find a suitable relocation site were also opposed to the freeway. Of those who expected to be unable to find a place to relocate their businesses, over 20 percent expressed opposition to the freeway.

Overall, these data and relationships indicate the not surprising observation that economic considerations are important in explaining the pro/con attitudes of businessmen toward a proposed freeway. There are, however, other factors that may explain opinion formation in the business community. Some of these factors will now be examined.

The study area has undergone a significant population redistribution within the last ten years with regard to its racial composition. Although no current estimates have been made about this distribution, the major trend has been from a predominantly Anglo residential area to a predominantly Mexican-American residential area.[6] Among the 175 businessmen in the study sample, only 34 (or 19 percent) were Mexican-Americans. As shown below, opinions of non-Anglos about the freeway tended to differ from those of the Anglo businessmen. While less than 10 percent of the Anglo businessmen

Race or Nationality Background	Attitude Toward Freeway			
	Favor	Oppose	No Opinion	Total
	----------Number----------			
Anglo	106	12	15	133
Non-Anglo	29	9	4	42
All Respondents	135	21	19	175

$\chi^2 = 5.37$; $\chi^2_{.90} = 4.61$; 2 d.f.

expressed opposition to the freeway, more than 20 percent of the Mexican-American businessmen were opposed. Since this difference was statistically significant, it could be an important factor in posing and evaluating inferences, using the results of the businessmen's survey, about the attitudes of the general population in the area.

The acquisition and sources of information about the freeway were analyzed to determine if they were related to subsequent support of or

[6] The data from the 1970 census tracts (in the study area) showed that about 67% of the population was Mexican-American compared to 35% in 1960. The Anglo proportion of the population was 31% in 1970 and about 64% in 1960.

opposition to the proposed freeway. The results are summarized in Table 6. The first part of Table 6 suggests that the respondents' flexibility in attitude was related to the elapsed time since first learning of the freeway. Of the 19 businessmen who had not decided on a position in favor of or opposed to the freeway, most of them (14) had either no knowledge of the proposal or had learned of it within the last year. On the other hand, the opinions of those who had known about the freeway for more than five years appeared to be fairly fixed, as only one of those 53 respondents had no opinion. Another aspect of attitude flexibility is suggested by the data in the second part of Table 6. The 34 persons who had attended at least one meeting of freeway-related groups were not uncertain about their attitudes toward the freeway. Only one of them had no opinion. Whether the 33 others took a definite position before or because of the attendance at a meeting is not discernible.

In addition to giving their own views about a proposed freeway, businessmen can be a potential source of information regarding the opinions of others in the neighborhood. How reliable such information might be and how it compares to their personal attitudes are two questions that should be answered in an evaluation of these opinions. The data in Table 7 aid such an evaluation.

Table 6

Attitudes Toward Freeway, by Selected Information Variables

Information Variable	Attitude Toward Freeway: Favor	Oppose	No Opinion	Total
	---Number---			
First Learned of Freeway[1]:				
5 or more years ago	45	7	1	53
1-4 years ago	43	7	3	53
Less than 1 year ago	33	6	7	46
Didn't know of freeway	13	1	7	21
Couldn't recall	0	1	1	2
Information Source[2]:				
Passive media only[3]	93	16	11	120
Attendance at meetings only	10	1	0	11
Both of above	19	3	1	23
None of above	13	1	7	21
All Respondents	135	21	19	175

[1] $\chi^2 = 19.14$; $\chi^2_{.99} = 16.81$; 8 d.f.

[2] $\chi^2 = 16.22$; $\chi^2_{.95} = 12.59$; 6 d.f.

[3] Includes conversations, newspapers, mail, radio/TV.

The first, and possibly most important, finding was that almost 60 percent (or 102 of 175) of the respondents did not know what other businessmen thought about the freeway. Such a result probably is influenced by the limits of the effectiveness of organizations of businessmen in the study area. There were, however, 73 respondents who thought they knew what attitudes most businessmen held regarding the freeway. Of these, 54 reported general support of the project. That these responses may have contained personal bias is suggested by the fact that those who personally favored (opposed) the freeway also thought the general climate of business opinion supported (opposed) the proposed project. The net result, whether personal bias was a dominant factor or not, was that the majority of the 73 respondents accurately perceived the desires of most study area businessmen, according to the study sample.

The last half of Table 7, regarding the businessmen's impressions of what the study area residents thought about the freeway, reveals some different implications. Not unexpectedly, businessmen generally did not know what the residents' attitudes were, and only 58 responses were usable for the following analysis. Of those 58 having an opinion, however, the majority (32) thought that most residents were in opposition to the proposed freeway. Although nothing can be concluded about the accuracy of this finding,[7] it indicates that businessmen believe that residents, having different activities and aspirations, will tend to view a proposed freeway development differently than will the business community.

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[7] A study of the residents in the Harrisburg corridor is being conducted by the Texas Transportation Institute, and those results will confirm or deny the validity of the businessmen's impressions.

Table 7

Opinions of Respondents Regarding Attitudes of Other Businessmen and Study Area Residents Toward the Freeway, by Personal Attitudes

Respondents' Opinions	Respondents' Personal Attitudes			
	Favor	Oppose	No Opinion	Total
	----------Number----------			
Attitudes of Other Businessmen Toward Freeway[1]:				
Most favor it	49	4	1	54
Most oppose it	7	6	0	13
Evenly divided pro/con	5	0	1	6
Attitudes not known	74	11	17	102
Attitudes of Study Area Residents Toward Freeway[2]:				
Most favor it	17	0	0	17
Most oppose it	20	10	2	32
Evenly divided pro/con	7	2	0	9
Attitudes not known	91	9	17	117
All Respondents	135	21	19	175

[1] $\chi^2 = 24.71$; $\chi^2_{.95} = 12.59$; 6 d.f.

[2] $\chi^2 = 16.93$; $\chi^2_{.95} = 12.59$; 6 d.f.

Finally, the businessmen's opinions about the attitudes of others toward a project should be used with the recognition that personal bias is likely to have influenced their responses. The Chi-square estimates for the opinions of both resident and other businessmen's attitudes support the conclusions that: (1) businessmen who personally favor (oppose) the project will tend to over-estimate the extent to which other businessmen and residents favor (oppose) the project; and (2) businessmen who have no personal opinion regarding a pro/con position will tend to overestimate the degree of a similar attitude among residents and fellow businessmen.

OPINIONS ABOUT LOCATION AND DESIGN

Once it has been determined that a new freeway should be built, the problems of location within a corridor and freeway design are of prime interest. To the extent that the project may be expected to generate disbenefits to a particular segment of the population, adjustments in location and design are possible to reduce some of the disbenefits. For example, continuous service or frontage roads may make the freeway more accessible to neighborhood residents. Such accessibility may wholly or partially compensate area residents who were unfavorably impacted by the freeway. To be sure, it is extremely difficult to quantify precisely the gains and losses attributable to adjustments in location and design. It is feasible, however, to adjust the direction of the gains and losses by including the desires of the impacted citizenry in the freeway's design and location. Thus, citizen ideas regarding grade levels, intersection spacing, frontage roads, etc. may be helpful in increasing the overall benefits to the community.

Location

Included in the survey of Harrisburg businessmen were several inquiries regarding location and design features of the proposed freeway. The first among these sought the opinion of the respondents about the geographical location of the freeway. Their responses were grouped into three classes (see Figure 3): (1) south of Canal Street; (2) Canal Street and north; and (3) others or no preference.[8] The businessmen were also asked why they preferred the indicated location. Both the preferences and reasons are given in Table 8.

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[8] A more detailed classification is presented in Table B-2.

Table 8

Preferred Freeway Location, by Selected Characteristics and Reasons

Characteristics and Reasons	Preferred Freeway Location			
	South of Canal	Canal and North	Others and No Preference	Total
	----------Number----------			
Personal Attitude Toward Freeway[1]:				
Favor	58	32	45	135
Oppose	4	8	9	21
No Opinion	5	3	11	19
All Respondents	67	43	65	175
Reasons for Preference:				
Would best serve area	29	12	3	44
Would take fewest firms	17	14	4	35
Would be cheapest location	13	11	5	29
Would take fewest homes	7	9	4	20
Other reasons	17	14	4	35
No particular reason	5	3	48	56
All Responses[2]	88	63	68	219

[1] $\chi^2 = 8.56$; $\chi^2_{.90} = 7.78$; 4 d.f.

[2] Some businessmen gave more than one reason.

The data there indicate: (1) no clear majority preference existed; (2) a relatively large number (55) had no preference; (3) of those having a preference, over 60 percent preferred a location south of Canal Street; and (4) the reasons given for preferring a location south of Canal Street were not significantly different from the reasons given for preferring a location on or north of Canal Street.[9]

To analyze the preferences for locations, several hypotheses were selected and checked. First of all, it was expected that a businessman's preference for a location north or south of Canal Street would depend upon the geographical location of his business. Those located north (south) of Canal Street should prefer a freeway location north (south) of Canal Street. Another geographical characteristic, residential location, was selected as a potential explanatory variable of freeway locational preferences. The expected result should show that residents and non-residents differed in their opinions about where the freeway should be built.

In addition to geographical characteristics, two informational variables were analyzed: (1) the elapsed time that respondents had known of the proposed freeway; and (2) the respondents' pro/con attitudes toward the freeway. In the first case, it was expected that the relative degrees of publicity that various proposed routes had received over the past ten years would be reflected in the locational preferences.[10] The other variable, pro/con attitude toward

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[9]The one possible exception was the reason "would take the fewest number of homes." It was the only reason that was named more frequently by supporters of the south of Canal locations than by supporters of the on or north of Canal Street locations.

[10]The oldest proposed route, between Harrisburg and Canal, had been mentioned publicly by Harris County officials as early as ten years ago. The routes north of Canal Street are of a relatively recent origin.

the freeway, was examined to determine if the locational preference was associated with the general attitude toward the freeway.

Utilizing the χ^2 statistic to detect significant differences, the analysis led to the rejection of most of the hypothesized relationships (Table 9). Only in the case of the pro/con attitude variable (Table 8) was a statistically significant result obtained. Those respondents who opposed the freeway were disproportionately in favor of a route location on or north of Canal; those favoring the freeway tended to prefer the locations south of Canal Street.

Overall, perhaps one of the most interesting findings was that the location of businesses did not significantly determine the preferred freeway location. Such a result could be due to the relative narrowness of the study area as perceived by the respondents, in which case they might tend to think that the proximity of the freeway would be adequate as long as it was located somewhere in the study area.

Design

The geometric design of a freeway is a technical, specialized field of knowledge developed by highway engineers. This is not to say, however, that opinions of non-technical persons cannot provide a contribution that might improve the level of satisfaction generated by a freeway facility. Personal preferences of people living and working in a freeway corridor might assist the highway agency in identifying some of the "trade-off" features of alternative designs. Such trade-offs then become elements for evaluation in the decision process.

Table 9

Preferred Freeway Location, by Selected Characteristics

Characteristic:	Preferred Freeway Location: South of Canal	Canal and North	Others and No Preference	Total
	----------Number----------			
Business Location:				
South of Canal	37	21	34	92
Canal and North	30	22	31	83
First Learned of Freeway:				
Less than 1 year ago	14	15	17	46
1-4 years ago	22	14	17	53
5 or more years ago	25	10	18	53
Didn't know of freeway	5	4	12	21
Couldn't recall	1	0	1	2
Respondents' Residence:				
Within study area	14	12	21	47
Outside study area	53	31	44	128
Type of Business:				
Retail	24	20	29	73
Service	21	16	22	59
Wholesale/Mfg.	22	7	14	43
All Respondents	67	43	65	175

In an attempt to determine what design features might be usefully evaluated by non-technical persons, the respondents were queried about the following: freeway elevation, frontage roads, on-off ramps, and cross-overs. In relating these design features to business activities, these conclusions can be made: (1) a significant majority (85 percent) preferred a freeway with frontage roads to one without frontage roads; (2) the on-grade freeway design was preferred to either elevated above grade or depressed below grade design; and (3) there was a tendency for businessmen to prefer that on-off ramps and crossovers be spaced no more than six blocks apart. An examination of these results follows.

Not surprisingly, the freeway benefits to businessmen were perceived as being strongly related to the presence of service or frontage roads. Of the 175 respondents, 149 preferred frontage roads; only five preferred no frontage roads; and 21 had no preference. As an element of freeway design, the presence or absence of a frontage road is an item about which non-technical people can be expected to have definite opinions.

The element of design elevation, however, did not elicit such clear-cut responses. The distribution of the responses was as follows:

(1) 76 preferred an on-grade design;
(2) 30 preferred an elevated design;
(3) 22 preferred a depressed design; and
(4) 47 had no preference of design.

A closer examination of this distribution revealed a significant relationship between preferred designs and preferred proximity to a freeway. As seen in the following data, there was a tendency for those who wanted to be located nearer the freeway to prefer also the on-grade elevation. This may imply

Preferred Proximity to Freeway	Preferred Design Elevation				
	On Grade	Elevated	Depressed	No Preference	Total
	----------	----------	Number	----------	----------
Abutting ROW	26	6	6	8	46
2-3 blocks away	24	8	7	9	48
4-5 blocks away	9	3	2	4	18
6 or more blocks away	3	6	2	4	15
No preference	14	7	5	22	48
All Respondents	76	22	30	47	175

$\chi^2 = 21.90$; $\chi^2_{.95} = 21.03$; 12 d.f.

that the respondents tended to view an on-grade freeway as similar to a major arterial with respect to the access afforded the traffic stream to their places of business; what is critical to such access, however, is the presence of on-off ramps and frontage roads and not the design elevation of the facility itself. Another reason that businessmen might prefer an on-grade design is that it might enhance the on-sight advertising effectiveness of their businesses.

With regard to the frequency of on-off ramps and crossovers, the respondents tended to favor spacing distances of less than six blocks, while a large number of businessmen had no preference. The data suggest that the respondents tended to view the location of ramps and crossovers as a single

Preferred Frequency of Crossovers	Preferred Frequency of Ramps				
	2-3 Blocks Apart	4-5 Blocks Apart	6 or More Blocks Apart	No Preference	Total
	----------	----------	Number	----------	----------
2-3 blocks apart	18	10	4	1	33
4-5 blocks apart	16	14	10	0	40
6 or more blocks apart	9	13	13	3	38
No preference	10	8	4	42	64
All Respondents	53	45	31	46	175

$\chi^2 = 92.20$; $\chi^2_{.99} = 21.66$; 9 d.f.

design problem, i.e., closely spaced ramps accompanied by closely spaced crossovers and more widely spaced ramps accompanied by more widely spaced crossovers. The relatively large number of respondents that indicated no preference shows that these design elements are more difficult for the non-technical person to evaluate and decide upon than, for example, the presence of frontage roads.

DECISIONS AND EXPECTATIONS

The effects of a freeway upon a community cannot be examined fully unless attention is given to the time dimension associated with the distribution of freeway related impacts. With respect to the group being considered in this study, the businessmen in a proposed corridor, decisions could be affected by the freeway well before the location has been determined. Once the center-line for the road has been decided, a more discernible pattern of effects might emerge. Further, the taking of right-of-way would have definite, if selective, effects upon businessmen, as would the construction phase. Finally, the impact of the operations of the completed freeway would produce additional effects.

In the planning stages, the primary effects of the freeway are likely to be transmitted by the expectations or anticipations about future events as perceived by the businessmen. These expectations will be formed and acted upon as new information is obtained and old information is re-evaluated. Consequently, at the early stages of freeway development, the linkages from cause to effect are fairly tenuous.

In an attempt to identify some of the linkages among business decisions, expectations, and the time dimension of highway planning, businessmen in the Harrisburg corridor were questioned about the freeway and its effect upon their business decisions. It was expected that the businessmen in the area had not perceived, as yet, a significant need to change their behavior because of the proposed freeway. At the same time, however, they may have had definite expectations about future events accompanied by plans formulated on the basis of those expectations.

Business Decisions

When asked if they had already made some decisions about their business because of the proposed freeway, 85 percent replied negatively. Of the 21 whose business decisions had already been influenced by the planned freeway, 17 had locations south of Canal Street. The data show that a significant relationship between location of business and response existed. This probably reflects the fact that the oldest proposed location

Have Already Made Freeway-Induced Decisions	Location of Business South of Canal	Canal and North	Total
	---------Number---------		
Yes	17	4	21
No	72	76	148
No Opinion	3	3	6
All Respondents	92	83	175

$\chi^2 = 8.08$; $\chi^2_{.95}$ 5.99; 2 d.f.

lies in the southern part of the study area. Thus, these businessmen may have had anticipations that were significantly different from those of their counterparts in the Northern section. Also, part of the southern section had already experienced some right-of-way taking near the terminus of State Highway 225.[11] Among the types of business decisions that had been influenced by the freeway were choice of new business locations, postponing remodeling and repairs, and postponing new acquisitions of property.

In addition to their own decisions, businessmen were questioned about the freeway's effects upon other study area businessmen and residents.

[11]The affected area is bordered on the north by Lawndale Avenue. See Figure 2.

Specifically, they were asked if any places of business or residences had been vacated because of the proposed freeway. Only nine respondents indicated that they knew of businesses that had moved, and 14 reported knowledge of residents who had moved. Since the decision to relocate is one of the major freeway-related effects, the responses do not reflect the spectrum of possible effects. What is suggested, however, is that the magnitude of the freeway's effect upon people in the corridor at this relatively early stage has been small.

Although few of the businessmen (21) had already taken some action in response to early stage planning for the freeway, their expectations about future events may have led them to anticipate decisions that would be influenced by the proposed freeway. The respondents were asked what decisions they currently expected to be making sometime in the future as a result of freeway developments. A negative response was obtained from 123 businessmen who did not expect to make any decisions in regard to future freeway developments. Thirty-nine other respondents were less certain and felt that the freeway's location and the location of on-off ramps and frontage roads would determine what decisions they would make. Only 18 businessmen firmly expected to make major business decisions in response to freeway developments; 12 expected they would have to close their businesses.

The above pattern of responses implies that freeway developments, which have yet to occur, are not expected to have much direct bearing on the decisions businessmen will be making. This probably reflects the simultaneous interaction of two variables--expectations and uncertainty. Some businessmen may have arrived at a definite set of expectations about future freeway developments; evaluated those expectations; and concluded that their decisions

will not be significantly affected. In the second instance, other businessmen may be very uncertain about what they expect future developments to be. As a result of this uncertainty, they have no reason to think their activities will be affected. In either case, businessmen are unlikely to act upon freeway developments until those developments are clearly perceived and relatively iminent.

A hypothetical question is sometimes helpful in conceptualizing the possible effects of impending events. The respondents were asked what their decision would be in the event their business property was taken in right-of-way proceedings. The data in Table 10 show that 121 (69 percent) said they would continue their business at a new location; 73 of those 121 would relocate within the study area. Twenty-four stated that they would go out of business. Interestingly, only 21 had no opinion about what they would do. This further indicates that their decision processes respond to the immimence of the causal events. Whether the respondents would actually make the decisions indicated by their responses to this hypothetical situation cannot be determined. What is indicated by the data in Table 10, however, is that the responses were formulated on the basis of the perceived availability of alternative sites. Of the 73 businessmen who stated they would relocate in the study area, 52 knew of an existing site that would be suitable for relocation of their operations, while only four businessmen would relocate within the study area even though they knew of no suitable sites. For those who would decide to move outside the study area, an unavailability of sites within the area was perceived by 30 of the 48 respondents. Consequently, the extent to which actual decisions (that may have to be made in the future) do not correspond with the responses given in the hypothetical decision-situation will be partially determined by the future availability of relocation

Table 10

Expected Decisions and Available Relocation Sites

Expected Decision if Business is in R.O.W.	Suitable Relocation Site Within Study Area			
	Exists	Doesn't Exist	No Opinion	Total
	----------Number----------			
Relocate in area	52	4	17	73
Relocate outside area	13	30	5	48
Cease operations	10	11	3	24
Other	6	1	2	9
No Opinion	10	4	7	21
All Respondents	91	50	34	175

$\chi^2 = 53.87$; $\chi^2_{.99}$ 20.09; 8 d.f.

sites. If more (fewer) sites become available, more (fewer) businessmen would be expected to relocate within the study area.

Neighborhood Effects

Businessmen not only have sets of expectations about the effects of the freeway upon their own businesses; also they may have definite ideas about expected differential impacts of the construction and operation of a freeway upon the neighborhood.

In recent years, highway agencies have been evaluating highway projects with regard to several social, economic, and environmental factors. The Federal Highway Administration, in its Policy and Procedure Memorandum 20-8, specified a minimum of 23 factors that must be analyzed. Some of these 23 factors were presented to the respondents for their evaluation, and the results are summarized in Table 11.

Overall, a plurality of businessmen expected a detrimental impact in only two categories: noise and air pollution from motor vehicles. The items most difficult for the respondents to evaluate were the freeway's expected effects upon area drainage, criminal activity, park usage, and school operations. The most widely agreed upon areas of expected improvements were city and neighborhood travel, general neighborhood appearance, and emergency medical services.

Economic, social, and environmental impacts of a highway project are oftentimes reflected by changes in land use and real estate values. In these areas of interest, the businessmen in the Harrisburg corridor anticipated future increases in the overall value of the area's tax base, increases in land values, and probable increases in the values of residential

Table 11

Expected Freeway Effect Upon Selected Neighborhood Factors

Factor	Expected Effect			
	Would Be Improved	Would Be Worsened	Would Not Change	No Opinion
	Number			
Travel to other parts of Houston	161	2	7	5
General neighborhood appearance	133	7	18	17
Medical services (including ambulance)	117	4	37	17
Local neighborhood travel	103	25	26	21
Employment opportunity	89	5	58	23
Fire protection	86	7	60	22
Police protection	81	5	63	26
Motor vehicle accidents	75	40	30	30
Drainage	74	4	56	41
Crime	42	11	79	43
Vehicle exhaust pollution	35	61	54	25
Park Usage	30	7	86	52
School organization and convenience	28	21	79	47
Noise	25	77	63	10

properties (see Table 12). Part of the expected increase in the values of residential properties was due to an expected change in the land usage. Currently a residential area with intermixed commercial establishments and peripheral manufacturing, the study area was expected to become increasingly industrial after a freeway has been built. Part of the expected increase in residential values, then, may be the result of the market's reallocating land to a higher usage.

There was also general agreement among the respondents that higher density apartment houses were expected to alter the single-family residential characteristic that now dominates. To a lesser extent, the respondents also expected an increase in the number of retail and service firms in the Harrisburg area.

Table 12

Expected Freeway Effect Upon Land Usage and Values

Usage/Value	Expected Freeway Effect			
	Would Be Increased	Would Be Decreased	Would Not Change	No Opinion
	----------Number----------			
Number of single family dwellings	46	33	63	33
Number of apartment houses	105	7	26	37
Number of industrial firms	102	11	37	25
Number of retail firms	74	26	56	19
Number of service firms	63	19	65	28
Land values	140	5	11	19
Residential property	72	33	46	24
Taxable property base	93	16	18	48

A P P E N D I C E S

APPENDIX A

SAMPLING AND STATISTICAL ANALYSIS

A proportional, stratified sample was obtained from a list of all businesses that were operating within the study area during 1970. The list was compiled by the Texas Highway Department. The listed firms were given a precoded designation, for type of business, on the basis of their firm names (see Table B-1 for a description of type of business categories).

As shown in Table A-1, a ten percent proportional sample was designed. Each business category was systematically sampled using an interval and a random start. In the field, a similarly precoded (by type of business) alternate was used to replace the originally selected firm under the following conditions:

(1) if the originally selected firm had ceased operating in the study area;

(2) if the owner/manager of the originally selected firm could not be contacted or would not cooperate;

(3) if the originally selected firm was part of a multi-unit business, a unit of which already was represented in the sample;

(4) if the originally selected firm was part of a multi-unit business and was not being operated as a separate entity.

The selection of an alternate was based on geographical proximity to the originally selected business. The similarly precoded firm that was nearest the originally selected firm was chosen as the alternate, except that in (4) above, the controlling unit of the multi-unit firm was the selected alternate if it was also located in the study area and had not already been chosen. If the controlling firm either was outside the study area or had already been chosen, the geographical proximity rule applied.

Table A-1

Sample and Population, by Type of Business

Type of Business	Precoded Population	Designed Sample Proportion	Designed Sample Size	Actual Sample Proportion	Actual Sample Size
Retail	649	10.2	66	11.2	73
Service	549	10.2	56	10.7	59
Wholesale/Mfg.	512	10.3	53	8.4	43
All Businesses	1710	10.2	175	10.2	175

The data were collected using field interviewers and a pre-tested questionnaire. The interviewers were staff members of the Texas Transportation Institute who had also designed and pretested the questionnaire. The questionnaire utilized both free-response and multiple choice questions and was administered in a structured, personal interview with each of the 175 owner/managers. A copy of the questionnaire can be obtained from the Texas Transportation Institute.

After the interviews with the owners/managers were completed, the firms were reclassified according to their dominant type of sales - retail, service, or wholesale/manufacturing. The precoded and actual type of business were somewhat different (see Table A-1), and the analysis of the data was made using the actual firm type.

Two statistical tests are useful in analyzing the survey sample data. One of them, the χ^2 test, is used in the text. The χ^2 test[1] is applied to testing the compatability of actual and expected frequencies in two-way classifications, that is, in testing the hypothesis that there is no relationship between the two classifications. When computed χ^2 values exceed the χ^2 value for a chosen probability level, the hypothesis of independence is rejected. Such cases offer opportunities for positing theoretical relationships between the two classified entities.

The second statistical technique, inference, uses the normal distribution to determine confidence intervals for the parameter P, the proportion

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[1]The calculations of χ^2 were made using the procedure recommended in Li, Jerome, Statistical Inference I, (Ann Arbor, Michigan: Edwards Brothers, Inc.) 1964.

of the population having a certain attribute. The 95 percent confidence interval is defined as:

$$p - 1.96\sigma < P < p + 1.96\sigma, \text{ where}$$

$$\sigma = \sqrt{\frac{pq}{n}\left(1 - \frac{n}{N}\right)}, \text{ and}$$

p = the proportion of the sample having a certain attribute;

q = 1 - p;

n = 175, the size of the sample; and

N = 1710, the size of the population.

For convenient usage, the paired values for p and 1.96σ are presented in Figure A-1. The values for p are on the horizontal axis, and the values for 1.96σ are on the vertical axis. For a given p, the 95 percent confidence interval for P can be determined by adding to and subtracting from p the corresponding value of 1.96σ. For example, if p = 70, then 1.96σ = 6.45. The 95 percent confidence interval for P is 70±6.45 or 63.55 - 76.45. (The proportions have been multiplied by 100 to convert them into percentages.)

While no inferences about the population are made in the text of this report, the interested reader can easily apply Figure A-1 to any of the sample results that are presented.

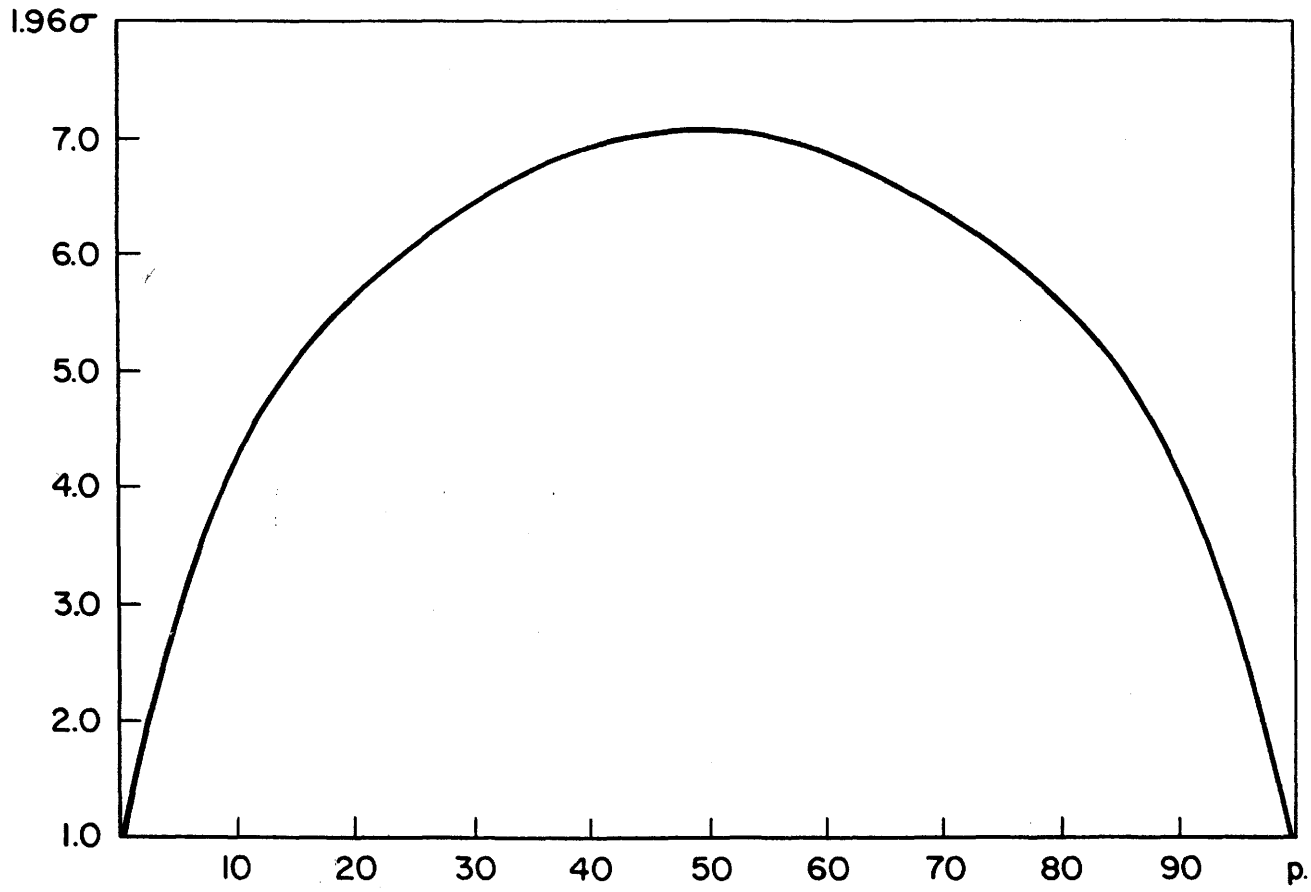

Figure A-1. The relationship between p and 1.96σ for 95 percent confidence intervals.

APPENDIX B

SUPPLEMENTAL DATA

Table B-1

Classification of Business
For the Harrisburg Freeway Corridor Study

Type of Business	Specific Type of Activity
Retail	Food
	Apparel and accessories
	Eating and drinking
	Service stations
	General merchandise
	Automotive sales (parts, new & used car dealers)
	Building materials, hardware, and farm equipment
	Furniture, home furnishings, and equipment
Services	Hotels, motels, and other lodging places
	Personal (barber shops, beauty salons, and cleaners)
	Repair shops (auto and other)
	Recreation (motion picture, and other)
	Medical (Doctors, Dentists, Clinics, etc.)
	Accountants and business services
	Legal (Lawyers, etc.)
	Transportation, electric, gas and sanitary and communication services
	Plumbers, electricians, etc.
	Miscellaneous
	Banking
	Credit agencies
	Insurance carriers, agents, and brokers
	Real Estate
	Contract construction
	Miscellaneous

Table B-1
(cont'd)

Type of Business	Specific Type of Activity
Wholesale and Manufacturing	Distribution
	Warehouses
	Food and kindred products
	Textile mill products
	Apparel and other finished products made from fabrics, etc.
	Lumber and wood products
	Paper, printing, publishing and allied industries
	Chemicals and allied products
	Petroleum refining and related industries
	Rubber and plastic products
	Leather and leather products
	Stone, clay and glass products
	Primary metal industries
	Fabricated metal products
	Machinery
	Transportation equipment
	Electrical equipment
	Miscellaneous

Table B-2

Preferred Freeway Location, by Type of Business

Preferred Location	Type of Business			
	Retail	Service	Wholesale/Mfg.	Total
	----------Number----------			
Harrisburg (S)	6	7	6	19
Canal (N)	6	3	2	11
Navigation (N)	6	4	2	12
Between MKT RR and Harrisburg (S)	2	1	1	4
Between Harrisburg and Canal (S)	16	13	15	44
Between Canal and Navigation (N)	3	0	1	4
Between Navigation and B. Bayou (N)	5	9	2	16
Other	12	8	4	24
No Opinion	17	14	10	41
All Businesses	73	59	43	175

(S) Included in general classification "South of Canal."

(N) Included in general classification "Canal and North."

Table B-3

Selected Demographic Characteristics of Respondents

Characteristic	Number of Respondents
Sex:	
Male	154
Female	21
Age:	
Less than 30 years old	18
30-39	28
40-49	51
50-59	40
60 or more years old	38
Education Level:	
Less than 9 years	26
9-12	82
More than 12 years	67
All Respondents	175

Table B-4

Interviewer Observations of Real Estate within 100 Yards of Sample Businesses

Observations	Percent of Business
Condition of Businesses:	
Excellent	5
Good	46
Fair	41
Poor	9
Condition of Residences:	
Excellent	27
Good	41
Fair	28
Poor	10
Number of Vacant Lots:	
None	85
1	9
2	1
3 or more	5
Number of Unoccupied Business Buildings:	
None	93
1	6
2	1
3 or more	0
Number of 1 or 2 Family Residences:	
None	36
1-4	36
5-10	18
11 or more	10
Number of Apartment Houses:	
None	83
1-4	13
5-10	2
11 or more	1
Evidence of Land Use Changes:	
Residential to apartment	1
Residential to commercial	25
Residential to industrial	8
Commercial to vacant	4
Others	6
None	58
Number of Businesses	(175)

Table B-5

Age, Type of Organization, and Number of Locations of Sample Businesses, by Type of Business

Characteristic	Type of Business			
	Retail	Service	Whse. or Mfg.	All Businesses
	----------Percent----------			
Age of Business[1] (years):				
Less than 5	21	9	43	13
5-9	16	11	12	13
10-19	21	19	23	21
20 or more	42	61	58	53
Number of businesses	(71)	(57)	(43)	(171)
Type of Organization				
Sole proprietorship	66	51	26	51
Partnership	7	7	2	6
Corporations or estates	27	42	72	43
Number of Locations				
1 location	79	81	77	79
2	11	8	12	11
3 or more	10	10	12	10
Number of Businesses	(73)	(59)	(43)	(175)

[1]The age of four businesses was not known.

Table B-6

Age of Main Building, Floor Space of Buildings, and Size and Frontage of Tract of Sample Businesses, by Type of Business

Characteristic	Type of Business			
	Retail	Service	Whse. or Mfg.	All Businesses
	----------Percent----------			
Age of Main Building (years):				
Less than 5 years	3	6	0	3
5-9	6	10	18	10
10-19	21	22	29	23
20-29	27	25	32	28
30 or more	42	37	21	35
Number of businesses[1]	(66)	(51)	(38)	(155)
Floor Space of Buildings (sq. ft.):				
Less than 1,000	27	26	2	21
1,000 - 1,999	22	9	2	13
2,000 - 2,999	12	10	5	10
3,000 - 4,999	18	17	9	16
5,000 - 9,999	4	10	21	10
10,000 or more	16	28	60	31
Number of businesses[2]	(73)	(58)	(43)	(174)
Size of Tract (sq. ft.):				
Less than 5,000	25	25	12	21
5,000 - 9,999	33	25	16	26
10,000 - 19,999	19	16	9	15
20,000 - 49,999	16	23	30	22
50,000 or more	7	11	33	15
Number of businesses[3]	(69)	(56)	(43)	(168)
Frontage of Tract (feet):				
Less than 50	24	19	2	17
50 - 99	26	32	21	27
100 - 149	25	17	31	24
150 - 249	19	15	17	17
250 or more	5	17	28	15
Number of businesses[4]	(72)	(59)	(42)	(173)

[1]Twenty didn't know the age of main building.

[2]One didn't know the floor space of the buildings.

[3]Seven didn't know the size of the tract.

[4]Two didn't know the frontage of the tract.

Table B-7

Value of Property, Change in Value of Property, Degree of Property Ownership, Monthly Rent, and Change in Monthly Rent of Sample Businesses, by Type of Property

Characteristic	Type of Business			
	Retail	Service	Whse. or Mfg.	All Businesses
	----------Percent----------			
Value of Property				
Less than $20,000	19	15	7	14
$20,000 - $49,999	33	35	14	28
$50,000 - $99,999	28	19	14	21
$100,000 - $199,999	11	19	21	17
$200,000 - $499,999	6	8	25	12
$500,000 or more	3	4	18	8
Number of businesses[1]	(36)	(26)	(28)	(90)
Change in Value of Property				
Increased	65	77	64	69
Decreased	11	5	3	7
Unchanged	24	17	32	24
Number of businesses[2]	(54)	(40)	(31)	(125)
Degree of Property Ownership				
Owner	45	54	56	51
Renter	55	46	44	49
Number of businesses	(73)	(59)	(43)	175)
Monthly Rent				
Less than $100	12	28	6	16
$100 - $199	47	28	12	32
$200 - $299	19	20	12	17
$300 - $399	6	4	12	7
$400 - $499	6	8	19	9
$500 or more	9	12	37	16
Number of businesses[3]	(32)	(25)	(16)	(73)
Change in Rent				
Increased	31	20	59	40
Decreased	3	5	12	6
Unchanged	66	75	29	59
Number of businesses[4]	(32)	(20)	(17)	(69)

[1]Eighty-five didn't estimate the value of their property.

[2]Fifty didn't know whether the value of their property had changed in the last five years.

[3]One hundred two either did not rent or refused to give their monthly rent.

[4]One hundred six either did not rent or didn't know whether the rent had changed in the last five years.

Table B-8

Values of Equipment, Payroll, and Sales,
by Type of Business

Characteristic	Type of Business			
	Retail	Service	Whse. or Mfg.	All Businesses
Estimated Market Value of Equipment	----------Percent----------			
Less than $10,000	55	42	12	39
$10,000 - $49,999	22	29	27	26
$50,000 - $99,999	3	6	12	7
$100,000 - $199,999	7	8	25	12
$200,000 - $499,999	2	4	7	4
$500,000 or more	3	6	15	7
Number of businesses[1]	(58)	(52)	(40)	(150)
Monthly Payroll				
Less than $5,000	77	58	33	60
$5,000 - $9,999	17	17	13	16
$10,000 - $19,999	0	13	15	8
$20,000 - $49,999	5	4	31	11
$50,000 or more	2	8	8	5
Number of businesses[2]	(64)	(53)	(39)	(156)
Annual Gross Sales				
Less than $10,000	13	18	0	11
$10,000 - $19,999	23	4	2	11
$20,000 - $49,999	3	20	7	10
$50,000 - $99,999	14	14	5	12
$100,000 - $149,999	10	0	9	6
$150,000 - $199,999	6	6	5	6
$200,000 - $299,999	6	12	7	8
$300,000 - $399,999	2	8	9	6
$500,000 or more	23	20	55	30
Number of businesses[3]	(62)	(51)	(42)	(155)
Change in Gross Sales				
Increased	46	53	72	55
Decreased	15	11	2	10
Unchanged	39	36	26	35
Number of businesses[4]	(59)	(55)	(43)	(157)

[1]Twenty-five did not estimate a value.

[2]Most recent monthly payroll. Nineteen declined to give such data.

[3]Based on 1970 gross sales. Twenty either declined or had less than one year of sales.

[4]Based on last five years. Eighteen either declined or had less than five years of sales.