stances. The discrepancy in the example of the discussion, 28 percent of the maximum flow rate observed (i.e., the capacity), is larger than generally observed. However, this discrepancy is decreased by appropriate selection of other model parameters (k_T and k_ν as defined by $T_j = k_T \Delta x_j$ and $\nu_j = k_\nu \Delta x_j$, respectively. Such adjustments—that is, reduction of the nominal capacity and decreases in k_T and k_ν—will yield a lower value of roadway capacity and, consequently, produce the effects expected by Hauer and Hurdle.

Publication of this paper sponsored by Committee on Freeway Operations.

Evaluation of the I-35 Route Redesignation in San Antonio

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This paper presents the results of studies conducted in San Antonio, Texas, to evaluate the effectiveness of the redesignation of I-35 to an alternate freeway route. The redesignation was designed as a temporary measure to reroute traffic from a congested freeway to one with adequate available capacity. Therefore, only the advance guide signs and gore signs on the approaches to the diversion points were modified. Diversion potential was estimated by using planning-survey and license-plate origin-destination data. Changes in route choice were identified through license-plate origin-destination studies. Mailed questionnaires used to identify characteristics of through and diverting drivers indicated that, although not all through drivers were expected to divert, a significant number shifted from their original routes.

The Texas State Department of Highways and Public Transportation (SDHPT), working in cooperation with the San Antonio Corridor Management Team (CMT), has initiated programs aimed at alleviating congestion and reducing accidents on I-35 in San Antonio near the central business district (CBD). Included among the programs are (a) the redesignation of the I-35 route around the CBD and (b) use of changeable message signs for incident management and freeway diversion.

The Texas Transportation Institute (TTI) was contracted to evaluate the effectiveness of these two programs as part of research sponsored by the Federal Highway Administration (FHWA) on human factors requirements for real-time motorist information displays. In this paper the effects of the I-35 route redesignation are evaluated.

BACKGROUND

Facility Description

The Interstate and other major highway routes through and around the San Antonio metropolitan area are shown in Figure 1. I-35 in San Antonio is the major facility in the Austin-Laredo corridor. It also forms the western and northern boundaries of the CBD. This section of the freeway was completed in 1957. Design standards at the time, coupled with the presence of major drainage tributaries and proximity to the CBD, dictated sharp horizontal alignment of the four-lane facility. Retaining walls and rigid structures prohibit expansion along the existing roadway surface. Because of capacity constraints and alignments, considerable congestion and relatively high accident rates are experienced (1).

I-10 in the southeast part of the city and I-37 were constructed in the late 1960s and early 1970s as eight-lane facilities according to higher design standards. The I-10/I-37 route around the CBD has considerable available capacity and is seldom congested.

Object of I-35 Route Redesignation

The object of the route redesignation was to encourage through drivers in the I-35 Austin-Laredo corridor to travel on the wider I-10/I-37 route in order to reduce congestion and accident rates on I-35. The redesignation was designed as a temporary measure until I-35 could be reconstructed. The I-35 route from the I-35/I-10/US-90 interchange to the I-35/I-37 interchange is about 7.7 km (4.8 miles). The I-10/I-37 route is about 9.0 km (5.6 miles), 1.3 km (0.8 mile) longer.

Sign Changes

SDHPT modified the advance guide signs and gore signs on the freeway sections shown on Figure 2. The sign modifications, completed in November 1977, included moving the destination names (Austin or Laredo) and the I-35 shields so that northbound (NB) and southbound (SB) I-35 traffic would follow the I-10/I-37 route around the CBD. Figure 3 illustrates a typical signing change, which was made at the NB I-35 exit to eastbound (EB) I-10.

For ease of discussion, the two routes will be referred to as route A and route B throughout the remainder of this paper. Route A is the original I-35 route; route B is the newly redesignated route that follows I-10/I-37 around the CBD (see Figure 2).

Study Scope

This study addresses only NB travel in terms of on-site data collection and questionnaires. Cost constraints limited the field data collection to only one direction, and NB was chosen because more appropriate data-collection sites existed there. Some overall conclusions about SB travel are drawn when appropriate.

For the purposes of this study, a through trip is any trip whose origin and destination require that the vehicle

Figure 1. Major highways in the San Antonio area.

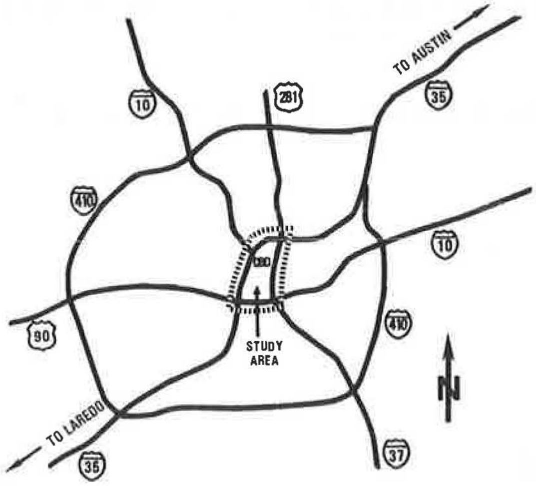
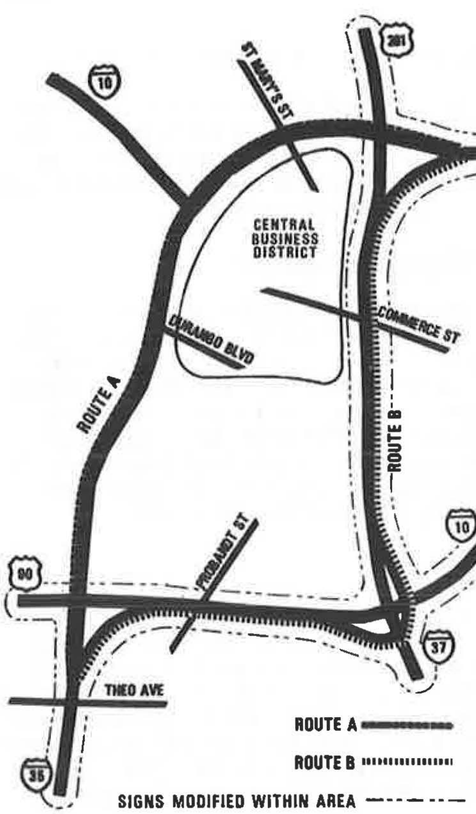


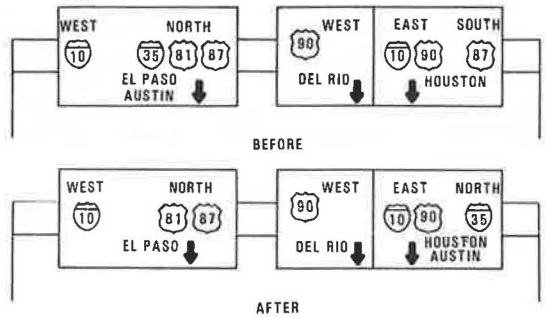
Figure 2. Primary and diversion routes.



travel completely through the study area. That is, a through trip is one originating south or southwest of the I-35/I-10/US-90 interchange and destined for north or northeast of the I-37/I-35/US-281 interchange (see Figure 1).

This paper is a summary of an evaluation of the I-35 route redesignation in San Antonio, prepared under the project on human factors requirements for real-time motorist information displays. Further details on the topics and analyses may be found in Stockton, Dudek, and Hatcher (2).

Figure 3. Typical sign changes.



BASE CONDITIONS

Objectives

The primary object of this portion of the study was an estimate of the number of through trips that could potentially be diverted to the redesignated route (B). This was to be accomplished by estimating the existing number and distribution of through trips on routes A and B immediately before the sign changes.

Approach

Because it was impractical to actually measure the number of daily through trips, daily through volumes were estimated by determining the number of through drivers from previous planning survey origin-destination (O-D) data, developing annual traffic volume growth factors in the corridor, and extrapolating the planning survey data to present (1977) volumes by using the growth factors. The distribution of drivers by route (A or B) was obtained from a license-plate O-D study.

The most recent study providing information from which through trips could be estimated was a 1969 O-D survey prepared by the San Antonio-Bexar County Urban Transportation Study (SABCUTS) (3). This survey gives detailed information on the number of daily trips among various external stations (at the county line) and internal districts (within the county).

The two external stations and internal areas (several internal districts combined) that are most relevant to the route redesignation study are shown in Figure 4. These stations and areas were assumed to include virtually all O-D trip combinations that would require drivers to travel on route A or B.

Figure 5 shows the locations of the four permanent automatic traffic counters located within the study area and four other automatic counters installed for this project. A traffic-volume growth factor was developed based on traffic volumes collected from 1969 to 1977 at a counter located on route A near St. Mary's Street (Figure 5, counter A2). The 1969 through volumes from the planning survey O-D data were then extrapolated to 1977 conditions by using the growth factor.

License-plate O-D studies were conducted before the sign changes to estimate the distribution of through drivers between routes A and B. Study days and time periods were selected to include a good sampling of nonlocal drivers, because it was anticipated that this classification of drivers would be most influenced by the sign changes. The before O-D studies were conducted on Friday and Saturday, September 23 and 24, 1977, at 10:00-11:00 a.m., 1:00-2:00 p.m., and 3:00-5:00 p.m.

The O-D study stations for the before survey are shown in Figure 6. License-plate numbers of all NB

Figure 4. O-D stations and areas.

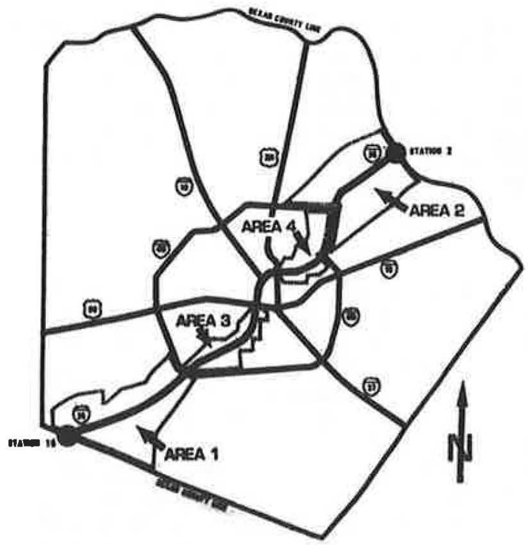
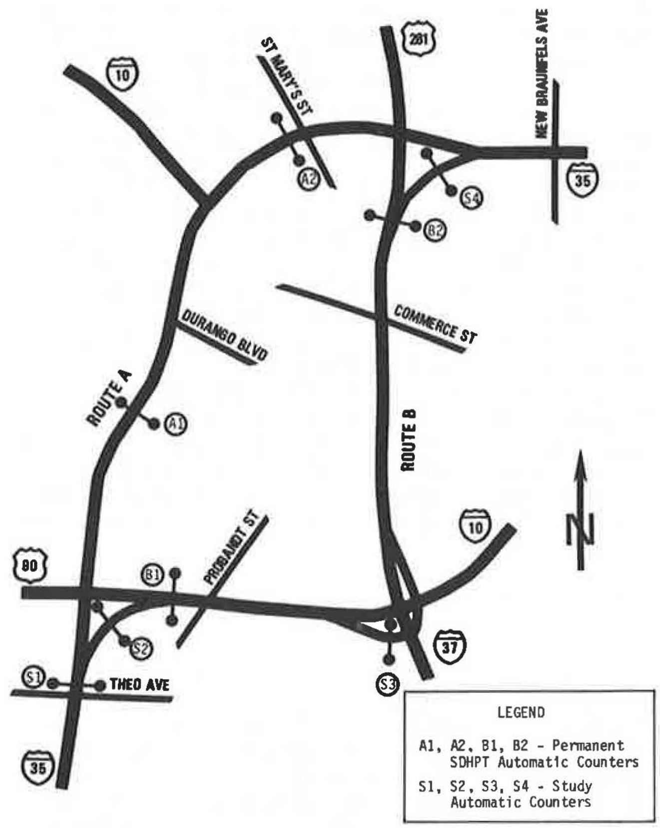


Figure 5. Automatic counter locations.



vehicles were recorded at the origin location of the study area (station A) and at the destination location on each of the two possible routes (stations B and C). At station C (the I-37 to I-35 connector ramp) personnel were able to read plate numbers from ground level and record them on cassette tape recorders. Stations A and B were high-speed, high-volume freeway locations (I-35 at Theo Avenue and I-35 at St. Mary's Street). At these stations personnel had to sit on overhead bridge structures and use binoculars to read the license plates. After the data were reduced from the tapes, the license-

Figure 6. License-plate O-D study locations.

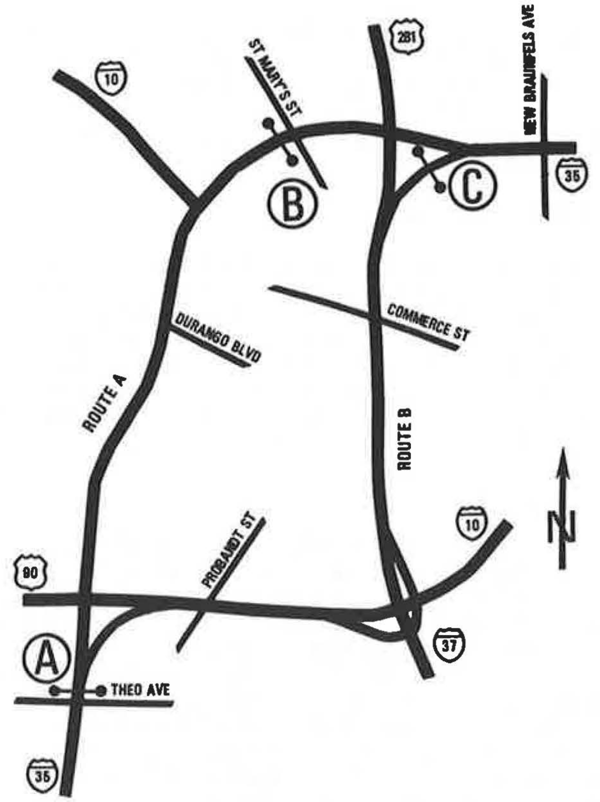


plate numbers for vehicles passing the two destination situations (stations B and C) were computer-matched against the plate numbers recorded at the origin (station A) to identify the total through traffic on each route. This technique was previously used successfully by TTI in similar studies conducted in Dallas (4).

Results

1969 Through Drivers

The results of the 1969 SABCUTS O-D data analysis are shown below. The analysis indicates that an average of 4811 vehicles/day (total both directions) traveled through the study area in 1969.

Trips	Number (N=4811)
External-external	
Between station 2 and station 15	388
External-internal	
Between station 2 and area 1	13
Between station 2 and area 3	213
Between station 15 and area 2	61
Between station 15 and area 4	133
Internal-internal	
Between area 1 and area 2	50
Between area 1 and area 4	187
Between area 2 and area 3	839
Between area 3 and area 4	2927

A conservative estimate is that 75 percent (388) of the actual 518 drivers that traveled between station 2 and station 15 used I-35, while 25 percent (130) traveled on the I-410 east loop.

Traffic Volume Growth

The annual average daily traffic (AADT) in the Austin-Laredo corridor for the years 1969 through 1977 was estimated from counts taken on route A near St. Mary's Street. The results show a change in AADT from 49 358 vehicles/day in 1969 to 61 085 in 1977—a 24 percent increase in volume.

Estimated 1977 Through Volumes

If it is assumed that the percentage increase in through trips was identical to the percentage increase in AADT, the 24 percent growth can be applied to the 1969 O-D data. This results in an estimated average of 5950 vehicles/day (total both directions) traveling through the study area in 1977. By further assuming an equal distribution of through trips in both directions, 2980 through vehicles/day are estimated in each direction.

License-Plate Study

Although the license-plate O-D technique used in this study increases the sample size compared to other study approaches, not all license plates can be read. This is because, among other things, capabilities and experience of the survey technicians vary. Thus, it was important to compare the actual volumes at the origin (input) station upstream of the I-35/I-10/US-90 interchange recorded by the survey party with those obtained from automatic counters located near the survey station (see Figure 5). Adjustments of survey counts could be made should any discrepancies among the automatic counts be noted.

A comparison of the two counts showed that the survey crew located at the freeway input station recorded on cassette tapes the licenses of an average of 88 percent of all vehicles recorded on the automatic counters. The license-plate volume data were therefore adjusted upward by 12 percent to obtain a more accurate estimate of the route choice by through drivers.

The results of the license-plate survey (Table 1) reveal that, on the average during the study period, NB through traffic represents 7.6 percent of the total traffic entering the area upstream of the I-35/I-10/US-90 interchange; 5.9 percent of the total entering traffic used route A, whereas 1.7 percent used route B.

As can be seen in Table 1, it is estimated that an average of 78 percent of all through drivers used route A, while 22 percent used route B before the sign changes. The distribution of through drivers by route is of primary importance, because these data reflect the volume of traffic that could potentially use redesignated route B.

Estimated Through Trips on Route A

It was noted earlier that 5960 estimated average through trips were made each day in 1977 (2980 in each direction). By using the route distribution found in Table 1, we can estimate that 78 percent, or approximately 4650 through trips/day, were made on route A. This volume amounts to approximately 7 percent of the total daily traffic on I-35 in the study area.

SHORT-TERM EFFECTS OF SIGN CHANGES

Object

Studies were conducted to determine the immediate effects of the sign modifications in terms of through drivers changing their route choices.

Approach

Short-term effects of the sign changes in terms of route choice were determined by conducting after studies of license plates on Friday and Saturday during the same time periods as the before studies. Because of the Christmas and New Year's holidays, the after studies were delayed until January 13 and 14, 1978, to reduce any possible bias in the after results.

Results

The license-plate O-D data were again adjusted to reflect the differences between the total freeway volumes obtained from the license plate survey and those obtained from the permanent counters. The license-plate freeway volume data represented an average of 89 percent of the total counted volume, compared with 88 percent for the before study.

A summary of the through traffic as a percentage of total NB traffic entering the study area is given in Table 2. The data show that during the after study the through traffic represented 8.3 percent of the total NB traffic; 6.0 percent used route A and 2.3 percent route B. These values reflect a 0.5 percent increase in the percentage of through traffic compared to the before study period. The data also show that in the after period 28 percent of the through drivers used route B, a 6 percent increase compared to the before study in which 22 percent of the through drivers used route B (Table 1).

The data were further analyzed to estimate the actual volume of traffic influenced by the sign changes (increased use of route B) during the study days in January. In order to estimate the volumes, two assumptions were made: First, it was assumed that the average percentage of arriving freeway traffic on NB I-35 determined from the license-plate studies to be traveling through the study area is valid for the entire day; second, the average percentage distribution of through drivers on routes A and B obtained from the field studies would hold true for the entire day.

Another factor that was considered was the seasonal variation in traffic volume between the study months (September and January). Thus, the volume data were normalized in terms of AADT. An estimate of the through traffic by using a specific route (ETT) during one of the four study days was obtained from the following equation:

$$\text{ETT} = \text{total traffic on I-35 at Theo} \times \text{seasonal correction factor} \times \text{fraction of total traffic using route} \quad (1)$$

Data used in estimating the average daily change in through NB traffic on routes A and B are presented in Table 3. The total northbound volumes on I-35 were obtained from automatic counters located near Theo Avenue. Seasonal correction factors were computed from data documented in the SDHPT annual summary of freeway volumes (5). The fractions of total traffic using each route were derived from the license-plate O-D data summarized in Tables 1 and 2.

The results shown in Table 3 indicate that an estimated average of 2727 NB through vehicles/day (normalized to AADT) used route A during the September study days, whereas 2710 through vehicles/day traveled route A during the January studies—essentially no change. In contrast, 751 NB vehicles/day used route B during the September study days and 1028 vehicles/day during January—an increase of 277 vehicles/day (normalized to AADT).

If it can be assumed that the change in the SB direction is the same as that of the NB, then it is estimated

Table 1. NB through traffic before sign changes.

Study Period		Total NB I-35 Traffic at Theo	Through Traffic		Through Drivers Using Route A			Through Drivers Using Route B		
Day	Time	(vehicles/h)	No.[a]	% of Total Traffic	No.[a]	% of Total Traffic	% of Through Traffic	No.[a]	% of Total Traffic	% of Through Traffic
Friday, 9/23/77	10:00-11:00 a.m.	2 210	130	5.9	100	4.5	77	30	1.4	23
	1:00-2:00 p.m.	2 530	133	5.3	111	4.4	83	22	0.9	17
	3:00-4:00 p.m.	3 020	248	8.2	175	5.8	71	73	2.4	29
	4:00-5:00 p.m.	3 130	252	8.1	197	6.3	78	55	1.8	22
Subtotal		10 890	763	7.0	583	5.4	76	180	1.6	24
Saturday, 9/24/77	10:00-11:00 a.m.	2 480	196	7.9	162	6.5	83	34	1.4	17
	1:00-2:00 p.m.	2 680	227	8.5	173	6.5	76	54	2.0	24
	3:00-4:00 p.m.	2 420	168	6.9	120	4.9	71	48	2.0	29
	4:00-5:00 p.m.	2 410	236	9.8	203	8.4	86	33	1.4	14
Subtotal		9 990	827	8.3	658	5.9	80	169	1.7	20
Total		20 880	1590	7.6	1241	5.9	78	349	1.7	22

[a]Adjusted.

Table 2. NB through traffic after sign changes.

Study Period		Total NB I-35 Traffic at Theo	Through Traffic		Through Drivers Using Route A			Through Drivers Using Route B		
Day	Time	(vehicles/h)	No.[a]	% of Total Traffic	No.[a]	% of Total Traffic	% of Through Traffic	No.[a]	% of Total Traffic	% of Through Traffic
Friday, 1/13/78	10:00-11:00 a.m.	2 100	148	7.0	103	4.9	70	45	2.1	30
	1:00-2:00 p.m.	2 510	212	8.4	170	6.8	80	42	1.6	20
	3:00-4:00 p.m.	3 070	266	8.7	204	6.6	77	62	2.1	23
	4:00-5:00 p.m.	3 050	226	7.4	147	4.8	65	79	2.6	35
Subtotal		10 730	852	7.9	624	5.8	73	228	2.1	27
Saturday, 1/14/78	10:00-11:00 a.m.	2 270	176	7.7	128	5.6	73	48	2.1	27
	1:00-2:00 p.m.	2 690	236	8.7	176	6.5	75	60	2.2	25
	3:00-4:00 p.m.	2 510	237	9.4	167	6.6	70	70	2.8	30
	4:00-4:39 p.m.[b]	1 684	155	9.2	103	6.1	66	52	3.1	34
Subtotal		9 154	804	8.8	574	6.3	71	230	2.5	29
Total		19 884	1656	8.3	1198	6.0	72	458	2.3	28

[a]Adjusted.
[b]Tape recorder malfunctioned.

Table 3. Estimated NB through traffic during study days.

			Route A		Route B[a]	
Study Day	Total NB I-35 Traffic at Theo (vehicles/h)	Seasonal Correction Factor	Fraction of Total Traffic Using Route	Estimated Through Traffic (vehicles/h)	Fraction of Total Traffic Using Route	Estimated Through Traffic (vehicles/h)
Friday, 9/23/77	47 430	0.975	0.054	2497	0.016	740
Saturday, 9/24/77	45 510	0.984	0.066	2956	0.017	761
Average				2727		751
Friday, 1/13/78	46 190	1.024	0.058	2743	0.021	993
Saturday, 1/14/78	41 220	1.031	0.063	2677	0.025	1062
Average				2710		1028

[a]Average increase in NB through volumes on Route B = 1028 - 751 = 277 vehicles/h.

that approximately 550 through vehicles/day on I-35 were influenced by the static sign changes during the January study days.

In summary, the before-and-after data revealed that the percentage of NB drivers traveling through the study area increased during the January studies. In addition, there was a significant increase in the number of through drivers that used route B.

CHARACTERISTICS OF THROUGH DRIVERS

Object

The object of this portion of the study was to determine the characteristics of through drivers in terms of familiarity and knowledge of alternate freeway routes around the downtown area.

Approach

Before-and-after questionnaires were mailed to NB through drivers identified from the license-plate studies. The questionnaires were coded by study time periods and driver travel route. Addresses of the through drivers were obtained from the Motor Vehicle Division of SDHPT. Unfortunately, addresses for out-of-state residents could not be obtained. In addition, questionnaires were not mailed to businesses and automobile rental companies because of the difficulty of establishing actual drivers of the vehicles.

It should be noted that the amount of license-plate data that was reduced from the tapes (45 000 plate numbers from the before study and 130 000 from the after study) dictated a relatively long time between conducting the study and receiving questionnaires from the drivers. This lag of from six to eight weeks may have diminished the individual drivers' ability to recall some particulars of the trips they made on the study day.

Results

Approximately one-fourth of all through drivers identified on the study days responded to the mailed questionnaires (25 percent in the before study, 24 percent in the after).

Frequency of Route Use

Questions related to frequency of use of routes A and B were included in the questionnaires in the belief that use frequency would reflect driver familiarity with each route, which would then give some clues as to the characteristics of drivers switching to route B after the sign changes.

Drivers were asked to indicate how often they used each route: from one to five times a week, from one to three times a month, less than once a month, or never before. It may be inferred that drivers who traveled the route one to five times a week could be considered as very familiar drivers, those using the facility from one to three times a month as familiar drivers, less than once a month as somewhat familiar, and never before as unfamiliar.

The table below compares driver familiarity based on the frequency of route use.

	Familiarity with Route A	
Familiarity with Route B	Very Familiar to Familiar	Somewhat Familiar to Unfamiliar
Before sign change (N = 394)		
Very familiar to familiar	62	8
Somewhat familiar to unfamiliar	21	9
After sign change (N = 405)		
Very familiar to familiar	57	8
Somewhat familiar to unfamiliar	21	14

The data reveal that there was a 5 percent reduction in the proportion of through drivers who may be considered very familiar or familiar with both routes (62 percent before, 57 percent after). Conversely, there was a 5 percent increase in the proportion of drivers somewhat familiar and unfamiliar with both routes between the before study (9 percent) and the after study (14 percent).

Because the freeway sign changes are directed at through drivers less familiar with the routes, the data indicate that the increased use of route B by through drivers after the sign changes is a result of a greater percentage of less familiar drivers traveling through the city during the after study. This indicates that the sign changes were successful in attracting through drivers to route B.

Local Versus Nonlocal Drivers

Another analysis was performed to determine which types of drivers (i.e., local or nonlocal) traveling through the city shifted to route B. The license-plate studies provided data about which route drivers selected, so plate numbers on each route could be matched with the addresses of the drivers obtained from the Motor Vehicle Division of SDHPT.

Those drivers residing in Bexar County were categorized as local drivers, whereas those living outside Bexar County were categorized as nonlocal drivers. Even though addresses were not obtained for out-of-state drivers, the mere fact that the license-plate numbers were available allowed these drivers to be included in the analysis. Thus, the analysis includes all the through drivers (license-plate matches) for both the before and the after studies.

The route selection, based on driver residence, is clearly reflected in the table below.

	Local Drivers (%)		Nonlocal Drivers (%)	
Route	Before Sign Change (N = 1103)	After Sign Change (N = 1166)	Before Sign Change (N =298)	After Sign Change (N = 317)
A	75	76	90	67
B	25	24	10	33

Before the sign changes, the route choice by local drivers traveling through the study area was 75 percent on route A and 25 percent on route B. After the sign changes, 76 percent of the local through drivers selected route A and 24 percent route B—a slight but probably insignificant increase toward route A. The results, however, show a definite increased use of route B by nonlocal drivers. The route selection by nonlocal drivers before the sign changes was 90 percent on route A and 10 percent on route B. After the sign changes, 33 percent of the nonlocal drivers traveled on route B during the study periods.

SUMMARY OF RESULTS

The results of the analysis of base conditions showed that there was an average of approximately 5960 through trips/day (total both directions). O-D studies showed that approximately 78 percent or 4650 of the through trips were made on route A.

The comparison of before and after license-plate O-D data revealed that, in the short term, approximately 6 percent of the through trips had shifted to the new route after the sign changes (route B: 22 percent before, 28 percent after).

Approximately one-fourth of all through drivers identified in the license-plate survey responded to questionnaires sent out after each of the two studies. The questionnaire studies showed that there was a 5 percent reduction in the number of drivers very familiar or familiar with both routes (62 percent of the before sample, 57 percent after). There was also an increase of 5 percent of drivers somewhat familiar or unfamiliar with both routes (9 percent before, 14 percent after).

When route choice was stratified by local versus nonlocal driver residence, it was found that route choice by local drivers remained fairly consistent. However, after the sign changes, 23 percent more nonlocals used route B than previously (10 percent before, 33 percent after).

We conclude that the redesignation of I-35 to the I-10/I-37 route significantly reduced expected volumes on the original I-35 route. An estimate of before and after study days indicated that approximate diversion for those days was 550 vehicles/day.

ACKNOWLEDGMENT

This paper discusses one phase of a research project on human factors requirements for real-time motorist information displays conducted by TTI and sponsored by FHWA. We wish to express appreciation to the personnel of the San Antonio district of the Texas SDHPT, particularly Gene W. Sparks and Gilbert G. Gavia for their assistance throughout the project. The contents of this paper reflect our views and we alone are responsible for the facts and the accuracy of the data presented. The contents do not reflect the official views or policies of the Federal Highway Administration. The

paper does not constitute a standard, specification, or regulation.

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Improved Air Quality Through Transportation System Management

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Many cities must reduce total automotive emissions if they are to meet the national ambient air quality standards set by the U.S. Environmental Protection Agency under the authority of the Clean Air Act. This paper summarizes the results of two recent transportation air quality analyses in the Denver metropolitan area: first, an examination of implementation experience with six program measures in Denver's 1973 Transportation Control Plan and, second, a more in-depth examination of the potential role of parking management in reducing vehicle kilometers of travel (VKMT). Conclusions are that meaningful VKMT reductions are possible (in the order of 6-8 percent), that air quality measures are cost effective, that few real cost or administrative barriers exist to impede implementation, and that most measures are within the current authority of one or more agencies. These jurisdictions often overlap, and support action and institutional cooperation are therefore greatly needed. Successful implementation is impeded by political and institutional unwillingness to generate controversy or to go against vested interests that conflict with the agency's priorities.

To meet the national ambient air quality standards promulgated by the U.S. Environmental Protection Agency (EPA) under the authority of the Clean Air Act, many American cities will have to reduce total automotive emissions. The development and implementation of air quality transportation control plans, which began in 1973, has been a frustrating experience for most people. Too often, potential transportation measures to improve air quality are viewed as ineffective or not implementable. They are also considered as disincentives, incompatible with ongoing state and local programs, that will incur large direct and indirect costs.

Our own conclusions, however, are much more positive. The tight deadlines for the 1970 Clean Air Act and the severity of the air quality problem in many cities have combined to make it impossible to meet the ambient air standards on time, but both the transportation control plan requirement and, more recently, the consistency requirement of Title 23 have contributed significantly to the initiation of studies and the implementation of measures that will improve air quality. These requirements have forced state and local transportation agencies to give air quality explicit and thorough consideration and have prodded the agencies to take reasonable steps toward improvement.

The provisions of the 1977 amendments to the Clean Air Act and the resulting implementing guidelines (1) provide significant opportunities to build on previous successes and to accelerate implementation of measures.

The amendments, which provide new deadlines for attainment of the air standards, have set in motion a second generation of air quality transportation plans. Initial revisions to the state implementation plan were due on January 1, 1979; cities that cannot meet the standards by 1982 must complete a more systematic and comprehensive alternatives analysis by July 30, 1980 (1). Emphasis by both EPA and the U.S. Department of Transportation (DOT) is on a truly coordinated and integrated planning process in which air quality measures are routine actions undertaken by state, regional, and local agencies to better manage their multimodal transportation systems.

Two recent studies in Denver provide an opportunity to assess the realism of this objective and in particular to examine issues of effectiveness, cost, institutional acceptance, and consistency. The first study examined implementation experience with six program measures contained in Denver's 1973 Transportation Control Plan (2); the second is a more in-depth examination of the potential of one particular form of transportation system management—parking management—to contribute to improved air quality (3).

Our answer to the question of whether the second