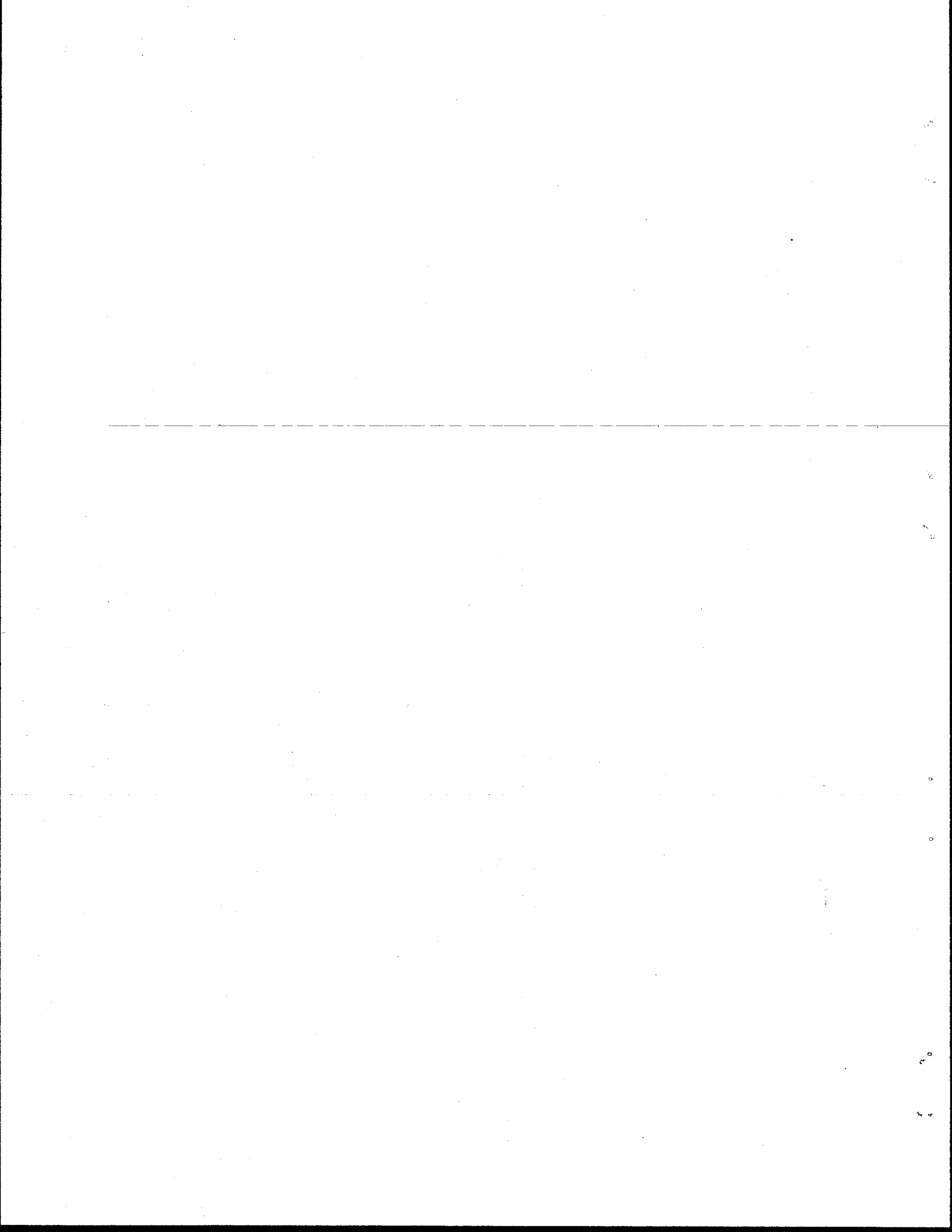


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LAND USE IMPACT OF WIDENING NORTH TEXAS AVENUE  
IN A DEVELOPING AREA OF BRYAN, TEXAS

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and Public Transportation  
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## PREFACE

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The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, 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 information is particularly valuable in preparing environmental documents. This report relates the findings of research done upon an area of Bryan, Texas, where North Texas Avenue (business route of State Highway 6) was upgraded from a two-lane to a four-lane facility. The improvement took place in a developing area where the majority of acreage was 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 1958 and 1964, which were both before construction began, and 1970 and 1977, which were both after the improvement was completed. Total acres in each type of land use in these four years and the types of changes between years were determined. Comparisons of the types and rates of development before and after the upgrading occurred were made. The data are reported in narrative graphic, and tabular form. Causes of development other than the improved highway 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 in different areas.

## SUMMARY OF FINDINGS

Land use data were collected for the North Texas Avenue Study Area in Bryan, Texas, to determine the uses and rates of change in use before and after the improvement of North Texas Avenue from a two-lane to a four-lane facility. The study covers a 20 year span from 1958 to 1977. This period includes seven years before construction, three years during construction, and 10 years after construction was completed.

The findings are summarized as follows:

1. The total Study Area has gone from being 30 percent developed in 1958 to 44 percent developed in 1977.
  - a. The stage of development has remained "developing" throughout the study period.
  - b. The predominant land use in the total Study Area has remained unimproved, although some types of development have increased greatly.
  - c. Residential use had the highest absolute increase in acreage. The increase in commercial acreage was only slightly less than the increase in residential acreage. Industrial acreage had the highest percentage increase by increasing 699 percent as compared to a 37 percent increase for residential and a 173 percent increase for commercial.
2. Properties abutting North Texas Avenue changed use at a faster rate than nonabutting properties.
  - a. The predominant land use on abutting properties has changed from unimproved to residential. Commercial acreage was only slightly less than residential acreage in 1970 and 1977.

- b. Industrial development had the highest percentage increase on abutting land, although the total industrial acreage was still only approximately one-eighth as much as residential acreage in 1977.
  - c. Semi-public-nonprofit development emerged on abutting land with the construction of a church. Public-governmental development remained constant.
3. Nonabutting properties have also undergone changes.
- a. The predominant land use on nonabutting land has remained unimproved.
  - b. Residential development has had the largest increase in acreage on nonabutting land.
  - c. Commercial is the only other type of nonabutting development. The amount has fluctuated over the years and was only approximately one-tenth as much as residential in 1977.
4. The period of most change on abutting land was the short-run after period (1964 to 1970) which actually includes changes that occurred one year before construction, during the construction years, and three years after construction was completed.
- a. Abutting land was changing use at a rate of 2.68 percent per year in this period as compared to 2.02 percent in the before period (1958-1964) and 0.84 percent in the long-run after period (1970-1977).
  - b. Most changes were from unimproved land becoming developed, although some change from one improved use to another did occur.

5. The period of most change for nonabutting land was the before period (1958-1964).
  - a. Nonabutting land was changing use at a yearly rate of 0.62 percent in the before period as compared to 0.56 percent in the short-run after period and 0.41 percent in the long-run after period.
  - b. Most changes on nonabutting land were also due to unimproved land becoming improved.
6. The improvement of the highway has been a factor in land use change in the area.
  - a. The abutting land had already been forecasted to become more commercial and industrial in a general area plan published in 1958. This plan also projected the improvement of North Texas Avenue.
  - b. Opinions of planners, developers, and residents were that the improvement had not been a important factor in the land use changes that have occurred.
  - c. Other factors, such as the planning and construction of a new by-pass opened in early 1972 to the northeast of the area, have also had influence upon land development in the area, although perhaps a negative influence in some cases.
  - d. However, the highway improvement has had at least a short-run positive effect on land development and possibly offset some of the negative effects that the opening of the by-pass would have had on land use in this area. The improvement of North Texas Avenue probably helped retain some of the traffic that would otherwise have been drawn to the by-pass.



## IMPLEMENTATION STATEMENT

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

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 other study areas is accomplished. Those findings are or will be described in other reports.

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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 highways and freeways. Much research has been conducted in the past to learn the impact of new highway construction. Little research has been done to show what happens when an existing highway is upgraded. In order to optimize public benefits, highway agencies need information of this kind to help predict what will happen in a particular area when an existing facility is improved. This information is valuable in the preparation of environmental documents.

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 relates the findings of investigation in an area in Bryan, Texas, where North Texas Avenue (business route of State Highway 6) was improved. Areas with other types of highway improvements and areas in varying land uses and stages of development when improvement began were also studied and reports are available or are forthcoming.

Objectives of this study were 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 North Texas Avenue Study Area. Since land use could have been affected by anticipation of a better roadway, data were collected for a time well before formal planning for this specific facility began.

A 1958 map from the Brazos Area Plan provided land use for the first "before" year. Although North Texas Avenue was designated to become a wider roadway in that plan, no formal action was taken to upgrade the roadway until the end of 1965 when funding was provided. Other proposed street changes in the plan have never been implemented. Data were collected for 1964, which was considered the last "before" year. Construction actually began in 1966. The two "after" years for which data were collected are 1970 and 1977.

The land was divided into abutting and nonabutting properties which were studied separately to determine the differences in land uses and rates of development. Abutting properties were those improved tracts with frontage on North Texas Avenue. On undeveloped tracts, a section 300 feet (91.44 meters) deep was designated as abutting property. All other land was classified as nonabutting.

To determine some of the reasons underlying the land use changes in the area, several knowledgeable people were interviewed. Builders and

developers who were familiar with the area provided information on sales and developments. Residents of the area were interviewed to determine their opinions of the highway impact. People involved in planning for the improvement were asked why the improvement was made and what impact it had on land use. All of these people also provided insight into consideration given to highway design in making decisions about developing the land involved. Other factors which might have influenced changes were also investigated. Among these were traffic volume, population, and income in the area.

#### Location of Highway Improvement

The improved portion of North Texas Avenue is located in the metropolitan area of Bryan-College Station. This metropolitan area is located approximately in the middle of a triangle formed by the Dallas-Forth Worth, San Antonio, and Houston metropolitan areas. As Table 1 shows, the two adjoining cities had an estimated 1977 population of 88,949. Brazos County, in which the two cities are located, was designated as a Standard Metropolitan Statistical Area after the 1970 U.S. Census count.

Although agriculture, agribusiness, and manufacturing are economically important to the area, the major influence on the area's economy is Texas A&M University. With a fall 1977 enrollment of 28,848 and over 15,000 permanent employees, the university had a total economic impact of over \$171 million on Bryan-College Station in 1977.<sup>1</sup> Wages and salaries paid to employees, university expenditures for utilities, services, and supplies;

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<sup>1</sup> Statistics provided by the State Department of Highways and Public Transportation.

Table 1. Population Changes in Bryan-College Station, Brazos County, and Texas A&M University, 1950-1977

	1950	Change and % Change 1950-1960	1960	Change and % Change 1960-1970	1970	Change and % Change 1970-1977	1977
Bryan	18,102	9,440 52%	27,542	6,177 22%	33,719	13,385 40%	47,104
College Station	7,925	3,471 44%	11,396	6,280 55%	17,676	24,169 137%	41,845
Brazos County	38,390	6,505 17%	44,895	13,083 29%	57,978	42,570 73%	100,548
Texas A&M (fall enrollment)	6,675	546 8%	7,221	7,095 98%	14,316	14,532 102%	28,848



student expenditures for food, housing and related items; and money spent by people attending athletic events and continuing education programs make up most of the benefits realized by the community. According to the Bureau of the Census, Bryan-College Station is one of the fifteen fastest growing metropolitan areas in the nation. This is due in large part to the growth of Texas A&M. As Table 1 shows, the fall 1977 enrollment was 102 percent greater than the fall 1970 enrollment of 14,316. The rate of growth at Texas A&M is expected to decline and enrollment is expected to stabilize at approximately 32,000 students in 1982.

Another possible source of economic growth is beginning to emerge in Brazos and surrounding counties. In the small community of Kurten, approximately 15 miles northeast of Bryan-College Station, 32 oil producing wells were drilled during 1977. Drilling is increasing monthly bringing into the county millions of dollars to pay the wages and salaries of local and imported oilfield workers and to purchase goods and services from local businesses.

In addition to the oilfield discoveries, a November 1976 report from the U.S. Bureau of Mines states that some 450 million tons of lignite are commercially recoverable in Brazos and neighboring counties. The discovery and development of these energy sources will undoubtedly attract industry to the area and give the local economy a broader base that is less dependent upon the university.

The growth of the two cities and the university has generated increasing traffic and made greater demands on the street and highway systems. A highway improvement made in anticipation of greater traffic volumes was the widening and resurfacing of a portion of North Texas Avenue.

The study area, as shown in Figure 1, is approximately one mile (1.609 kilometers) northwest of the Bryan Central Business District. It is approximately 5 miles (8.045 kilometers) from the College Station Central Business District and Texas A&M University.

### Key Characteristics of Highway Improvement

To collect data on highway improvements from varying areas, the stage of development of the area before the improvement began was determined.<sup>2</sup> The type of highway, whether it was in an urban or suburban area, and the predominant abutting land use were also determined to describe the setting in which the highway improvement took place.

For the North Texas Avenue Study Area the stage of development before the improvement began was "developing." The study area, as well as the abutting land, was predominantly unimproved with residential development being the most common type of improvement. The improvement was made upon a full access, state maintained highway. The road was changed from two lanes to four lanes without curbs and gutters.

### Source of Data

Data on planning and construction of the improvement on North Texas Avenue were collected from files at the District Office of the State Department of Highways and Public Transportation (SDHPT). The Department was also the source of traffic volume 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 as follows: undeveloped - 0 to 10% improved; developing - 10 to 80% improved; and developed - 80 to 100% improved.

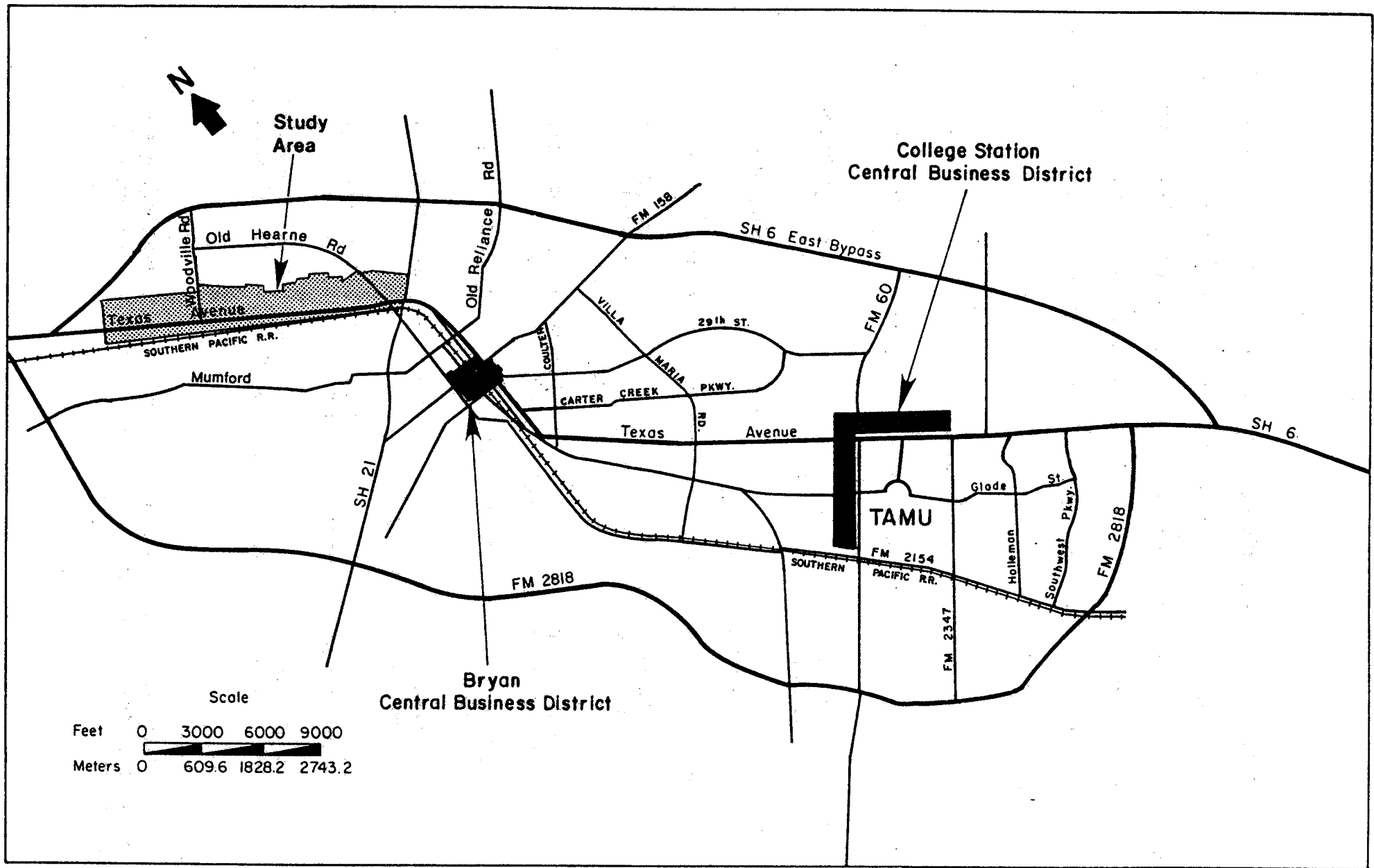


Figure 1. Map of the Bryan-College Station Area Showing the Location of the North Texas Avenue Study Area

Land use data were collected from files and maps at the District Office of the SDHPT; from city directories of Bryan-College Station; from personal interviews with realtors and others who were informed of changes in the area; and from detailed on-site inspection of the area. The 1970 U.S. Census and projections made by the SDHPT were sources of population and socio-economic data.

### Definitions

Land use categories assigned to the properties are as follows:<sup>3</sup>

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

Residential-Multiple Family - tract improved with duplexes or apartment complexes.

Residential-Mobile Home - tract improved with mobile home.

Commercial-Traffic-Serving - tract improved with a commercial business deriving much of its income by serving traffic, e.g., motels, service stations, and restaurants.

Commercial-Nontraffic-Serving - tract improved with a commercial business other than traffic-serving businesses.

Industrial - tract improved for manufacturing, processing, or storing.

Public-Governmental - tract improved with governmental office, park, public owned utility, etc.

Semi-Public-Nonprofit - tract with improvement such as church, nonprofit club, or other nonprofit organization.

Unimproved - land that has never been developed for any particular use, land that is presently unused, and agricultural land.

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<sup>3</sup>Data for 1958 were not available to break down residential development into the sub-categories of single family, multiple family, and mobile homes.

Time periods used in the analysis are:

Before Period - the period from 1958 to 1964 which ends the year before funding was approved and formal planning and construction began.

Short-Run After Period - the period which includes changes that occurred since the end of 1964 through 1970. This period includes the construction years, 1966 and 1967.

Long-Run After Period - the period which includes changes that occurred since the end of 1970 through 1977.

CHARACTERISTICS OF AREA ROADS BEFORE AND  
AFTER IMPROVEMENT OF NORTH TEXAS AVENUE

North Texas Avenue

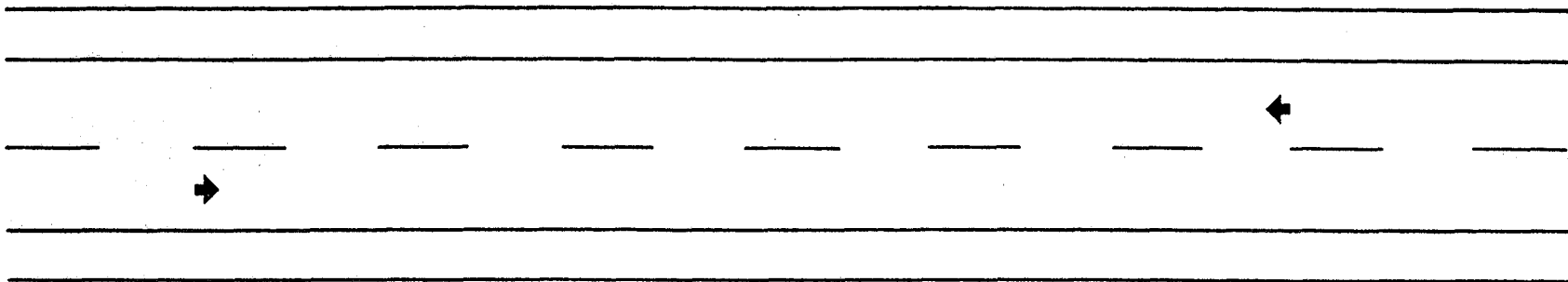
Texas Avenue (business route of State Highway 6) runs northwest and southeast through the lengths of both Bryan and College Station. Hearne and eventually Waco are the destinations of the through traffic going northwest. Navasota, Hempstead, and Houston can be reached traveling southeast on Highway 6. The section northwest of downtown Bryan is called North Texas Avenue.

The District Office of the SDHPT requested authorization to begin investigation, planning, and engineering for the North Texas Avenue project in November 1965. Approval was granted in December, and the contract was let in June 1966. Construction began in August 1966, and the improvement was completed in May 1967. The project included 3 miles of North Texas Avenue from State Highway 21 northwest to the city limits of Bryan.

As Figure 2 shows, the highway previously had two 14 feet (4.27 meters) lanes and eight feet (2.44 meters) shoulders. The pavement was asphalt. The improvement created four 12½-foot (3.81 meters) lanes with a four-foot (1.22 meters) median and no paved shoulders.

As Table 2 indicates, most points on this section of North Texas Avenue have not had large traffic volume increases in the last 20 years. Some locations have actually experienced a decrease in traffic. The heaviest traffic in recent years has occurred near State Highway 21 where several commercial and industrial establishments are located. Old Hearne Road also funnels traffic into North Texas Avenue in that vicinity. The volume increased by 106 percent from 1957 to 1975 just northwest of State

# Before Period Design



11

# After Period Design

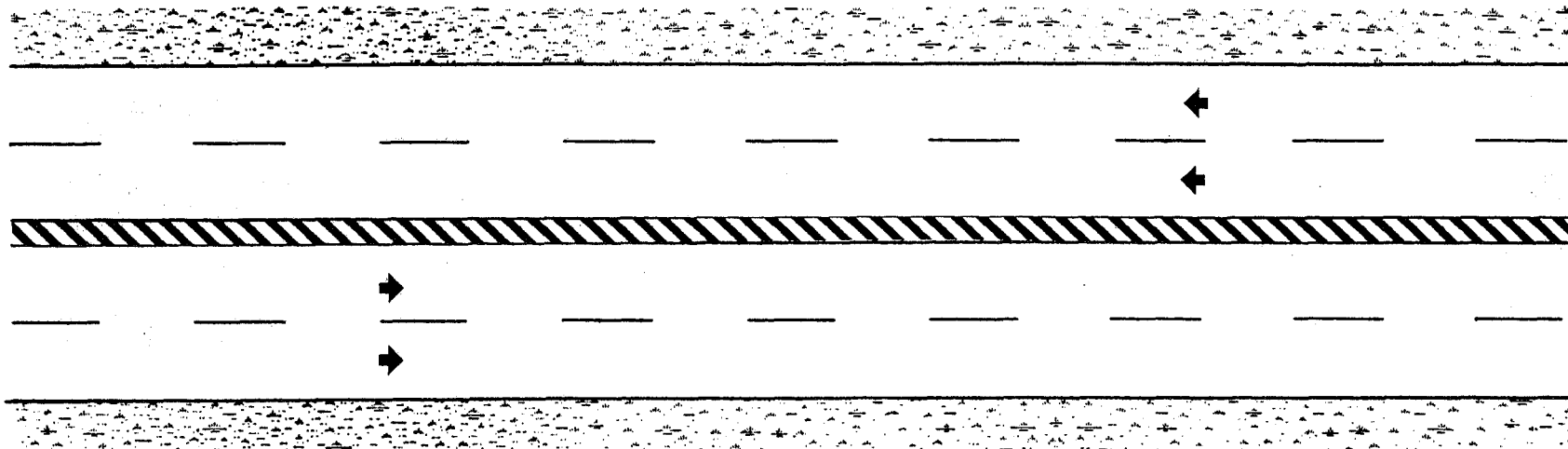


Figure 2. Design of North Texas Avenue Before and After Improvement

Table 2. Twenty-Four Hour Traffic Counts on North Texas Avenue and Other Streets in the Area

Location of Traffic Count	1957	1969	1970	1972	1973	1974	1975	1977
<b>STUDY ROUTE</b>								
North Texas Avenue								
Southeast of State Highway 21	8,560						11,351	14,990
Northwest of State Highway 21	4,980						10,268	10,650
Northwest of Old Hearne Road	5,220							
Southeast of Wilhelm Street					7,910	7,820		7,140
Northwest of Russell Street	4,890							
Northwest of Stevens Drive	4,330	4,340	4,840		3,750			5,150
Northwest of Woodville Road								
Southeast of State Highway 6								
East By-Pass				3,660		3,670	3,770	2,950
Northwest of State Highway 6								
East By-Pass	3,260		3,800	5,630	5,980	5,980	5,830	5,270
<b>INTERSECTING ROADS</b>								
State Highway 21								
Northeast of North Texas Avenue	5,090						8,035	9,000
Southwest of North Texas Avenue	2,060						6,709	7,400
Southwest of Sims Streets	2,820							6,168
Sims Street								
South of North Texas Avenue	810							1,330
Russell Street								
Northeast of North Texas Avenue	240							1,050
Stevens Drive	670							350
<b>PARALLEL ROADS</b>								
State Highway 6 East By-Pass								
Northwest of State Highway 21					3,630			4,890
Southeast of FM Road 974					3,470			4,590
Old Hearne Road								
North of North Texas Avenue	490							2,150



Highway 21. This was an average increase of six percent a year. Another four percent increase occurred there between 1975 and 1977 for a two percent average indicating that traffic volume was growing at a slower rate per year. The actual decreases and decreases in rates were not unexpected due to the construction of a by-pass that diverts traffic around the two cities as well as around this portion of North Texas Avenue.

### Parallel Roads

As the map in Figure 1 indicates, Old Hearne Road begins at an intersection with North Texas Avenue and runs north for a short way and then turns northwest. It then runs parallel to North Texas Avenue and provides access to several of the same locations. A point just north of North Texas Avenue had an increase in traffic volume of 339 percent between 1957 and 1977. That point had a 2,150 count for 1977. A point further northwest near Wilkes Street had a 1977 count of 1,500, and a point near Woodville Road had a count of 660 in 1977. As expected, traffic counts decreased as distance from Texas Avenue increased.

Although not inside the Study Area, the State Highway 6 East By-Pass has had an effect upon land use in the area and should be included here in the parallel roads section. The East By-Pass begins very near the northwest boundary of the Study Area. It is at that point that one may elect to take the East By-Pass thereby avoiding the centers of Bryan and College Station, or travel on North Texas Avenue into the business sections of the two towns. The by-pass was carrying a load of 4,890 cars per day in 1977, at a point northwest of State Highway 21. This was an increase of 35 percent from a count of 3,630 in 1973. A point further North West.

near FM Road 974 had counts of 3,470 in 1973, and 4,590 in 1977. This is traffic that presumably would have been on North Texas Avenue if the East By-Pass had not been built.

#### Intersecting Roads

State Highway 21 intersects North Texas Avenue at the beginning of the Study Area. It is four-lane on the east side of the intersection and two-lane on the west side. It carries more traffic than any other street in the Study Area except North Texas Avenue. Traffic volumes are higher on the east side of the intersection as indicated in Table 2.

Sparse traffic count data were available for several primarily residential city streets in this Study Area. They are presented in Table 2 but are not discussed in the text.

## CHARACTERISTICS OF STUDY AREA BEFORE AND AFTER IMPROVEMENT OF NORTH TEXAS AVENUE

### Size and Boundaries of Study Area

The Study Area, located in north Bryan, encompasses approximately 713.52 acres (288.75 hectares). An area on each side of North Texas Avenue was chosen and data for both abutting and nonabutting property were collected. The southwestern side of the area extends back to the Southern Pacific Railroad track. This was a logical boundary because access to land on the other side of the tracks is not available from North Texas Avenue. The northeastern boundary was drawn along streets, property lines, and other logical boundaries. The northwestern boundary is the city limits of Bryan and the southeastern boundary is State Highway 21. The Study area is approximately three miles long. The total Study Area ranges from approximately 1,350 feet (460 meters) wide to approximately 2,250 feet (767 meters) wide.

### Land Use Characteristics

Figures 3 and 4 show the "before" land use for 1958 and 1964, respectively. The "after" land uses are indicated in Figures 5 and 6 for 1970 and 1977.

In the years before the improvement, the North Texas Avenue Study Area was classified as developing. The total study area was 30 percent developed (including streets and roads) in 1958 and 34 percent developed in 1964. In 1970, 40 percent of the total study area was developed, and 44 percent was developed in 1977. The predominant land use has remained unimproved, and, thus, the area is still classified as developing. Residential development has

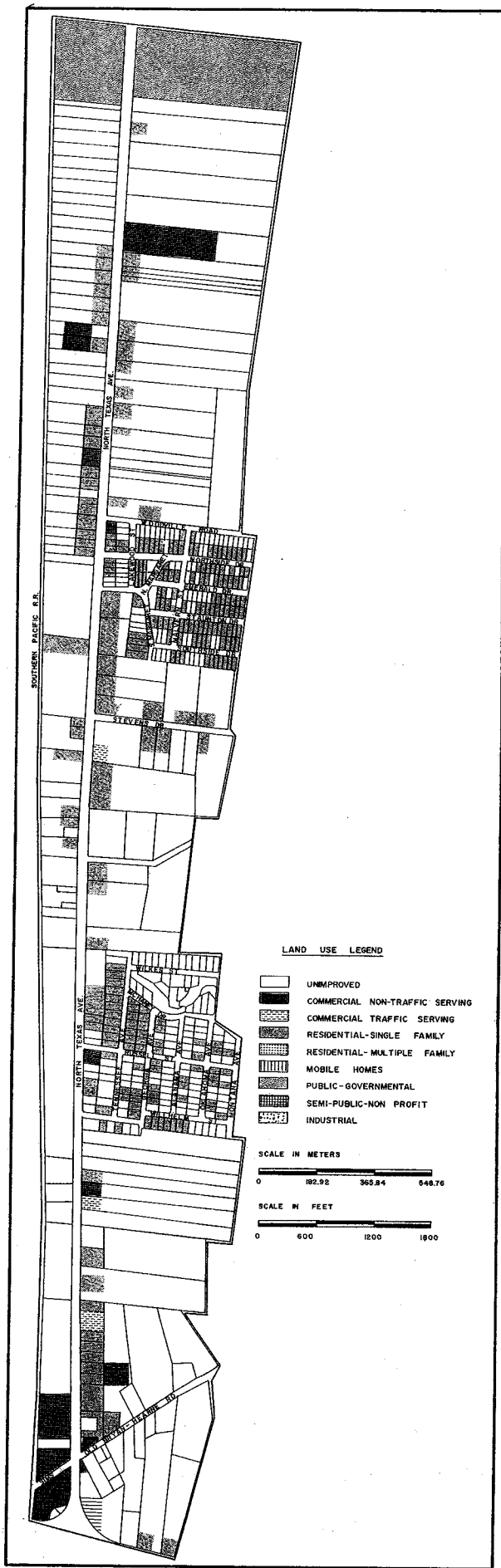


Figure 3. Land Use in the North Texas Avenue Study Area in 1958

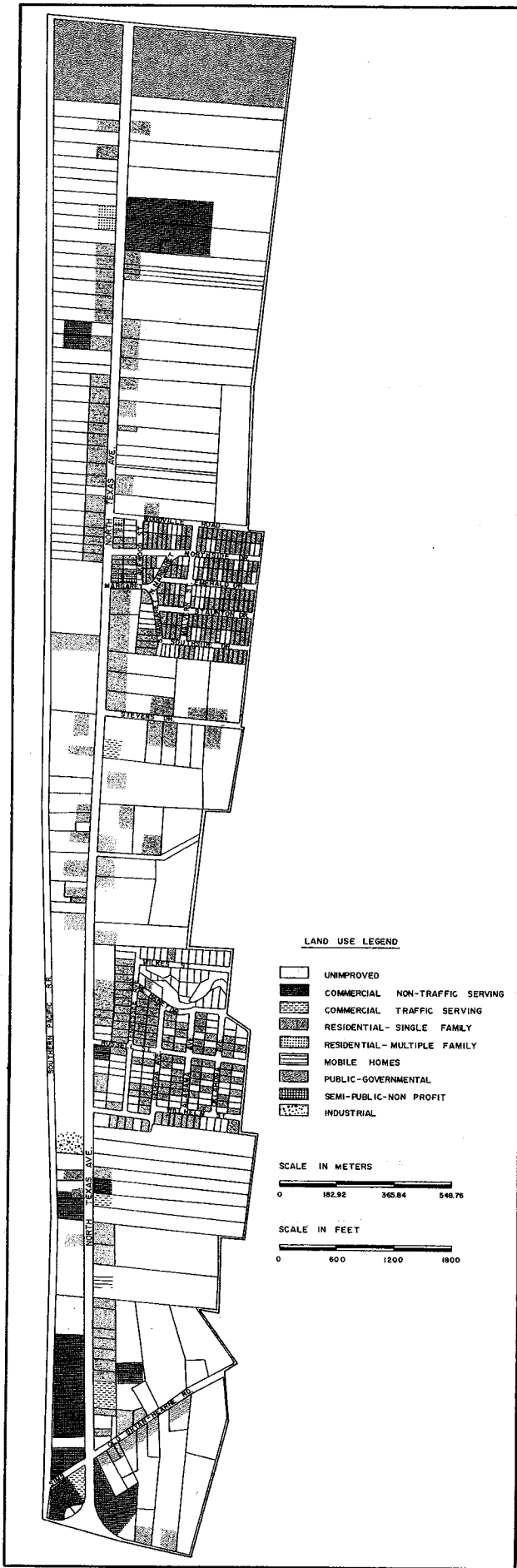


Figure 4. Land Use in the North Texas Avenue Study Area in 1964

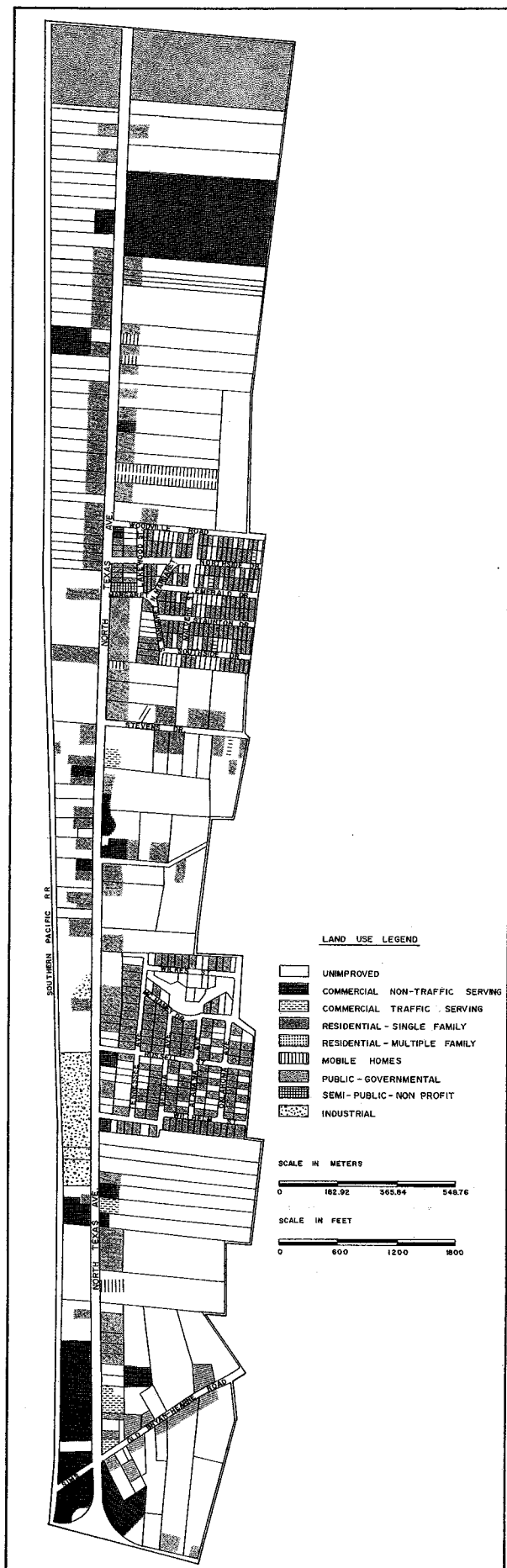


Figure 5. Land Use in the North Texas Avenue Study Area in 1970

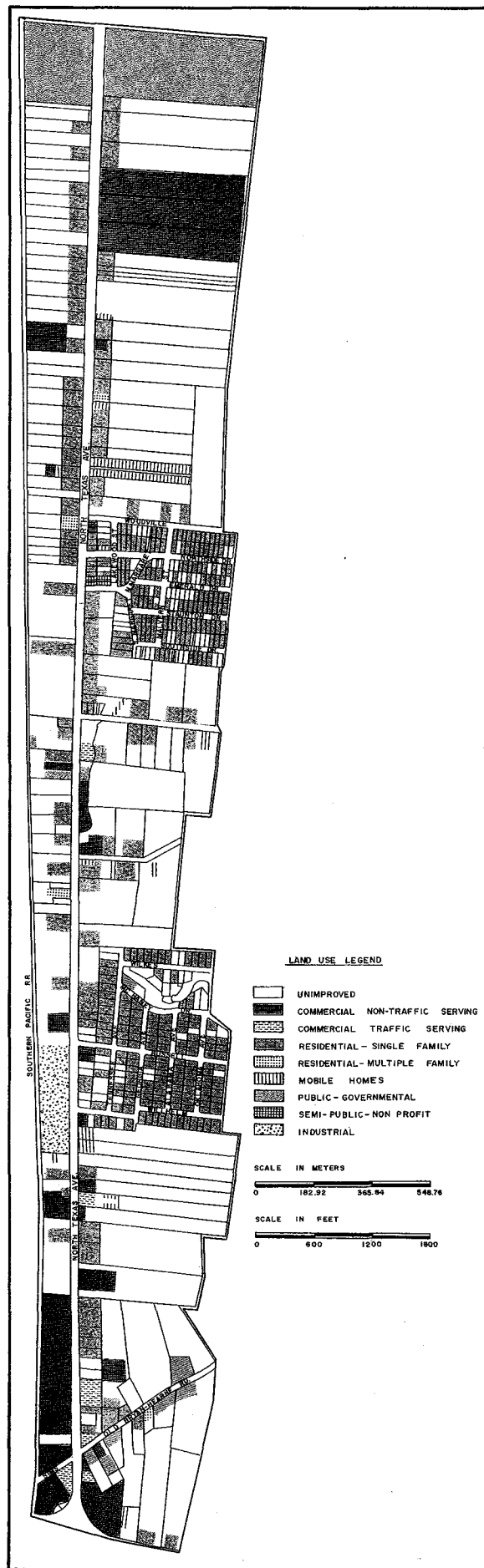


Figure 6. Land Use in the North Texas Avenue Study Area in 1977

been the type of improvement that has occurred most often. Commercial development has increased to having the second most acreage in 1970 and 1977.

### Land Use Changes

Although the North Texas Avenue Study Area has not been the most dynamic area of Bryan-College Station, there have been many changes. Land use changes are discussed first on an overall basis and then in terms of proximity to North Texas Avenue.

#### Overall Study Area

As indicated in Table 3, the majority of the 713.52 acres (288.75 hectares) in this study area have remained unimproved. Residential has been the primary type of development increasing by 25 percent between 1958 and 1964, by 11 percent between 1964 and 1970, and by 15 percent between 1970 and 1977. Mobile homes accounted for slightly over one-fifth of the increase in residential acreage from 1958 to 1977. The growth in commercial acreage has been notable. Commercial acreage increased by 32 percent between 1958 and 1964, by 95 percent between 1964 and 1970, and by six percent between 1970 and 1977. Industrial use has increased over five fold in this 20-year period with most of the increase occurring between 1964 and 1970. Semi-public-nonprofit use has emerged in the form of a church. The City of Bryan has owned a large tract in the northwestern portion of the Study Area for many years. This created a constant public-governmental acreage throughout the entire study period. Acreage in streets and right-of-ways has also remained constant. Therefore, except for the widening of North Texas Avenue the properties in the Study Area have had no change in access. Total changes in land use are charted in Figure 7.



Table 3. Changes in Land Use of All Properties by Time Period and Year<sup>a</sup>

Land Use and Type of Change	Total Acres by Time Period and Year <sup>b</sup>				
	Before		After		
	1958	1964	1970	1977	
Commercial-Traffic-Serving	2.45	3.37	3.49	3.98	
Absolute Change		+ .92	+ .13	+ .48	
Percent Change		+37%	+4%	+14%	
Commercial-Nontraffic-Serving	21.51	28.24	58.26	61.42	
Absolute Change		+6.73	+30.02	+3.16	
Percent Change		+31%	+106%	+5%	
Total Commercial	23.96	31.61	61.75	65.40	
Absolute Change		+7.65	+30.15	+3.65	
Percent Change		+32%	+95%	+6%	
Residential-Single Family	83.48	104.49	109.17	122.13	
Absolute Change		+21.01	+4.68	+12.06	
Percent Change		+25%	+4%	+12.%	
Residential-Multiple Family	c	0	0	1.94	
Absolute Change		-	0	+1.94	
Percent Change		-	0	-	
Residential-Mobile Homes	c	.93	7.42	10.47	
Absolute Change		-	+6.49	+3.05	
Percent Change		-	+698%	+41%	
Total Residential	85.28	105.42	116.59	134.54	
Absolute Change		+21.04	+11.17	+17.95	
Percent Change		+25%	+11%	+15%	
Public-Governmental	39.96	39.96	39.96	39.96	
Absolute Change		0	0	0	
Percent Change		0	0	0	
Semi-Public-Nonprofit	0	.56	.56	.56	
Absolute Change		+ .56	0	0	
Percent Change		-	0	0	
Industrial	.97	1.55	8.31	7.75	
Absolute Change		+ .58	+4.18	- .56	
Percent Change		+60%	+269%	-7%	
Streets	63.27	63.27	63.27	63.27	
Absolute Change		0	0	0	
Percent Change		0	0	0	
Unimproved	500.98	471.14	423.08	402.08	
Absolute Change		-29.84	-45.59	-21.05	
Percent Change		-6%	-10%	-5%	

<sup>a</sup>Total creage equals 713.52 acres (288.75 hectares).<sup>b</sup>One acre equals .4046856 hectares.<sup>c</sup>Data unavailable.

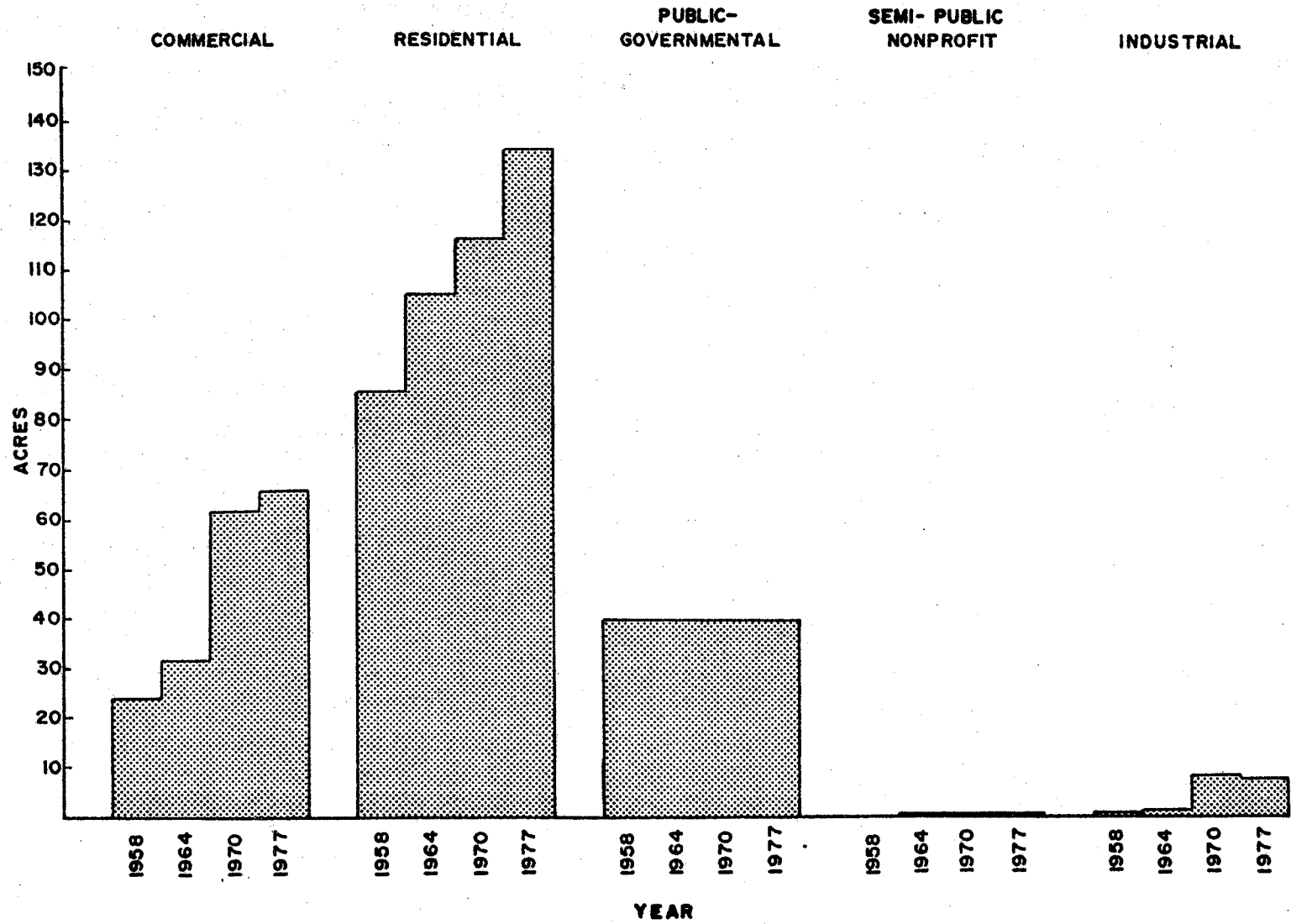


Figure 7. Total Changes in Land Use in the North Texas Study Area

\*One acre equals .4046856 hectares.

### Proximity to North Texas Avenue

Tracts of land were classified according to their location relative to North Texas Avenue. Tracts with frontage on North Texas Avenue were classified as abutting. Whole abutting tracts were included to avoid division of a development. A 300 feet (91.44 meters) deep section of undeveloped tracts was considered abutting. Three hundred feet was chosen to be consistent with other case studies in this project. All other land in the Study Area was classified nonabutting. The division of land into these two categories was done to facilitate comparison. Although the improvement of the highway may have influenced land use changes on nonabutting properties, it is expected that abutting properties would have been most affected. This can be proved or disproved by examining the two categories of land separately.

Unimproved land constituted the dominant abutting land use (about 45 percent) in the first before year, 1958 (Table 4). All other uses, including streets and roads represented the remaining 55 percent of abutting land that year. Residential development accounted for slightly over 30 percent of the abutting development, and public-governmental development made up slightly over 29 percent of improved abutting acreage at that time. Commercial improvements accounted for 13 percent of total abutting development and industrial improvements accounted for 0.7 percent. The remainder of improved abutting land was in streets and roads in 1958.

All abutting improved land categories, except streets and roads, increased by 1964, the last "before" year. Abutting land was 62 percent improved by that time although undeveloped was still the dominant land use category. Commercial development had the highest absolute and percentage increase in acreage. However, residential was still the dominant improved use and public-governmental use was second.

Table 4. Changes in Land Use of Abutting Property by Time Period and Year<sup>a</sup>

Land Use and Type of Change	Abutting Acres by Time Period and Year <sup>b</sup>			
	Before		After	
	1958	1964	1970	1977
Commercial-Traffic Serving	2.45	3.37	3.49	3.98
Absolute Change		+0.92	+0.12%	+0.48
Percent Change		+37%	+4%	+14%
Commercial-Nontraffic Serving	15.52	26.17	49.13	54.15
Absolute Change		+10.65	+22.96	+5.02
Percent Change		+69%	+88%	+10%
Total Commercial	17.97	29.54	52.63	58.13
Absolute Change		+11.57	+23.09	+5.5
Percent Change		+64%	+78%	+10%
Residential-Single Family	c	46.58	48.76	52.95
Absolute Change		-	+1.73	+4.19
Percent Change		-	+4%	+9%
Residential-Multiple Family	c	0	0	1.65
Absolute Change		-	0	+1.65
Percent Change		-	0	-
Residential-Mobile Homes	c	.77	6.49	6.83
Absolute Change		-	5.72	+0.34
Percent Change		-	+743%	+5%
Total Residential	41.41	47.35	55.25	61.43
Absolute Change		+5.94	+7.45	+6.18
Percent Change		+15%	+16%	+11%
Public-Governmental	39.96	39.96	39.96	39.96
Absolute Change		0	0	0
Percent Change		0	0	0
Semi-Public-Nonprofit	0	.56	.56	.56
Absolute Change		+0.56	0	0
Percent Change		-	0	0
Industrial	.97	1.55	8.31	7.75
Absolute Change		+0.58	+4.17	-0.56
Percent Change		+60%	269%	-7%
Streets	36.67	36.67	36.67	36.67
Absolute Change		0	0	0
Percent Change		0	0	0
Unimproved	112.58	93.94	56.19	45.06
Absolute Change		-18.64	-34.72	-11
Percent Change		-17%	-37%	-20%

<sup>a</sup>Total abutting acreage equals 249.57 acres (101.00 hectares).

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

<sup>c</sup>Data unavailable.

In 1970, which was two years after construction was completed, 76 percent of abutting land was improved. Each category of land improvements, except streets and roads, had increased in acreage since 1964. Commercial improvements had increased most and were only slightly lower than residential use in acreage.

A slight decrease in abutting industrial use occurred between 1970 and 1977. All other improved categories had increases in acreage again, except streets and roads. Residential was the dominant type of abutting land use with commercial use being only slightly less. Eighty-one percent of abutting land was developed in 1977.

Nonabutting land was only 16 percent improved in 1958. The improvements were mostly residential with some commercial (Table 5).

Improved acreage increased to 19 percent of total nonabutting land by 1964. Residential improvements had increased by 35 percent, but commercial usage had decreased by 65 percent.

In 1970, 21 percent of nonabutting land was improved. Residential remained the dominant improved use and had increased by six percent. Commercial development had more than tripled but was still only two percent of total nonabutting acreage.

Between 1970 and 1977, residential acreage increased and commercial acreage decreased slightly. The net result was an increase in improved acreage to 23 percent of nonabutting land in 1977.

Considering changes over the entire period from 1958 to 1977, industrial development had the highest percentage increase on abutting land although commercial development had the highest absolute increase in acreage. Residential development had the highest percentage and absolute increase in

Table 5. Changes in Land Use of Nonabutting Property by Time Period and Year<sup>a</sup>

Land Use and Type of Change	Nonabutting Acres by Time Period and Year <sup>b</sup>				
	Before		After		
	1958	1964	1970	1977	
Commercial Nontraffic-Serving	5.99	2.07	9.13	7.27	
Absolute Change	-3.92		+7.06	-1.86	
Percent Change	-65%		+341%	-20%	
Total Commercial	5.99	2.07	9.13	7.27	
Absolute Change	-3.92		+7.06	-1.86	
Percent Change	-65%		+341%	-20%	
Residential-Single Family	c	57.91	60.85	69.18	
Absolute Change	-		+2.94	+8.33	
Percent Change	-		+5%	+14%	
Residential-Multiple Family	c	0	0	.29	
Absolute Change	0		0	+.29	
Percent Change	0		0	-	
Residential-Mobile Homes	c	.16	.93	3.64	
Absolute Change	-		+.77	2.71	
Percent Change	-		+481%	+292%	
Total Residential	42.96	58.07	61.78	73.12	
Absolute Change	+15.11		3.71	+11.34	
Percent Change	+35%		+6%	+18%	
Streets	26.60	26.60	26.60	26.60	
Absolute Change	0		0	0	
Percent Change	0		0	0	
Unimproved	388.39	377.21	366.43	356.96	
Absolute Change	-11.18		-10.78	-9.47	
Percent Change	-3%		-3%	-3%	

<sup>a</sup>Total nonabutting acreage equals 463.94 (187.75 hectares)

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

<sup>c</sup>Data unavailable

acreage on nonabutting land. Changes in abutting and nonabutting acreages are charted in Figures 8 and 9.

### Land Use Impediments

Other factors which could have influenced land use changes were researched to determine their effects in the North Texas Avenue Study Area. Some of the impediments found in other case studies in this project were not found in this area. Unlike College Station, Bryan has no zoning, therefore eliminating the possibility of restrictions of that type. No evidence was found of problems with drainage or lack of utilities that might have slowed development. No cases of land being held for higher prices was found.

The concensus among those interviewed was that more land development did not occur because of the location of this area relative to other things in the county. The area is too far from Texas A&M University to be a desirable place for residences or commercial establishments that cater to the university sector. This is critical in a county that derives the majority of its income from the university. Growth in Brazos County has been occurring primarily in College Station and south Bryan, somewhat removed from the Study Area.

The industrial development that has occurred may also be a deterrent to other types of development. The aesthetic quality of the area is lowered by unsightly industrial equipment, noise, and heavy truck traffic. The residential potential along North Texas Avenue is particularly affected by this.

One final possible deterrent is the railroad that runs almost parallel to North Texas Avenue. No streets cross the railroad within the Study Area denying easy access from North Texas Avenue to the land beyond the railroad.

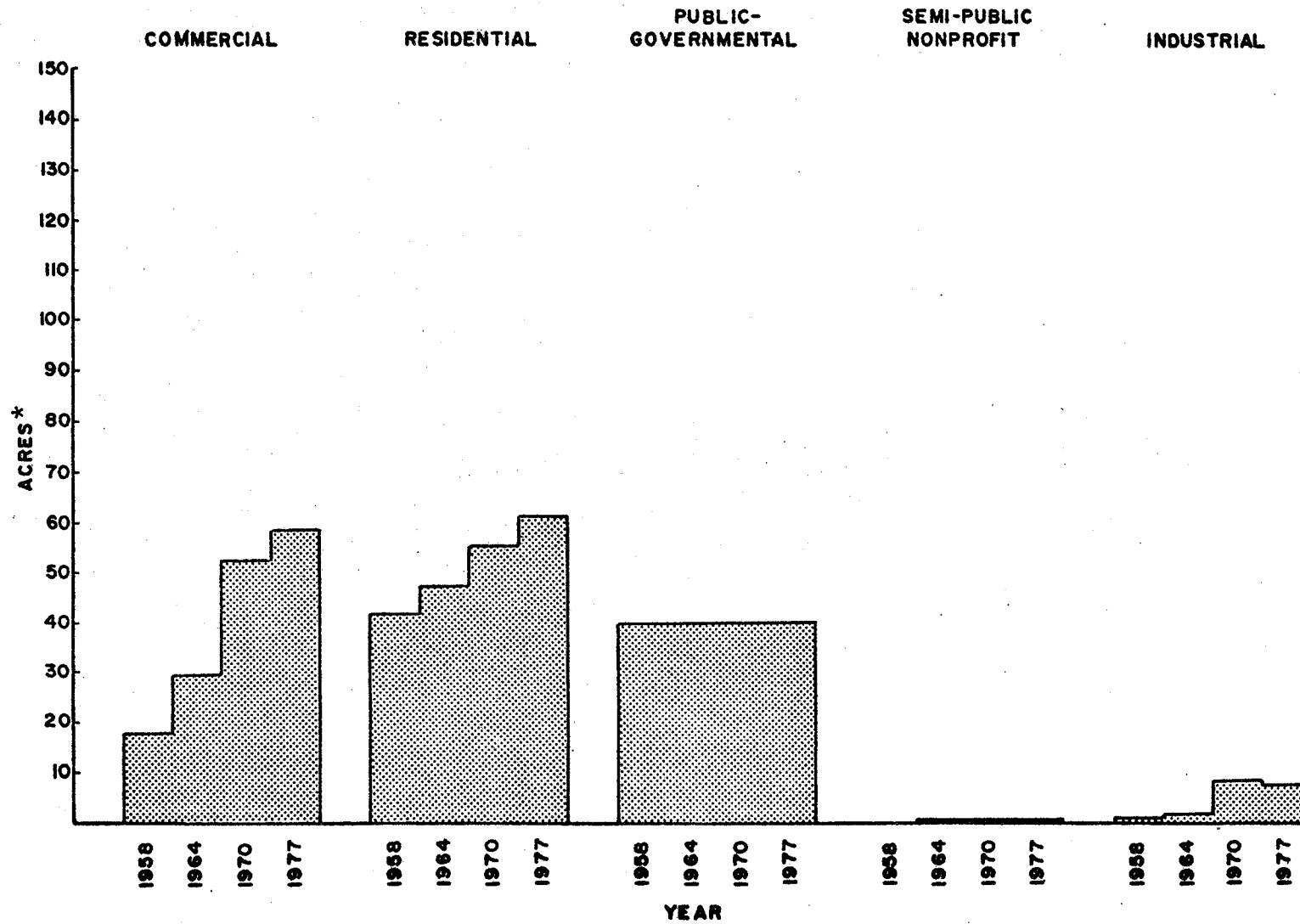


Figure 8. Changes in Abutting Land Uses in the North Texas Avenue Study Area

\* One acre equals .4046856 hectares.



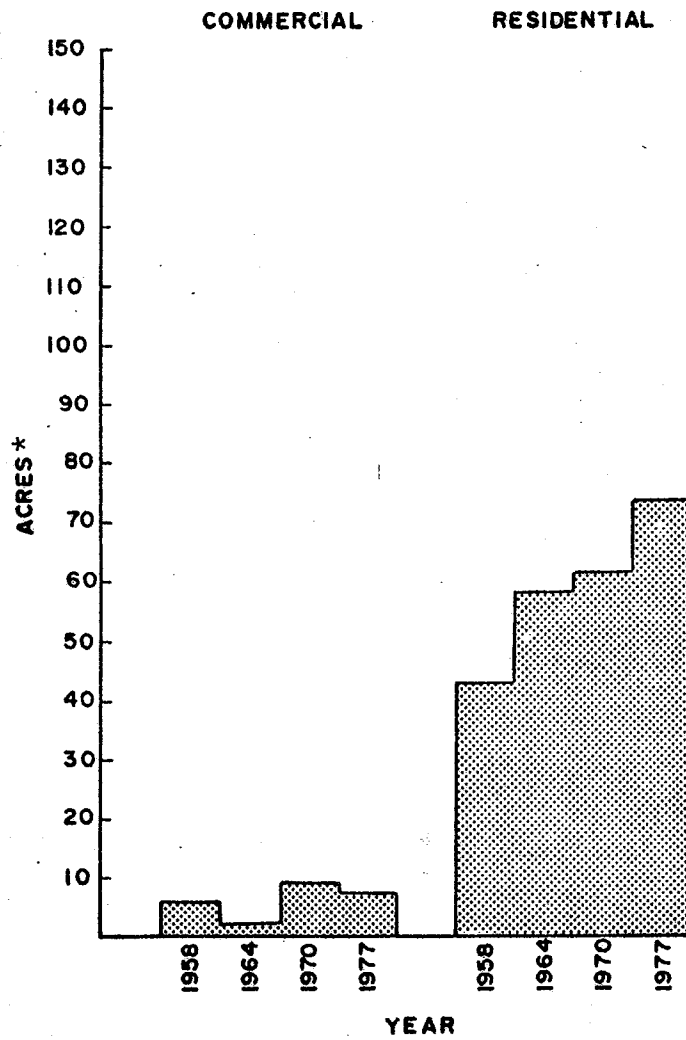


Figure 9. Changes in Nonabutting Land Uses in the North Texas Avenue Study Area

\*One acre equals .4046856 hectares.

This could be limiting the types or amount of development that occurs on that side.

### Socio-Economic Characteristics

The socio-economic characteristics of the North Texas Avenue Study Area were investigated to better describe the setting in which the highway improvement took place. In 1970, this study area was in Census Tract 3 of the Bryan-College Station Standard Metropolitan Statistical Area. Census Tract 3 is larger than the Study Area but shares three common boundaries. The boundaries for the census tract are: State Highway 21 to the southeast, the Southern Pacific Railroad to the southwest, and the Bryan city limits to the northeast and northwest. The Study Area boundaries differ only on the northeastern side where the delineation is along streets and property lines making the Study Area smaller than the census tract. Data for 1970 were the only census tract level data available for the area.

As Table 6 shows, socio-economic indicators for Census Tract 3 did not consistently fall above or below those for Bryan or Brazos County. Census Tract 3 enjoys a higher level of social and economic well-being in some respects and lower level in others. Median family income was higher in the census tract than in the city or county and percent of families below the poverty level was lower in the census tract. However, the median number of school years completed was noticeably lower in the census tract. Consequently, the percent of high school graduates was also lower in the census tract than in the city or county.

The median value of owner occupied residences was also lower in Census Tract 3 with a median value of \$11,100, as compared to \$12,200 in Bryan, and \$13,000 in Brazos County. The percent of white collar workers was

Table 6. Comparison of 1970 Socio-Economic Characteristics of Census Tract 3 to Bryan-College Station.

	SMSA (Brazos County)	Bryan	College Station	Tract 3
<u>Population</u>	57,978	33,719	17,676	2,278
Median School Years Completed	12.2	11.9	15.8	10.7
Percent High School Graduates	54.5	49.6	82.9	36.0
Median Family Income	\$7,636	\$7,775	\$7,849	\$8,563
Median Income of Families and Unrelated Individuals	\$4,002	\$6,341	\$1,824	\$7,988
Median Value Owner Occupied Residences	\$13,000	\$12,200	\$18,500	\$11,100
Median Rent Paid by Tenants	\$74	\$64	\$87	\$71
Percent Families Below Poverty Level	16.6	16.0	14.1	5.0
<u>Occupations</u>				
Total Employed, 16 Years and Over	21,909	13,120	6,345	853
Percent Professional, Technical and Kindred Workers	24.8	20.3	39.4	6.57
Percent Managers and Administrators except farm	8.5	10.0	6.0	13.72
Percent Sales Workers	6.6	7.4	5.5	9.85
Percent Clerical and Kindred Workers	17.3	17.4	17.9	19.34
Percent Craftsmen, Foremen, and Kindred Workers	10.1	12.2	4.5	21.92
Percent Operatives, Except Transport	6.8	7.8	3.6	9.38
Percent Transport Equipment Operatives	3.0	4.0	1.0	5.28
Percent Laborers, Except Farm	4.6	4.7	4.0	6.92
Percent Farm Workers	3.6	1.3	4.0	-
Percent Service Workers	11.4	11.4	12.0	7.03
Percent Private Household Workers	3.3	3.5	2.0	-

lower in the census tract than in the other two areas of comparison, but the percent of service and private household workers was also less than the percent in the city and county. The working force was made up of 49.48 percent professionals, managers, sales workers and clerical workers (white collar); 43.50 percent craftsmen, foremen, operatives of some kind, or laborers (blue collar); and the remaining 7.03 percent were service or private household workers.

In summary, the median resident of Census Tract 3, in 1970, was less educated than the median resident in Bryan and Brazos County, and Census Tract 3 homeowners lived in homes valued lower than those of the average homeowner in the city or county. However, the median family income was higher in the census tract and there were fewer workers in the less prestigious categories of occupations.

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

An attempt is made to examine the impact of the improvement upon land use. Two types of data are used to indicate the extent of this impact: (1) actual changes in land use in the area, and (2) the opinions of people knowledgeable about the area.

### Effects on Abutting and Nonabutting Land Use

Tables 7 and 8 illustrate the amount of abutting and nonabutting acreage that changed use and what the previous and new uses were. In this study area, most land use change occurred due to unimproved land becoming developed. However, some changes from one improved use to another did occur. In the whole study area, 214.95 acres (86.99 hectares) changed use between 1958 and 1977. Of this acreage, 33.50 acres (13.56 hectares), or 16 percent, were previously improved for another use.

To compare changes on abutting and nonabutting land, acres changing use were put on a percentage basis in Tables 7, 8, and 9. This was done because the nonabutting section is larger than the abutting section. The abutting percentages are the percentages of total abutting land. Likewise, the nonabutting percentages are percentages of total nonabutting land. The yearly rate of change, as shown in Table 9, was calculated to adjust for the difference in number of years between the periods.

As indicated by Table 9, abutting property was changing use at a rate of 2.02 percent per year in the before period. Improvement of previously unimproved land accounted for most of the change. Nonabutting land was changing use at a 0.62 percent rate per year. This was totally the result of unimproved land being put to use.

Table 7. Types of Land Use Changes on Abutting Acreage by Time Period<sup>a</sup>

Change	Before Period		Short-run After Period		Long-run After Period		Total After Period	
	1958-1964		1964-1970		1970-1977		1964-1977	
	Acres Changing Use	Percent of Total Abutting Acres	Acres Changing Use	Percent of Total Abutting Acres	Acres Changing Use	Percent of Total Abutting Acres	Acres Changing Use	Percent of Total Abutting Acres
Unimproved to Commercial	12.16	4.87	21.84	8.75	1.73	.69	23.57	9.44
Unimproved to Industrial	1.55	.62	6.77	2.71	0	0	6.77	2.71
Unimproved to Residential	9.48	3.80	8.16	3.27	8.26	3.31	16.42	6.58
Unimproved to Semi-Public	.56	.22	0	0	0	0	0	0
Commercial to Residential	2.02	.81	0	0	1.72	.69	1.72	.69
Commercial to Unimproved	.33	.13	0	0	.48	.19	.48	.19
Residential to Commercial	1.36	.54	.65	.26	2.06	.82	2.71	1.09
Residential to Unimproved	1.86	.74	2.76	1.10	0	0	2.76	1.10
Industrial to Commercial	.97	.39	0	0	0	0	0	0
Industrial to Unimproved	0	0	0	0	.52	.21	.52	.21
Total Land Changing Use	30.29	12.13	40.18	16.09	14.77	5.91	54.95	22.01
Improved Land	6.54	2.62	3.41	1.36	4.78	1.91	8.19	3.28
Unimproved Land	23.75	9.51	36.77	14.73	9.99	4.00	46.76	18.73
Total Land Not Changing Use	219.28	87.87	209.39	83.91	234.80	94.09	194.62	77.99
Total Abutting Land	249.57	100	249.57	100	249.57	100	249.57	100

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

Table 8. Types of Land Use Changes on Nonabutting Acreage by Time Period<sup>a</sup>

Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1958-1964		1964-1970		1970-1977		1964-1977	
	Acres Changing Use	Percent of Total Nonabutting	Acres Changing Use	Percent of Total Nonabutting	Acres Changing Use	Percent of Total Nonabutting	Acres Changing Use	Percent of Total Nonabutting
Unimproved to Commercial	2.95	.64	.77	.17	1.28	.27	2.05	.44
Unimproved to Residential	14.21	3.06	10.37	2.23	10.99	2.37	21.36	4.60
Commercial to Unimproved	0	0	.20	.04	0	0	.20	.04
Residential to Unimproved	0	0	4.17	.90	1.02	.22	5.19	1.12
Total Land Changing Use	17.16	3.70	15.51	3.34	13.29	2.86	28.80	6.20
Improved Land	0	0	4.37	.94	1.02	.22	5.39	1.16
Unimproved Land	17.16	3.70	11.14	2.40	12.27	2.64	23.41	5.04
Total Land Not Changing Use	446.78	96.30	448.43	96.66	450.65	97.40	434.95	93.75
Total Nonabutting Land	463.94	100	463.94	100	463.94	100	463.94	100

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

Table 9. Percentage Change in Abutting and Nonabutting  
Acreage by Period and Type of Land Use

	<u>Before Period</u>		<u>Short-Run After Period</u>		<u>Long-Run After Period</u>		<u>Total After Period</u>	
	1958-1964		1964-1970		1970-1977		1964-1977	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Previously Improved Land	2.62%	0%	1.36%	0.94%	1.91%	0.22%	3.27%	1.16%
Yearly Rate of Change	0.44%	0%	0.23%	0.16%	0.27%	0.03%	0.25%	0.09%
Previously Unimproved Land	9.51%	3.70%	14.73%	2.40%	4.00%	2.64%	18.73%	5.04%
Yearly Rate of Change	1.59%	0.62%	2.46%	0.40%	0.57%	0.38%	1.44%	0.39%
Total Land	12.13%	3.70%	16.09%	3.34%	5.91%	2.86%	22.00%	6.20%
Yearly Rate of Change	2.02%	0.62%	2.68%	0.56%	0.84%	0.41%	1.69%	0.48%



The short-run after period, which includes changes from the end of 1964 through 1970, was the period of most change for abutting property. This period actually includes one year prior to construction, the construction years, and two years after completion of construction. Abutting land use change was occurring at a rate of 2.68 percent per year, a slight increase over the before period. Nonabutting land was changing use at 0.56 percent per year, a slight decrease from the before period. Unimproved land that became developed accounted for most of the change again.

The long-run after period evidenced a reduction in the rate of change on both abutting and nonabutting acreage. Both abutting and nonabutting rates fell not only lower than in the short-run after period but also lower than in the before period. The rate of change was 0.84 percent for abutting property and 0.41 percent for nonabutting property. Once again the improvement of previously unimproved land was the main type of change.

These rates of change indicate a possible effect of the improvement upon land use in the short-run after period. The higher abutting rate in this period, which includes one year before construction, the construction years, and two years after construction, was perhaps, in part, a result of the widening and reconditioning of North Texas Avenue. The improvement indicated that more traffic was anticipated and that the area was expected to be one of continued growth. This very likely influenced decisions about land use.

This influence appeared to be curtailed greatly as the rates of development in the long-run after period fell to even lower than in the before period. The rate of change for total abutting property was higher than the rate for total nonabutting property in each period. This is as expected since it was anticipated that abutting property would receive the greatest impact and experience the most land use change after a road improvement.

### Other Factors Influencing Change

An aspect of development in this location is the economy of the metropolitan area as a whole. The economy has remained healthy and growing with new industries and businesses being added yearly. The increased input of Texas A&M University has been the dominant force in creating a prosperous, dynamic community. Although the North Texas Avenue Study Area has not received as many direct benefits from the university as other areas located closer to the school, indirect benefits are felt throughout the county, as well as this study area. People, industries, and businesses have been drawn to this thriving community that has enjoyed economic well-being for many years.

As indicated earlier, another factor that has influenced some of the development in this area is the construction of the State Highway 6 East By-Pass to the northeast of North Texas Avenue. Residential development on nonabutting land has been impacted by this new facility. The by-pass provides very good access to downtown Bryan and College Station. Developers of new residential additions or enlargements of old additions near the border or just outside of the Study Area stated that the by-pass, not the improvement of North Texas Avenue, was a major reason for their renewed interest in this area of Bryan. The by-pass probably had a depressing effect on commercial development elsewhere in the Study Area by taking away traffic that would have otherwise been on North Texas Avenue.

The railroad, which provides the southerly boundary of the Study Area, helps make an attractive place for industrial development. The possibility of spurs which could connect an industry to the railroad and also the physical layout of the land caused by the railroad have created a strip conducive to industrial development rather than some other type.

Although Bryan has no zoning, formal plans for use of the city's land have been formulated. The Brazos Area Plan published in 1958 indicated that the land near the intersection of North Texas Avenue and State Highway 21 would likely be used for commercial development in the future. A small amount of commercial development was actually there at that time. The land for approximately one mile out on the southerly side of North Texas Avenue was designated for industrial use. Some industrial use had already occurred when these plans were developed. Plans for residential use prevailed for the remainder of abutting property and for much of the nonabutting. Part of the nonabutting land was expected to remain unimproved.

The Comprehensive Bryan Plan published in 1970 designated more land to become industrial by 1990. In addition to that portion indicated in the Brazos Area Plan, the land near the intersection with State Highway 21 was planned for industrial use rather than commercial. Beyond the mile-long strip of planned industrial use on the southerly side of the highway out to the city owned property at the end of the Study Area lies a planned strip of commercial development. Commercial development was also planned for a strip of the abutting property over one and one-half miles long beginning at Old Hearne Road on the northerly side of North Texas Avenue. Residential development accounted for almost all of the planned use of nonabutting land with a small amount of public and semi-public land included.

Although land development has occurred very similiary to that indicated in the plans, the City of Bryan has had little influence in causing these types of developments to occur. The city has no legal means of controlling land use. If development is to occur on land not previously platted, the city has the authority to impose certain restrictions, e.g., distance from

the street, type and amount of parking, and curb openings. The city cannot dictate the type of development. The only legal means of land use control available in Bryan is through deed restrictions. If a deviation from a deed restriction occurs, it is the citizens who would be affected that instigate an action to prohibit the nonconforming development, not the city. The plans for this area were predictions of what the planners thought was likely to occur. These predictions were based upon land use at that time, the physical characteristics of the area, and the amenities the area offered for various types of development, i.e., the railroad for industrial development. The Comprehensive Bryan Plan was released after the improvement of the highway. The road condition may have been a factor in predicting the land use nearby.

#### Opinions of Knowledgeable People

To get an impression of how important the highway improvement was judged to be in terms of influence upon land use, several people were interviewed about their opinions on the topic. The people who were involved in the planning of this improvement stated that the project was carried out to handle the traffic load that the old highway no longer adequately served. Traffic counts had been increasing and were expected to continue to increase on this main road in a growing community. The improvement of the road was felt to have had little influence upon the amount of development that took place. The businesses and industries were said to have been drawn to the large volume of traffic on this road, not its design. It was assumed that the road would be maintained to keep pace with the growth.

Builders and developers expressed the opinion that the road improvement has had little positive effect on residential development, particularly the

recent development. The development in the last few years has been affected more by the State Highway 6 East By-Pass that provides good access to the nonabutting land on the northerly side of the Study Area. The by-pass has had positive effects on residential land use near it and probably negative effects on some development, particularly commercial development, abutting North Texas Avenue by taking traffic away from the roadway.

A resident of the area since 1952 also feels that the highway improvement did not significantly impact land use in this area. He stated that building and development were well underway before the road improvement occurred. The Highway 6 By-Pass was once again named as the roadway that caused more change in this area than North Texas Avenue. As a long-term resident who has watched the area develop, tried unsuccessfully to sell his residential property that abutts North Texas Avenue, and is aware of some future developments, he foresees a continuation of the industrial and commercial growth on abutting property and a reduction of abutting residential acreage.

## CONCLUSIONS

Although much of the North Texas Avenue Study Area remains unimproved, changes have occurred that have important implications for future land use. The commercial and industrial development on abutting land is expected to continue and change the previously residential character of the area even more.

Fifty-five percent of abutting land was developed in 1958. Although residential remained the type of improvement with most acreage, by 1977 when 82 percent of abutting land was developed, commercial acreage had increased to just under three acres less than residential acreage. Combining commercial and industrial use, the residential usage was no longer dominant in 1977. Based on the city's plans for the area and the suggestion of proposed developments by informed people, the commercial-industrial growth should continue.

Only 16 percent on nonabutting land was developed in 1958. It was and has remained predominantly unimproved through 1977 when 23 percent of the land was developed. There were instances of land changing from one improved use to another, but the primary type of change was from previously unimproved land to an improved use. Most change occurred in the period between 1964 and 1970 which is the short-run after period. If the improvement had any effect on land use change, it would have occurred predominantly in this period. Yearly rates of land use change were minimal and differences between rates of change in the periods before and after the highway improvement were too slight to detect any significant differences. Therefore, it is concluded that the improvement of North Texas Avenue had little effect on land use change and did not cause any major land use changes.