

1. Report No. FHWA/TX-80/15+225-18		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Land Use Impact of Improving State Highway 356 in a Developing Area of Dallas, Texas				5. Report Date May 1980	
				6. Performing Organization Code	
7. Author(s) Pamela J. Cosby and Jesse L. Buffington				8. Performing Organization Report No. Research Report 225-18	
9. Performing Organization Name and Address Texas Transportation Institute The Texas A&M University System College Station, Texas 77843				10. Work Unit No.	
				11. Contract or Grant No. Research Study 2-8-77-225	
12. Sponsoring Agency Name and Address State Department of Highways and Public Transportation 11th and Brazos Streets Austin, Texas 78701				13. Type of Report and Period Covered Interim - September 1976- May 1980	
				14. Sponsoring Agency Code	
15. Supplementary Notes Research performed in cooperation with DOT, FHWA, and SDHPT. Research Study Title: Economics of Highway Design Alternatives					
16. Abstract Previous studies of highway construction effects on land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the land use effects of such improvements. This report relates the findings of research done in Dallas, Texas, where a section of State Highway 356 (Irving Boulevard) was upgraded. Part of this section of State Highway 356 (SH 356) was previously two lanes with paved shoulders and open ditches. The remainder of this section of SH 356 was four-lane with a gravel median and open ditches. The improvement changed the whole section to a six-lane facility with left turn lanes, paved shoulders and curbs and gutters. Access roads run parallel to part of this section of SH 356. The improvement took place in a developing area where the predominant types of development were commercial and industrial. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the road improvement. Data were collected for a period including four years before planning for this specific improvement began and all the years since through 1978. Total acreage in each type of land use was determined for 1958 and 1961, which were before formal planning began, and 1967 and 1978 which were both after the road improvement was completed. Comparisons were made between the before and after types and rates of development. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the street improvement were also researched and are reported. Highway planners should be able to use this report and subsequent reports of this study to make more accurate predictions of land use changes due to specific highway improvements.					
17. Key Words Highways, impact, land use, abutting and nonabutting property			18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service Springfield, Virginia 22161		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages	22. Price

LAND USE IMPACT OF IMPROVING STATE HIGHWAY 356  
IN A DEVELOPING AREA OF DALLAS, TEXAS

by

Pamela J. Cosby  
Research Associate

Jesse L. Buffington  
Research Economist

Research Report 225-18  
Research Study Number 2-8-778-225  
Economics of Highway Design Alternatives

Sponsored by  
State Department of Highways  
and Public Transportation

in Cooperation with the  
Federal Highway Administration  
U.S. Department of Transportation

May 1980

Texas Transportation Institute  
The Texas A&M University System  
College Station, Texas

## PREFACE

The authors wish to express appreciation to those who have assisted in this study. Special thanks are due Mr. James W. Barr and Mr. James R. Farrar of the Texas State Department of Highways and Public Transportation (SDHPT). Mr. Bill Buglehall, Mr. Don Walden, and Mr. Arnold Breeden of the Dallas/Fort Worth Regional Planning Office of the SDHPT in Grand Prairie were particularly helpful in supplying data and providing assistance. Mr. John Keller, Mr. Frank Fallwell, Mr. Henry Grann, and Mr. W. C. Gromatzky of District 18 of the SDHPT were all extremely helpful and most cooperative in providing information.

Numerous officials with the City of Dallas also assisted. Among those were: Mr. Monroe McCorkle, Mr. Fred Timm, Mr. John Kimbrough, Mr. Doug Waskom, Ms. Susan Murphy, Mr. Rod Kelly, Mr. James Schroder, Jr., Ms. Pamela Bonnell, and Mr. Jim Prince. The authors are grateful for their help and courtesy. Mr. Jimmy Deford with Dallas County and numerous business people and residents also were most helpful in granting interviews and supplying information.

Members of the Texas Transportation Institute have been most supportive and have offered suggestions and encouragement. Ms. Katie Womack's efforts in securing land use and other data are very much appreciated. Mr. Eric Schulte very skillfully prepared the maps and other graphics. Special assistance was provided by Ms. Karen Spohr in typing the manuscript.

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented within. The contents do not necessarily reflect the official views of the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

## ABSTRACT

Previous studies of highway construction effects on land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the land use effects of such improvements. This report relates the findings of research done in Dallas, Texas, where a section of State Highway 356 (Irving Boulevard) was upgraded. Part of this section of State Highway 356 (SH 356) was previously two lanes with paved shoulders and open ditches. The remainder of this section of SH 356 was four-lane with a gravel median and open ditches. The improvement changed the whole section to a six-lane facility with left turn lanes, paved shoulders and curbs and gutters. Access roads run parallel to part of this section of SH 356. The improvement took place in a developing area where the predominant types of development were commercial and industrial. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the road improvement. Data were collected for a period including four years before planning for this specific improvement began and all the years since through 1978. Total acreage in each type of land use was determined for 1958 and 1961, which were before formal planning began, and 1967 and 1978 which were both after the road improvement was completed. Comparisons were made between the before and after types and rates of development. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the street improvement were also researched and are reported. Highway planners should be able to use this report and subsequent reports of this study to make more accurate predictions of land use changes due to specific highway improvements.

## SUMMARY OF FINDINGS

Data were collected and analyzed for the State Highway 356 (SH 356) study area in Dallas, Texas, to examine the impact upon land use of improving the road. The two and one-third mile long section that this study focuses upon was changed to a six-lane facility with left turn lanes, paved shoulders, and curbs and gutters. It previously was partly two lanes with paved shoulders and open ditches and partly four lanes with a gravel median and open ditches. Data were collected for 1958, which was four years prior to formal planning for this project; 1961, the year immediately before formal planning began; 1967, the first year after construction was completed; and 1978, the year in which data collection took place. The period from 1958 to 1961 is called the *before period*. The years from 1961 to 1967 make up the *short-run after period*. The *long-run after period* is 1967 to 1978.

The findings are summarized as follows:

1. The road improvement took place in an area northwest of downtown Dallas.
  - a. The area was classified as a developing one throughout the years of study.
    - (1) The total area was 30 percent developed in 1959, the first study year.
    - (2) Eighty-seven percent of the total study area was developed in 1978, the last study year.
  - b. The predominant types of development have remained commercial and industrial throughout the years of study.
2. Properties abutting SH 356 have experienced a great amount of change.

- a. Abutting commercial use has increased from 25.98 acres to 198.14 acres (663 percent).
  - b. Industrial use on abutting land increased from 26.64 acres to 91.11 acres (242 percent).
  - c. Single family residential use decreased from only 0.18 acres to none.
  - d. Street and railroad acreage increased from 39.65 acres to 61.38 acres (55 percent).
  - e. Only three percent of abutting land remained undeveloped in 1978.
3. Nonabutting land also underwent extensive land use change.
- a. Commercial acreage increased dramatically from 23.24 acres to 207.82 acres (794 percent).
  - b. Industrial use on nonabutting land expanded from 23.01 acres to 76.11 acres (231 percent).
  - c. Multiple family residential and public/semi-public acreages rose slightly but stayed at very low levels compared to commercial and industrial uses.
  - d. Nonabutting single family residential acreage decreased from 25.02 acres to 14.01 acres (44 percent).
  - e. Street and railroad acreage increased from 111.95 acres to 146.12 acres (31 percent).
  - f. Twenty-six percent of nonabutting land remained unimproved in 1978.
4. The period of the greatest rate of change was the *before period* for both abutting and nonabutting land.

- a. The average annual rate of change for abutting land was 5.128 percent in the *before period* as compared to 4.380 percent in the *short-run after period*, and 2.714 percent in the *long-run after period*.
  - b. The average annual rate of change for nonabutting land was 3.456 percent in the *before period*, 2.113 percent in the *short-run after period*, and 2.846 in the *long-run after period*.
5. The road improvement is judged to have been a positive factor in attracting development to the area.
- a. Although rates of change were higher in the period before the road improvement occurred, development did continue at a steady pace in the after periods although less undeveloped land was available.
  - b. People who were familiar with this area and the land use changes that have taken place generally stated that the improved road had helped attract development.
6. The changes that took place were in accord with land use plans and zoning.

## IMPLEMENTATION STATEMENT

This report relates the findings of a case study on land use changes that have occurred after an existing street was improved. The findings can be implemented immediately by highway agencies in predicting what would happen as a result of a similar street improvement in a comparable area elsewhere.

This case study is one of several being done in Texas cities. The predictive capabilities will be increased after analysis and comparison of data from all areas is accomplished. Those findings will be described in other reports.



METRIC CONVERSION FACTORS  
RELEVANT TO THIS REPORT

Approximate Conversions to Metric Measures

<u>U.S. Customary Units Used in Report</u>		<u>Factor (multiply by)</u>		<u>Metric Equivalents</u>
acres	x	0.4	=	hectares
miles	x	1.6	=	kilometers
feet	x	0.3	=	meters

TABLE OF CONTENTS

	<u>Page</u>
PREFACE . . . . .	i
ABSTRACT. . . . .	ii
SUMMARY OF FINDINGS . . . . .	iii
IMPLEMENTATION STATEMENT. . . . .	vi
METRIC CONVERSION FACTORS RELEVANT TO THIS REPORT . . . . .	vii
TABLE OF CONTENTS . . . . .	viii
LIST OF TABLES. . . . .	ix
LIST OF FIGURES . . . . .	x
INTRODUCTION. . . . .	1
Purpose and Objective of Study . . . . .	1
Method of Study. . . . .	2
Location of the Road Improvement . . . . .	2
Key Characteristics of Study Area. . . . .	5
Sources of Data. . . . .	7
Definitions. . . . .	8
CHARACTERISTICS OF AREA STREETS AND ROADS BEFORE AND AFTER IMPROVEMENT OF SH 356 . . . . .	9
Parallel Roads . . . . .	13
Intersecting Roads . . . . .	13
CHARACTERISTICS OF THE STUDY AREA BEFORE AND AFTER IMPROVEMENT OF STATE HIGHWAY 356. . . . .	14
Size and Boundaries of the Study Area. . . . .	14
Land Use Changes . . . . .	14
Proximity to Collins Street. . . . .	20
<i>Abutting Properties</i> . . . . .	20
<i>Nonabutting Properties</i> . . . . .	22
Land Use Controls and Plans. . . . .	25
Socio-Economic Characteristics . . . . .	27
IMPACT OF HIGHWAY IMPROVEMENT ON LAND USE IN THE STUDY AREA . . . . .	30
Effects on Abutting and Nonabutting Land . . . . .	30
<i>Abutting Property</i> . . . . .	30
<i>Nonabutting Properties</i> . . . . .	33
Opinions of Knowledgeable People . . . . .	33
Conclusions. . . . .	34

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Population and Percentage Change in Population for Dallas, Fort Worth, and the SMSA . . . . .	6
2	Twenty-Four Hour Traffic Counts on State Highway 356 and Other Parallel and Intersecting Streets. . . . .	12
3	Changes in Land Use of All Properties by Time Period and Year . . . . .	19
4	Changes in Land Use of Abutting Properties by Time Period and Year. . . . .	21
5	Changes in Land Use of Nonabutting Properties by Time Period and Year. . . . .	24
6	Comparison of 1960 and 1970 Socio-Economic Characteristics of Census Tract 100 to Dallas and the Dallas SMSA. . . . .	28
7	Absolute Changes in Land Use of Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change . . . . .	31
8	Average Annual Percentage Changes in Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change . . . . .	32

LIST OF FIGURES

<u>Figures</u>		<u>Page</u>
1	Map of Dallas Showing the Location of the State Highway 356 Study Area . . . . .	10
2	Design of State Highway 356 Before and After Improvement . .	11
3	Land Use in the State Highway 356 Study Area in 1958 . . . .	15
4	Land Use in the State Highway 356 Study Area in 1961 . . . .	16
5	Land Use in the State Highway 356 Study Area in 1967 . . . .	17
6	Land Use in the State Highway 356 Study Area in 1978 . . . .	18
7	Changes in Abutting Land Uses in the State Highway 356 Study Area . . . . .	23
8	Changes in Nonabutting Land Uses in the State Highway 356 Study Area . . . . .	26

## INTRODUCTION

### Purpose and Objective of Study

The near completion of the Interstate Highway System, the completion of many urban freeways, and the increasing shortage of funds for future highway construction have caused state highway agencies to concentrate on upgrading and increasing the capacity of existing streets and highways. Much research has been conducted in the past to learn the impact of new highway construction, but little has been done to indicate what happens when an existing highway is upgraded. In order to optimize public benefits, highway agencies need information of this kind to help predict the consequences of improvement of an existing facility.

One important impact of any highway construction is the changes that occur in adjacent land use. The overall purpose of this study is to determine land use changes in areas where an existing highway or street has been improved. This report presents the findings of investigation in an area of Dallas, Texas, where a section of State Highway 356 (SH 356) was improved. Areas with other types of improvements and areas in varying stages of development with different types of predominant land use when improvement began have been studied or are under study. Reports of findings in those areas are available or are forthcoming.

Objectives of this study are as follows:

- (1) To determine the initial and long-range land use impacts of different highway design changes on existing highways with a minimum of data collection.

- (2) To determine traffic volume changes resulting from various types of improvements.

### Method of Study

A "before and after" approach was employed in this study to discover land use changes in the SH 356 study area. Since land use could have been affected by anticipation of a better roadway, data were collected for a time well before the improvement of this facility began (the applicable time periods are defined in the Definitions Section).

Land use data were collected for 1958 and 1961, the two *before* years and for 1967 and 1978, the *after* years. On-site inspections aided in identifying the correct land uses.

The land was divided into abutting and nonabutting properties. Abutting properties were defined as those with frontage on SH 356. On undeveloped tracts, a section extending back 300 feet from SH 356 was designated as abutting. Land use changes and rates of land development were determined for each category to facilitate comparison.

To determine reasons underlying the land use changes in the area, several knowledgeable people were interviewed. Real estate salespeople and developers provided information on land developments. City officials who were familiar with the area also provided information about land use changes. Other factors which might have influenced land use changes were also investigated. Among these were: traffic volumes, population, and incomes in the area.

### Location of the Road Improvement

The improved portion of SH 356 is located within the city limits of Dallas, west of the Central Business District. Dallas is located in Dallas

County one of eleven counties making up the Dallas/Fort Worth Standard Metropolitan Statistical Area (SMSA). Due to the interdependence between cities and counties in the SMSA, a brief discussion of the SMSA as a whole is presented with some specific details about Dallas included.

Although the Dallas/Fort Worth SMSA grew at an estimated 8.7 percent between 1970 and 1976, this was somewhat less than the 11.5 percent rate of growth for the state.<sup>1</sup> The cities of Dallas and Fort Worth both lost several residents through out migration to the smaller communities in the SMSA.

The economy of the Dallas/Fort Worth SMSA is well balanced in the areas of manufacturing, trade, transportation, finance, services, and real estate. Manufacturing, the largest contributor to personal income, is comprised primarily of light industry such as electronics, aircraft, apparel, oil-field equipment, food processing, automotive transportation, printing and publishing, and nonelectrical equipment.

The second largest contributor to personal income in the Dallas/Fort Worth area is the wholesale and retail trade sector. Numerous shopping centers, including several regional malls (with greater than 50,000 square feet), are located in the SMSA. Among the many large retail firms is Dallas' original Neiman-Marcus department store, one of the world's best known and most unusual. This area is also the heart of an eleven state wholesale market and distribution network. At the center of the Dallas/Fort Worth wholesale business is the Dallas Market which is the largest wholesale merchandising complex

---

<sup>1</sup>Information on the Dallas/Fort Worth SMSA is from: Austin, Joanne P. "Dallas-Fort Worth: The Southwest Metroplex," Texas Business Review, September 1978.

located at one site in the world. Buyers from all fifty states and approximately 25 foreign countries come to choose from merchandise ranging from wearing apparel to toys and home furnishings. Dallas is ranked number one nationally as a market for summer and winter home furnishings, gifts and floor coverings; number one as a regional toy market; and second as a national apparel market.

Despite the fact that Dallas/Fort Worth has no inland waterway, it is a major crossroad for nearly all types of domestic and international shipping and is the major point of intersection of routes from New York, Los Angeles, Chicago, and Mexico City. In addition to several interstate, state, and federal highways, the area is served by ten railroads, forty-five common carriers, and five major bus lines. But perhaps the primary factor in the transportation network of Dallas/Fort Worth is the Dallas/Fort Worth Regional Airport that opened in January 1974. The airport is the largest in the nation and is reported to be the third busiest handler of scheduled air carrier operations in the world.

The services sector of the economy of Dallas/Fort Worth is also very important with conventions and tourism rated as two of the area's most important industries. The most popular tourist attraction is Six Flags Over Texas, which bypassed the Alamo in 1963 as the number one tourist attraction in Texas. Other attractions include professional and intercollegiate sports, the Texas State Fair, museums, fine restaurants, and excellent shopping facilities. Dallas has been rated first nationally in total number of meetings held in the city. Both Dallas and Fort Worth have large convention centers, exhibit space, and hotel rooms that attract the convention business. Service income is also generated by health and educational facilities including seven



private four-year colleges, one private junior college, and the Baylor University schools of nursing and dentistry.

The finance, insurance, and real estate sector is also very important in the SMSA. Among the over 200 commercial banks in the area are the two largest banks in Texas, located in Dallas. The area has long been recognized as the financial center of the state. The Dallas/Fort Worth area is also the state's leading insurance center with more than 260 insurance companies.

The population of Dallas, as well as that of Fort Worth, increased greatly between 1950 and 1970 (Table 1). According to the Bureau of the Census, the population of both cities then declined between 1970 and 1975 before again increasing by 1977. The metropolitan area as a whole did not lose population and has continued to grow. (The separate Dallas and Fort Worth SMSA's were combined into one SMSA after the 1970 census was taken.) Much of the growth has been in the smaller cities surrounding Dallas and Fort Worth.

#### Key Characteristics of Study Area

The study area is one of eighteen study sites chosen for analysis of land use changes relative to street improvements. The study areas were chosen according to the following characteristics:

- (1) Stage of area development before the improvement,
- (2) Type of highway or street design change,
- (3) Predominant land use before the improvement, and
- (4) Type of setting (urban or suburban).

Using these characteristics, different types of study sites have been selected that will permit analyses of various design changes and the resulting impacts on land use.

Table 1. Population and Percentage Change in Population for Dallas, Fort Worth, and the SMSA<sup>a</sup>

	1950	Change and % Change 1950-1960	1960	Change and % Change 1960-1970	1970	Change and % Change 1970-1975	1975	Change and % Change 1975-1977	1977
Dallas	434,462	245,222 56%	679,684	164,717 24%	844,401	31,604 -4%	812,797	31,731 4%	844,528
Dallas SMSA	614,799	468,802 76%	1,083,601	472,533 44%	1,556,134	-	b	b	b
Fort Worth	278,778	77,490 28%	356,268	37,208 10%	393,476	35,112 -9%	358,364	9,629 3%	367,993
Fort Worth SMSA	361,253	211,962 59%	573,215	188,870 33%	762,085	-	b	b	b
Dallas-Fort Worth SMSA	b	-	b	-	2,378,353	158,595 7%	2,536,948	136,252 5%	2,623,200

<sup>a</sup>Data from the Bureau of the Census, U.S. Department of Commerce Publications.  
<sup>b</sup>Prior to 1970, the Dallas and Fort Worth SMSA's were separate. After the 1970 Census Count, one area was designated as the Dallas-Fort Worth SMSA combining the two separate SMSA's plus some additional territory.

Since the SH 356 area was 30 percent improved in 1958 and 42 percent improved in 1961, the stage of development before the improvement began was *developing*.<sup>2</sup> The primary types of development were commercial and industrial. The improvement is located inside of the Dallas city limits.

#### Sources of Data

The source of information on the design change and construction dates of the road improvement was the District 18 Office of the SDHPT in Dallas. Data on the planning and justification of the design change were provided by personnel of the District Office and from planners with the City of Dallas.

The Dallas-Fort Worth Regional Planning Office of the SDHPT in Grand Prairie was the major source of land use information. The City of Dallas Planning Office also provided some land use data and data on zoning. The U.S. Soil Conservation Service Office in Dallas also contributed to the collection of land use data by making aerial maps available. On-site inspection and city directories helped determine the correct land uses. Interviews with real estate developers, SDHPT personnel, city planners and other city officials, county officials, area residents, and property owners also provided background information on land use and plans for the road improvement.

---

<sup>2</sup>The percentage of total land area already improved with buildings, parks, roads, and streets is used to determine which stage of development the study area falls within. The three stages of development defined in this manner are: *undeveloped* - 0 to 10% improved, *developing* - 10% to 80% improved, and *developed* - 80% to 100% improved.

Traffic volume data were obtained from the State Department of Highways and Public Transportation and the City of Dallas. The U.S. Census was the source of population and other socioeconomic data.

### Definitions

The following land use categories and time periods were used in this study:

Single-Family Residential - tract improved with occupiable house for one family.

Multiple-Family Residential - tract improved with duplex or apartment complexes designed to house two or more families.

Commercial - tract improved with a commercial business.

Public/Semi-Public - tract improved with a governmental office, park, public-owned utility, church, or other non-profit organization.

Industrial - tract improved for manufacturing, product storage, etc.

Streets and Roads - land improved with a street or road; includes land dedicated as right-of-way.

Unimproved - land which has not been developed for any particular use; also includes previously developed land that is presently vacant or unused and land used for agricultural purposes.

Time periods used in the analysis area as follows:

Before Period - the period from 1958 to 1961 which ends the year before planning for the road improvement began.

Short-Run After Period - the period which includes changes that occurred since the end of 1961 through 1967. This period includes the construction years.

Long-Run After Period - the period which includes changes that occurred since the end of 1967 through 1978.

CHARACTERISTICS OF AREA STREETS AND ROADS  
BEFORE AND AFTER IMPROVEMENT OF SH 356

State Highway 356 (SH 356) is a major east-west arterial in Dallas as shown in Figure 1. It begins at the intersection of Interstate 35 and U.S. 77 and continues west through Irving, Texas. The section of SH 356 that this study concentrates upon begins at Woodall Street, which is just southwest of Interstate 35, and continues west to the Trinity River.

Part of this section of SH 356, which is approximately two and one-third miles long, was previously two lanes with paved shoulders and open ditches. The remainder of this section was previously four lanes with a gravel median and open ditches (Figure 2). The improvement changed the whole section to a six lane facility with a raised median, protected left turn lanes, paved shoulders and curbs and gutters. Investigation, planning, and engineering began in 1962. The contract was let in 1965, and the construction was completed in January 1967. No right-of-way had to be acquired.

Twenty-four hour traffic counts shown in Table 2 give an indication of how traffic has increased on SH 356 and on parallel and intersecting roads in the area. Traffic counts on SH 356 fluctuated before planning for the improvement began. A count for a location east of Mockingbird Lane changed from 14,570 vehicles per day in 1955, to a high of 19,750 in 1957, back down to 18,300 in 1958, and still lower at 17,490 in 1960. The counts fluctuated somewhat in the *short-run after period*, 1961 to 1967, but generally increased from just over 21,000 to just over 24,000. Counts also fluctuated in the *long-run after period* but generally increased from just over 24,000 vehicles per day to 30,000. Counts at a point just east of the Trinity River, which forms the western boundary of the study area, were lower than those in the eastern end of the study area (Table 2).

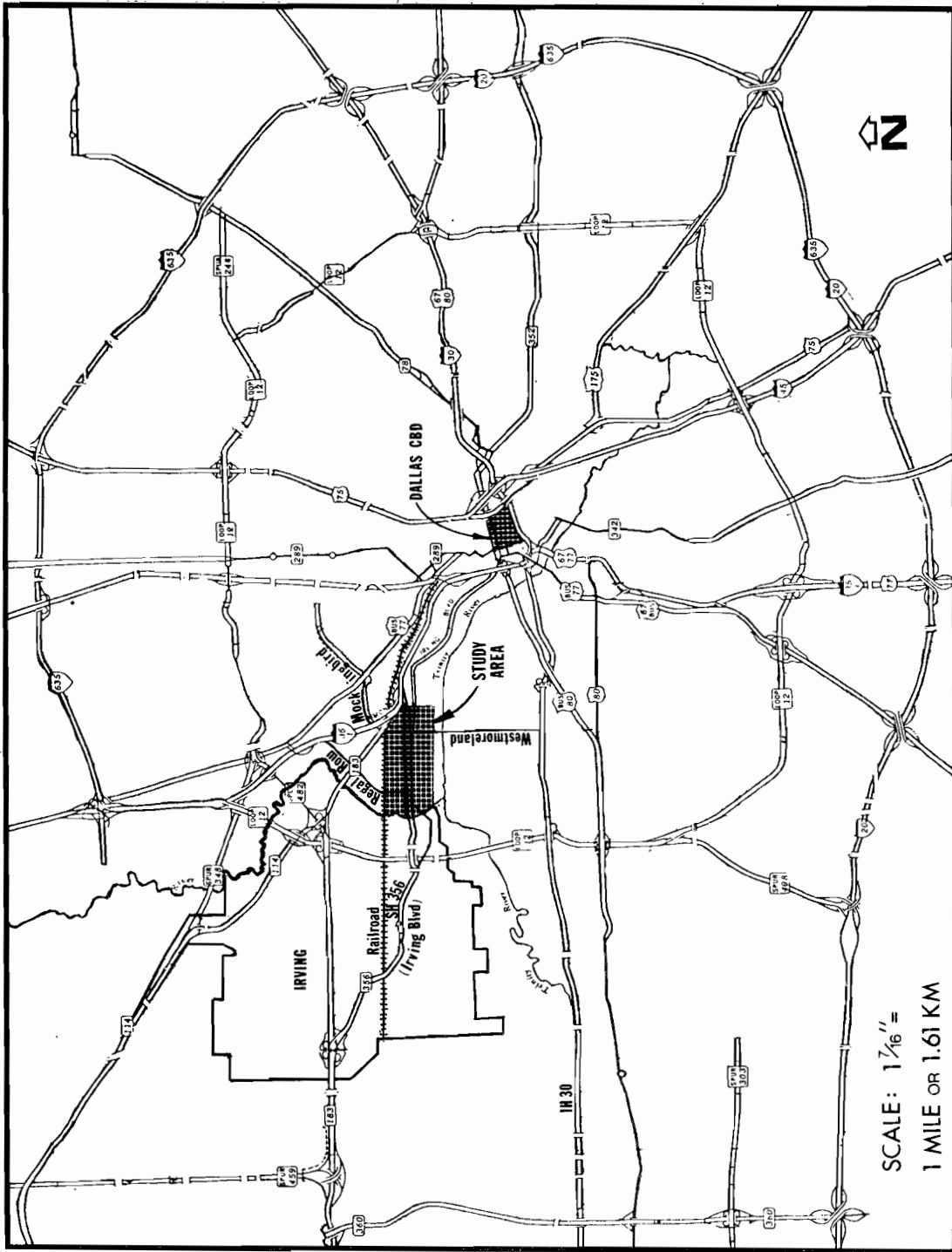
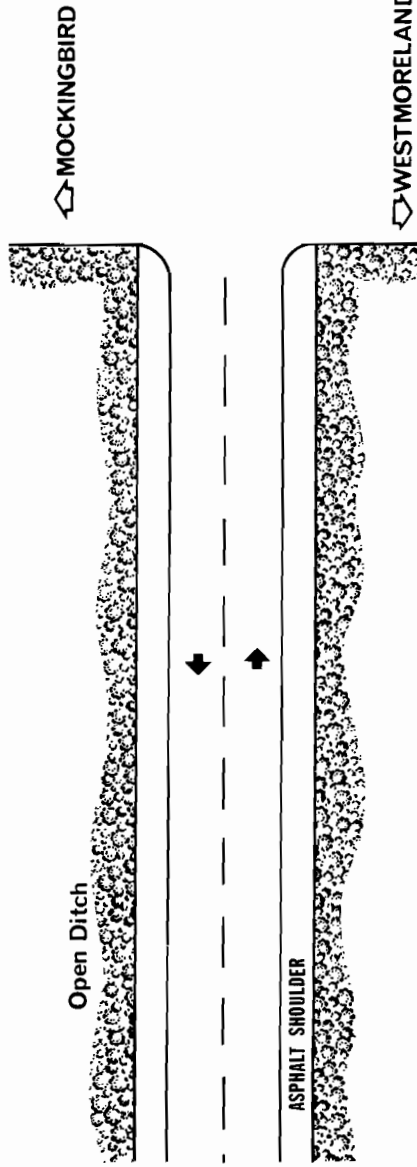


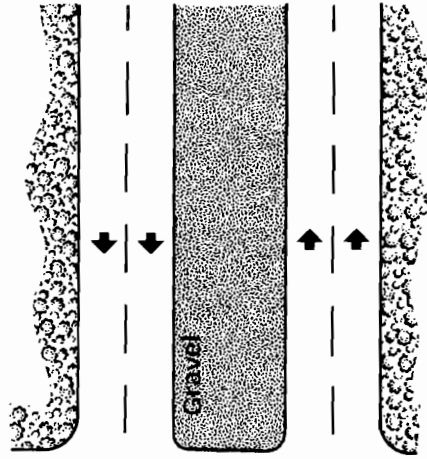
Figure 1. Map of Dallas Showing the Location of the State Highway 356 Study Area

## Before Period Design

SEGMENT 2



SEGMENT 1



## After Period Design

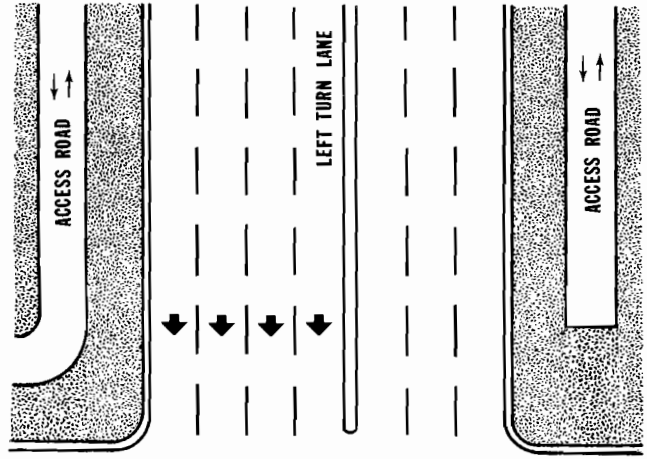
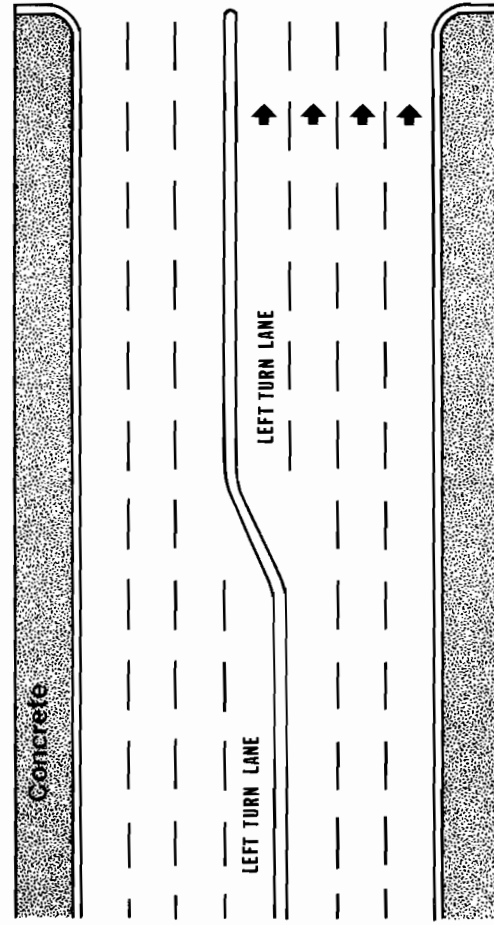


Figure 2. Design of State Highway 356 Before and After Improvement

Table 2. Twenty-Four Hour Traffic Counts on West Berry Street and Other Parallel and Intersecting Streets

Location of Traffic Count	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
STUDY ROUTE State Highway 356 East of the Trinity River East of Mockingbird Lane		13,990		18,300		11,890		13,040	13,560	14,340	14,820	15,690	19,980	21,380	22,890	21,440	17,560	18,300	17,760	17,680	20,870	20,750	19,670	21,720
		14,570	15,820	19,750		17,490		21,140	18,520	20,770	21,250	23,300	24,220	25,840	27,350	25,750	26,500	29,180	30,060	29,660	29,540	29,450	28,340	30,000
						15,640		21,510	23,910	28,890	31,120	36,200	42,370	43,840	46,620	46,750	53,750	57,370	58,390	63,790	68,440	69,560	72,960	79,910
PARALLEL ROADS John Carpenter Freeway West of Regal Row Canada Drive East of Mockingbird Lane Singleton Boulevard East of Mockingbird Lane West of Mockingbird Lane																			6,914					
													12,989				12,954		13,628					
									11,807						11,503		10,897				10,071			
INTERSECTING STREETS Mockingbird Lane North of SH 356 South of SH 356 Regal Row Northeast of Viscount Drive Northeast of Chancellor									9,344	23,914	24,080					14,550	21,352		16,079	27,937	14,929			29,416
																				9,064				14,984
																								12,848



### Parallel Roads

In the early 1960's, John Carpenter Freeway, which is north of State Highway 356, had approximately the same amount of traffic as the eastern part of the study section of SH 356. However, the counts on Carpenter Freeway soon accelerated and were over twice the count for SH 356 by 1971. In 1978, almost 80,000 vehicles traversed a section of Carpenter Freeway that runs approximately parallel to SH 356. This freeway, which is an alternate route for SH 356 in some cases, probably attracted part of the traffic that otherwise would have used SH 356.

Canada Drive and Singleton Boulevard, which are south and parallel to SH 356, have had much lower traffic volumes than SH 356. But since the traffic volumes on Singleton Boulevard have been lower and have not increased, it is doubtful that very much traffic has been drawn away from SH 356.

### Intersecting Roads

Mockingbird Lane (also called Westmoreland Road) is the most heavily traveled road that intersects the study section of SH 356. The section of Mockingbird Lane which is north of SH 356 has much higher counts than the southern section (Table 2). This indicates that Mockingbird is carrying a great deal of traffic that is turning on to SH 356. Regal Row intersects SH 356 in the western end of the study area. Very few traffic counts were available for Regal Row, however, it appears to carry much less traffic than Mockingbird Lane.

## CHARACTERISTICS OF THE STUDY AREA BEFORE AND AFTER IMPROVEMENT OF STATE HIGHWAY 356

### Size and Boundaries of the Study Area

The SH 356 study area covers approximately 914 acres. An area on each side of the road was chosen to include approximately three blocks (or the equivalent distance) of land on each side of SH 356, thus including both abutting and non-abutting land. Levee Road marks the southern boundary, and the Chicago, Rock Island, and Pacific Railroad forms the northern boundary. The western border is delineated by the Trinity River, and Woodall Street marks the eastern end. The study area extends approximately 2,000 feet to the north and south of SH 356 at the widest part of the study area. The southwestern section of the study area extends considerably less distance from the highway due to the existence of a levee and the Trinity River. It is assumed that the road improvement would have no impact upon the levee or the river and not have a discernible effect on the land beyond. Thus, that area was not included in the study area. The study area is approximately two and one-third miles long.

### Land Use Changes

As shown in the maps in Figures 3, 4, 5, and 6, this area underwent a great deal of development between 1958 and 1978. The 914 acre area was primarily unimproved in 1958. There were approximately 50 acres of both commercial and industrial developments, approximately 25 acres of single family residential, small amounts of public and multiple family residential, and over 151 acres in streets and railroads (Table 3). Thirty percent of the study area was improved in 1958.

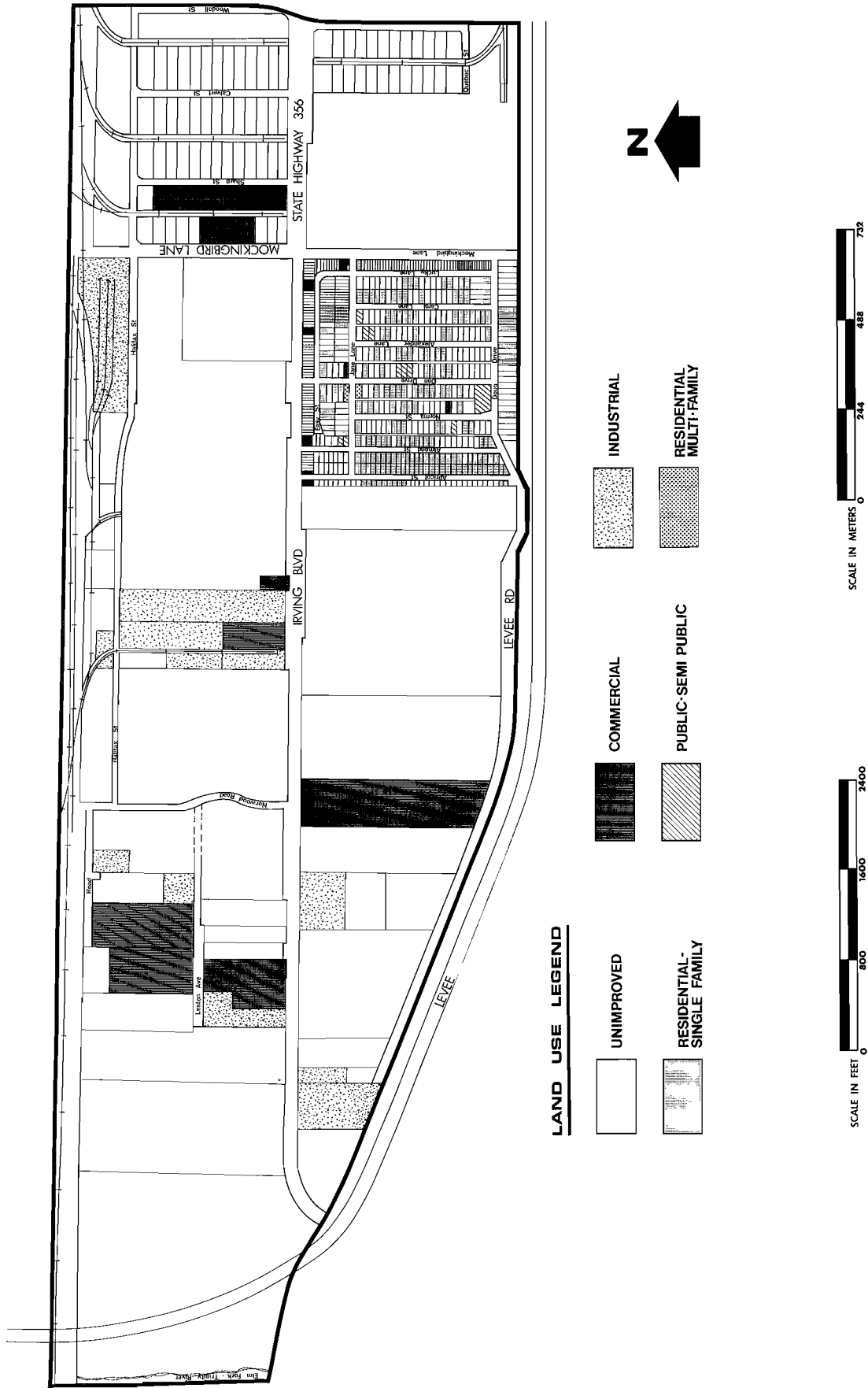


Figure 3. Land Use in the State Highway 356 Study Area in 1958

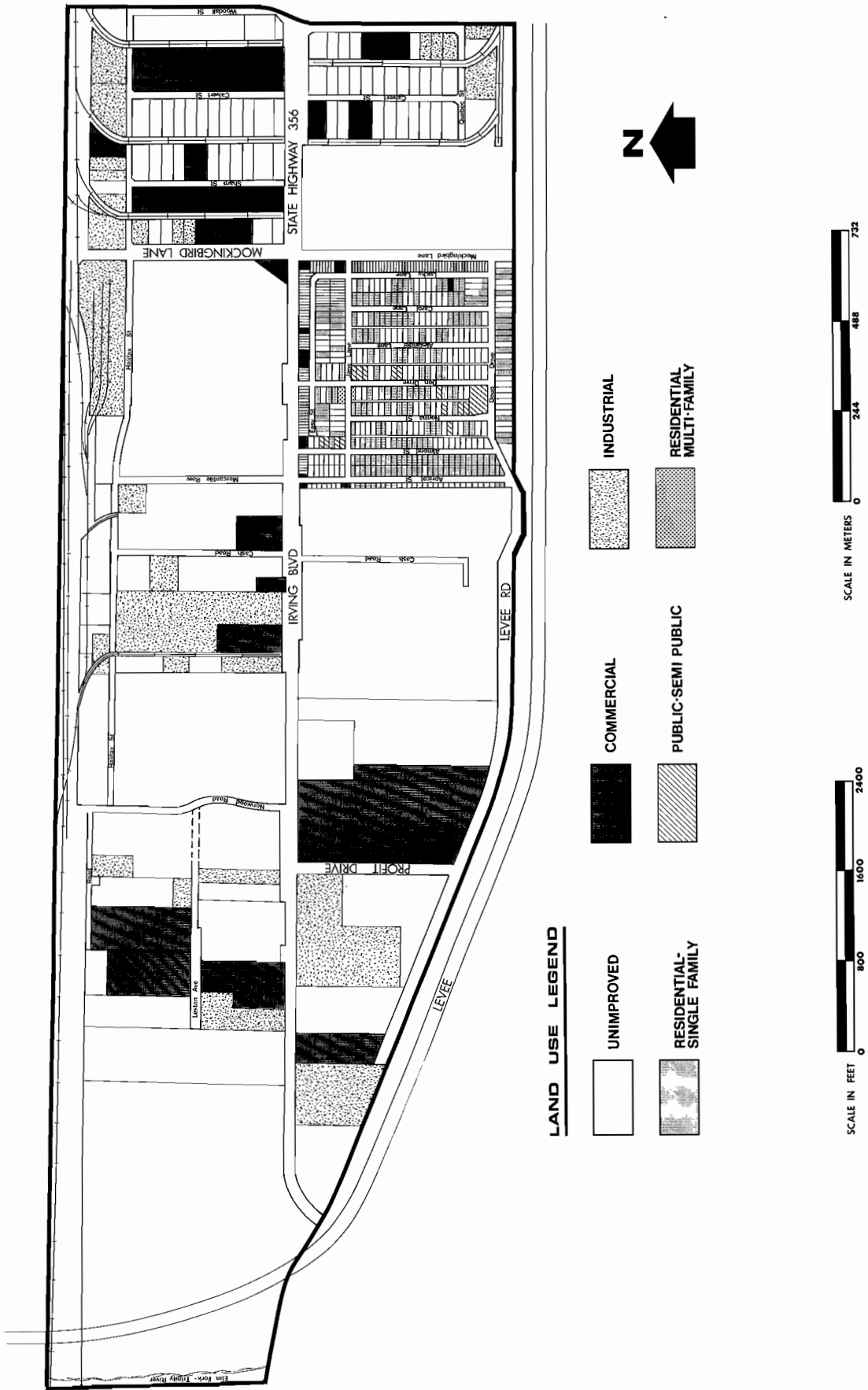


Figure 4. Land Use in the State Highway 356 Study Area in 1961

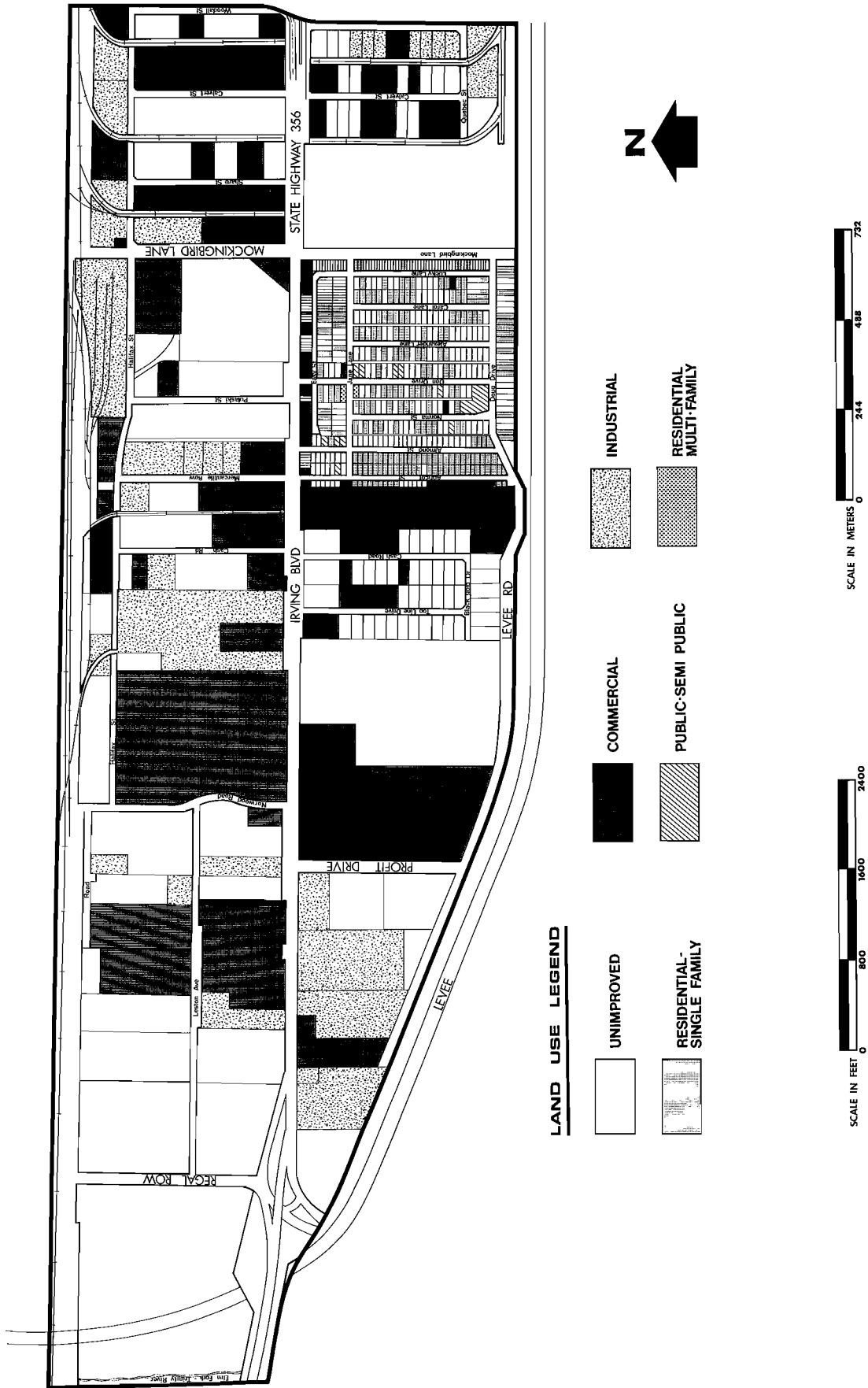


Figure 5. Land Use in the State Highway 356 Study Area in 1967

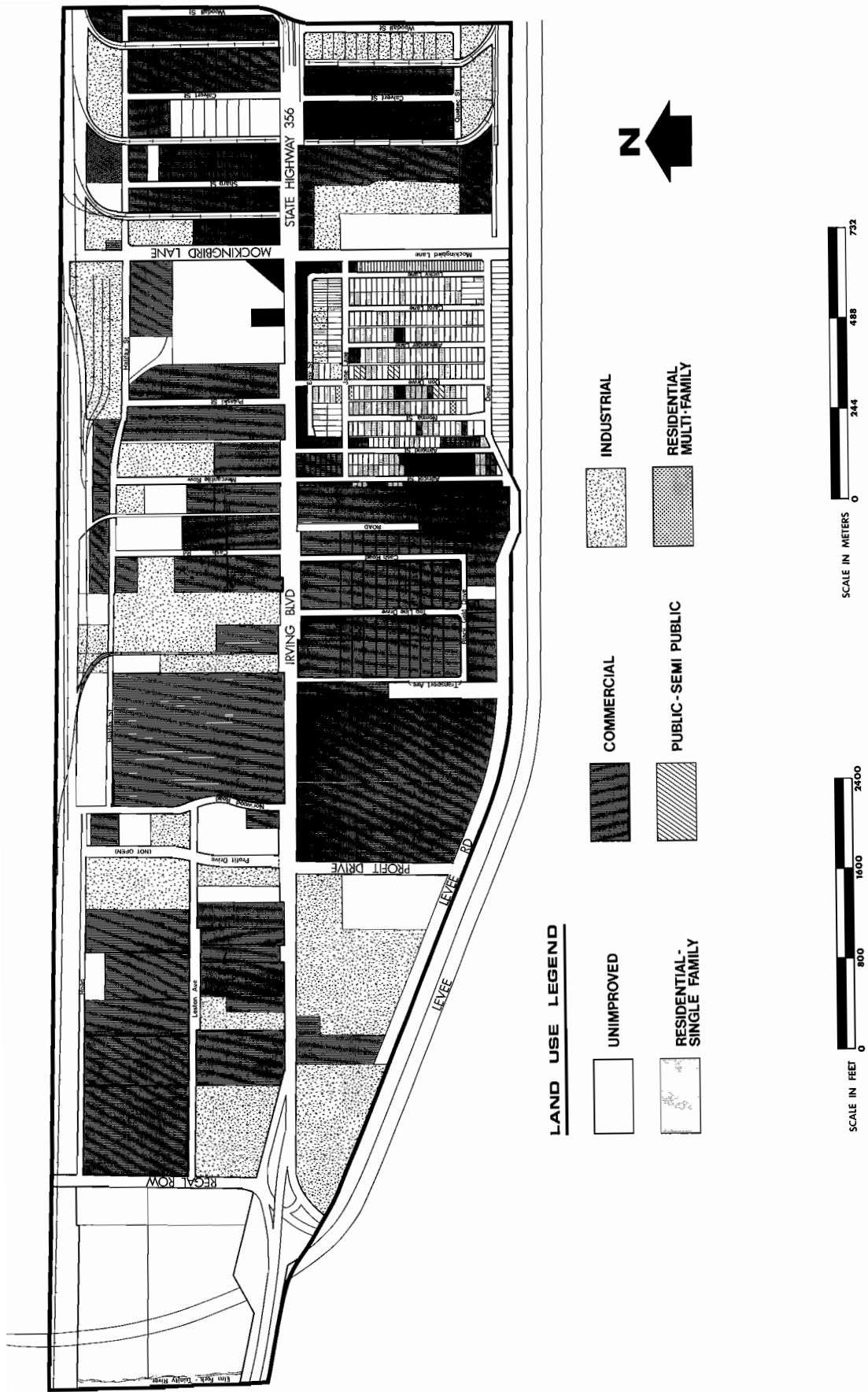


Figure 6. Land Use in the State Highway 356 Study Area in 1978

Table 3. Changes in Land Use of All Properties  
by Time Period and Year

Land Use and Type of Change	Total Acres by Time Period and Year <sup>a</sup>			
	Before		After	
	1958	1961	1967	1978
Residential-Single Family	25.20	28.20	25.09	14.01
Absolute Change	+3.00	-3.11	-11.08	
Percent Change	+12%	-11%	-44%	
Residential-Multiple Family	0.31	0.31	0.31	0.45
Absolute Change	0	0	+0.14	
Percent Change	0	0	+45%	
Commercial	49.22	90.27	217.78	405.96
Absolute Change	+41.05	+127.51	+188.18	
Percent Change	+83%	+141%	+86%	
Industrial	49.65	85.54	98.51	167.22
Absolute Change	+35.89	+12.97	+68.71	
Percent Change	+72%	+15%	+70%	
Public/Semi-Public	1.64	2.56	2.70	2.23
Absolute Change	+0.92	+0.14	-0.47	
Percent Change	+56%	+5%	-17%	
Streets and Railroads	151.60	177.11	191.85	207.50
Absolute Change	+25.51	+14.74	+15.65	
Percent Change	+17%	+8.3%	+8%	
Unimproved	636.81	530.44	378.19	117.05
Absolute Change	-106.37	-152.25	-261.14	
Percent Change	-17%	-29%	-69%	
Total Acres	914.09	914.09	914.09	914.09

<sup>a</sup>One acre equals .4046856 hectares.

Between 1958 and 1978 industrial acreage more than tripled, and commercial acreage increased over eight times the 1958 amount. In 1978, 87 percent of this study area had been developed. The specific types of changes that occurred are discussed in further detail in terms of proximity to SH 356.

#### Proximity to SH 356

Tracts of land were classified according to their location relative to SH 356. Tracts with frontage on the highway were classified as abutting with whole tracts being included to avoid division of a development. The tracts were classified according to property lines in 1978. A section 300 feet deep was delineated as abutting on undeveloped portions. All other tracts not having frontage on SH 356 were classified as nonabutting.

The division of the land into these two categories permits a comparative analysis to determine which type of land underwent most change. It is expected that abutting properties would be most affected by the highway improvement, but nonabutting land use can also be influenced.

*Abutting Properties.* In 1958, which was four years prior to the beginning of investigation, planning, and engineering for this particular project, 92.76 acres (26 percent) of the 361.14 abutting acres had been developed (Table 4). Commercial and industrial uses covered about 26 acres each, and there were small amounts of single and multiple family residences. Streets and railroads covered the remaining improved land.

Between 1958 and 1961, which is called the *before period*, abutting commercial acreage more than doubled and industrial acreage increased by 60 percent (Table 4). Multiple family residential acreage decreased to none and single family acreage increased very slightly. An additional 3.59 acres of streets and



Table 4. Changes in Land Use of Abutting Properties  
by Time Period and Year

Land Use and Type of Change	Total Acres by Time Period and Year			
	Before		After	
	1958	1961	1967	1978
Residential-Single Family	.18	.24	.24	0
Absolute Change	+ .06		0	- .24
Percent Change	+ 33%		0	- 100%
Commercial	25.98	61.96	137.60	198.14
Absolute Change	+35.98		+75.64	+ 60.54
Percent Change	+ 138%		+ 122%	+ 44%
Industrial	26.64	42.57	48.91	91.11
Absolute Change	+15.93		+ 6.34	+ 42.20
Percent Change	+ 60%		+ 15%	+ 86%
Streets and R.R.	39.65	43.24	56.15	61.38
Absolute Change	+ 3.59		+12.91	+ 5.23
Percent Change	+ 9%		+ 30%	+ 9%
Unimproved	268.69	213.13	118.24	10.51
Absolute Change	-55.56		-94.89	-107.73
Percent Change	- 21%		-45%	- 91%
Total Abutting Acres	361.14	361.14	361.14	361.14

railroads were added. The changes in the *before period* were indications of the future alterations in this area's land use.

In the *short-run after period*, 1961 to 1967, abutting commercial acreage again more than doubled. Industrial acreage increased by 15 percent and an additional 12.91 acres were committed to street and railroad use. There were no other changes on abutting land in this period.

During the *long-run after period*, 1967 to 1978, abutting commercial acreage increased by 44 percent and industrial use increased by 86 percent. Total abutting commercial acreage was 198.14 in 1978, and total abutting industrial acreage was 91.11 acres. There was no other type of abutting land use other than streets and railroads in 1978. Changes in abutting land use are charted in Figure 7.

*Nonabutting Properties*. Nonabutting land was thirty-three percent developed in 1958. Almost equal acreages were in single family residential use (25.02 acres), commercial use (23.24 acres), and industrial use (23.01 acres) (Table 5). There were small amounts of multiple family residential and public acreage and 111.95 acres in streets and railroads.

In the *before period*, industrial acreage had the largest increase (19.96 acres or 87 percent). Commercial acreage increased by 5.07 acres, single family residential increased by 2.94 acres and public use increased by 0.92 acres. An additional 21.92 acres were added to streets and railroads.

Between 1961 and 1967, nonabutting commercial use increased over threefold from 28.31 acres to 80.18 acres (183 percent). Industrial acreage increased again, but by much less than in the previous period (15 percent). Public acreage and acres in streets and railroads increased slightly and single family acreage began to decrease.

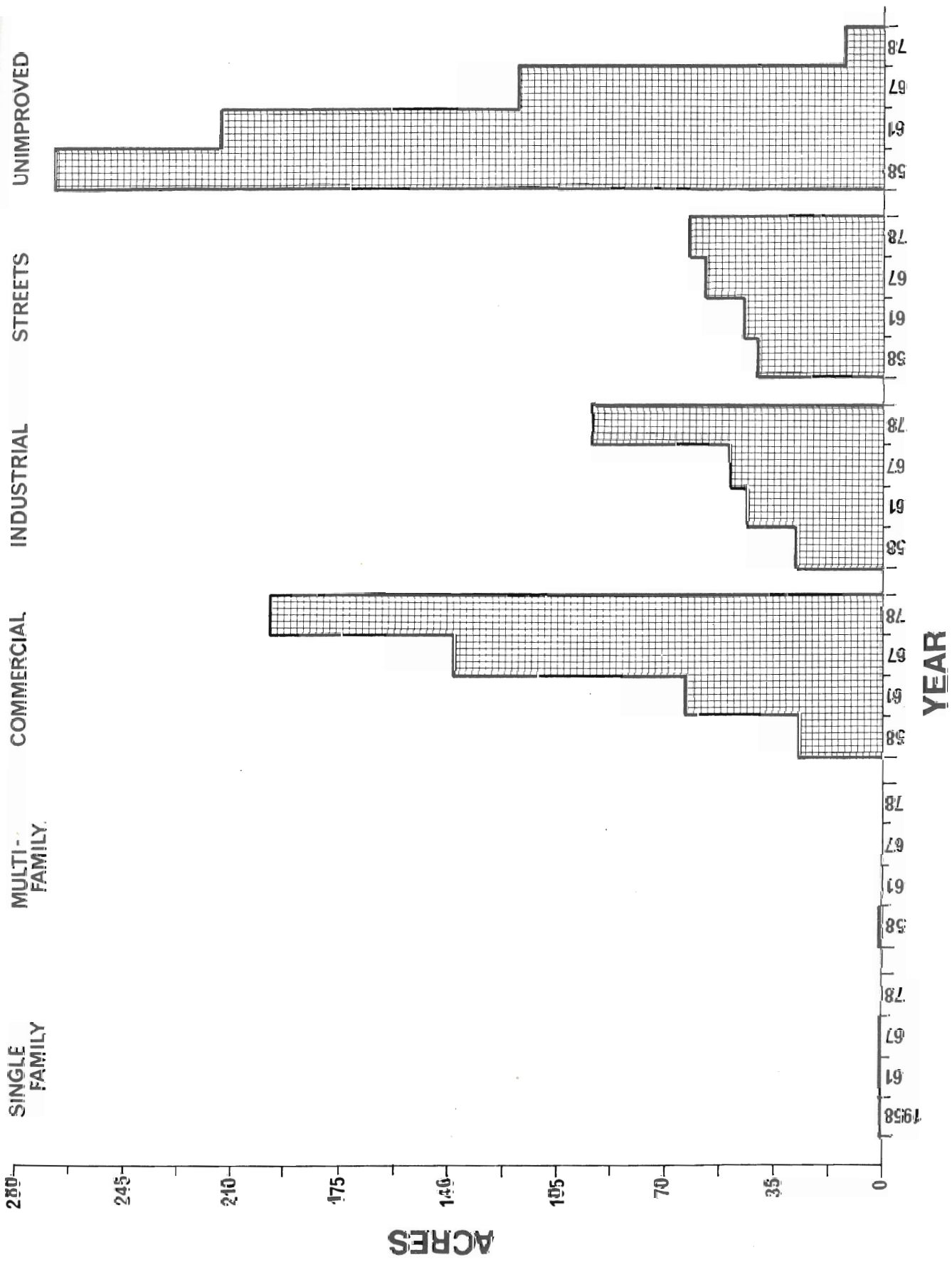


Figure 7. Changes in Abutting Land Uses in the State Highway 356 Study Area

Table 5. Changes in Land Use of Nonabutting Properties by Time Period and Year

Land Use and Type of Change	Total Acres by Time Period and Year <sup>a</sup>			
	Before		After	
	1958	1961	1967	1978
Residential-Single Family	25.02	27.96	24.85	14.01
Absolute Change	+2.94	-3.11	-10.84	
Percent Change	+12%	-11%	-44%	
Residential-Multiple Family	0.31	0.31	0.31	0.45
Absolute Change	0	0	+0.14	
Percent Change	0	0	+45%	
Commercial	23.24	28.31	80.18	207.82
Absolute Change	+5.07	+51.87	+127.64	
Percent Change	+22%	+183%	+159%	
Industrial	23.01	42.97	49.60	76.11
Absolute Change	+19.96	+6.63	+26.51	
Percent Change	+87%	+15%	+53%	
Public and Semi-Public	1.64	2.56	2.70	2.23
Absolute Change	+0.92	+0.14	-0.47	
Percent Change	+56%	+6%	-17%	
Streets and Railroads	111.95	133.87	135.70	146.12
Absolute Change	+21.92	+1.83	+10.42	
Percent Change	+20%	+1%	+8%	
Unimproved	368.12	317.31	259.95	106.55
Absolute Change	-50.81	-57.36	-153.40	
Percent Change	-14%	-18%	-59%	
Total Nonabutting Acres	553.29	553.29	553.29	553.29

<sup>a</sup>One acre equals .4046856 hectares.

The *long-run after period* was a continuation of the trend in the previous period with nonabutting commercial acreage increasing greatly (127.64 acres or 159 percent). Industrial acreage also increased again (26.51 acres or 53 percent), and there was a small increase in multiple family housing (0.14 acres). Single family residential use decreased (10.84 acres or 44 percent) as well as public acreage (0.47 acres or 17 percent). Streets and railroad acreage also increased again. Nonabutting land use changes are shown in Figure 8.

#### Land Use Controls and Plans

Land use is regulated in Dallas by zoning. The SH 356 area is zoned industrial. Some tracts were previously zoned commercial but were changed to industrial. No new single family residences can be built in industrially zoned areas. This has been the case in the SH 356 study area since single family acreage has declined considerably giving way to commercial and industrial development. Commercial development as well as multiple family development can take place in areas with the type of industrial zoning that this area has.

The zoning is consistent with two land use projections for Dallas. In a 1957 report entitled *Thoroughfares*, prepared for the Dallas Area Master Plan Committee of the Department of City Planning, a map of future land use indicated that the area was expected to be almost totally commercial or industrial in 1980. A small amount of residential use was expected to exist where the present single family developments are located. Another future land use map in a 1976 Dallas-Fort Worth Regional Transportation Study report also indicated that the study area would be commercial and industrial with a small amount of single family residential use. These uses were projected for 1985. Land use in this area has evolved as was projected by both of these plans.

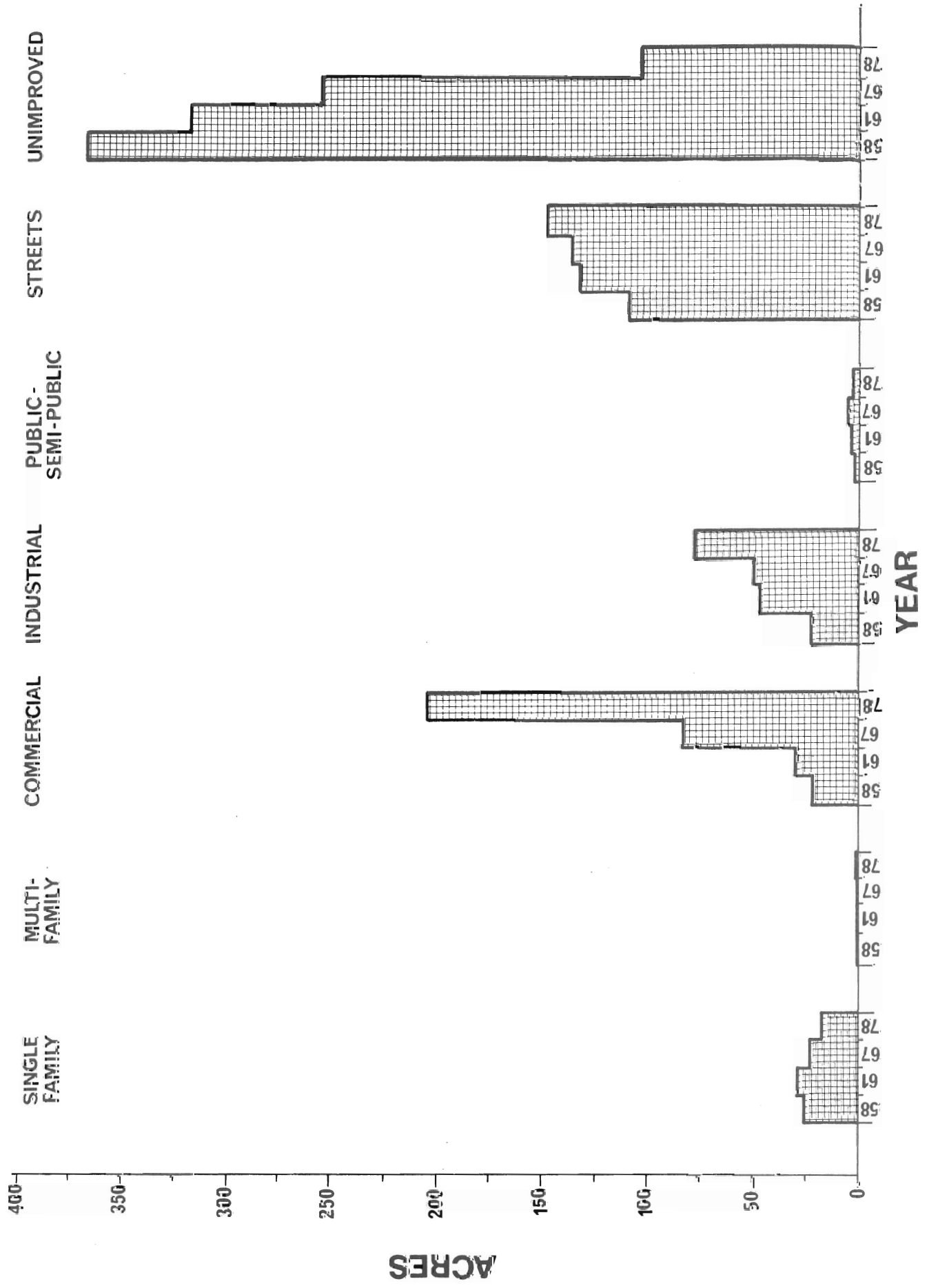


Figure 8. Changes in Nonabutting Land Uses in the State Highway 356 Study Area

## Socio-Economic Characteristics

Selected socio-economic characteristics were investigated to reveal differences between the general location that the study area is in, Dallas as a whole, and the Dallas SMSA. Census tract data for 1960 and 1970 gives an indication of the relative changes in population and other characteristics (Table 6). The SH 356 study area is within Census Tract 100 which is three to four times as large as the study area alone.

The population of the census tract declined between 1967 and 1970 unlike that of the city and SMSA which both showed sizeable increases. The population decline is not surprising since this area was becoming more and more commercial and industrial.

The median school years completed increased in the census tract but was still lower than in the city and SMSA. The median number of years completed in 1970 was 10.7 for the census tract and 12.2 for both the city and SMSA. Median family income was also considerably lower in the census tract than in the other two areas. The SMSA had a median family income of \$8,542 in 1970 as compared to \$7,984 in the city and only \$4,829 in the SMSA. Likewise, median value of owner occupied residences and median rent paid by tenants was also lower in the census tract than in the other two areas of comparison for both 1960 and 1970.

As might be expected from the population and income figures, the total number employed people residing in the census tract declined. The number of professionals as well as several other categories of workers declined in number reflecting the general exodus of residents from this area of Dallas.

Overall, the residents of this area of Dallas have a lower socio-economic status than the residents of Dallas as a whole and the SMSA. This is

Table 6. Comparison of 1960 and 1970 Socio-Economic Characteristics of Applicable Census Tracts to Dallas and the Dallas SMSA<sup>a</sup>

Socio-Economic Characteristics	SMSA		Dallas		Census Tract 100	
	1960	% Change	1960	% Change	1960	% Change
	1970		1970		1970	
Population	1,083,601	+44%	1,556,134	+24%	4,460	-20%
Median School Years Completed	11.8	+3%	12.2	+3%	9.8	+9%
Median Family Income	\$5,925	+76%	\$10,405	+68%	\$4,219	+74%
Median Income of Families and Unrelated Individuals	\$5,083	+68%	\$8,542	+57%	\$3,525	+37%
Median Value of Owner Occupied Residences	\$10,800	+54%	\$16,600	+46%	\$7,900	+49%
Median Rent Paid by Tenants	\$60	+83%	\$110	+77%	\$52	+33%
Total Employed	441,828	+51%	665,510	+30%	1,851	-11%
Professional, Technical, and Kindred Workers	51,364	+100%	102,672	+71%	138	-15%
Managers and Administrators	51,088	+24%	63,352	+17%	32	+38%
Sales Workers	38,863	+55%	60,224	+34%	20	-45%
Clerical and Kindred Workers	80,320	+78%	142,843	+51%	179	+38%
Craftsmen, Foremen, and Kindred Workers	55,259	+57%	86,845	+29%	208	-16%
Operatives	65,904	+48%	97,574	+33%	361	-10%
Laborers	21,220	+57%	33,355	+39%	135	-1%
Service Workers	37,239	+78%	66,320	+52%	414	+25%
Private Household Workers	14,763	-17%	12,325	-17%	212	-62%

<sup>a</sup>Data from the Bureau of the Census, U.S. Department of Commerce Publications.



exemplified by the lower level of education, lower incomes, lower value of residences, and declining number of employed people. The number of people actually employed at businesses and industries within the census tract is assumed to have increased considerably due to the expansion of those types of land use. Obviously, many of those people do not reside within the census tract.

## IMPACT OF THE HIGHWAY IMPROVEMENT ON LAND USE IN THE STUDY AREA

To examine the impact on land use of the improvement of SH 356, two types of data were used. These types are:

- (1) land use changes in the area, and
- (2) opinions of people knowledgeable about the area.

### Effects on Abutting and Nonabutting Land

Improving and changing the design of a road may affect some types of land use more than others. Therefore, the specific shifts in land use should be examined for each time period. Table 7, which shows changes in absolute acres, indicates not only changes from undeveloped to developed but also changes from one type of development to another or reversions back to undeveloped. These changes point out important aspects of land use transformation that may be, in part, a result of the road improvement. Table 8 is expressed in terms of annual average percentage changes for each land use type and time period. The percentages adjust for differences in lengths of time periods and for the larger acreage in the nonabutting category. This permits a more meaningful comparison of abutting and nonabutting land use changes. The changes are discussed first for abutting property and then for nonabutting.

*Abutting Property.* Although Table 7 indicates that more abutting acres changed use in the *long-run after period* than during the earlier periods, this could be expected due to the much longer time span in the latter period. When the changes were put on an average annual percentage basis, the *before period* was the time of the greatest rate of change. The average annual rate of change was over five percent for abutting acres in the *before period* as compared to over four percent in the *short-run after period* and less than three percent in the *long-run after period*. Only one small change on abutting land was the

Table 7. Absolute Changes in Land Use of Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change

Type of Land Use Change	Before Period 1958-1961		Short-Run After Period 1961-1967		Long-Run After Period 1967-1978		Total After Period 1961-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
	----- Acres* -----							
Single Family to Public	0	0	0	1.63	0	0	0	1.63
Single Family to Commercial	0	0.86	0	0.22	1.08	0	1.08	0.22
Single Family to Streets	0.90	0	0	0	0	0	0	0
Single Family to Unimproved	0	0.86	0.43	0.36	0.17	0	0.60	0.36
Public to Commercial	0	0	0	0	0.92	0	0.92	0
Public to Single Family	0	0	0	0	0	0.34	0	0
Commercial to Single Family	0	0	0	0	0	0.86	0	0.86
Commercial to Multiple Family	0	0	0	0	0	0.43	0	0.43
Unimproved to Single Family	0.82	7.94	0.34	29.24	1.71	5.41	2.05	34.65
Unimproved to Commercial	0.29	0	0	0.77	0	0	0	0.77
Unimproved to Public	0	0	0	10.62	0	5.05	0	15.67
Unimproved to Industrial	0	0	0	0	0	1.95	0	1.95
Unimproved to Streets	0	0	0.40	5.57	0.17	0	0.57	5.57
Total Land Changing Use	2.01	9.66	1.17	48.41	4.05	14.04	5.22	62.45
Improved Land	0.90	1.72	0.43	2.21	2.17	1.63	2.60	3.84
Unimproved Land	1.11	7.94	0.74	46.20	1.88	12.41	2.62	58.61

\*One acre equals 0.4046856 hectares.

Table 7. Absolute Changes in Land Use of Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change

Type of Land Use Change	Before Period 1958-1961		Short-Run After Period 1961-1967		Long-Run After Period 1967-1978		Total After Period 1961-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
	----- Acres -----							
Single Family to Commercial	0	0	0	0.17	0.24	5.45	0.24	5.62
Single Family to Public	0	0.14	0	0	0	0	0	0
Single Family to Unimproved	0	0.70	0	3.90	0	5.79	0	9.69
Single Family to Industrial	0	0	0	0	0	0.56	0	0.56
Single Family to Multiple Family	0	0	0	0	0	0.14	0	0.14
Commercial to Single Family	0	0.17	0	0	0	0.14	0	0.14
Commercial to Public	0	0.14	0	0	0	0	0	0
Commercial to Unimproved	0	0	0	0.92	0	0.65	0	1.57
Commercial to Industrial	0	0	0	0.29	0	0.17	0	0.46
Public to Single Family	0	0.42	0	0	0	0	0	0
Public to Commercial	0	0	0	0.14	0	0.55	0	0.69
Industrial to Commercial	0	0	0	2.60	0	0	0	2.60
Industrial to Unimproved	0	2.15	0	0	0	0	0	0
Unimproved to Commercial	35.98	5.38	75.64	50.17	60.30	122.60	135.94	172.77
Unimproved to Industrial	15.93	22.11	6.34	8.94	42.20	25.78	48.54	34.72
Unimproved to Single Family	0.06	3.19	0	0.96	0	0.96	0	1.92
Unimproved to Public	0	1.06	0	0.28	0	0.08	0	0.36
Unimproved to Streets & Roads	3.59	21.92	12.91	1.83	5.23	10.42	18.14	12.25
Total Land Changing Use	55.56	57.38	94.89	70.20	107.97	173.29	202.86	243.49
Unimproved Land	55.56	53.66	94.89	62.18	107.73	159.84	202.62	222.02
Improved Land	0	3.72	0	8.02	0.24	13.45	0.24	21.47

Table 8. Average Annual Percentage Changes in Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change

Type of Land Use Change	Before Period 1958-1961		Short-Run After Period 1961-1967		Long-Run After Period 1967-1978		Total After Period 1961-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
	----- Percent -----							
Single Family to Commercial	0	0	0	0.005	0.003	0.089	0.004	0.059
Single Family to Public	0	0.008	0	0	0	0	0	0
Single Family to Unimproved	0	0.042	0	0.117	0	0.095	0	0.103
Single Family to Industrial	0	0	0	0	0	0.009	0	0.006
Single Family to Multiple Family	0	0	0	0	0	0.002	0	0.001
Commercial to Single Family	0	0.010	0	0	0	0.002	0	0.001
Commercial to Public	0	0.008	0	0	0	0	0	0
Commercial to Unimproved	0	0	0	0.028	0	0.011	0	0.017
Commercial to Industrial	0	0	0	0.009	0	0.003	0	0.005
Public to Single Family	0	0.025	0	0	0	0	0	0
Public to Commercial	0	0	0	0.004	0	0.009	0	0.007
Industrial to Commercial	0	0	0	0.078	0	0	0	0.028
Industrial to Unimproved	0	0.130	0	0	0	0	0	0
Unimproved to Commercial	3.321	0.324	3.491	1.511	1.517	2.014	2.214	1.837
Unimproved to Industrial	1.470	1.332	0.293	0.269	1.062	0.424	0.791	0.369
Unimproved to Single Family	0.006	0.192	0	0.029	0	0.016	0	0.020
Unimproved to Public	0	0.064	0	0.008	0	0.001	0	0.004
Unimproved to Streets & Roads	0.331	1.321	0.596	0.055	0.132	0.171	0.295	0.130
Total Land Changing Use	5.128	3.456	4.380	2.113	2.714	2.846	3.304	2.587
Improved Land	5.128	3.233	4.380	1.872	2.711	2.626	3.300	2.360
Unimproved Land	0	0.223	0	0.241	0.003	0.220	0.004	0.227

Only one small change on abutting land was the result of one type of an improvement changing to another use. The majority of change was due to land becoming developed for the first time. Although land use change does not appear to have been accelerated by the road improvement, development did continue at a steady pace even though less and less undeveloped abutting land was available.

*Nonabutting Properties.* Nonabutting land also experienced more absolute change in the *long-run after period* but a higher rate of change in the *before period*. The nonabutting rate of change was 3.456 percent in the *before period*, 2.113 percent in the *short-run after period*, and 2.846 percent in the long-run after period. There were several small changes from one type of improvement to another on nonabutting land, although the majority of change was due to undeveloped land becoming developed.

#### Opinions of Knowledgeable People

Numerous interviews were conducted with people in the Dallas area who had knowledge of this study site. A better understanding was gained about the characteristics of this area before and after the road was improved.

Several of those interviewed expressed the belief that this section of SH 356 was very dangerous prior to improvement. The road improvement was said to have eliminated this problem, although some stated that the road is beginning to become congested again.

Most of those from the State Department of Highways and Public Transportation said that the road improvement had encouraged development. However, the opinion was expressed that the development was a continuation of the trends set into motion before the road improvement.

Some of those from the City of Dallas said that this area was planned for commercial and industrial use and had developed in that manner. The road improvement was said to have encouraged continued development that might have been discouraged by a congested dangerous road. Most of the real estate and business people interviewed also thought that the road improvement had encouraged development.

### Conclusions

The SH 356 study area underwent numerous changes during the years upon which this study focuses, 1958 through 1978. The area changed from one that was 30 percent improved in 1958 to one that was 87 percent improved in 1978. The predominant types of development have been commercial and industrial.

The rates of land use change did not increase after the road was improved suggesting that land use change was not accelerated. However, based partly upon the interviews conducted with knowledgeable people, the road improvement is judged to have encouraged development by providing a more attractive and less congested locale. The land did continue to develop at a steady pace after the road improvement occurred even though less undeveloped land was available. Some changes in use of existing developments also occurred, mostly on nonabutting land primarily in the periods after the road improvement. Only three percent of abutting land and 19 percent of nonabutting land remained unimproved in 1978. In summary, the road improvement was a positive factor in attracting development to this area that might not otherwise have occurred if the congested conditions present before the improvement had continued.