

A MEDIAN STUDY IN SAN ANTONIO, TEXAS

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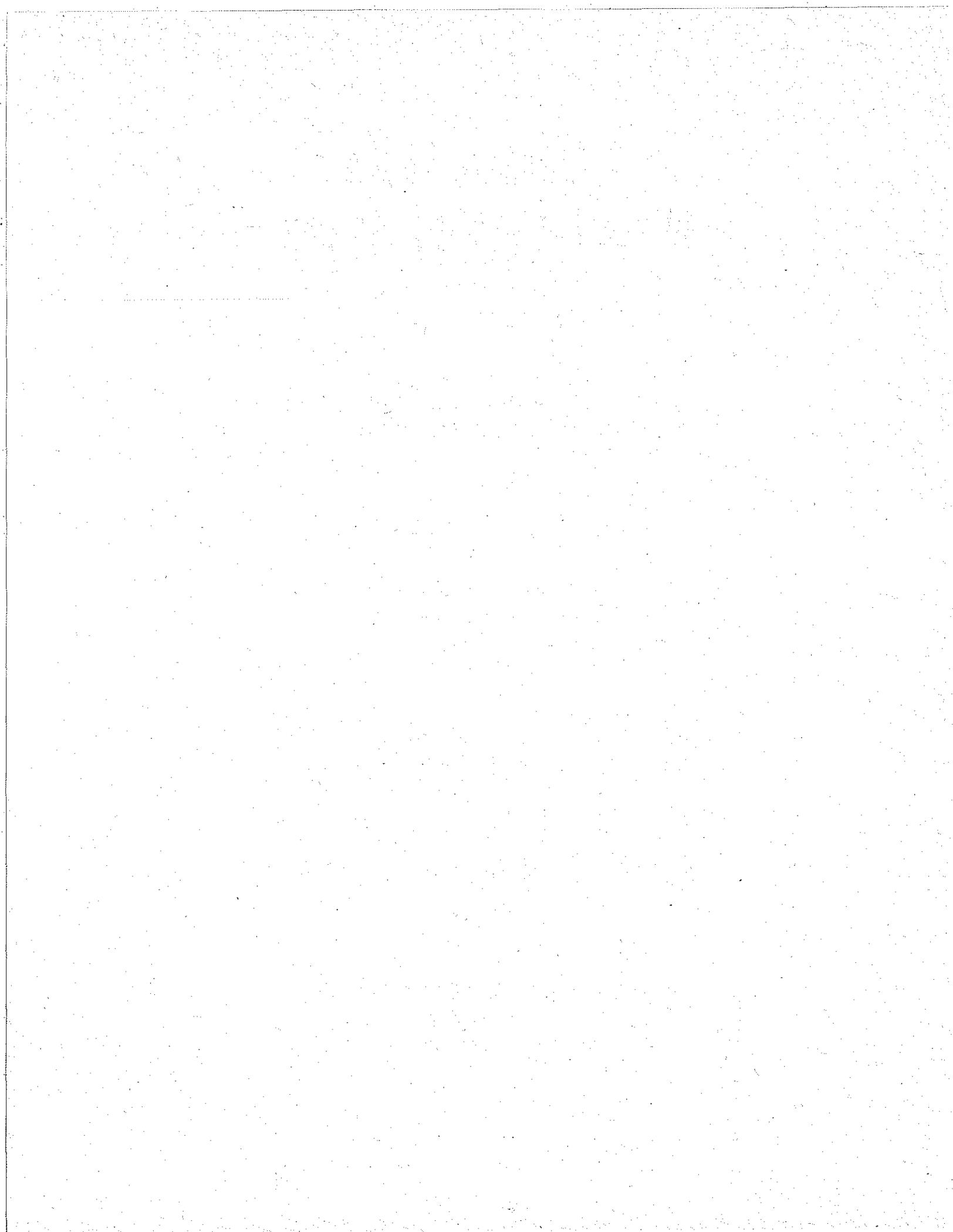


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FOREWORD

In September, 1958, a committee composed of members of the Texas Highway Department and the Texas Municipal League was formed to investigate and make recommendations on city-state median practices.

It was the intent of this committee to develop information on the effect that the addition of the median would have on a facility's ability to handle traffic more efficiently and safely and the effect that it would have on the local businesses. This information could then be used as a basis for evaluating future potential median sites to determine if a median-type facility should be installed.

The Texas Transportation Institute, as the official research agency of the Texas Highway Department, was asked to conduct the actual research program for the Committee. Three study sites, involving a heavily traveled route in a large city (San Antonio), a moderately traveled route in a medium sized city (Baytown), and a lightly traveled route in a small town (Pleasanton), were selected for the analysis.

Because of the variations in the conditions under observation, findings of these three studies are being released as separate reports. However, a statement of general conclusions concerning all three areas is included in each of the reports. For more detailed information, the other reports should be obtained.

General Conclusions of Over-all Study, Pleasanton — Baytown — San Antonio

Although there were wide differences in the size, traffic density and community orientation of the three areas included in this study, certain conclusions concerning the effect of medians can be drawn. These conclusions point up both similarities and differences that were observed under the different sets of conditions.

ECONOMIC

From an economic standpoint, the stimulus to new growth was perhaps the most significant effect of the median program. The street improvement program created attractive and desirable commercial sites in each of the three areas. The desirability of these sites is attested by the rapid influx of new businesses which began immediately after construction was completed.

In general, the construction process itself provided the most severe shock to the economic system of the community. This shock was most severe in Baytown, the middle-sized city, where some businesses were completely isolated from traffic for varying lengths of time due to both the contractor's scheduling and inclement weather conditions. It was less severe in Pleasanton, the smallest city, where local customers had few alternative firms in which to shop. In San Antonio, the largest city, the effect was less uniform. Certain classes of firms such as service stations were severely affected but from the standpoint of the area as a whole, their losses were made up by gains in the nontraffic serving businesses. On the basis of these three experiences, then, it may be concluded that the effect of the construction process on a firm will depend upon:

1. The provisions in plans and specifications and the care exercised by the contractor to prevent firm isolation for extended periods.
2. The availability of alternative firms near the area under construction.
3. The character of the firm itself. That is, whether it is oriented toward a large number of low volume sales (such as a service station or coffee shop) or a smaller number of high volumes sales (such as a furniture store or automobile dealer).

After the new facility was completed, business as a whole began to rapidly recover the sales lost during construction. After a full year of operation with the median, total business volume was above the preconstruction level in both San Antonio and Baytown. Of course, some of this gain was due to the establishment of new businesses along the facility, and many old firms were still below their base volumes. In general the businesses operating in older, less modern, less well kept buildings were most severely affected and were not able to regain their lost sales volumes. More modern firms with vigorous, progressive management often increased their sales well above their base levels.

The assumptions that losses in left-turn customer traffic into businesses would be offset by increases in right-turn traffic was not completely borne out. Customer turns appear to be inversely related to city size and traffic volume. In both of the smaller cities there was a noticeable increase in right-turn customer traffic after the median was built. In San Antonio, however, where traffic volume was very heavy and speeds high, there was an actual reduction in right turns. This indicates that customer turns may be dependent upon both convenience and firm loyalty which is more pronounced in the smaller cities. In the three cities as a whole, the reduction in total customer traffic averaged about 10 percent after the median was installed.

TRAFFIC

Traffic studies were conducted at each of the three study locations to investigate the effect of introducing a median on the character of traffic operation and safety. In general, there were four types of traffic studies conducted in each of the study locations. These studies were:

1. Traffic volume studies.
2. Accident studies.
3. Operational studies.
4. Travel time studies.

Although the purpose of the studies was to determine the effect of the median on traffic operation and safety, it was generally difficult to relate changes in traffic operation to specific roadway elements. In general, improved traffic operation was attributable to the overall upgrading of the highway facility; however, there were cases where the effects of the median could be specifically evaluated. Brief results of the separate traffic studies are indicated in the following sections.

Traffic Volume Studies

Traffic volume studies conducted at each of the study locations indicated fairly static traffic volume conditions throughout the entire study period. In Baytown there was actually a slight decrease in traffic volume on S.H. 146 due to diversion to a new parallel facility. Cross street traffic in Baytown experienced normal increases as did S.H. 281 in the Pleasanton study. Traffic volumes in the study section in San Antonio, a section of Southwest Military Drive, remained static at approximately 20,000 vehicles per day.

Accident Studies

Accident studies conducted at each of the study locations indicated reductions in certain types of accidents and increases in other types. There was a significant reduction in rear-end collisions involving vehicles waiting or slowing to make left turns. Head-on collisions involving the opposing streams of traffic were also elimi-

nated. These reductions were attributable to the installation of a median.

Increases were observed, however, in other types of accidents. In the Baytown study, right-angle collisions increased due to an inefficient signal system, but later were reduced by re-design of the system. Also, there were increases observed in accidents involving vehicles making improper lane changes. In some instances fixed-object type accidents increased when medians were installed.

Operational Studies

Operational studies conducted at the study locations indicated a large number of irregular maneuvers before medians were installed. These irregular maneuvers were virtually eliminated by the installation of the median, but a great many U-turns were created at the median openings. Normally, the U-turn maneuver is not too hazardous under low traffic volume conditions; how-

ever, in some cases the median was not wide enough to permit most vehicles to make a legal U-turn.

Travel Time Studies

Travel time studies conducted in Baytown and San Antonio indicated a great deal of congestion and delay during the "before" period. Travel time studies for the "after" period indicated an increase in traffic speeds due to the improvement of the facility. Some of this increase can be attributed to the median since it provided separate left turn lanes and eliminated delay due to vehicles waiting to make left turns. The increase is also attributable to the fact that congestion was relieved by the construction of additional traffic lanes. In Pleasanton, the travel time studies indicated a fairly high level of service in both the "before" and "after" conditions. Only minor delays were experienced in the "before" study and the majority of these were due to traffic signals rather than traffic congestion and vehicles waiting to make left turns.

A Median Study in San Antonio, Texas

Introduction

The Texas Highway Department and the various cities and towns of Texas have long been concerned with the necessity for and problems involved in improving highway routes along city streets. These routes are usually major traffic arteries in the larger cities and often serve as the Main Street in the smaller towns. As such they are usually heavily developed with commercial businesses throughout their length.

These combination highway routes and city streets are charged with fulfilling two diametrically opposed functions. In the smaller towns they must move the transient traffic through the town as quickly, safely and efficiently as possible and still serve as service streets to the businesses located on the adjacent land. In the larger cities they must perform these same functions and in addition carry the traffic moving between major sections of the city or between the suburban and central downtown areas. The difficulty in performing these functions concurrently has long been recognized.

Several procedures have been tried in an attempt to increase the efficiency with which this dual-purpose facility can be made to perform its functions. Among the more successful have been: speed zoning and signalization to regulate traffic flow; street widening or the creation of additional traffic lanes to increase the physical size of the facility; the creation of bypasses or alternate routes to remove through traffic; and finally the addition of a median barrier to increase traffic speed and decrease the number of accident exposure points. Median barriers are, of course, usually operated in conjunction with some type of traffic signalization and control.

With the advent of the median barrier, however, have come additional problems. Businesses which had been accessible to the total traffic flow from each direction were now directly accessible from only one direction. Motorists wishing to patronize businesses on the left side of the street were forced to go to the next median opening, turn around and return to the merchant. Merchants were naturally skeptical about the proportion of their customers who would go to the additional trouble of crossing the median to trade at their firms.

As a consequence, both the Texas Highway Department and the local city governments were frequently petitioned for the alteration or abolition of existing median improvements, and planned street improvement programs which included medians in their design were frequently resisted with vigor.

Since the Texas Highway Department was jointly concerned with the city each time a median was built, it was anxious to develop a solid foundation of facts from which the question of median installation and operation could be evaluated. It is not surprising, then, that in September, 1958, a joint City-Highway Department committee was formed to investigate and make recommendations on city-state median practices.

As the Committee reviewed the history of median operations, it found that medians have long been justified in the minds of their builders on the basis of their effectiveness in providing more efficient traffic movement and improving safety conditions. They have been opposed primarily on economic grounds. Local merchants feel that medians reduce their exposure to passing traffic and reduce their total sales volume.

The committee felt, then, that its primary job was to determine through scientifically controlled research procedures just how the medians measured up to what was generally expected of them. That is, how much, if any, they increased traffic flow, eliminated delays, and increased safety, and how much, if any, they affected the retail sales volumes of adjacent businesses.

To do this, it was decided to select three study areas which were operating under nonmedian conditions but upon which medians were scheduled to be constructed in the immediate future. Each of these areas would then be subjected to a detailed analysis concerning both its record of traffic operation and the economic condition of its attendant businesses. The field work for this type of analysis would need to be initiated in time for a complete record of traffic and economic conditions to be developed prior to the beginning of construction. Additional analyses, covering the same type of data, would then be made at periodic time intervals after the new median had been built.

This research procedure is commonly known as the "Before and After" approach. Quite simply, its aim is to develop a complete picture of an area under its original set of operating conditions, let the operating conditions be changed, and then develop another picture. The research techniques carried on under this program are merely the mechanical workings of the researcher's analogous camera.

After the research approach was decided upon and the problems of financing solved, the first step was to select the appropriate areas for study. Funds and personnel were available to handle three separate study sites. These were selected on the basis of the size of the city, the scheduling of median construction, the density of traffic, the type of commercial and residential development and the availability of the needed traffic and economic information.

San Antonio, a city of 588,000 population in 1960 and an estimated 641,500 in 1963, has a diversified, balanced economy with income from trade with the wide agricultural area surrounding it and the industrial resources within its boundaries. It is the chief commercial center for a great area in southern Texas with some influence into northern Mexico. It is the principal military center in Texas and derives a commercial advantage from military installations located in or near the city. A heavy tourist trade is also a major source of income to the city and its residents.

The city acts as a highway hub for South Texas. When the system is completed San Antonio will be served by three Interstate Highways, IH 35 for north and south traffic between Laredo and Dallas, IH 10 for

east and west traffic between Houston and El Paso and IH 37 between Corpus Christi and San Antonio. There are six additional state and U. S. highways serving the city.

Concluding Observations — San Antonio, Texas

ECONOMIC ANALYSIS

Some general observations concerning the effect of construction of the median on businesses within the study area may be briefly stated as follows:

1. The construction of the new facility actually covered about two years, but the major part of the construction was accomplished during 1962. The first year was devoted primarily to the relocation of utilities, which had very little effect on the flow of traffic or business activity in the area. In 1962 the construction was scheduled in such a manner that businesses were isolated from traffic for only short periods of time. However, some businesses were definitely hurt during the major construction period.

2. After the completion of the new facility, the area began to grow. A shopping center occupying a full block adjacent to Southwest Military Drive, was built in 1963 and was fully occupied by 13 firms by early 1964. In addition to the shopping center, three additional businesses were established in other segments of the area in 1962 and 1963.

3. Some of the older firms that had been using the shoulders of the old street for customer parking had limited parking after the new road was built. Six of these businesses closed during the last two years of the study. The buildings in which three of these were located have been moved to other sites in San Antonio. The owners of these lots are now planning to rebuild, but farther back from the street in order to provide sufficient space for customer parking. Three additional firms in the study area closed in 1963. Buildings that housed these firms were vacant at the end of the study.

4. Businessmen along the route feel that the new facility has increased the speed and flow of traffic, thereby making it more difficult for prospective customers to execute shopping turns. This is primarily the concern of firms located in mid-block or away from median openings.

5. In contrast to the Baytown and Pleasonton area, the San Antonio area had a larger reduction of shopping U-turns in relation to the total traffic volume along the route.

6. It appears that the commercial development occurring in the area in 1963 will continue. Additional

businesses are being established along the route and older businesses are modernizing their buildings in an attempt to improve the general appearance of the area. This improvement should contribute to retail sales volumes and the economy of all firms in the area.

TRAFFIC ANALYSIS

The results of the "before" and "after" traffic studies in San Antonio, Texas, can be summarized as follows:

Traffic Volumes

Traffic volumes on Loop 13 within the study section were essentially the same during "before" and "after" periods. This static condition was believed to be the result of the diversion of through traffic from Loop 13 to Interstate 35, a newly completed, more direct route through San Antonio.

Accidents

The analysis of accident data for one year before and one year after reconstruction of the facility indicated reductions in all types of accidents except the fixed-object type. Rear-end collisions were significantly reduced and head-on collisions involving the opposing streams of traffic were eliminated. These reductions were attributable to the installation of the median while other reductions were attributable to the general improvement of the facility.

Operational Studies

A motion picture study of traffic operation during the "before" period indicated that there were very few irregular maneuvers occurring in the study section. The "after" study indicated no irregular movements and very few U-turn movements.

Travel Speeds

Travel time studies indicated some congestion and delay on Loop 13 during the "before" period. The improved facility increased the travel speed from 1 to 7 miles per hour in both directions. For all practical purposes, the only delay observed in the "after" study was the result of signalization and an officer-controlled school crossing.

Economic Analysis

This phase of the study is concerned with the economic influence of the median on businesses located along Southwest Military Drive in San Antonio. The study area includes an area from Commercial Street on the west to the intersection of South Flores Street on the east. Only those firms fronting the facility were considered as being the influence zone of the median.

Southwest Military Drive serves as the southern part of the interloop around San Antonio. It is also known as Loop 13. The old street was a two lane facility with

paved shoulders. It was a heavily traveled street, with especially heavy morning and evening traffic peaks. A large amount of the morning and evening traffic is generated by the military installations in the southwest and southeast sections of San Antonio as shown in Figure 1. Military personnel and civilian employees of these bases use this route to commute to and from work.

A considerable amount of the traffic using Loop 13 in 1959 was transit traffic. At that time the loop served as a by-pass of the downtown area for traffic on all the

leaving study area firms. The characteristics of San Antonio traffic are quite different from that of Baytown and Pleasanton. The Baytown and Pleasanton routes carried a higher proportion of transit traffic which created a demand for more traffic serving businesses such as service stations, motels, and restaurants. The San Antonio area had only a few service stations and restaurants and no motels. In this area, abutting businesses are characteristically of the general retail type. Therefore, these businesses depend heavily upon local customers. Many of these businesses were located in the center of a block and were dependent upon access by two-way traffic or left and right turns into and out of their businesses.

When one considers the effect of a median upon businesses located in an area, it is important to consider both the traffic volume and the characteristics of the shopping turns before and after the construction of the median. This enables a more accurate evaluation by comparing any increase or decrease in one to the other.

Since the median barrier does not restrict right turns into or out of businesses, the primary concern of the retailer is how the loss in left-turn traffic will affect his business. Therefore, detailed traffic counts were made before and after the construction of the median. These traffic counts included the total volume and directional movement of shopping turns into and out of business establishments abutting Southwest Military Drive.

Before construction of the median, customer traffic had a wider range of alternatives in entering and leaving businesses. The traffic could enter from the same side of the street by making a right turn or from the opposite side by making a left turn and crossing the opposing traffic stream. It could also leave in either direction. If a firm was located at an intersection, traffic could also enter and leave by side street exits.

After the median was built, customers were restricted from making left turns either into or out of businesses located in mid-block. Also, since medians were constructed on three of the cross streets, customers could approach or leave firms located in any one of the quadrants of the intersection by right turns. Therefore, turning movements of not only those businesses located in

mid-block but some of these located at median openings were affected by the construction program.

According to the data in Table 8, traffic volumes during the daylight hours (7 a.m. to 7 p.m.) along Southwest Military Drive showed an increase of 14 percent after the construction of the median. This increase in traffic represented an average of 156 additional vehicles per hour. Each of the 12 hours showed an increase, with the largest gains occurring during the morning and evening rush hours.

An examination of shopping turns showed a completely different story. A comparison of the before and after shopping turns in Figure 6 clearly shows that there was a significant decrease in the number of total turns in the "after" period. At no hour during the day, after the median was constructed, did shoppers execute as many turns as were made before the median was constructed. The average number of shopping turns per hour dropped from 780 before the median was constructed to 490 turns under median conditions. Shoppers generally followed the same pattern in both periods, with pronounced peaks around 11 a.m. and 5 to 6 p.m. in the afternoons. However, the proportion of shopping turns to average daily traffic during traffic peaks in the "after" period is considerably lower than in the "before" period.

This particular characteristic of the "after" traffic leads to the hypothesis that fewer shopping trips are combined with trips to and from work. This is probably a result of both the increased speed of traffic and the increased restrictions on turning movements which made it considerably more inconvenient to combine shopping stops with trips to and from work.

When comparing the 12-hour ADT to shopping turns into businesses as shown in Table 8, the 41 percent decrease in shopping turns is a particularly significant drop when one considers that during this time total traffic increased by 14 percent. This is emphasized by the fact that hourly traffic increased in each of the 12 hours under median conditions while there was an average of 185 fewer shopping turns per hour into businesses along Southwest Military Drive. This permits two pos-

Table 8
A COMPARISON OF HOURLY AVERAGE DAILY TRAFFIC TO SHOPPING TURNS INTO BUSINESSES ALONG SOUTHWEST MILITARY DRIVE IN SAN ANTONIO, TEXAS

Hours	Before		After		Percent Change	
	Customer Turn Ins	Traffic	Customer Turn Ins	Traffic	Customer Turn Ins	Traffic
7 - 8	225	904	122	1,249	-47%	38%
8 - 9	332	744	202	953	-39	28
9 - 10	441	901	258	1,034	-43	15
10 - 11	525	998	267	1,184	-49	19
11 - 12	530	1,026	355	1,120	-32	9
12 - 1	521	1,047	294	1,131	-44	8
1 - 2	513	1,085	326	1,247	-37	15
2 - 3	524	1,188	326	1,196	-38	.7
3 - 4	514	1,287	337	1,428	-35	11
4 - 5	543	1,425	345	1,835	-37	29
5 - 6	598	1,441	317	1,511	-47	5
6 - 7	191	1,188	89	1,221	-53	3
Total	5,457	13,234	3,238	15,109	-41%	14%
Average	455	1,103	270	1,259		

INFLUENCE OF MEDIAN ON TURN INS AND OUTS ALONG SOUTHWEST MILITARY DRIVE, SAN ANTONIO, TEXAS.

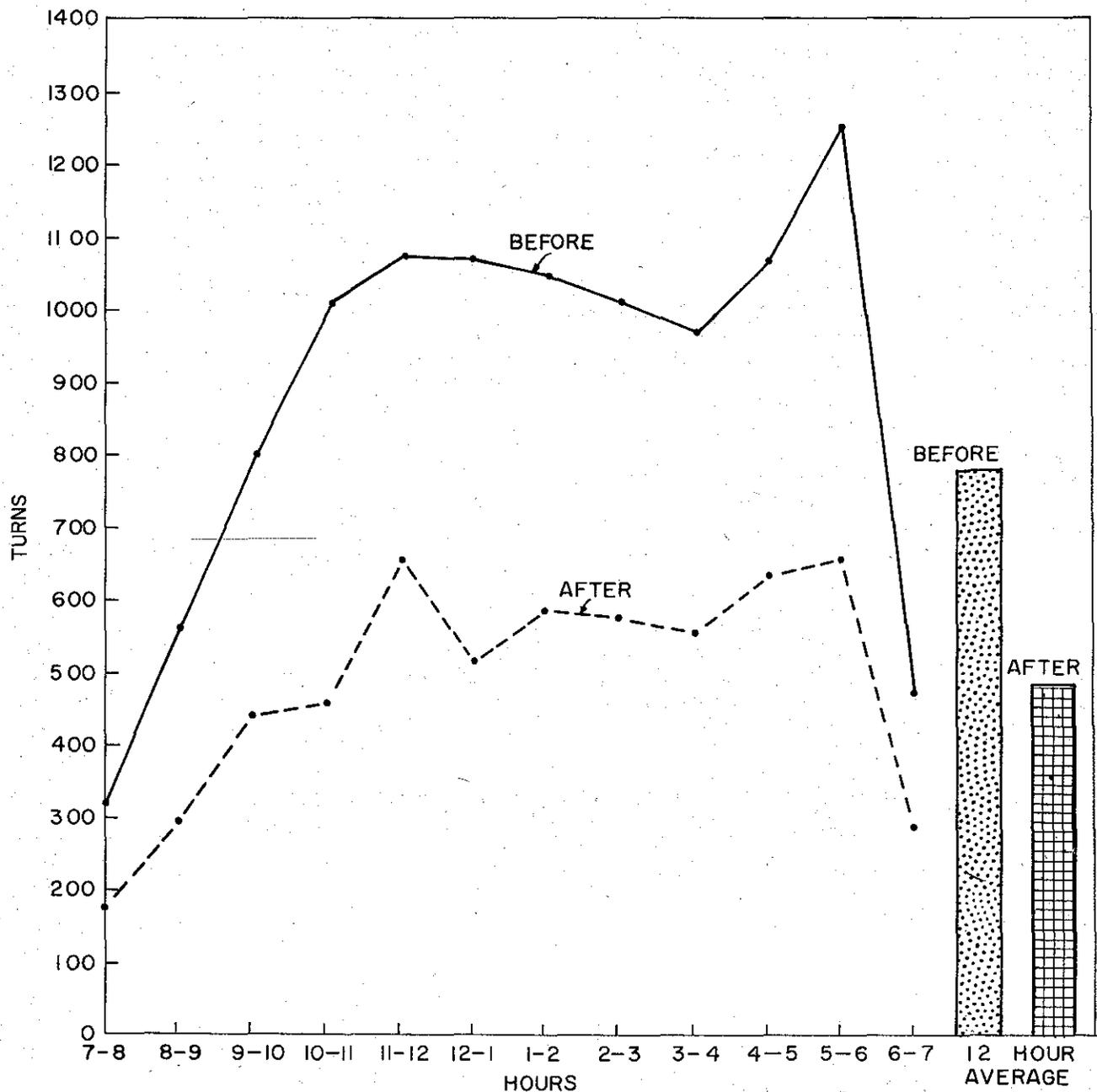


Figure 6.

sible explanations: either shoppers are now entering or leaving by the way of side streets, or abutting firms are drawing fewer total customer trips. Many of the firm managers held the latter view. They stated that their firms had fewer total customers in the 12 month period following completion of the facility. Since total sales volume increased, this indicates that the average size of sale per customer trip had increased. This in turn would suggest that the small purchase or non-essential trip had been most restricted.

Figures 7 and 8 show graphically the relationship between hourly traffic and shopping turns into and out of businesses before and after the construction of the median. These data are presented on logarithmic charts in order to compare figures of different magnitudes. The number of shopping turns is small relative to total traffic along the route with both type of turns generally following the same pattern. However, it is apparent that shopping traffic under median conditions did not follow the trend of total traffic. Absolute increases in total traffic between 4 and 5 p.m. indicate that Southwest Military Drive is now handling a larger number of work trips and suggests that the new facility has drawn additional work trips between the major military bases.

Since the median restricts cross traffic turns in the mid-block area and focuses cross traffic at specified points, it is particularly interesting to observe the effect of the median on the direction of shopping turns. The original hypothesis assumed that there would be fewer left turns under median conditions, and a corresponding increase in right turns, since the median is not considered an obstacle to right turns.

The data presented in Table IX show the effects of the median on directional turns by customers into businesses. In this comparison, businesses were divided into traffic serving and nontraffic serving groups. In refutation of the hypothesis, these data show a large reduction in right turns as well as a reduction in cross traffic turns after the construction of the median. This 50 percent decrease in total turns was due primarily to the almost complete elimination of left turns into three traffic serving businesses located at busy intersections. Businesses located around these intersections were further restricted by medians on the side streets. This additional barrier apparently discouraged many prospective customers and caused them to shift their patronage to other firms with better accessibility to traffic. This is pointed out in Table 9 which shows that left turns before the median was constructed accounted for 54 percent of customer traffic compared to only 15 percent in the "after" period.

Table 10 attempts to show the percentage changes of right and left turns and U-turns resulting from the median barrier. The data in Table 10 are generally the same as those presented in Table 9 but rearranged to point out more clearly the changes occurring within certain types of turns, before and after the median.

This table emphasizes the reduction in both right and left turns. The reduction in left turns was expected, but as mentioned previously, the drop in right turns conflicts with the hypothesis that the losses in left turns would be at least partially offset by increases in right turns.

There are a number of possible explanations for this decrease. Businessmen along the route feel that the

Table 9
THE INFLUENCE OF MEDIANS ON TURNS INTO BUSINESS FIRMS ALONG SOUTHWEST MILITARY DRIVE SAN ANTONIO, TEXAS

	Total Turn Ins	Right Turn		Left Turn		U-Turns	
		Num-ber	% of Total	Num-ber	% of Total	Num-ber	% of Total
TRAFFIC SERVING BUSINESSES							
Before	1,076	499	46	577	54		
After	466	385	83	71	15	10	2
NONTRAFFIC SERVING BUSINESSES							
Before	4,381	2,117	48	2,264	52		
After	2,772	1,622	58	1,079	39	71	3
TOTALS							
Before	5,457	2,616	48	2,841	52		
After	3,238	2,007	62	1,150	36	81	2

increased traffic speed has made it more hazardous to make right turns into businesses because of the rapid deceleration necessary to change average traffic speed to safe turning speed. They believe the motorist fears a rear-end accident when slowing down to make a turn; consequently, he passes on by rather than risk an accident. Another reason could be the circuitous routing created by the median, this makes it necessary for a shopper to make a U-turn at an opening in the median or make use of a side street in order to return in the direction from which he came.

Table 11 shows that turns out of businesses generally followed the same basic pattern as the turns into businesses showed in Table 10. However, there was an even larger decrease in turns out of businesses operating under median conditions. The 50 percent decrease in total shopping turns out of abutting businesses indicates that 9 percent fewer customers exited directly on to the new facility than entered directly.

This greater reduction in turns out of businesses is probably the result of shoppers leaving the businesses by side street exits or through customer parking areas provided by some individual firms and shopping centers. Since there is no information available on this type of traffic movement, however, it is difficult to determine the proportion of customers using these approaches.

The hourly changes in the character of turns into and out of study area businesses are shown graphically in Figures 10, 11, 12, and 13. Here again is shown the sharp reduction in left turns as well as lesser reduction in right turns. This is merely a more detailed breakdown of information presented in the preceding tables.

Figures 10 and 11 show the effects of a median on left-turn traffic into and out of businesses. Before the construction of the median, there was a pronounced peak of left turns both into and out of businesses from 5 to 6 PM, amounting to about 350 turns each. This is contrasted to around 100 left turns being executed during the same hour under median conditions.

The fact that there were 15 U-turns per hour made by customers leaving businesses as compared to five U-turns per hour in entering is interesting in itself. It indicates that shoppers are more prone to make this particular cross traffic movement if they have time to wait

INFLUENCE OF THE MEDIAN ON TURNS INTO BUSINESSES IN RELATION TO THE AVERAGE HOURLY TRAFFIC ON SOUTHWEST MILITARY DRIVE — SAN ANTONIO, TEXAS.

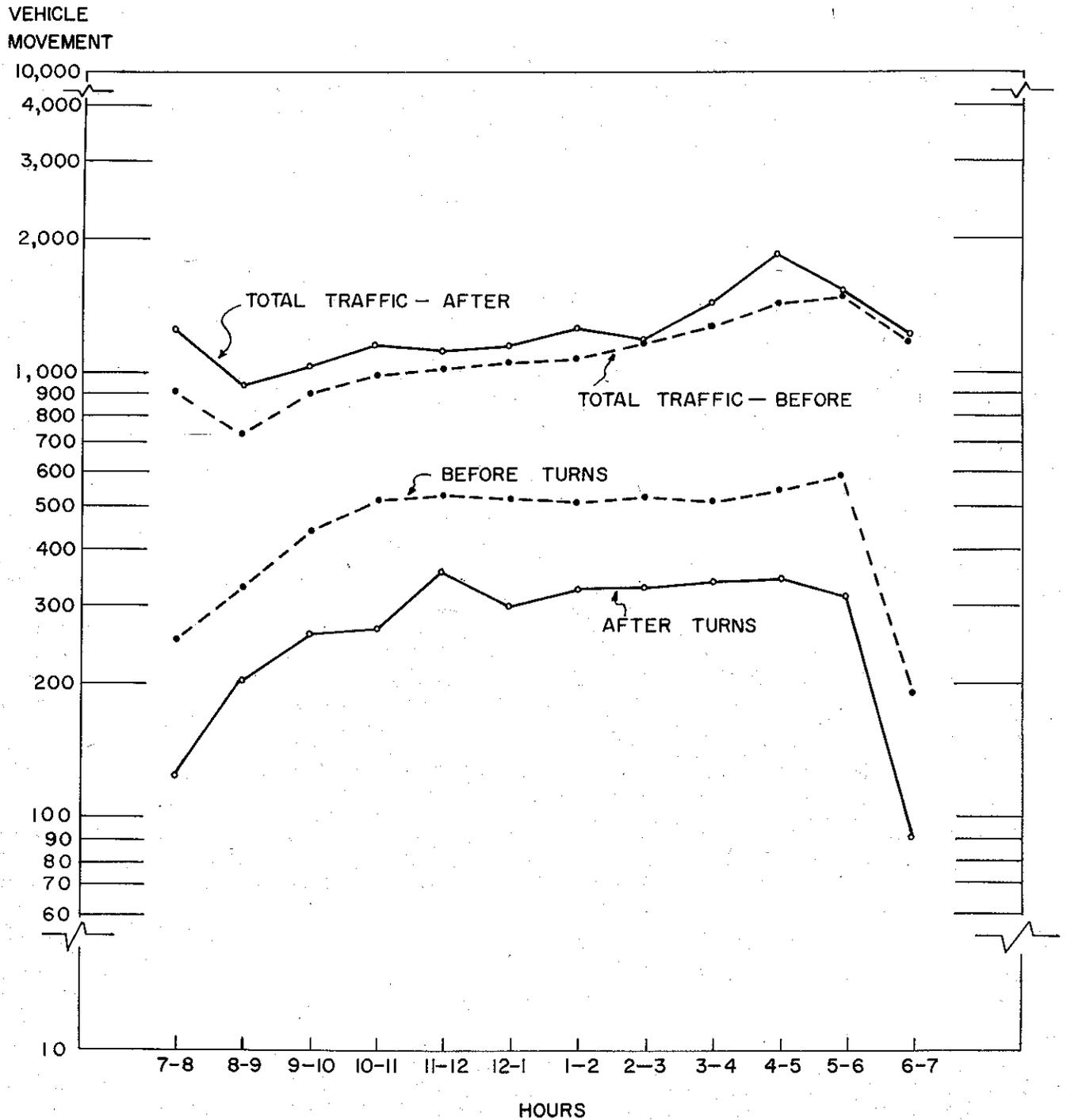


Figure 7.

INFLUENCE OF THE MEDIAN ON TURNS OUT OF BUSINESSES IN RELATION TO THE AVERAGE HOURLY TRAFFIC ON SOUTHWEST MILITARY DRIVE — SAN ANTONIO, TEXAS.

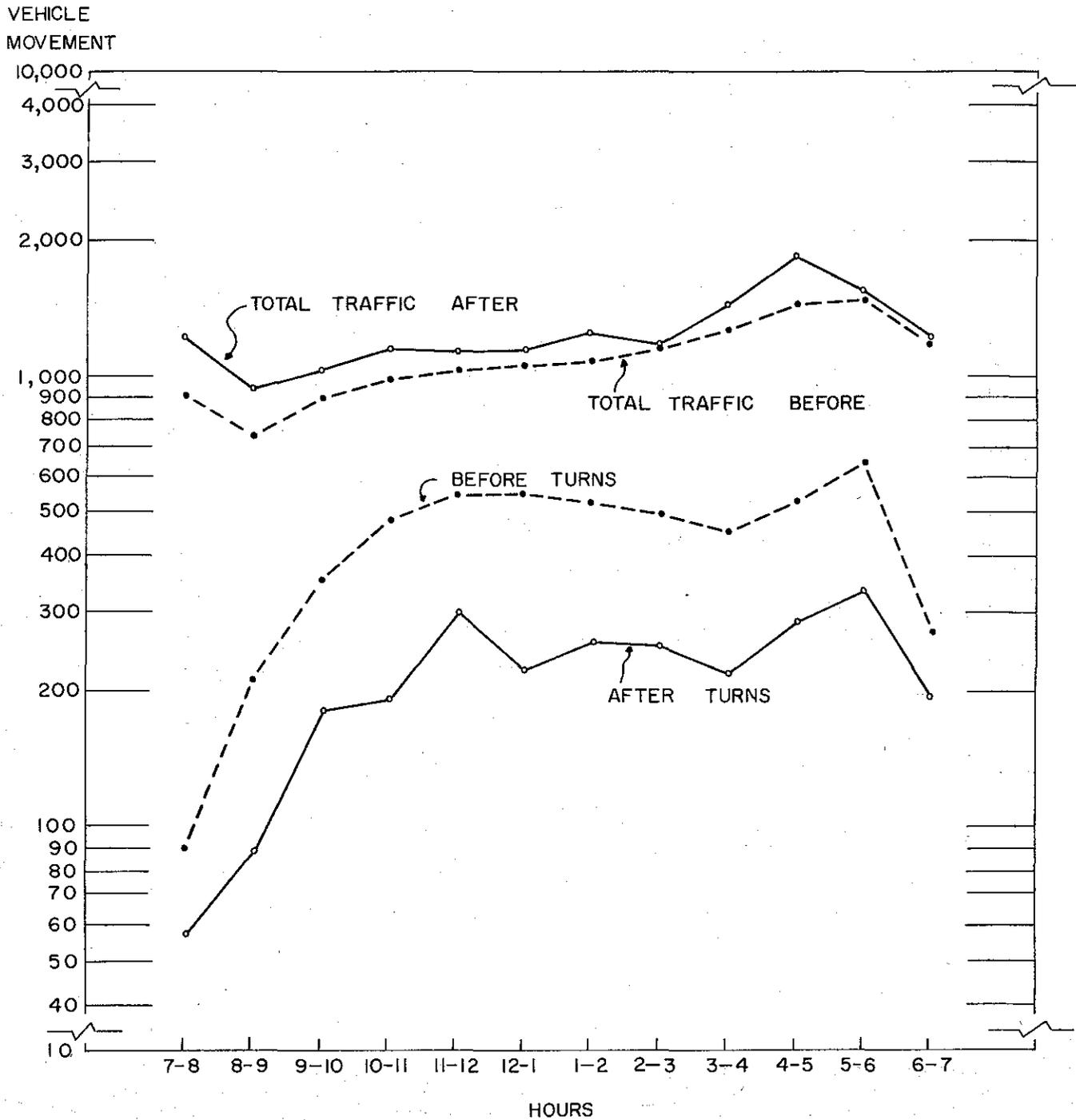


Figure 8.

INFLUENCE OF THE MEDIAN ON SHOPPING TURNS INTO BUSINESSES AS A PERCENT OF AVERAGE HOURLY TRAFFIC ON SOUTHWEST MILITARY DRIVE SAN ANTONIO, TEXAS

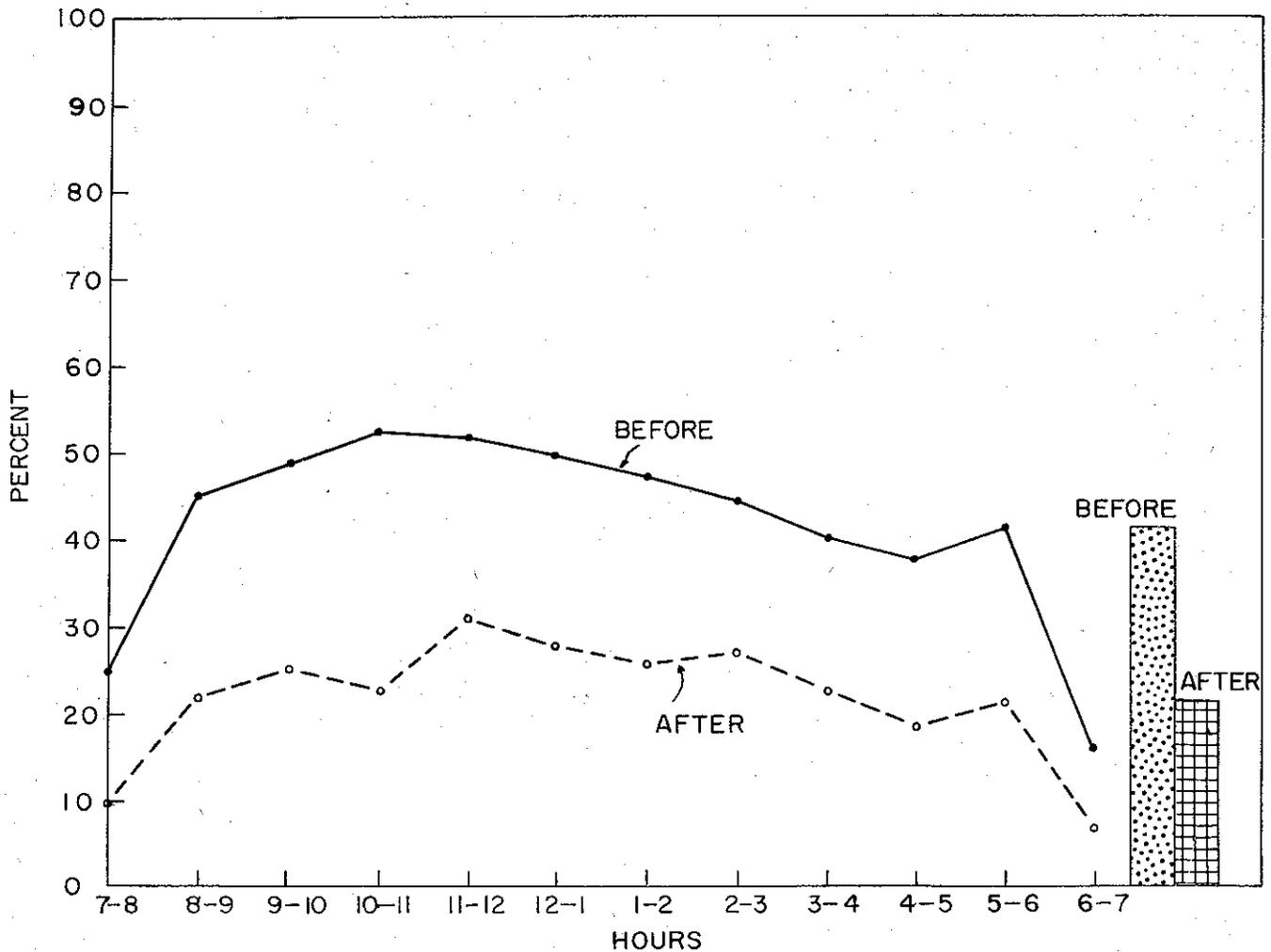


Figure 9.

in the safety of a parking lot while choosing a break in the traffic stream. In summarizing Figures 10 and 11 it is evident that the median reduces left-turn traffic, and creates a smaller number of U-turns. Even when the U-turns are combined with the left turns, however, the level of cross traffic under median conditions is still significantly reduced.

A visual inspection of Figure 12 and 13 shows that both the right turns into and out of businesses followed the same general pattern before and after the median was built. The major difference, however, is the lower level of right turns executed after the median was constructed.

There was a similarity between right and left-turn movements in that in both cases the number of turns into businesses was greater than the number of turn outs.

Since U-turns are created by the median, some additional attention was paid to determining their distribution within the area and their occurrence throughout the day. Figure 14 shows an outline of the study area with businesses located in their proper relation to the median openings. The figure shows the number of U-turns at each median opening and the number of these that were directly connected to a shopping trip. These shopping U-turns are also divided into those that turned into and those that turned out of businesses along the route.

INFLUENCE OF MEDIAN ON LEFT TURNS INTO BUSINESS FIRMS ALONG SOUTHWEST MILITARY DRIVE, SAN ANTONIO.

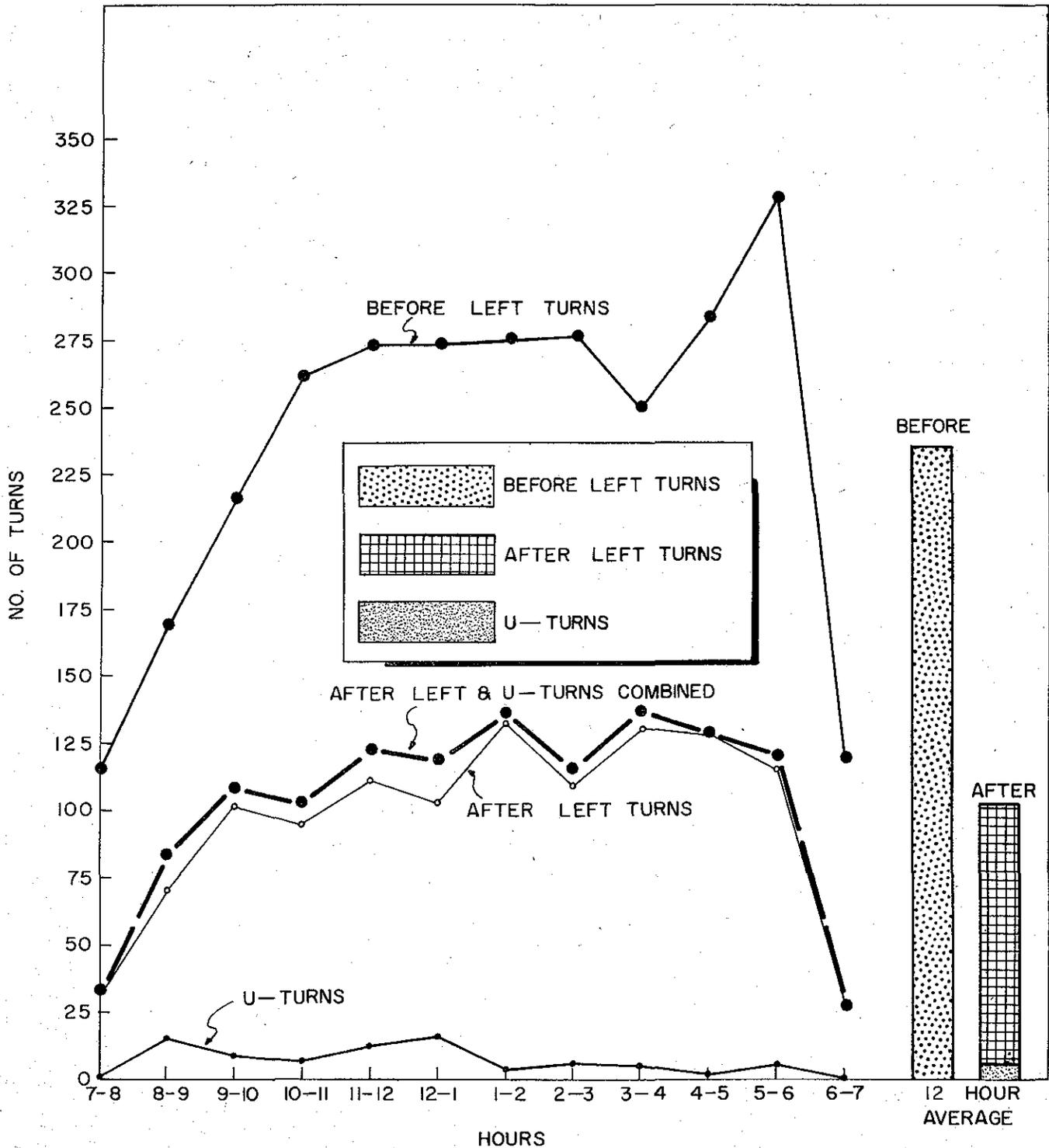


Figure 10.

INFLUENCE OF MEDIAN ON LEFT TURNS OUT OF BUSINESS FIRMS ALONG SOUTHWEST MILITARY DRIVE, SAN ANTONIO.

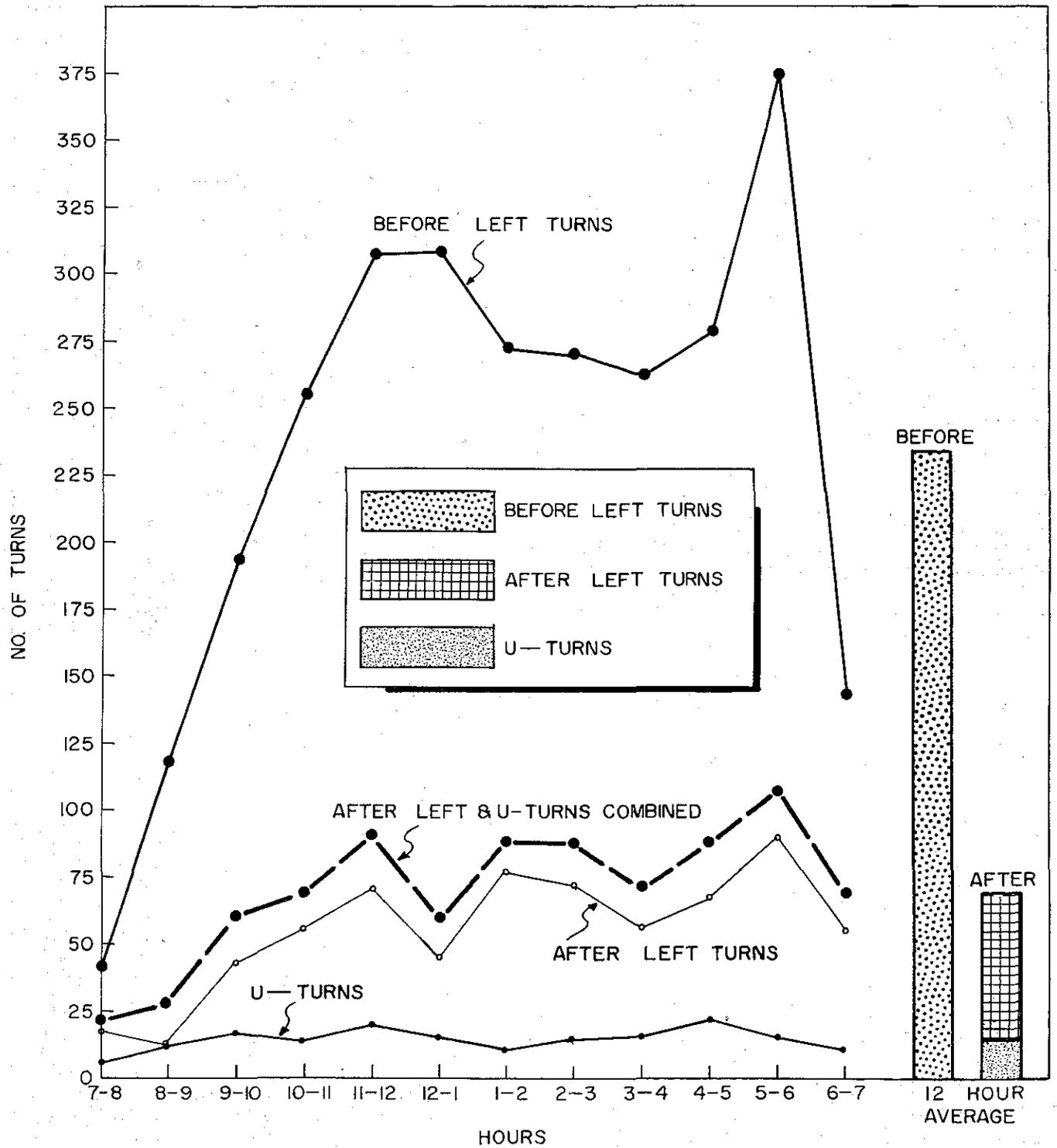


Figure 11.

Table 10
 INFLUENCE OF A MEDIAN ON TURNS INTO TRAFFIC AND NONTRAFFIC SERVING BUSINESSES ALONG
 SOUTHWEST MILITARY DRIVE, SAN ANTONIO, TEXAS

	Traffic Serving			Nontraffic Serving			Total		
	Before	After	Percent Change	Before	After	Percent Change	Before	After	Percent Change
Right Turns	499	385	-23	2,117	1,622	-23	2,616	2,007	-23
Left and U Turns'	577	L- 71	-76	2,264	L- 1079	-49	2,841	L- 1069	-59
		U- 10			U- 71			U- 81	
Total	1,076	466	-57	4,381	2,772	-37	5,457	3,238	-41

'No U-Turns in the Before Period.



The restrictions of cross traffic turns on the new facility make it difficult to approach or leave those businesses that are located away from a median opening.

INFLUENCE OF MEDIAN ON RIGHT TURNS INTO BUSINESS FIRMS ALONG SOUTHWEST MILITARY DRIVE, SAN ANTONIO.

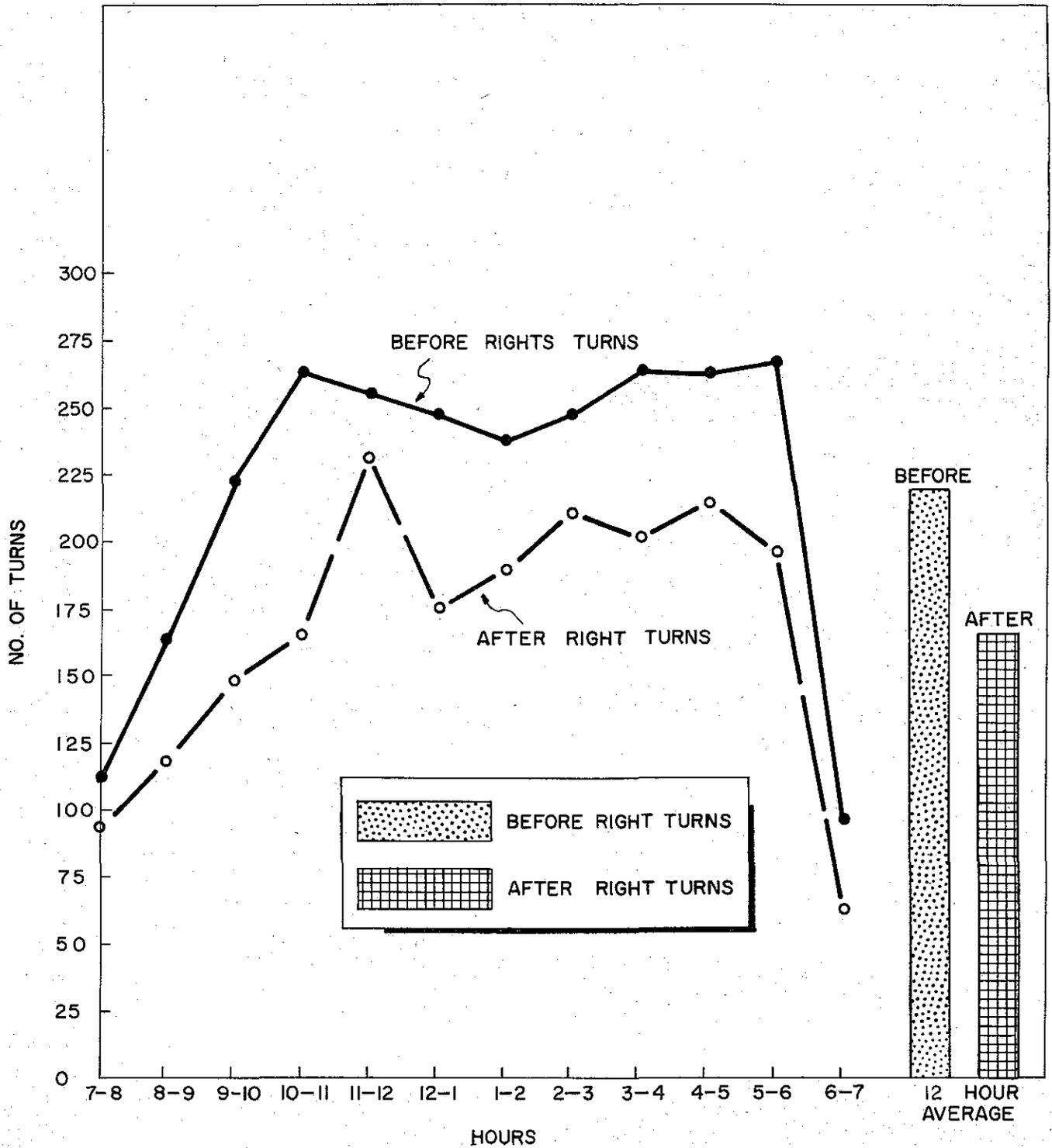


Figure 12.

INFLUENCE OF MEDIAN ON RIGHT TURNS OUT OF BUSINESS FIRMS ALONG SOUTHWEST MILITARY DRIVE, SAN ANTONIO.

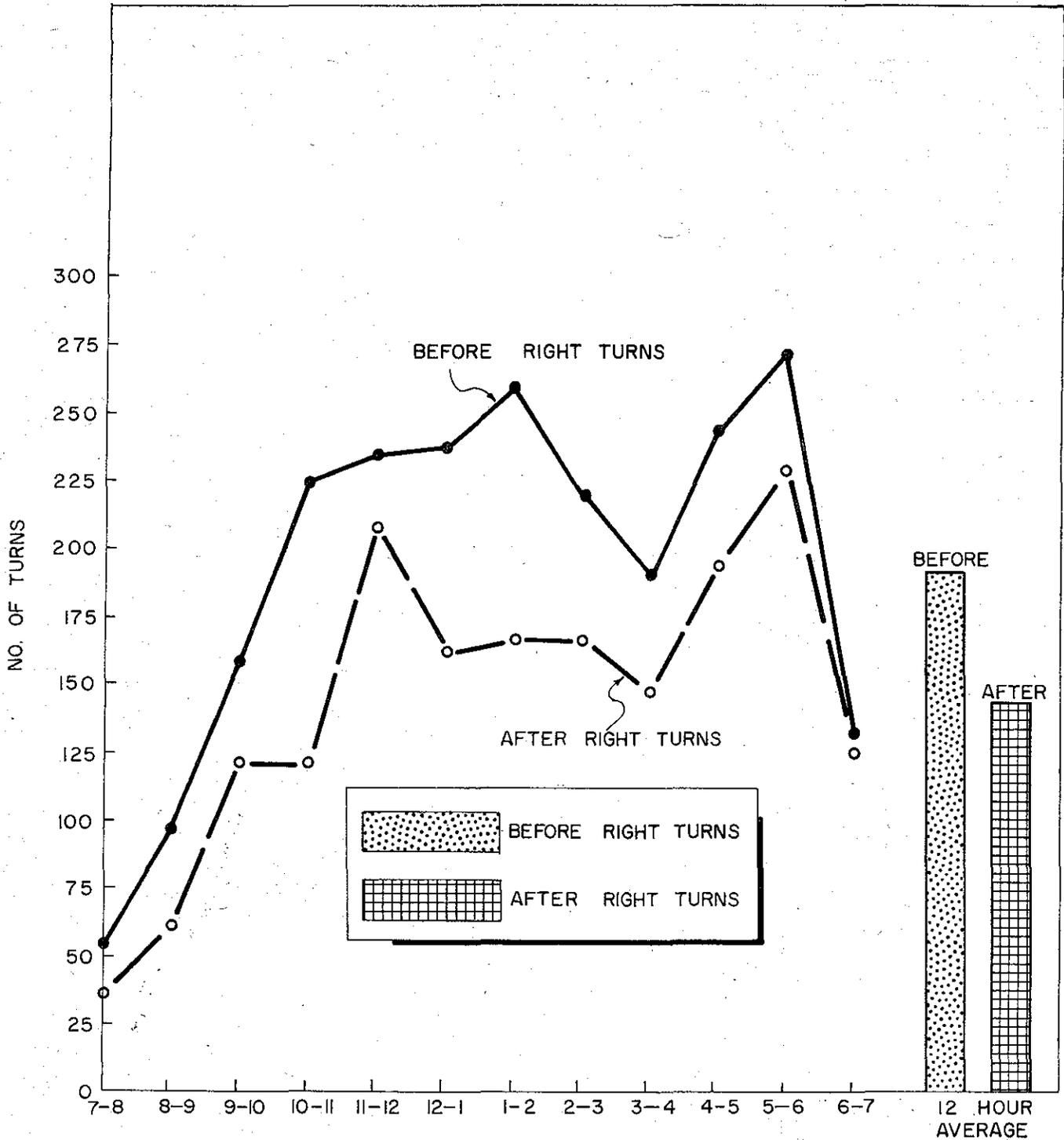
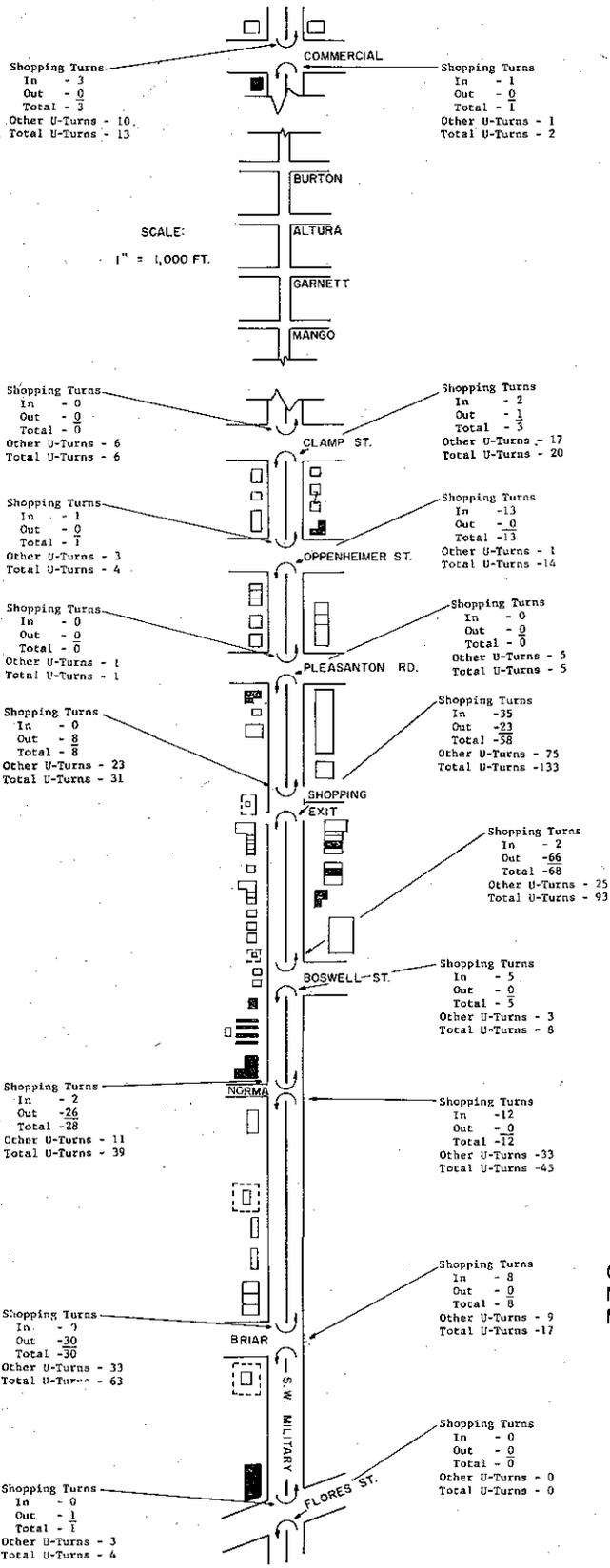


Figure 13.



CHARACTERISTICS OF U-TURNS ON SOUTHWEST MILITARY DRIVE IN 1963 AFTER CONSTRUCTION OF MEDIAN.

Figure 14.

Table 11
 INFLUENCE OF A MEDIAN ON TURNS OUT OF TRAFFIC AND NONTRAFFIC SERVING BUSINESSES ALONG
 SOUTHWEST MILITARY DRIVE, SAN ANTONIO, TEXAS

	Traffic Serving			Nontraffic Serving			Total		
	Before	After	Percent Change	Before	After	Percent Change	Before	After	Percent Change
Right Turns	497	266	46	1829	1471	20	2326	1737	-25
Left and U-Turns ¹	561	L- 66	83	2263	L- 594	67	2824	836	70
Total	1058	U- 30 362	66	4092	U- 146 2211	46	5150	2573	50

¹No U-Turns in the Before Period.

By studying the character of the turns at each opening, the business generation of U-turns traffic can be better appreciated. However, the businesses in San Antonio did not generate nearly as many U-turns as were gener-

ated in the Pleasanton and Baytown areas. This indicates that the increased speed and heavier volume of traffic in San Antonio probably had a tendency to reduce the number of U-turns.

Traffic Analysis

Traffic studies were conducted to investigate the character of the traffic operation and to evaluate the level of service that existed in the study section in San Antonio during the "before" and "after" study periods.

The study site, a section of south Loop 13 known as Southwest Military Drive, 1½ miles in length, extended from South Flores to Commercial Avenue. The study site is shown in Figure 15. During the "before" study period a typical cross section of Southwest Military Drive provided two traffic lanes with paved shoulders; however, due to the high volume of traffic, the shoulders were being used as additional traffic lanes. Figure

16 shows the typical cross section for the "before" period and photographs illustrating normal traffic operation on the facility. For the "after" study period, the roadway had been reconstructed to provide three traffic lanes in each direction, separated by a 14-foot median with added left turn lanes at each intersection. Figure 17 shows a typical section "after" reconstruction.

Within the test area, four intersections were signalized during the "before" period and five intersections were signalized during the "after" period. The signalized intersections are listed in Table 12 and brief descriptions of control equipment are given.

Table 12
 SIGNALIZATION OF LOOP 13 STUDY SECTION

Location	Signal Type	
	Before	After
S. Flores Drive	Fixed time controller. 60% for Loop 13, 40% for S. Flores Drive.	Two phase, volume density controller with four minor movement controllers, one minor movement for each left turn movement.
Boswell	Semi-actuated controller with detector on Boswell.	Three phase full actuated nonvolume density controller. One phase for Loop 13, one for Boswell and one for left turns from Loop 13 into Boswell.
Sear's Entrance	Semi-actuated controller with detector on Sear's entrance.	Three phase full actuated non-volume density controller. One phase for Loop 13, one for Sear's entrance, one for left turns from Loop 13 into Sear's entrance.
Pleasanton Road	Fixed time controller. A percentage of green time was provided as a leading green for left turns off Loop 13 into Pleasanton Road. 50% Loop 13, 10% left turn, 40% Pleasanton Road, 60 second cycle off peak, 70 second cycle for peak.	Two phase volume density controller with four minor movement controllers, one minor movement for each left turn movement.
Commercial	No Signal	Two phase volume density controller with four minor movement controllers, one minor movement for each left turn movement. Pedestrian button, pedestrian signals, and pedestrian timers have been included for school.

Four types of traffic studies were conducted to evaluate comparatively the "before" and "after" traffic conditions. These studies were:

1. Traffic volume studies.
2. Accident studies.
3. Operational studies.
4. Travel time studies.

Although these studies were aimed at evaluating the effect of the median on traffic operation, it was generally difficult to relate changes in traffic operation to specific roadway elements. This was due to the fact that the facility under study was greatly improved through reconstruction and it was to be expected that other new elements of the facility would produce an effect on traffic operation. Therefore, in general, the findings of the traffic studies reflect the effect of changing the entire highway facility. However, there were cases in which the effects of the median could be specifically evaluated.

TRAFFIC VOLUME STUDIES

Traffic volumes were recorded at four different locations in the study section and on all cross streets in both the "before" and "after" study periods. Manual and machine traffic counts were made to obtain representative 24-hour volumes for the "before" and "after" period. The results are shown in Figure 18.

A comparison of the traffic volumes observed during the "before" and "after" study periods showed essentially no change. At some of the locations there was actually a slight decrease in traffic volumes. In general, there was an apparent stability in volume conditions which was believed to be due to the diversion of some of the through traffic from Loop 13. During the "before" study period, through traffic entering the San Antonio area by way of U.S. 81 used Loop 13 as a bypass around the city. In the "after" study period, a section of Interstate 35 through San Antonio was opened to traffic making a more desirable and direct route for the through traffic that had been using Loop 13.

ACCIDENT STUDIES

Accident data were obtained from police report forms for a one-year period preceding construction of the new facility and for a one-year period after the facility was completed and opened to traffic on December

Table 13
ACCIDENT SUMMARY
LOOP 13
San Antonio, Texas

Accidents by Type	Study Period	
	Before	After
Rear-end	91	34
Out-of-Control	9	5
Head-on	3	0
Side swipe	39	18
Right angle	89	10
Fixed object	2	5
Pedestrian	1	0
TOTAL	234	72
Personal Injury Accidents	40	14
Fatalities	0	0

1, 1962. The accidents for both the "before" and "after" periods were classified into types as shown in Table 13.

A comparison of the "before" and "after" accident data showed a 69% reduction in total accidents and a corresponding reduction in the accident cost. In numerical values, total accidents decreased from 234 to 72 and property damage decreased from \$50,161.00 to \$17,508.50. Also personal injury accidents were reduced from 40 to 14.

In the analysis of accidents by type, it was noted that significant decreases occurred in all types except the fixed-object accident. This type increased from 2 to 5 for the "after" period. This increase is attributable to the installation of a median in most cases; however, the overall effect of a median was to reduce accidents. The large reduction in rear-end type accidents is attributable to a great extent to the provision of added left-turn lanes to remove slowing or waiting traffic from the through lane. Also, the reduction in head-on collisions from 3 to 0 is directly attributable to the addition of a median. The decrease in sideswipe and right-angle type collisions on the other hand are due primarily to improvement of the facility, rather than specifically to the introduction of a median.

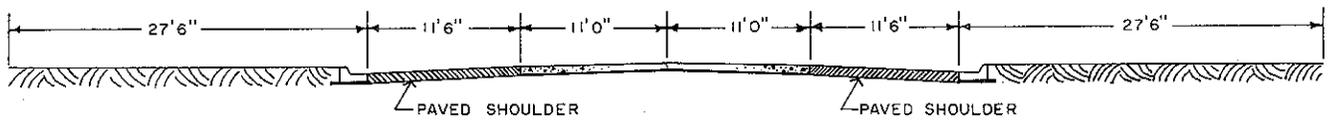
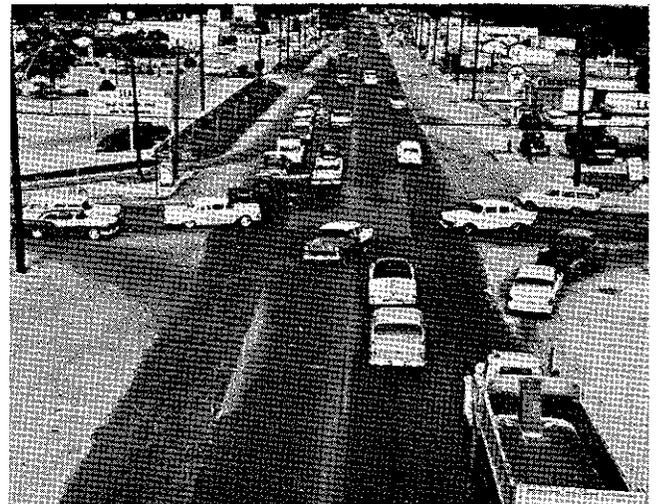
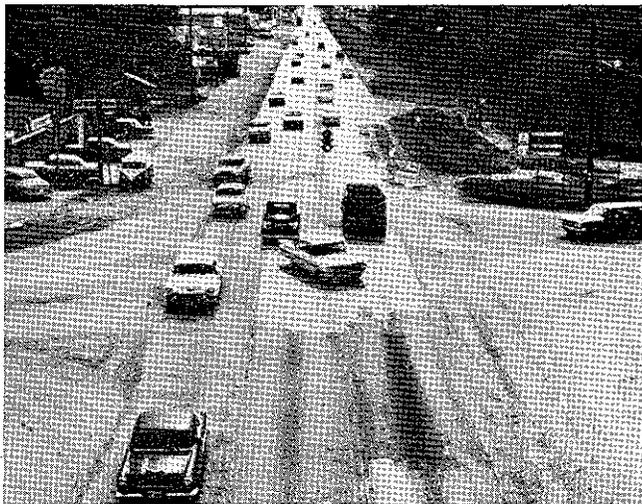
OPERATIONS STUDIES

Motion picture studies of selected areas on Loop 13 were conducted to investigate the extent to which improper maneuvers were occurring during the "before" period. This study indicated that very few maneuvers on the facility could actually be classified as irregular. These findings are completely different to the results of similar studies in Baytown and Pleasanton. In comparison, the greatest number of irregular maneuvers was observed in Pleasanton, the smaller town; however, a substantial number of irregular maneuvers were observed in Baytown, the medium-sized city. Correspondingly, traffic volumes were lower in Pleasanton (approx. 4,000) and Baytown (approx. 10,000) than in San Antonio (approx. 20,000). There appears to be a general correlation of irregular driving habits with the size of the city and with traffic volumes on the major facility.

There were essentially no irregular movements observed during the "after" period and the number of U-turns at the median openings was proportionately less than observed at the other two study locations. It would appear also that the number of U-turns or, in general, the number of maneuvers on a major arterial are inversely related to the city size and to the traffic volumes on the facility.

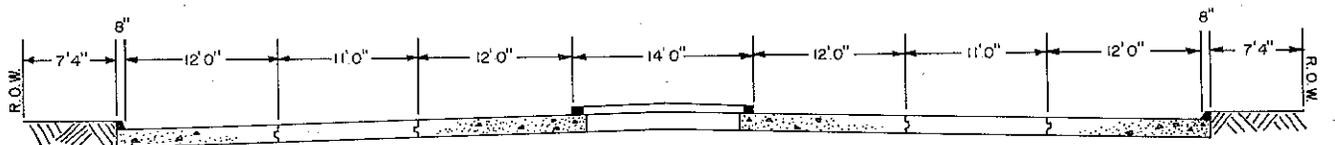
TRAVEL TIME STUDIES

Travel time studies were conducted in order to obtain a measure of the level of service provided by the facility both during the "before" and "after" periods. The travel time data were obtained by the "average-car method" in which a vehicle was driven through the study section at the average speed of traffic. Travel time runs to record speed and delay for both the "before" and "after" studies were conducted during three periods: the morning peak period from 6:45 to 8:00 a.m., the morning off-peak period from 9:10 to 9:40 a.m. and the afternoon peak from 4:15 to 5:30 p.m. The control sections used in the studies were as shown in Figure 19.



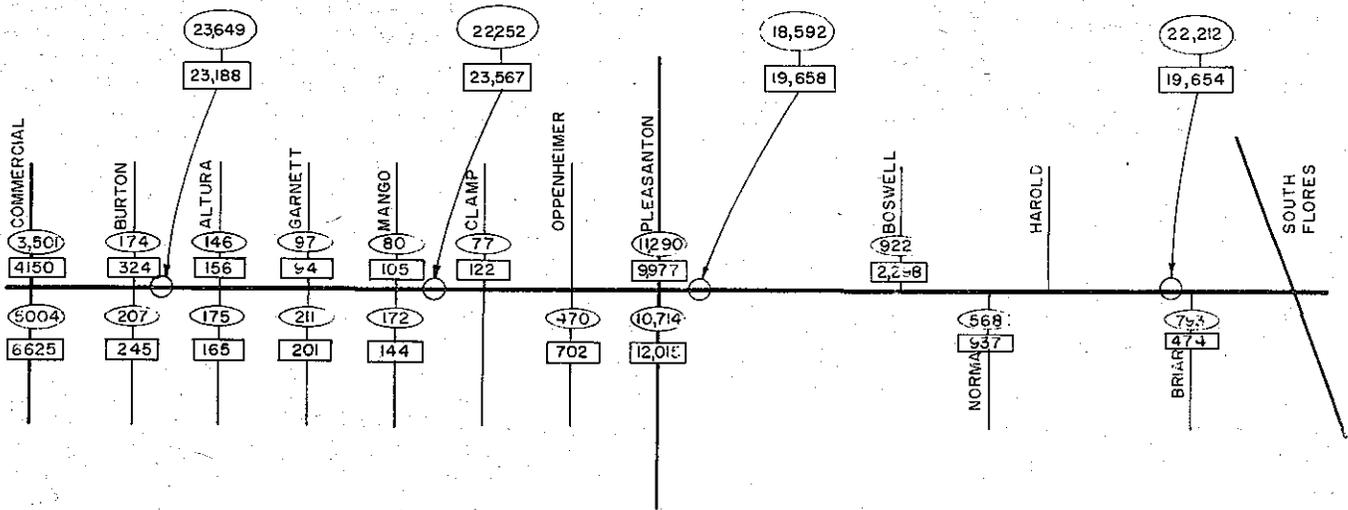
TYPICAL "BEFORE" SECTION
SAN ANTONIO STUDY

Figure 15.



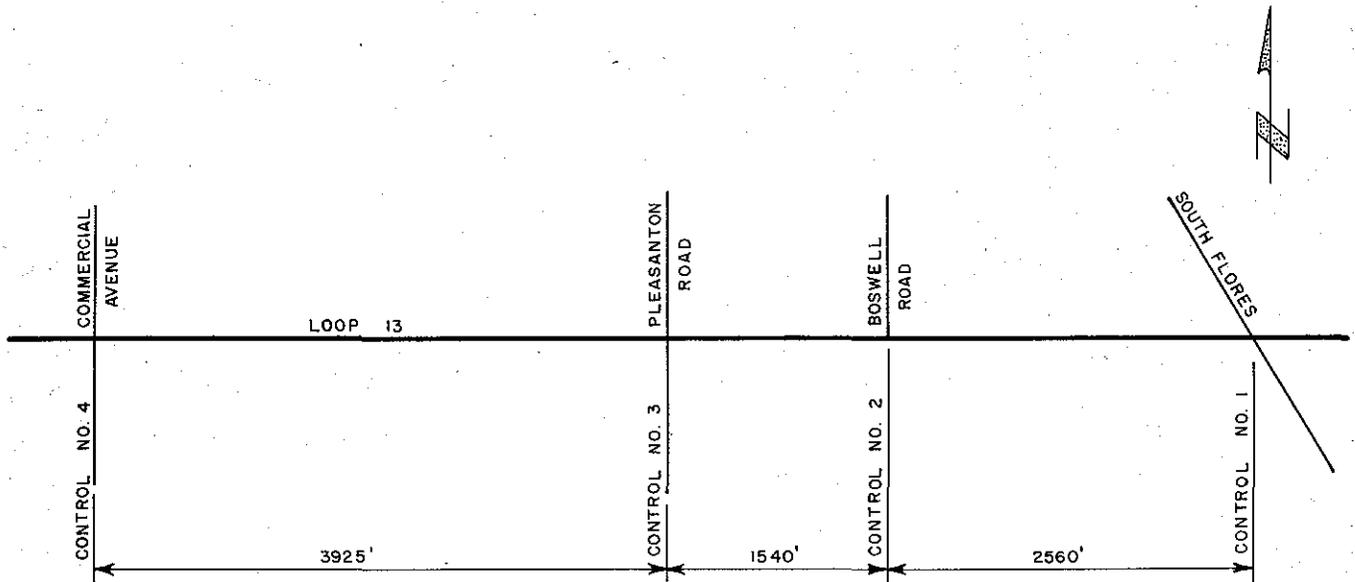
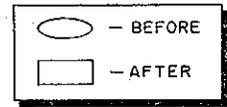
TYPICAL "AFTER" SECTION
SAN ANTONIO STUDY

Figure 17.



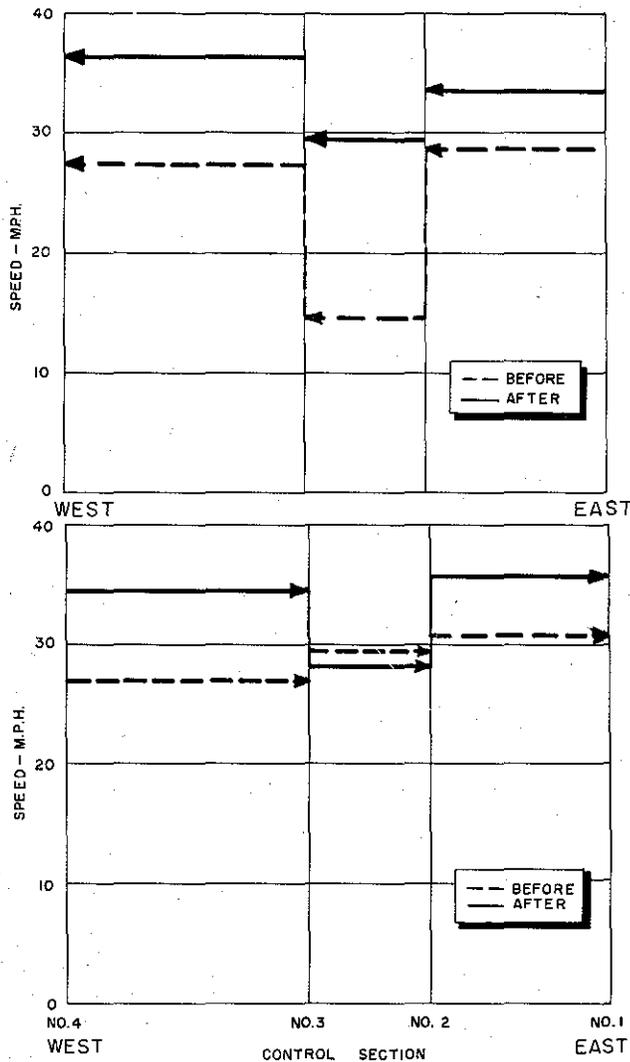
**TRAFFIC VOLUMES
SAN ANTONIO STUDY**

Figure 18.



**SAN ANTONIO STUDY
CONTROL SECTION FOR TRAVEL SPEED STUDY**

Figure 19.



**SAN ANTONIO STUDY
TRAVEL SPEEDS**

Figure 20.

Figure 20 shows a plot of the "before" and "after" travel speeds for both directions of travel. Travel speeds were increased in all but one of the control sections and the slower travel speed in this one section was attributed to traffic signals rather than changes in the design of the facility. The increases ranged from one to seven miles per hour. The improvement cannot be attributed wholly to the introduction of the median; however, providing added left-turn lanes played a major part in increasing the capacity of the facility and thus decreasing the congestion which caused delays and slower speeds during the "before" period.

Delays in the "before" period were due to congestion and signalization. There was a slight increase in total delay during the "after" period but this delay was due to additional signalization rather than congestion as noted during the "before" period. Also, an officer-controlled school crossing zone near Commercial Avenue contributed greatly to the delay during the "after" study.

Appendix A

Table 14
TEST OF HYPOTHESIS OF NO. DIFFERENCE
BETWEEN STUDY AND CONTROL FIRMS

Sales of Study Firms		Sales of Control Firms	
X ₁	X ₁ ²	X ²	X ₂ ²
1,374	1,887,876	1,111	1,234,321
989	978,121	695	483,025
470	2,200,900	1,150	1,322,500
891	793,881	582	338,724
998	996,004	1,511	2,283,121
96	9,216	343	117,649
40	1,600	127	16,129
99	9,801	109	11,881
98	9,604	72	5,184
80	6,400	40	1,600
165	27,225	192	36,864
2,302	5,529,204	2,342	5,484,964
12	144	17	289
77	5,929	63	3,969
127	16,129	81	6,561
19	361	36	1,296
24	576	36	1,296
13	169	26	676
14	196	18	324
24	576	53	2,809
15	225	12	144
160	25,600	210	44,100
72	5,184	250	62,500
332	110,224	340	115,600
315	99,225	339	114,921
267	71,289	262	68,644
75	5,625	80	6,400
50	2,500	309	95,481
95	9,025	256	65,536
40	1,600	149	22,201
X 9,333		10,811	
X²	12,804,409		11,948,709

$$\Sigma X_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N} = 12,804,409.0 - \frac{2,903,496.3}{9,900,912.7} =$$

$$\Sigma X_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N} = 11,948,709 - \frac{3,895,924}{8,052,785} =$$

$$S_1^2 = \frac{\Sigma X_1^2}{N_1 - 1} = \frac{9,900,912.7}{29} = 341,410.8$$

$$S_2^2 = \frac{\Sigma X_2^2}{N_2 - 1} = \frac{8,052,785}{29} = 277,682.2$$

$$S_d = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2} + \frac{S^2}{N^2}} = \sqrt{\frac{341,410.8}{30} + \frac{277,682.2}{30}} = \sqrt{20,636.5} = 143.654$$

$$\bar{d} = \bar{X}_1 - \bar{X}_2 = 311.1 - 360.4 = -49.3$$

$$t = \frac{\bar{d}}{S_d} = \frac{-49.3}{143.65} = .343 \text{ NS}$$

Table 15
TEST OF HYPOTHESIS OF NO DIFFERENCE BE-
TWEEN PERSONAL SERVICES IN STUDY AREA
AND THEIR CONTROLS

X ₁	X ₁ ²	X ₂	X ₂ ²
13	169	26	676
14	196	18	324
24	576	53	2809
15	225	12	144
ΣX	66	109	3953
ΣX²		1166	

$$\Sigma X_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N} = 1166 - \frac{1089}{3} = 77.0$$

$$\Sigma X_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N} = 3953.0 - \frac{2970.3}{3} = 982.7$$

$$S_1^2 = \frac{\Sigma X_1^2}{N_1 - 1} = \frac{77}{3} = 25.7$$

$$S_2^2 = \frac{\Sigma X_2^2}{N_2 - 1} = \frac{982.7}{3} = 327.6$$

$$S_d = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}} = \sqrt{\frac{25.7}{4} + \frac{327.6}{4}} = \sqrt{88.3} = 9.4$$

$$\bar{d} = \bar{X}_1 - \bar{X}_2 = 16.5 - 27.3 = -10.8$$

$$t = \frac{\bar{d}}{S_d} = \frac{-10.8}{9.4} = -1.149 \text{ NS}$$

Table 16
TEST HYPOTHESIS OF NO. DIFFERENCE BETWEEN
HARDWARE AND FURNITURE STUDY GROUP AND
THEIR CONTROL

X ₁	X ₁ ²	X ₂	X ₂ ²
160	25,600	210	44,100
72	5,184	250	62,500
332	110,224	340	115,600
315	99,225	339	114,921
267	71,289	262	68,644
X	1,146	1401	
X²		311,522	405,765

$$\Sigma X_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N} = 311,522 - \frac{262,663.2}{4} = 48,858.8$$

$$\Sigma X_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N} = 405,765 - \frac{392,560.2}{4} = 13,204.8$$

$$S_1^2 = \frac{\Sigma X_1^2}{N_1 - 1} = \frac{48,858.8}{4} = 12,214.7$$

$$S_2^2 = \frac{\Sigma X_2^2}{N_2 - 1} = \frac{13,204.8}{4} = 3,301.2$$

$$S_d = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}} = \sqrt{\frac{12,214.7}{5} + \frac{3,301.2}{5}} = \sqrt{3103.1} = 55.70$$

$$\bar{d} = \bar{X}_1 - \bar{X}_2 = 229.2 - 280.2 = -51.0$$

$$t = \frac{\bar{d}}{S_d} = \frac{-51.0}{55.70} = -.915 \text{ NS}$$

Table 17
TEST OF HYPOTHESIS OF NO. DIFFERENCES BETWEEN AUTO BUSINESSES IN STUDY AREA AND THEIR CONTROLS

X_1	X_1^2	X_2	X_2^2
1374	1,887,876	1111	1,234,321
989	978,121	695	483,025
470	2,200,900	1150	1,322,500
891	793,881	582	338,724
993	996,004	1511	2,283,121
96	9,216	343	117,649
40	1,600	127	16,129
ΣX	4858	5519	
ΣX^2	6,867,598		5,795,469

$$\Sigma x_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N} = 6,867,598 - \frac{23,600,164}{7} = 3,496,146.0$$

$$\Sigma x_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N} = 5,795,469 - \frac{30,459,361}{7} = 1,444,131.7$$

$$S_1^2 = \frac{\Sigma x_1^2}{N_1 - 1} = \frac{3,496,146.0}{6} = 582,691.0$$

$$S_2^2 = \frac{\Sigma x_2^2}{N_2 - 1} = \frac{1,444,131.7}{6} = 240,688.6$$

$$S_d = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}} = \sqrt{\frac{582,691.0}{7} + \frac{240,688.6}{7}} = 342.96$$

$$\bar{d} = \bar{x}_1 - \bar{x}_2 = \frac{694.0}{7} - \frac{788.4}{7} = -94.4$$

$$t = \frac{\bar{d}}{S_d} = \frac{-94.4}{342.96} = -.275 \text{ NS}$$

Table 19
TEST OF HYPOTHESIS OF NO. DIFFERENCE BETWEEN FOOD SERVICES IN STUDY AREA AND THEIR CONTROLS

X_1	X_1^2	X_2	X_2^2
2302	5,529,204	2342	5,484,964
12	144	17	289
77	5,929	63	3,969
127	16,129	81	6,561
19	361	36	1,296
24	576	36	1,296
ΣX	2561	2575	
ΣX^2	5,552,343		5,498,375

$$\Sigma x_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N} = 5,552,343 - \frac{1,093,118.7}{7} = 4,459,224.3$$

$$\Sigma x_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N} = 5,498,375 - \frac{1,105,104.2}{7} = 4,393,270.8$$

$$S_1^2 = \frac{\Sigma x_1^2}{N_1 - 1} = \frac{4,459,224.3}{5} = 891,844.9$$

$$S_2^2 = \frac{\Sigma x_2^2}{N_2 - 1} = \frac{4,393,270.8}{5} = 878,654.2$$

$$S_d = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}} = \sqrt{\frac{891,844.9}{6} + \frac{878,654.2}{6}} = 543.215$$

$$\bar{d} = \bar{X}_1 - \bar{X}_2 = \frac{426.8}{5} - \frac{429.1}{5} = -2.3$$

$$t = \frac{\bar{d}}{S_d} = \frac{-2.3}{543.215} = -.00004 \text{ NS}$$

Table 18
TEST OF HYPOTHESIS OF NO. DIFFERENCE BETWEEN SERVICE STATIONS IN STUDY AREA AND THEIR CONTROLS

X_1	X_1^2	X_2	X_2^2
99	9801	109	11881
98	9604	72	5184
80	6400	40	1600
165	27225	192	36864
ΣX	442	413	
ΣX^2	53030		55529

$$\Sigma x_1^2 = \Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N} = 53030 - \frac{195,364}{4} = 4189$$

$$\Sigma x_2^2 = \Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N} = 55529 - \frac{170,569}{4} = 12,886.7$$

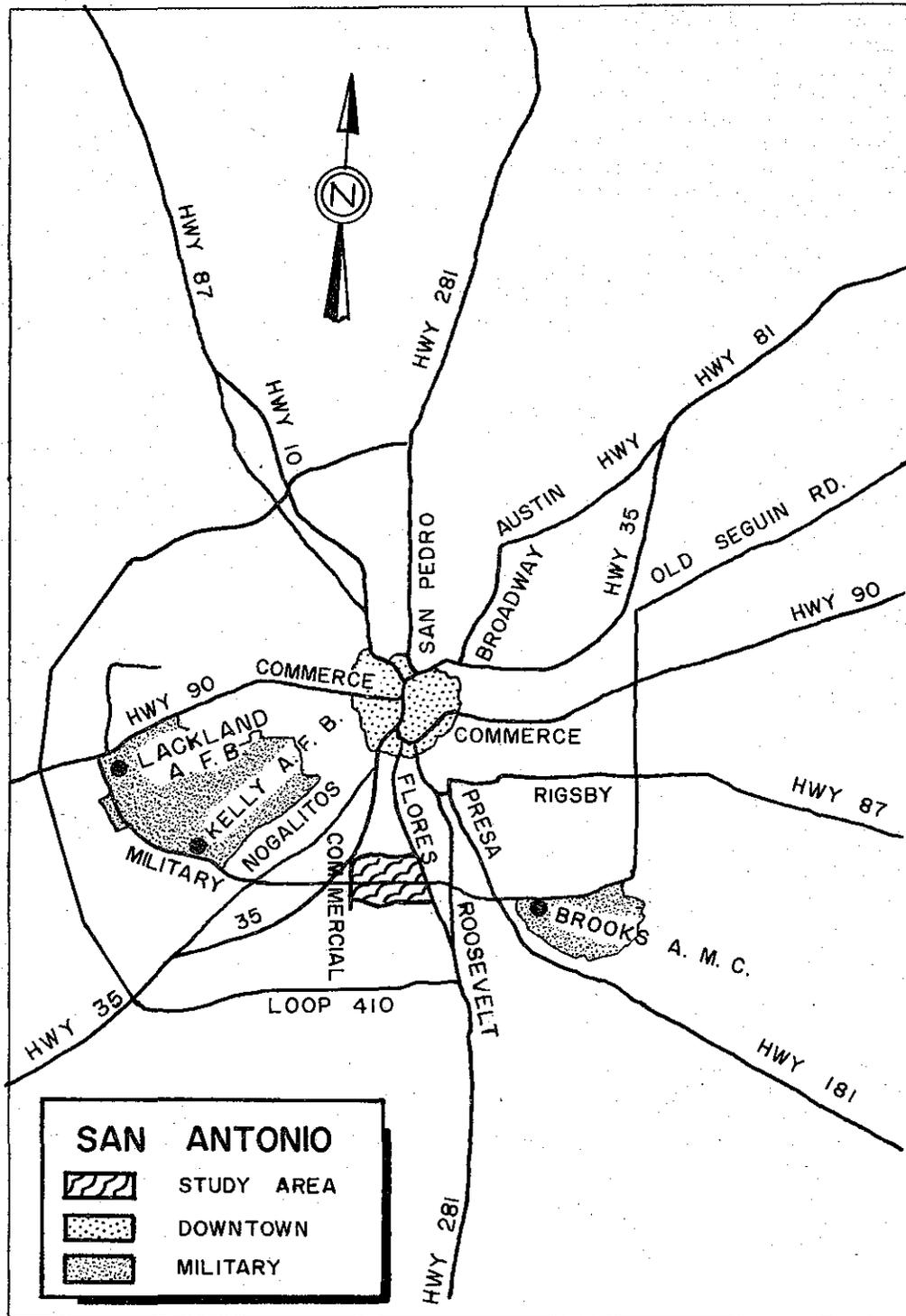
$$S_1^2 = \frac{\Sigma x_1^2}{N_1 - 1} = \frac{4189.0}{3} = 1396.3$$

$$S_2^2 = \frac{\Sigma x_2^2}{N_2 - 1} = \frac{12,886.7}{3} = 4295.6$$

$$S_d = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}} = \sqrt{\frac{1396.3}{4} + \frac{4295.6}{4}} = 37.73$$

$$\bar{d} = \bar{X}_1 - \bar{X}_2 = \frac{110.5}{4} - \frac{103.3}{4} = 7.2$$

$$t = \frac{\bar{d}}{S_d} = \frac{7.2}{37.73} = +.191 \text{ NS}$$



MAPS OF MAJOR STREETS SHOWING MILITARY INSTALLATIONS AND STUDY AREA

Figure 1.

major U. S. highways coming into San Antonio. In 1960 the city freeway section of Interstate 35 was opened from Southwest Military Drive to Broadway on the north side of the downtown area. Then in 1962 the section from Broadway on the north side of the downtown area resulted. Then in 1962 the section from Broadway to the northeast intersection with Loop 13 was completed, permitting traffic to travel from southwest San Antonio to the northeast without a stop. When this facility was opened to traffic people could use it rather than Loop 13 which then became the longer and slower route due to the numerous traffic lights.

In 1959 the daily traffic averaged around 20,000 vehicles a day. About 30% of this traffic or around 6,500 vehicles, used the street during the peak traffic hours. In this case the peak hours were from six to nine in the mornings and from four to seven in the evening.

The study area between South Flores and Commercial Streets had both retail and residential areas abutting Southwest Military Drive. The western portion, from Clamp Street west, was practically all residential property in 1959. However, there were three businesses located at Commercial Street and Southwest Military Drive, the most western point of the study area. The area from Clamp Street east to Boswell was all retail in 1959. See Figure 14 for detail on street layouts. Then on the north side of Southwest Military Drive from Boswell Street to South Flores Street, the abutting property in 1959 consisted of one block of vacant property, with the remainder devoted to a government housing area. The vacant lot was developed into a shopping center in 1963. By the end of 1963 the center was approximately 2/3 occupied with seven or eight businesses in operation. Since then another four or five firms have begun operation so that the center is now fully occupied.

During the duration of the study period, 1959 through 1963, there appeared to be a trend toward converting residential properties in the western portion of the area into small businesses. This trend was accelerated and became more noticeable after the new street was completed. Some of the homes in the area have been converted into used car lots, real estate offices, insurance offices and, in some cases, garages have been converted to small shops of various kinds. The area is still zoned residential but people in the area believe that in a short time (one or two years) developers will buy up groups of the homes and develop the land into high type commercial property. It appears that the area will eventually have complete commercial zoning, and new businesses will be established within this section.

SELECTION OF STUDY AREA AND CONTROL BUSINESSES

The same procedure or steps were used in this study as had previously been developed in the Baytown and Pleasanton areas. First, inventory was made of all businesses in the study area, and their locations were plotted on a strip map of the area. The businesses were then classified and grouped according to the particular characteristics of their operation. Since the study was confined to retail firms, those businesses such as insurance companies and real estate offices were omitted from the study group since their operations were not considered to be characteristic of general retail businesses.

Control firms were then selected in order to minimize the influence of external factors, such as the general economic conditions in the city caused by an area wide recession or boom which would affect all businesses in the city.

In the selection of the control firms, each firm was selected on the basis of its similarity to the study area firm that it was to control. This is necessary in order to assure that the controls were truly representative of study area firms. Special attention was given to the location of these firms as to the type of street on which they were located and the general economic conditions of their particular section of San Antonio. No control businesses were picked from areas that had plans for street improvement which would affect sales of businesses along the route while the improvement program was underway. Officials of both the district office of the Texas Highway Department and the city of San Antonio offered valuable assistance in the selections of comparable areas from which control firms could be chosen. However, the actual selection was done by study team staff members.

Within the study area there were about 15 businesses that were members of multifirm or chain store operations. All controls for these businesses were selected from the same chain group. In dealing with these chain stores, the managers of the study area firms were most helpful in the selection of the particular firm to be used as a control. This cooperation of the managers was especially desirable when soliciting the cooperation of the control firm. In a number of cases the headquarters or main office in San Antonio was able to furnish the interviewer with the desired data for both study and control firm.

Individual controls for each of the other businesses were selected on the basis of similarity to the study area firm in size, location, and type of operation.

After the control firms were selected, each was personally contacted and his cooperation as a participant in the study was sought. If a firm preferred not to participate in the study a preselected alternate business was chosen. Figure 2 shows the general location of each control firm in San Antonio that furnished sales information for years 1959 through 1963.

TESTING OF CONTROL AND STUDY FIRMS

In order to determine whether the control firms were statistically comparable to the study firms, these two groups of firms were subjected to the student "t" test. This is a simple statistical test used to determine whether the selected control firms are truly representative of or taken from the same parent population as the study group. Since sales volumes are the accepted measure of comparability, variations both above and below the means of each group of firms are of interest; consequently the two-tailed "t" test was found to be the appropriate measure.

In using the "t" test, a confidence level is chosen and the value of "t" is computed and compared to the values shown in a published table showing significant "t" values for different sample sizes. A computed "t" value larger than the one shown at the desired confidence level causes a rejection of the null hypothesis of no difference or indicates that there is a significant difference between

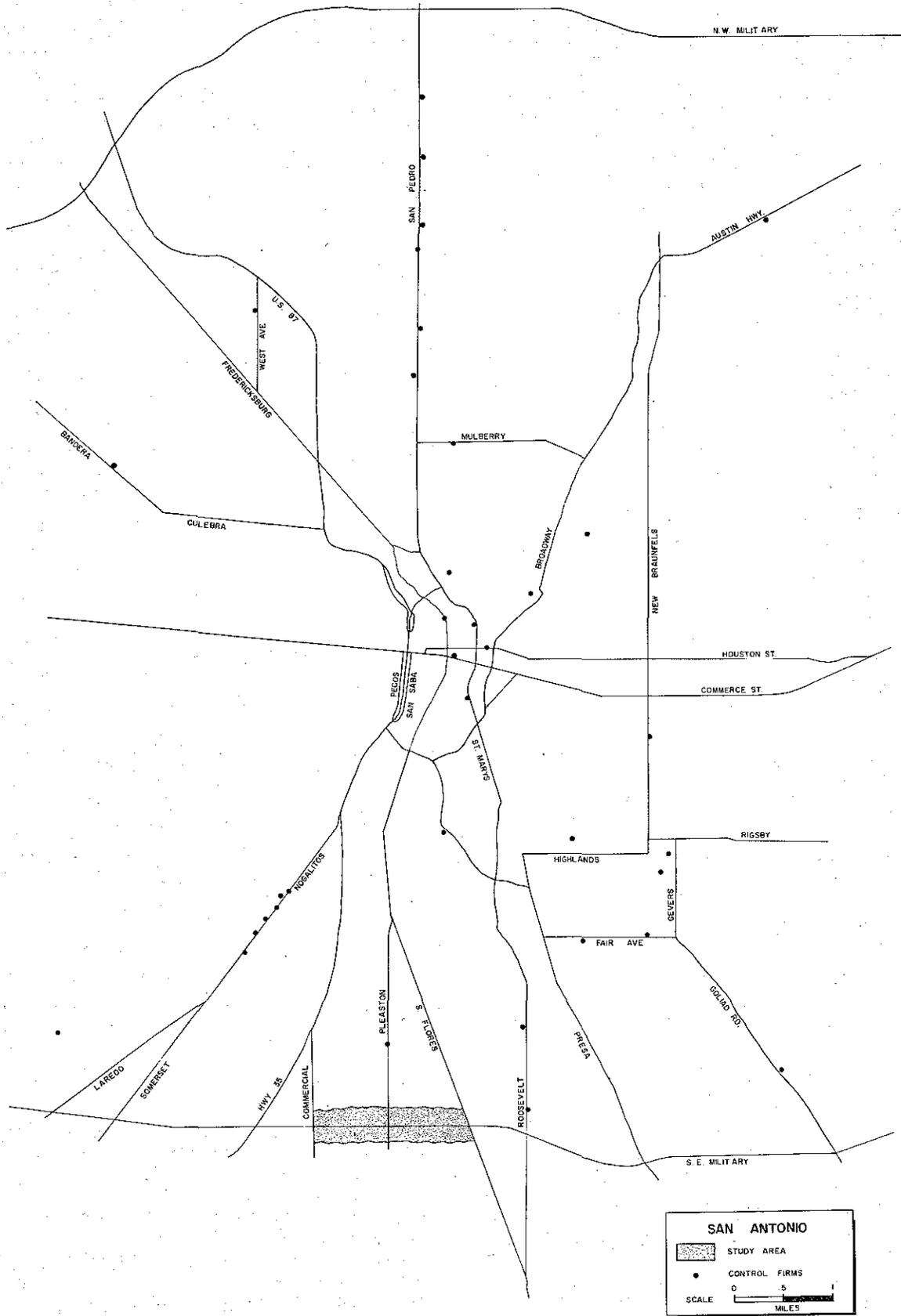


Figure 2.

Table 1

BUSINESS BY TYPE AND RECORD OF FIRM PARTICIPATION IN THE SAN ANTONIO MEDIAN STUDY ("X" REPRESENTS YEARS FIRMS PARTICIPATED)

	1959	1962	1963
Food Service Group			
Drive-In Restaurant ⁹	X	X	X
Snack Bar ¹¹	X	X	X
Grocery	X	X	X
Drive-In Grocery	X	X	X
Restaurant ¹⁴	X	X	X
Restaurant ¹⁴	X	X	X
Restaurant ¹⁴	X	X	X
Milk & Grocery ^{2,4}	X		X
Grocery ³	X	X	X
Drive-In Restaurant ¹			
Automotive Group			
Auto Sales ⁶	X	X	X
Auto Sales ⁶	X	X	X
Auto Sales	X	X	X
Truck Sales	X	X	X
Trailer Sales	X	X	X
Truck Motor Sales	X	X	X
Auto Parts	X	X	X
Auto Parts ^{4,5}	X	X	X
Auto Sales ⁷	X	X	X
Auto Sales ⁸	X	X	X
Service Station Group			
Major Brand Station	X	X	X
Major Brand Station	X	X	X
Major Brand Station	X	X	X
Independent Station ¹⁵	X	X	X
Hardware-Appliance-Furniture			
Furniture ⁶	X	X	X
Appliance Sales	X	X	X
Appliance Auto Accessories	X	X	X
Appliance Auto Accessories	X	X	X
TV & Radio ¹²	X	X	X
Paint Sales ⁸		X	X
Appliance Sales ⁹			X
Paint Sales ⁹			X
Personal Service			
Beauty Shop	X	X	X
Beauty Shop ¹³	X	X	X
Beauty Shop	X	X	X
Barber Shop			
Barber Shop			
Dry Cleaners	X	X	X
Beauty Shop ⁹			X
Miscellaneous Retail			
Drug ³	X	X	X
Jewelry ¹¹	X	X	X
Apparel	X	X	X
Liquor ¹	X	X	X
Drug Store ^{5,14}	X		
Shoe Store ⁶		X	X
Loan & Appliance ⁸		X	X
Shoe Store ⁵		X	X
Dry Goods ⁹			X
Film & Development ⁹			X
Clothing Store ²	X		
General Merchandise ³	X	X	X
Shoe Store ³	X	X	X
Jewelry ²	X		
Apparel ¹			
Dry Goods ¹			
Liquor ¹			
Dress Shops ¹			
Sporting Goods ¹			
TV & Radio ¹			

¹Would not cooperate in study.

²Cooperative in 1959—non cooperated thereafter—not included in study.

³Furnished only percentage increase or decrease in sales from base period 1959.

⁴Closed during 1962.

⁵Closed during 1960.

⁶Began operations in 1959.

⁷Began operations in 1961.

⁸Began operations in 1962.

⁹Began operations in 1963.

¹⁰Changed owners and name of business in 1959, changed name again in 1963.

¹¹Changed owners in 1960.

¹²Changed owners in 1962.

¹³Changed locations within study area.

¹⁴Changed to another type of business in 1960.

¹⁵Changed brands of gasoline—1962.

the two groups of data. In this study, the confidence level was set at "t" = .05, or at the 95 percent level of probability. In other words, a significant "t" value would mean that in less than 5 percent of the cases could a value of "t" larger than the theoretical value as shown in the published tables be due to chance alone. A smaller computed "t" value would indicate that such a difference could not be shown.

Rather than show a detailed calculation of the "t" test on each of the six groups of businesses and their controls, only the results will be shown in the text. An example of the detailed calculation used for each type of business is placed in the appendix.

Listed below are the six retail groupings with the number of firms in each group and the value of "t" for each one of the groups.

Type of Business	Number of Firms	Computed Value of "t"	Max. Limits of "t" Value*
Auto	7	-.275	2.447
Service Station	4	+.191	3.187
Food Services	6	-.000*	2.571
Hardware & Furniture	5	-.915	2.776
Personal Services	4	-1.149	3.182
Mis. Retail	4	-2.513	3.182

*When interpreting the results, larger computed "t" values would indicate a significant difference between the means of the two groups.

According to the results of this test on the above six groupings of retail firms, we can accept the working hypothesis that there are no significant differences between the study and control firms and that the selected control firms are truly representative of those included in the study.

Business Interviews

In the early part of 1960 the manager or owner of each firm in both the study and control area was personally interviewed. In the interviews with each business, information was obtained regarding the history of operation and management, and conditions of the building in which it was located. Additional information was gathered from study area firms relative to parking spaces available to customers before the construction of the new facility. The main purpose of the interview, however, was to persuade the manager or owner of each business to furnish an accurate record of sales for each of the years represented in this study.

In the first round of personal interviews eight firms preferred not to reveal sales data on their operations. However, three of these firms did agree to keep records on their sales and furnish information showing the trend of sales for the years covered in this study.

A picture of firm tenure and cooperation is shown in Table 1. Each firm's record of participation in the study is designated by an "X" under the years in which that particular firm furnished sales data. The footnotes are used to explain certain characteristics pertaining to the operation of individual firms during the study. In this table the firms were classified into 7 major groupings based on the Standard Industrial Classification Index of retail firms. These groupings will be used throughout the study in order to permit more detailed comparisons of the business activity by types of retail business.

Business Analysis

At the initiation of this study there were 53 firms located in the selected area along Southwest Military Drive. Three of these firms were not used in the study due to the nature of their business. These were two optical sales firms and a real estate insurance firm. The remaining 50 firms were all contacted and interviewed by 1960. Most of the firms were very cooperative. However, 8 of the 50 firms interviewed would not cooperate in the study as they felt it was not to the best interest of their firms to reveal gross sales volumes. Four firms preferred to participate only to the extent of furnishing a percentage increase or decrease in their sales from the base year, 1959. Three of the firms cooperating in their first interview refused to cooperate later; therefore, the sales of these firms were not included in the study.

The analysis of the economic influence of a median upon adjacent businesses is based on sales from 34 firms in the "before" period. The sales of new businesses locating in the study area and beginning operation after 1959 were also included in a separate part of the study. In fact, there were 13 additional businesses that began operation sometime after 1959. Eleven of these firms were cooperative in supplying sales volume for their periods

of operation. This increase of 13 businesses was largely the result of the development in 1963 of a vacant block on the north side of Southwest Military into the LaFeria Shopping Center. Businesses began occupying the center during the summer months and by December 1963 about 75 percent of the center was occupied. By the spring of 1964 the center was fully occupied. The activities of these firms, not fully reflected in this study, will give a substantial boost to the area's economy during the next few years.

The time periods for this study differ somewhat from the Baytown and Pleasanton Studies. In those areas, three consecutive years were used to cover the "before," "during" and "after" periods. In this area 1959 was selected as the year to represent the period before construction. The city of San Antonio and Texas Highway Department were delayed in the construction of the new street because of problems encountered in the relocation of utilities. The actual construction—the tearing up of the old pavement and rebuilding of the street occurred during 1962. This meant that 1962 was the real construction period, and that 1963, the 12-month period following completion of the facility, became the "after" period.

It is difficult to compare sales volumes of businesses between periods unless each period covers the same length of time. Therefore, the 1960 and 1961 gross sales of study and control firms will be used only to show the trend of sales during the five-year period. They will not be included in major tables in which the gross sales of the three periods are compared to show the effect that the median has had on businesses located along the new route.

Continuous Operation

The first method of comparison is shown in Table 2. This is a comparison of only those firms that were in

Table 2
TOTAL SALES OF ALL FIRMS THAT WERE IN OPERATION AT BOTH THE BEGINNING AND ENDING OF STUDY PERIOD

Type of Business and Number	Before Period		During Period			After Period		
		Base Sales	Sales	Change from Base Period	Percent Change	Sales	Change from Base Period	Percent Change
		(Dollars)	(Dollars)	(Dollars)	(Percent)	(Dollars)	(Dollars)	(Percent)
STUDY GROUP								
Auto and Auto Parts ¹	(7)	5,281,780	5,803,049	+ 521,269	+ 9.9	6,302,335	+1,020,556	+19.3
Service Station	(4)	440,925	353,177	- 87,748	-19.9	346,066	- 94,859	-21.5
Food Service ²	(5)	2,624,979	1,416,766	-1,208,213	-46.2	1,951,765	- 673,214	-25.6
Furniture, Hdw. and App. ¹	(5)	1,961,423	1,839,338	- 122,085	- 6.2	1,731,783	- 229,640	-11.7
Personal Services	(6)	90,651	61,847	- 28,804	-31.8	55,295	- 35,356	-39.0
Other Retail ²	(3)	444,764	475,115	+ 30,351	+ 6.8	466,363	+ 21,599	+ 4.8
TOTAL	(30)	10,844,522	9,949,292	- 895,230	- 8.2	10,853,608	+ 9,086	+ 0.1
CONTROL GROUP								
Auto Parts ¹	(8)	5,813,514	5,270,353	- 543,161	- 9.3	5,667,515	- 145,999	- 2.5
Service Station	(4)	412,821	393,433	- 19,388	- 4.7	395,935	- 16,866	- 4.1
Food Service ¹	(6)	2,629,013	2,299,387	- 329,626	-12.5	2,220,833	- 408,180	-15.5
Furniture, Hdw. and App. ¹	(4)	2,499,370	2,410,708	- 88,662	- 3.5	2,313,755	- 185,615	- 7.4
Personal Services	(4)	108,305	95,027	- 13,278	-12.3	96,120	- 12,185	-11.2
Other Retail ²	(4)	1,758,765	1,603,812	- 154,953	- 8.8	1,719,385	- 39,380	- 2.2
TOTAL	(30)	13,201,788	12,072,720	-1,129,068	- 8.5	12,413,543	- 788,425	- 6.0

¹Includes 1960 sales as the base for one firm beginning operation in 1959.
²Includes 1960 sales as the base for two firms beginning operation in 1959.



Small residence converted into a beauty shop.

operation at both the beginning and the end of the study. The data presented here cover 30 study area businesses and their controls, divided into six general industry groups. Some minor part of the fluctuation in sales occurring within certain types of businesses during these years may be attributed to various reasons other than the street construction. Such changes as management, new products being added, increased competition, changing name of business, and changing business ownership are some of the additional factors affecting sales volumes of firms in the study and control group of businesses.

During the years of observation the study area businesses showed less than one percent increase in sales while the control group had a combined loss of six percent. Each group of businesses in the control area reported a drop in sales ranging from a two percent decrease for the miscellaneous retail group, to a 15.5 percent decrease for the food services group.

Had it not been for the million-dollar increase in sales experienced by the auto sales firms, all study area businesses would have shown a combined loss equal to or larger than that experienced by all control firms. Even within this group, business changes were not consistent between firms. Those firms selling only automobiles appeared to be affected according to their location with respect to cross streets. Those located at through street corners appeared to be enhanced while those located in the center of a block were adversely affected.

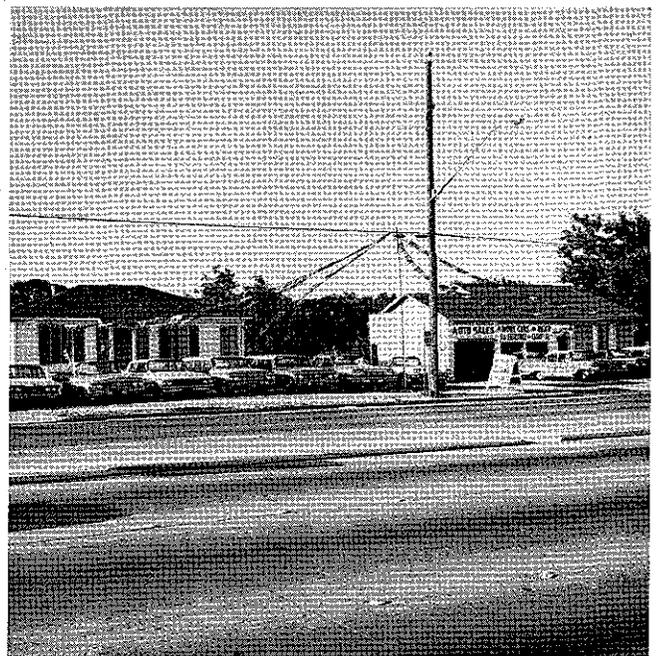
Of all the study area groups, only the automotive and "other retail" groups showed increases in sales during both the "construction" period and the 12 months following completion of the new facility. The construction process appeared to be most detrimental to the food service group, as they had the largest decline in sales of any industry group. Their sales did pick up in the "after" period, but were still 25 percent below the 1959 level. Interviews with these firms did not reveal any internal problems which might have caused the drop in sales. However, one external factor of significance to the food

group, as well as all others in the study area, was the increased competition generated by the development of a new shopping center about two miles east of the study area. A number of the operators of study businesses felt that the new shopping center had had an adverse effect on their sales. However, the operators of businesses located away from cross traffic or median openings felt that the added competition had not affected their sales as much as the median, which had eliminated all left turns into and out of their businesses.

When comparing the sales of all businesses, both study and control areas revealed similar trends during the "construction" period. Both areas had a decline in sales of a little over eight percent. In the 12-month period following completion of the facility, the 30 study area businesses recovered a little over eight percent of the sales lost during the construction period compared to the 2.5 percent recovered by the 30 control businesses. Therefore, according to this method of comparison, it can be concluded that those firms that were in operation throughout the study period actually fared somewhat better than their control.

Total Operations

A similar method of comparing the sales of study and control businesses is shown in Table 3. This table compares the sales of all firms which were in operation during any one of the three years. For a picture of the business activity in the whole area this appears to be the most logical method to use, since it shows the total activity in the area rather than just the activity of surviving firms. It does not allow for any new businesses to be included in the control group since the method used in selecting controls was on a one-for-one basis at the initiation of the study. Therefore, with a number of new businesses opening up in the study area, the total sales of study area businesses would naturally be larger as a result of the additional firms. This is clearly point-



Another case of residential property being used as commercial property.

Table 3
TOTAL SALES OF ALL FIRMS THAT WERE IN OPERATION DURING ANY ONE OF THE THREE STUDY PERIODS

Type of Business	Before Period		During Period		After Period	
	Base Sales (Dollars)	Sales (Dollars)	Change from Base Period (Dollars)	Percent Change (Percent)	Change from Base Period (Dollars)	Percent Change (Percent)
Auto and Auto Parts	(8) ¹ 5,321,280 ²	(9) 5,961,049	+ 639,769	+12.0	+ 1,102,446	+20.7
Service Stations	(4) 440,925	(4) 353,177	- 87,748	-19.9	- 94,359	-21.5
Food Services	(6) 2,643,694 ²	(7) 1,509,159	-1,139,535	-43.0	- 611,451	-23.1
Furniture, Hdw. and App.	(5) 1,961,423 ²	(6) 1,874,588	- 86,835	- 4.4	- 123,540	- 6.3
Personal Services	(6) 90,651	(6) 61,847	- 28,804	-31.8	- 26,726	-28.4
Other Retail	(5) 579,974 ²	(7) 761,673	+ 181,699	+31.3	+ 423,569	+73.0
TOTALS	(34) 11,042,947	(39) 10,521,493	- 521,454	- 4.7	+ 670,439	+ 6.1
		CONTROL AREA				
Auto and Auto Parts	(8) 5,813,514 ²	(8) 5,270,353	- 543,161	- 9.3	- 145,999	- 2.5
Service Stations	(4) 412,321	(4) 393,433	- 19,388	- 4.7	- 16,386	- 4.1
Food Services	(6) 2,629,013 ²	(6) 2,299,387	- 329,626	-12.5	- 408,180	-15.5
Furniture, Hdw. and App.	(5) 2,741,820 ²	(5) 2,493,323	- 248,497	- 9.1	- 428,065	-15.6
Personal Services	(4) 108,305	(4) 95,027	- 13,278	-12.3	- 12,185	-11.3
Other Retail	(4) 1,755,765 ²	(4) 1,603,812	- 151,953	- 8.8	- 39,380	- 2.2
TOTALS	(31) 13,464,238	(31) 12,155,335	- 1,308,903	- 9.7	- 1,050,695	- 7.8

¹Numbers in parenthesis represents the number of firms in operation each year.

²1960 was used to represent base period for one firm beginning operation in 1959.

³1960 was used to represent base period for two firms beginning operation in 1959.

ed out in Table 3 which shows 34 businesses in the study area that furnished sales volumes in the base or "before" period, 39 in the "during" or construction period and 41 in the "after" period. The control area had one less in the "after" period as one of the control firms had closed.

During the study period, six study area businesses closed and the buildings in which they were operating were still vacant at the end of 1963. These vacant buildings, many in need of repair or upkeep, tended to detract from the general appearance of the area. Businesses closing up were of the following type: one auto sales, two liquor stores, one barber shop, and two restaurants. These were all small firms, and in some cases the businesses were considered marginal and their buildings old and in need of repair or remodeling. Five of these firms were located quite near the right-of-way and had used city property for customer parking before the street was widened. When the frontage they had been using for parking was taken for the new street and curbs constructed, these businesses were left with practically no customer parking available in front of their buildings. With the installation of curbs and elimination of on-street parking, customers now have to use the entrances or curb openings when approaching a business. In some cases there is only enough space for parallel parking in front of the firm. In addition, for those firms housed in a common building, individual curb openings are not provided to each business. This means that access to a business can be blocked if a customer should stop in the driveway near the entrance to a group of businesses which occupy the same building and share a common curb opening. Remaining firms that were still operating businesses with this type of parking restriction generally felt that they could not continue much longer under these conditions.

The comparison of sales by the method shown in Table 3 did not reveal any major change in the number of business groups experiencing gains and losses. Again the automotive and general retail firms were the only groups of study area businesses experiencing an increase in sales. All other groups in both the study and control area had a sales decrease. On a percentage basis the retail group with a 73 percent gain, experienced the largest increase.

Of those losing business, personal services experienced the largest percentage loss followed by the food service, service station, and furniture, hardware and appliance groups. Of these four losing groups, however, only two service stations, and the combined group of furniture, hardware and appliance continued to decline throughout the "construction" and "after" periods.

A large part of the loss incurred by the service station group probably can be attributed to the changed conditions brought about by construction of the median. Although three of these firms are located at median openings, the concentration of all cross traffic at these points makes it difficult to cross the main street at those intersections that are not signalized. The other station is located in the middle of a block which necessitates a U-turn for opposite lane traffic. One of the stations located at a median opening is faced by a median on the side street also. This means that a customer can approach and leave this firm only by successive right turns.

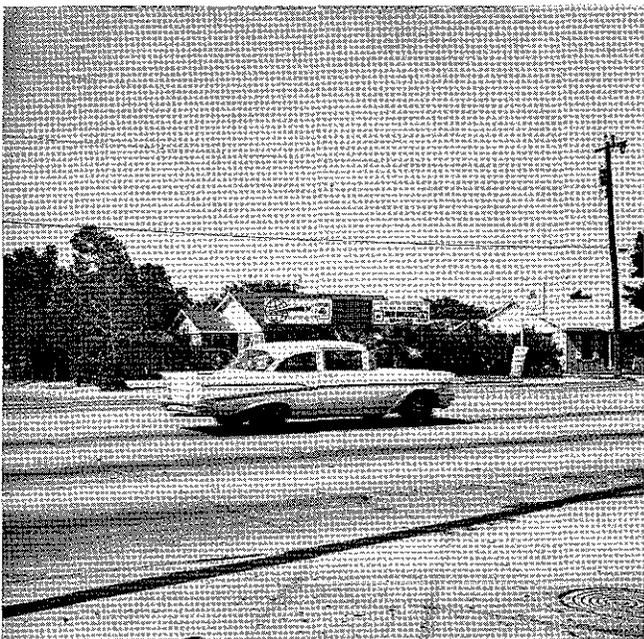
As a group, the operators of the service stations felt that the median was primarily responsible for the



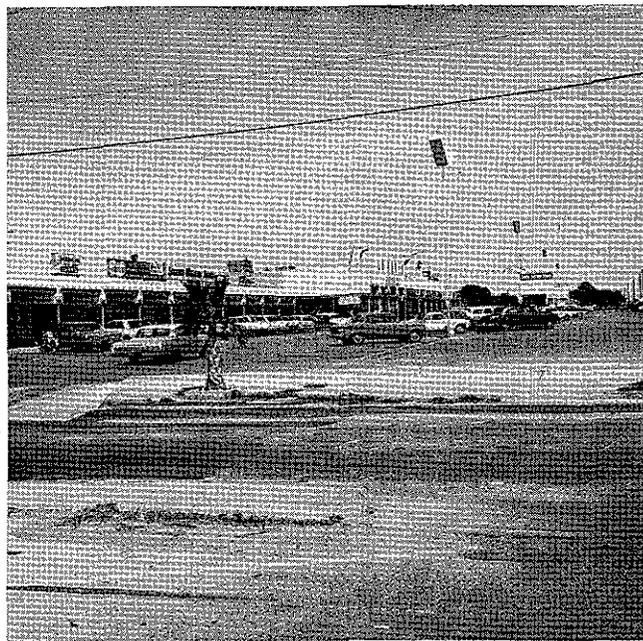
New businesses were established during the construction of the facility.

21.5 percent decrease in their sales from the pre-median period. During this time, the control stations had only 4.1 percent decrease in sales for a net difference of about 17 percent that might be attributed to the median.

In summing up Table 3, it may be concluded that by this method of measurement study area businesses operating under median conditions reported a total sales volume some 14 percent better than their controls. However, it should be remembered that this gain was largely due to the very strong increase in sales by the au-



Dwellings along Southwest Military Drive are being converted to commercial property.



The development of a shopping center in the area in 1963 with 12 firms will boost the economic activity of the area.

tomotive sales group. Of the six groups of firms studied, three performed considerably worse than their controls.

Individual Firm

Another method used in analyzing the effect of the construction of the median on business activity is shown in Tables 4 and 5. Each of these tables represent data on the basis of individual firms; however, to facilitate comparison they are grouped into traffic and nontraffic serving groups.

There are four firms included in Table 4 that did not reveal their actual sales volume, but consented to furnish percentage changes from the base year. The "before" period sales represent the base, where all index numbers equal 100. The name of the firms have been omitted in order to protect the identity of cooperating firms. In order to permit maximum use of firm data, 1960 sales were used as a base for firms beginning operation in 1959. This provides a full year of pre-median sales to represent their base sales level.

These tables present a generally similar picture to that shown in Tables 2 and 3; however, they place more emphasis on the individual business and permit a more concise division into traffic serving and nontraffic serving categories.

There were 27 study area firms classified as non-traffic businesses. These firms, after a full year's operation under median conditions, were operating 3.4 percent above the level of the base period and a net of 9.7 percent above the level of the control area. However, these gains were not all encompassing since 16 of the study area firms showed a loss in sales from base period levels. This means that the other businesses had sufficient gains in business activity to offset the losses and show a net gain for the nontraffic businesses located within the study area. On the other hand, the selected

control group had only five firms operating above their base period level. The automotive and general retail groups were the only categories of firms in the control area that in total were operating near their base period level.

The grocery and personal service groups (which include cleaners, barber shops and beauty shops) appear to have suffered the most in both the study and control areas. In both cases, though, the control businesses were operating substantially above the level of the study firms.

Table 6 presents an index of sales for the traffic serving businesses in both the study and control areas. A comparison of these two tables shows that the study area service stations and restaurants did not fare as well as their respective controls. During the construction period both the study and control firms were operating below the base period level. However, the study area

group operated 20.9 percent below their base compared to a drop of only 1.4 percent for the control firms. The sales of study area businesses continued to decline during the period following construction while the control businesses experienced a 3.4 percent gain and were operating 2 percent above their base level at the end of the study.

According to index of sales shown in Table 6, the study area restaurants were hurt more than the service stations, but both were operating 21.5 percent and 27.2 percent respectively below the level of the base period. This level of operation is considerably lower than that experienced by the control firms. The decline in activity by traffic serving businesses in the study area during the "construction" period is consistent with findings in other cities. However, in this instance, the continued decline in the "after" period is peculiar to this area. Therefore, it appears that traffic serving businesses operating under the influence of a median were definitely affected

Table 4

INDEX OF SALES SHOWING THE EFFECT OF THE CONSTRUCTION OF A MEDIAN ON EACH NON-TRAFFIC SERVING BUSINESS IN THE STUDY AREA
YEAR 1959=100%

Type of Business	Before	During	After
Grocery	100 ¹	85.2 ²	88.3 ¹
	100	50.5	73.8
	100	81.9	95.4
Sub Total ²	100	51.6	74.5
Auto and Auto Parts and Allied Business	100 ¹	90 ¹	75 ¹
	100	117.9	141.3
	100 ³	123.6	134.8
	100	83.4	57.5
	100	91.0	115.0
	100	108.8	65.3
	100	121.0	219.4
	100	131.3	135.1
Sub Total ²	100	109.8	119.3
Furniture Appliances and Hardware	100 ³	110.5	120.0
	100	16.7	11.1
	100	111.8	128.8
	100	71.6	75.6
	100	57.5	41.3
Sub Total	100	93.8	88.3
Personal Services: Barber and Beauty Shops and Cleaners	100	31.0	38.0
	100	64.2	68.0
	100	93.2	66.8
	100	96.8	76.8
	100	37.1	35.7
	100	55.8	63.8
Sub Total	100	68.2	61.0
Other Retail: Drugs, Apparel and Jewelry	100 ¹	87.1 ¹	83.1 ¹
	100 ²	104.2 ¹	106.0 ¹
	100 ³	108.2	108.9
	100 ³	114.7	120.0
	100	56.7	67.2
Sub Total ²	100	106.8	111.6
TOTAL	100%	93.9%	103.4%

¹Percentage figures furnished by firms that would not reveal actual sales.

²Totals do not include those firms furnishing percentage figures.

³1960 was used as the base period for those firms beginning operation in 1959.

Table 5

INDEX OF SALES SHOWING THE EFFECT OF THE CONSTRUCTION OF A MEDIAN ON NONTRAFFIC SERVING BUSINESSES IN THE CONTROL AREA
YEAR 1959=100%

Type of Business	Before	During	After	
Grocery	100 ¹	87.1 ¹	89.2 ¹	
	100	112.0	115.6	
	100	95.5	97.0	
	100	85.3	81.1	
Sub Total ²	100	86.3	82.4	
Auto and Auto Parts and Allied Businesses	100	65.3	74.3	
	100 ³	147.8	148.9	
	100	89.5	78.4	
	100	72.9	98.7	
	100	92.2	97.0	
	100	27.0 ⁴	57.0	
	100	122.3	142.4	
	100	14.2 ⁵	72.9	
	Sub Total	100	90.6	97.5
	Furniture, Appliance and Hardware	100 ³	102.5	97.1
100		88.4	98.8	
100		106.5	94.7	
100		70.4	70.7	
Sub Total		100	97.2	93.2
Personal Services: Cleaners, Barber and Beauty Shops	100	99.1	94.2	
	100	102.0	98.4	
	100	75.7	82.1	
	100	95.4	92.0	
	Sub Total	100	87.7	88.7
Other Retail: Drugs, Apparel and Jewelry	100 ³	85.3	84.7	
	100 ³	93.0	100.8	
	100	87.6	96.0	
	100	104.5	123.2	
Sub Total	100	91.2	97.8	
TOTAL	100%	91.1%	93.7%	

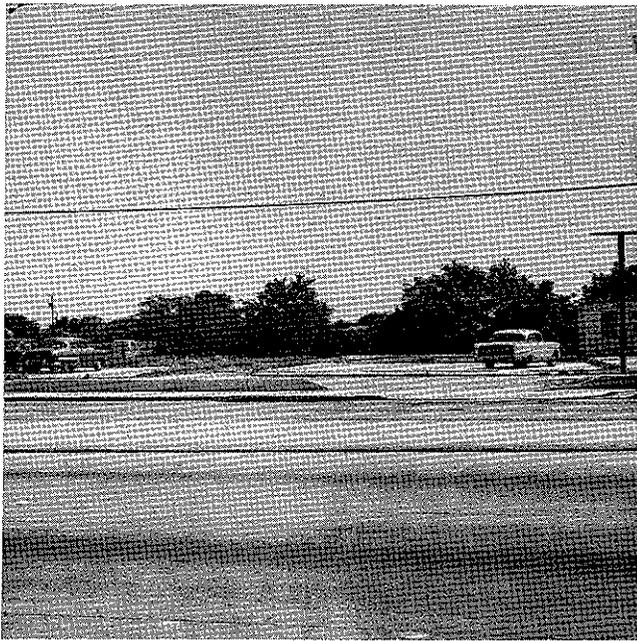
¹Percentage figures furnished by firm that would not reveal actual sales.

²Totals do not include those firms furnishing percentage figures.

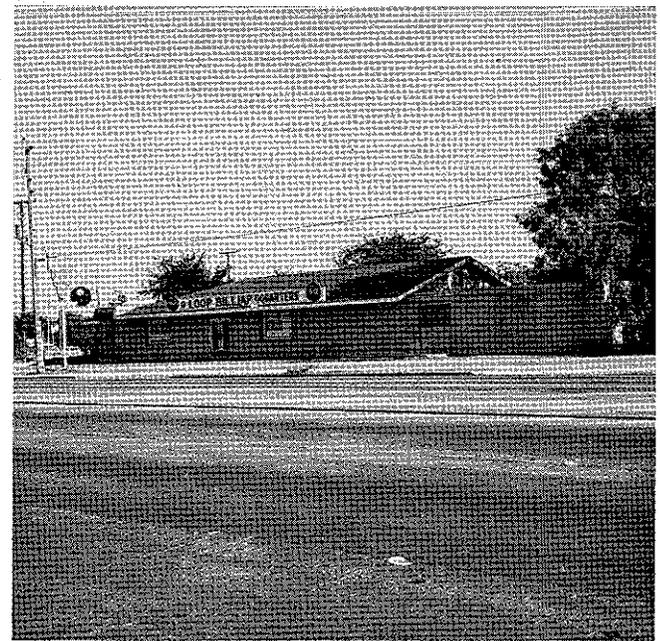
³1960 was used as a base period for those firms beginning operation in 1959.

⁴Operated for only 9 months of year.

⁵Operated for only 6 months of year.



The foundations are the only evidence of two businesses that were moved out of the area.



This restaurant closed during the construction, reopened later as a billiard parlor, and is now vacant.

during both the period of construction and the 12-month period following completion of the divided facility.

Five-Year Trends of Business Activity

Up to this point, the report has dealt with only those sales volumes covering the individual years 1959,

1962 and 1963. However, sales volumes were collected from the firms for each year from 1959 through 1963.

In the Baytown and Pleasanton studies, sales volumes of study and control area firms were compared on a monthly basis. Since this study covers a five-year span, it did not appear practical to attempt to obtain gross sales on a monthly basis for this period of time.

These sales volumes are shown graphically in Figures 3, 4, and 5 grouped by type of businesses. Each year's sales volume includes the actual sales that were reported by each firm, regardless of the number of months that the firm operated during the year. Therefore, a firm may have operated for one month or for a whole year during any one of the five years.

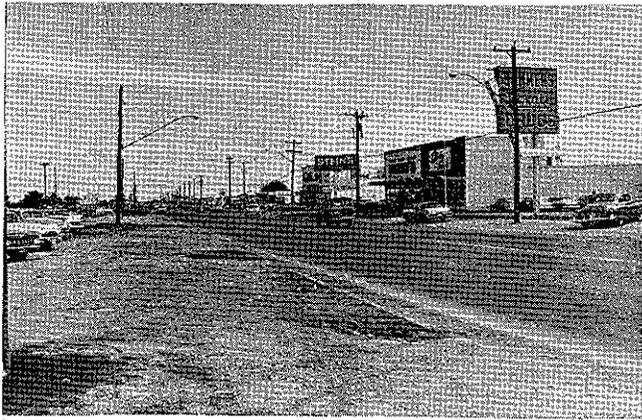
Over the five-year period, both the control and study area food service businesses had a decline in gross sales as shown in Figure 3. However, in 1962, the period of construction, the study area food group experienced a very sharp drop in sales. The managers of these businesses attributed this sharp drop in sales directly to the inconvenience caused by the street being torn up. Even though there was one less study area firm in operation during 1963, sales of the six remaining businesses increased by over 500,000 dollars. This indicates that the firms still in operation were beginning to regain at least a major part of their lost business after a year's operation under median conditions.

Also shown in Figure 3 is a comparison of the study and control area service stations. Within this group of businesses there was considerably less fluctuation in sales during the five-year period. Business activity of the four control stations showed a small decline, but over-all was considerably more stable than that of the four study area stations. A large part of the increase in sales volume during 1961 by the four study area stations can be attributed to the change in management of one firm early in the year. The difference in the levels of

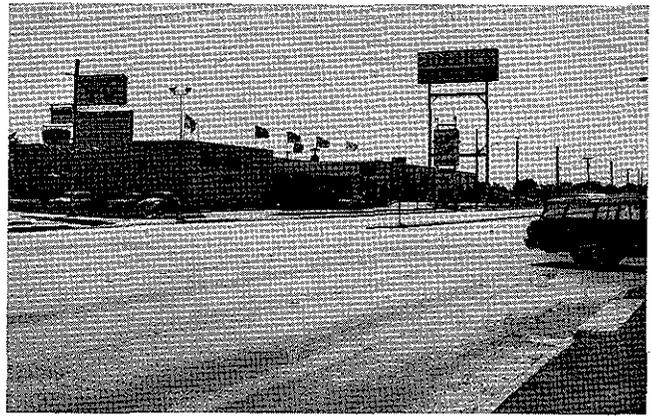
Table 6
INDEX OF SALES SHOWING THE EFFECT OF THE
CONSTRUCTION OF A MEDIAN ON TRAFFIC SERV-
ING BUSINESSES
YEAR 1959=100%

Type of Business	STUDY AREA		
	Before	During	After
Service Stations	100	84.7	91.2
	100	90.6	80.0
	100	130.2	96.7
	100	46.8	61.2
Sub Total	100%	80.1	78.5
Restaurants	100 ¹	43.8	52.6
	100	101.5	87.3
	100	91.1	80.5
Sub Total	100%	77.4	72.8
TOTAL	100%	79.1	76.4
CONTROL AREA			
Service Stations	100	83.7	87.4
	100	113.2	93.7
	100	109.3	149.4
	100	91.5	92.6
Sub Total	100%	95.3	95.9
Restaurants	100	98.6	115.1
	100	109.0	105.5
	100	125.2	142.5
Sub Total	100%	108.0	119.7
TOTAL	100%	98.6	102.0

¹1960 was used as a base period for those firms beginning operation in 1959.



The old facility, without curbing and having unpaved shoulders detracted from the general appearance of the area.



The new facility has improved the over-all appearance of the area as well as the flow of traffic.

operation in 1962 and 1963 between the two groups of stations is believed to be directly related to the installation of the median.

Since all but two of the businesses presented in Figure 3 are traffic serving firms, the individual trends shown in the two charts are highly representative of traffic serving businesses as a whole. Therefore, over the five-year period it appears that the traffic serving businesses, which consist primarily of service stations and

restaurants, were definitely hurt both by the construction of the median and by having to operate under the restrictions it imposed on customer traffic.

The first chart on Figure 4 compares the hardware, furniture, and appliance firms located in the study and control areas. Both groups experienced an increase in sales over the five-year period, and sales of both groups follow a similar pattern over the five-year period; however, the study area firms did not keep pace with the control group. In 1959 the difference between the two

A COMPARISON OF SALES FOR STUDY AND CONTROL AREA BUSINESSES LOCATED IN SAN ANTONIO, TEXAS BY YEARS.

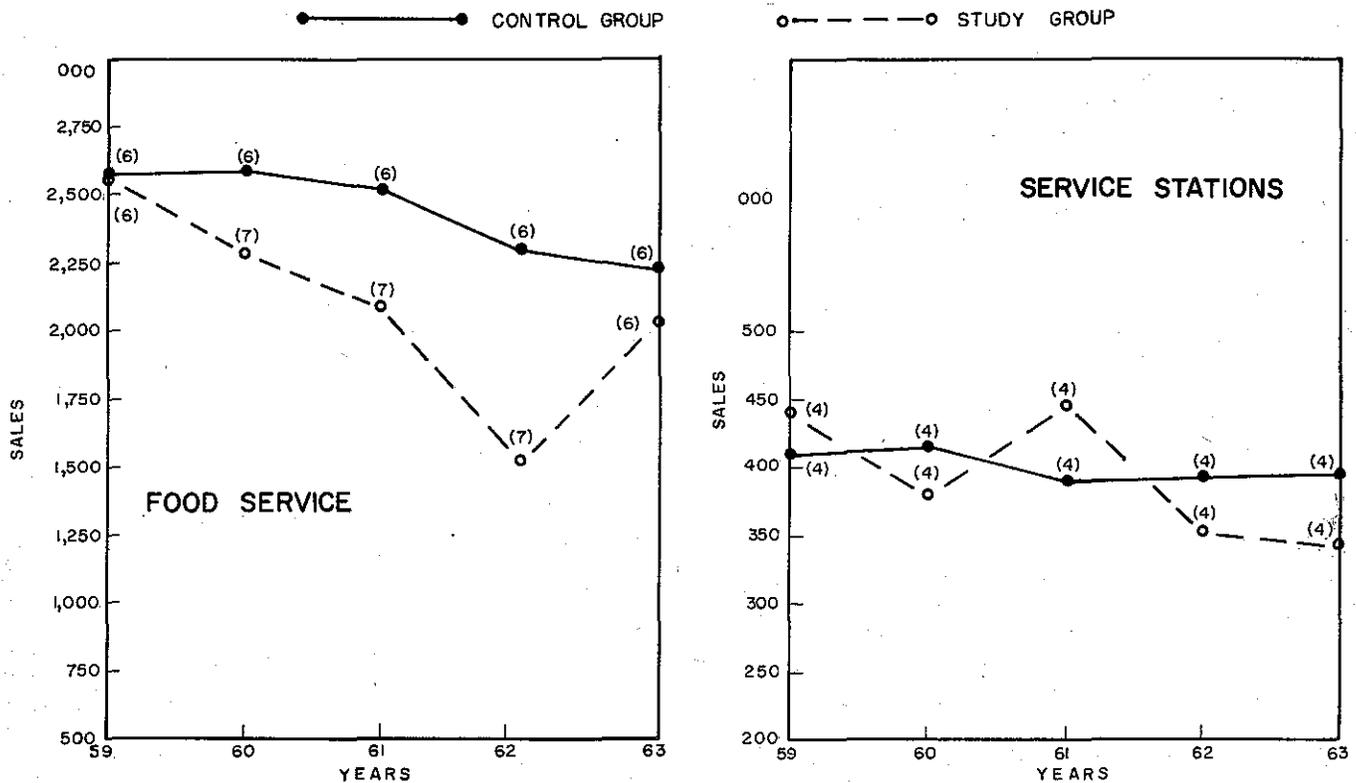


Figure 3.

A COMPARISON OF SALES FOR STUDY AND CONTROL AREA BUSINESSES LOCATED IN SAN ANTONIO, TEXAS BY YEARS.

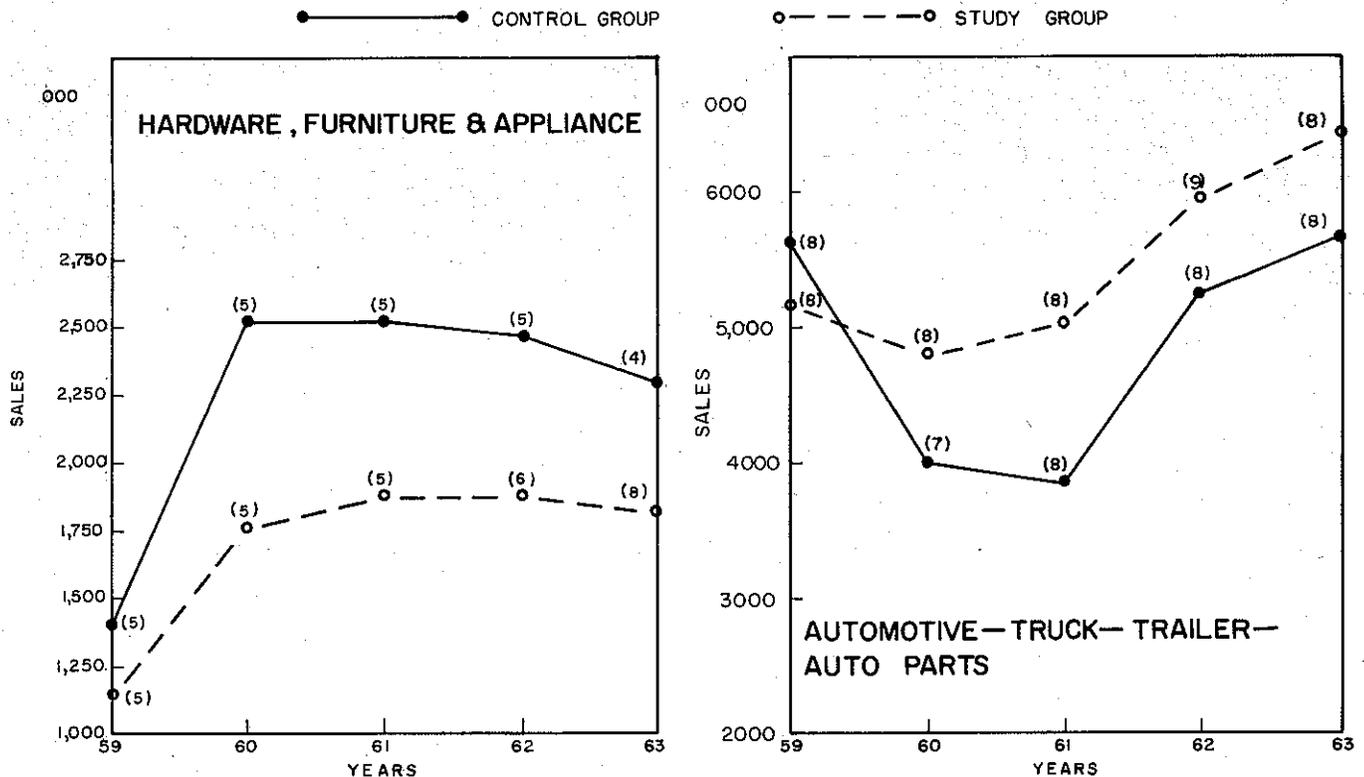


Figure 4.

groups was around 250,000 while in 1963 the control firms were operating about \$500,000 above the study firms. During these years, one control business closed while the study area group gained three new businesses. Only one of these new firms reported a full year of sales in 1963. The other two were new businesses opening during the later part of 1963, but added very little to the over-all sales volumes of the hardware and furniture group. It is significant to note, however, that all of this spread occurred during 1960 and 1961 before construction was begun, and that the spread actually narrowed somewhat during the significant influence years 1962-63. It appears then that the net result shown in the first chart of Figure 4 is that study area firms in the furniture, hardware and appliances categories were not adversely affected by the median since the variation in sales between the two areas occurred before median construction was begun.

According to the second chart shown in Figure 4 the automotive businesses in the study and control areas were quite similar in their sales cycle but a much steeper drop in sales between 1959 and 1960 pushed the control businesses below the operation level of the study area businesses. With the study area automotive firms experiencing a more favorable growth pattern over the five-year period, the control group was never able to fully recover its loss. The loss in control group volume can be explained by one control firm closing in 1960 and reopening later in 1961. However, this firm never did re-

cover to its 1959 level of operation after reopening. The loss of one study area firm in 1963 had very little effect on the over-all sales as it was a small auto parts firm and represented only a small proportion of total auto group sales.

In summarizing the automotive sales, it appears that the businesses located in the study area were not adversely affected by the median. They showed a continual growth throughout the last four years which covers both the period during construction and the "after" period of this study.

The first chart in Figure 5 shows that the personal services businesses in both the study and control area experienced a gradual decline in sales volumes over the five-year period. During the first year, there was a 10 percent difference in the level of study and control sales, and as time passed the difference continued to increase, with study area businesses showing a more rapid decrease in sales than their control firms. The extra firm included in 1963 was in business only the last few months of the year, so its influence on the total sales was small.

One significant point not included in Figure 5, but believed to be important when analyzing the sales of the personal services businesses, is the condition of the buildings in which the study and control businesses were housed. Over the five-year period the owners of buildings in which the control businesses were operating kept the buildings in a much better state of repair. Within

A COMPARISON OF SALES FOR STUDY AND CONTROL AREA BUSINESSES LOCATED IN SAN ANTONIO, TEXAS BY YEARS.

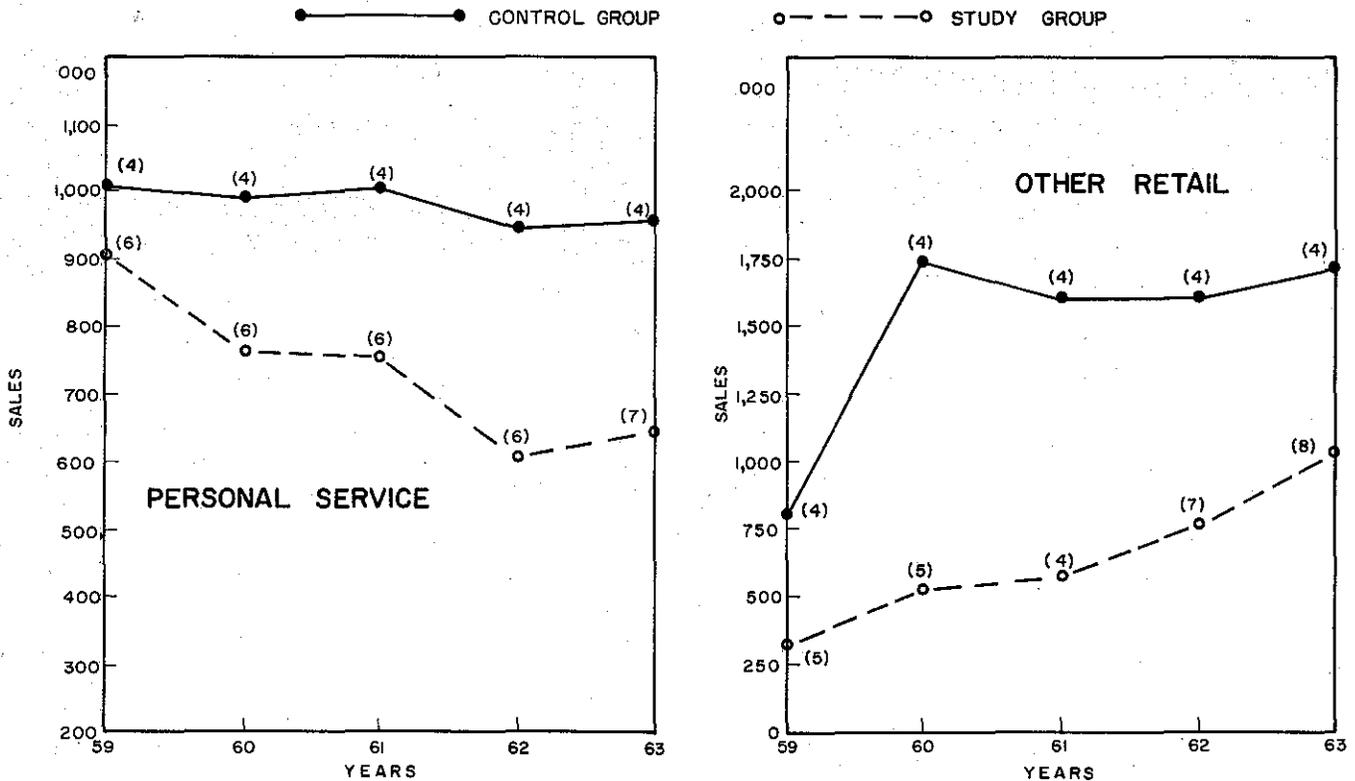


Figure 5.

the study area, however, a number of the buildings were in need of maintenance and at the time of the last interviews appeared near the end of their economic life. In general, there appears to be a definite relationship between sales volumes and degeneration in the general appearance of the business with each increment of decline adding to the decline of the other. In situations such as these the chain of events began with a drop in firm sales followed by a request for lower rent. Rather than have the building vacant, the landlord lowered the rent, but attempted to maintain his net return on capital investment by reducing his outlay on maintenance and repair. The poor appearance further depressed sales and the downward spiral continued.

In summing up the business activity of this group of firms, it appears that a large part of the decline in sales occurring in 1962 and 1963 was caused by the construction of the median.

Also shown in Figure 5 is the five-year trend of sales for the group of businesses classified as "other retail." This group includes such businesses as drug, apparel, shoe, jewelry, liquor, department, camera and photo stores.

Over the five-year period, both study and control area firms have shown a gradual increase in sales, even during 1961 when there were only four study area firms reporting sales.

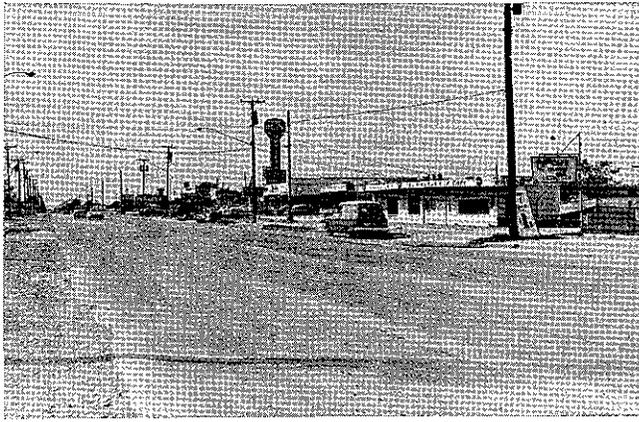
However, the increase in the study area was somewhat less than that indicated in the controls.

There were eight other firms operating in the study area that fell into this category, but they would not reveal information on their gross sales. Therefore, this represents only about 50 percent of the study area firms. Several of the nonreporting firms did report that their sales had dropped considerably and felt that the area had less shopping traffic in the "after" period. They believed that the increased speed of traffic and the inconvenience of maneuvering with the median as a barrier were the primary reasons for this drop in customers. Two of these firms furnished percentage figures on their sales volumes to support their contentions. In these cases the businesses were operating from 20 to 30 percent below their 1959 level of operation.

Over-all, however, the evidence indicates that the median did not adversely affect study area firms in an absolute sense, since sales continued a steady increase throughout the period. In comparison to the control firms, however, the rate of increase was somewhat lower. This indicates that there was perhaps a small adverse effect chargeable to the median, since in its absence study area firms would have been expected to perform with a rate of increase equal to their control.

Retail Sales of San Antonio Area

According to information published in Sales Management Magazine, the business activity in San Antonio showed an increase in sales of 19.1 percent from 1959 to 1963. Table 7 shows the trend of retail sales as estimated for the city of San Antonio by Sales Management



Before construction of the improved facility customers used shoulders of street for parking when shopping at firms along Southwest Military Drive.



Some of the older businesses now have a limited amount of parking space available for their customers. There are four businesses in this building.

Magazine covering the three years used in this study. Some of the breakdowns used by the reporting agency were grouped to coincide with the 6 groups of firms, classified in this report by type of business. If these sales shown in Table 7 are representative of San Antonio's general economic condition, then most of the firms under scrutiny in this study were operating below the general level of all other San Antonio businesses. Only the automotive firms located in this study area had gains in sales that were comparable to the percentage gains experienced by the whole automotive industry of San Antonio.

According to city officials, San Antonio has had faster growth to the north and northwest of downtown San Antonio. In these areas, large shopping centers have been developed and the sales generated by these centers have been a big influence in the over-all rate of gain showed by San Antonio retail businesses.

The area of San Antonio in which the study area is located is considered to be a middle income area without

the potential for business growth that exists in some of the higher income areas. Therefore, it is reasonable to believe that both the retail firms located in the study area and their controls, which were selected from this or similar type areas of the city, should not be expected to show sales increases comparable to the average for the city as a whole.

Median Influence on Customer Traffic

After the collection of economic data from each business, a concerted effort was made to determine the effect the median had on customer traffic entering and

Table 7
A COMPARISON OF RETAIL SALES FOR BUSINESS FIRMS OF SAN ANTONIO FOR YEARS 1959, 1962 AND 1963¹

	1959 ² Sales (000)	1962		1963			
		Sales (000)	Change from Base Period		Sales (000)	Change from Base Period	
Sales (000)	Percent		Sales (000)	Percent			
Food	157,580	179,202	21,662	13.7	188,226	30,646	19.5
Eating and Drinking	42,116	51,390	9,274	22.0	50,403	8,287	19.7
Sub Total	199,696	230,592	30,936	15.5	238,629	38,933	19.5
Gen. Merchandise	116,604	136,634	20,030	17.2	147,843	31,239	26.8
Apparel	40,764	43,633	2,869	7.0	44,866	4,102	10.1
Drugs	20,868	23,630	2,762	13.2	24,627	3,759	18.0
Sub Total	178,236	203,897	25,661	14.4	217,336	39,100	21.9
Furniture and Appliances,	29,180	29,281	101	10.3	32,161	2,981	10.2
Lumber, Bldg. and Hdw.	29,547	30,303	756	2.6	32,104	2,557	8.6
Sub Total	58,727	59,584	857	1.5	64,265	5,538	9.4
Auto	157,698	17,449	16,251	10.3	191,275	33,577	21.3
Gas Stations	43,881	49,561	5,680	12.9	52,764	18,883	20.2
Other	47,830	43,500	-4,330	-9.1	52,817	4,987	10.5
TOTAL	686,068	761,383	75,315	11.0	817,086	131,018	19.1

¹Data drawn from Sales Management Magazine.

²Base year.