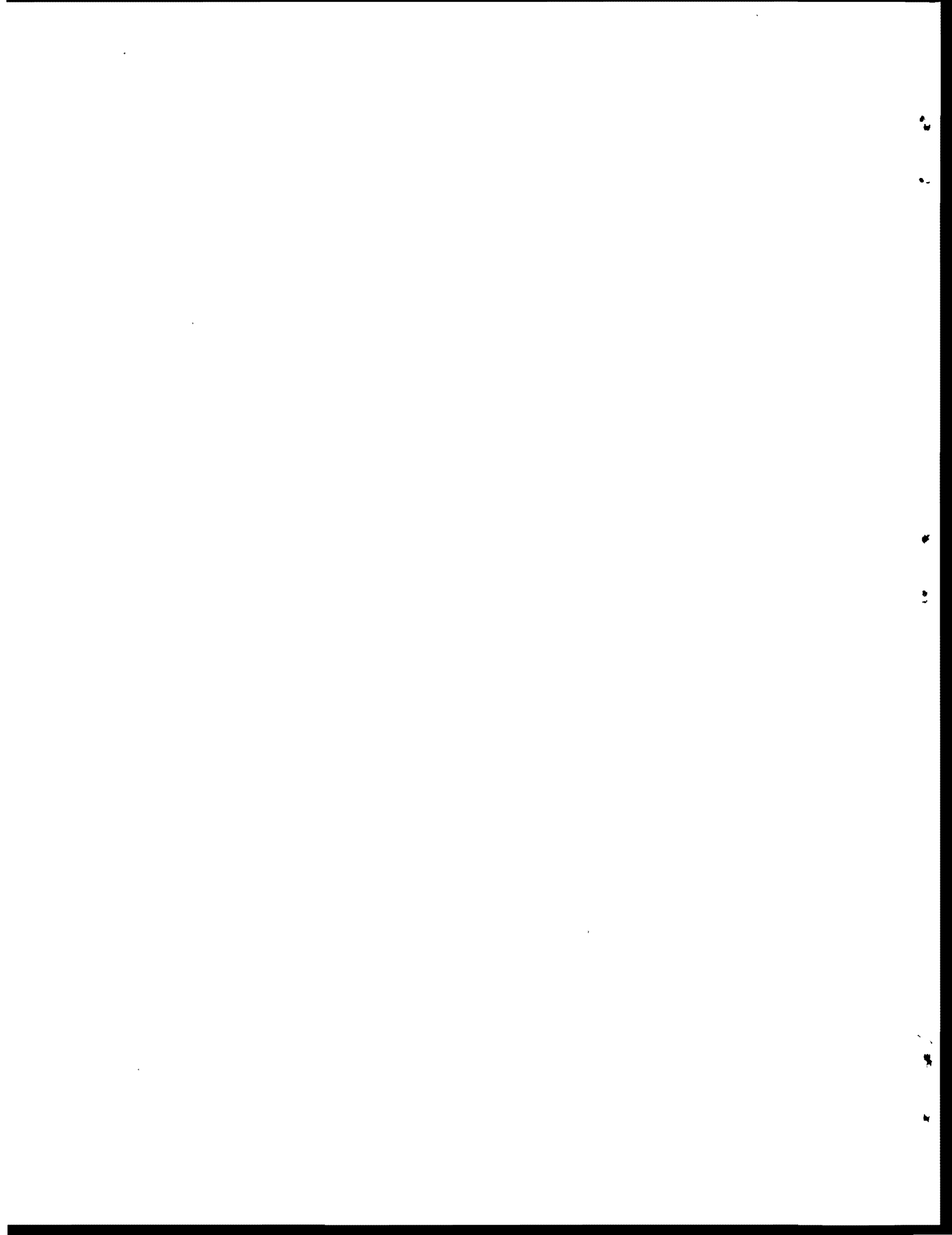


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LAND USE IMPACT OF IMPROVING
WEST VICKERY BOULEVARD IN A
DEVELOPING AREA OF FORT WORTH, TEXAS

by

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Economics of Highway Design Alternatives

Sponsored by the State Department of Highways
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1951

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 Breedon of the Dallas/Fort Worth Regional Planning Office of the SDHPT in Grand Prairie were particularly helpful in providing assistance and supplying data. Mr. J. R. Stone, Mr. Frank J. Durda, and Mr. Burton Clifton of District 2 of the SDHPT were also very cooperative in providing information.

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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 land use studies about the effects of highway construction have focused mainly on the effects of new construction. Due to the present emphasis on upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the effects on land use of such improvements. This report relates the findings of research done in an area of Fort Worth, Texas, where a section of West Vickery Boulevard was upgraded from a two-lane, open ditch facility to one with four lanes, curbs and gutters, and left turn lanes at major intersections. The improvement took place in a developing area where the predominant land use was single family residential. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the road improvement. Formal planning for the project began in 1969, and construction was completed in 1973. Total acreage in each type of land use was determined for two *before* years, 1964 and 1968, and two *after* years, 1975 and 1978. Comparisons were made between the types of land use and rates of change before and after the road improvement. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the road improvement were also investigated and are reported. Highway planners can use this report and other reports of this study to make more accurate predictions of land use changes due to road improvements.

IMPLEMENTATION STATEMENT

This report relates the findings of a case study on land use changes that have occurred after an existing road was improved. The findings can be implemented immediately by highway agencies in predicting what would happen as a result of a similar road 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 are or will be described in other reports.

SUMMARY OF FINDINGS

Data were collected and analyzed for the West Vickery Boulevard study area in Fort Worth, Texas, to examine the impact on land use of upgrading the road. The approximately one and one-fourth mile section that this study concentrates upon was changed from a 22-foot wide, two-lane facility with open ditches to a 48-foot wide, curbed and guttered, four-lane road with left turn lanes at two major intersections. Data were collected for 1964, which was five years prior to official planning for this project; 1968, the year immediately before planning began; 1975, the first year after construction was completed; and 1978, the year in which data collection took place. The period between 1964 and 1968 is called the *before period*. The years from 1968 to 1975 are called the *short-run after period* and the *long-run after period* is 1975 to 1978.

The findings are summarized as follows:

1. The road improvement took place in the southwestern section of Fort Worth.
 - a. The area was classified as a developing one throughout the study years.
 - (1) The total study area was 69 percent improved in 1964, the first study year.
 - (2) Seventy-three percent of the area was developed by the end of 1978, the last study year.
 - b. The predominant land use remained single family residential.
2. Properties abutting West Vickery Street experienced little increase in total developed land between 1964 and 1978, although some changes occurred.
 - a. Abutting single family residential acreage decreased from 13.56 acres to only 5.52 acres, with most of it changing to commercial use.
 - b. Abutting commercial acreage increased from 9.67 acres to 14.95 acres.
 - c. Industrial use increased from 4.33 acres to 12.18.
 - d. Multiple family residential use remained constant at one acre.

- e. Sixty-two percent of abutting land was developed in 1964, and 73 percent was developed in 1978.
3. Nonabutting land also had little change in land use.
 - a. Both single family and multiple family residential acreages decreased slightly between 1964 and 1978 on nonabutting land.
 - b. Commercial and industrial uses both increased, with the largest increase being in commercial use.
 - c. The small acreages of public/semi-public and mobile homes remained constant.
 - d. Seventy-two percent of nonabutting land was developed in 1964, and 73 percent was developed in 1978.
4. The average annual rates of change for both abutting and nonabutting land were higher in the *long-run after period* than in the other periods.
 - a. The average annual rate of change for abutting land was 3.63 percent in the *long-run after period*, as compared to 2.49 percent in the *short-run after period* and 2.34 in the *before period*.
 - b. The average annual rates of change for nonabutting land were very small with an average of only 0.41 percent of nonabutting land changing use in the *long-run after period* as compared to 0.15 percent in the *before period* and 0.24 in the *short-run after period*.
 - c. The rates for nonabutting land are too small to infer an impact of the road, but the abutting rates of change may suggest an influence.
5. The improvement of West Vickery was viewed as a positive influence on land use by people knowledgeable about the area.
 - a. The street improvement was not thought to have instigated land use change but rather have encouraged revitalization of the area in terms of improvements to existing structures and conversions from residential to commercial.
 - b. The street improvement helped alleviate a congested situation that would have become a detriment to the area if allowed to persist.
6. Land use in this area did not veer greatly from what had been projected for the area.

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

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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 Fort Worth, Texas, where a section of West Vickery Boulevard 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 West Vickery 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 1964 and 1968, the two *before* years and for 1975 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 West Vickery. On undeveloped tracts, a section extending back 300 feet from the street 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 West Vickery Boulevard is in within the city limits of Fort Worth, Texas (Figure 1). Forth Worth is located in Tarrant County, one of the eleven counties making up the Dallas/Fort Worth Standard Metropolitan Statistical Area (SMSA). Due to the interdependence between cities

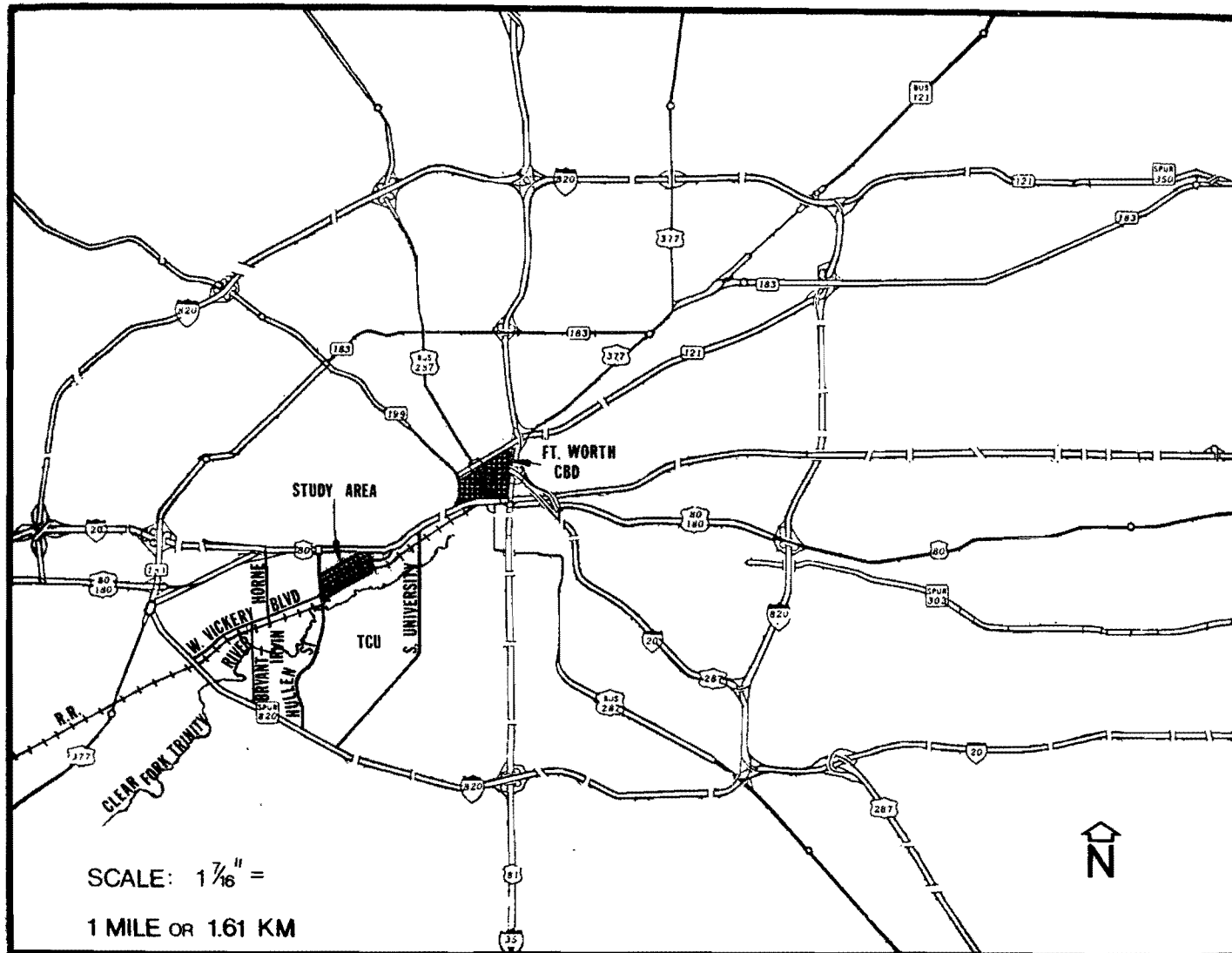


Figure 1. Map of Fort Worth Showing the Location of the West Vickery Study Area.

and counties in the SMSA, a brief discussion of the SMSA as a whole is presented with some specific details about Fort Worth included.

The economy of the Dallas/Fort Worth SMSA is well balanced in the areas of manufacturing, trade, transportation, finance, services, and real estate¹. 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 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.

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

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 Fort Worth increased by over 100,000 between 1950 and 1970 but then declined by over 35,000 between 1970 and 1975 (Table 1). An increase was again recorded between 1975 and 1977. Dallas also lost population between 1970 and 1975 but not as much as Fort Worth. The Dallas/Fort Worth SMSA showed an increase during the same period (the separate Dallas and Fort Worth SMSA's were combined into one SMSA after the 1970 census was taken).

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.

Since the West Vickery Study area was 69.1 percent improved in 1964 and 69.5 percent improved in 1968, the stage of development before the improvement began was *developing*². The predominant type of development was single family resi-

²The 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.

Table 1. Population and Percentage Change in Population for Fort Worth, Dallas, and the SMSA^a

	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
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	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
Dallas-Fort Worth SMSA	b	-	b	-	2,378,353	158,595 7%	2,536,948	136,252 5%	2,623,200

^aData from the Bureau of the Census, U.S. Department of Commerce Publications.

^bPrior 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.

dential. The improvement occurred in an urban area within the city limits of Fort Worth.

Sources of Data

The source of information on the design change of West Vickery Boulevard and the construction dates was the District 2 Office of the SDHPT in Fort Worth. Data on land use were obtained primarily from the Dallas-Fort Worth Regional Planning Office of the SDHPT in Grand Prairie. The City of Fort Worth also provided some land use information and data on zoning. On-site inspection and city directories also helped in the determination of the correct land uses. Interviews with real estate developers, SDHPT personnel, city planners and other city officials, residents of the area, and property owners also provided information on land use changes that have taken place in this area.

Traffic volume data were obtained from the SDHPT and the City of Fort Worth. 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 1964 to 1968 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 1968 through 1975. This period includes the construction years.

Long-Run After Period - the period which includes changes that occurred since the end of 1975 through 1978.

CHARACTERISTICS OF AREA STREETS AND ROADS
BEFORE AND AFTER IMPROVEMENT OF
WEST VICKERY BOULEVARD

Vickery Boulevard begins at an intersection with Old Benbrook Road in Southwestern Fort Worth. It continues first northeast and then east to Ayers Street in Eastern Fort Worth. The section of Vickery Boulevard that this study focuses on begins at Hulen Street and continues east for approximately one and one-fourth mile to Montgomery Street.

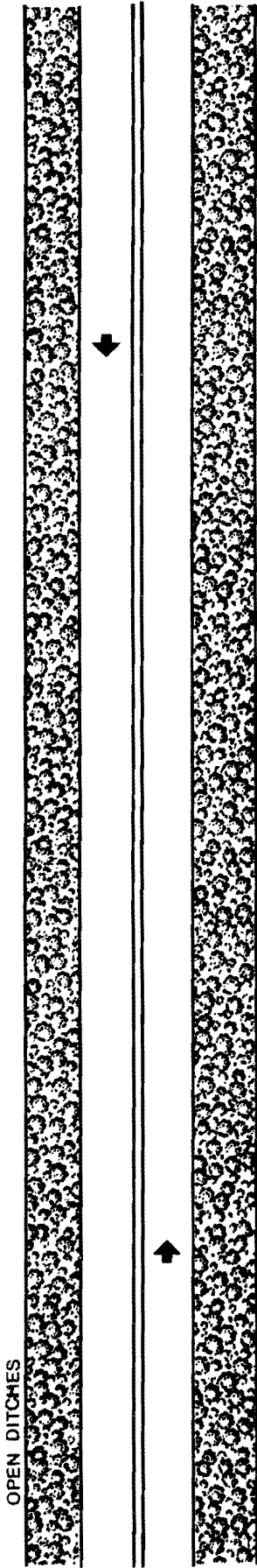
This section of road was previously a 22 foot wide, two-lane facility with open ditches. It was changed to a 48 foot wide, four-lane road with curbs and gutters and left turn lanes at Clover and Montgomery Streets (Figure 2). A bond issue was approved in 1969 that provided funds for the project. The actual contract for construction was let in 1972 and the work was completed in 1973. Five to ten feet of right-of-way was purchased.

Twenty-four hour traffic counts shown in Table 2 give an indication of how traffic has changed on West Vickery Boulevard and on some parallel and intersecting roads in the area. Counts for only one location were available for this section of West Vickery. Data were available for a location just west of Montgomery Street for several years from 1957 through 1979. Prior to the improvement of the street, traffic counts increased from the mid 6,000's to the low 10,000's. The count remained at 10,500 in 1973 and 1975 and then increased to 12,670 in 1977 and 16,358 in 1979. The counts do not reflect an immediate reaction to the road improvement, although traffic did eventually increase considerably.

Intersecting Streets

An examination of traffic counts on intersecting streets quickly shows that

Before Period Design



After Period Design

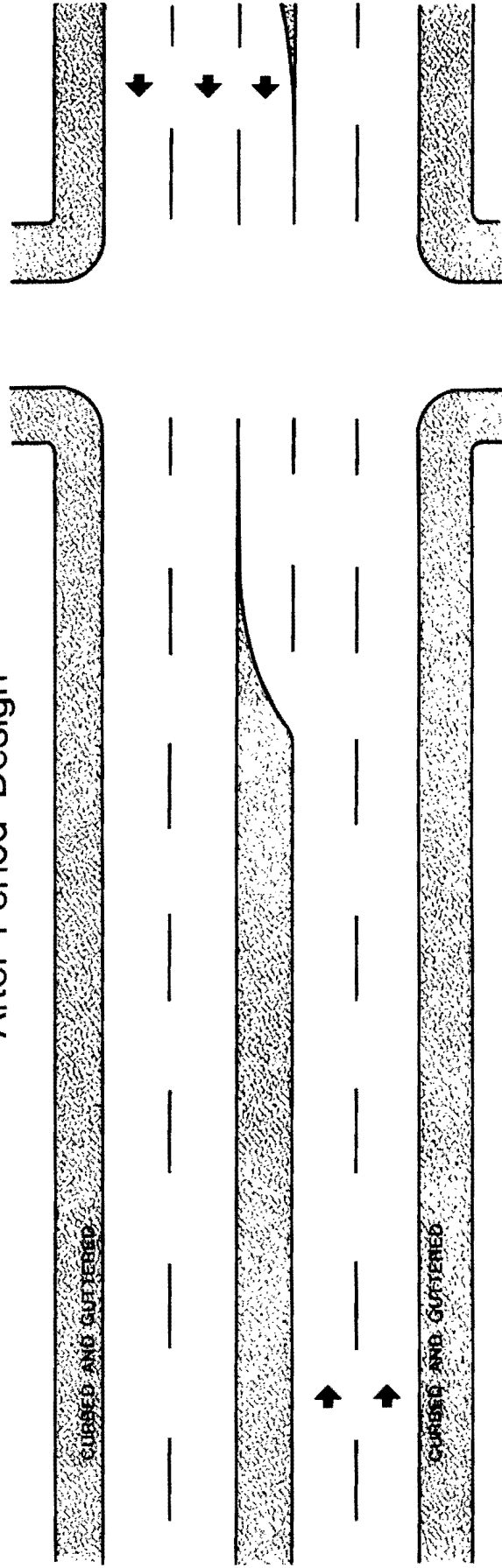


Figure 2. Design of West Vickery Boulevard Before and After Improvement.

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

Location of Traffic Count	1957	1958	1959	1960	1961	1962	1964	1965	1967	1969	1971	1973	1975	1977	1979
STUDY ROUTE West Vickery Boulevard West of Montgomery Street	6,343	6,358	6,588	6,525	7,035	7,888	8,000	7,100	8,100	10,000	10,900	10,500	10,500	12,670	16,358
INTERSECTING STREETS Montgomery Street North of West Vickery			5,035	5,103	5,374	5,412	5,158	5,700	5,765	5,620	7,664	7,536	4,596	8,660	6,029
Flushing Street North of West Vickery				2,735	2,840	3,203	3,068	2,586		2,936	2,500	2,688	3,364		4,052
Hulen Street North of West Vickery										7,884	13,472	14,136	17,232	18,920	21,181
South of West Vickery										8,156	15,024	16,276	17,060	26,250	27,821
PARALLEL STREETS Interstate 30 (West Freeway) East of Ashland Avenue	39,006			39,239	40,106	42,686	51,465	51,093	56,504	68,452	73,424	74,056	61,424	88,560	
East of University	39,846	46,101	43,768	42,825	46,713	45,215	56,927	64,834	70,892	78,332	74,744	76,024	67,000	91,190	
CAMP BOWIE BOULEVARD West of Horne Street				28,861	28,336	29,080	31,063	34,046	28,648	33,648	33,352	32,608	33,184	34,600	33,429
COLONIAL PARKWAY West of Rodgers Avenue						5,120	5,400	5,900	5,400	4,900	4,200	4,400	4,200	4,290	

Hulen Street carries more traffic through the study area than any other street. The number of vehicles on this street has risen dramatically since 1969 (Table 2). In 1979, the counts at two locations on Hulen were 21,181 and 27,821 compared to only 6,029 on Montgomery Street and 4,052 on Flushing Street.

Parallel Streets

The major road that runs parallel to this portion of West Vickery is Interstate 30 (also called the West Freeway). Traffic has steadily increased on this facility to around 90,000 vehicles per day in 1977. Some traffic may use this highway as an alternate route to some locations. Other parallel streets are Camp Bowie Boulevard and Colonial Parkway. The traffic counts have been very stable for both of these streets since 1969. Camp Bowie Boulevard has had counts in the lower 30,000's since 1969, and Colonial Parkway has carried between 4,200 and 4,900 vehicles per day since that time.

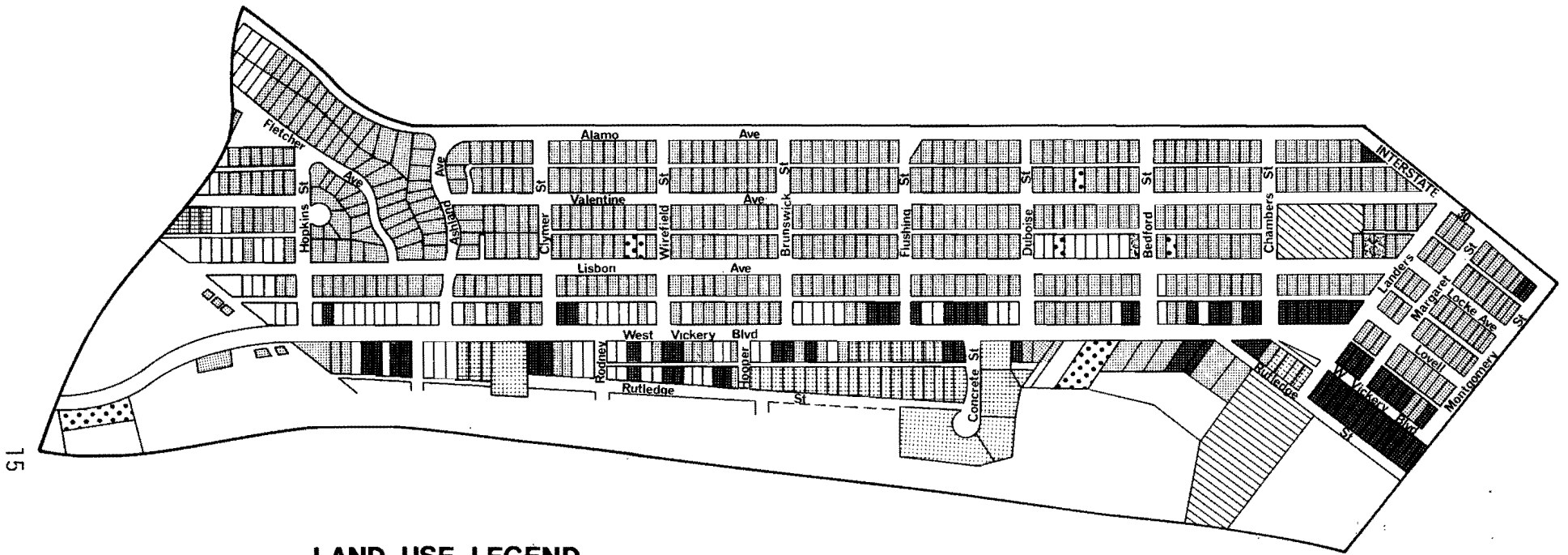
CHARACTERISTICS OF THE STUDY AREA BEFORE AND AFTER IMPROVEMENT OF WEST VICKERY BOULEVARD

Size and Boundaries of the Study Area

The West Vickery Boulevard Study area encompasses approximately 210 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 West Vickery, thus including both abutting and nonabutting land. The southern section of the area does not extend as far as the northern part due to the existence of railway yards that border and were not included in the study area. They existed before and after West Vickery was improved and were not believed to be affected by the improvement. The northern boundary is formed by Alamo Avenue and Interstate 30. The western and eastern boundaries are Hulén Street and Montgomery Street, respectively. At the widest point, the study area extends approximately 900 feet on each side of West Vickery. The study area is approximately one and one-quarter mile long.








Land Use Changes

As shown in the land use maps in Figure 3,4,5, and 6, this study area underwent only a moderate amount of change between 1964 and 1978. The amount of single family and multiple family residential acres decreased while acreage in mobile home and public/semi public use remained the same (Table 3). Commercial, industrial, and street and road acreage all increased. Unimproved land decreased from 65.01 acres to 56.26 acres (13 percent). The specific types of change are discussed in further detail in terms of proximity to West Vickery Boulevard.



15

LAND USE LEGEND

- | | | | | | |
|---|---------------|---|--------------------|--|--------------|
|  | UNIMPROVED |  | COMMERCIAL |  | MOBILE HOMES |
|  | SINGLE FAMILY |  | INDUSTRIAL | | |
|  | MULTI FAMILY |  | PUBLIC-SEMI PUBLIC | | |

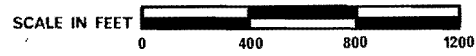
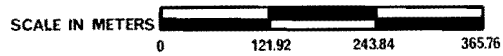
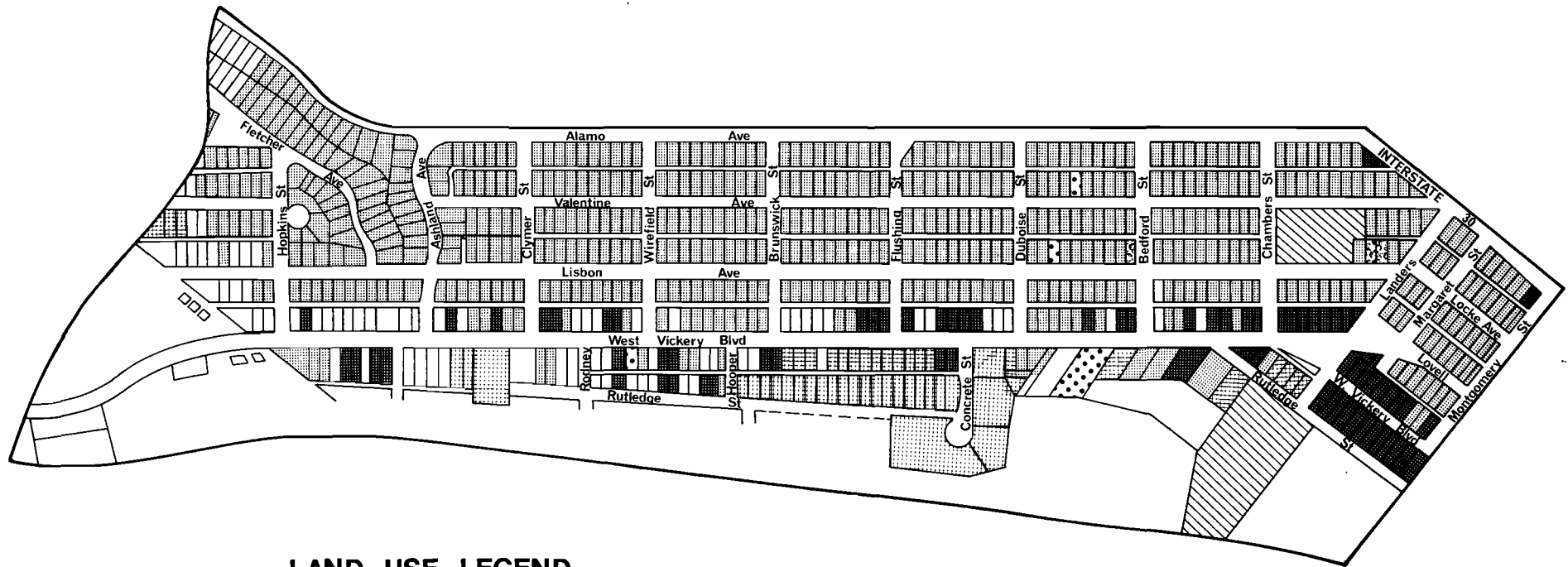


Figure 3. Land Use in the West Vickery Boulevard Study Area in 1964.



LAND USE LEGEND








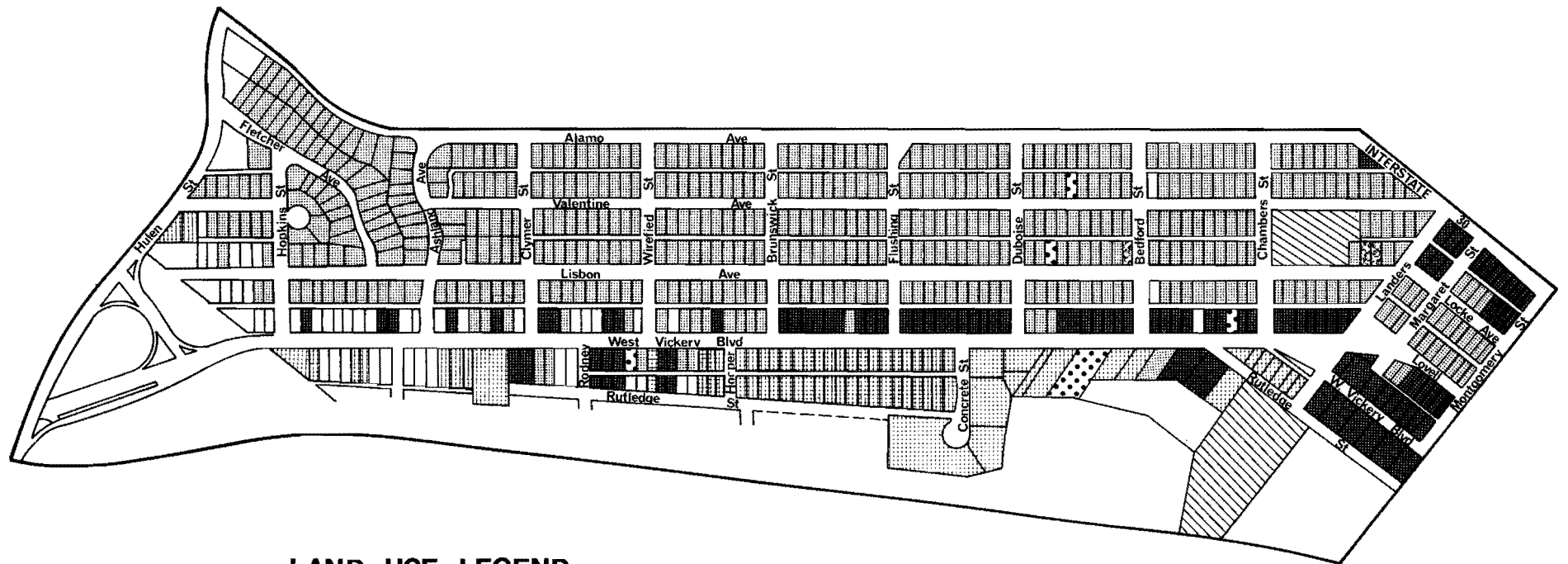
- | | | | | | |
|---|---------------|---|--------------------|--|--------------|
|  | UNIMPROVED |  | COMMERCIAL |  | MOBILE HOMES |
|  | SINGLE FAMILY |  | INDUSTRIAL | | |
|  | MULTI FAMILY |  | PUBLIC-SEMI PUBLIC | | |



Figure 4. Land Use in the West Vickery Boulevard Study Area in 1968.



LAND USE LEGEND

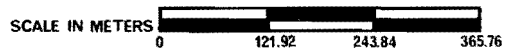
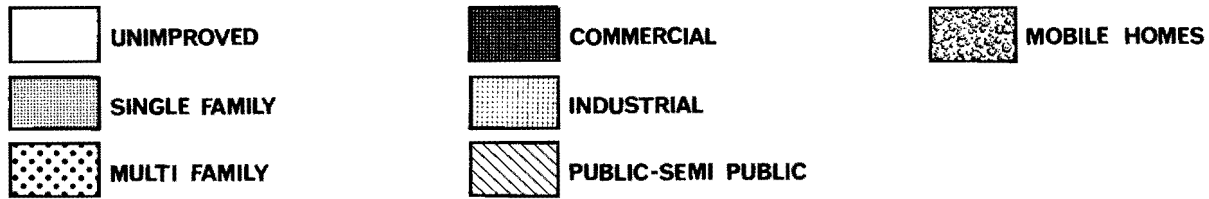
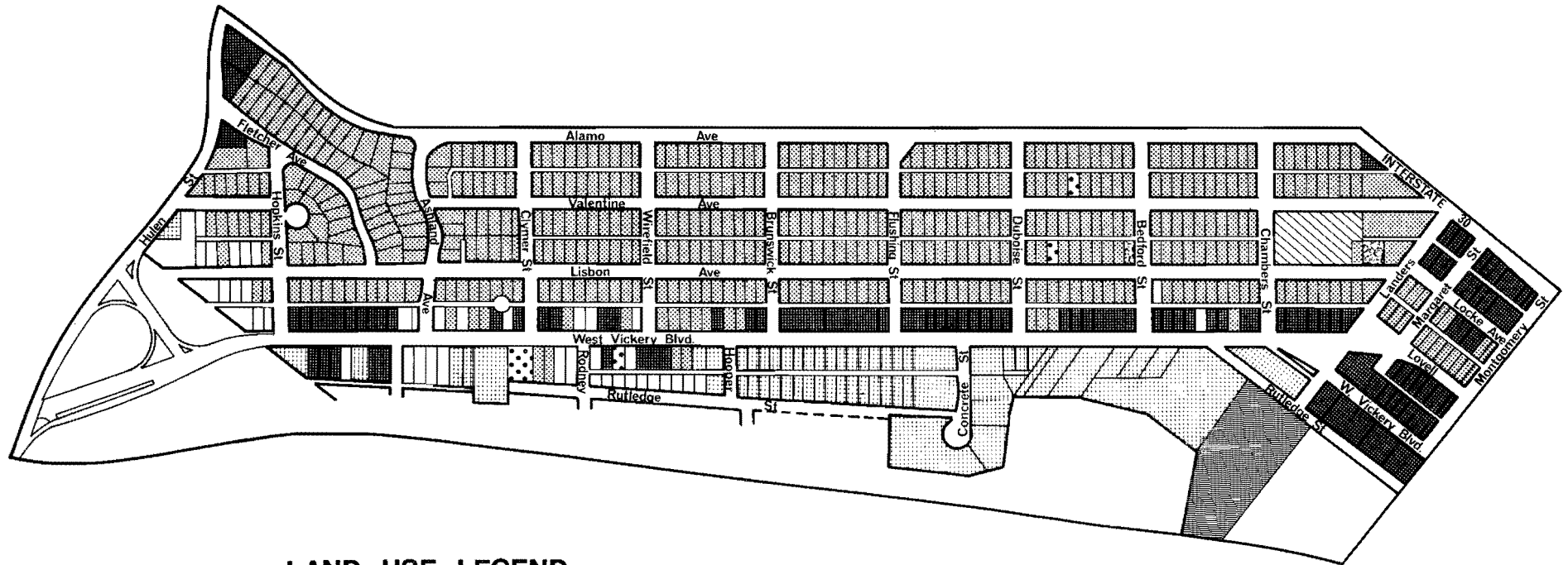









Figure 5. Land Use in the West Vickery Boulevard Study Area in 1975.



LAND USE LEGEND

- | | | |
|--|---|--|
|  UNIMPROVED |  COMMERCIAL |  MOBILE HOMES |
|  SINGLE FAMILY |  INDUSTRIAL | |
|  MULTI FAMILY |  PUBLIC-SEMI PUBLIC | |

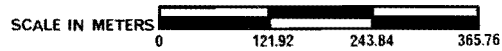


Figure 6. Land Use in the West Vickery Boulevard Study Area in 1978.

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 ^a			
	Before		After	
	1964	1968	1975	1978
Residential-Single Family	83.81	81.58	73.68	72.69
Absolute Change	-2.23		-7.90	-0.99
Percent Change	-3%		-10%	-1%
Residential-Multiple Family	1.33	1.22	1.22	1.22
Absolute Change	-0.11		0	0
Percent Change	-8%		0	0
Residential-Mobile Homes	0.34	0.34	0.34	0.34
Absolute Change	0		0	0
Percent Change	0		0	0
Commercial	10.41	10.49	15.49	19.29
Absolute Change	-0.08		+5.00	+3.80
Percent Change	-1%		+48%	+25%
Public/Semi-Public	2.15	2.15	2.15	2.15
Absolute Change	0		0	0
Percent Change	0		0	0
Industrial	11.08	12.37	23.09	19.27
Absolute Change	+1.29		+10.72	-3.82
Percent Change	+12%		+87%	-17%
Streets and Roads	36.03	37.85	38.94	38.94
Absolute Change	+1.82		+1.09	0
Percent Change	+5%		+3%	0
Unimproved	65.01	64.16	62.34	56.26
Absolute Change	-0.85		-1.82	-6.08
Percent Change	-1%		-3%	-10%
Total Acres	210.16	210.16	210.16	21.06

^aOne acre equals .4046856 hectares.

Proximity to West Vickery Boulevard

Tracts of land were classified according to their location relative to West Vickery Boulevard. Tracts with frontage on the street 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 West Vickery were classified as nonabutting.

Abutting Properties. In 1964, which was five years prior to the passing of the bond issue that financed this project, abutting land was 62 percent developed. Single family residential use covered 13.56 acres while commercial use took 9.67 acres and streets 8.14 acres (Table 4). There were 4.33 acres of industrial use and one acre of multiple family residential use.

Between 1964 and 1968, which is called the *before period* single family residential use decreased by 1.65 acres while commercial, industrial, and streets and roads all increased. Most of the changes were due to single family residences being converted to commercial buildings or being removed for the alteration of a street. The abutting property was 64 percent improved in 1968.

During the *short-run after period*, 1968 through 1975, the trend of converting single family residential acreage to other use continued. Single family acreage decreased by 5.60 acres while commercial increased by 2.92 and industrial by 3.35. Unimproved land decreased by only 0.67 acres. Sixty-five percent of abutting land had been developed by the end of 1975.

The *long-run after period* was a continuation of the land use changes that had occurred in the previous two periods. Single family residential acreage decreased but not by as much as in previous periods. Single family residential use decreased by 0.79 acres while commercial use increased by 2.25 acres, and

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

Land Use and Type of Change	Total Acres by Time Period and Year ^a			
	Before		After	
	1964	1968	1975	1978
Residential-Single Family	13.56	11.91	6.31	5.52
Absolute Change	-1.65	-5.60	-0.79	
Percent Change	-12%	-47%	-13%	
Residential-Multiple Family	1.00	1.00	1.00	1.00
Absolute Change	0	0	0	
Percent Change	0	0	0	
Commercial	9.67	9.78	12.70	14.95
Absolute Change	+0.11	+2.92	+2.25	
Percent Change	+1%	+30%	+18%	
Industrial	4.33	5.56	8.91	12.18
Absolute Change	+1.23	+3.35	+3.27	
Percent Change	+28%	+60%	+37%	
Streets and Roads	8.14	9.68	9.68	9.68
Absolute Change	+1.54	0	0	
Percent Change	+19%	0	0	
Unimproved	22.44	21.21	20.54	15.81
Absolute Change	-1.23	-0.67	-4.73	
Percent Change	-5%	-3%	-23%	
Total Abutting Acreage	59.14	59.14	59.14	59.14

^aOne acre equals .4046856 hectares.

industrial use increased by 3.27 acres. Seventy-three percent of the abutting land had been developed by the end of 1978. Abutting land use changes are depicted in Figure 7.

Nonabutting Properties. In 1964, nonabutting land was 72 percent improved. The improvements were primarily single family residential with small amounts of multiple family, mobile homes, commercial, public/semi-public, and industrial acreage mixed in. There were 27.89 acres of streets and roads (Table 5).

The first period, 1964 through 1968, had reductions in single family residential, multiple family residential, and commercial acreages. Industrial use and acreage in streets and roads both increased. Undeveloped land actually increased by only 0.38 acres keeping the percent of developed land at 72 percent (after rounding) in 1968.

Single family residential use decreased again in the *short-run after period* while commercial and industrial increased. These changes were of greater magnitude than those in the previous period (Table 5). Almost seventy three percent of the nonabutting land was developed at the end of 1975.

In the *long-run after period*, the only increase in acreage was an increase in commercial use. This was due partly to the conversion of a small amount of single family residential acreage to commercial and to the development of previously unimproved land. Nonabutting land was 73 percent improved in 1978. Changes on nonabutting land are graphed in Figure 8.

Land Use Controls and Plans

Land use is regulated in Fort Worth by zoning. This study area is zoned industrial on the southeastern side of West Vickery. Commercial zoning lines the street on the northwestern side of the area with the exception of a small

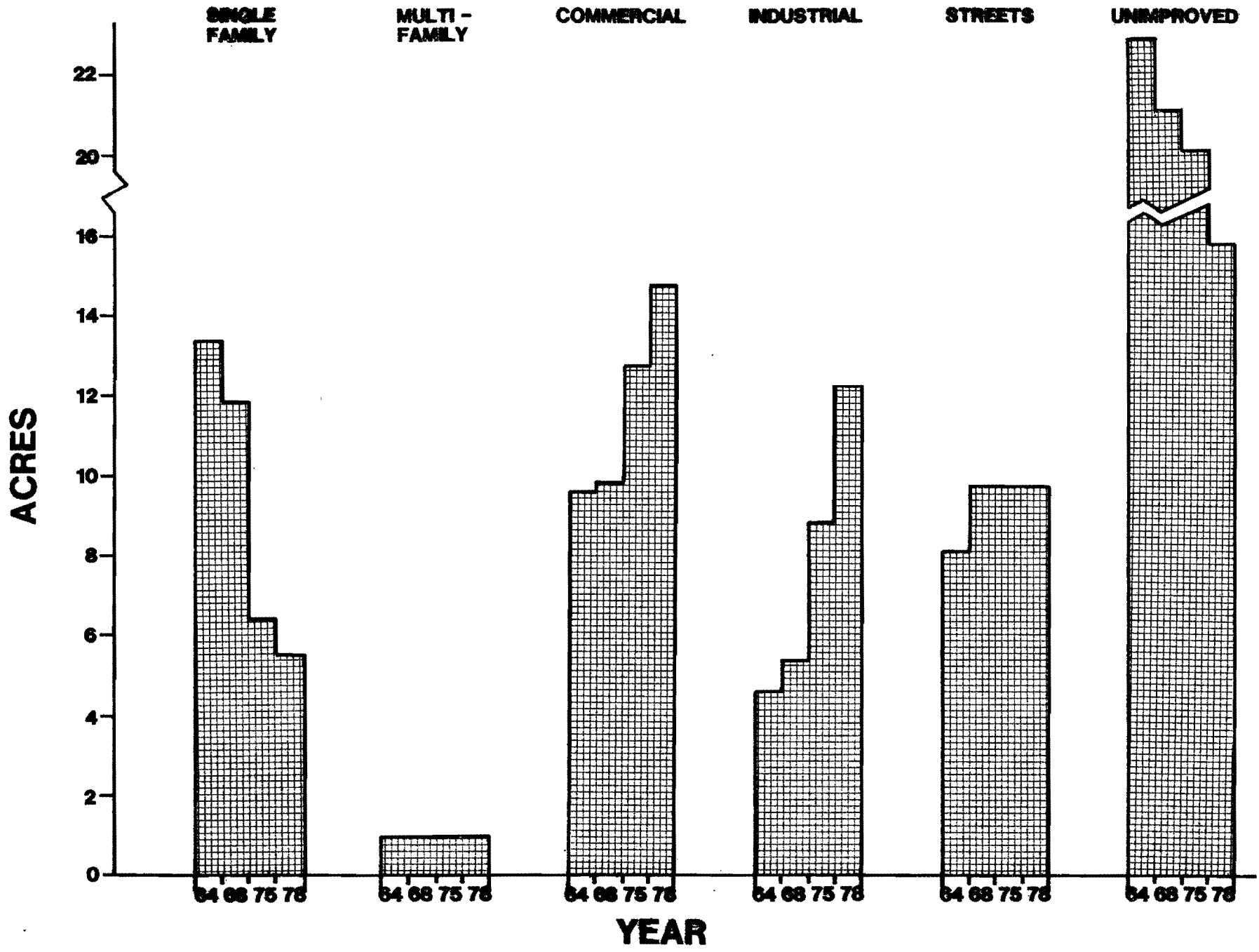


Figure 7. Changes in Abutting Land Uses in the West Vickery Street Study Area.

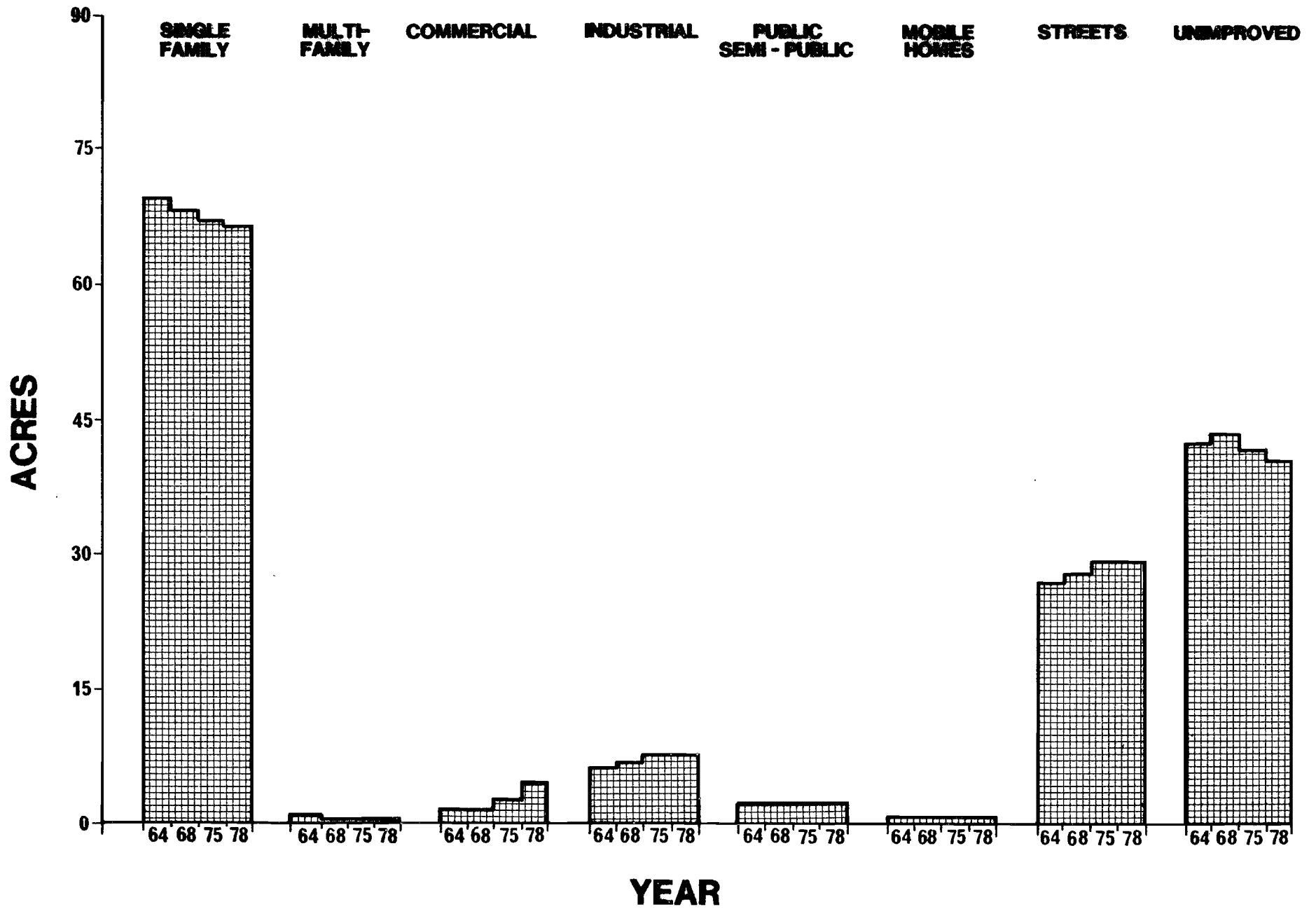


Figure 8. Changes in Nonabutting Land Uses in the West Vickery Street Study Area.

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

Land Use and Type of Change	Total Acres by Time Period and Year ^a			
	Before		After	
	1964	1968	1975	1978
Residential-Single Family	70.25	69.67	67.37	67.17
Absolute Change	-0.58		-2.30	-0.20
Percent Change	-1%		-3%	-0.3%
Residential-Multiple Family	0.33	0.22	0.22	0.22
Absolute Change	-0.11		0	0
Percent Change	-33%		0	0
Residential-Mobile Homes	0.34	0.34	0.34	0.34
Absolute Change	0		0	0
Percent Change	0		0	0
Commercial	0.74	0.71	2.79	4.34
Absolute Change	-0.03		+2.08	+1.55
Percent Change	+2%		+293%	+56%
Public/Semi-Public	2.15	2.15	2.15	2.15
Absolute Change	0		0	0
Percent Change	0		0	0
Industrial	6.75	6.81	7.09	7.09
Absolute Change	+0.06		+0.28	0
Percent Change	+1%		+4%	0
Streets and Roads	27.89	28.17	29.26	29.26
Absolute Change	+0.28		+1.09	0
Percent Change	+1%		+4%	0
Unimproved	42.57	42.95	41.80	40.45
Absolute Change	+0.38		-1.15	-1.35
Percent Change	+1%		-3%	-3%
Total Nonabutting Acres	151.02	151.02	151.02	151.02

^aOne acre equals .4046856 hectares.

residential tract. The remainder of the northwestern side of the study area (the nonabutting portion) is zoned for one or two family housing. Few zoning changes have occurred in this area either before or after the street improvement.

Land use plans were investigated to determine if the use in this area was in accord with previously proposed uses. A City of Forth Worth plan entitled *Arlington Heights Sector General Plan* published in 1972 indicated that land use has not evolved exactly as expected. The major exception is that a freeway was proposed that would have gone through the study area consuming a great deal of land. This freeway, which was to have been called the Northside-Southwest Freeway, is not now expected to ever be built. However, expectation of it must have surely affected land use. Another proposed change that has not come about is a bike and hike trail just south of Valentine Avenue. Otherwise, the area was projected to have residential, commercial, and industrial developments. Also a considerable amount of multiple family use was projected for the northwestern half of the study area which has not yet occurred. The single family residences there may be expected to be converted more to multiple family use in the future.

Another projection of land use in the 1967 *Dallas - Fort Worth Regional Transportation Study Report* did not indicate as much commercial usage as has actually occurred but otherwise predicted land development relatively well. Overall, land use did not veer greatly from that which was projected as long ago as 1967.

Socio-Economic Characteristics

Selected socio-economic characteristics were investigated to give an indi-

cation of differences between the study area and Fort Worth as a whole and the Fort Worth Standard Metropolitan Statistical Area. Census tract data from 1960 and 1970 were used to approximate the characteristics of the study area and to reveal how they were changing. Unfortunately, 1980 census data were not available to permit a look at more recent changes.

West Vickery Boulevard is the dividing line between two census tracts. Approximately half of the study area is within Census Tract 26 and the other half is in Census Tract 53. Due to the rather large differences in levels of socio-economic well being, the statistics for both census tracts are reported (Table 6).

The population in Census Tract 26 rose from 6,886 in 1970 to 7,267 in 1970 (a six percent increase). During the same period, the population in Census Tract 53 declined from 1,622 to 1,105 (a 32 percent decrease). This is consistent with the type of land use changes discovered in this study since Census Tract 53 is southeast of Vickery Boulevard in an area that has become more and more commercial and industrial. The portion of the study area to the northwest, located in Census Tract 26, still has sections that are primarily residential. The median number of school years completed remained at 12.4 from 1960 to 1970 for Census Tract 26. The median number for Census Tract 53 was 8.5 in 1960 and 9.4 in 1970. The median number in Census Tract 26 was higher than those for the city and SMSA in both 1960 and 1970, while the median school years completed in Census Tract 53 was considerably lower in both years than those for the two larger areas. The income figures also followed this general pattern with Census Tract 26 having higher incomes than Fort Worth or the SMSA and Census Tract 53 having lower incomes. The median value of owner occupied housing also followed that pattern with the exception of 1970 when the median value was higher in the SMSA than in the city and the two census tracts. Median rent paid by tenants

Table 6. Comparison of 1960 and 1970 Socio-Economic Characteristics of Census Tracts 26 and 53 to Fort Worth and the Fort Worth SMSA

Socio-Economic Characteristics	SMSA			FORT WORTH			CENSUS TRACT 26			CENSUS TRACT 53		
	1960	% Change	1970	1960	% Change	1970	1960	% Change	1970	1960	% Change	1970
Population	573,215	+33%	762,085	356,268	+10%	393,516	6,886	+6%	7,267	1,622	-32%	1,105
Median School Year Completed	11.4	+6%	12.1	11.4	+4%	11.9	12.4	0%	12.4	8.5	+11%	9.4
Median Family Income	\$5,617	+60%	\$10,101	\$5,484	+69%	\$9,271	\$7,139	+45%	\$10,375	\$5,078	+37%	\$6,942
Median Income of Families and Unrelated Individuals	\$4,952	+74%	\$8,607	\$4,622	+63%	\$7,515	\$6,502	+39%	\$9,032	\$4,858	+25%	\$6,056
Median Value of Owner Occupied Residences	\$8,500	+49%	\$13,100	\$8,500	+31%	\$11,100	\$9,400	+21%	\$11,400	\$7,000	+23%	\$8,600
Median Rent Paid by Tenants	\$65	+38%	\$90	\$64	+27%	\$81	\$94	+13%	\$106	NOT REPORTED	—	\$76
Total Employed ^a	214,782	+45%	310,567	138,094	+16%	160,451	2,958	+15%	3,414	575	-7%	532
Professional, Technical, and Kindred Workers	28,126	+75%	49,284	18,541	+32%	24,412	642	-3%	624	70	-26%	52
Managers and Administrators	20,944	+24%	26,056	12,939	+2%	13,128	341	-24%	260	30	-13%	26
Sales Workers	35,220	-29%	24,959	11,117	+19%	13,201	338	+15%	287	21	+52%	32
Clerical and Kindred Workers	17,017	+251%	59,658	23,193	+29%	30,033	643	+42%	914	71	+46%	104
Craftsmen, Foremen, and Kindred Workers	30,833	+53%	47,072	16,828	+25%	21,051	282	+89%	533	94	+15%	108
Operatives	33,680	+59%	53,682	20,164	+41%	28,462	284	+53%	434	131	-9%	119
Laborers	5,782	+146%	14,250	6,805	+17%	7,943	61	+38%	84	78	-42%	45
Service Workers	18,649	+68%	31,314	13,508	+38%	18,706	149	+63%	272	53	-13%	46
Private Household Workers	10,345	+59%	4,292	4,837	-27%	3,515	49	-88%	6	0	0%	0

^aThe total number of people employed in 1960 does not equal the total of the categories.

was not reported for Census Tract 53 in 1970, but for 1970 rent paid in that tract was lower than in the other areas while rent paid in Census Tract 26 was higher than in the city and SMSA.

Employment, like population, increased in Census Tract 26 and decreased in Census Tract 53. Unlike the city and SMSA, both census tracts lost employees in the professional and managerial categories. Census Tract 53 also had a decrease in number of employees in the operatives laborers categories.

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

To examine the impact on land use of the improvement of West Vickery Boulevard, two types of data were used. These types are:

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

Effects on Abutting and Nonabutting Land

The specific changes from one type of land use to another were 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 transformatin 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 changes are discussed first for abutting properties and then for nonabutting.

Abutting Properties. The greatest amount of change on abutting land in terms of absolute acres occurred in the *short-run after period*. However, when the changes were put on an average annual percentage basis the *long-run after period* incurred more change. The average annual rate of change in the *long-run after period* was 3.63 percent as compared to 2.49 percent in the *short-run after period* and 2.34 in the *before period*

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

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1964-1968		1968-1975		1975-1978		1968-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
	----- Acres* -----							
Single Family to Commercial	0.28	0.01	3.85	2.19	0.79	0.54	4.64	2.73
Single Family to Industrial	1.13	0	1.09	0.11	0	0	1.09	0.11
Single Family to Unimproved	0.24	0.40	0.66	0	0	0	0.66	0
Single Family to Streets	0	0.28	0	0	0	0	0	0
Multiple Family to Single Family	0	0.11	0	0	0	0	0	0
Commercial to Industrial	0.25	0.04	0.90	0.17	0.92	0	1.82	0.17
Commercial to Unimproved	0.75	0	1.24	0	0	0	1.24	0
Industrial to Unimproved	0.32	0	0	0	0	0	0	0
Unimproved to Single Family	0	0	0	0	0	0.34	0	0.34
Unimproved to Commercial	0.83	0	1.21	0.06	2.38	1.01	3.59	1.07
Unimproved to Industrial	0.17	0.02	1.36	0	2.35	0	3.71	0
Unimproved to Streets	1.54	0	0	1.09	0	0	0	1.09
Total Land Changing Use	5.51	0.86	10.31	3.62	6.44	1.89	16.75	5.51
Improved Land	2.97	0.84	7.74	2.47	1.71	0.54	9.45	3.01
unimproved Land	2.54	0.02	2.57	1.15	4.73	1.35	7.30	2.50

*One acre equals .4046856 hectares.

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		Short-Run After Period		Long-Run After Period		Total After Period	
	1964-1968		1968-1975		1975-1978		1968-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Commercial	0.12	*	0.93	0.21	0.45	0.12	0.78	0.18
Single Family to Industrial	0.48	0	0.26	0.01	0	0	0.18	0.01
Single Family to Unimproved	0.10	0.07	0.16	0	0	0	0.11	0
Single Family to Streets	0	0.05	0	0	0	0	0	0
Multiple Family to Single Family	0	0.02	0	0	0	0	0	0
Commercial to Industrial	0.11	0.01	0.22	0.02	0.52	0	0.31	0.01
Commercial to Unimproved	0.32	0	0.30	0	0	0	0.21	0
Industrial to Unimproved	0.14	0	0	0	0	0	0	0
Unimproved to Single Family	0	0	0	0	0	0.07	0	0.02
Unimproved to Commercial	0.35	0	0.29	0.01	1.34	0.22	0.61	0.07
Unimproved to Industrial	0.07	*	0.33	0	1.32	0	0.63	0
Unimproved to Streets	0.65	0	0	0.10	0	0	0	0.07
Total Land Changing Use	2.34	0.15	2.49	0.35	3.63	0.41	2.83	0.36
Improved Land	1.27	0.15	1.87	0.24	0.97	0.12	1.59	0.20
Unimproved Land	1.07	*	0.62	0.11	2.66	0.29	1.24	0.16

*Less than 0.01 percent

The increase in rate of change in abutting land may be, in part, a reaction to the improvement of the street. In each period, changes from one type of development to another involved more acreage than the development of previously unimproved land. This exemplifies the revitalization of this area.

Nonabutting Properties. The average annual rates of change for nonabutting land also increased but were much smaller than for abutting. An average of 0.15 percent of nonabutting land changed use each year of the *before period* while an average of 0.35 percent changed use in the *short-run after period* and an average of 0.41 percent per year changed use in the *long-run after period*. Most of the nonabutting land use change in the *before* and *short-run after periods* were the results of conversions from one type of improvement to another. The change in the *long-run after period* was primarily the result of new development with a small amount of conversions from an existing type of improvement to another.

Opinions of Knowledgeable People

Numerous interviews were conducted with people who had knowledge of this study area. A better understanding was gained of the land use changes that have taken place and the impact of the street improvement.

The personnel of the State Department of Highways and Public Transportation expressed the opinion that the street improvement did not induce much change in land use. Most of the development that occurred was said to be a continuation of what had begun prior to the street improvement. One possible effect mentioned was a deterring effect on development by all the talk and planning for the improvement project. The expectation of the removal of on street parking

