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16. Abstract <p>Previous studies on the effects of highway construction upon land use have focused mainly upon the effects of the construction of new highways. In view of a new emphasis upon upgrading and expanding existing facilities rather than building new ones, the need arises for information concerning the effects of such improvements upon land use. This report relates the findings of research done in an area of Houston, Texas, where Gessner Road was upgraded from a two-lane to a six-lane road with a raised median. The improvement took place in a developing urban area where the predominant land use was residential. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the street improvement. Data were collected for a period including seven years before funds were provided for the improvement. Total acres in each type of land use were determined for two "before construction" years, 1962 and 1968, and for two "after construction" years, 1972 and 1978. Comparisons were made of the types and rates of development before and after the upgrading occurred. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the street improvement were also researched and are reported. Highway planners should be able to use this report and subsequent reports of this study to make more accurate predictions of land use changes due to specific highway improvements.</p>					
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LAND USE IMPACT OF IMPROVING GESSNER ROAD
IN A DEVELOPING AREA IN HOUSTON, TEXAS

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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. Also, Mr. Robert Todd, Mr. Merwyn Hirsh, and Mr. Chris Olavson of the Houston-Galveston Regional Transportation Study were helpful in providing materials and data sources.

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Members of the Texas Transportation Institute have been most supportive and have offered suggestions and encouragement. Ms. Karen Spohr very ably typed this 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 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 report relates the findings of research done in an area of Houston, Texas, where Gessner Road was upgraded from a two-lane to a six-lane road with a raised median. The improvement took place in a developing urban area where the predominant land use was residential. Land use changes were analyzed for both abutting and nonabutting properties that might have been affected by the street improvement. Data were collected for a period including seven years before funds were provided for the improvement. Total acres in each type of land use were determined for two "before construction" years, 1962 and 1968, and for two "after construction" years, 1972 and 1978. Comparisons were made of the types and rates of development before and after the upgrading occurred. The data are reported in narrative, graphic, and tabular form. Causes of development in the area other than the street improvement were also researched and are reported. Highway planners should be able to use this report and subsequent reports of this study to make more accurate predictions of land use changes due to specific highway improvements.

SUMMARY OF FINDINGS

Land use data were collected for the Gessner Road Study Area in Houston, Texas to determine the impact on land use of improving the road from a two-lane, open ditch design to a six-lane road with curbs and gutters and a raised median. Data were collected for 1962, which was seven years before funds were provided for the improvement; 1968, the last year before funding; 1972, the first year after the improvement was completed; and 1978, the last full year data collection was possible.

The findings are summarized as follows:

1. The total study area has undergone numerous changes from 1962 to 1978.
 - a. The stage of development has changed from "developing" to "developed."
 1. Sixty percent of the total area was developed in 1962, and 78 percent was developed in 1968.
 2. Ninety-three percent was developed in both 1972 and 1978.
 - b. The area has remained predominantly residential. However, the type of residential use has changed from being totally single family to a combination of single and multiple family.
2. Properties abutting Gessner Road experienced several notable changes.
 - a. The predominant abutting land use changed from industrial to commercial between 1962 and 1968, and remained commercial through 1978.
 1. Commercial acreage increased from 3.62 acres (1.46 hectares) in 1962 to 31.85 acres (12.89 hectares) in 1978 (a 780 percent overall increase).

2. Industrial acreage decreased from 7.75 acres (3.14 hectares) in 1962, 1968, and 1972, to none in 1978, when the one large industrial tract became unimproved.
- b. Abutting residential use changed from totally single family use to predominantly multiple family use.
 1. Single family acreage decreased from 2.26 acres (0.91 hectares) in 1962 to 0.78 acres (0.32 hectares) in 1978 (a 65 percent decrease).
 2. Multiple family acreage increased from none in 1962 to 18.15 acres (7.35 hectares) in 1978.
- c. Changes in other abutting uses also occurred.
 1. Public-governmental use increased from 0.26 acres (0.11 hectares) in 1962 to 19.05 acres (7.71 hectares) in 1968, 1972, and 1978.
 2. Acreage in streets increased slightly when two streets were extended on land previously classified as abutting.
3. Nonabutting land also underwent numerous changes in the period between 1962 and 1978.
 - a. The predominant land use remained single family residential although acreage in this use increased between 1962 and 1968, and then decreased in 1972 and 1978.
 - b. Commercial acreage increased by 183 percent on nonabutting land.
 - c. Multiple family acreage increased from none to 77.39 acres (31.32 hectares).
 - d. Industrial acreage declined by 17 percent over the study period.
 - e. Public usage remained constant at 0.39 acres (0.16 hectares)

and semi-public usage dropped from 6.97 acres (2.82 hectares) to none.

- f. Acreage in streets increased when two streets were extended.
4. The period of most change for abutting properties was the "before" period, 1962 to 1968.
 - a. Abutting land changed use at an annual rate of 6.69 percent in that period, as compared to 3.81 percent between 1968 and 1972, and 1.51 percent between 1972 and 1978.
 - b. Previously unimproved land that became improved for the first time accounted for most of the change in the "before" period.
 5. The period of most change for nonabutting properties was the "short-run after" period, 1968 to 1972.
 - a. Nonabutting land changed use at an annual rate of 4.07 percent, as compared to 2.66 percent between 1962 and 1968, and 0.87 percent between 1972 and 1978.
 - b. Previously unimproved land that became improved accounted for most of the nonabutting land use changes during this short-run after" period.
 6. Land use changes were affected by the improvement of Gessner Road.
 - a. The road improvement had little, if any, impact on the changes that occurred prior to 1968.
 1. Funds had not yet been allocated indicating that this particular road improvement would take place.
 2. Many of the changes that occurred before then were on or near land that had been platted in the 1950's or early 1960's.
 - b. The road improvement was an influence in later land use changes.

1. Commercial and multiple family residential developments that were put on unimproved land were located in the Gessner area partly because of the improved access.
2. The improvement was also important in the changes from single family residential use to commercial and multiple family uses.

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.

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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 relates the findings of investigation in an area of Houston, Texas, where Gessner 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 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 Gessner 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).

A 1962 land use map from the City Planning Department of Houston provided land use for the first "before" year. The Houston City Directory provided information to compile a map for 1968, the last "before" year. Aerial maps were the sources of land use for 1972 and 1978, the two "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 Gessner Road. On undeveloped tracts, a section extending back 300 feet from Gessner Road was designated as abutting. Land use changes and rates of land development were determined for each category to facilitate comparison.

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

Location of the Road Improvement

The improved portion of Gessner Road is located within the incorporated city limits of Houston. Houston, the nation's fifth largest city and largest city in the South and Southwest, is the business and population center of a dynamic metropolitan area situated approximately 50 miles from the Gulf of Mexico. The growth of Houston, Harris County, and the Houston SMSA has been phenomenal in recent decades, as is illustrated in Table 1. The 1978 Houston population has been estimated at 1,623,000 by the Houston Chamber of Commerce, and when compared to the 1970 census figure of 1,232,000 represents an increase of 31.7%.

Several industries have contributed to the extraordinary growth of the Houston-Gulf Coast region, but the chemical and petrochemical industries have played an extremely important part in the city's growth. The discovery of oil and gas in southeast Texas and the opening of the Houston Ship Channel in the early 1900's stimulated development of petroleum refining in the area to the extent that today over 50% of the nation's major petrochemical manufacturing capacity is located in the region. The Houston SMSA has long been the nation's leading producer of refined petroleum and petrochemicals, and, as a result, various allied industries have also located in the metroplex.

The Houston-Gulf Coast region possesses an excellent transportation network, to both the international and national business market. The port of Houston is the third largest seaport in the United States in total tonnage and ranked second in total dollars of foreign trade. The major import products are steel, petroleum, and passenger cars, while the port's leading export

Table 1. Population and Percent Changes of Area Population for the Houston SMSA, Harris County, and City of Houston

	1940 ^a	Change and % Change 1940-1950	1950 ^a	Change and % Change 1950-1960	1960 ^a	Change and % Change 1960-1970	1970 ^a	Change and % Change 1970-1978	1978 ^b
Houston SMSA	646,869	+300,631 +46.5%	947,500	+482,894 +51.0%	1,430,394	+568,922 +39.8%	1,999,316	+661,684 +33.1%	2,661,000
Harris County	528,961	+277,740 +52.5%	806,701	+436,457 +54.1%	1,243,158	+498,754 +40.1%	1,741,912	+562,088 +32.3%	2,304,000
City of Houston	384,514	+211,649 +55.0%	596,163	+342,056 +57.4%	938,219	+294,583 +31.4%	1,232,802	+390,198 +31.7%	1,623,000

Source:

- (a) Bureau of Census, U.S. Department of Commerce Publications.
- (b) Houston Chamber of Commerce

commodities are agricultural products, petroleum equipment, and chemicals. Also serving the international market, air passenger and freight service is provided through two large airport terminals in the Houston area. The national business market is served well through a variety of transport modes. Low-cost barge transportation is available via the Intracoastal Waterway which connects Houston to the midcontinent regions of the Mississippi River and its tributary systems. Rail and motor freight operations are provided by six major railroad companies and a large number of common-carrier, specialty-carrier, and local-delivery trucking firms. Houston is also a major center of oil and gas transmission for pipeline companies which operate 13 crude oil and products pipelines and 21 gas pipelines which serve almost every section of the nation.

The favorable industrial, transportation, and energy environment of the Houston-Gulf Coast area has led to an increasingly diversified economic structure during the past 20 years. During the 1960's, Houston's growth as a corporate center expanded tremendously. Since 1970, over 200 major companies have moved their headquarters, divisions, or subsidiaries to Houston making the city an important center of international economic activity.

The substantial business activity and population growth and the subsequent growth of Houston as a marketing center has generated increasing amounts of traffic and has made greater demands on the street and highway system to provide adequate access to developed and developing urban areas. The improvement of Gessner Road was accomplished to meet the traffic needs of area residents and business people.

The study area, as shown in Figure 1, is situated about 15 miles (24.14 kilometers) from Houston's central business district (CBD) and is very near to IH 10, the closest freeway and major traffic carrier. As will be illustrated later in the report, the study area is located in a section of the city which is described primarily as low density residential.

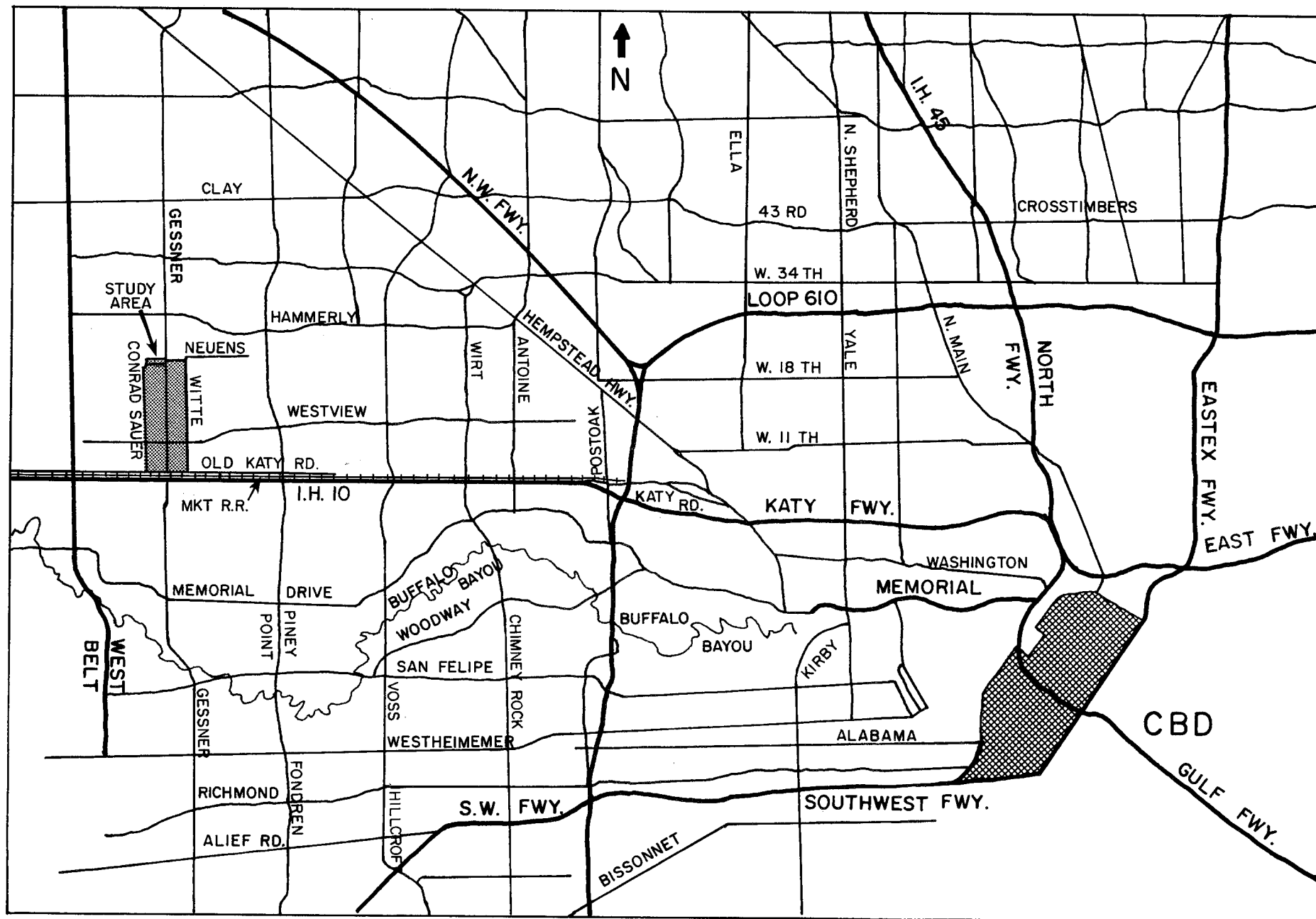


Figure 1. Map of the Northwest Houston Area Showing the Location of the Gessner Road Study Area

Key Characteristics of Street Improvement

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

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

These factors were determined for the period of time prior to the beginning of the street improvement project. 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 Gessner Road area was 60 percent improved in 1962 and 78 percent improved in 1968, the stage of development before the improvement began was "developing."¹ The primary type of improvement was single-family residential although almost all of it was on nonabutting land. Commercial and industrial improvements were predominant on abutting land. The improvement took place on a two-lane, city maintained road that was within the urban fringe areas of Houston.

¹The percentage of total land area already improved with buildings, parks, roads, and streets is used to determine which stage of development the study area falls within. the three stages of development defined in this manner are: Undeveloped - 0 to 10% improved, developing - 10% to 80% improved, and developed - 80% to 100% improved.

Sources of Data

The major source of information about plans for the widening of Gessner Road was the Houston City Planning Department, while construction and street design data were collected from the Houston Public Works Department, Paving Division.

Land use data were available through several sources, but the most applicable information was provided by the City Planning Department (CPD). Other sources of valuable land use data were the District Office of the State Department of Highways and Public Transportation (SDHPT), Harris County Agricultural Stabilization and Conservation Service Office, and Houston-Galveston Regional Transportation Study (H-GRTS). Most of the land use data were collected from colored (Lambert) maps, aerial photographs, and on-site inspections of the area. Background land use information was collected from city directories of Houston, from Sanborn (fire insurance) maps, from subdivision platting records maintained by Harris County, and from personal interviews with real estate developers and brokers, city planners and officials, and property owners and area residents. Information about city-wide and regional land use plans was obtained from (CPD) reports and H-GRTS publications.

Traffic volume data were provided by the Houston Traffic and Transportation Department for city streets and relevant state and federal highways. H-GRTS was also a source of traffic volume information. The Houston Chamber of Commerce provided historical U.S. census and population projections along with housing information for Houston and its metropolitan area. Socio-economic data were collected from U.S. Bureau of the Census publications found in the City of Houston's Public Library.

Definitions

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

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

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

Commercial - tract improved with a commercial business.

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

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

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

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

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

Time periods used in the analysis are as follows:

Before Period - the period from 1962 to 1968 which ends the year before formal planning and construction began.

Short-Run After Period - the period which includes changes that occurred since the end of 1968 through 1972. This period includes the construction years, 1970 and 1971.

Long-Run After Period - the period which includes changes that occurred since the end of 1972 through 1978.

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

Gessner Road

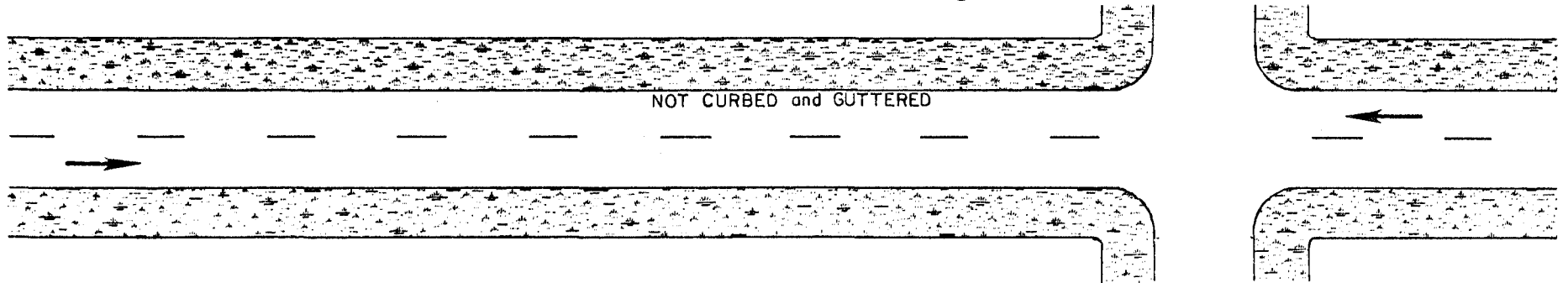
Gessner Road is a major north-south arterial and extends approximately from West Bellfort Street to U.S. Highway 290. Gessner, which was first listed in the Houston Major Thoroughfare Plan in 1956, has been extended several times with further extensions presently underway. As shown in Figure 1, the section that this study focuses upon is from Neuens Road to Old Katy Road which borders Katy Freeway (also called U.S. Highway 90 and Interstate Highway 10).

The improvement changed this section from two 10-foot (3.05 meters) lanes that were undivided with an open ditch to six 11-foot (3.35 meters) lanes with a raised median and curbs and gutters (Figure 2). Although Gessner Road was scheduled to be widened in the future in the 1957 Major Thoroughfare Plan, no formal action on this particular project was taken until 1969. The project was funded under the 1969 Capital Improvement Program, and the initiation order that gave approval to begin formal action was issued in June 1969. Public hearings were held in January through April 1970. The work order was issued in May 1970, and the project was accepted by the city as completed in June 1971.

Traffic counts for Gessner Road indicate higher volumes in recent years near Old Katy Road than at points further north (Table 2). The count just north of Old Katy Road was 40,062 in 1977. This was a 162 percent increase from the count of 15,314 in 1967, which was two years before improvement began, and a 79 percent increase from the count of 22,380 in 1970, the year construction was completed.

Although recent traffic counts for Gessner Road just north of Long Point are less than those near Old Katy Road, they have increased greatly. The count on Gessner Road increased over tenfold from the 1960 count of 2,986 to the 1976

Before Period Design



After Period Design

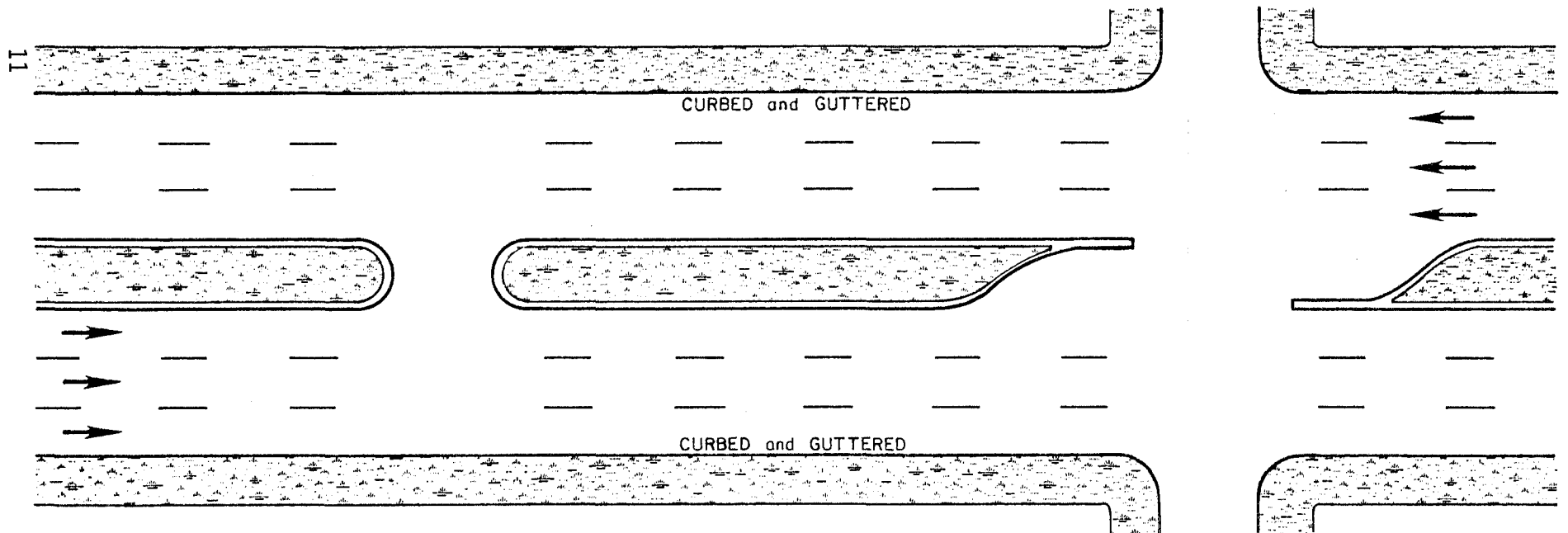


Figure 2. Design of Gessner Road Before and After Improvement

Table 2. Twenty-Four Hour Traffic Counts on Gessner Drive and Major Intersecting and Parallel Streets.

Location of Traffic Count	1959	1960	1961	1962	1963	1964	1965	1966	1967	1969	1970	1971	1972	1973	1974	1975	1976	1977
STUDY ROUTE																		
Gessner Road																		
North of Katy Freeway	1,537		2,006				4,721		15,314			22,380		30,227		35,075		40,062
North of Long Point Road		2,986	2,847		6,155		7,943		9,518		16,463	20,947		28,707		30,868	32,171	
North of Hammerly Drive														19,359	14,200	23,303		18,907
South of Hammerly Drive														21,003				
INTERSECTING STREETS																		
Long Point Road																		
At Gessner Road					3,635		4,639		5,738		6,928			13,893		13,342		
At Conrad Sauer Road														9,302		6,850		7,254
At Witte Road																10,352		9,667
Hammerly Road																		
East of Gessner														10,701		11,797	13,429	18,326
Katy Freeway																		
At Witte Road																		137,870
At Wilcrest																		95,863
At Bunker Hill	11,691		12,720	15,952	19,447	27,167	27,826	37,430										
At Wirt Road	19,651			22,496		38,691	40,128	46,009					91,009					
West of West Belt									11,000	12,000	13,500	14,750	16,500	22,000				
PARALLEL STREETS																		
Witte Road																		
At Katy Freeway				4,600											16,961			
At Long Point Road	3,402				4,197	4,685		5,041								6,765		
At Warwana														4,208		5,135		5,400
West Belt																		
At Katy Freeway																		20,868
At Kimberly															24,949	22,929		

count of 32,171. Counts for a point on Gessner just north of Hammerly, which is outside of the study area, have fluctuated since 1973 but have averaged around 19,000 cars per day for the four counts available.

Intersecting Streets

Long Point Road, which intersects Gessner approximately in the middle of the study area (Figure 1), had increasing traffic volumes at a point near Gessner from the count of 3,635 in 1963, to the count of 13,893 in 1973. However, in 1975 the count decreased by 551 to 13,342. A location on Long Point at Conrad Sauer Drive has also experienced reductions in volume. The count was 9,032 in 1973, 6,850 in 1975, and 7,254 in 1977. The probable cause for the reductions in traffic volume on Long Point is the completion and improvement of other roads in the general area that also run east and west, most notably Westview (which passes through the Study Area) and Hammerly Boulevard (which is to the north of the study Area). Hammerly's traffic counts at a point east of Gessner have increased from 10,701 in 1973 to 18,326 in 1977.

Katy Freeway (IH 10 and U.S. 90), separated from the study area by Old Katy Road and a railroad track, is the major traffic carrier in the vicinity of the study area. Although no traffic counts were available for Katy Freeway at Gessner Drive, other counts give an indication of the volumes carried by this facility. Katy Freeway at Witte Road, which is on the eastern border of the study area, had a 1977 count of 137,870 vehicles for a twenty-four hour period. The only other 1977 count available was 95,863 recorded for Katy Freeway at Wilcrest which is approximately one and one-half miles west of the study area. A point on Katy Freeway at Wirt Road illustrates the rapid growth in traffic

from 1959 to 1966 when the count increased from 19,651 to 46,009. The number for that point had almost doubled by 1972 when 91,009 vehicles were counted.

Parallel Roads

Witte Road runs parallel to Gessner Road on the eastern side of the study area (Figure 1). A recent traffic count near Katy Freeway was much higher than counts further north, as was the case on Gessner Road. A 1974 count for Witte Road near Katy Freeway was 16,901, whereas a 1975 count near Long Point Road was 6,765, and a 1975 count at Warwana was 5,135.

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

Size and Boundaries of the Study Area

The Gessner Road Study Area encompasses approximately 489.29 acres (198.01 hectares). An area on each side of the road was chosen to include a minimum of three blocks of land on each side of Gessner Road, thus including both abutting and nonabutting land in the area delineated for land use change analysis. The western side of the area extends approximately 1,350 feet (411.48 meters) to Conrad Sauer Drive. The eastern side extends approximately 1,350 feet (411.48 meters) to Witte Road. Neuens Road to the north and Old Katy Road to the south form the other boundaries.

Land Use Characteristics

As indicated in the land use maps in Figures 3 and 4, the majority of the total study area land was developed in the "before" years of 1962 and 1968, although several large tracts of undeveloped land remained. Sixty percent of the total area was developed in 1962, and 78 percent was developed in 1968. The type of development (except for streets) with most acreage on abutting property was industrial in 1962 and commercial in 1968. Single family residential was the predominant type of development on nonabutting land in both "before" years.

Although changes occurred, 93 percent of the total area was developed in both of the "after" years, 1972 and 1978. The area was then in the "developed" classification. As Figures 5 and 6 demonstrate, commercial development was predominant on abutting land in 1972 and 1978. Single family residential development remained predominant on nonabutting property in both of the "after"

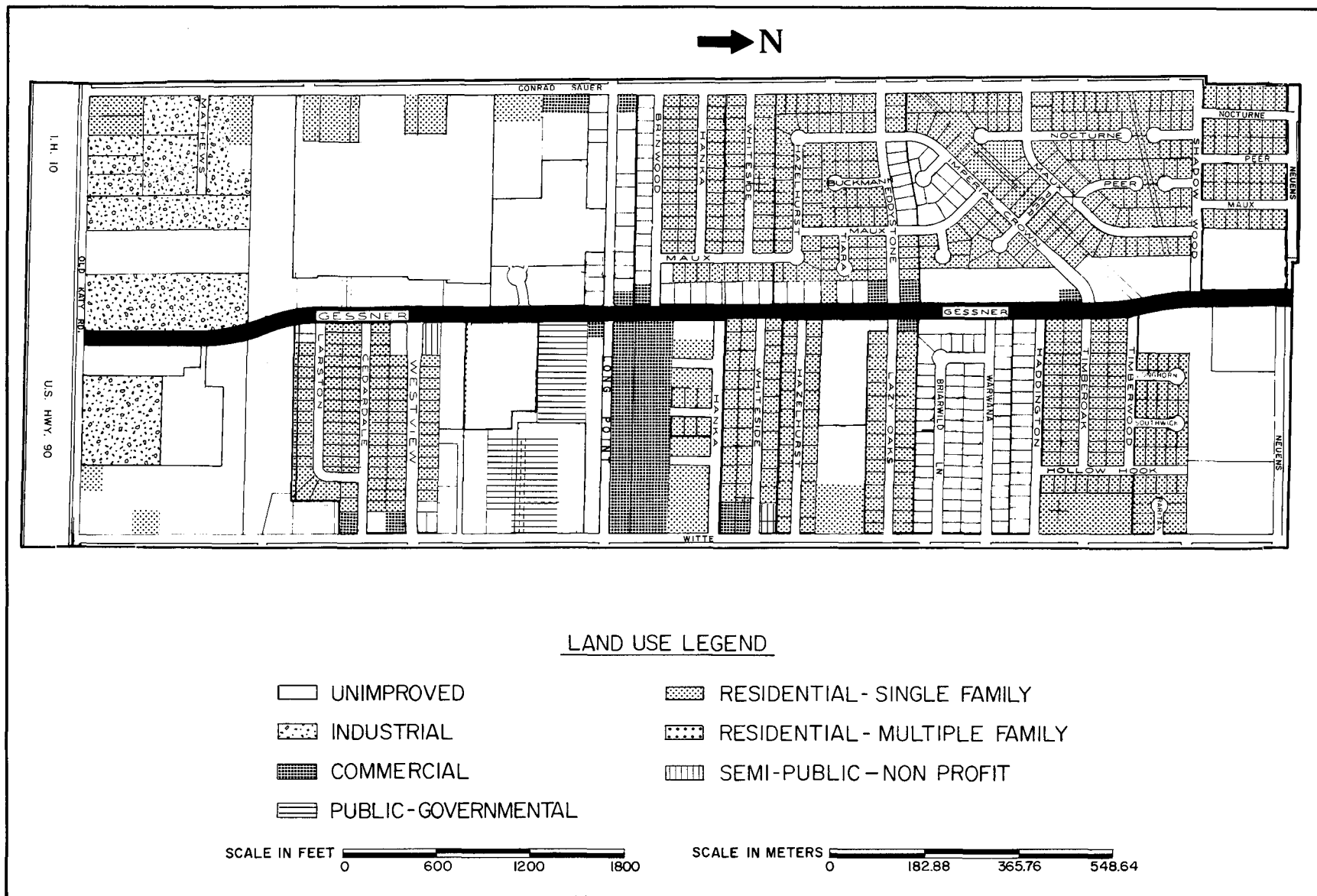


Figure 3. Land Use in the Gessner Road Study Area in 1962

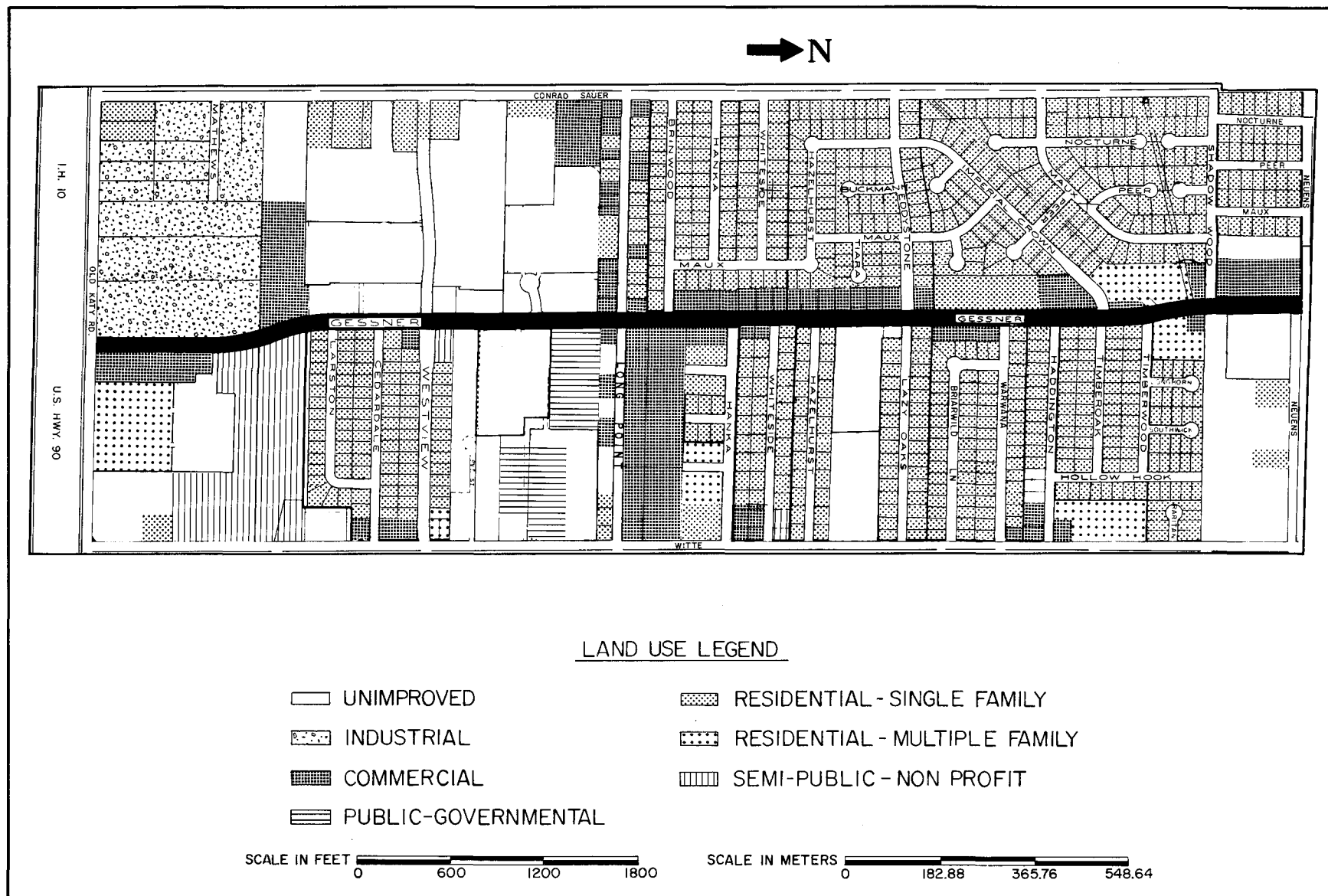


Figure 4. Land Use in the Gessner Road Study Area in 1968

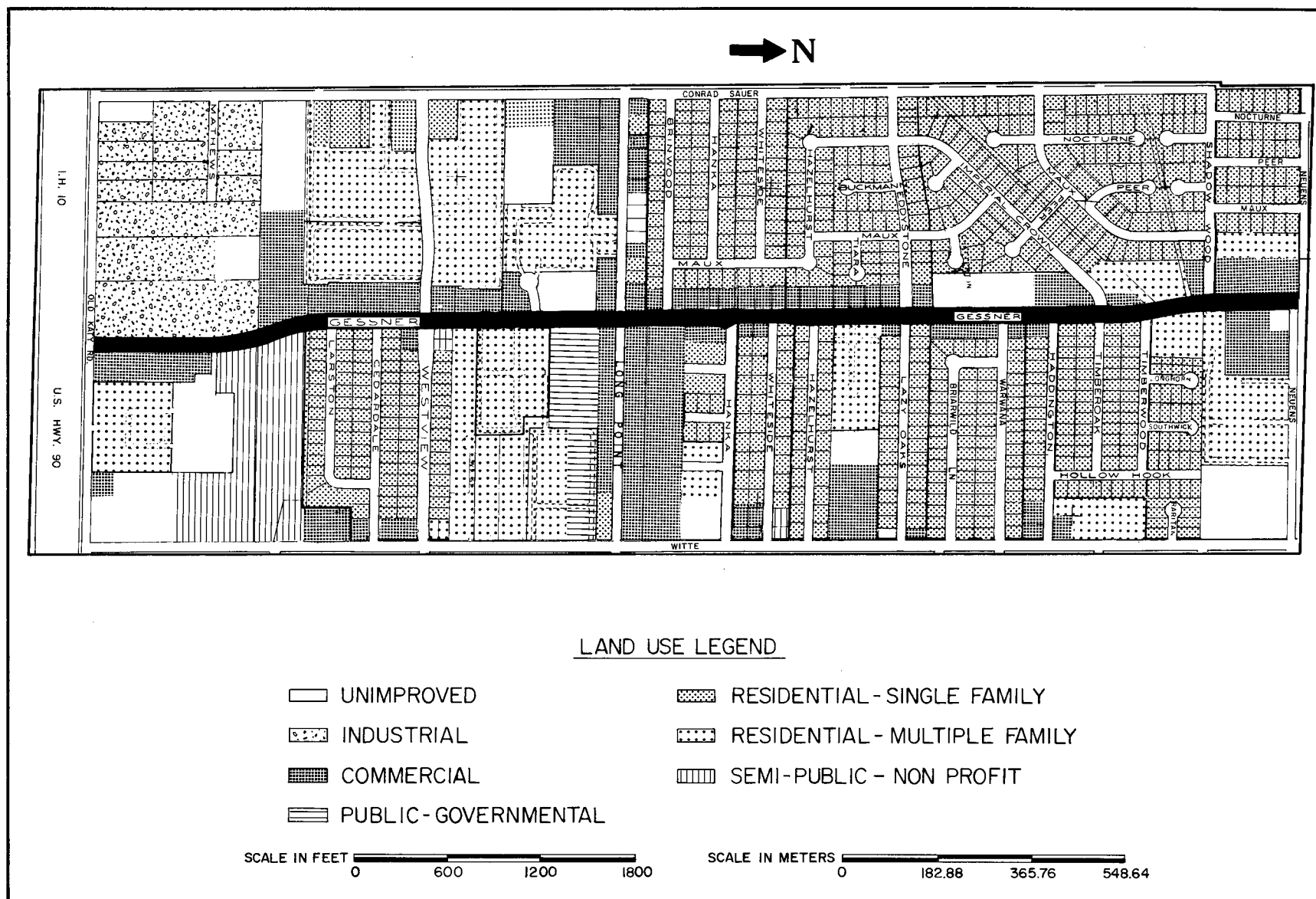


Figure 5. Land Use in the Gessner Road Study Area in 1972

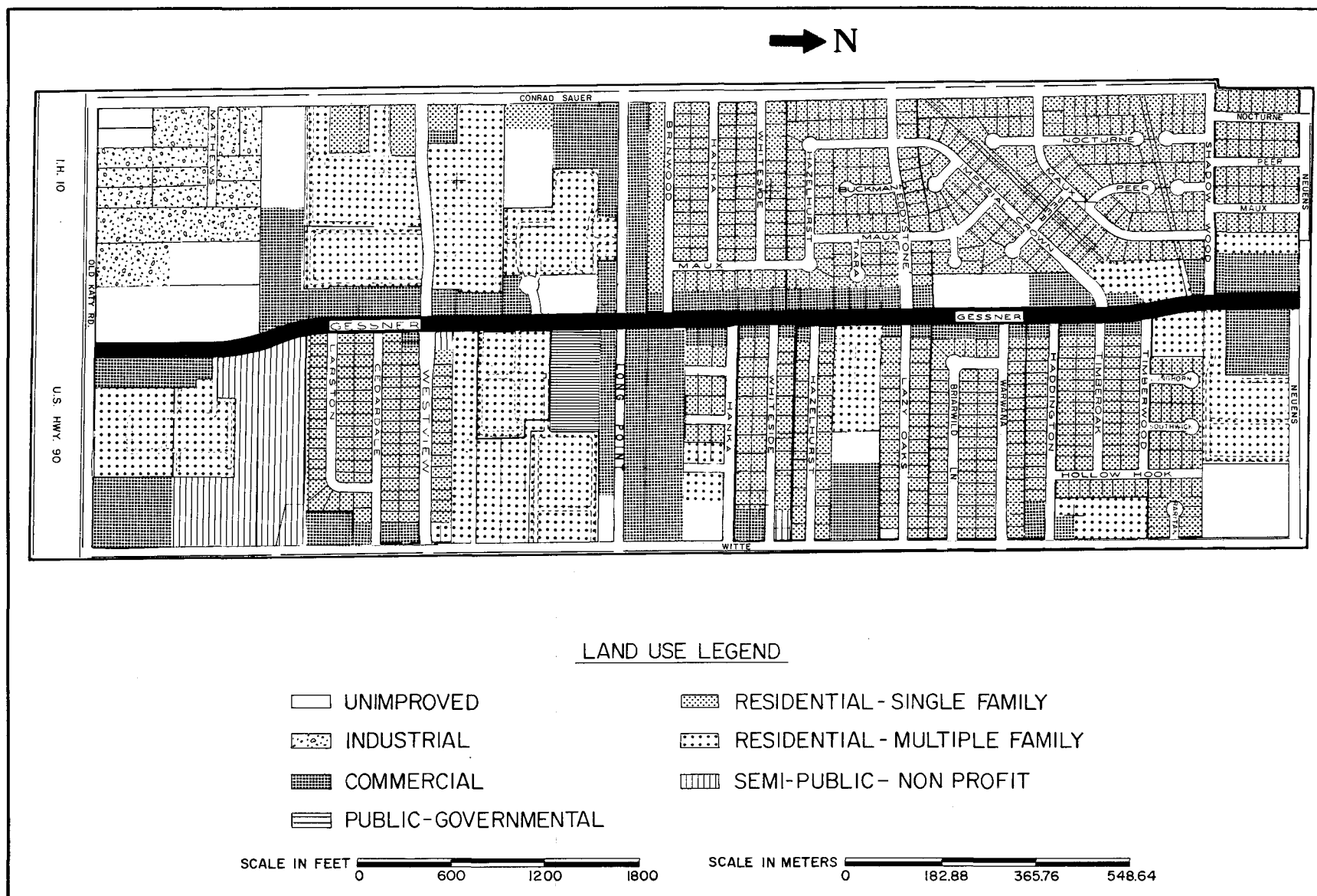


Figure 6. Land Use in the Gessner Road Study Area in 1978

years, although multiple family residential development increased greatly during this time.

Land Use Changes

As stated previously, the Gessner Road Study Area has changed from being 60 percent developed in 1962 to 93 percent developed in 1978. The changes that have occurred are discussed first in terms of the total study area and then in terms of proximity to Gessner Road.

Overall Study Area

The area has remained a primarily residential one (Table 3). However, commercial development has increased, particularly on the abutting property; and the type of residential development has changed from being totally single family to being a combination of single and multiple family. Publicly owned acreage increased while both semi-public and industrial acreages decreased slightly over the 16 year study period. The single family residences are concentrated mainly in the northern half of the study area with all industrial, all public, and much of the commercial developments being located in the southern half of the area nearer to Katy Freeway. Total unimproved land decreased greatly during the study period leaving only seven percent of the total acreage not developed in 1978.

Proximity to Gessner Road

Tracts of land were classified according to their location relative to Gessner Road. Tracts with frontage on Gessner Road were classified as abutting with whole abutting tracts being included to avoid division of a development. For example, an apartment complex with frontage on Gessner Road might extend

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			
	1962		1968		1972		1978
Commercial	16.48		42.39		58.73		67.57
Absolute Change		25.91		16.34		8.84	
Percent Change		157%		39%		15%	
Residential-Single Family	146.07		167.39		160.44		157.02
Absolute Change		21.32		-6.95		-3.42	
Percent Change		15%		-4%		-2%	
Residential-Multiple Family	0		18.05		88.20		95.54
Absolute Change		18.05		70.15		7.34	
Percent Change		-		389%		8%	
Public	0.65		19.44		19.44		19.44
Absolute Change		18.79		0		0	
Percent Change		2891%		0		0	
Semi-Public	11.62		11.62		7.72		4.65
Absolute Change		0		-3.90		-3.07	
Percent Change		0		-34%		-40%	
Industrial	30.41		30.67		28.67		18.85
Absolute Change		0.26		-2.00		-9.82	
Percent Change		0.8%		-6%		-34%	
Streets	90.41		90.41		92.80		92.80
Absolute Change		0		2.39		0	
Percent Change		0		3%		0	
Unimproved	193.65		109.32		33.29		33.42
Absolute Change		-84.33		-76.03		0.13	
Percent Change		-44%		-70%		0.4%	

^aTotal Acreage equals 489.29 acres (198.01 hectares).

^bOne acre equals .4046856 hectares.

back several hundred feet from the road but would be all included as abutting since it was a single development. For the undeveloped portions of the area, a section 300 feet (91.44 meters) back from the right-of-way was considered abutting property. All other land was classified as nonabutting.

The division of the properties into these two categories permitted a comparative analysis to be done in an effort to determine the influence of the road improvement on land use changes. Although the improved facility could have influenced land use changes on nonabutting properties, it could be expected that abutting properties would have been most affected. Examining the two groups separately will determine which underwent the most change.

Abutting Properties. In the first "before" year, 1962, over 63 percent of the 109.17 abutting acres was still unimproved. Except for streets and roads, industrial use was the main type of improvement. There were small amounts of commercial, single family residential, public, and semi-public developments on abutting land at that time (Table 4).

The "before" period, 1962 to 1968, was a rapid growth time for the abutting land with unimproved land being reduced by 61 percent. Commercial and public acreages increased most during this time, both increasing by almost 19 acres (7.69 hectares). Multiple family residential development appeared for the first time and single family residential development increased slightly.

The years from 1968 to 1972, which are called the short-run after period, experienced increases in multiple family residential and commercial acreages but a slight decrease in single family residential acreage. Streets increased by 0.32 acres (0.13 hectares) and unimproved land decreased by 77 percent to only 6.15 acres (2.49 hectares).

In the long-run after period, 1972 to 1978, commercial acreage increased slightly and single family residential acreage had a small decrease. Due to a

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		
	1962		1968		1972	1978
Commercial	3.62		22.46		29.72	31.85
Absolute Change		18.84		7.26	2.13	
Percent Change		520%		32%	7%	
Residential-Single Family	2.26		2.71		2.26	0.78
Absolute Change		0.45		0.45	-1.48	
Percent Change		20%		-17%	-65%	
Residential-Multiple Family	0		4.59		18.15	18.15
Absolute Change		4.59		13.56	0	
Percent Change		-		295%	0	
Public	0.26		19.05		19.05	19.05
Absolute Change		18.79		0	0	
Percent Change		7227%		0	0	
Semi-Public	4.65		4.65		4.65	4.65
Absolute Change		0		0	0	
Percent Change		0		0	0	
Industrial	7.75		7.75		7.75	0
Absolute Change		0		0	-7.75	
Percent Change		0		0	-100%	
Streets	21.12		21.12		21.44	21.44
Absolute Change		0		0.32	0	
Percent Change		0		2%	0	
Unimproved	69.51		26.84		6.15	13.25
Absolute Change		-42.67		-20.69	7.10	
Percent Change		-61%		-77%	115%	

^aTotal Acreage equals 109.17 acres (43.93 hectares).

^bOne acre equals .4046856 hectares.

change from industrial use to unimproved acreage, there was no longer any industrial use on abutting land, and unimproved acreage increased to 13.25 acres (5.36 hectares). Changes in abutting acreages by type of land use are charted in Figure 7.

Nonabutting Properties. In 1962, 67 percent of nonabutting land was improved, including streets and roads. Thirty-eight percent of nonabutting land was in single family residential development. Industrial, commercial, and semi-public improvements comprised the remainder of nonabutting development (Table 5).

In the "before" period, 1962 to 1968, increases occurred in commercial, single family residential, and industrial developments. Multiple family residential development occurred for the first time on nonabutting land. Unimproved land decreased by 34 percent.

As Table 5 indicates, more change on nonabutting land occurred in the next period, the short-run "after" period, than at any other time. The years 1968 to 1972 had increases in commercial, multiple family, and street developments. Single family residential and industrial acreages decreased. The most prominent of these changes was the large increase (420 percent) in acres of multiple family developments. Unimproved nonabutting land decreased by 67 percent in this period.

The final period, 1972 to 1978, had continued growth in commercial and multiple family acreages, although not as much as in the previous period. Single family residential and industrial acreages both decreased again. Unimproved acreage decreased by 26 percent. Changes in nonabutting acreages by type of land use are charted in Figure 8.

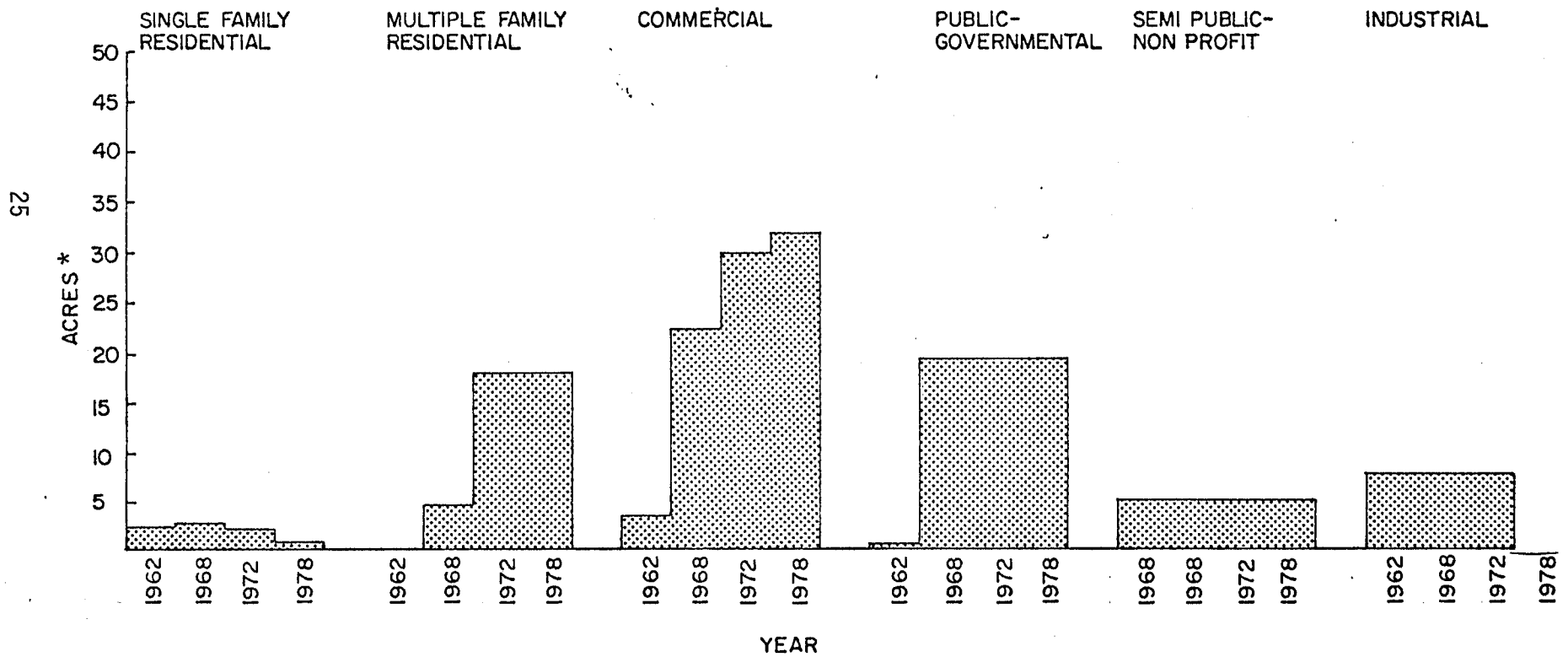


Figure 7. Changes in Abutting Land Uses in the Gessner Road Study Area.

*One acre equals .4046856 hectares

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

Land Use and Type of Change	Total Acres by Time Period and Year ^b						
	Before			After			
	1962		1968		1972		1978
Commercial	12.86		19.93		29.01		35.72
Absolute Change		7.07		9.08		6.71	
Percent Change		55%		46%		23%	
Residential-Single Family	143.81		164.68		158.18		156.24
Absolute Change		20.87		-6.50		-1.94	
Percent Change		15%		-4%		-1%	
Residential-Multiple Family	0		13.46		70.05		77.39
Absolute Change		13.46		56.59		7.34	
Percent Change		-		420%		10%	
Public	0.39		0.39		0.39		0.39
Absolute Change		0		0		0	
Percent Change		0		0		0	
Semi-Public	6.97		6.97		3.07		0
Absolute Change		0		-3.90		-3.07	
Percent Change		0		-56%		-100%	
Industrial	22.66		22.92		20.92		18.85
Absolute Change		0.26		-2.00		-2.07	
Percent Change		1%		-9%		-10%	
Streets	69.29		69.29		71.36		71.36
Absolute Change		0		2.07		0	
Percent Change		0		3%		0	
Unimproved	124.14		82.48		27.14		20.17
Absolute Change		-41.66		-55.34		-6.97	
Percent Change		-34%		-67%		-26%	

^aTotal Acreage equals 380.12 acres (153.83 hectares).

^bOne acre equals .4046856 hectares.

Land Use Impediments

In the Gessner area as in every area, there are reasons for the lack of development or delay of development on certain tracts. In the Gessner Area, one large tract abutting Gessner Road has remained unimproved. This tract, located between Imperial Crown Street and Eddystone Drive on the west side of Gessner, is being held off the market presumably for a higher price.

Other large sections of land that were unimproved early in the study period and now are multiple family tracts, did not have good access for such development until sometime after 1968 when Westview Road was extended on the western side of Gessner. There are now large multiple family units on each side of Westview.

Other Factors Influencing Change

A large regional shopping center located outside of the study area and south of Katy Freeway on Gessner Road probably drew other commercial developments to the general area and to the study area. Rather than locate elsewhere, they took advantage of the traffic attracted to the area by this facility. The section of Gessner Road on the side of the shopping center was also improved at approximately the same time as the section in the study area.

Land Use Controls and Plans

Houston does not have zoning laws and has no legal means of controlling land use. Perhaps the only way the city can control land use is through approving plats that are required for new area developments or redevelopment of certain areas in a manner which does not utilize the lots as previously approved. When approving proposed plats, the city has the authority to impose certain restrictions, e.g., location and number of access points to major thoroughfares,

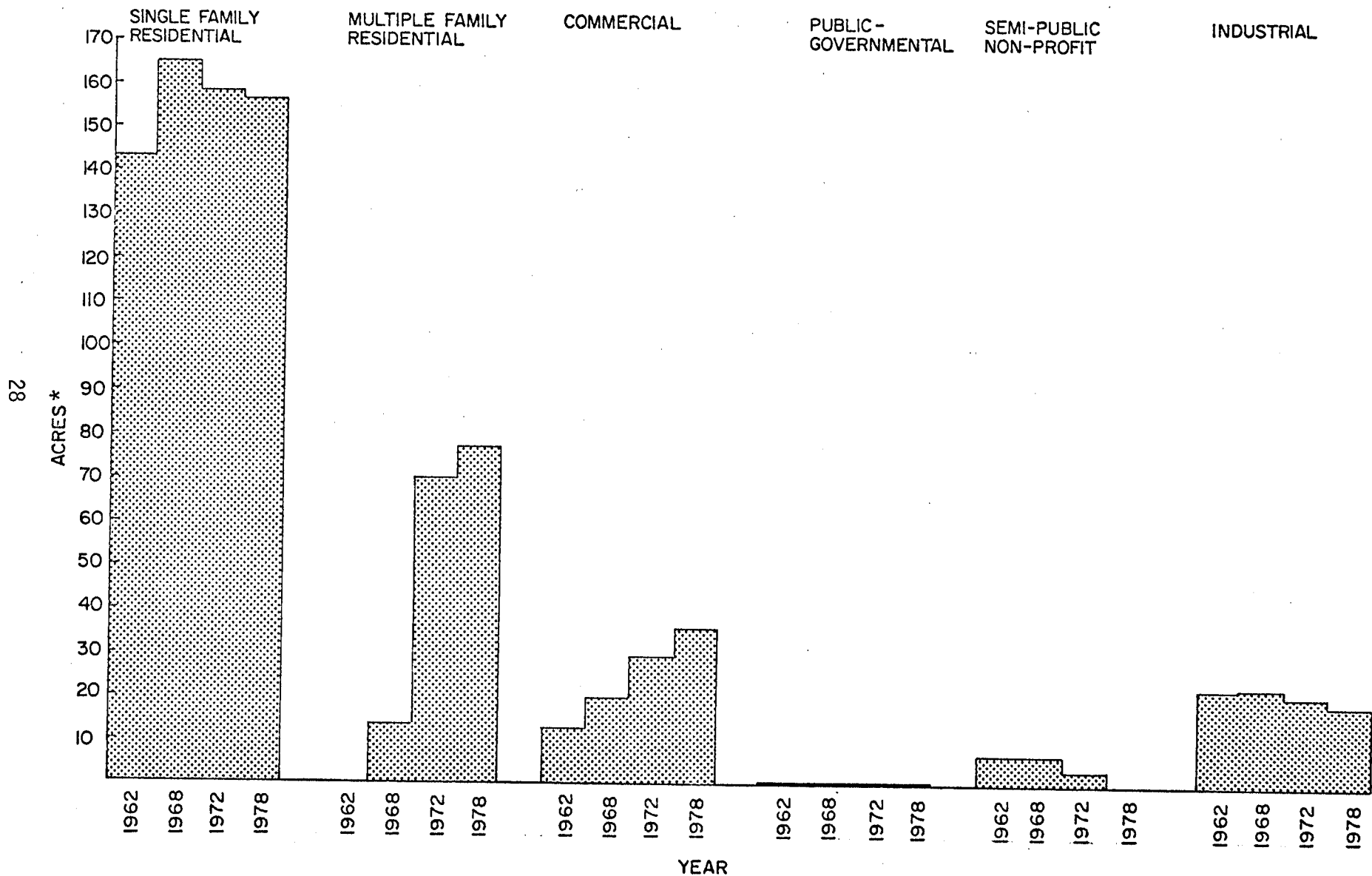


Figure 8. Changes in Nonabutting Land Uses in the Gessner Road Study Area

*One acre equals .4046856 hectares.

type and width of local streets, and the set-back distance of buildings from the street; but the city cannot dictate the type of development. As previously stated, deed restrictions are the only legal method of controlling land use in Houston, and area property owners, not the city, would likely instigate the action to prevent a nonconforming land use.

Although Houston area land use planners have no enforcement power, general or comprehensive land use plans have been formulated that reflect trends in land developments. A projected 1980 land use plan published in 1960 by the Houston Metropolitan Area Transportation Study forecasted that the study area would remain primarily single-family residential with a small amount of industrial use near Katy Freeway. The Houston City Planning Department in the General Study Plan for 1990 done in 1972 (which was after the improvement on Gessner Road), projected the same land uses as the previous plan for the Gessner Road area.

These land use plans are predictions based on existing land use, land development trends, age of existing improvements, and amenities offered for various types of developments. Development in the Gessner Road area has varied somewhat from these plans in that a considerable amount of commercial and multiple family developments have occurred. Perhaps the reason for these discrepancies is that the land use plans are too general to account for block by block differences as done in this study.

Socio-Economic Characteristics

The socio-economic characteristics of an area can have an impact on the use made of the area's land. Selected characteristics were investigated to reveal major differences, if any, between the study area and Houston, as a whole, or all of Harris County. Data from 1960 and 1970 were used to determine changes that occurred.

Census tract data were used to approximate the statistics for the Gessner Road Study Area. The area on the east of Gessner Road fell into Census Tract 91-B in 1960, and Census Tract 444 in 1970. These two census tract numbers represent the same portion of land. The area on the west of Gessner was in Census Tract 91-C in 1960, and Census Tract 447 in 1970. Census Tract 447 encompasses land not included in Census Tract 91-C, which may distort the comparison somewhat. It is not believed to be a major problem, however, since most statistics are reported in medians and percentages, and the additional population added by the increased amount of land in the census tract in 1970 is believed to be homogeneous with the population from the original area in the 1960 census tract. The statistics should be very similar if not identical to the ones that would have been reported without the additional population.

As shown in Table 6, the median school years completed and the percent of high school graduates were higher in both census tracts for both 1960 and 1970, than in Houston or Harris County, as wholes. Census Tract 91-C (447) had a more educated population than Census Tract 91-B (444) in both years.

Median family income was also higher in the two census tracts than in the city or county. In 1960, Census Tract 91-B had a median family income of \$8,599 as compared to \$5,902 for Houston and \$6,040 for Harris County. Median family income for Census Tract 92-C was even higher, \$9,411, than in the other census tract. Median family incomes increased for all areas in 1970, but the differences between the census tracts and the city and county, as wholes, became greater. Median family incomes were \$13,572 and \$15,100 for Census Tracts 444 and 447, respectively, while Houston reported \$9,876 and Harris County reported \$10,348.

Table 6. Comparison of 1960 and 1970 Socio-Economic Characteristics of Applicable Census Tracts to Houston and Harris County

	Harris County		Houston		Census Tract 91-B (444) ^a		Census Tract 91-C (447) ^{ab}	
	1960	1970	1960	1970	1960	1970	1960	1970
<u>Population</u>	1,243,158	1,741,912	938,219	1,232,793	7,669	18,175	4,093	10,181
Median School Years Completed	11.3	12.1	11.3	12.1	12.7	12.9	13.2	13.3
Percent High School Graduates	45.2	56.3	51.8	57.9				
Median Family Income	\$6,040	\$10,348	\$5,902	\$9,876	\$8,599	\$13,572	\$9,411	\$15,110
Median Income of Families and Unrelated Individuals	\$5,310	\$8,742	\$5,093	\$8,055	\$8,379	\$12,991	\$9,320	\$14,701
Median Value of Owner Occupied Residences	\$10,700	\$14,800	\$10,900	\$14,400	\$15,900	\$24,300	\$18,300	\$26,200
Median Rent Paid by Tenants	\$68	\$98	\$67	\$96	-	\$119	-	-
<u>Occupation</u>								
Total Employed ^c	470,452	711,749	363,636	515,619	2,730	7,266	1,386	4,051
Percent Professional, Technical, and Kindred Workers	12.54	16.88	12.49	16.53	23.99	26.80	29.87	30.63
Percent Managers and Administrators, Except Farm	9.99	8.87	9.97	8.78	14.87	14.37	19.41	16.79
Percent Sales Workers	7.83	8.71	8.08	8.97	16.67	13.94	17.82	15.43
Percent Clerical and Kindred Workers	15.98	19.54	16.56	20.09	16.92	23.08	16.38	19.28
Percent Craftsmen, Foremen, and Kindred Workers	13.85	14.57	12.72	13.10	12.05	9.51	8.23	6.17
Percent Operatives	14.43	13.67	13.79	13.53	6.08	5.34	1.88	3.66
Percent Laborers	5.85	5.26	5.74	5.43	1.76	1.81	0.29	2.00
Percent Service Workers	8.98	10.47	9.44	11.14	3.63	4.82	2.96	5.55
Percent Private Household Workers	3.76	2.03	4.21	2.09	1.25	0.33	1.15	0.49

^aCensus tract numbers changed from 1960 to 1970. Census Tracts 91-B and 444 are identical. Census Tract 447 is slightly larger than Census Tract 91-C.

^bPopulation and total employed may be inflated for Census Tract 447 due to the larger area that is included.

^cTotal employed was all workers over 14 years of age in 1960 and all workers over 16 years of age in 1970. This may have inflated the 1960 count.

A large discrepancy also existed between the median value of owner occupied residences in the two census tracts and in the city and county, as wholes. The census tracts reported higher values with Census Tract 91-C (447) having the most expensive median home in both years. Once again, the time span between 1960 and 1970 increased the differences between the statistics for the census tracts as compared to Houston and Harris County.

Both census tracts had more professional workers than did Houston or Harris County. Census Tract 91-B (444) had 23.99 percent professionals in 1960 as compared to 12.54 percent for Harris County and 12.49 percent for Houston. Census Tract 99-C (447) had 29.87 percent professionals in that year. The census tracts continued to lead in 1970 with 26.80 percent in Census Tract 91-B and 30.63 percent in Census Tract 91-C. This compared to 16.88 percent in Harris County and 16.53 percent in Houston.

The percentages of managers and sales workers were also higher in the census tracts than in the city or county. Percentage of clerical workers was higher in Census Tract 91-B (444) than the other two areas of comparison but lower in Census Tract 91-C (447) than in Houston. There were smaller percentages of workers in the remaining less prestigious categories in the census tracts than in Houston and Harris County for both years.

The above statistics describe an area that has more affluence and socioeconomic well-being than the city of Houston or Harris County as wholes. The census tracts, and thus the study area, have a population that is more educated, has higher incomes, and has higher percentages of workers in the white collar job classifications. In terms of education and income, the census tracts have made greater gains between 1960 and 1970, than the two larger areas of comparison in total.

IMPACT OF HIGHWAY IMPROVEMENT ON LAND USE IN THE STUDY AREA

To examine the impact on land use of the Gessner Road improvement, two types of data are used. These types are: (1) land use changes in the area, and (2) opinions of people knowledgeable about the area.

Effects on Abutting and Nonabutting Land

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

Abutting Property. As demonstrated in Table 7, the majority of land use change on abutting property occurred in the period before the road improvement began. Those changes were in the forms of unimproved land becoming commercial or public, and to a lesser degree, due to unimproved land becoming multiple family. Small changes from one improved use to another occurred in the before period when small amounts of single family use changed to commercial use and vice versa.

In the short-run after period, changes from unimproved to multiple family use were most prominent. Although the percentage of total land changing use was

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

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1962-1968		1968-1972		1972-1978		1968-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Unimproved	0	2.40	0	3.45	0	0.52	0	3.97
Single Family to Multiple Family	0	4.94	0	2.53	0	3.07	0	5.60
Single Family to Commercial	0.52	0.39	0.45	0.65	1.48	1.42	1.93	2.07
Single Family to Industrial	0	0.77	0	0	0	0	0	0
Commercial to Single Family	0.26	0	0	0.13	0	0	0	0.13
Industrial to Unimproved	0	0	0	2.00	7.75	2.07	7.15	4.07
Industrial to Multiple Family	0	8.13	0	0	0	0	0	0
Semi-Public to Multiple Family	0	0	0	6.97	0	0	0	6.97
Unimproved to Streets	0	0	0	2.07	0	0	0	2.07
Unimproved to Public	18.79	0	0	0	0	0	0	0
Unimproved to Semi-Public	0	0	0	3.07	0	0	0	3.07
Unimproved to Single Family	0.71	29.37	0	0.77	0	0	0	0.77
Unimproved to Multiple Family	4.59	0.39	13.56	47.09	0	4.27	13.56	51.36
Unimproved to Commercial	18.97	6.68	6.81	8.56	0.65	5.29	7.46	13.58
Unimproved to Industrial	0	7.62	0	0	0	0	0	0
Total Land Changing Use	43.84	60.69	20.82	77.29	9.88	16.64	30.70	93.93
Improved Land	0.78	16.63	0.45	15.73	9.23	7.08	9.68	22.81
Unimproved Land	6.57	1.93	4.66	4.05	0.10	0.42	1.93	1.87

^aOne acre equals .4046856 hectares.

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

Type of Land Use Change	Before Period		Short-Run After Period		Long-Run After Period		Total After Period	
	1962-1968		1968-1972		1972-1978		1968-1978	
	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting	Abutting	Nonabutting
Single Family to Unimproved	0	0.11	0	0.23	0	0.02	0	0.10
Single Family to Multiple Family	0	0.22	0	0.17	0	0.13	0	0.15
Single Family to Commercial	0.08	0.02	0.10	0.04	0.23	0.16	0.18	0.05
Single Family to Industrial	0	0.03	0	0	0	0	0	0
Commercial to Single Family	0.04	0	0	0.01	0	0	0	0.01
Industrial to Unimproved	0	0	0	0.13	1.18	0.09	0.71	0
Industrial to Multiple Family	0	0.36	0	0	0	0	0	0
Semi-Public to Multiple Family	0	0	0	0.46	0	0	0	0.18
Unimproved to Streets	0	0	0	0.14	0	0	0	0.05
Unimproved to Public	2.87	0	0	0.20	0	0	0	0
Unimproved to Semi-Public	0	0	0	0.20	0	0	0	0.08
Unimproved to Single Family	0.11	1.29	0	0.05	0	0	0	0.02
Unimproved to Multiple Family	0.70	0.02	3.11	3.10	0	0.19	1.24	1.35
Unimproved to Commercial	2.90	0.29	1.56	0.56	0.10	0.23	0.68	0.36
Unimproved to Industrial	0	0.33	0	0	0	0	0	0
Total Land Changing Use	6.69	2.66	4.76	5.08	1.51	0.73	2.81	2.47
Improved Land	0.12	0.73	0.10	1.03	1.41	0.31	0.89	0.60
Unimproved Land	6.57	1.93	4.66	4.05	0.10	0.42	1.93	1.87

^aDerived from the absolute acreages in Table 7. For example, the individual acreages changing use during the before period are divided by the total abutting or nonabutting acreage to obtain the corresponding percentages for that period. This procedure is repeated for each period.

less than in the before period, the average annual percentage of land that changed from unimproved to multiple family more than tripled between these periods even though the amount of unimproved land available for improvement was greatly reduced in the short-run after period. The Gessner Road improvement may have accelerated these changes to multiple family use.

The long-run after period experienced more change due to improved tracts being converted to other uses than did the before or short-run after periods. The changes were from single family use to commercial and from industrial to unimproved (the tract that changed from industrial to unimproved has undergone commercial construction since the time of data collection). A small amount of unimproved land became commercial.

Nonabutting Property. Most of the nonabutting acreage that was unimproved and changed use, changed from unimproved to either single family or multiple family residential use. As in the case of the abutting acreage, most of the change to multiple family use occurred during the short-run after period, suggesting an even greater Gessner Road improvement influence. However, part of this change may have been due to the improved access given to nonabutting acreage in the after period by the extension of Westview Street on the western side of the study area. Also, Table 8 shows that the average annual percentage change in land use of nonabutting land was about one-third that of abutting land, indicating that the nonabutting land available for development was not being used up nearly as rapidly as was the case with abutting land. The remaining unimproved nonabutting acreage which changed use, changed to commercial, industrial, or street use, mostly in the after period. Table 8 shows that the average annual percentage change from unimproved to commercial use did increase in the after period. The Gessner Road and Westview Street improvements may have influenced some of these land use changes.

Most of the nonabutting acreage that changed from one improved use to another changed to multiple family use, primarily during the before period (Table 7). The remaining previously improved nonabutting acreage that changed use, changed from single family residential to commercial or industrial or vice versa, primarily during the after period (especially during the long-run after period). In the case of the change from single family residential to commercial use, the average annual percentage change increased during the long-run after period over that of the before period, suggesting a possible influence of the Gessner Road and/or Westview Street improvement. However, the annual percentage change in use for this type of land use change did not increase as much for nonabutting land as for abutting land.

The total amount of abutting and nonabutting land changing use from the unimproved and improved categories are shown at the bottom of Table 7. On abutting land, 74.54 acres (30.17 hectares) or 68.3 percent changed use in the 16-year period. The vast majority of the abutting acreage changing use was previously unimproved, regardless of the time period. However, the period of most absolute change was the before period. Also, the average annual percentage change for abutting land was highest in this period and considerably higher than that for nonabutting land (Table 8). In contrast, 154.62 acres (62.57 hectares) or 40.68 percent of the nonabutting land changed use during the 16-year period. Also, as in the case of abutting land, most of the nonabutting acreage changing use was previously unimproved, regardless of the time period. Also, the average annual percentage change was greatest during that period and somewhat higher than that for abutting land (Table 8). Comparing the before period with the total after period, the average annual percentage change in use of previously

unimproved abutting and nonabutting land decreased in the after period, but only slightly for nonabutting land. This is a logical occurrence because of the reduction of land available for development.

Finally, the average annual percentage change in use of previously improved abutting and nonabutting land increased in the total after period over that which occurred in the before period (Table 8). Improved nonabutting land experienced a slight decrease in the rate of change during the total after periods.

From the data presented in Tables 7 and 8, it appears that the Gessner Road improvement had a positive effect on land use changes, especially on previously improved abutting land in the long-run after period.

Influence of Katy Freeway

Katy Freeway (IH 10 and U.S. 290) is separated from the southern boundary of the study area only by the Old Katy Road and a railroad track. Due to the high volume of traffic, this major thoroughfare could possibly influence land use nearby. In an effort to separate out at least part of this influence, all of the properties abutting Old Katy Road were subtracted out and new annual rates of change were calculated for the study area.

The deletions had little effect on the abutting properties. The most apparent result was that the rate of change in the long-run after period was somewhat less for land that was previously in an improved use. The difference between the rates in the long-run after period and the rates in the before period indicated a slightly lesser impact of the Gessner Road improvement on abutting land use in the latter period.

Conversely, separating out these Katy Road properties increased the amount of change from the before period to both the short-run and long-run after

periods on nonabutting property indicating that greater rates of change occurred. This may possibly point out more of the effect of the highway improvement upon nonabutting land use, but as stated previously, the effect on nonabutting land is obscured by the improvement of other streets in the area.

Although it would be impossible to completely separate the influences of Katy Freeway and Gessner Road on land use, separating out the properties nearest Katy Freeway does not alter the analysis greatly or change the conclusions derived from looking at the total study area.

Opinions of Knowledgeable People

Officials from the City Planning Department and from the Public Works Department were interviewed to obtain their opinions about the impact of the improvement of Gessner Road upon land use. The belief was expressed that the road improvement was done because of land development that had already occurred. Traffic counts for Gessner indicated that the facility was becoming inadequate for such volumes generated by the prior development.

The improvement was believed to have been important in the development that occurred afterwards due to the dramatically improved access. Commercial and multiple family developments were those mentioned as having received the greatest influence of the road improvement. It was contended that without the improvement, part of this development would not have been located in the Gessner Area.

Real estate personnel agreed with the belief that commercial and multiple family developments were most enhanced by the road improvement. They also pointed out that the improved road was a factor in the changes from single family residential land use to commercial.

In general, those interviewed believed that the road was improved because of development that had already occurred, but that the new condition and design of the road was an important influence in the use made of the land later. The road was a consideration in the decision to locate in this particular area.

Conclusions

The Gessner Road study area has experienced many land use changes during the study period from 1962 to 1978. The total area has remained primarily residential, although the type of residential use has changed from being 100 percent single family to being only 59 percent single family with the remainder being in multiple family use. Commercial developments, primarily in the forms of strip development along Gessner Road, have increased over 300 percent.

Abutting land was 36 percent improved in 1962, and 75 percent improved in 1968. The change in amount of improved land in this period before the road improvement occurred points out the extent of the transition the abutting land underwent during that time. The rate of change for abutting property was 6.69 percent per year during that period which was the highest rate of change for any period on abutting land. Although the before period development could have been influenced by anticipation of the road improvement, it is concluded that the impact on abutting land during this period was small, if any, because no formal action for this specific project had taken place. Although the overall average annual rate of change on abutting land dropped slightly in the short-run after period, the influence of the street was a factor in commercial and multiple family development on previously unimproved land. Based on personal interviews, it is concluded that these types of development were accelerated by the improved access created by the new road design. The road improvement was also a factor in the decision to change some abutting single family residences to commercial

use. The average annual rate of change for all abutting land in the long-run after period, 1972 to 1978, fell considerably. This is attributed, in part, to the smaller amount of unimproved land available for development. However, the average annual rate of change for improved abutting properties increased greatly in the long-run after period as a result of several acres changing from single family to commercial uses.

Nonabutting land is believed to have been most influenced in the short-run after period, 1968 to 1972. The average annual rate of change rose from 2.66 percent in the before period to 5.08 percent. The multiple family and commercial developments that occurred were reported to have been located in the Gessner area partly because of the improved access provided by both the Gessner Road improvement and the extension of Westview on the west side of the study area. The overall average annual rate of change for nonabutting land slowed greatly in the long-run after period, 1972 to 1978, but was higher than the abutting rate probably due to the greater amount of unimproved tracts available on nonabutting land. For previously improved property, the overall average annual rate of change increased on abutting land and decreased on nonabutting land.

In summary, the road improvement had an effect on land use in the Gessner Road area. The most pronounced effect on abutting land was the acceleration of commercial and multiple family developments. Changes from single family residences to commercial developments were also attributed in part to the new road design and capacity. The road improvement's effect on nonabutting land use change is not readily discernible due to the improvements of other streets in the area that may have had an influence. However, nonabutting average annual percentage change did almost double between the before and short-run after periods.