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16. Abstract <p>Previous studies on the effects of highway construction upon 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 effects of such improvements upon land use. This report relates the findings of research done in an area of Arlington, Texas where a section of Farm-to-Market Road 157 was restriped to create five lanes where four had previously existed. The additional lane is used as a continuous left turn lane. The road already had curbs and gutters. The improvement took place in a developing area where the majority of the land was still unimproved. 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 six years before the improvement began up to the end of 1978. Total acres in each type of land use were determined for two "before construction" years, 1963 and 1968, and for two "after construction" years, 1970 and 1978. Comparisons were made of the types and rates of development before and after the upgrading occurred. 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.</p>					
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LAND USE IMPACT OF IMPROVING SECTION TWO  
OF FARM TO MARKET ROAD 157 IN A  
DEVELOPING AREA OF ARLINGTON, TEXAS

by

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Research Report 225-15  
Research Study Number 2-8-77-225  
Economics of Highway Design Alternatives

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## PREFACE

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Mr. Bill Buglehall and Don Walden of the Dallas/Fort Worth Regional Planning Office of the SDHPT in Grand Prairie were particularly helpful in supplying data and providing assistance. Mr. Burton Clifton, Mr. R. W. Renfro, and others of District 2 of the SDHPT in Fort Worth were very cooperative in providing traffic count data and information on the construction and design change of the road.

Officials of the City of Arlington provided valuable information and suggestions. Several business people and residents of Arlington also provided data about the study site and the road improvement.

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 greatly appreciated. Her hard work and perseverance greatly aided this study. 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 or policies of the Federal Highway Administration. This report does not constitute a standard, a specification, or regulation.

## ABSTRACT

Previous studies on the effects of highway construction upon 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 effects of such improvements upon land use. This report relates the findings of such improvements upon land use. This report relates the findings of research done in an area of Arlington, Texas where a section of Farm-to-Market Road 157 was restriped to create five lanes where four had previously existed. The additional lane is used as a continuous left turn lane. The road already had curbs and gutters. The improvement took place in a developing area where the majority of the land was still unimproved. 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 six years before the improvement began up to the end of 1978. Total acres in each type of land use were determined for two "before construction" years, 1963 and 1968, and for two "after construction" years, 1970 and 1978. Comparisons were made of the types and rates of development before and after the upgrading occurred. 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.

## 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.

## SUMMARY OF FINDINGS

Land use data were collected for the Section Two of Farm to Market Road 157 study area in Arlington, Texas, to determine the impact upon land use as a result of improvement of the road. The road was changed from four through-lanes to four-through lanes with a continuous left turn lane. This design change was accomplished by restriping the existing surface. Data were collected for 1963, which was six years prior to the restriping; 1968, the last year before the improvement project; 1970, the first year after the improvement; and 1978, the last full year data collection was possible. The findings are summarized as follows:

1. The total study area has undergone numerous changes from 1963 to 1978.
  - a. The area was developing throughout the years of study.
    - (1) Forty-three percent of the study area was developed in 1963, and 47 percent was developed in 1968.
    - (2) Fifty-three percent was developed in 1970, and 58 percent was developed in 1978.
2. Properties abutting this portion of FM 157 underwent several notable changes.
  - a. The predominant type of abutting development changed from single family residential to commercial.
    1. Single family residential use decreased from 25.14 acres (10.17 hectares) to only 0.46 (0.19 hectares).
    2. Commercial acreage increased from 7.14 acres (2.89 hectares) to 64.33 acres (26.03 hectares).
    3. Industrial and public/semi-public uses also decreased.
3. Nonabutting land also experienced several notable changes in land use.

- a. Single family residential remained the predominant land use throughout the years between 1963 and 1978.
  - b. Commercial, multiple family, and industrial uses increased considerably during the study years.
  - c. Public/semi-public use increased slightly and mobile home acreage remained constant.
4. The period of most change for both abutting and nonabutting land was the short-run after period from 1968 through 1970.
- a. The average annual rate of change for abutting land was 12.85 percent in the short-run after period as compared to 4.15 in the before period and 2.41 in the long-run after period.
  - b. The average annual rate of change for nonabutting land was 2.69 percent in the short-run after period, 1.57 percent in the before period, and 0.35 percent in the long-run after period.
5. The improvement of this section of FM 157 had a positive effect on land use change by providing a more attractive place for development, particularly commercial development.
- a. The opinions of people knowledgeable about the area were that the addition of a continuous left turn lane encouraged the type of development that took place.
  - b. The rates of land use change, which were higher in the period immediately after the road improvement, support the contention that the design change affected land use.
  - c. The growth of Arlington and the entire Dallas/Fort Worth area has certainly been a major factor in the development that has occurred in the FM 157 area.

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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 Arlington, Texas, where a section of Farm-to-Market Road 157 (FM 157) was improved (this portion of the road will be referred to as section two of FM 157 since a previous report concentrated on another section). 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 section two of FM 157 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 1963 and 1968, the two "before" years and the "after" years, 1970 and 1978. 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 FM 157. On undeveloped tracts, a section extending back 300 feet from FM 157 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 changes. Other factors which might have influenced land use changes were also investigated. Among these were: traffic volumes, population, and median family income in the area.

### Location of the Road Improvement

The improved portion of FM 157 is located within the city limits of Arlington, Texas (Figure 1). Arlington is located in the eastern edge of

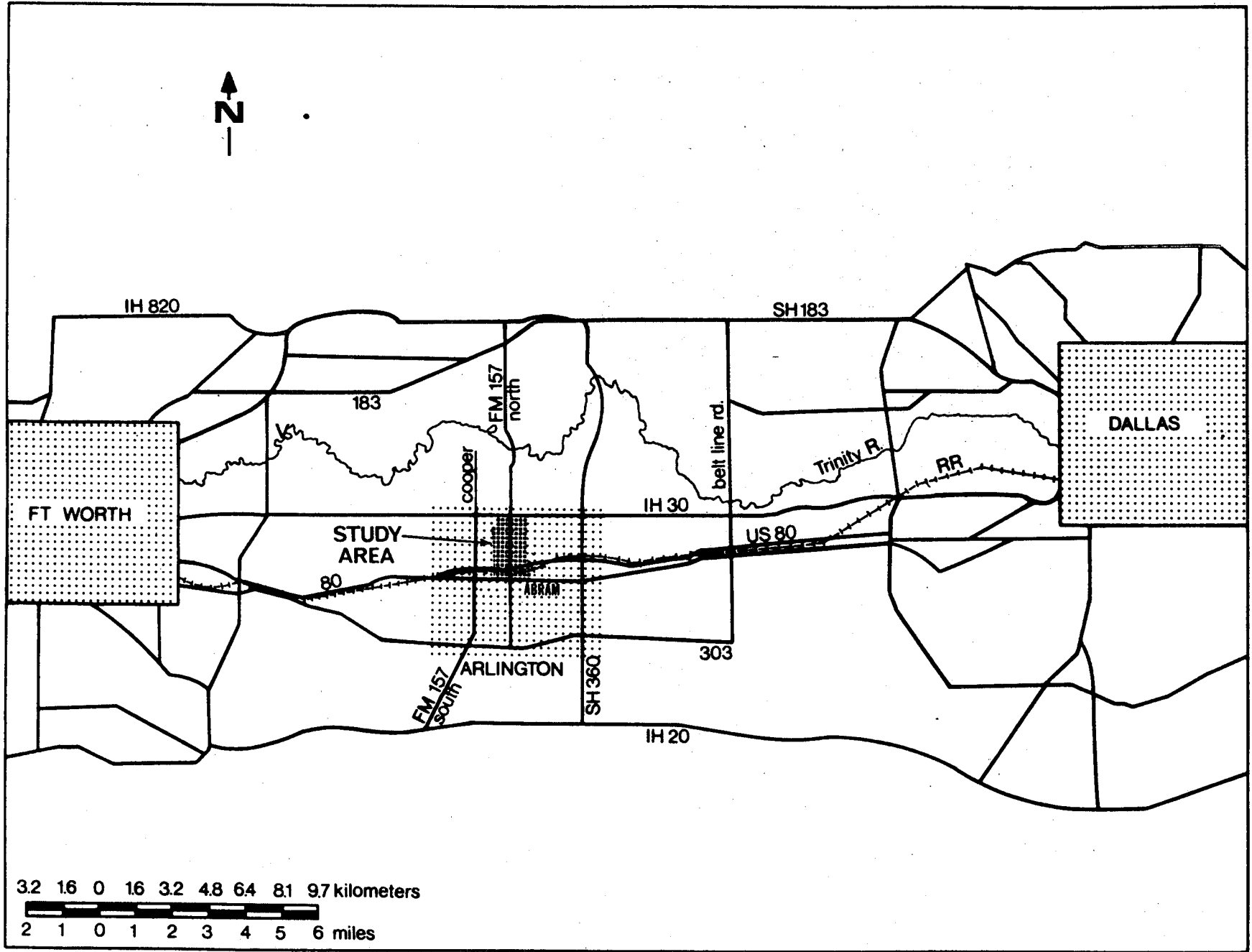


Figure 1. Map of the Dallas/Fort Worth Area Showing the Location of the Section One of Farm to Market Road 157 Study Area

Tarrant County, one of the eleven counties making up the Dallas/Fort Worth Standard Metropolitan Statistical Area (SMSA). Arlington is positioned nearly midway between Dallas and Fort Worth in this largest SMSA in Texas. Due to the interdependence between cities and counties in the SMSA, a brief discussion of the SMSA as a whole is presented first followed by a more specific description of Arlington.

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 recorded net increases in total population but 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 in the area is the 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

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<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.

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.

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 motor 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. 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.

Arlington, located approximately midway between Dallas and Fort Worth has emerged from being a small agricultural service center to being an integral part of the SMSA. The city, benefiting from its central location, has attracted major industrial, retail, and entertainment developments.

The population of Arlington has increased from 7,692 in 1950 to 90,643 in 1970 (a 1,078 percent increase) and to 160,000 in 1978 (a 77 percent increase since 1970), as shown in Table 1. The population is projected to reach 170,000 in 1980 and 208,600 in 1985. Although many Arlington residents work within the city, numerous residents work in Dallas or Fort Worth but prefer Arlington as a place to live.

There are over 350 industrial firms in Arlington making and distributing numerous products. Among the largest is an automobile assembly plant.

Entertainment facilities at Six Flags Over Texas Amusement Park and the Texas Ranger Baseball Park are important contributors to income in Arlington. Six Flags attracts more tourists than any other recreational facility in the state.

City retail sales almost tripled between 1960 and 1970 increasing from \$64,978,000 to \$190,594,000. The increase was even greater between 1970 and 1978, when sales increased over fourfold to \$799,572,000.

Table 1. Population and Percentage Change in Population for  
Arlington, 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
Arlington	7,692	37,083 482%	44,775	45,868 102%	89,723	-	b
Dallas	434,462	245,222 56%	679,684	164,717 24%	844,401	-	b
Dallas SMSA	614,799	468,802 76%	1,083,601	472,533 44%	1,556,134	-	c
Fort Worth	278,778	77,490 28%	356,268	37,208 10%	393,476	-	b
Fort Worth SMSA	361,253	211,962 59%	573,215	188,870 33%	762,085	-	c
Dallas-Fort Worth SMSA	c	-	c	-	2,378,353	158,595 7%	2,536,948

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

<sup>b</sup>Data unavailable.

<sup>c</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.

## Key Characteristics of Street Improvement

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 section two of FM 157 area was 43 percent improved in 1963 and 47 percent improved in 1969, the stage of development before the improvement began was *developing*.<sup>2</sup> The primary type of improvement was single family. The improvement is located inside of the north Arlington city limits.

### Sources of Data

The source of information on the design change and construction dates of the road improvement was the District 2 Office of the SDHPT in Fort Worth. Data

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<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.

on the planning and justification of the design change were provided by personnel of the District Office and from planners with the City of Arlington.

The Dallas-Fort Worth Regional Planning Office of the SDHPT in Grand Prairie was the major source of land use information. The city of Arlington Planning Office also provided some land use data and data on zoning. On-site inspection and city directories helped determine the correct land uses. Interviews with real estate developers, SDHPT personnel and city planners and officials, area residents, and property owners also provided background information on land use and plans for the road improvement.

Traffic volume data were obtained from the District 2 Office and the Dallas-Fort Worth Regional Planning Office of the SDHPT. The Arlington Chamber of Commerce and the U.S. Census provided 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-Governmental - tract improved with a governmental office, park, public-owned utility, etc.

Semi-Public-Nonprofit - tract improved with a governmental office, park, public owned utility, etc.

Semi-Public-Nonprofit - tract with improvements such as churches, nonprofit clubs, or other non-profit organizations.

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 1963 to 1968 which ends the year before the road improvement began.

Short-Run After Period - the period which includes changes that occurred since the end of 1968 through 1970. This period includes the year in which the restriping occurred, 1969.

Long-Run After Period - the period which includes changes that occurred since the end of 1970 through 1978.

CHARACTERISTICS OF AREA STREETS AND ROADS  
BEFORE AND AFTER IMPROVEMENT OF FM 157

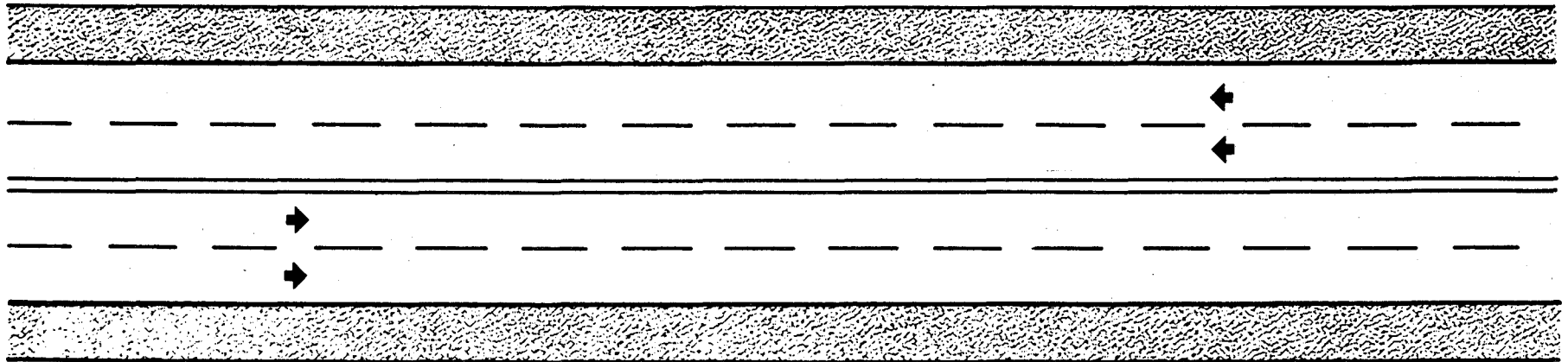
FM 157

Farm to Market Road 157 (FM 157) is a major north-south arterial in Arlington as shown in Figure 1. The road actually begins north of Arlington in Grapevine, Texas, near the Dallas-Fort Worth Airport and continues south to Euless, Arlington, Mansfield and Maypearl. The section of FM 157 that this report concentrates on begins at the intersection with Interstate 30 (formerly Dallas-Fort Worth Turnpike) and extends south for approximately 1.72 miles (2.77 kilometers) to Abrams Street. This section of FM 157 is referred to as Section Two in the title since a previous report focuses upon a different portion of the road.

The improvement changed this section of FM 157 from four wide lanes to five lanes with the fifth lane used for a continuous left turn lane. Curbs and gutters existed before the improvement (Figure 2). This restriping project was accomplished in 1969. No right-of-way had to be acquired.

Traffic counts on FM 157 just north of U.S. 80 were available for each year from 1966 through 1977 (Table 2). Between 1966 and 1968, which were the years before the improvement of the road, the annual average increase in daily traffic was seven percent per year. The years between 1968 and 1970, which are called the short-run after period, had an increase of 12 percent per year. The years from 1970 to 1977 showed a two percent increase per year. Although traffic counts on FM 157 have continued to increase, the rate of increase has declined sharply.

# Before Period Design



# After Period Design

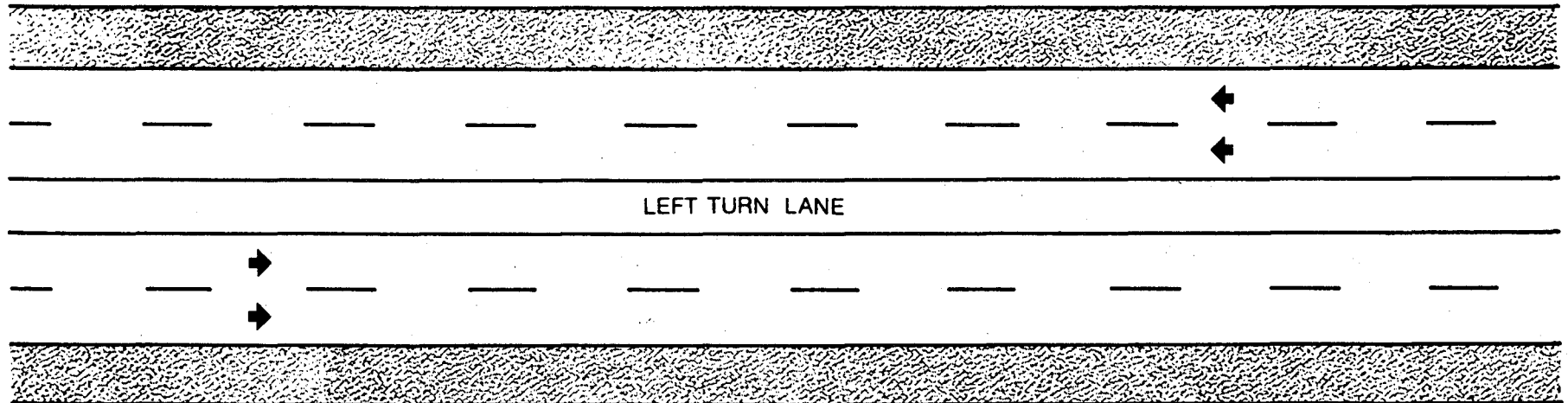


Figure 2. Design of Section Two of Farm to Market Road 157 Before and After Improvement

Table 2. Twenty-Four Hour Traffic Counts on FM 157  
and Other Parallel and Intersecting Streets

Location of Traffic Count	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
STUDY ROUTE FM 157 South of I 30 North of Randol Mills Road North of U.S. 80	16,340	16,530	18,560	20,980	23,140	22,690	18,970 23,100	24,620 24,510	22,980	25,600	30,740 23,930 24,660	28,130 25,460 27,170
PARALLEL STREETS State 360 North of Randol Mills Road North of U.S. 80 South of U.S. 80 Stadium Drive North of U.S. 80 Cooper Street North of I 30 South of Randol Mills Road South of Abrams	13,180	13,280	18,290	21,270	27,000	26,950	26,300	26,310 25,840 28,650 3,790 1,890 12,080 20,820	31,315 25,220	26,500	25,160 26,290 6,870 12,700	37,116 36,460 9,790 5,547 11,632 28,389
INTERSECTING STREETS Abrams Street West of FM 157 East of FM 157 U.S. 80 West of FM 157 East of FM 157 Sanford Street East of FM 157 Randol Mills Road West of FM 157 East of FM 157 Copeland Road East of FM 157 Interstate 30 East of FM 157	18,000	18,050	18,870	20,380	21,350	22,370	16,580 23,520 21,410 36,020	18,470 19,530 23,360 29,140 2,050 20,060 13,180 3,360	23,030	23,640	20,770 21,830 24,330 24,720 1,810 17,090 14,560 4,710	19,455 20,005 25,230 26,671 3,232 25,460 16,687 4,283 34,800



### Parallel Roads

State Highway 360 is east of and parallel to FM 157. This alternate north-south route has also had increasing traffic counts at a point just north of U.S. 80. Traffic on State 360 increased by an average of 19 percent per year between 1966 and 1968, and by an average of 24 percent per year between 1968 and 1970. The increase was five percent per year between 1970 and 1977. Although the percentage increases for State 360 are higher than those for FM 157, the same pattern of diminishing rates of increase in traffic is present for both streets. This may be due in part to the decreasing rate of population growth of the Dallas/Fort Worth Metroplex. Although the area is still growing, it is not growing as fast as it was, and, therefore, as a result traffic counts on these two roads may logically not be increasing as rapidly.

Other parallel roads have had increases in traffic counts in recent years but not enough data was available for a comparison of rates of increase (Table 2).

### Intersecting Roads

Another road that has also followed the pattern of decreasing rates of traffic count growth is U.S. 80 (Division Street), one of the major intersecting roads in this study area. Using the same years of comparison as before, U.S. 80 had an annual average increase of two percent between 1966 and 1968, a seven percent increase between 1968 and 1970, and a three percent increase between 1970 and 1977. Counts for other intersecting streets are reported in Table 2 although they are not as complete as the ones for U.S. 80 and do not permit the same comparison.

## CHARACTERISTICS OF THE STUDY AREA BEFORE AND AFTER IMPROVEMENT OF FARM TO MARKET ROAD 157

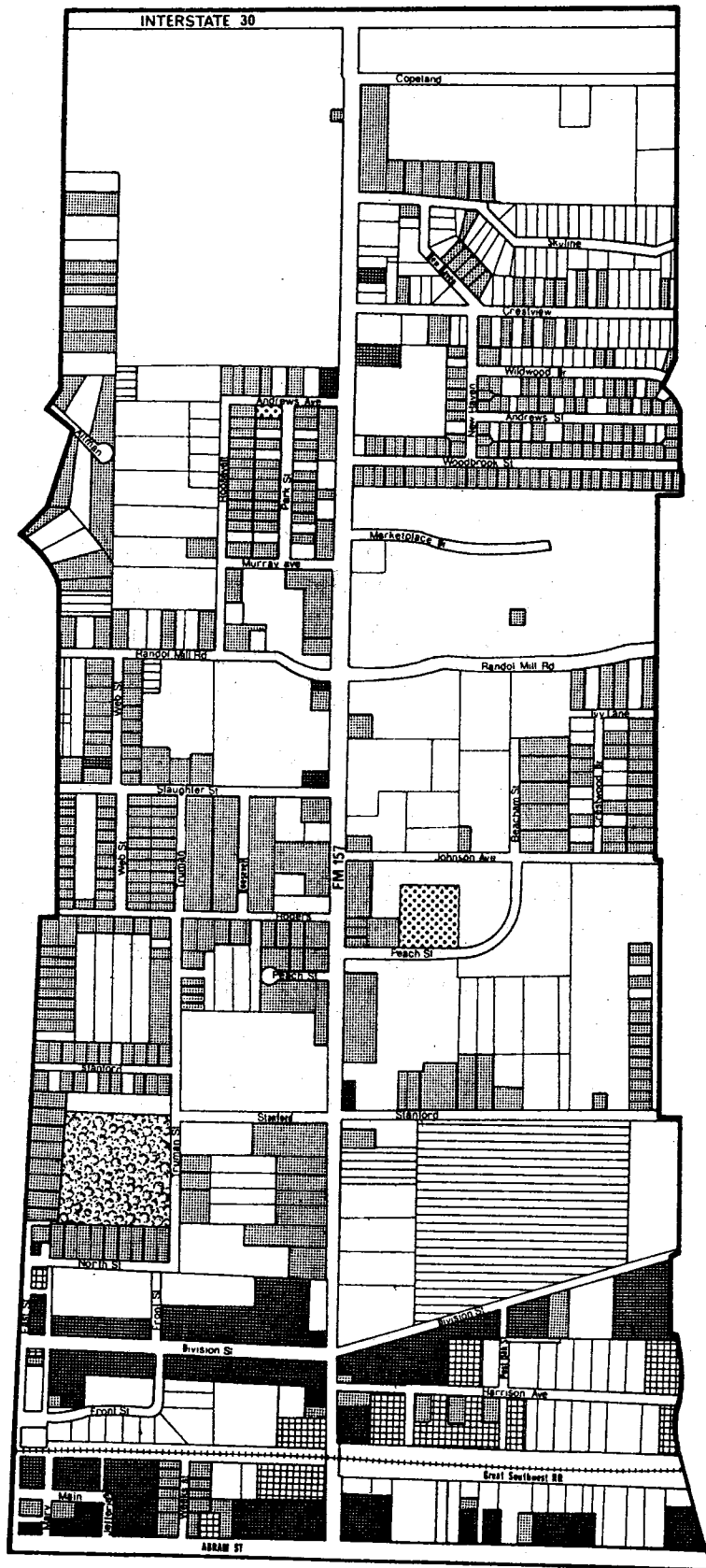
### Size and Boundaries of the Study Area

This study area encompasses approximately 808.08 acres (326 hectares). 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 FM 157, thus including both abutting and nonabutting land. Interstate 30 and Abrams Street form the northern and southern borders, respectively. The western and eastern borders were drawn along property lines and residential-type streets. The study area extends approximately 1,800 feet (549 meters) on each side of FM 157 and is approximately 9,000 feet (2,743 meters) long.








Most of the single-family residences on the western side of the study area are approximately 30 years old. The homes on the eastern side range from five to 20 years old with the newest homes being located in the northeastern quadrant.

### Land Use Characteristics

As indicated in the land use maps in Figures 3, 4, 5, and 6, this study area contains several types of land use. In 1963, the first year for which data were collected, 43 percent of the study area had been improved. The type of development covering most acreage was single family residences. Although single family residential remained the predominant type of development in terms of acreage; commercial, industrial, and multiple family uses increased greatly in the study years, 1963 through 1978. Eventually, the sum of acreage in other types of developments was considerably greater than that in single family residential. In 1968, 47 percent of the study area was developed; in 1970, 53



**LAND USE LEGEND**

-  UNIMPROVED
-  SINGLE FAMILY
-  MULTIPLE FAMILY
-  COMMERCIAL
-  INDUSTRIAL
-  PUBLIC/SEMI PUBLIC
-  MOBILE HOMES

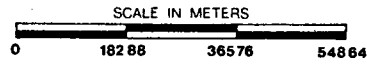
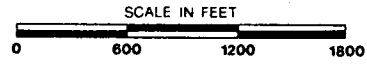


Figure 3. Land Use in the Section Two of FM 157 Study Area in 1963

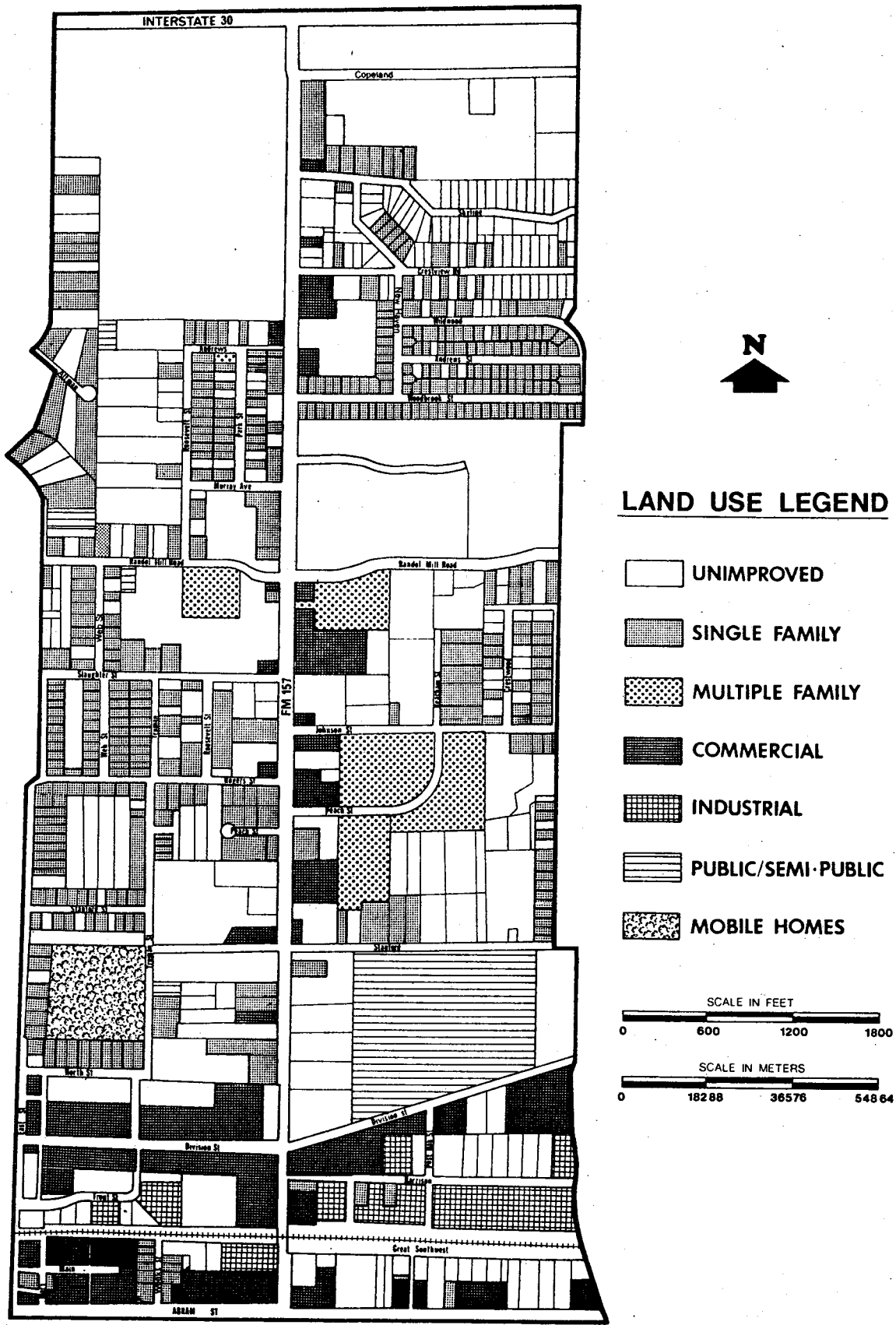


Figure 4. Land Use in the Section Two of FM 157 Study Area in 1968

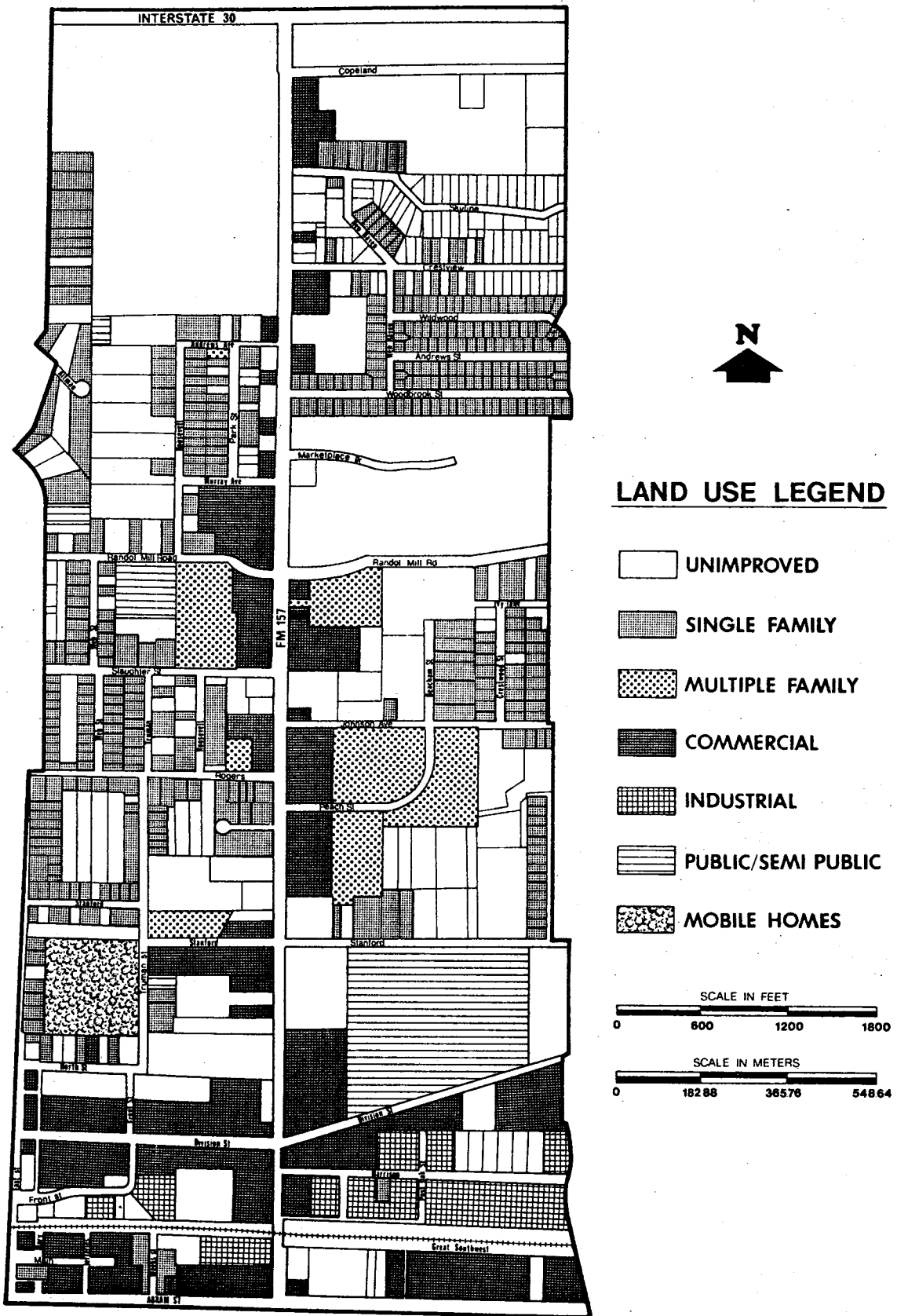


Figure 5. Land Use in the Section Two of FM 157 Study Area in 1970

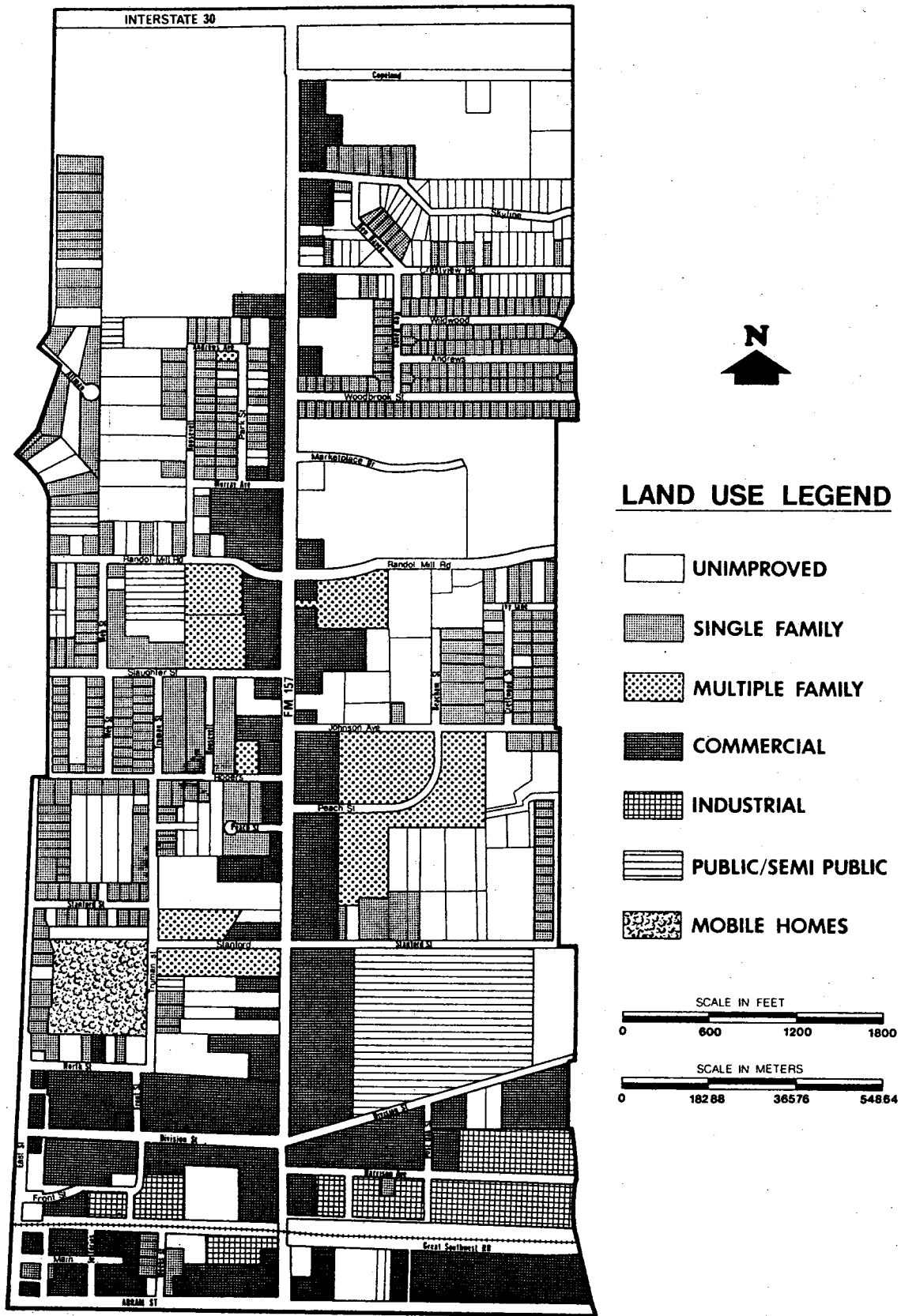


Figure 6. Land Use in the Section Two of FM 157 Study Area in 1978

percent was developed; and in 1978, 58 percent was developed. The most prominent type of new development was commercial.

### Land Use Changes

The transformation of this area from one that was 43 percent developed to one that was 58 percent developed has involved many types of changes. These changes are discussed first in terms of the total study area and then in terms of proximity to FM 157.

### Overall Study Area

In 1963, unimproved tracts were scattered throughout the study area. Single family residential use was the predominant type of development (Table 3). There was over three times as much land in single family residential use as there was in commercial use, the use with the second most acreage (with the exception of streets and roads).

The years between 1963 and 1968 set the stage for the evolution of this area from one that contained mostly single family housing to one that was characterized more by other uses. Single family residential use decreased by 11 percent while commercial use increased by 46 percent. Multiple family use also experienced a dramatic increase between 1963 and 1968 when it rose from 3.17 acres (1.28 hectares) to 27.94 acres (11.31 hectares), a 781 percent rise. Industrial and public/semi-public uses also increased during that time.

The same types of changes continued in the period between 1968 and 1970. Single family use declined again as commercial, multiple family, industrial, and public and semi-public uses increased. Commercial acreage had the greatest absolute and percentage increase between 1968 and 1970.

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	
	1963	1968	1970	1978
Residential-Single Family	156.24	139.22	134.43	136.45
Absolute Change	-17.02		-4.79	+2.02
Percent Change	-11%		-3%	+2%
Residential-Multiple Family	3.17	27.94	35.01	38.88
Absolute Change	+24.77		+7.07	+3.87
Percent Change	+781%		+25%	+11%
Residential-Mobile Homes	9.88	9.88	9.88	9.88
Absolute Change	0		0	0
Percent Change	0		0	0
Commercial	42.48	61.85	100.85	125.33
Absolute Change	+19.37		+39.00	+24.48
Percent Change	+46%		+63%	+24%
Industrial	11.47	17.83	20.72	25.30
Absolute Change	+6.36		+2.89	+4.58
Percent Change	+55%		+16%	+22%
Public and Semi-Public	35.62	33.71	37.02	37.02
Absolute Change	-1.91		+3.31	0
Percent Change	-5%		+10%	0
Streets and Roads	91.99	91.99	91.99	91.99
Absolute Change	0		0	0
Percent Change	0		0	0
Unimproved	457.23	425.66	378.18	343.23
Absolute Change	-31.57		-47.48	-34.95
Percent Change	-7%		-11%	-9%
<b>Total Acreage</b>	<b>808.08</b>	<b>808.08</b>	<b>808.08</b>	<b>808.08</b>

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



The final period, 1970 to 1978, was again a time of a large increase in commercial acreage. Single family residential use increased slightly, and multiple family and industrial uses also increased in acreage again.

The net effect of all these changes was to transform this area into one that is well over half improved and one that contains a large portion of commercial and industrial developments instead of mainly single family developments.

#### Proximity to FM 157

Tracts of land were classified according to their location relative to FM 157. Tracts with frontage on FM 157 were classified as abutting with whole abutting tracts being included to avoid division of a development. A section 300 feet (91.44 meters) from the right-of-way was considered abutting on the undeveloped tracts. All other land was classified as nonabutting.

Although the improved facility could have influenced land use changes on nonabutting properties, it is expected that abutting properties would be most affected. The division of land into the abutting and nonabutting categories permits a comparative analysis to determine which underwent the most change.

*Abutting Properties.* In 1963, the first *before* year, 50 percent of the 126.47 abutting acres (51.18 hectares) was developed (Table 4). Excluding streets and roads, single family residential was the most common abutting land use (25.14 acres or 10.17 hectares). There were 7.14 acres (2.89 hectares) of commercial use, 2.90 acres (1.17 hectares) of industrial use, 2.34 acres (0.95 hectares) of public/semi-public use, and 25.99 acres (10.52 hectares) of streets and roads.

In the *before period* 1963 to 1968, commercial use increased by 189 percent. This was due, in part, to one industrial and several single family

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 <sup>a</sup>						
	Before			After			
	1963	1968	1970	1978			
Residential-Single Family	25.14	15.79	1.91	0.46			
Absolute Change	-9.35	-13.88	-1.45				
Percent Change	-37%	-88%	-76%				
Residential-Multiple Family	0	0	0	3.87			
Absolute Change	0	0	3.87				
Percent Change	0	0	-				
Commercial	7.14	20.61	48.24	64.33			
Absolute Change	+13.47	+27.63	+16.09				
Percent Change	+189%	+134%	+33%				
Industrial	2.90	1.61	1.61	1.32			
Absolute Change	-1.29	0	-0.29				
Percent Change	-44%	0	-18%				
Public and Semi-Public	2.34	0	0	0			
Absolute Change	-2.34	0	0				
Percent Change	-100%	0	0				
Streets	25.99	25.99	25.99	25.99			
Absolute Change	0	0	0				
Percent Change	0	0	0				
Unimproved	62.96	62.47	48.72	30.50			
Absolute Change	-0.49	-13.75	-18.80				
Percent Change	-1%	-22%	-39%				
Total Abutting Acreage	126.47	126.47	126.47	126.47			

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

residential tracts changing to commercial usage. One public/semi-public tract changed back to unimproved.

During the period in which the road improvement took place, 1968 to 1970, abutting commercial usage increased by 134 percent. In absolute acreage, this increase was larger than the one in the *before period* (27.63 acres as compared to 13.47 acres). Single family residential use decreased again, and only 1.91 acres (0.77 hectares) remained in that use on abutting land.

During the period from 1970 to 1978 increases in commercial acreage were again the most extensive type of abutting land use change. Multiple family residential use emerged for the first time on abutting land, and single family residential and industrial uses decreased slightly. Changes in abutting acreages by type of land use are charted in Figure 7.

*Nonabutting Properties.* In 1963, 58 percent of nonabutting land was still unimproved (Table 5). Nineteen percent was in single family residential use, the most prevalent type of development. Commercial and public/semi-public uses both covered about five percent of nonabutting land. There were also small amounts of multiple family residential, mobile homes, and industrial uses. Streets and roads accounted for ten percent of nonabutting land.

The first big change in nonabutting land use occurred between 1963 and 1968 when multiple family residential use increased from 3.17 acres (1.28 hectares) to 27.94 acres (11.31 hectares). Commercial, industrial, and public/semi-public uses also increased while single family residential use decreased.

The increases in commercial acreage were also the major changes between 1968 and 1970 and between 1970 and 1978. The net result of all the changes on nonabutting land was that single family residential and public/semi-public uses increased slightly; commercial, industrial, and multiple family residential uses increased greatly; and mobile home and street acreage remained constant. The

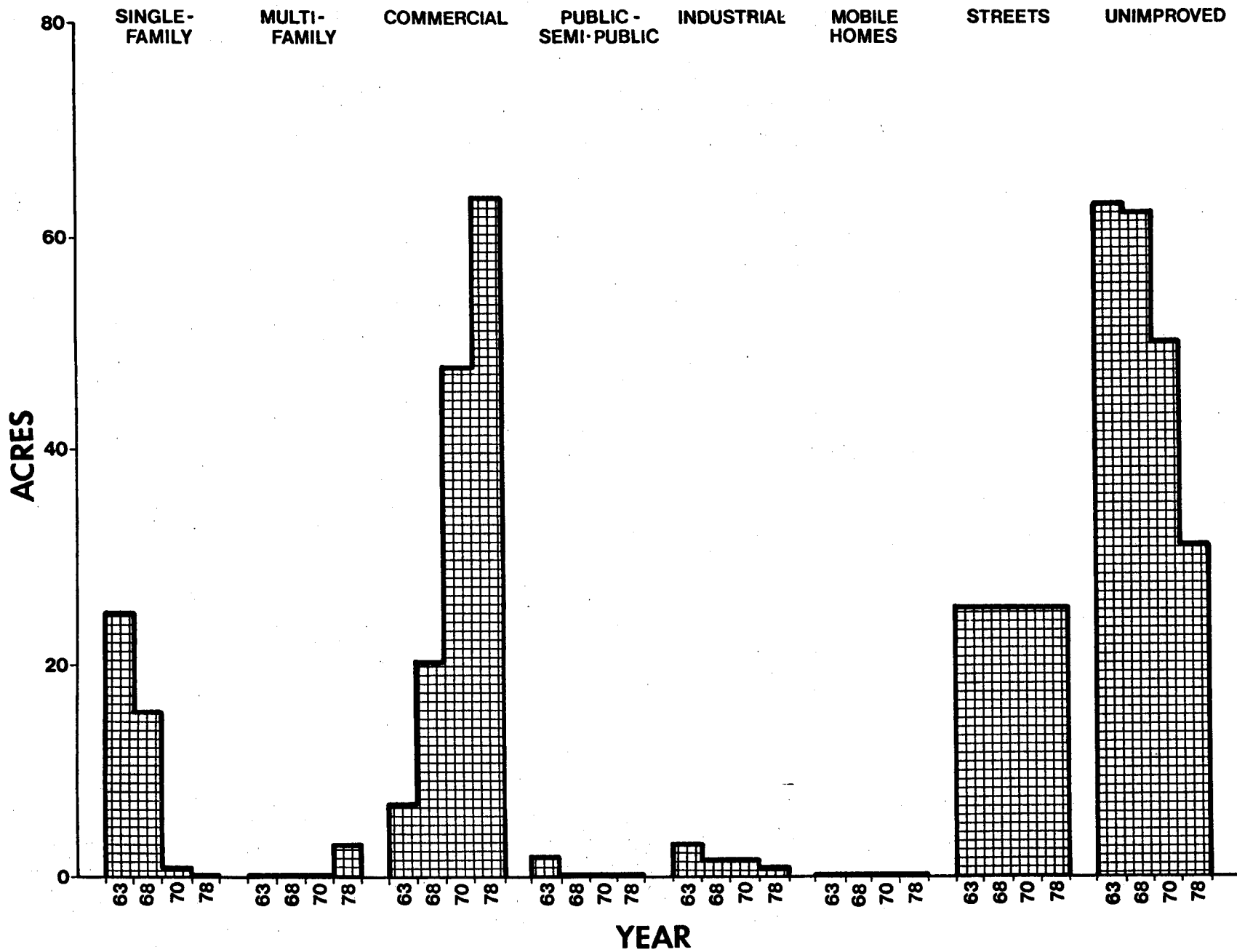


Figure 7. Changes in Abutting Land Uses in the Section Two of Farm to Market Road 157 Study Area

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	
	1963	1968	1970	1978
Residential-Single Family	131.10	123.43	132.52	135.99
Absolute Change	-7.67	+9.09	+3.47	
Percent Change	-6%	+7%	+3%	
Residential-Multiple Family	3.17	27.94	35.01	35.01
Absolute Change	+24.77	+7.07	0	
Percent Change	+781%	+25%	0	
Residential-Mobile Homes	9.88	9.88	9.88	9.88
Absolute Change	0	0	0	
Percent Change	0	0	0	
Commercial	35.34	41.24	52.61	61.00
Absolute Change	+5.87	+11.37	+8.39	
Percent Change	+17%	+28%	+16%	
Public and Semi-Public	33.28	33.71	37.02	37.02
Absolute Change	+0.43	+3.31	0	
Percent Change	+1%	+10%	0	
Industrial	8.57	16.22	19.11	23.98
Absolute Change	+7.65	+2.89	+4.87	
Percent Change	+89%	+18%	+25%	
Streets and Roads	66.00	66.00	66.00	66.00
Absolute Change	0	0	0	
Percent Change	0	0	0	
Unimproved	394.27	363.22	329.46	312.73
Absolute Change	-31.05	-33.73	-16.73	
Percent Change	-8%	-9%	-5%	
<b>Total Nonabutting Acreage</b>	<b>681.61</b>	<b>681.61</b>	<b>681.61</b>	<b>681.61</b>

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

total amount of unimproved nonabutting land decreased by 21 percent. Changes in nonabutting acreages by type of land use are shown in Figure 8.

#### Land Use Impediments

There are two large sections of land in the northern end of the study area that have remained unimproved. These tracts have been held back presumably because their owners did not wish to sell. The tract in the northwestern corner is reportedly going to be developed as a commercial center soon. No other impediments to land use change, with the exception of zoning which is discussed in a later section, were discovered in this area.

#### Influence of Other Major Roads

There are several roads that intersect this study area that also have had an influence on land use. The effects of these roads and the effect of FM 157 are too intertwined to evaluate separately. It is recognized that Interstate 30, U.S. 80, Abrams Street, and Randal Mill Road are very important factors to be considered when researching land use. All of these roads have high traffic volumes and provide attractive locales for many types of development. A lot of commercial developments have been located near U.S. 80 and Abrams. All of the industrial developments are also in that area but appear to be located there more because of the railroad than the streets. Although these streets certainly have been important, due to the way this study area is delineated, FM 157 is the most important thoroughfare and the focal point in terms of roads.

#### Other Factors Influencing Change

The growth of the entire Dallas-Fort Worth Metroplex has certainly been a primary factor in the growth of all of Arlington as well as in this study area.

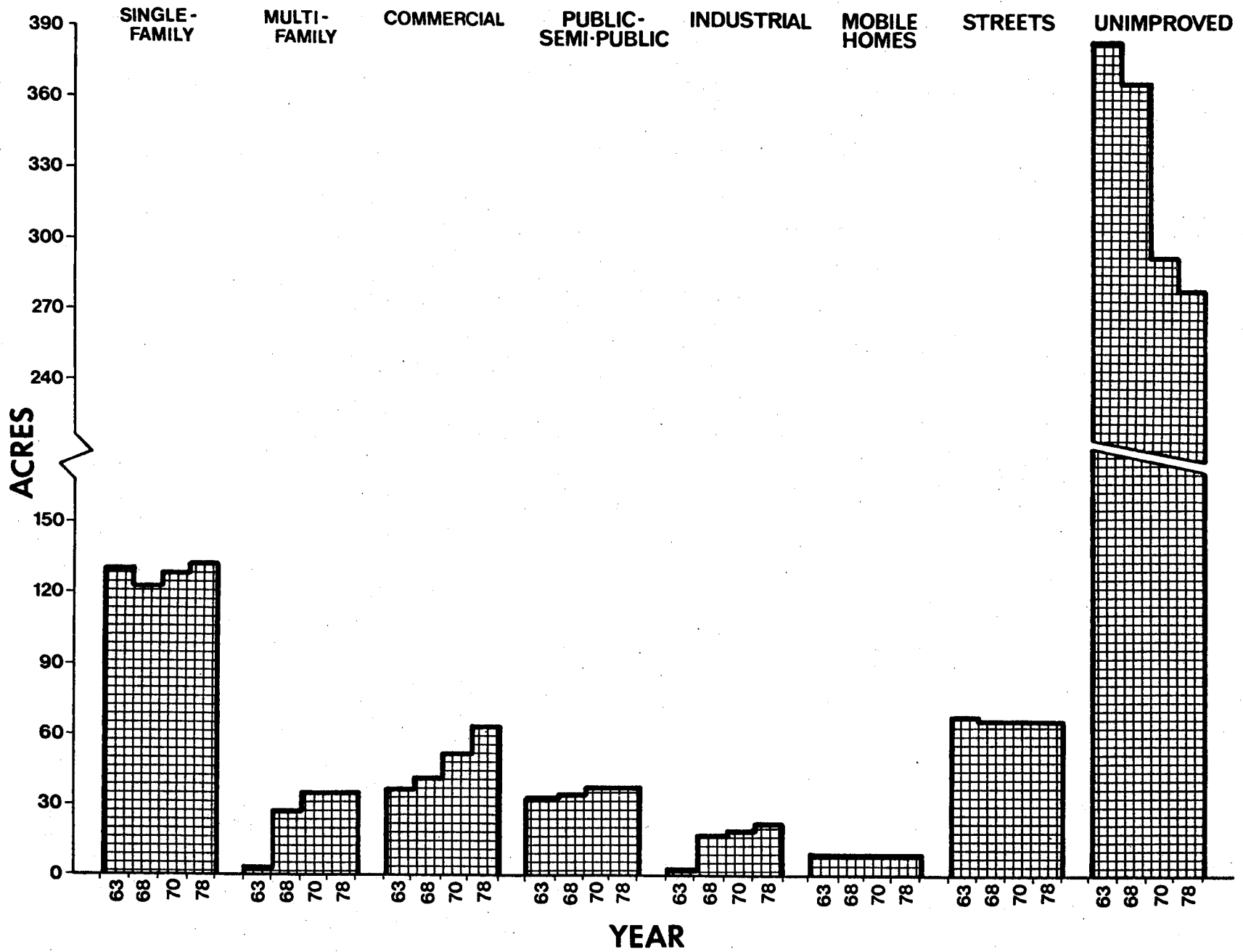


Figure 8. Changes in Nonabutting Land Uses in the Section Two of Farm to Market Road 157 Study Area

Being centrally located between the two large cities makes Arlington an ideal place for businesses, industries, and residences. The development in the study area reflects the general expansionary trend of the Metroplex's economy.

Another influence has been the railroad which cuts through the southern end of the study area. All of the industrial development in this study area has located along the railroad.

#### Land Use Controls and Plans

Land use is regulated in Arlington by zoning. Most of the abutting land is zoned commercial. There are also several commercially zoned tracts on nonabutting land particularly along I30, Abrams Street, and U.S. 80. The remainder of nonabutting land contains many tracts zoned for multiple family housing, some single family residential zoning, and some industrial zoning in the southern part of the study area. The available data indicate that there were five changes in zoning on abutting land between 1968 and 1978 and 13 changes on nonabutting land for that same period. All of the changes on abutting land were changes to a commercial use. Three of those were previously another type of commercial zone and two were previously multiple family zones. Most of the zoning changes on nonabutting land were also changes to commercial use. The remainder were changes to office and multiple family zones. Five of those tracts had previously been zoned single family residential. The others were previously multiple family or commercial. Very few of the requested zoning changes were denied. Only one exception was discovered that was an attempted change from single family to commercial on nonabutting land. In general, although zoning has surely been a consideration in development decisions for this area, it has not been an extremely restrictive factor since several changes in zoning were granted.



Two land use plans for Arlington were available to determine if development in the study area has occurred generally as projected. A plan entitled the *Arlington Plan*, published in 1964, predicted that development would occur basically as it actually has. The most notable exceptions are that many of the existing single family residential areas were projected to become multiple family areas, and a large tract on the eastern side of FM 157 just north of Randal Mill Road was projected to become public/semi-public land but has remained mostly vacant.

In another plan published in 1971 entitled *Arlington, Texas, Urban Development Framework*, the development was also predicted to occur generally as it has. The restriping of FM 157 had already occurred when this plan was published. The residential category was not broken down into single and multiple family, but, basically, there were no major discrepancies between the predicted and actual development. Some of the land in the study area is still undeveloped, but that development will likely occur similar to those plans. A year was not specified for when the plans were expected to become reality.

#### Socio-Economic Characteristics

Selected socio-economic characteristics were investigated to reveal differences between the study area, Arlington as a whole, and the Fort Worth SMSA (Arlington is in the Fort Worth SMSA). Data from 1960 and 1970 were used to determine changes.

Census tract data were used to estimate the statistics of the FM 157 study area. Since the study area was in part of four census tracts, an average weighted by population in each tract was derived for each statistic.

The population of this area has grown as quickly as that of the SMSA but not nearly as quickly as that for Arlington as a whole (Table 6). This is not

Table 6. Comparison of 1960 and 1970 Socio-Economic Characteristics of the Section Two of FM 157 Study Area to Arlington and the Fort Worth SMSA<sup>a</sup>

Socio-Economic Characteristics	Fort Worth SMSA			Arlington			Study Area <sup>b</sup>		
	1960	% Change	1970	1960	% Change	1970	1960	% Change	1970
Population	573,215	+33%	762,085	44,775	+105%	91,685	16,431	+33%	21,795
Median School Years Completed	11.4	+6%	12.1	12.3	+2%	12.6	11.7	+3%	12.0
Median Family Income	\$5,617	+80%	\$10,101	\$6,574	+55%	\$10,218	\$5,743	+65%	\$9,461
Median Income of Families and Unrelated Individuals	\$4,952	+74%	\$8,607	\$6,024	+44%	\$8,690	\$6,340	+20%	\$7,637
Median Value of Owner Occupied Residences	\$8,800	+162%	\$13,100	\$10,900	+58%	\$17,200	\$9,103	+47%	\$13,352
Median Rent Paid by Tenants	\$65	+55%	\$90	\$78	+71%	\$133	\$83	+39%	\$115
Total Employed	214,782	+45%	310,567	16,005	+151%	40,136	6,161	+67%	10,318
Professional, Technical, and Kindred Workers	28,126	+75%	49,284	2,932	+206%	8,977	869	+88%	1,631
Managers and Administrators	20,944	+24%	26,056	1,421	+155%	3,628	476	+43%	681
Sales Workers	35,220	-29%	24,959	2,839	+15%	3,266	445	+58%	702
Clerical and Kindred Workers	17,017	+251%	59,658	1,418	+512%	8,678	1,107	+104%	2,257
Craftsmen, Foremen, and Kindred Workers	30,833	+53%	47,072	2,757	+102%	5,576	1,002	+64%	1,647
Operatives	33,680	+59%	53,682	2,464	+120%	5,412	1,149	+54%	1,772
Laborers	5,782	+146%	14,250	166	+711%	1,347	171	+188%	492
Service Workers	18,649	+68%	31,314	1,042	+193%	3,058	524	+100%	1,050
Private Household Workers	10,345	-59%	4,292	398	-51%	194	94	-14%	81

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

<sup>b</sup>Census tracts A-0017, A-0021, A-0022 and A-0023 from the 1960 census and tracts 217.01, 217.02, 221, 222, and 223 from the 1970 census were used to provide weighted averages to represent the census tract characteristics.

surprising since this area is older and more established than other sections of the city, although this area maintains a moderate rate of growth. The median school years completed in the study area have increased although they were lower than in the city and SMSA in 1970. The same is true for median family income. Median family income was higher in the study area in 1960 than in the city or SMSA but lost ground by 1970 when both the city and SMSA reported higher figures.

The median value of owner occupied houses was higher in the study area than in the SMSA in both 1960 and 1970 but remained less than in the whole city. Median rent paid by tenants was higher in the study area than in the SMSA in both years and higher than in the city in 1960, but in 1970, Arlington reported the highest median rent.

The total number of people in the study area who were employed increased by 67 percent between 1960 and 1970 as compared to a 45 percent increase in the SMSA and a 151 percent increase in the city. The percentage increases in the white collar occupations were not as high for the study area as in the city but higher in the study area than in the SMSA. There were large increases in all occupation categories for the study area except in the private household workers category.

Overall, the study area residents generally had a slightly lower level of socio-economic well being than the residents of Arlington as a whole but a higher level than the residents of all of the Fort Worth SMSA. This area had basically middle class attributes as would be expected after an on-site inspection.

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

To examine the impact on land use of the FM 157 restriping, 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 unimproved to an improved use but also changes from an improved use to some other improved use or back to unimproved. 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 percentage changes for each land use type and time period. The percentages are adjusted for differences in lengths of time periods and for the larger acreage in the nonabutting category. This permits a more meaningful comparison between the abutting and nonabutting categories. These changes are discussed first for abutting property and then for nonabutting.

*Abutting Property.* As indicated by Table 7, the most change in terms of total acreage occurred during the short-run after period. This period includes all the changes that occurred from the end of 1968 to the end of 1970. The restriping of this section of FM 157 was accomplished in 1969. When the changes are put on an average annual percentage basis, as in Table 8, the *short-run after period* is still the time of most change. The average annual percentage change for abutting land was 12.85 in the *short-run after period* as compared to

Table 7. Absolute Changes in Land Use of Abutting and Nonabutting Acreage by Time Period and Type of Land Use Change<sup>a</sup>

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1964-1968		1968-1970		1970-1978		1968-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Commercial	4.63	2.30	9.93	0.81	1.45	0	11.38	0.81
Single Family to Public	0	0.43	0	0	0	0	0	0
Single Family to Unimproved	7.57	9.36	3.95	0	0	1.30	3.95	1.30
Single Family to Industrial	0	0.32	0	0.32	0	0	0	0.32
Commercial to Multiple Family	0	0	0	0	3.87	0	3.87	0
Commercial to Unimproved	0	0	0.45	0.90	0	0	0.45	0.90
Public/Semi-Public to Unimproved	2.34	0	0	0	0	0	0	0
Industrial to Commercial	1.29	0.77	0	0	0.29	0	0.29	0
Unimproved to Single Family	2.85	4.74	0	10.22	0	4.77	0	14.99
Unimproved to Commercial	7.55	2.80	18.15	11.46	18.80	8.39	36.95	19.85
Unimproved to Industrial	0	8.10	0	2.57	0	4.87	0	7.44
Unimproved to Multiple Family	0	24.77	0	7.07	0	0	0	7.07
Unimproved to Public	0	0	0	3.31	0	0	0	3.31
Total Land Changing Use	26.23	52.59	32.48	36.66	24.41	19.33	56.89	55.99
Improved Land	15.83	13.18	14.33	2.03	5.61	1.30	19.94	3.33
Unimproved Land	10.40	40.41	18.15	34.63	18.80	18.03	36.95	52.66

<sup>a</sup>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	
	1963-1968		1968-1970		1970-1978		1968-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Commercial	0.73	0.07	3.93	0.06	0.14	0	0.90	0.01
Single Family to Public	0	0.01	0	0	0	0	0	0
Single Family to Unimproved	1.20	0.27	1.56	0	0	0.02	0.31	0.02
Single Family to Industrial	0	0.01	0	0.02	0	0	0	0.005
Commercial to Multiple Family	0	0	0	0	0.38	0	0.31	0
Commercial to Unimproved	0	0	0.18	0.07	0	0	0.04	0.01
Public/Semi-Public to Unimproved	0.37	0	0	0	0	0	0	0
Industrial to Commercial	0.20	0.02	0	0	0.03	0	0.02	0
Unimproved to Single Family	0.45	0.14	0	0.75	0	0.09	0	0.22
Unimproved to Commercial	1.19	0.08	7.18	0.84	1.86	0.15	2.92	0.29
Unimproved to Industrial	0	0.24	0	0.19	0	0.09	0	0.11
Unimproved to Multiple Family	0	0.73	0	0.52	0	0	0	0.10
Unimproved to Public	0	0	0	0.24	0	0	0	0.04
Total Land Changing Use	4.15	1.57	12.85	2.69	2.41	0.35	4.50	0.82
Improved Land	2.50	0.38	5.67	0.15	0.55	0.02	1.58	0.05
Unimproved Land	1.65	1.19	7.18	2.54	1.86	0.33	2.92	0.77

4.15 for the *before period* and 2.41 for the *long-run after period*. This means that an average of 12.85 percent of the abutting land changed use in each of the years in the *short-run after period*. This suggests that the addition of a left turn lane in this section of FM 157 may have been an impetus to land use change. The majority of the changes on abutting land were due to land changing from unimproved to an improved use. However, there were changes in each period that were the result of land use changing from one improved category to another. More of this type change occurred in the *short-run after period*. The majority of this type of change in this period was due to the conversion of single family residences into commercial establishments. This suggests that the road improvement encouraged redevelopment of old structures into a different use.

The effect on abutting property of the restriping of the road appeared to have lessened considerably in the *long-run after period* since the annual average percentage change decreased to less than in the *before period*.

*Nonabutting Properties.* More absolute acres of nonabutting land changed use in the *before period* than in the other two periods, however, the rate of change was higher in the *short-run after period*. In the *short-run after period* 2.69 percent of nonabutting acres changed use as compared to 1.54 percent in the *before period* and 0.35 percent in the *long-run after period*. These rates of change on nonabutting land may also reflect some immediate reaction to the restriping of the road. Almost all of the changes were changes from unimproved to an improved use.

#### Opinions of Knowledgeable People

Numerous people were interviewed who had knowledge of this area. A better understanding was obtained of why the road was restriped and what the land use impacts were.

Officials from the State Department of Highways and Public Transportation and from the City of Arlington agreed that the road was restriped to include a continuous left turn lane because traffic was becoming very congested. The left turn lane was designed to take those vehicles making left turns out of the path of through-traffic, thus increasing the capacity of the road. Generally, city officials believed the road improvement encouraged and accelerated study area development.

Real estate people and land owners also agreed that the addition of the continuous left turn lane encouraged development. The small strip commercial, fast-food type places in mid-block were the properties said to have been most affected. The continuous left turn lane has provided an easy access to those type places.

#### Conclusions

Although this area has contained commercial and industrial developments throughout the years of study, 1963 through 1978, there have been changes, particularly on abutting land, that have altered the character of the area. Single family residential development almost totally disappeared on abutting land. Those tracts were changed primarily to commercial use or reverted back to unimproved. The abutting land was almost totally commercial, industrial, or unimproved in 1978.

There were slight increases in single family residential use on nonabutting land and large increases in multiple family, commercial, and industrial use. The improvement of the road provided a place that was more attractive for developments such as commercial, industrial, and multiple family that create high volumes of traffic. The annual percentage change in the traffic volumes on FM 157 during each period roughly parallels the land use changes. Based on the



opinions of knowledgeable people and the rates of development which were higher for the period immediately following the road improvement, the creation of a left turn lane by restriping FM 157 is judged to have encouraged and accelerated the new development and redevelopment of older structures in the study area. Without this new road design that permitted a more efficient flow of traffic, the congestion on FM 157 would have been a discouragement to development.