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LAND USE IMPACT OF IMPROVING
PIPELINE ROAD IN A DEVELOPING
AREA OF HURST, TEXAS

by

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Research Report 225-21
Research Study Number 2-8-77-225
Economics of Highway Design Alternatives

Sponsored by the State Department of Highways
and Public Transportation

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Texas Transportation Institute
The Texas A&M University System
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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 Mrs. Betty Benson in typing the manuscript.

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

ABSTRACT

Previous studies of highway construction effects on land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the land use effects of such improvements. This report relates the findings of research done in Hurst, Texas, where a section of Pipeline Road was upgraded. This section of Pipeline Road was previously two lanes with open ditches. The improvement changed the whole section to a four-lane striped facility with curbs and gutters. The improvement took place in a developing area where the predominant type of development was single family residential. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the road improvement. Data were collected for a period including four years before planning for this specific improvement began and all the years since through 1978. Total acreage in each type of land use was determined for 1963 and 1966, which were before formal planning began, and 1970 and 1978 which were both after the road improvement was completed. Comparisons were made between the before and after types and rates of development. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the street improvement were also researched and are reported. Highway planners should be able to use this report and subsequent reports of this study to make more accurate predictions of land use changes due to specific highway improvements.

SUMMARY OF FINDINGS

Data were collected and analyzed for the Pipeline Road study area in Hurst, Texas, to examine the impact on land use of upgrading the road. The approximately 1.7 mile section of Pipeline Road that this study concentrates upon was changed from a two-lane facility with open ditches to a four-lane facility with curbs and gutters. Data were collected for 1963, which was four years prior to official planning for this project; 1966, the year immediately before planning began; 1970, the first year after construction was completed; and 1978, the year in which data collection took place. The period between 1963 and 1966 is called the *before period*. The years from 1966 to 1970 are called the *short-run after period*. The *long-run after period* is 1970 through 1978.

The findings are summarized as follows:

1. The Road improvement occurred in Hurst, a suburb of Dallas and Fort Worth.
 - a. The study area, which includes both land that abuts Pipeline Road and nonabutting land, changed from a developing area to one that was mostly developed.
 - (1) The total study area was 76 percent improved in 1963, the first study year.
 - (2) Eighty-nine percent of the area was developed by the end of 1978.
 - b. The predominant land use remained single family residential from 1963 through 1978.
2. Sixteen percent of abutting land was developed between 1963 and 1978 and some changes from one type of development to another occurred.
 - a. Commercial acreage increased from 24.68 acres to 39.65 acres.
 - b. Public/semi-public use increased from 8.47 acres to 11.56 acres.

- c. Single family residential acreage decreased from 4.23 acres to only 0.63 acres, with most of it reverting to unimproved as commercial developments encroached.
3. Twelve percent of nonabutting land became developed for the first time between 1963 and 1978, and some changes in types of development also occurred on nonabutting land.
 - a. Single family residential acreage increased from 237.48 acres to 269.34 acres.
 - b. There were 3.67 acres in multiple family use in 1963 and 11.44 acres in 1978
 - c. Commercial usage increased from 3.58 acres to 12.35 acres.
 - d. Public/semi-public acreage increased from 33.61 acres to 40.17 acres.
 - e. Seventy nine percent of nonabutting land was developed in 1963 and 91 percent was developed by the end of 1978.
4. The average annual rates of change for both abutting and nonabutting land were higher in the *short-run after period* than in the other periods.
 - a. The average annual rate of change for abutting land was 2.26 percent in the *short-run after period*, as compared to 1.84 percent in the *before period* and 1.76 percent in the *long-run after period*.
 - b. The nonabutting average annual rates of change were 1.80 percent in the *short-run after period*, 0.26 percent in the *before period*, and 0.75 percent in the *long-run after period*.
 - c. The greater rates of change in the *short-run after period* may indicate a response to the better and faster access to this area provided by the improved street.

5. Interviews with people knowledgeable about the area revealed a belief that the road improvement had been an encouragement to development.
 - a. The previous congestion was believed to have been hampering development.
 - b. The initial stimulant effect of the road improvement was expected to decline as the road again became congested.
6. Land use in this area has occurred as was planned.
 - a. A 1967 regional plan indicated primarily commercial use on abutting land and single family residential use on nonabutting land as has occurred.
 - b. Interviews with city officials indicated that land use is as it was expected to be.

IMPLEMENTATION STATEMENT

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

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

METRIC CONVERSION FACTORS
RELEVANT TO THIS REPORT

Approximate Conversions to Metric Measures

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

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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 Hurst, Texas, where a section of Pipeline Road 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 area 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 Pipeline Road 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 1966, the two *before* years and 1970 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 Pipeline Road. 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 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 Pipeline Road is within the city limits of Hurst, Texas (Figure 1). Hurst is in Tarrant County, one of the eleven counties making up the Dallas/Fort Worth Standard Metropolitan Statistical Area (SMSA).

The population of Hurst has increased tremendously over the past three decades (Table 1). Only 150 people were residents of Hurst in 1950. The number grew to 10,165 in 1960 and 27,215 in 1970. The 1977 estimate was 29,604. The city was incorporated in January of 1952 and the city charter was adopted in December of 1956.

Some of the community facilities available in Hurst are 18 churches, three motels, and 18 shopping centers. There are 13 city parks and numerous public recreational facilities.

Hurst has a small amount of industry, but the three major employers are Northeast Shopping Mall, Hurst General Hospital, and the City of Hurst. The economic viability of Hurst is interwoven with that of the SMSA as a whole. Many residents of Hurst obtain their livelihood in one of the other cities in the area, primarily in Dallas or Fort Worth. Following is a discussion of the characteristics of the SMSA as a whole.

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

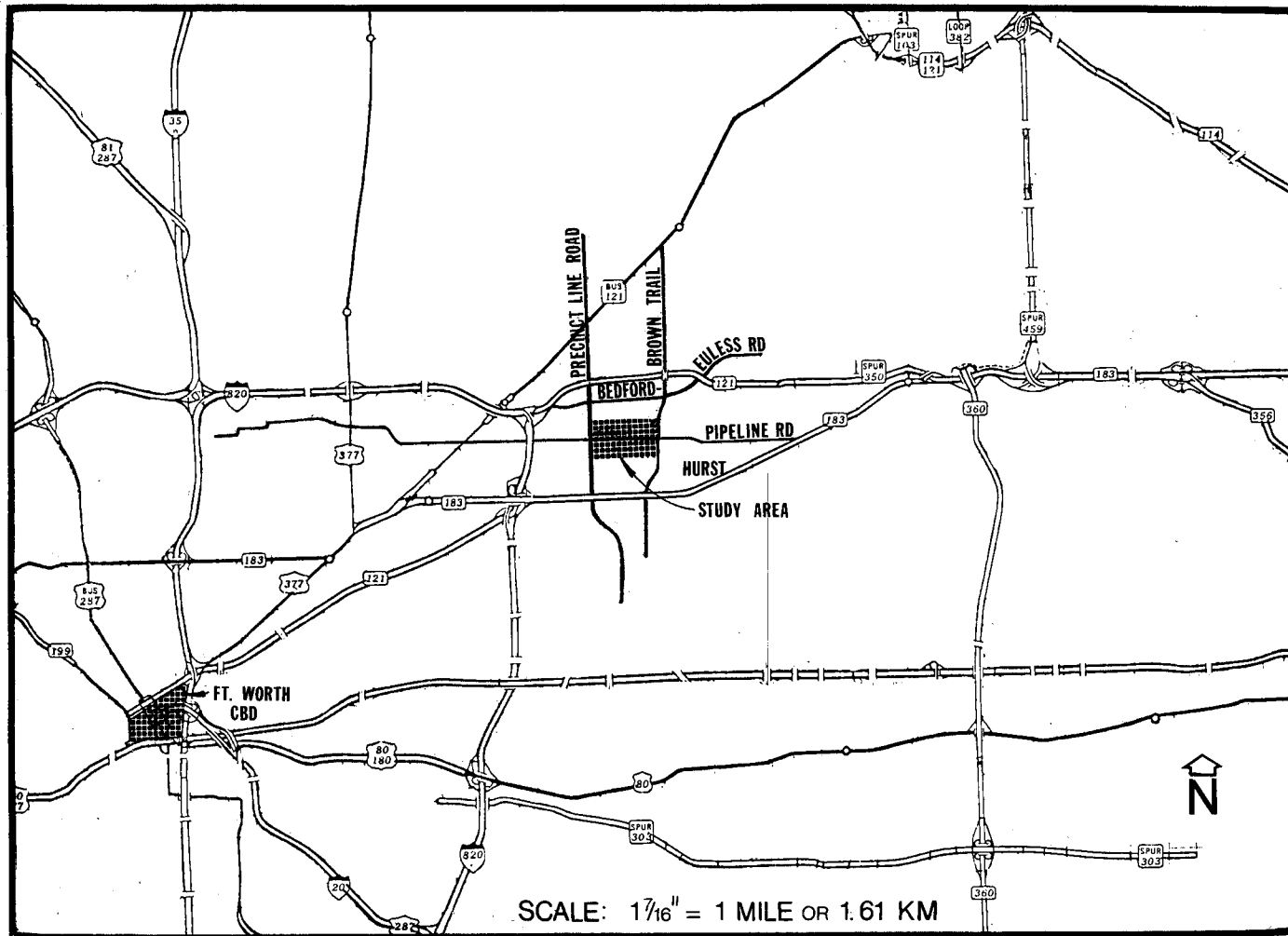


Figure 1. Map of Hurst and Fort Worth Showing the Location of the Pipeline Road Study Area

Table 1. Population and Percentage Change in Population for Hurst, Dallas, Fort Worth 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
Hurst	150	10,015 6,677%	10,165	17,050 168%	27,215	961 4%	28,176	1,428 5%	29,604
Dallas	434,462	245,222 56%	679,684	164,717 24%	844,401	31,604 -4%	812,797	31,731 4%	844,528
Dallas SMSA	614,799	468,802 76%	1,083,601	472,533 44%	1,556,134	-	b	b	b
Fort Worth	278,778	77,490 28%	356,268	37,208 10%	393,476	35,112 -9%	358,364	9,629 3%	367,993
Fort Worth SMSA	361,253	211,962 59%	573,215	188,870 33%	762,085	-	b	b	b
Dallas-Fort Worth SMSA	b	-	b	-	2,378,353	158,595 7%	2,536,948	136,252 5%	2,623,200

^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.

comprised primarily of light industry such as electronics, aircraft, apparel, oil-field equipment, food processing, automotive transportation, printing and publishing, and nonelectrical equipment.¹

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.

Despite the fact that Dallas/Fort Worth has no inland waterway, it is a major crossroad for nearly all types of domestic and international

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

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 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 Pipeline Road area was 75 percent improved in 1963 and

76 percent improved in 1966, the stage of development before the improvement began was *developing*.² The primary type of development was single family residential. The improvement is located within the city limits of Hurst.

Sources of Data

The source of information on the design change and construction dates for Pipeline Road was the City of Hurst. Data on land use was obtained from the Dallas-Fort Worth Regional Planning Office of the SDHPT in Grand Prairie.

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 Hurst. The U.S. Census was the source of population and other socio-economic data.

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 was within. The three stages of development defined in this manner are: *undeveloped* - 0 to 10 percent developed, *developing* - 10 to 80 percent developed, and *developed* - 80 to 100 percent developed.

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 are as follows:

Before Period - the period from 1963 to 1966 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 1966 through 1970. This period includes the construction years.

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

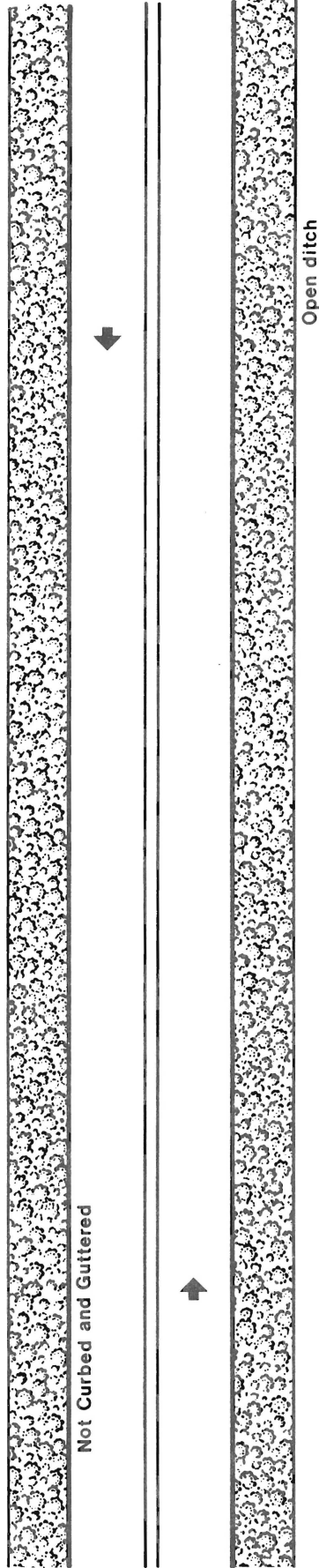
CHARACTERISTICS OF AREA STREETS AND ROADS
BEFORE AND AFTER IMPROVEMENT OF PIPELINE ROAD

Pipeline Road is a major east-west arterial in Hurst, Texas, as shown in Figure 1. Pipeline begins at Loop 820 and extends east into Bedford and Euless, Texas. The section that this study concentrates upon begins at Precinct Line Road and extends east to Brown Trail.

This section of Pipeline Road was previously two lanes with open ditches. The improvement changed the road to a four-lane, striped facility with curbs and gutters (Figure 2). The order initiating investigating, planning, and engineering was issued in 1967. The contract for construction was let in 1968, and the work was completed in 1969. A very small amount of right-of-way at some intersections was acquired.

Very few counts were available to indicate traffic volumes on Pipeline Road, but the few that were available indicate that traffic increased quite dramatically (Table 2). A location east of Precinct Line Road had a 24-hour volume of 6,260 vehicles in 1964. This count had increased to 14,000 in 1975, 14,460 in 1977, and to 16,000 in 1979. Counts for another location on Pipeline Road just west of Brown Trail indicated a volume of 9,600 in 1964 and 18,197 in 1973. More counts would have permitted a better indication of how quickly the counts increased and if they increased immediately after the road was improved.

Before Period Design



After Period Design

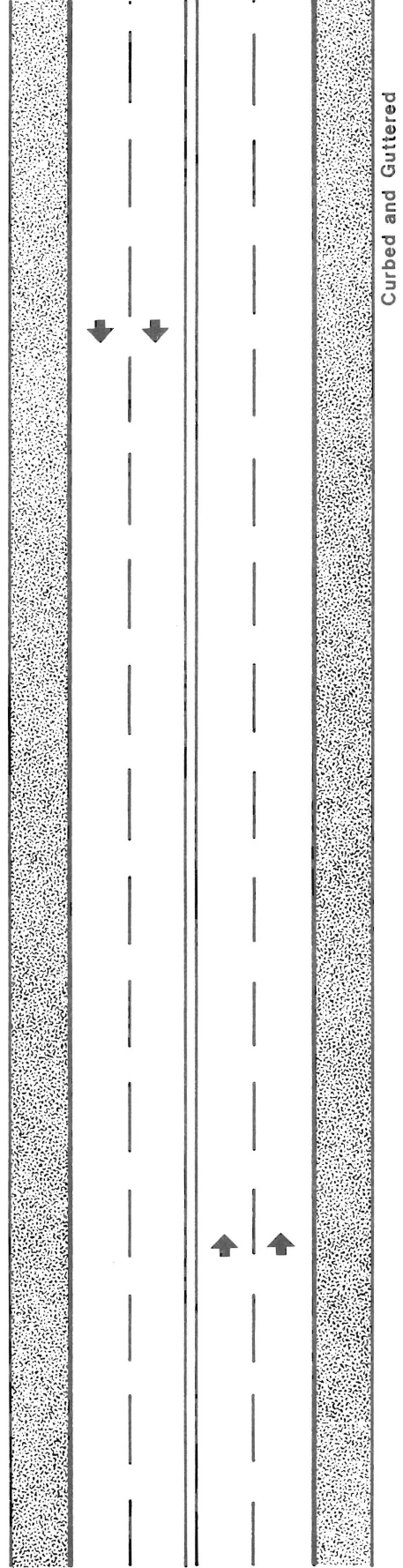


Figure 2. Design of Pipeline Road Before and After Improvement

Table 2. Twenty-four Hour Traffic Counts on Pipeline Road and Other Intersecting and Parallel Roads

Location of Traffic Count	1964	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
STUDY ROUTE Pipeline Road East of Precinct Line Road West of Brown Trail	6,260 9,600					18,197		14,000		14,460		16,000
INTERSECTING ROADS Precinct Line Road at Pipeline Road Harrison Lane at Pipeline Road Hurstview Drive at Pipeline Road Brown Trail at Pipeline Road		17,131 5,716 7,114					11,108	1,312				
PARALLEL ROADS Bedford-Eules Road at Precinct Line Road at Hurstview Drive State Highway 121 East of Loop 820 West of Precinct Line Road State Highway 183 East of Norwood Drive							17,424 13,636			14,110 11,240		
					38,390	42,640	48,370	52,000	57,390	67,100	65,720	
					38,390	40,040	48,040	52,000	59,980	68,610	67,590	
	27,740		30,400	30,223	13,520	11,370	8,650	13,270	14,990	13,190	12,870	

Intersecting Roads

Few counts were available for streets that intersect the study section of Pipeline Road. It is obvious from Table 2 that Precinct Line Road is the most heavily travelled intersecting road.

Parallel Roads

Counts were available for three parallel roads that could be alternate routes for Pipeline Road. Bedford-Eules Road, which is north of Pipeline Road, appears to have lost traffic between 1974 and 1977 (Table 2). Although too few counts are available to give a complete picture of what was happening, some of this traffic may have been attracted to Pipeline Road.

State Highway 121 (SH 121) is north of both Pipeline and Bedford-Eules Roads. Counts at two locations indicate that traffic volume on SH 121 increased dramatically, from the upper 30,000's to the mid 60,000's, between 1972 and 1978. State Highway 183 (SH 183) had a sharp decrease in daily traffic between 1971 and 1972 (Table 2). This was due to the opening of a section of SH 121 connecting IH 820 on the west and SH 183 on the east. Traffic was attracted away from SH 183 to SH 121 because the latter provided a better route through Hurst to Dallas from Fort Worth. State Highway 121 is clearly the most heavily used road through Hurst.

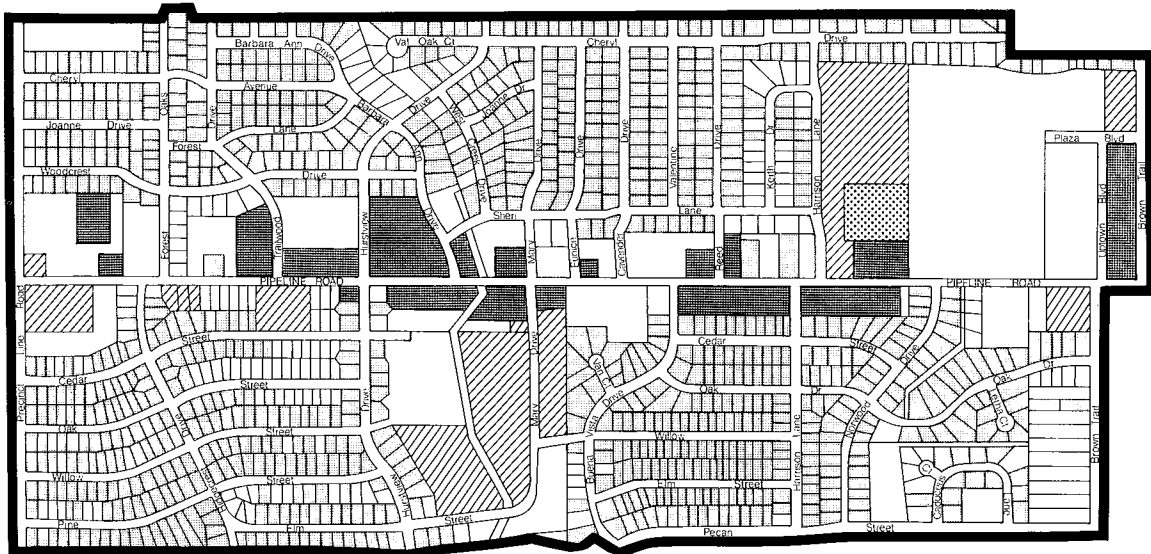
CHARACTERISTICS OF THE STUDY AREA BEFORE AND AFTER IMPROVEMENT OF PIPELINE ROAD

Size and Boundaries of the Study Area

The Pipeline Road study area covers approximately 544 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 Pipeline Road. This permitted the inclusion of both land that abutted Pipeline Road and nonabutting land. The western and eastern borders of the study area are Precinct Line Road and Brown Trail, respectively. The northern boundary is drawn along property lines, and the southern boundard is delineated by property lines and Pecan Street. The study area extends a little over 2,000 feet on each side of Pipeline Road and is approximately 1.7 miles long.

Land Use Changes

As shown in the maps in Figures 3, 4, 5, and 6, numerous changes occurred in the Pipeline Road study area between 1963 and 1978. The most extensive type of development remained single family residential (Table 3). There were almost 242 acres of single family residential use, just over 42 acres of public/semi-public land, approximately 28 acres of commercially used land, and just over 3 1/2 acres of multiple family residential acreage. There were over 98 acres in streets and roads. Over 130 acres (24 percent) remained undeveloped in 1963.



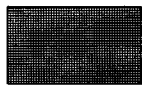
LAND USE LEGEND



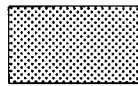
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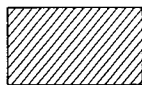
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SINGLE FAMILY**



COMMERCIAL



**RESIDENTIAL
MULTIPLE FAMILY**



PUBLIC

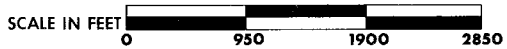
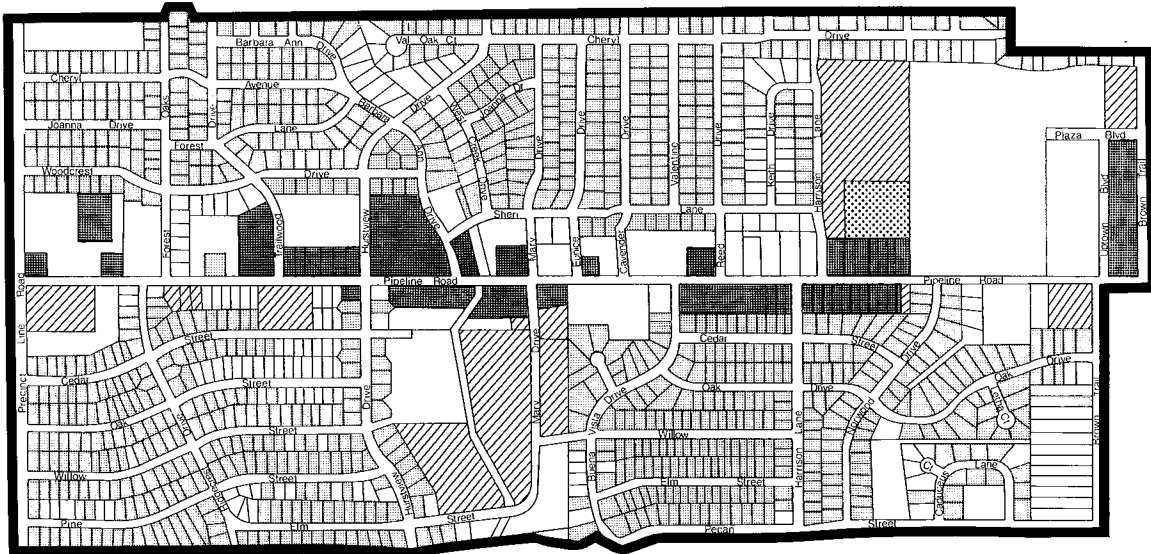


Figure 3. Land Use in the Pipeline Road Study Area in 1963



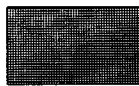
LAND USE LEGEND



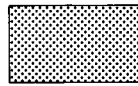
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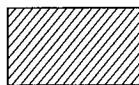
**RESIDENTIAL
SINGLE FAMILY**



COMMERCIAL



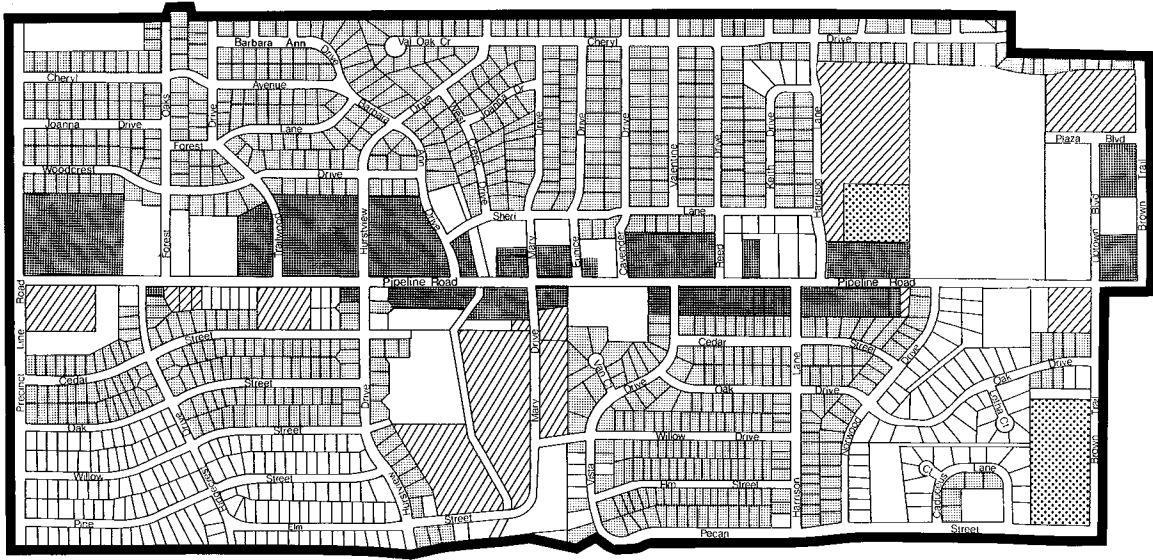
**RESIDENTIAL
MULTIPLE FAMILY**



PUBLIC



Figure 4. Land Use in the Pipeline Road Study Area in 1966



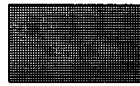
LAND USE LEGEND



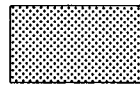
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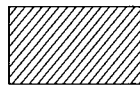
**RESIDENTIAL
SINGLE FAMILY**



COMMERCIAL



**RESIDENTIAL
MULTIPLE FAMILY**



PUBLIC

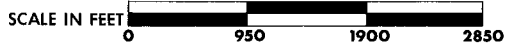
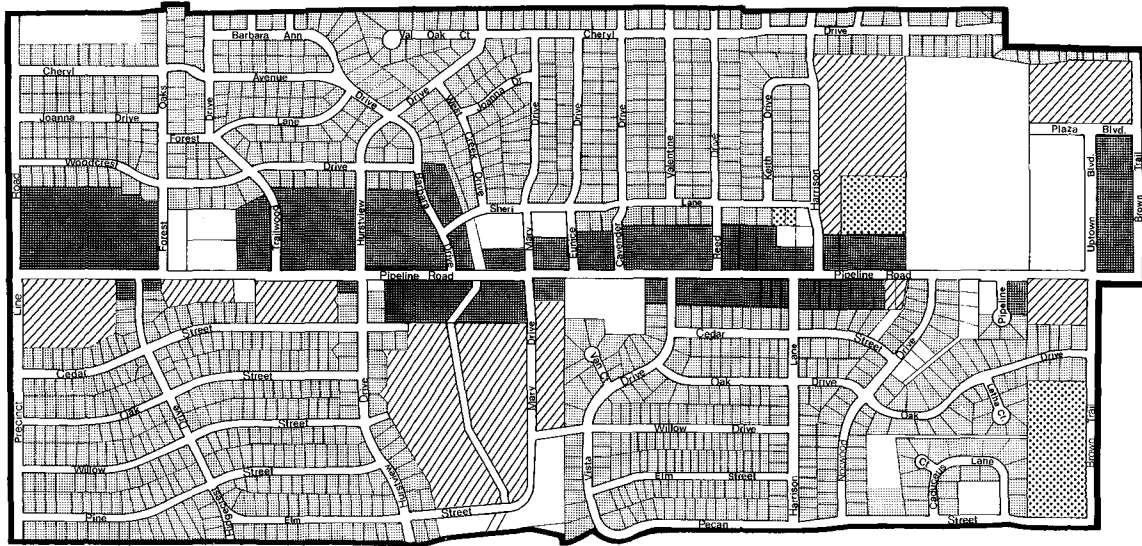


Figure 5. Land Use in the Pipeline Road Study Area in 1970



LAND USE LEGEND



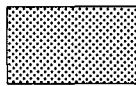
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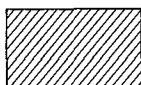
**RESIDENTIAL
SINGLE FAMILY**



COMMERCIAL



**RESIDENTIAL
MULTIPLE FAMILY**



PUBLIC

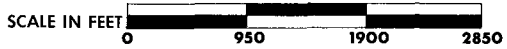


Figure 6. Land Use in the Pipeline Road Study Area in 1978

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

Land Use and Type of Change	Total Acres by Time Period and Year ^b			
	Before		After	
	1963	1966	1970	1978
Residential-Single Family	241.71	238.47	257.74	269.97
Absolute Change	- 3.24		+ 19.27	+ 12.23
Percent Change	- 1%		+ 8%	+ 5%
Residential-Multiple Family	3.67	3.67	10.12	11.44
Absolute Change	0		+ 6.45	+ 1.32
Percent Change	0		+ 176%	+ 13%
Commercial	28.26	28.28	39.51	52.00
Absolute Change	+ 0.02		+ 11.23	+ 12.49
Percent Change	+ 1%		+ 40%	+ 32%
Public/Semi-Public	42.08	37.60	40.11	51.73
Absolute Change	- 4.48		+ 2.51	+ 11.62
Percent Change	- 11%		+ 7%	+ 29%
Streets	98.11	98.11	98.11	98.11
Absolute Change	0		0	0
Percent Change	0		0	0
Unimproved	130.37	138.07	98.61	60.95
Absolute Change	+ 7.70		-39.46	- 37.66
Percent Change	+ 6%		-29%	- 38%

^aTotal acreage equals 544.20

^bOne acre equals .4046856 hectares

All types of development increased in acreage between 1963 and 1978. By 1978, only 11 percent of the study area remained undeveloped. The specific types of changes are discussed in further detail in terms of proximity to Pipeline Road.

Proximity to Pipeline Road

Tracts of land were classified according to their location relative to Pipeline Road. Tracts with frontage on the highway were classified as abutting with whole tracts being included to avoid division of a development. This created an abutting area that was not of a consistent width. The tracts were classified according to property lines in 1978. A section 300 feet deep was delineated as abutting on undeveloped portions. All tracts not having frontage on Pipeline Road were classified as nonabutting.

Abutting Properties. In 1963, which was four years prior to the beginning of investigation, planning, and engineering for this project, 63 percent of abutting land had been developed. There were almost 25 acres of commercial land, 8.47 acres of public/semi-public land and 4.23 acres of single family residential land (Table 4). There were also 19.20 acres in streets and roads. Although there were small amounts added to the existing right-of-way, the street acreage does not reflect the changes. The acreage was very small and too difficult to determine to justify the effort. There were only very small amounts added at some intersections. The right-of-way in this area is a continuing problem

Table 4. Changes In Land Use of Abutting Properties by Time Period and Year^a

Land Use and Type of Change	Total Acres by Time Period and Year ^b			
	Before		After	
	1963	1966	1970	1978
Residential-Single Family	4.23	0.99	0.86	0.63
Absolute Change	- 3.24	- 0.13	- 0.23	
Percent Change	- 77%	- 13%	- 27%	
Commercial	24.68	24.70	32.20	39.65
Absolute Change	+ 0.02	+ 7.50	+ 7.45	
Percent Change	+ 0.1%	+ 30%	+ 23%	
Public/Semi-Public	8.47	7.55	7.26	11.56
Absolute Change	- 0.92	- 0.29	+ 4.30	
Percent Change	- 11%	- 4%	+ 59%	
Streets	19.20	19.20	19.20	19.20
Absolute Change	0	0	0	
Percent Change	0	0	0	
Unimproved	32.88	37.02	29.94	18.42
Absolute Change	+ 4.14	- 7.08	- 11.52	
Percent Change	+ 13%	- 19%	- 38%	

^aTotal acreage equals 89.46

^bOne acre equals .4046856 hectares

due to businesses being located near the road. The right-of-way presently varies from 49 feet to 70 feet, and the city would like to obtain 80 feet.

Between 1963 and 1966, which is called the *before period*, there were decreases in single family residential and public/semi-public uses. Over four acres of land was returned to the unimproved category. There were some new developments in that period, but those were outweighed by the reversions to unimproved land making the net results a decrease in the above land use categories involving developed land.

This trend was somewhat reversed in the *short-run after period*, 1966 through 1970, when commercial acreage increased by 30 percent (7.50 acres). Single family residential acreage decreased only slightly as did public/semi-public acreage.

The *long-run after period*, 1970 through 1978, was a time of another addition to commercial acreage (7.45 acres or 23 percent) and a further reduction in single family residential use (0.23 acres or 27 percent). Only 0.63 acres of single family residential use remained in 1978. Seventy-nine percent of abutting acres were developed by the end of 1978. Abutting land use changes are shown in Figure 7.

Nonabutting Properties. As shown in Table 5, nonabutting land was developed primarily with single family residences in 1963 (237.48 acres). There were 33.61 acres in public/semi-public use, 3.67 acres in multiple family residential use, and 3.58 acres in commercial use.

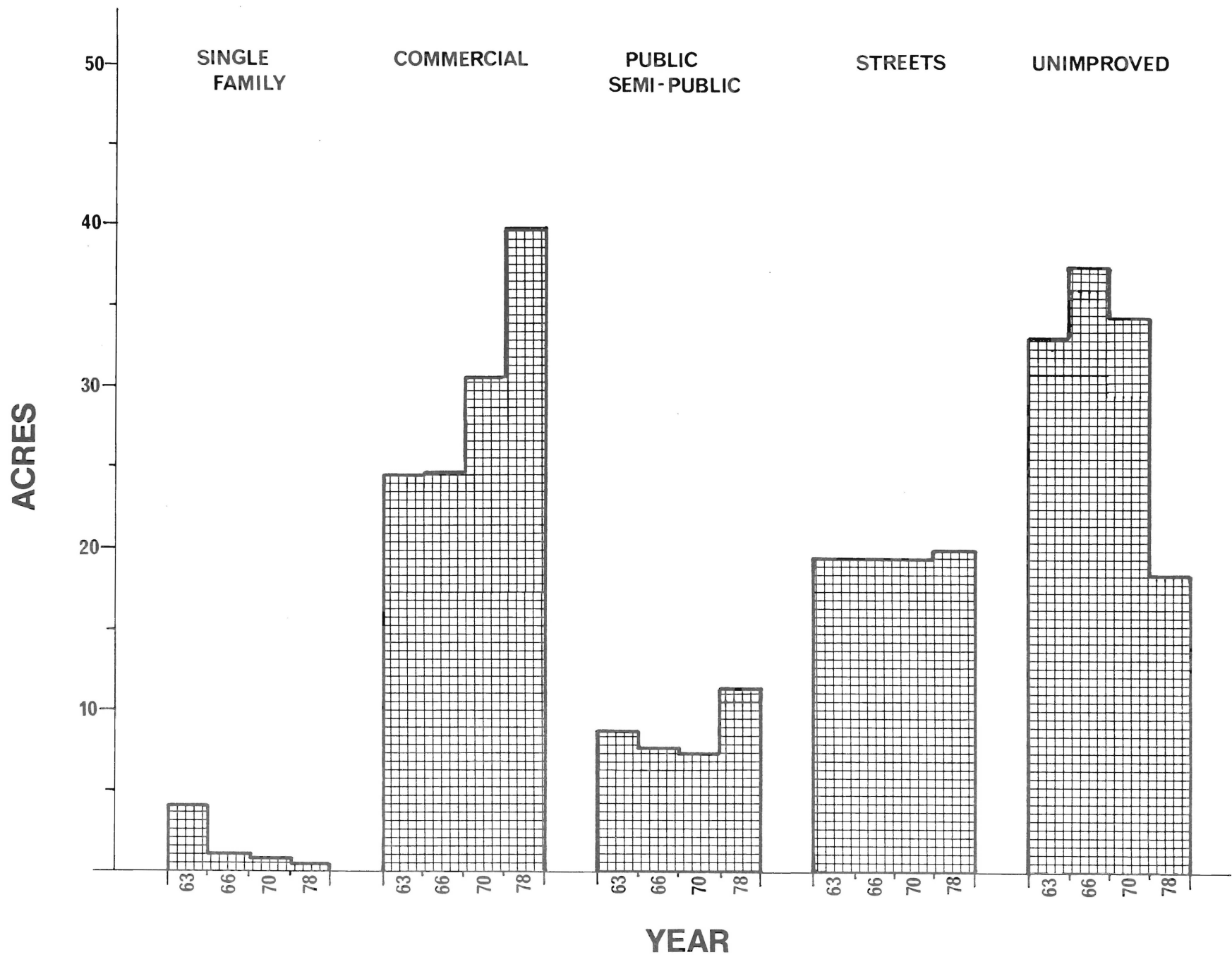


Figure 7. Changes in Abutting Land Uses in the Pipeline Road Study Area

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

Land Use and Type of Change	Total Acres by Time Period and Year ^b			
	Before		After	
	1963	1966	1970	1978
Residential-Single Family	237.48	237.48	256.88	269.34
Absolute Change	0		+ 19.40	+ 12.46
Percent Change	0		+ 8%	+ 5%
Residential-Multiple Family	3.67	3.67	10.12	11.44
Absolute Change	0		+ 6.45	+ 1.32
Percent Change	0		+ 176%	+ 13%
Commercial	3.58	3.58	7.31	12.35
Absolute Change	0		+ 3.73	+ 5.04
Percent Change	0		+ 104%	+ 69%
Public/Semi-Public	33.61	30.05	32.85	40.17
Absolute Change		- 3.56	+ 2.80	+ 7.32
Percent Change		- 11%	+ 9%	+ 23%
Streets	78.91	78.91	78.91	78.91
Absolute Change	0		0	0
Percent Change	0		0	0
Unimproved	97.49	101.05	68.67	42.53
Absolute Change		+ 3.56	-32.38	- 26.14
Percent Change		+ 4%	- -32%	- 38%

^aTotal acreage equals 454.74

^bOne acre equals .4046856 hectares

Almost 79 acres were committed to streets and roads. Seventy-nine percent of nonabutting land had been improved by the end of 1963.

During the *before period*, 1963 to 1966, nonabutting single family residential and commercial acreages remained constant. Public/semi-public acreage decreased by 3.56 acres, which reverted to unimproved land.

There were increases in various uses in the *short-run after period*, 1966 through 1970. Single family residential acreage increased by 19.40 acres while multiple family residential acreage increased by 6.45 acres. Commercial use rose by 3.73 acres and public/semi-public use increased by 2.80 acres. The net result of the changes was that 2.38 acres of unimproved land became developed as compared to a decrease in improved acreage in the previous period.

The *long-run after period* was a continuation of the changes that began in the *short-run after period*. Single family residential, multiple family residential, commercial, and public/semi-public acreages all increased. The increases in commercial and public/semi-public uses were larger than in the previous period. The nonabutting unimproved category decreased by 26.14 acres. Ninety-one percent of nonabutting land was improved by 1978. Nonabutting land use changes are shown in the graph in Figure 8.

Land Use Controls and Plans

Land use in Hurst is regulated by zoning. The area is zoned for uses much the same as the existing uses. Commercial zoning is dominant

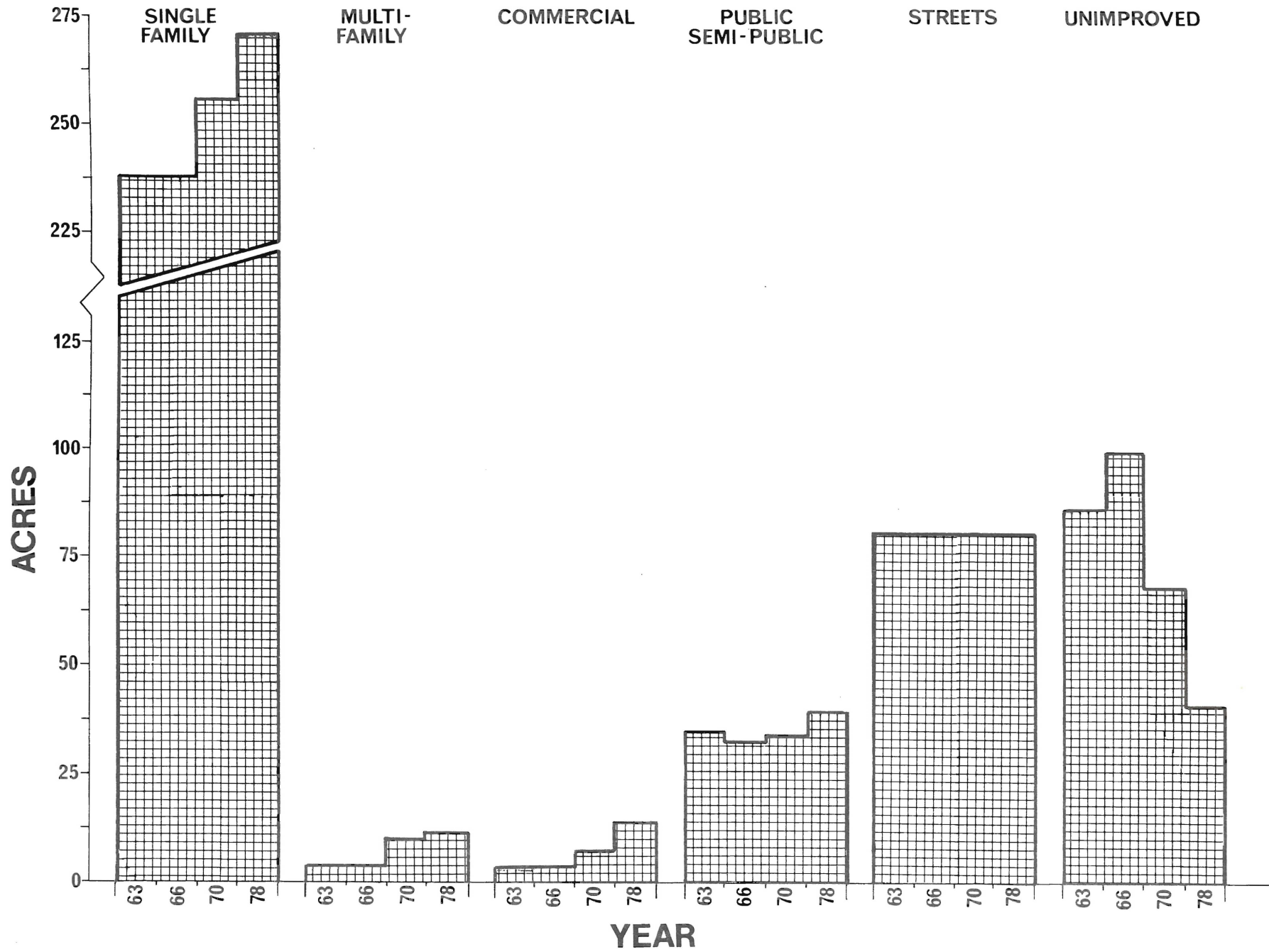


Figure 8. Changes in Nonabutting Land Uses in the Pipeline Road Study Area

on abutting land and single family residential is the main type on nonabutting land. Various other types of zoning provide areas for the churches, parks, schools, and apartments that exist. Based on interviews with knowledgeable people, zoning is not seen as a dominant restrictive force in land use change in this particular area. Requests for commercial zoning along the highway were readily approved.

Land use change in this area appears to have occurred as expected. In the publication entitled *The Dallas-Fort Worth Regional Transportation Study*, it was predicted that there would be single family housing on the nonabutting property and primarily commercial developments on the abutting. This 1967 publication also indicates a few public developments were expected to be scattered throughout the study area. Land was expected to be used in this manner through 1985. The actual land use has conformed very closely to this projection. Additionally, interviews with city officials confirms that land use in this study area has occurred as was planned.

Socio-Economic Characteristics

Selected socio-economic characteristics were investigated to compare the study area to Hurst as a whole and to the SMSA. U.S. Census data from 1960 and 1970 were used to give an idea of changes before and after the improvement of Pipeline Road. Unfortunately, 1980 data are not yet available to include more recent changes. Census tract data were used to approximate the statistics for the Pipeline Road study area.

In 1960, the study area was within Census Tract T-34. In 1970, the approximate same area was divided into two census tracts, 134.01 and 134.02. The statistics for the two 1970 tracts were added together or averaged using a weighted average technique based upon the number of people in each tract. The data presented for the census tracts should be used as generalizations that provide a broad look at the types of changes that occurred in the area. Statistics for Hurst for 1960 were not available. However, the census tract covered essentially the area that would have been the city at that time.

As indicated in Table 6, Hurst and the census tracts increased in population at a much faster rate than did the SMSA. The educational level was higher in the census tracts than in the SMSA and likewise the income levels. The 1970 educational and income levels were very similar for the city and the census tracts. The median value of residences was higher in the census tracts than in the SMSA as a whole. In 1970, the median value of owner occupied residences was considerably higher in Hurst as a whole than in the census tracts.

There were large gains in the numbers of people employed in each category of work in the census tracts. The largest percentage gains were in the laborers, service workers, private household workers, and professionals categories. The professionals and clericals categories had the largest gains in terms of absolute number of people.

In summary, the data indicated a higher level of socio-economic

Table 6. Comparison of 1960 and 1970 Socio-Economic Characteristics of Applicable Census Tracts to Hurst and the Fort Worth SMSA^a

Socio-Economic Characteristics	SMSA			Hurst ^b			Census Tract ^c		
	1960	% Change	1970	1960	% Change	1970	1960	% Change	1970
Population	573,215	+ 33%	762,085	10,165	+168%	27,215	10,169	+131%	23,501
Median School Years Completed	11.4	+ 6%	21.1	b	-	12.5	12.2	+ 2%	12.4
Median Family Income	\$ 5,617	+ 80%	\$ 10,101	b	-	\$ 12,018	\$ 6,801	+ 76%	\$ 11,951
Median Income of Families and Unrelated Individuals	\$ 4,952	+ 74%	\$ 8,607	b	-	\$ 11,497	\$ 6,706	+ 71%	\$ 11,487
Median Value of Owner Occupied Residences	\$ 8,800	+162%	\$ 13,100	b	-	\$ 18,300	\$ 11,500	+ 46%	\$ 16,742
Median Rent Paid by Tenants	\$ 65	+ 55%	\$ 90	b	-	\$ 157	not reported	—	\$ 157
Total Employed	214,782	+ 45%	310,567	b	-	11,233	3,614	174%	9,910
Professional, Technical, and Kindred Workers	28,126	+ 75%	49,284	b	-	2,460	624	230%	2,058
Managers and Administrators	20,944	+ 24%	26,056	b	-	1,103	406	111%	858
Sales Workers	35,220	- 29%	24,959	b	-	1,046	311	197%	925
Clerical and Kindred Workers	17,017	+251%	59,658	b	-	2,425	726	199%	2,170
Craftsmen, Foremen, and Kindred Workers	30,833	+ 53%	47,072	b	-	1,596	668	124%	1,495
Operatives	33,680	+ 59%	53,682	b	-	1,411	479	175%	1,319
Laborers	5,782	+146%	14,250	b	-	262	46	389%	225
Service Workers	18,649	+ 68%	31,314	b	-	907	240	255%	852
Private Household Workers	10,345	+ 59%	4,292	b	-	23	34	232%	113

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

^bData other than population was not available for Hurst in 1960.

^cThe study area was within Census Tract T-34 in 1960 and within Census Tracts 134.01 and 134.02 in 1970.

well being in the census tracts than in the Fort Worth SMSA as a whole in 1960 and 1970. The census tracts were very comparable to the city of Hurst in 1970.

IMPACT OF HIGHWAY IMPROVEMENT ON LAND USE IN THE STUDY AREA

To examine the impact of the improvement of Pipeline Road, two types of data were used. These types were:

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

Effects on Abutting and Nonabutting Land

Specific shifts in land use during each time period were examined. Table 7, which shows changes in absolute acres, indicates not only changes from unimproved land to some improved use but also changes from one type of improvement to another. 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 Table 7 indicates, the absolute amount of abutting land use change was greatest in the *long-run after period*. When these changes are put on an average annual percentage basis, as in Table 8, the *short-run after period* is the time of greatest change. The changes primarily involved undeveloped land becoming commercial. This

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

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1963-1966		1966-1970		1970-1978		1966-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
	----- Percent -----							
Single Family to Commercial	0	0	0	0	0.23	0.90	0	0.94
Single Family to Public/ Semi-Public	0	0	0	0	0	0	0	0
Single Family to Unimproved	3.24	0	0.36	0	0	0	0.36	0
Single Family to Multiple Family	0	0	0	0.34	0	0	0	0.34
Commercial to Unimproved	0.79	0	0	0	0	0	0	0
Commercial to Public/ Semi-Public	0	0	0	0	0.30	0	0.30	0
Public/Semi-Public to Unimproved	0.11	3.56	0	0	0	0	0	0
Public/Semi-Public to Commercial	0.81	0	0.29	0	0	0.22	0.29	0.22
Unimproved to Commercial	0	0	7.21	3.73	7.75	3.92	15.18	6.79
Unimproved to Public/ Semi-Public	0	0	0	2.80	4.00	7.54	4.00	10.34
Unimproved to Single Family	0	0	0.23	19.74	0	13.36	0	31.76
Unimproved to Multiple Family	0	0	0	6.11	0	1.32	0	7.43
Unimproved to Streets	0	0	0	0	0.34	0	0.34	0
Total Land Changing Use	4.95	3.56	8.09	32.72	12.62	27.26	20.47	57.82
Improved Land	4.95	3.56	0.65	0.34	0.53	1.12	0.95	1.50
Unimproved Land	0	0	7.44	32.38	12.09	26.14	19.52	56.32

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

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1963-1966		1966-1970		1970-1978		1966-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
	----- Percent -----							
Single Family to Commercial	0	0	0	0	0.03	0.02	0	0.02
Single Family to Public/ Semi-Public	0	0	0	0	0	0	0	0
Single Family to Unimproved	1.20	0	0.10	0	0	0	0.03	0
Single Family to Multiple Family	0	0	0	0.02	0	0	0	0.01
Commercial to Unimproved	0.29	0	0	0	0	0	0	0
Commercial to Public/ Semi-Public	0	0	0	0	0.04	0	0.03	0
Public/Semi-Public to Unimproved	0.04	0.26	0	0	0	0	0	0
Public to Commercial	0.30	0	0.08	0	0	0.01	0.03	0.01
Unimproved to Commercial	0	0	2.01	0.21	1.08	0.12	1.41	0.12
Unimproved to Public/ Semi-Public	0	0	0	0.15	0.56	0.21	0.37	0.19
Unimproved to Single Family	0	0	0.06	1.09	0	0.37	0	0.58
Unimproved to Multiple Family	0	0	0	0.34	0	0.04	0	0.14
Unimproved to Streets	0	0	0	0	0.05	0	0.03	0
Total Land Changing Use	1.84	0.26	2.26	1.80	1.76	0.75	1.91	1.06
Improved Land	1.84	0.26	0.18	0.02	0.07	0.03	0.09	0.03
Unimproved Land	0	0	2.08	1.78	1.69	0.72	1.82	1.03

greater rate of change may suggest a response to the improved road condition in the *short-run after period*.

Nonabutting Property. The greatest amount of change for non-abutting land, both in terms of absolute and percentage change, occurred in the *short-run after period*. These changes were due mainly to unimproved land being converted to single family use. This increase in change may also indicate an initial response to a better and faster access to this area. To learn more about the impact of the road upon land use, several knowledgeable people were interviewed. Following is a discussion of those interviews.

Opinions of Knowledgeable People

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

Those interviewed from the State Department of Highways and Public Transportation thought the road improvement may have had some initial stimulant effect on land use that would subside as the road became congested again. The belief was expressed that a different type of design such as one with a continuous left turn lane or one with a raised median and protected left turn would have been better. However, there were problems in acquiring right-of-way, partly because of the gas pipeline that runs parallel to the road.

Those interviewed from the city of Hurst indicated that the road

improvement had encouraged development in this area. It is believed that development would have stopped if the congested situation continued.

All of the business people interviewed expressed the belief that the road improvement had helped attract new development. They also expressed the idea that congestion was previously bad enough to be hurting development in the area.

Conclusions

It is very likely, based upon the rates of change in the *short-run after period* and the opinions of those interviewed, that the widening of Pipeline Road encouraged land use change in this area. The rates of change for both abutting and nonabutting land were higher in this period in which the road improvement took place than at any other time. All of those interviewed agreed that the road improvement had been an important factor in the land use changes that took place. Therefore, the road improvement is judged to be a positive influence that encouraged new development and a small amount of redevelopment.