

# Operation Big Switch: Successful Implementation of an Express Lane Concept To Manage Freeway Traffic During a Major Construction Phase

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As work progressed on the \$200 million reconstruction and expansion effort on the U.S. 59 Southwest Freeway in Houston, it was recognized that it was possible for each contractor to concurrently complete Phase 2 and for the traffic shift from this phase to Phase 3 to occur simultaneously. A traffic control plan was adopted to close all entrance and exit ramps, close the outside main lane (dedicating it as a work zone), and maintain express traffic on the remaining two main lanes. The public information and traffic management measures that were implemented during this project are discussed. Results of the strategy are discussed, and conclusions are presented.

The U.S. 59 Southwest Freeway reconstruction project consists of five separate but adjacent contracts along a 13.6 mi section of urban freeway. This represented approximately \$200 million in contract work. Work on these projects was performed by four different contractors (Figure 1). The contracts were let in successive months in accordance with the policy of the Texas Department of Transportation (TxDOT). Although each project had an individual traffic control plan, the plans were part of a coordinated traffic control strategy that helped ensure a smoother transition for motorists from segment to segment.

The construction on each project was divided into three phases. Phase 1 consisted of construction of the permanent frontage roads. Phase 2 consisted of construction of the outside freeway lanes and shoulders and permanent exit and entrance ramps. Phase 3 consisted of construction of inside freeway lanes, shoulders, and the high-occupancy vehicle (HOV) lane. Higher-than-normal liquidated damages were specified to ensure that contractors completed each phase. However, each contractor could not be expected to reach the end of each phase at the same time. Therefore, a specific traffic control plan to manage traffic during the traffic shift from one phase to the next was developed. This shift consisted of relocation of concrete median barriers and temporary pavement transitions.

As work progressed on the project, project personnel recognized that it was possible for each contractor to concurrently complete Phase 2 and for the traffic shift from this phase to

Phase 3 to occur simultaneously. The principal advantage to implementing a concurrent traffic shift for all four projects was in reducing the response of the workers and public to at least four traffic shifts that would have to take place at night. Weekend nighttime hours were the only allowable times for the freeway main lanes and ramps to be closed to accommodate the shift.

Consequently, the possibility of implementing a concurrent traffic shift was investigated. It was then determined that the following sequence would provide enough time for the relocation of concrete median barriers and the construction of highway and ramp transitions:

1. Closure of the outside freeway lane in three lane sections, the outside two lanes in four lane sections, and all entrance and exit ramps from 8:00 p.m. Friday to 10:00 a.m. Saturday.
2. Continuation of the above, with the exception that the highest volume entrance ramp located approximately one-third of the way in the closure limits on Saturday from 10:00 a.m. to 10:00 p.m.
3. Closure of all freeway main lanes and ramps from 10:00 p.m. Saturday to 5:00 p.m. Sunday.

The effect of this sequence on motorist delays was conducted. It was determined that a diversion of 50 percent of the total traffic using the Southwest Freeway during this time period would be needed.

A meeting among all four contractors, TxDOT project personnel, district traffic engineering and construction personnel, and the City of Houston Traffic and Transportation Department was held to initially discuss this option. On the basis of past experience, all parties agreed that this level of diversion could be attained with the implementation of an effective public information campaign and associated traffic management measures. The public information and traffic management measures that were implemented are discussed in this paper. In addition, the results of the strategy and conclusions are presented.

## DESCRIPTION OF CORRIDOR

U.S. 59 Southwest Freeway is one of the most congested freeways serving the Houston area, with excessive delays to

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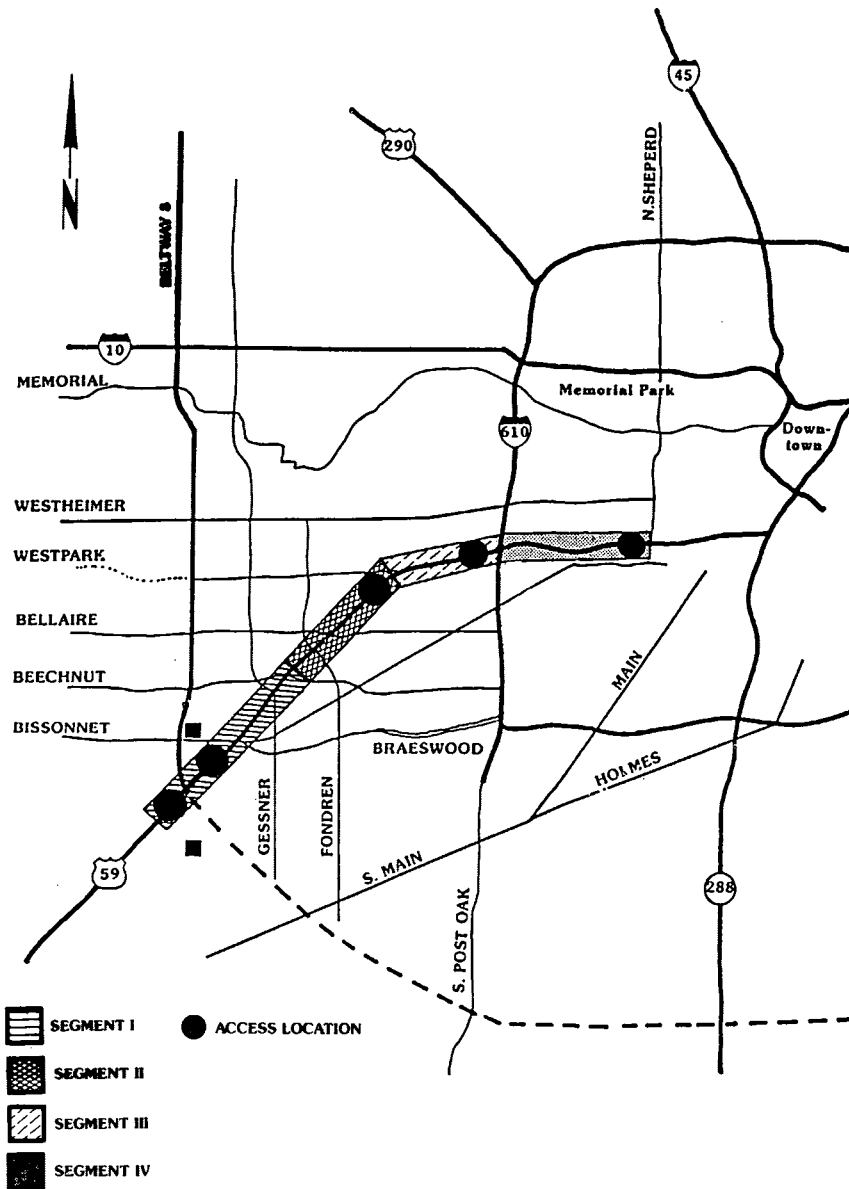


FIGURE 1 U.S. 59 construction segments.

motorists during periods of high traffic demands. To alleviate this congestion, TxDOT and the Metropolitan Transit Authority of Harris County (METRO) are working together to improve the operation of the freeway and frontage road system. At the conclusion of the approximate 3-year construction effort, users will benefit from increased freeway and roadway capacity, an additional freeway interchange, selected ramp reversals, frontage road intersection improvements, extension of the frontage road system, and pavement rehabilitation. In addition, a barrier-separated HOV lane with elevated interchanges at selected locations will be constructed in the freeway median to serve the HOV demand. Figure 1 presents the limits of the construction project. Construction in Segments 1, 2, and 3 simultaneously began in mid-1989; that for Segment 4 began approximately 6 months later.

Vehicle classification studies in a six-lane section of freeway south of Westpark in June 1991 indicated that average daily

traffic for a typical weekday was approximately 124,000 vehicles per day. Heavy trucks accounted for 5.2 percent of the total vehicle demand. Because of the congested conditions, peak hour volumes of only 4,734 vehicles per hour (northbound) and 5,266 vehicles per hour (southbound) were observed during the study. Similar studies east of the construction in a 10-lane section measured approximately 201,000 vehicles per day; the truck percentage was observed at 3.1 percent. Previous studies completed on weekends indicated minimal differences for Saturday traffic demands for the entire 24-hr period. However, peaking was not evident; the traffic was somewhat evenly distributed during daylight hours. Sunday traffic demands were about 80 percent of the weekday totals.

The geometrics of the surface street system throughout the corridor varies. However, most of the roadways studied are four- or six-lane divided arterials. There were no computer

controlled signal systems operating in the corridor during Operation Big Switch; the timing of traffic signals was not adjusted during the freeway closure.

### ADVANCED PLANNING

The first major task in this study was the development of a traffic control plan such that all four contractors could complete their work as soon as possible. Meetings with all those involved began in July, approximately 2 months before the planned traffic switch. This meeting and several others that followed were attended by representatives of the contractors, TxDOT, METRO, the Texas Transportation Institute (TTI), and the City of Houston. Items discussed in detail are summarized in the following list:

- Traffic control plan: Maintain two express lanes for through traffic as long as possible, and provide exits for emergency vehicles near hospitals within corridor;
- Public information: Begin as soon as possible to encourage the public to avoid the freeway;
- Signing: Use temporary static, electronic changeable message signs;
- Diversion: Approximately 50 percent of the total existing traffic must be diverted for the operation to be successful;
- Weather (a major concern): Barrier relocation may proceed in the rain, but dry pavement is necessary for pavement marking;
- Contractors' progress: Concern about whether all four contractors would be ready to make the traffic switch by the planned weekend was expressed;
- Other events: Schedule closure to avoid major events within the corridor.

### TRAFFIC CONTROL PLAN

The basis for the traffic control plan was prepared by a consultant for METRO. All involved agreed that this would be the preferred method to complete the traffic switch. A summary of the traffic control plan and its development is presented next.

When TxDOT and METRO first established the traffic control philosophy for the Southwest Freeway Project, traffic was to be shifted on all three segments at one time. After months of review and schedule slippages, this was deemed to be too idealistic. As a result, new milestones were established for the contracts. To further complicate the shift, a fourth segment was introduced in April 1990. The current arrangement requires traffic to be placed on temporary transitions at each end of each segment. These transitions involve main lane traffic weaving movements of 36 to 44 ft. Again, this independent arrangement was not the preferred method of traffic handling envisioned during early stages of plan preparation. A staggered traffic shift would mean transitions at each end as well as between each project segment. A concurrent traffic shift would require transitions at each end only, some 12 mi apart. It now appears possible that all four segments can make a Phase 2 (main lane) inbound traffic shift on the same date with little coordination. This shift was tar-

geted for September 7, 1991. The contractor's schedules were reviewed and supported an inbound traffic shift on September 7, 1991. Everyone would benefit (the traveling public, METRO, TxDOT, and the contractors) by accomplishing this major shift simultaneously. Some of the apparent benefits were cost savings to METRO and TxDOT for not performing the transitions, minimization of the out-of-service time for the Chimney Rock exit ramp, elimination of main lane traffic weaves throughout the project, and savings to the contractors by not performing traffic control associated with the transitions.

Several options were considered to achieve the main lane inbound traffic shift within the project's limit. Serious consideration was given to maintaining the current three lanes on the freeway during the preparatory work for the lane shift. If three lanes are maintained, the traffic in the right lane will be close to the concrete median barrier moving and resetting activities and expose a high vertical edge of embankment, pavement, or both to the traffic in the outside lane. An attempt to maintain full capacity would place the traveling public, as well as workers, at risk, which far outweighed the potential benefits. The unanimously agreed upon General Philosophy for the Phase 2 inbound shift was to close all exit and entrance ramps, close the outside main lane (dedicating it as a work zone), and maintain express traffic on the remaining two main lanes. This would only remain in effect for the weekend shift. Main lane traffic would flow and should have adequate capacity. The only ramps to remain open were those at IH-610. The exit ramp at Fondren could also be maintained for emergency vehicles. The inbound shift was planned to be implemented during one weekend in September 1991. All traffic was planned to be on the new inbound Phase 2 pavement by the following Monday. Freeway main lane through traffic and local exit service road traffic was split before the beginning of Segment 1 to prepare for the main lane shift. The point of separation was not addressed in any of the project's traffic control plans. This point must be carefully chosen to best serve the safety of the workers, the safety and convenience of the traveling public, including that on the Sam Houston Tollway and city streets, and the least possible disruption to the merchants along these travelways. The following two scenarios describe in detail the approach end transitions. The departure end of Segment 4 does not present any unusual problems and is straightforward in its implementation.

### RESULTS OF TRAFFIC STUDIES

Traffic studies were completed by TTI at 56 count sites from September 3 through 16, 1991. Table 1 presents a listing of the completed counts; Figure 2 provides approximate locations for each count. The count sites were selected to provide answers to two questions that arose during the extensive planning process undertaken before the operation was implemented. The first addressed documentation on the diversion of motorists avoiding the construction area. A second concern was major impacts on traffic patterns near retail centers within the corridor. Most count sites were studied at regular 6-month intervals once construction began.

Addressing the second question is important when considering the public image of TxDOT and METRO. The two major locations of concern were the traffic patterns near the Sharpstown and Westwood malls. The traffic patterns on streets

**TABLE 1 Traffic Count Locations, U.S. 59 Southwest Freeway Corridor**

Traffic Count Locations	Map Code
Beechnut EB -- East of US 59	14-A
Beechnut EB -- West of US 59	13-A
Beechnut WB -- East of US 59	14-B
Beechnut WB -- West of US 59	13-B
Bellaire EB -- East of Fondren	18-A
Bellaire EB -- East of US 59	23-A
Bellaire EB -- West of Fondren	17-A
Bellaire EB -- West of US 59	22-A
Bellaire WB -- East of Fondren	18-B
Bellaire WB -- East of US 59	23-B
Bellaire WB -- West of Fondren	17-B
Bellaire WB -- West of US 59	22-B
Beltway 8 Frontage Road SB -- North of US 59	1-D
Beltway 8 NB Beechnut Exit	3-C
Beltway 8 NB Beechnut Exit -- FR Before	3-C
Beltway 8 SB to US 59 WB	2-D
Bissonnet EB -- East of Country Creek	8-A
Bissonnet EB -- East of US 59	12-A
Bissonnet EB -- West of Country Creek	7-A
Bissonnet EB -- West of US 59	10-A
Bissonnet WB -- East of Country Creek	8-B
Bissonnet WB -- East of US 59	12-B
Bissonnet WB -- West of Country Creek	7-B
Bissonnet WB -- West of US 59	10-B
Clarewood EB -- East of Fondren	15-A
Clarewood EB -- West of US 59	24-A
Clarewood WB -- East of Fondren	15-B
Clarewood WB -- West of US 59	24-B
Club Creek EB -- East of Country Creek	9-A
Club Creek EB -- West of US 59	11-A
Club Creek WB -- East of Country Creek	9-B
Club Creek WB -- West of US 59	11-B
Country Creek NB -- North of Bissonnet	6-C
Country Creek SB -- North of Bissonnet	6-D
Country Creek SB -- South of Club Creek	5-D
Fondren NB -- North of Bellaire	16-C
Fondren NB -- North of US 59	20-C
Fondren NB -- South of Bellaire	19-C
Fondren NB -- South of US 59	21-C
Fondren SB -- North of Bellaire	16-D
Fondren SB -- North of US 59	20-D
Fondren SB -- South of Bellaire	19-D
Fondren SB -- South of US 59	21-D
I-10 EB M/L @ Gessner	----
I-10 WB M/L @ Gessner	----
Richmond EB -- East of Hillcroft	26-A
Richmond WB -- East of Hillcroft	26-B
US 59 EB to Beltway 8 NB	4-A
Westheimer EB -- East of Hillcroft	25-A
Westheimer WB -- East of Hillcroft	25-B
Westpark EB -- East of US 59	27-A
Westpark EB -- West of I-610	29-A
Westpark EB -- West of US 59	28-A
Westpark WB -- East of US 59	27-B
Westpark WB -- West of I-610	29-B
Westpark WB -- West of US 59	28-B

with direct access to these major retail centers were monitored in June and December of each year once the construction began. The Saturday and Sunday traffic volumes are a measure of the retail activity for those days.

Table 2 presents comparisons of the data collected on Saturday, September 7, 1991, with recent traffic studies. A detailed examination of the volumes observed at the Bellaire/Fondren intersection should provide an indication of any shifts in overall travel patterns near Sharpstown Mall. This comparison includes all traffic observed within the intersection as recorded by the automatic recording equipment. Summing the departure traffic demands within the intersection provides the following results: June 1991, 92,618 vehicles; September 7, 1991, 84,387 vehicles; and September 14, 1991, 87,524 vehicles.

A comparison of the studies conducted during Operation Big Switch with those completed the following week reveals that total traffic departures were observed to be 3.6 percent less. This small difference is insignificant and could be a result of normal fluctuations in daily traffic. Therefore, it can be stated that the freeway closure had limited impacts on the total traffic demands within the Bellaire/Fondren intersection, resulting in limited effects on retail sales.

Another comparison to measure impacts near Sharpstown Mall are traffic counts completed on Bellaire Boulevard on the east and west sides of the freeway. Total traffic demands (combined eastbound and westbound) west of U.S. 59 are as follows: June 1991, 51,729 vehicles; September 7, 1991, 49,017 vehicles; and September 14, 1991, 56,977 vehicles.

Using the June 1991 traffic demands as base volumes revealed a decline of 5.2 percent during the closure, but traffic was observed to increase by 10.1 percent the next Saturday. The following is a comparison of the traffic demands east of the freeway: June 1991, 32,204 vehicles; September 7, 1991, 37,279 vehicles; and September 14, 1991, 34,201 vehicles.

The June data were again used as the basis for comparison, and a 15.8 percent increase was observed during the operation and a 6.2 percent increase the next weekend. This indicates that the construction activities had a positive impact on the traffic on Bellaire Boulevard immediately adjacent to Sharpstown Mall.

Similar comparisons may be completed for traffic observed on Bissonnet Street, which provides access to Westwood Mall. Summing the data collected for Bissonnet east of County Creek (eastbound and westbound) results in the following: June 1991, 47,479 vehicles; September 7, 1991, 46,096 vehicles; and September 14, 1991, 46,451 vehicles.

A comparison with the June data indicates a 2.9 percent decrease during Operation Big Switch and a 2.2 percent decrease the next Saturday. These differences are insignificant and may be due mainly to daily fluctuations in traffic patterns.

On the basis of the limited comparisons made during this study, Operation Big Switch did not significantly affect Saturday traffic demands near the two regional shopping malls. Although traffic demands did differ slightly from those observed before and after the closure, these differences were not considered significant. The variations observed could have been caused by normal traffic variations as well as by altered traffic patterns because of the construction. No detailed comparisons of these traffic demands are included in this paper. However, traffic volumes collected during this period are presented in Tables 3 and 4.

## ESTIMATES OF DIVERSION

Traffic studies were also completed at several locations near the corridor to measure diversion away from the freeway. The results of these studies are presented in Tables 5 and 6. These study sites were selected on the basis of expected diversion routes preferred by the public. No specific route was suggested to the public through the information program implemented before the freeway closure. Because of failures with traffic counting equipment, data were not available for all of these selected locations during Operation Big Switch.

FIGURE 2 Count locations during Operation Big Switch.

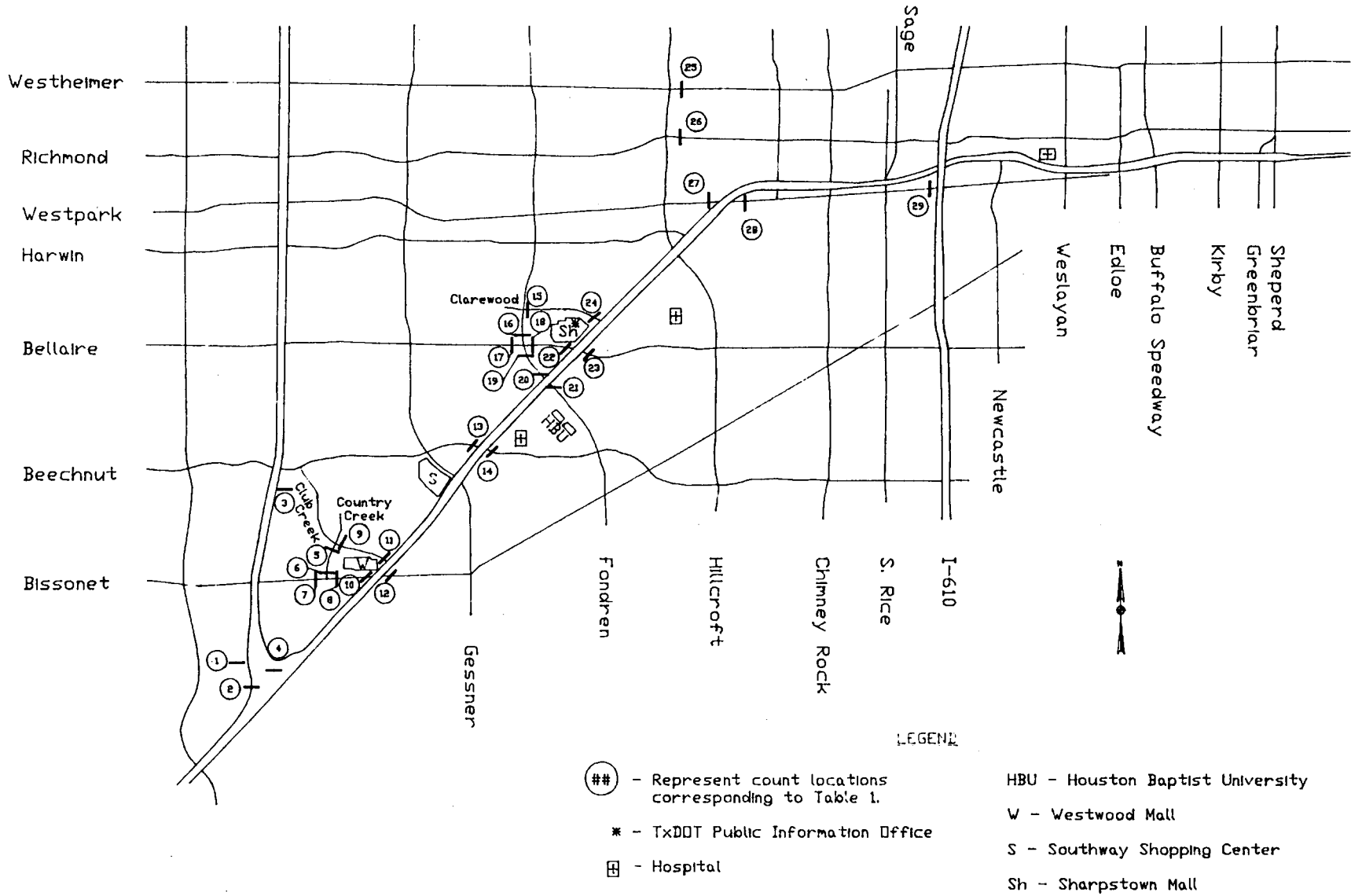


TABLE 2 Comparison of 24-hr Saturday Traffic Volumes, U.S. 59 Southwest Freeway Corridor

Traffic Count Locations	Previous Traffic Studies Date	Studies Volume	Studies During "Big Switch" Volume	"Big Switch" % Change	Studies After "Big Switch" Volume	% Change
Beechnut EB -- East of US 59	Jun-91	10,620	19,393	N/A	N/A	N/A
Beechnut EB -- West of US 59	Jun-91	34,657	15,182	-7.84	16,473	-52.47
Beechnut WB -- East of US 59	Jun-91	12,045	12,784	N/A	N/A	N/A
Beechnut WB -- West of US 59	Jun-91	32,642	16,086	-4.48	16,841	-48.41
Bellaire EB -- East of Fondren	Jun-91	26,911	26,955	-5.79	28,611	6.32
Bellaire EB -- East of US 59	Jun-91	15,324	18,245	9.80	16,617	8.44
Bellaire EB -- West of Fondren	Jun-91	32,299	27,786	-20.23	34,831	7.84
Bellaire EB -- West of US 59	Jun-91	26,216	24,692	-18.37	30,249	15.38
Bellaire WB -- East of Fondren	Jun-91	24,412	N/A	N/A	28,006	14.72
Bellaire WB -- East of US 59	Jun-91	16,880	19,034	8.25	17,584	4.17
Bellaire WB -- West of Fondren	Jun-91	29,134	24,436	-4.60	25,613	-12.09
Bellaire WB -- West of US 59	Jun-91	25,513	24,325	-8.99	26,728	4.76
Beltway 8 Frontage Road SB -- North of US 59	Jun-90	7,172	N/A	N/A	10,940	52.54
Beltway 8 NB Beechnut Exit		N/A	5,518	1.45	5,439	N/A
Beltway 8 NB Beechnut Exit -- FR Before		N/A	20,191	12.91	17,882	N/A
Beltway 8 SB to US 59 WB		N/A	17,593	29.76	13,558	N/A
Bissonnet EB -- East of Country Creek	Jun-91	22,873	22,848	-2.16	23,353	2.10
Bissonnet EB -- East of US 59	Jun-91	23,042	22,770	5.16	21,652	-6.03
Bissonnet EB -- West of Country Creek	Jun-91	28,246	22,523	-2.05	22,995	-18.59
Bissonnet EB -- West of US 59	Jun-91	25,700	22,556	-6.80	24,203	-5.82
Bissonnet WB -- East of Country Creek	Jun-91	24,606	23,248	.65	23,098	-6.13
Bissonnet WB -- East of US 59	Jun-91	21,562	21,421	-.52	21,532	-.14
Bissonnet WB -- West of Country Creek	Jun-91	26,962	22,378	13.62	19,696	-26.95
Bissonnet WB -- West of US 59	Jun-91	26,733	23,603	-4.31	24,667	-7.73
Clarewood EB -- East of Fondren	Jun-91	11,769	4,417	-2.19	4,516	-61.63
Clarewood EB -- West of US 59	Jun-91	4,147	3,058	4.94	2,914	-29.73
Clarewood WB -- East of Fondren	Jun-91	7,016	8,049	N/A	N/A	N/A
Clarewood WB -- West of US 59	Jun-91	4,266	3,050	-44.49	5,495	28.81
Club Creek EB -- East of Country Creek	Jun-91	5,500	4,341	-18.97	5,357	-2.60
Club Creek EB -- West of US 59	Jun-91	5,751	4,659	-9.66	5,157	-10.33
Club Creek WB -- East of Country Creek	Jun-91	5,403	N/A	N/A	3,920	-27.45
Club Creek WB -- West of US 59	Jun-91	8,200	3,168	-14.19	3,692	-54.98
Country Creek NB -- North of Bissonnet	Jun-91	2,732	2,238	1.31	2,209	-19.14
Country Creek SB -- North of Bissonnet	Jun-91	1,870	1,548	-4.86	1,627	-12.99
Country Creek SB -- South of Club Creek	Jun-91	3,241	N/A	N/A	N/A	N/A
Fondren NB -- North of Bellaire	Jun-91	20,086	19,383	4.94	18,470	-8.05
Fondren NB -- North of US 59	Jun-91	16,491	13,800	43.76	9,599	-41.79
Fondren NB -- South of Bellaire	Jun-91	18,411	14,577	-10.82	16,345	-11.22
Fondren NB -- South of US 59	Jun-91	16,561	14,210	-32.29	20,987	26.73
Fondren SB -- North of Bellaire	Jun-91	20,257	17,922	-13.79	20,788	2.62
Fondren SB -- North of US 59	Jun-91	15,978	14,223	-12.52	16,258	1.75
Fondren SB -- South of Bellaire	Jun-91	16,487	13,613	-8.21	14,830	-10.05
Fondren SB -- South of US 59	Jun-91	15,661	18,392	17.59	15,641	-.13
I-10 EB M/L @ Gessner	Aug-91	82,210	85,654	-.84	86,377	5.07
I-10 WB M/L @ Gessner	Aug-91	80,048	81,198	-5.02	85,489	6.80
Richmond EB -- East of Hillcroft		N/A	19,368	13.79	17,021	N/A
Richmond WB -- East of Hillcroft	Jul-91	22,409	19,519	13.25	17,235	-23.09
US 59 EB to Beltway 8 NB	Jul-91	12,308	11,984	2.17	11,730	-4.70
Westheimer EB -- East of Hillcroft	Jul-91	36,974	52,099	21.06	43,034	16.39
Westheimer WB -- East of Hillcroft	Jul-91	34,872	50,044	7.65	46,488	33.31
Westpark EB -- East of US 59	Jun-91	12,717	26,740	76.48	15,152	19.15
Westpark EB -- West of I-610	Jul-91	15,103	28,109	103.72	13,798	-8.64
Westpark EB -- West of US 59	Jun-91	17,241	N/A	N/A	17,923	3.96
Westpark WB -- East of US 59	Jun-91	9,469	13,108	33.93	9,787	3.36
Westpark WB -- West of I-610		N/A	N/A	N/A	11,654	N/A
Westpark WB -- West of US 59	Jun-91	19,478	N/A	N/A	23,271	19.47

NOTE: % Change during "Big Switch" compares with studies completed the next week.  
 % Change after "Big Switch" compares with the previous traffic studies.

TABLE 3 Comparison of 24-hr Sunday Traffic Volumes, U.S. 59 Southwest Freeway Corridor

Traffic Count Locations	Previous Traffic Studies		Studies During "Big Switch"		Studies After "Big Switch"	
	Date	Volume	Volume	% Change	Volume	% Change
Beechnut EB -- East of US 59	Jun-91	8,140	9,066	N/A	N/A	N/A
Beechnut EB -- West of US 59	Jun-91	24,619	12,521	-1.11	12,661	-48.57
Beechnut WB -- East of US 59	Jun-91	9,104	10,335	N/A	N/A	N/A
Beechnut WB -- West of US 59	Jun-91	23,130	13,621	-1.26	13,795	-40.36
Bellaire EB -- East of Fondren	Jun-91	18,831	19,824	-3.14	20,466	8.68
Bellaire EB -- East of US 59	Jun-91	12,392	14,356	20.93	11,871	-4.20
Bellaire EB -- West of Fondren	Jun-91	20,247	21,370	-15.45	25,274	24.83
Bellaire EB -- West of US 59	Jun-91	17,977	18,791	-12.03	21,361	18.82
Bellaire WB -- East of Fondren	Jun-91	17,612	19,286	-1.28	19,536	10.92
Bellaire WB -- East of US 59	Jun-91	12,964	14,160	11.94	12,650	-2.42
Bellaire WB -- West of Fondren	Jun-91	22,512	18,538	-6.79	19,889	-11.65
Bellaire WB -- West of US 59	Jun-91	18,448	18,526	-5.14	19,529	5.86
Beltway 8 Frontage Road SB -- North of US 59		N/A	N/A	N/A	8,550	N/A
Beltway 8 NB Beechnut Exit		N/A	6,322	31.76	4,798	N/A
Beltway 8 NB Beechnut Exit -- FR Before		N/A	16,263	13.17	14,371	N/A
Beltway 8 SB to US 59 WB		N/A	13,314	29.27	10,299	N/A
Bissonnet EB -- East of Country Creek	Jun-91	18,713	18,171	.67	18,050	-3.54
Bissonnet EB -- East of US 59	Jun-91	17,766	19,024	12.06	16,976	-4.45
Bissonnet EB -- West of Country Creek	Jun-91	20,233	17,829	.71	17,703	-12.50
Bissonnet EB -- West of US 59	Jun-91	16,569	17,928	-2.45	18,378	10.92
Bissonnet WB -- East of Country Creek	Jun-91	19,025	18,273	1.46	18,010	-5.34
Bissonnet WB -- East of US 59	Jun-91	16,283	16,780	2.58	16,358	.46
Bissonnet WB -- West of Country Creek	Jun-91	21,305	17,434	15.82	15,053	-29.35
Bissonnet WB -- West of US 59	Jun-91	19,545	18,470	-1.28	18,709	-4.28
Clarewood EB -- East of Fondren	Jun-91	6,508	2,822	.82	2,799	-56.99
Clarewood EB -- West of US 59	Jun-91	2,275	2,650	25.35	2,114	-7.08
Clarewood WB -- East of Fondren	Jun-91	4,442	5,947	N/A	N/A	N/A
Clarewood WB -- West of US 59	Jun-91	2,900	2,238	-31.71	3,277	13.00
Club Creek EB -- East of Country Creek	Jun-91	2,652	3,144	-12.59	3,597	35.63
Club Creek EB -- West of US 59	Jun-91	3,667	2,941	-11.50	3,323	-9.38
Club Creek WB -- East of Country Creek	Jun-91	3,443	N/A	N/A	2,706	-21.41
Club Creek WB -- West of US 59	Jun-91	4,908	2,189	-15.90	2,603	-46.96
Country Creek NB -- North of Bissonnet	Jun-91	2,137	1,836	6.62	1,722	-19.42
Country Creek SB -- North of Bissonnet	Jun-91	1,375	1,170	2.09	1,146	-16.65
Country Creek SB -- South of Club Creek	Jun-91	3,393	N/A	N/A	N/A	N/A
Fondren NB -- North of Bellaire	Jun-91	14,241	13,792	19.57	11,535	-19.00
Fondren NB -- North of US 59	Jun-91	9,945	6,367	7.53	5,921	-40.46
Fondren NB -- South of Bellaire	Jun-91	10,750	10,082	3.04	9,785	-8.98
Fondren NB -- South of US 59	Jun-91	10,657	10,188	-26.32	13,827	29.75
Fondren SB -- North of Bellaire	Jun-91	13,739	12,704	-3.79	13,204	-3.89
Fondren SB -- North of US 59	Jun-91	10,318	9,693	-6.59	10,377	.57
Fondren SB -- South of Bellaire	Jun-91	12,722	9,310	-.70	9,376	-26.30
Fondren SB -- South of US 59	Jun-91	11,540	13,286	28.92	10,306	-10.69
I-10 EB M/L @ Gessner	Aug-91	69,723	68,502	2.74	66,678	-4.37
I-10 WB M/L @ Gessner	Aug-91	67,242	65,249	-.86	65,818	-2.12
Richmond EB -- East of Hillcroft		N/A	12,888	19.51	10,784	N/A
Richmond WB -- East of Hillcroft	Jul-91	13,303	12,876	12.72	11,423	-14.13
US 59 EB to Beltway 8 NB	Jul-91	10,628	13,465	43.37	9,392	-11.63
Westheimer EB -- East of Hillcroft	Jul-91	26,842	39,607	30.87	30,265	12.75
Westheimer WB -- East of Hillcroft	Jul-91	25,870	37,146	17.73	31,553	21.97
Westpark EB -- East of US 59	Jul-91	10,472	22,619	97.89	11,430	9.15
Westpark EB -- West of I-610	Jul-91	9,029	24,783	182.75	8,765	-2.92
Westpark EB -- West of US 59	Jun-91	13,757	N/A	N/A	N/A	N/A
Westpark WB -- East of US 59	Jun-91	8,233	10,454	39.74	7,481	-9.13
Westpark WB -- West of I-610		N/A	N/A	N/A	7,032	N/A
Westpark WB -- West of US 59	Jun-91	17,021	N/A	N/A	N/A	N/A

NOTE: % Change during "Big Switch" compares with studies completed the next week.  
 % Change after "Big Switch" compares with the previous traffic studies.

TABLE 4 Comparison of 24-hr Weekday Traffic Volumes, U.S. 59 Southwest Freeway Corridor

Traffic Count Locations	Previous Traffic Studies		Week Before "Big Switch"		Week After "Big Switch"	
	Date	Volume	Volume	% Change	Volume	% Change
Beechnut EB -- East of US 59	Jun-91	14,609	12,448	N/A	N/A	N/A
Beechnut EB -- West of US 59	Jun-91	37,275	18,525	-1.13	18,737	-49.73
Beechnut WB -- East of US 59	Jun-91	16,196	16,984	N/A	N/A	N/A
Beechnut WB -- West of US 59	Jun-91	36,315	18,786	-2.22	19,213	-47.09
Bellaire EB -- East of Fondren	Jun-91	26,220	27,129	1.92	26,618	1.52
Bellaire EB -- East of US 59	Jun-91	16,676	17,898	.15	17,872	7.17
Bellaire EB -- West of Fondren	Jun-91	32,443	28,282	-10.29	31,525	-2.83
Bellaire EB -- West of US 59	Jun-91	25,058	26,782	-3.16	27,656	10.37
Bellaire WB -- East of Fondren	Jun-91	23,692	25,880	-3.52	26,823	13.22
Bellaire WB -- East of US 59	Jun-91	18,076	19,327	-.38	19,401	7.33
Bellaire WB -- West of Fondren	Jun-91	30,008	24,508	-4.47	25,656	-14.50
Bellaire WB -- West of US 59	Jun-91	23,694	24,789	-.08	24,809	4.71
Beltway 8 Frontage Road SB -- North of US 59	Jun-90	13,643	14,805	20.21	12,316	-9.73
Beltway 8 NB Beechnut Exit	Sep-90	6,133	6,365	-5.95	6,768	10.35
Beltway 8 NB Beechnut Exit -- FR Before	Sep-90	15,322	18,211	.42	18,134	18.35
Beltway 8 SB to US 59 WB		N/A	17,127	1.46	16,881	N/A
Bissonnet EB -- East of Country Creek	Jun-91	24,981	23,022	.64	22,876	-8.43
Bissonnet EB -- East of US 59	Jun-91	25,737	23,310	.38	23,222	-9.77
Bissonnet EB -- West of Country Creek	Jun-91	30,334	22,545	1.05	22,310	-26.45
Bissonnet EB -- West of US 59	Jun-91	24,836	23,423	-.17	23,464	-5.52
Bissonnet WB -- East of Country Creek	Jun-91	24,217	22,955	1.77	22,555	-6.86
Bissonnet WB -- East of US 59	Jun-91	23,052	21,589	-.57	21,712	-5.81
Bissonnet WB -- West of Country Creek	Jun-91	26,662	22,022	6.37	20,704	-22.35
Bissonnet WB -- West of US 59	Jun-91	26,012	23,884	.78	23,699	-8.89
Clarewood EB -- East of Fondren	Jun-91	9,414	4,153	10.78	3,749	-60.18
Clarewood EB -- West of US 59	Jun-91	2,833	4,723	86.68	2,530	-10.70
Clarewood WB -- East of Fondren	Jun-91	5,939	7,371	N/A	N/A	N/A
Clarewood WB -- West of US 59	Jun-91	4,257	3,059	-31.55	4,469	4.98
Club Creek EB -- East of Country Creek	Jun-91	6,102	3,835	-21.04	4,857	-20.40
Club Creek EB -- West of US 59	Jun-91	6,066	6,249	6.75	5,854	-3.49
Club Creek WB -- East of Country Creek	Jun-91	5,929	4,188	-1.83	4,266	-28.05
Club Creek WB -- West of US 59	Jun-91	8,024	4,189	-3.55	4,343	-45.87
Country Creek NB -- North of Bissonnet	Jun-91	2,859	2,395	1.14	2,368	-17.17
Country Creek SB -- North of Bissonnet	Jun-91	3,287	1,837	-1.55	1,866	-43.23
Country Creek SB -- South of Club Creek	Jun-91	3,317	3,873	N/A	N/A	N/A
Fondren NB -- North of Bellaire	Jun-91	20,096	16,952	-3.98	17,655	-12.15
Fondren NB -- North of US 59	Jun-91	18,926	13,482	43.26	9,411	-50.27
Fondren NB -- South of Bellaire	Jun-91	18,989	15,417	-.49	15,493	-18.41
Fondren NB -- South of US 59	Jun-91	16,433	14,252	-15.61	16,889	2.77
Fondren SB -- North of Bellaire	Jun-91	20,258	17,979	-5.76	19,078	-5.82
Fondren SB -- North of US 59	Jun-91	16,356	15,260	-4.42	15,965	-2.39
Fondren SB -- South of Bellaire	Jun-91	17,128	14,580	-.30	14,624	-14.62
Fondren SB -- South of US 59	Jun-91	14,394	17,897	7.52	16,646	15.65
I-10 EB M/L @ Gessner	Aug-91	99,247	91,030	-2.53	93,391	-5.90
I-10 WB M/L @ Gessner	Aug-91	94,911	89,412	-3.68	92,832	-2.19
Richmond EB -- East of Hillcroft	May-91	17,734	20,620	.02	20,616	16.25
Richmond WB -- East of Hillcroft	Jul-91	22,688	20,028	-3.73	20,805	-8.30
US 59 EB to Beltway 8 NB	Jul-91	19,355	15,329	-3.68	15,915	-17.77
Westheimer EB -- East of Hillcroft	Jul-91	41,644	48,264	-3.13	49,821	19.64
Westheimer WB -- East of Hillcroft	Jul-91	46,465	49,784	2.73	48,462	4.30
Westpark EB -- East of US 59	Jun-91	17,611	22,845	13.43	20,140	14.36
Westpark EB -- West of I-610	Jul-91	22,640	18,489	-8.45	20,195	-10.80
Westpark EB -- West of US 59	Jun-91	24,775	N/A	N/A	23,998	-3.14
Westpark WB -- East of US 59	Jun-91	12,343	12,458	7.41	11,599	-6.03
Westpark WB -- West of I-610	May-90	10,040	11,492	6.07	10,834	7.91
Westpark WB -- West of US 59	Jun-91	26,993	N/A	N/A	28,072	4.00

NOTE: % Change during "Big Switch" compares with studies completed the next week.  
 % Change after "Big Switch" compares with the previous traffic studies.



TABLE 5 Comparison of Saturday Traffic Demands Along Diversion Route

Diversion Route	Base 24-hr Volume	Volume during "Big Switch"	% Change
Beltway 8 FR SB - North of U.S. 59	10,940	N/A	N/A
Beltway 8 NB Beechnut Exit	17,882	20,191	12.91
Beltway 8 SB to U.S. 59 WB	13,558	17,593	29.76
I-10 EB M/L @ Gessner	86,377	85,654	- 0.84
I-10 WB M/L @ Gessner	85,489	81,198	- 5.02
Richmond EB -- East of Hillcroft	17,021	19,368	13.79
Richmond WB -- East of Hillcroft	17,235	19,519	13.25
Westheimer EB -- East of Hillcroft	43,034	52,099	21.06
Westheimer WB -- East of Hillcroft	46,488	50,044	7.65
Westpark EB -- East of U.S. 59	15,152	26,740	76.48
Westpark EB -- West of I-610	13,798	28,109	103.72
Westpark EB -- West of U.S. 59	17,923	N/A	N/A
Westpark WB -- East of U.S. 59	9,787	13,108	33.93
Westpark WB -- West of U.S. 59	11,654	N/A	N/A
Westpark WB -- West of U.S. 59	23,271	N/A	N/A

Only two of the assumed diversion routes experienced a reduction in traffic volume measured for the 24-hr period on Saturday. The main lane counts on I-10 Katy Freeway for the eastbound decreased by 0.8 percent, and westbound declined by 5.0 percent. This site was selected to determine the number of motorists who used I-10 as a detour around the closure. On the basis of these volumes, it may be concluded that that type of diversion did not occur.

Five of the fifteen sites studied indicated an increase in traffic demand in excess of 20 percent for the Saturday 24-hr period. The two highest increases were observed for eastbound travel along Westpark. This was expected because it was easily accessible from all major cross streets within the Southwest Freeway corridor. Eastbound Westpark east of the closed freeway increased by 76.5 percent, most likely as a result of motorists diverting from the frontage roads. The highest increase observed was for the same roadway west of the I-610 West Loop. This was most likely caused by a com-

ination of vehicles from upstream Westpark and a volume of vehicles from Chimney Rock. Increases of 7.6 percent to 13.8 percent were observed at four of the study sites.

The best comparisons of the diversion from the freeway main lanes could be made by evaluating traffic counts completed along Westpark. However, because of problems with the equipment, data were not available for all six study sites. The problems were typically a result of road tubes that had been removed from the roadway surface. In some cases, the traffic counts malfunctioned in some manner. In order to have completed a better comparison, traffic counts should have been completed along the service roads along the freeway. However, the expected movement of construction equipment and uncertain public reaction did not allow for safe installation and monitoring of the equipment.

The best measure of diversion could have been obtained from traffic data collected by a permanent count station along the freeway. Unfortunately, data were not available at this

TABLE 6 Comparison of Sunday Traffic Demands Along Diversion Route

Diversion Route	Base 24-hr Volume	Volume during "Big Switch"	% Change
Beltway 8 FR SB - North of U.S. 59	8,550	N/A	N/A
Beltway 8 NB Beechnut Exit	4,798	6,322	31.76
Beltway 8 SB to U.S. 59 WB	10,299	13,314	29.27
I-10 EB M/L @ Gessner	66,678	68,502	2.74
I-10 WB M/L @ Gessner	65,818	65,249	- 0.86
Richmond EB -- East of Hillcroft	10,784	12,888	19.51
Richmond WB -- East of Hillcroft	11,423	12,876	12.72
Westheimer EB -- East of Hillcroft	30,265	39,607	30.87
Westheimer WB -- East of Hillcroft	31,553	37,146	17.73
Westpark EB -- East of U.S. 59	11,430	22,619	97.89
Westpark EB -- West of I-610	8,765	24,783	182.75
Westpark EB -- West of U.S. 59	N/A	N/A	N/A
Westpark WB -- East of U.S. 59	7,481	10,454	39.74
Westpark WB -- West of U.S. 59	7,032	N/A	N/A
Westpark WB -- West of U.S. 59	N/A	N/A	N/A

writing from that count site. Over-the-air reports from the traffic service agencies indicated that traffic throughout the area appeared to be lighter than normal.

### PUBLIC INFORMATION CAMPAIGN

Throughout the duration of the construction, TxDOT maintained a public affairs office in the corridor (Figure 2). The office, located in the Sharpstown Mall, is easily accessible by the public, news media, and the construction contractors. The public affairs office carefully planned news releases concerning Operation Big Switch. Merchants in the corridor were also contacted before the release of the plan to the news media. The *Houston Chronicle* published a number of articles covering the operation (1-7), as did other print media.

The broadcast media also provided good coverage of the freeway closure. Traffic reporting services began mentioning the planned work several days in advance and advised motorists to seek alternative routes that weekend. Several radio stations announced the closure throughout the weekend. Houston television stations also covered the operation. The media reported light traffic throughout the weekend within the corridor. No major traffic congestion directly related to Operation Big Switch was reported.

### SUMMARY AND RECOMMENDATIONS

On the basis of the results of the limited traffic studies completed and the positive results from the public, the implementation of Operation Big Switch was deemed a success. The activity involved the coordination of several construction contractors and government agencies. Assistance from the print and broadcast media was instrumental in obtaining cooperation from the public by selecting alternative routes to the closed freeway.

The construction of major freeways in most cases can be completed without major inconvenience to the public. However, the switching of traffic to new lanes normally requires some type of closure. In future instances, it is recommended that the following steps be completed to ensure a smooth operation. Each of these steps was implemented for this operation.

- A detailed review of existing corridor traffic is necessary to identify alternative routes and potential problem areas.
- Closure times must be selected for the least impact on the public while allowing adequate time for the contractor to complete the traffic switch.
- Early notification by public information to retail merchants in the corridor may serve to avert legal actions to halt the construction.
- Print and broadcast media should be involved to provide sufficient information to the public.

- All government agencies that may be affected by any freeway closure (police departments, hospitals, etc.) should be included in the planning process.

- Close coordination with all contractors involved is necessary. This includes the construction companies and all others, including traffic control and utilities.

If similar closure strategies are to be used for other construction projects, additional steps could be followed in the planning and implementation stages:

- Prepare complete documentation of all strategies discussed and implemented during the freeway closure.
- Provide real-time monitoring of traffic throughout the affected corridor, with emphasis on critical locations.
- Implement a temporary traffic control center to provide a focal point for information exchange. The center should have cellular telephone or radio contact with those doing the traffic monitoring and with the project supervisor. This center would only be needed during critical periods.
- Videotape the roadway closures. Videotapes should include all traffic control devices used for the operation. It is suggested that this be completed at selected time intervals through the duration of the operation to document that all devices have remained in place.

The preceding four steps were not included in Operation Big Switch. Even without these steps, however, the operation was a success and was completed without incident. The experiences gained during this effort have been used for similar (although smaller in duration and segment width) operations along the Southwest Freeway with similar success. The extensive public information campaign and early contact with the retail community were integral to each. This information will be useful in planning for comparable traffic switches on future projects.

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