FREEWAY OPERATIONS STUDIES

WORK ORDER # 14

CONTRACT No. (86) 06-03-A3-AG

(58545P5007)

FOR

IH-820 AT RUFE SNOW DRIVE

IH-820 AT WHITE SETTLEMENT ROAD

IH-35W AT NORTHSIDE DRIVE

SUBMITTED BY

TRAFFIC ENGINEERS, INC.

FORT WORTH, TEXAS

AUGUST 1986

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INTRODUCTION

Accessibility to freeway travel from an arterial most often comes through the diamond interchange facility. The level of service at a diamond is dependent upon many factors. These include the amount of separation between service roads, the storage capacity of each approach in terms of number of lanes and available queue storage, the type and operation of traffic control (i.e., signal or stop sign), the character and magnitude of the traffic, the relative geometrics of ramp to frontage road, the influence of traffic generator access points, and the function of the interchange relative to the adjacent land use. When some combination of these factors creates a situation where capacities are approached or exceeded, congestion and/or unsafe conditions result.

This work order is a study of three locations, identified by the FSIP identification process, which experience peak period safety and/or congestion problems.

IH-820 AT RUFE SNOW DRIVE

FREEWAY OPERATIONS STUDY

IH-820 at Rufe Snow Drive

A. Study Location

The subject problem location is at the diamond interchange of IH-820 and Rufe Snow. It serves as a major north-south arterial for North Richland Hills with major retail development immediately north of the interchange and residential areas to the south and the north. Figure 1 schematically shows the geometrics of the study area.

B. Problem/Task Statement

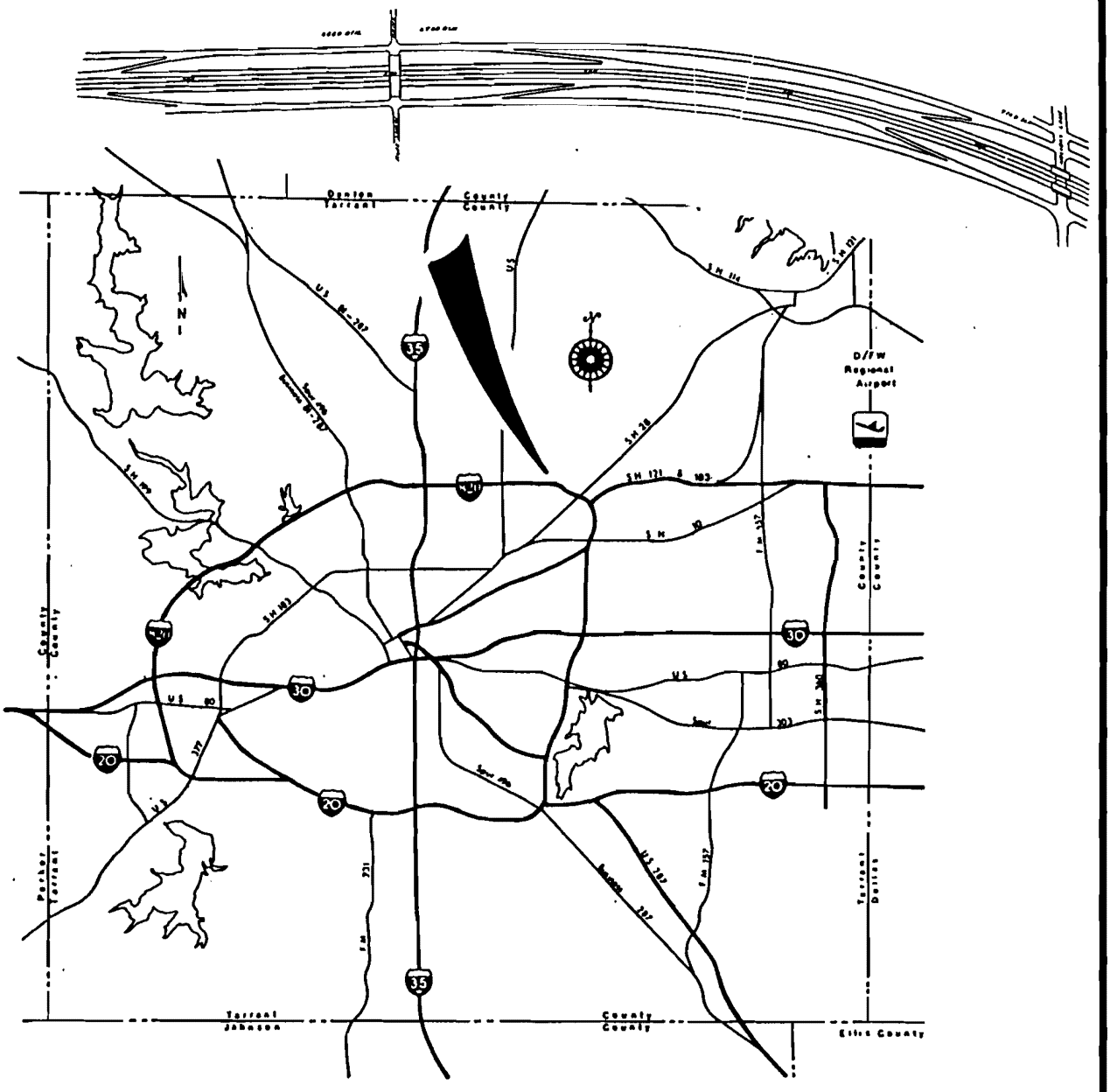
The Rufe Snow interchange is extremely congested and experiences safety and operational problems on all approaches, especially during peak periods. It is the task of this study to identify and evaluate possible improvements that can be implemented to lessen or alleviate the problems that exist.

C. Data Collection

To be able to analyze the problem situation, it was necessary to first obtain appropriate traffic volume and accident data. Morning and evening peak turning movement counts (Figure 2) were made to provide a basis for evaluating proposed improvements using PASSER III.

D. Observations/Analysis

The collision diagrams (Figures 3 & 4) reflect a fairly large number of intersection and intersection related accidents. Although this can often be expected with the high volumes involved, specific problem situations can be identified. Figure 4 reflects several problems on the westbound frontage road approach. Of the 35 accidents shown, 30 occurred on the frontage road or involved vehicles from the frontage road. Of these, 13 were rear-end collisions, 6 were sideswipe or lane change-angle accidents, and 4 were right angles between northbound throughs and right turns from the frontage road. The remaining 7 accidents included 2 dual turning accidents, and a wrong-way accident from a drive-way as well as other intersection turning accidents. These accidents seem to be a product of the queuing and weaving that occurs between the exit ramp and the intersection.



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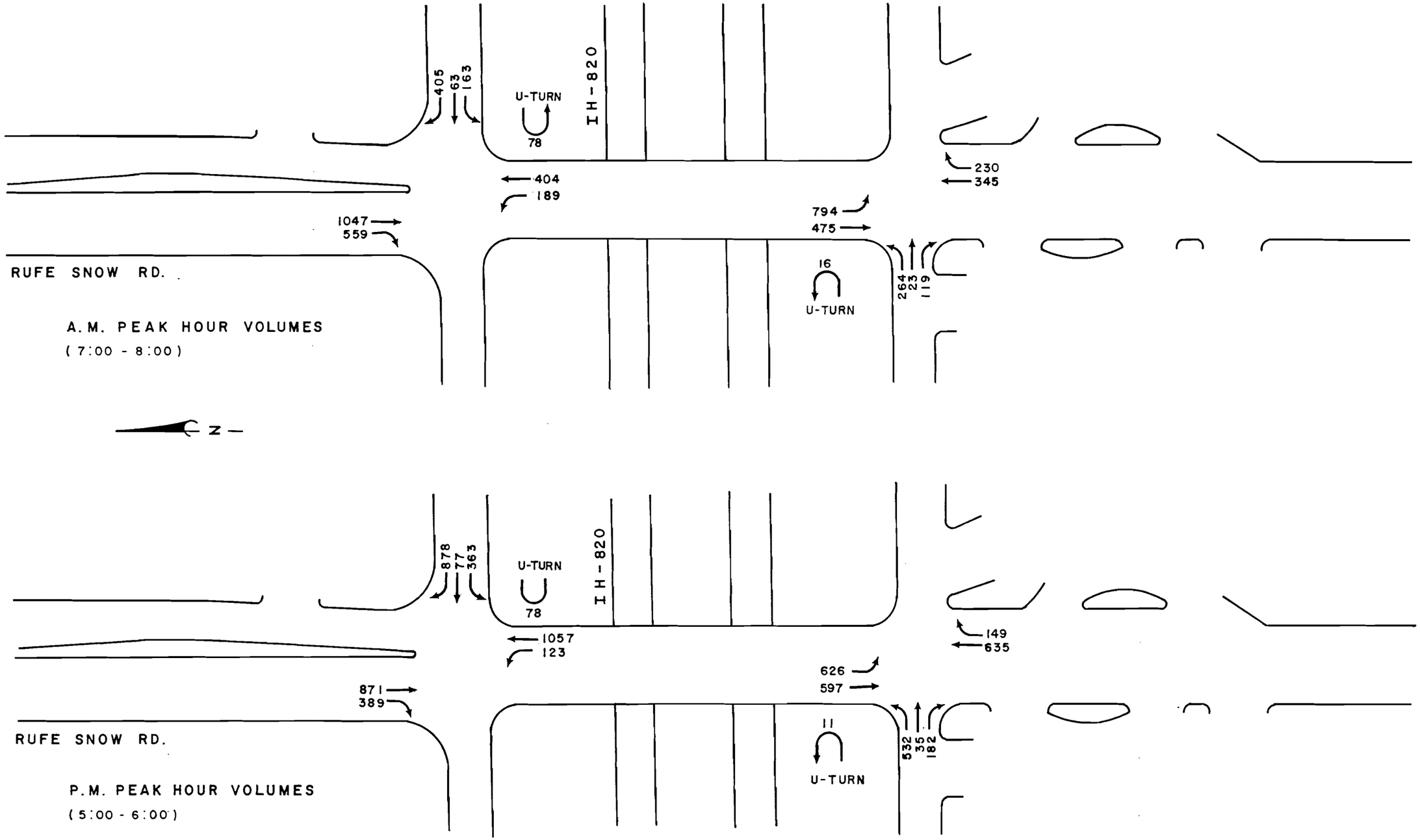
STUDY LOCATION

IH-820 AT RUFE SNOW DR

FIGURE 1



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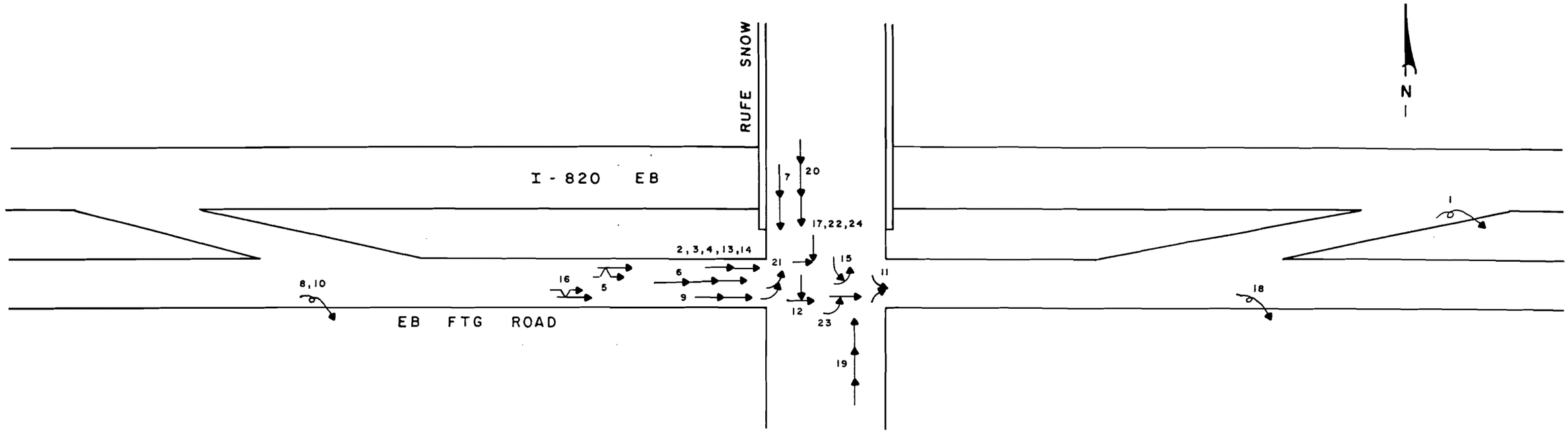
TURNING MOVEMENT COUNTS

IH-820 AT RUFE SNOW

NORTH RICHLAND HILLS, TEXAS

FIGURE 2



Accident Number	Date	Time	Pavement Condition	Injuries
1	1-05-85	1400	Dry	0
2	3-13-85	1100	Wet	0
3	3-16-85	1100	Wet	1
4	3-19-85	1400	Dry	1
5	4-20-85	1200	Dry	0
6	5-10-85	1500	Dry	0
7	5-21-85	2100	Dry	1
8	7-15-85	0100	Dry	0
9	7-23-85	1600	Wet	1
10	7-23-85	1700	Wet	0
11	7-29-85	1500	Dry	0
12	8-17-85	1000	Dry	0

Accident Number	Date	Time	Pavement Condition	Injuries
13	8-24-85	1700	Dry	2
14	9-07-85	1100	Dry	0
15	9-16-85	1500	Dry	0
16	9-28-85	1700	Wet	0
17	9-28-85	1700	Wet	0
18	11-11-85	1700	Dry	1
19	12-05-85	0800	Dry	0
20	12-19-85	1800	Dry	0
21	2-14-86	0800	Dry	0
22	3-06-86	0200	Dry	0
23	3-27-86	2300	Dry	0
24	4-30-86	2100	Wet	1

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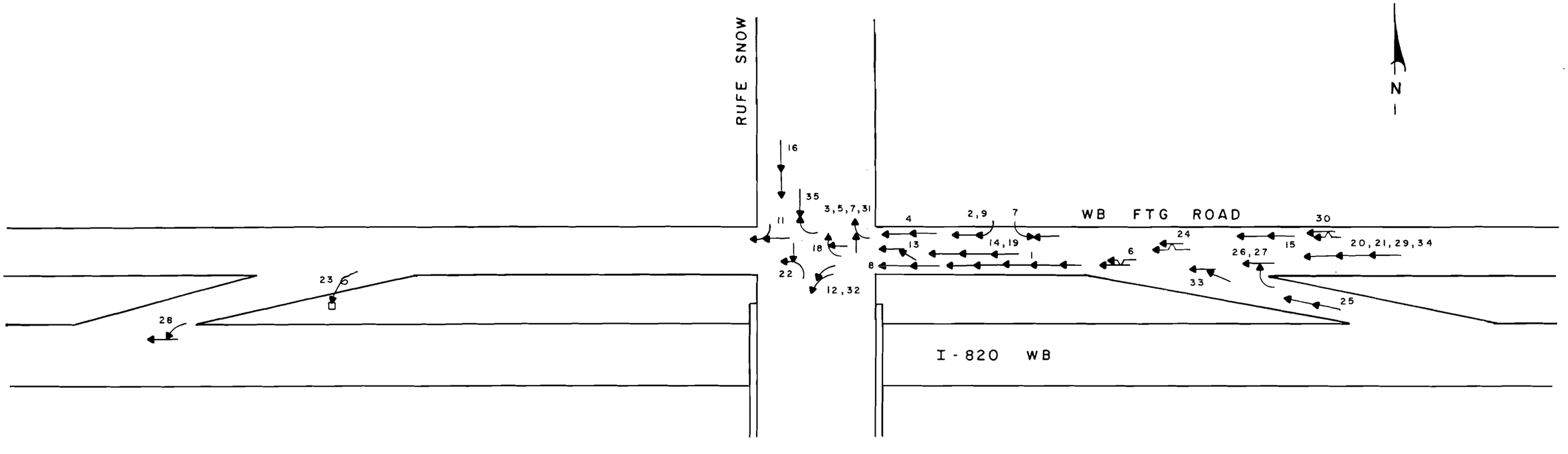
COLLISION DIAGRAM (SOUTH)

IH-820 AT RUFE SNOW

NORTH RICHLAND HILLS, TEXAS

FIGURE 3



Accident Number	Date	Time	Pavement Condition	Injuries
1	1-14-85	1500	Dry	0
2	1-31-85	1700	Snow	0
3	2-05-85	1300	Wet	0
4	2-26-85	1800	Dry	0
5	5-16-85	1400	Dry	0
6	5-19-85	0100	Dry	0
7	5-19-85	1800	Dry	0
8	5-21-85	1700	Dry	0
9	6-07-85	1500	Dry	0
10	6-14-85	1800	Dry	0
11	7-10-85	1000	Dry	0
12	7-26-85	1500	Dry	0
13	8-16-85	2200	Dry	0
14	9-02-85	1200	Dry	0
15	9-18-85	2100	Dry	1
16	9-21-85	1800	Dry	1
17	10-01-85	1100	Dry	0
18	10-04-85	1800	Dry	0

Accident Number	Date	Time	Pavement Condition	Injuries
19	10-10-85	1300	Dry	0
20	10-17-85	1900	Wet	0
21	10-17-85	1900	Wet	0
22	10-22-85	0600	Dry	0
23	10-28-85	1100	Wet	0
24	10-28-85	1400	Dry	0
25	11-08-85	1800	Dry	1
26	11-26-85	0700	Wet	0
27	11-26-85	1100	Wet	1
28	12-09-85	0800	Wet	0
29	12-16-85	1400	Dry	2
30	1-12-86	1400	Dry	0
31	2-13-86	2300	Dry	0
32	3-05-86	1500	Dry	0
33	3-06-86	1800	Dry	0
34	3-26-86	1700	Dry	0
35	4-30-86	1700	Dry	0

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COLLISION DIAGRAM (NORTH)

IH-820 AT RUFE SNOW

NORTH RICHLAND HILLS, TEXAS

FIGURE 4

Field observations and traffic counts confirm the extreme queuing and irregular weaving maneuvers that occur. It was observed that even though left turns and right turns are allowed from the middle lane, most turns take place from the outside lanes. This is particularly true for the right turns, due to geometry and driver expectancy limitations. As a result, queuing occurs back to the area of the frontage road/ramp junction during peak periods. Vehicles leaving the ramp are forced to wait in line or maneuver around the queues. Much of the maneuvering takes place across the jiggle bar gore. This is further complicated by occasional movements across the gore to the shopping center entrance.

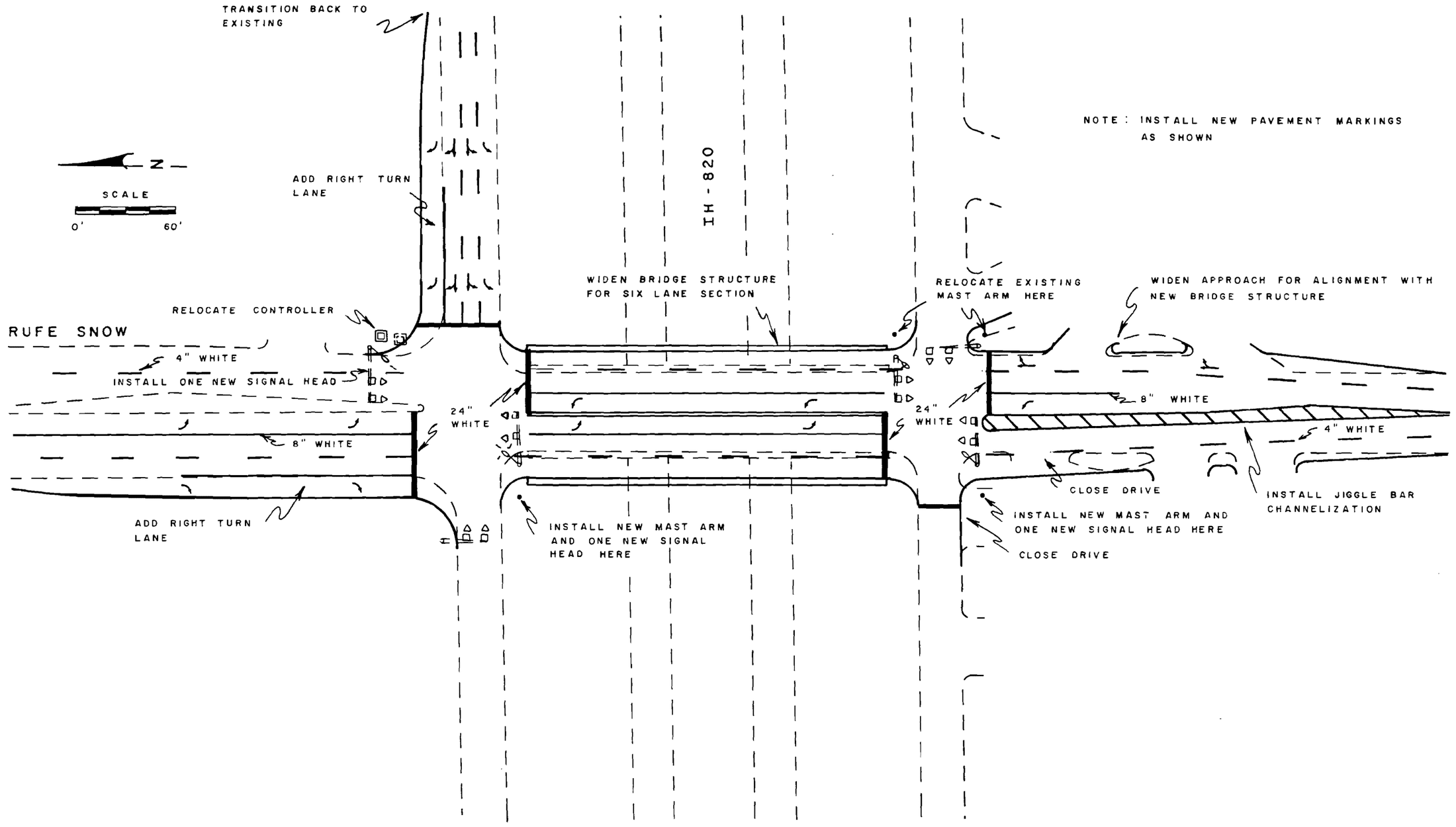
Intersection capacity deficiencies are most apparent during PM peak operations. The existing PM peak hour volumes exceed intersection capacity on both sides of the diamond. This was confirmed by a PASSER III analysis which showed V/C ratios as high as 1.65 at the north intersection. Such analysis indicates inadequate capacity for right turns on the westbound frontage road, for left turns from the bridge, and for through movements on Rufe Snow.

Development, particularly to the north, indicates that intersection volumes will continue to increase. As this occurs, the operations and safety problems associated with such extensive congestion will also continue to increase.

E. Conclusions and Recommendations

Recognizing the magnitude of currrent and growing deficiencies of this interchange, it is apparent that significant improvements are in order. Such improvements fall into the two areas of intersection capacity and ramp configuration. The following recommendations are made in each area:

1. Intersection Capacity (Figure 5)
    a. Widen bridge to provide 6 lanes (minimum).
    b. Widen and reconfigure southbound exterior approach to provide 1 left turn advance storage lane, 2 through lanes, and 1 right turn lane.
    c. Widen westbound frontage road to provide an additional right turn lane and more efficient dual right capability.
    d. Widen northbound exterior approach and southbound exterior departure to accommodate widened bridge; close drives in southwest quadrant.
    e. Modify signal hardware to match widening improvements.
    f. Remark and sign intersection compatible with a - e.



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INTERSECTION LAYOUT

IH-820 AT RUFE SNOW

NORTH RICHLAND HILLS, TEXAS

FIGURE 5

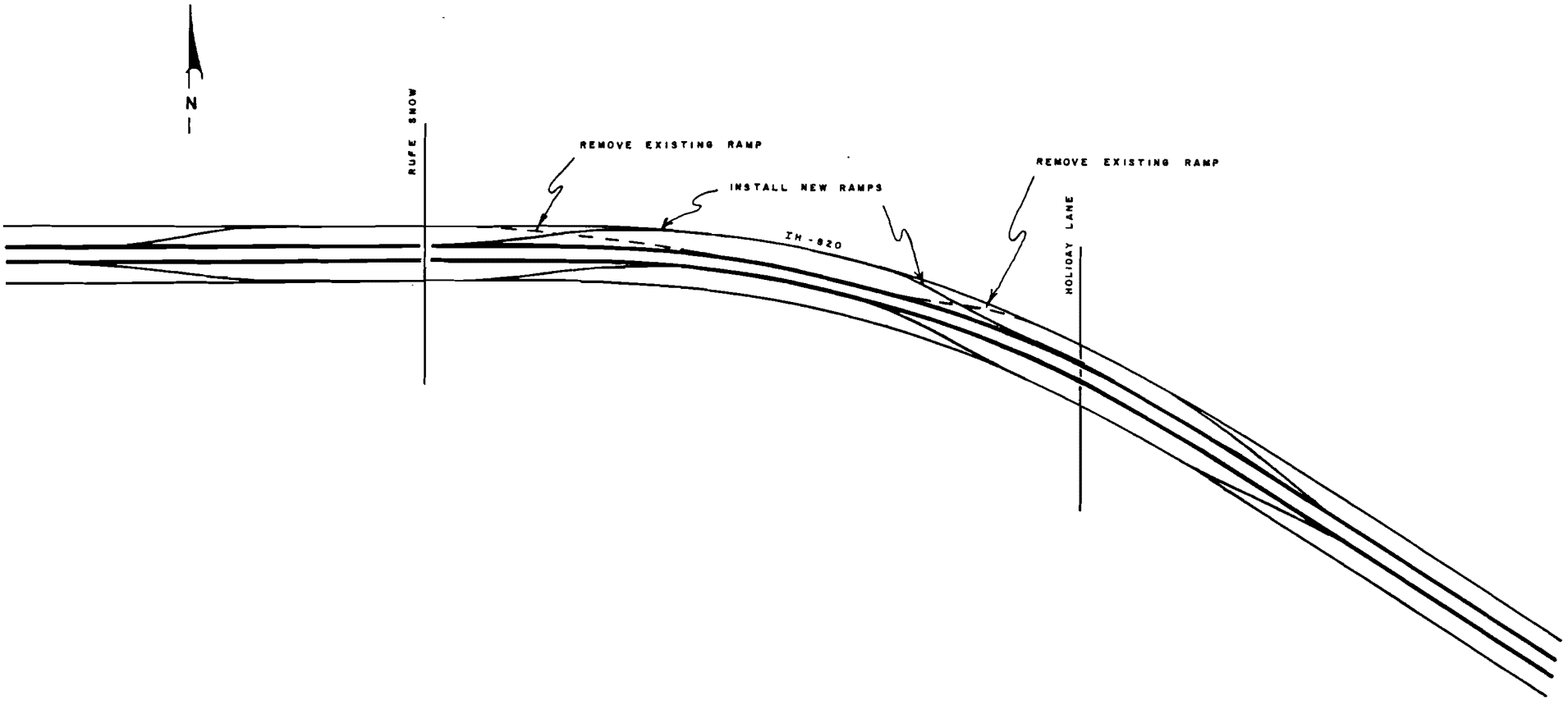
2. Ramp Configuration

Figure 6 shows a recommended reconfiguration of the ramps between Holiday Lane and Rufe Snow. Several considerations support such a reconfiguration. These include:

a. Inadequate separation distance exists between the exit ramp and the intersection to accommodate vehicle queuing and maneuvering under current and expected traffic loading.
b. The location of a shopping center access point in close proximity to the exit junction invites illegal and unsafe movements from the ramp.
c. Westbound movements from development along the frontage road could enter the intersection without passing through the busy signal.
d. Adequate ROW and separation distance is available to provide the reversal effectively.

The two areas of improvement could be accomplished independently or at the same time, dependent upon available resources. If a staged improvement is necessary, it is suggested that the intersection capacity improvements be addressed first.

The preliminary estimate of such improvements is $ 480,350. A estimate breakdown is shown in Figure 7.



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PROPOSED AREA RAMP MODIFICATIONS

IH-820 AT RUFE SNOW

NORTH RICHLAND HILLS, TEXAS

FIGURE 6

IMPROVEMENT COST ESTIMATE

IH-820 @ RUFE SNOW DR
Reconstruct Interchange & Ramps

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
	--INTERCHANGE RECONSTRUCTION--				
1	Widen Bridge	5375.00	SF	$55.00	$295,625.00
2	Traffic Signal Mod.	1.00	LS	$18,000.00	$18,000.00
3	Rdwy Excavation	350.00	CY	$4.50	$1,400.00
4	ACP & Base	8630.00	SF	$2.50	$21,575.50
5	Signing & Pav Mark	1.00	LS	$6,925.00	$6,925.00
6	Remove Curb & Gutter	600.00	LF	$2.00	$1,200.00
7	Install Curb & Gutter	650.00	LF	$9.00	$5,850.00
				SUBTOTAL 1	350,575.00
	--RAMP MODIFICATIONS--				
1	Remove Ramps (2)	1.00	LS	$3,915.00	$3,915.00
2	Construct Ramp	2.00	EA	$16,020.00	$32,040.00
3	Pavement Marking (lane lines)	1.00	LS	$450.00	$450.00
				SUBTOTAL 2	$36,405.00
				SUBTOTAL	$386,980.00
				10% MOB.	$38,698.00
				SUBTOTAL	$425,678.00
				10% ENG.	$42,567.80
				TOTAL	$468,245.80

FIGURE 7

IH-820 AT WHITE SETTLEMENT ROAD

FREEWAY OPERATIONS STUDY

IH-820 @ White Settlement Road

A. Study Location

The subject problem location is at the diamond interchange of IH-820 and White Settlement Rd, which serves to connect the City of White Settlement with a residential area west of IH-820. Presently, the interchange is controlled by utilizing stop signs on the frontage roads with all approaches marked as one lane. A layout of the intersection is shown in Figure 8.

B. Problem/Task Statement

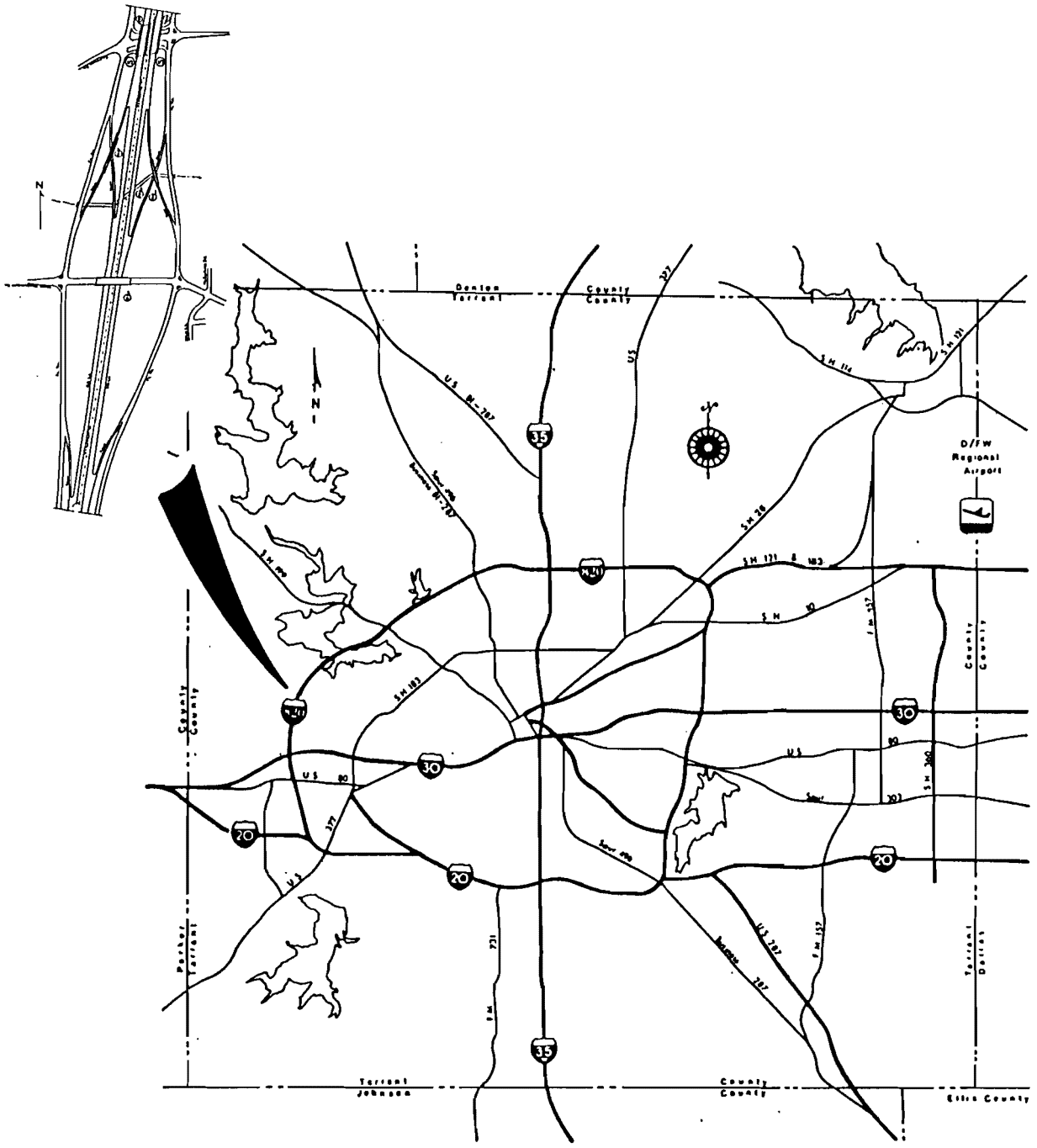
The intersection of IH-820 and White Settlement Rd experiences peak congestion which causes excessive delay for the off-ramp traffic. This and the type of accidents which occur suggest that a different control strategy may be needed. It is the objective of this study to identify and evaluate possible improvement alternatives that can be implemented to lessen the congestion problem and reduce the accident potential.

C. Data Collection

To be able to analyze the problem situation, it was necessary to first obtain appropriate traffic volume and accident data. The 24-hour machine counts (Figure 9) and the turning movement counts (Figure 10) were made to provide a basis for warrants and analysis. Accident data was obtained from the City of Fort Worth and supplemented with information from the SDHPT to determine the nature and frequency of accidents experienced at this location during the past 18 months.

D. Observations/Analysis

Of the 14 accidents plotted (Figure 11), 5 were right angle accidents that occurred on the west side of the diamond interchange. The remaining nine accidents, occuring on the east side, included 3 right angle accidents, 3 out-of-control type accidents, 2 driveway accidents on the frontage road, and 1 rear-end. The right angle collisions suggest that the two-way stop operation may not be sufficient for clear right-of-way assignment with the present traffic volume level. The vertical curve of the bridge also causes a problem by limiting sight distance.



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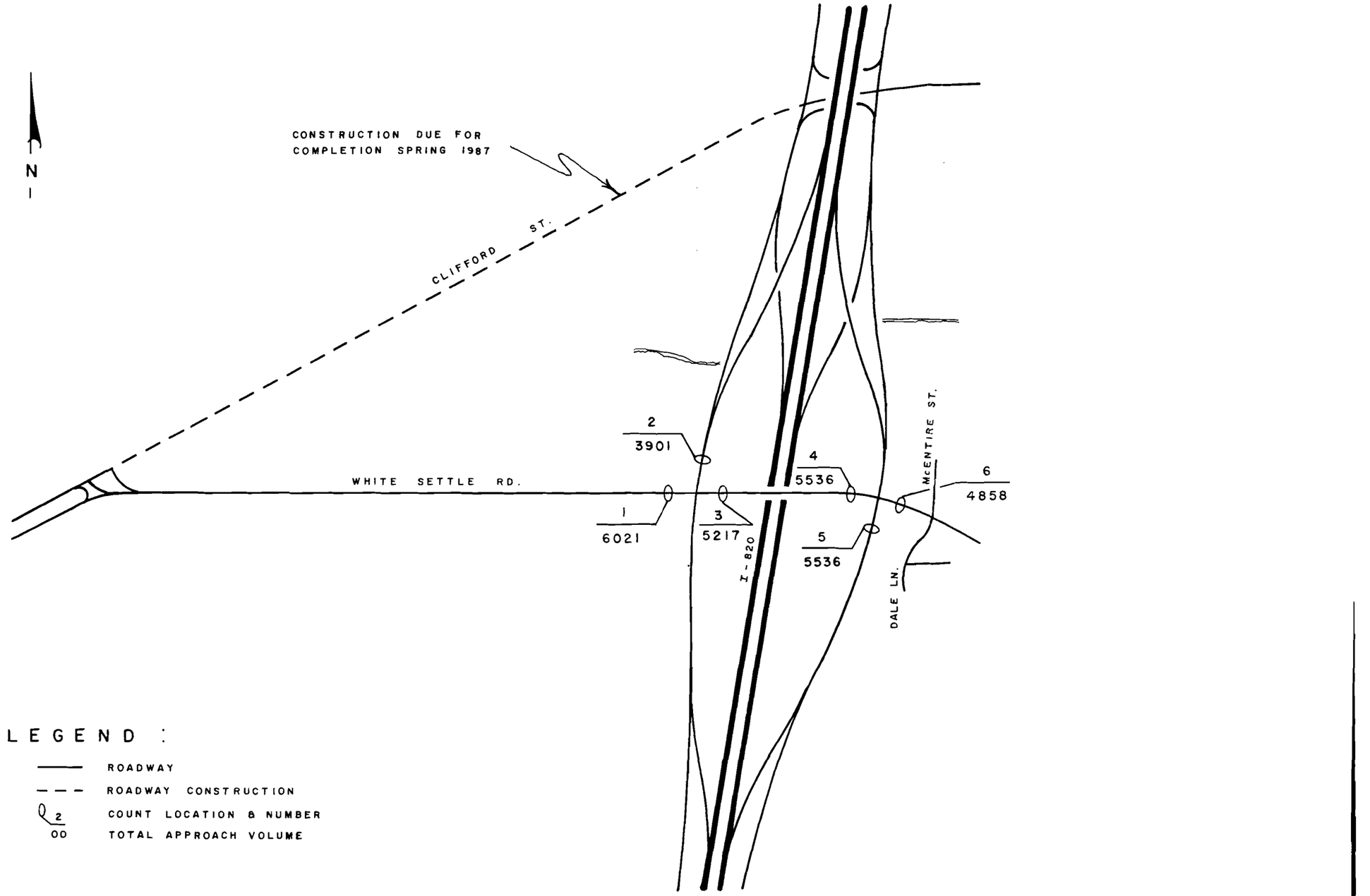
STUDY LOCATION

IH-820 AT WHITE SETTLEMENT RD

FIGURE 8



LEGEND :

- ROADWAY
- ROADWAY CONSTRUCTION
- 2 / 00 — COUNT LOCATION & NUMBER / TOTAL APPROACH VOLUME

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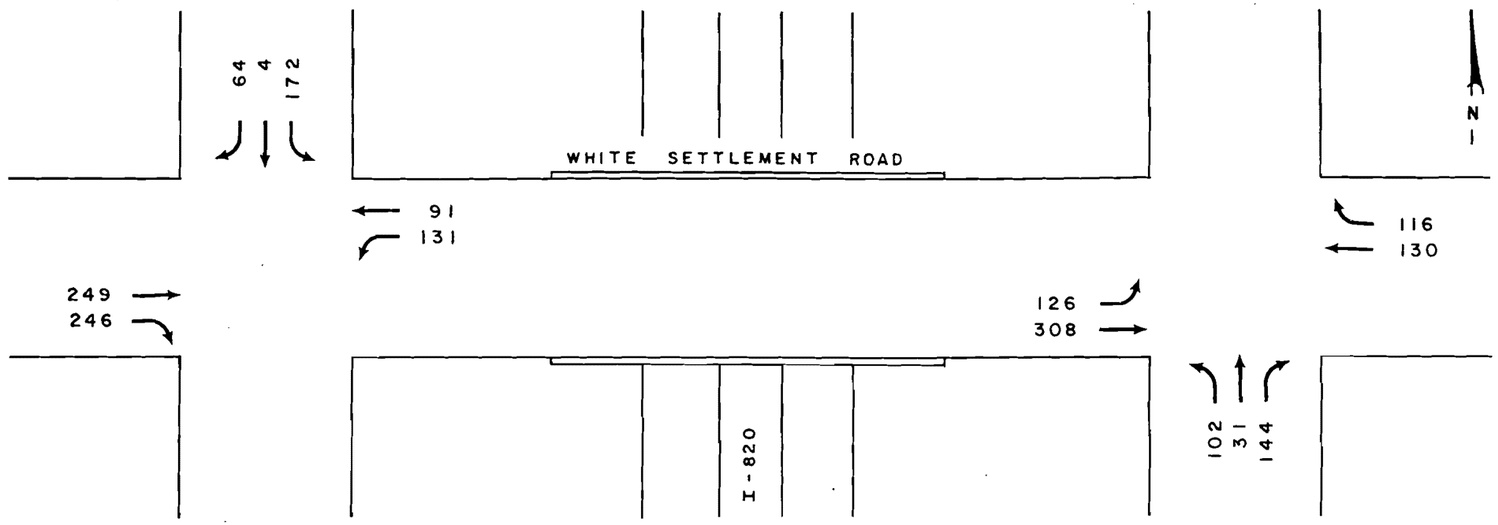
STUDY AREA AND 24 HOUR APPROACH VOLUMES

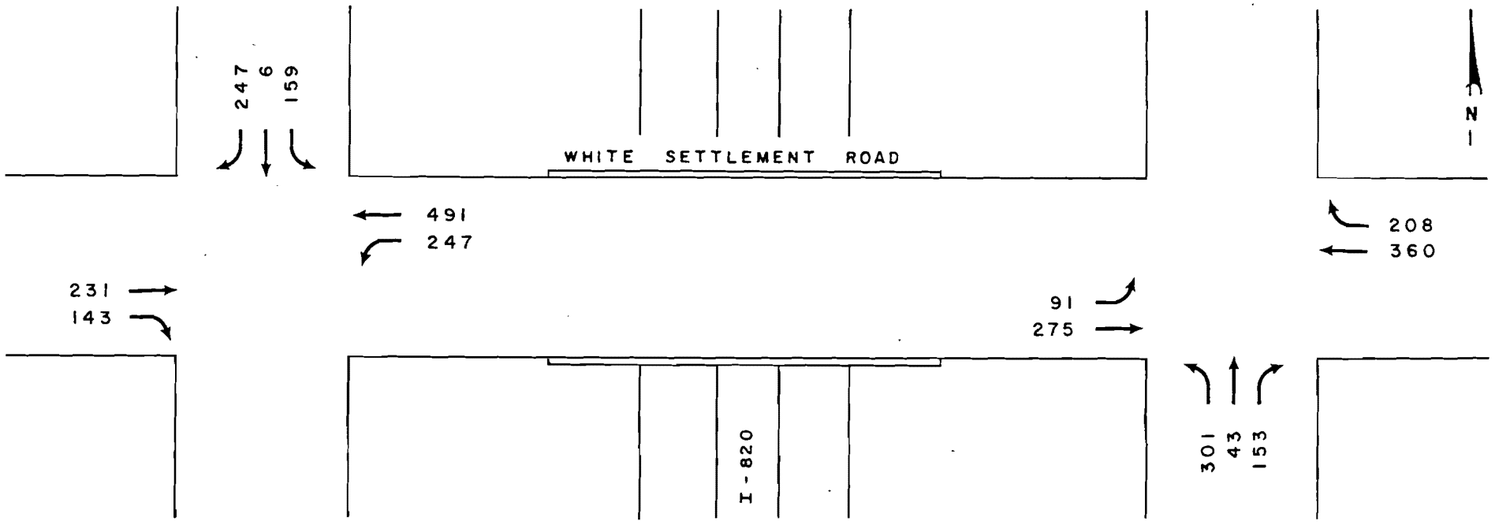
IH-820 AT WHITE SETTLEMENT ROAD

FORT WORTH, TEXAS

FIGURE 9



AM PEAK HOUR
(7:30 - 8:30)



PM PEAK HOUR
(4:45 - 5:45)

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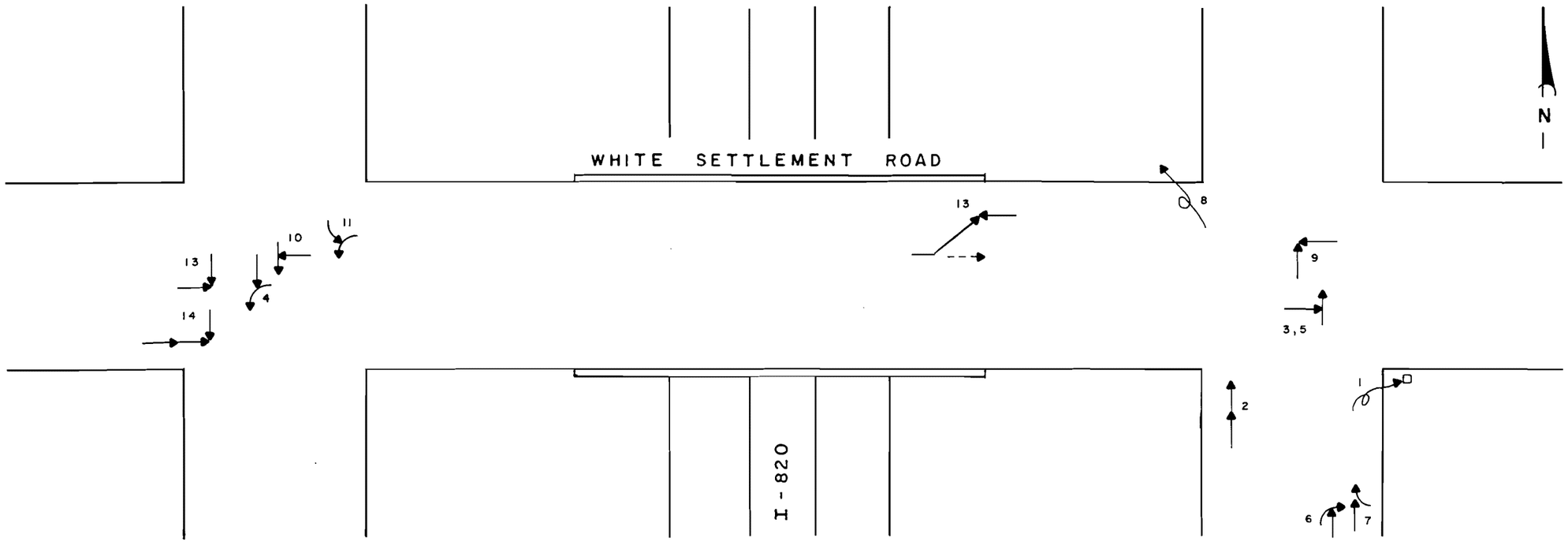
TURNING MOVEMENT COUNTS

IH-820 AT WHITE SETTLEMENT ROAD

FORT WORTH, TEXAS

FIGURE 10



Accident Number	Date	Time	Pavement Condition	Injuries
1	1-30-85	0500	Wet	0
2	3-03-85	1900	Dry	0
3	3-04-85	1700	Dry	0
4	6-11-85	1800	Dry	0
5	6-21-85	2200	Dry	0
6	6-22-85	1200	Dry	3
7	7-05-85	1200	Dry	0
8	11-03-85	0200	Dry	0
9	12-31-85	2200	Dry	0
10	1-24-86	0900	Dry	1
11	2-18-86	0800	Dry	0
12	3-04-86	0800	Dry	0
13	5-08-86	1800	Wet	0
14	5-20-86	1900	Dry	3

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COLLISION DIAGRAM

IH-820 AT WHITE SETTLEMENT ROAD

FORT WORTH, TEXAS

FIGURE 11

Signalization was investigated as a possible solution. The intersecting traffic volumes at this location do not satisfy the requirements of Warrants 1 and 2 of the MUTCD for traffic signal installation (See Appendix). For actuated signal warranting, 2 of the 4 possible conditions exist for the west side of the interchange and only 1 for the east side. Also, upon the completion of Clifford St, it is expected that some of the traffic generated by General Dynamics will be removed from the subject location.

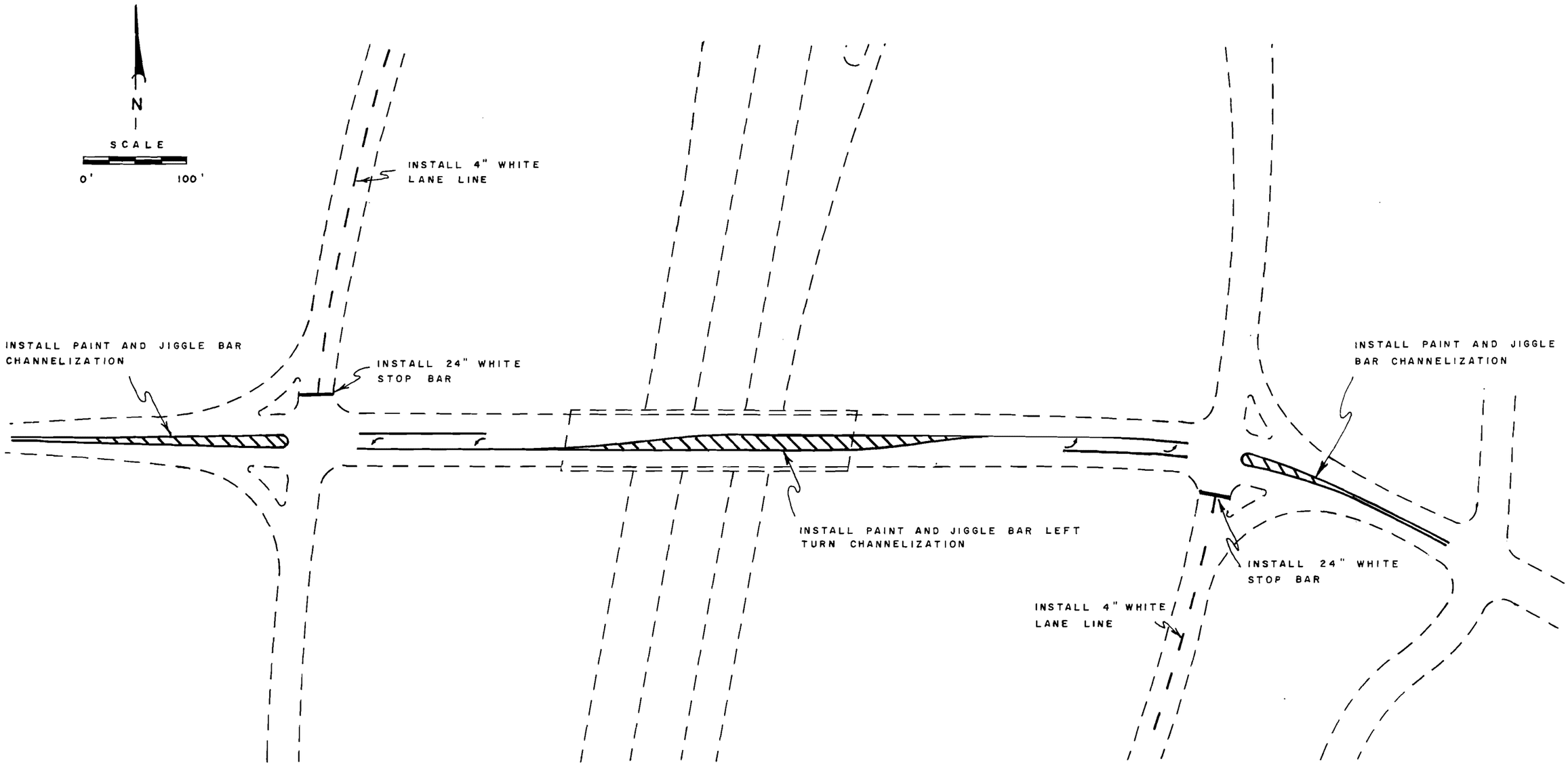
The utilization of an all-way stop operation was also explored. It appears that with the nearly even distribution of traffic volumes, especially on the east side, an all-way stop operation would work efficiently. However, since the congestion occurs mainly during peak periods, the delay experienced by eastbound and westbound traffic during non-peak periods may be less desirable.

E. Conclusions and Recommendations

Since this location marginally meets the requirements for signalization, the installation of a traffic signal should be delayed until after Clifford St is reopened. Construction on Clifford St is scheduled to be completed by Spring 1987. At this time traffic volume counts could be made again to determine if a signal is warranted.

If the right angle accidents continue to occur and/or the delay experienced by the ramp traffic increases, an all-way stop operation should be implemented as an interim to signalization or as a long term solution. Another improvement alternative would be to install the all-way stop operation on the east side only. This would deal with higher volume intersection, help to slow the traffic down, and also provide gaps for the west side of the interchange. Due to the vertical curve of the bridge, proper advance warning should be installed for either an all-way stop or a signal.

With the amount of left turn traffic on White Settlement, left turn lanes should be installed as an immediate improvement of the interchange operation. Also, pavement markings should be installed on the frontage roads to delineate lane usage. The recommended improvements are shown in Figure 12 and are estimated to cost $ 11,600. A detailed cost estimate is provided in Figure 13.



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INTERSECTION LAYOUT

IH-820 AT WHITE SETTLEMENT ROAD

FORT WORTH, TEXAS

FIGURE 12

IMPROVEMENT COST ESTIMATE

IH-820 at WHITE SETTLEMENT ROAD
Install Left Turn Lane and
Pavement Markings

ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
	(THERMO PAV MARK)				
1	24" White	65.00	LF	$7.50	$487.50
2	24" Yellow	360.00	LF	$9.00	$3,240.00
3	8" White	240.00	LF	$1.26	$302.40
4	4" White	255.00	LF	$0.75	$191.25
5	4" Yellow	2100.00	LF	$0.98	$2,058.00
6	Jiggle Bars	468.00	EA	$8.00	$3,744.00
7	"Arrows"	4.00	EA	$130.00	$520.00
				SUBTOTAL	$10,543.15
				10% ENG.	$1,054.32
				TOTAL	$11,597.47

FIGURE 13

IH-35W AT NORTHSIDE DRIVE

FREEWAY OPERATIONS STUDY

IH-35W at Northside Drive

A. Study Location

The subject problem location is at the diamond interchange of IH-35W and Northside Dr. The interchange serves an established residential area to the east and as a pass through facility to commercial, industrial, and residential areas to the west. Figure 14 shows the existing geometrics of the study location.

B. Problem/Task Statement

The northbound exit ramp at the Northside Dr interchange experiences congestion problems during peak periods. Also, the lack of adequate storage for the eastbound left turn movement causes congestion on the west side of the interchange. It is the task of this study to identify and evaluate possible improvements that can be implemented to lessen or alleviate the problems that exist.

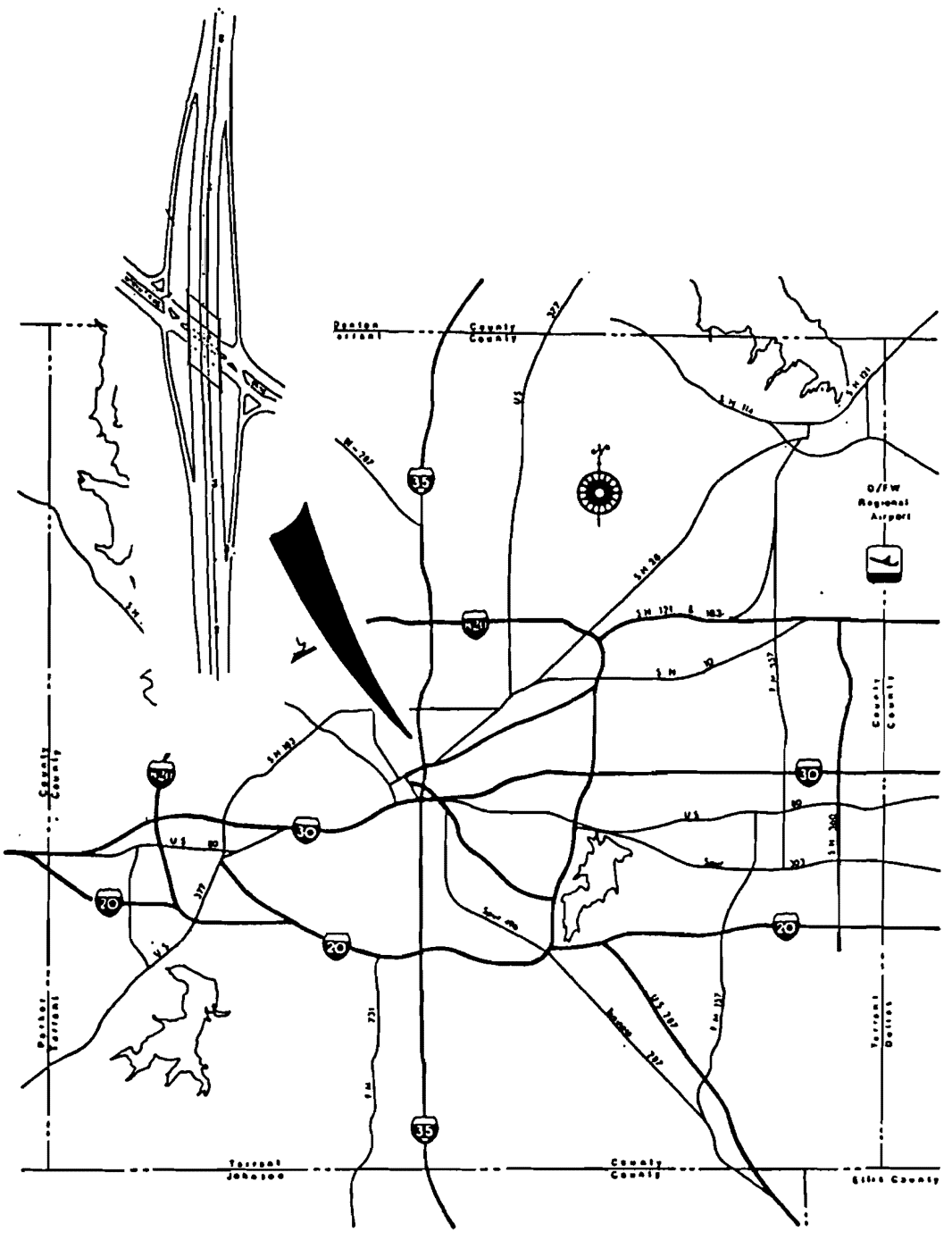
C. Data Collection

To be able to analyze the problem situation, it was necessary to first obtain appropriate traffic volume and accident data. Morning and evening peak turning movement counts (Figure 15) were made to provide a basis for evaluating existing conditions utilizing PASSER III. Accident data was obtained from the City of Fort Worth to determine the character of existing safety problems.

D. Observations/Analysis

The collision diagram (Figure 16) indicates 43 accidents occurred at the Northside interchange during the period January 1985 through June 1986. Of the 22 accidents which occurred on the east side of the interchange, 8 were right angle accidents, 3 rear-end collisions on the northbound exit ramp, 4 sideswipes and the remainder varied. The west side experienced 6 right angle accidents, 4 rear-end collisions at the southbound exit ramp right turn, 4 accidents involving the westbound left turn and 7 accidents of various nature.

From field observations it was noticed that during peak periods, the northbound exit ramp sometimes experiences congestion



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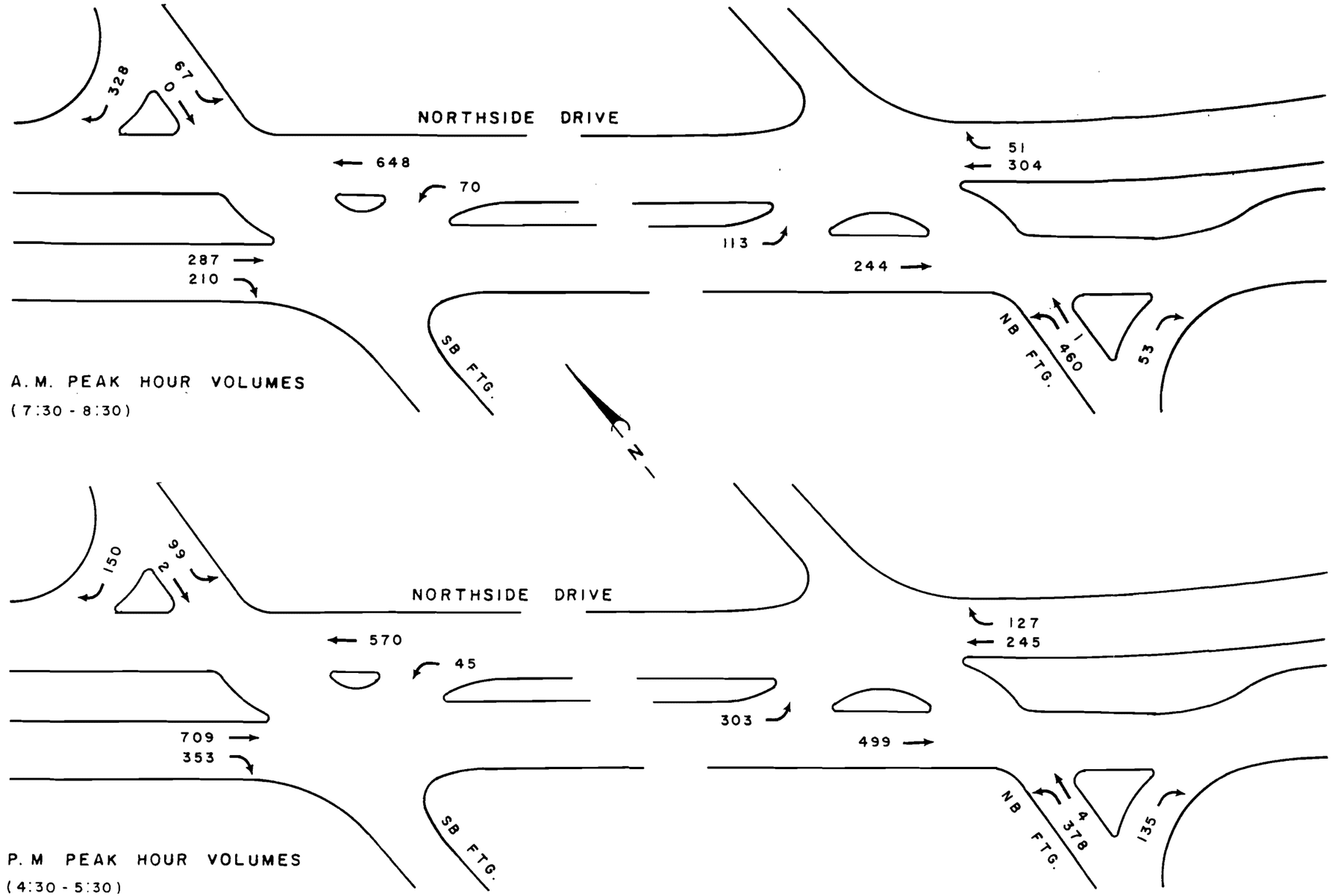
STUDY LOCATION

IH-35W AT NORTHSIDE DR

FIGURE 14



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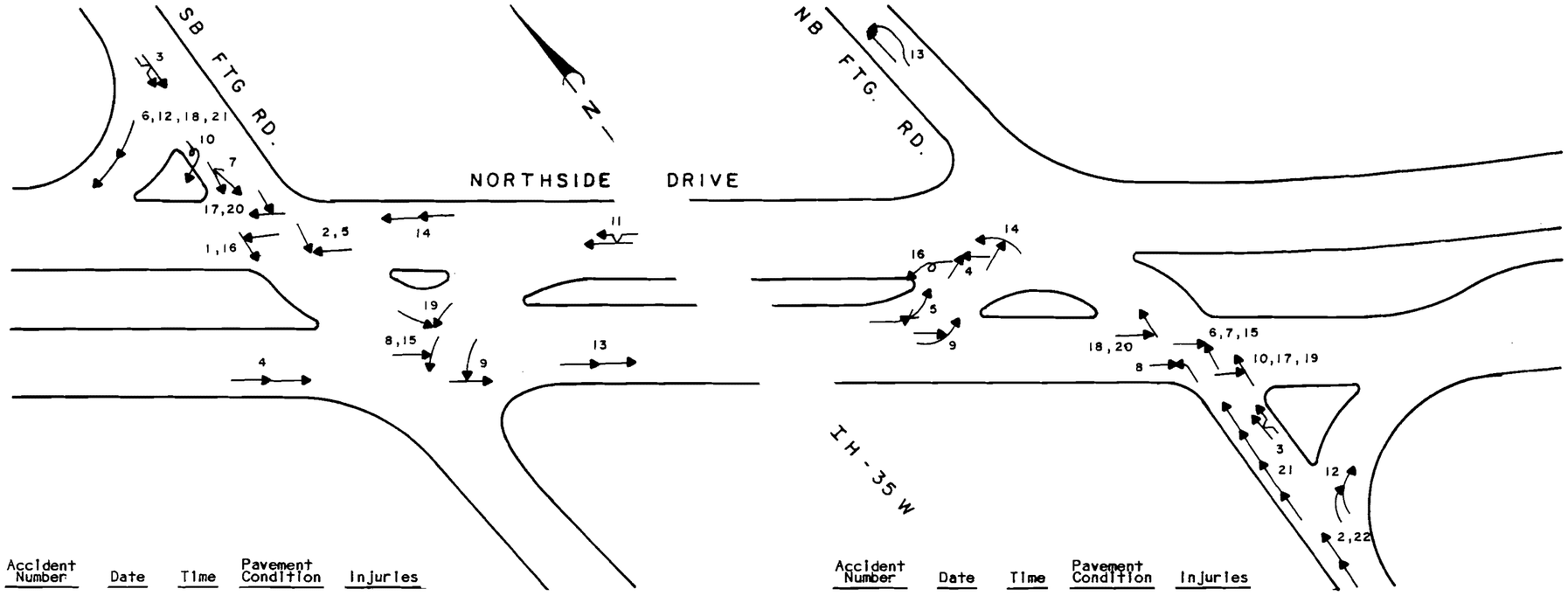
TURNING MOVEMENT COUNTS

IH-35W AT NORTHSIDE DRIVE

FORT WORTH, TEXAS

FIGURE 15



Accident Number	Date	Time	Pavement Condition	Injuries
1	1-02-85	1015	Icy	0
2	2-23-85	1715	Dry	1B
3	3-04-85	1650	Dry	0
4	5-14-85	1345	Dry	2C
5	7-11-85	1000	Dry	0
6	7-13-85	1815	Dry	0
7	7-24-85	0720	Dry	0
8	7-31-85	0900	Dry	0
9	10-11-85	1845	Dry	0
10	2-16-86	0355	Wet	1C
11	2-21-86	1600	Dry	0
12	3-03-86	0845	Dry	0
13	3-09-86	2235	Dry	1A
14	3-13-86	1535	Dry	0
15	3-19-86	0820	Dry	1C
16	4-09-86	2105	Wet	0
17	4-22-86	1335	Dry	0
18	5-24-86	1800	Wet	1C
19	5-27-86	0735	Dry	0
20	6-05-86	1510	Dry	0
21	6-28-86	1000	Dry	0

Accident Number	Date	Time	Pavement Condition	Injuries
1	2-22-85	1150	Wet	0
2	3-13-85	1100	Wet	0
3	3-18-85	1440	Dry	0
4	4-02-85	1615	Dry	0
5	4-09-85	0930	Dry	0
6	4-13-85	2130	Dry	0
7	4-23-85	1642	Dry	3B
8	6-08-85	1200	Dry	0
9	6-13-85	1415	Dry	0
10	6-22-85	0230	Dry	2B
11	6-23-85	1800	Dry	0
12	7-11-85	1125	Dry	0
13	7-12-85	2145	Dry	0
14	10-31-85	1015	Dry	1C
15	11-24-85	2350	Wet	2C
16	1-28-86	0715	Dry	0
17	1-28-86	2020	Dry	0
18	2-08-86	0930	Dry	0
19	2-11-86	1030	Dry	0
20	3-29-86	0920	Dry	1C
21	4-13-86	1830	Dry	0
22	4-19-86	1100	Wet	0

TRAFFIC ENGINEERS, INC.
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COLLISION DIAGRAM

IH-35W AT NORTHSIDE DRIVE

FORT WORTH, TEXAS

FIGURE 16

problems. Although a PASSER III analysis indicates the ramp is not at capacity, three times during an evening peak hour observation, the queue backed up to within approximately 120 ft of the main lanes. Other afternoon observations confirmed back-ups to the main lanes. Congestion was also noticed to occur on the west side of the interchange due to eastbound vehicles trying to get into the left turn lane to go north.

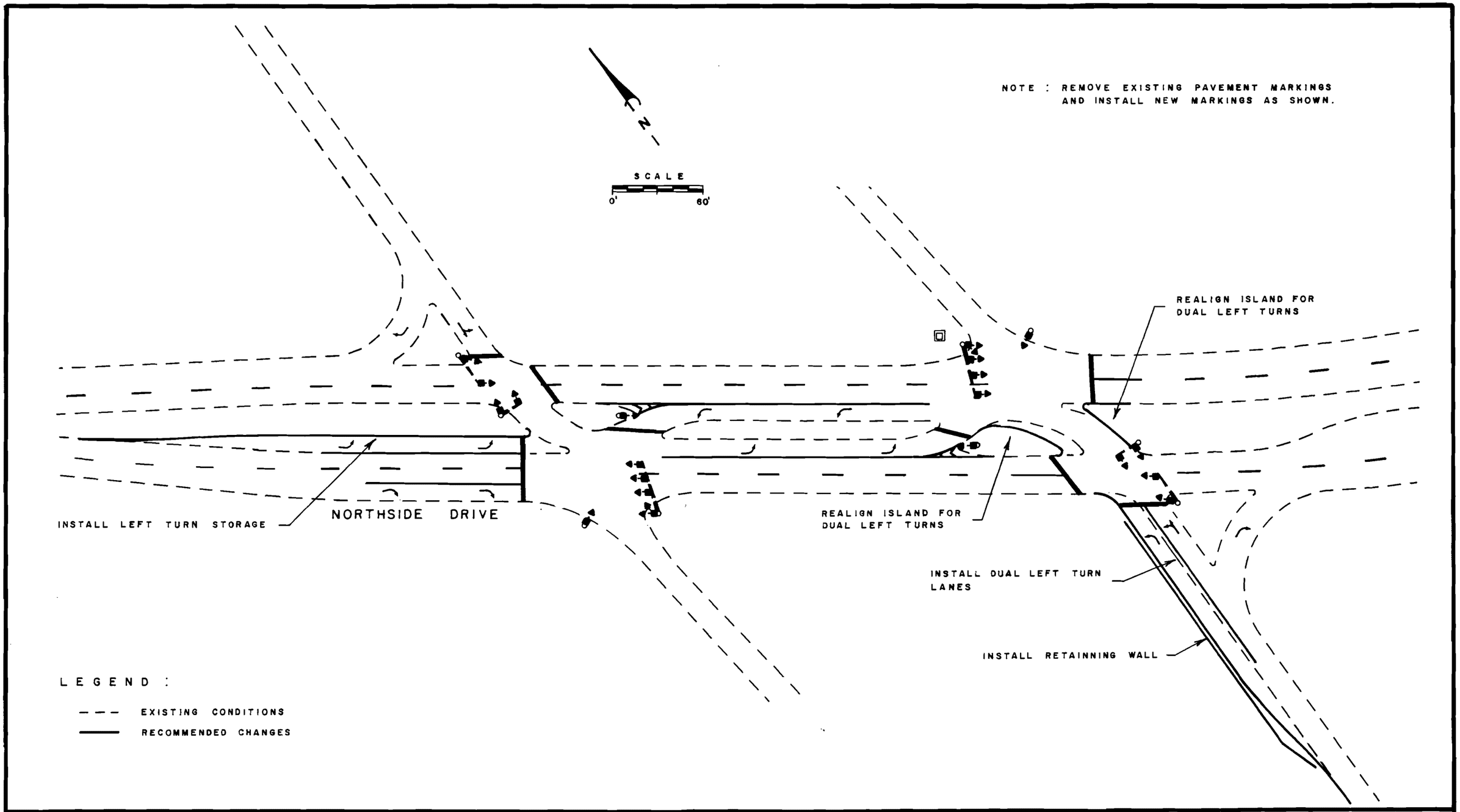
E. Conclusions and Recommendations

Many of the accidents that occur at this location are probably due to the experienced congestion and/or signal operation. Discussion with the City of Fort Worth's Transportation Department revealed plans to upgrade the traffic signal at the Northside interchange in the near future. This project will include the installation of a new controller, loop detectors and the replacement of the 8" signal heads with 12" ones. These changes will improve the signal operation to alleviate some of the problem.

In order to lessen the experienced congestion and to enhance interchange operations, the following recommendations are made:

1. Widen the northbound exit ramp to provide dual left turn lanes.
2. Install left turn storage on the exterior eastbound approach.
3. Install pavement markings as shown in Figure 17.

The total cost of the proposed improvements at the subject location is estimated to be $ 32,250. A detailed cost estimate is shown in Figure 18.



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INTERSECTION LAYOUT

IH-35W AT NORTHSIDE DRIVE

FORT WORTH, TEXAS

FIGURE 17

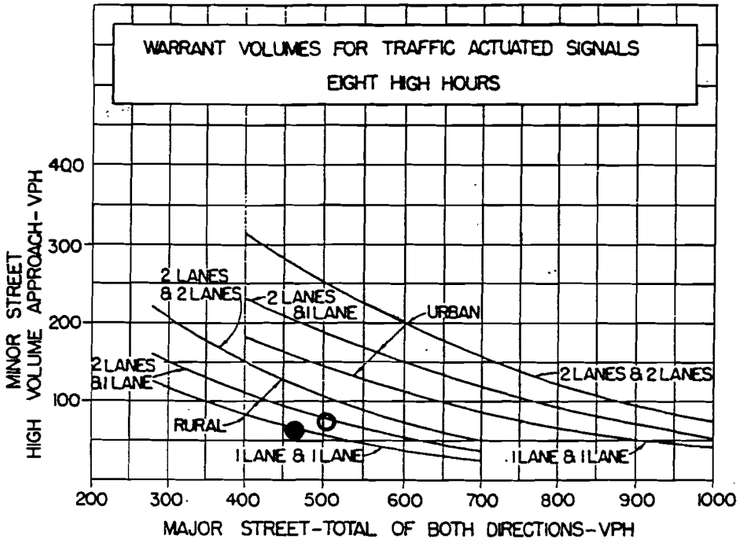
IMPROVEMENT COST ESTIMATE

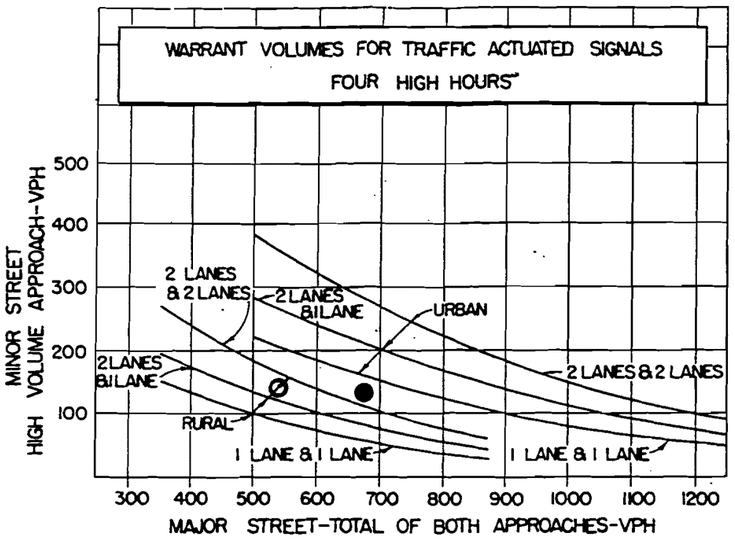
IH-35W at NORTHSIDE DR
Widen NB aproach, Provide Left
Turn Storage and Pavement Markings

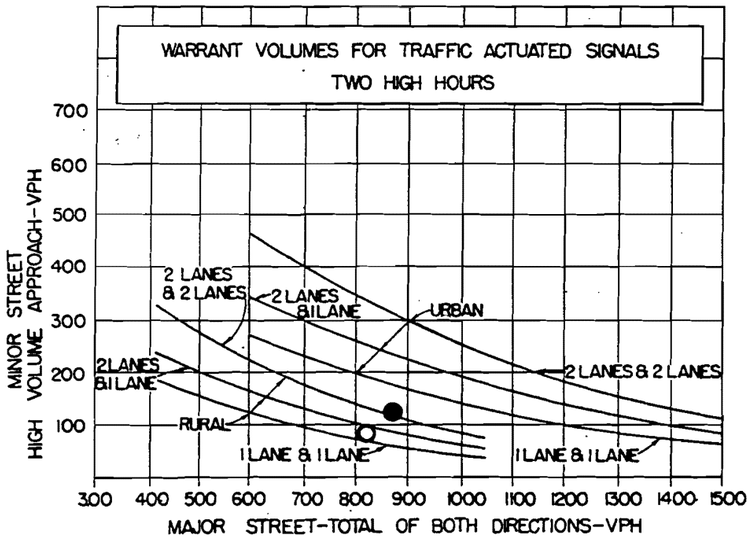
ITEM	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
1	Excavation	80.00	CY	$5.00	$400.00
2	Retaining Wall (New Jersey Barrier Shape)	210.00	LF	$30.00	$6,300.00
3	Remove Curb & Gutter	620.00	LF	$2.00	$1,240.00
4	Install Curb & Gutter	360.00	LF	$9.00	$3,240.00
5	3" ACP & Base	3565.00	SF	$1.84	$8,399.60
6	Relocate Sign and Luminaire	1.00	LS	$500.00	$500.00
7	Pavement Markings				
	24" White	255.00	LF	$7.50	$1,912.50
	8" White	810.00	LF	$1.26	$1,020.60
	4" White	600.00	LF	$0.75	$450.00
	"Arrows"	13.00	EA	$130.00	$1,690.00
8	Blast Cleaning	1.00	LS	$1,500.00	$1,500.00
				SUBTOTAL	$26,652.70
				10% MOB.	$2,665.27
				SUBTOTAL	$29,317.97
				10% ENG.	$2,931.80
				TOTAL	$32,249.77

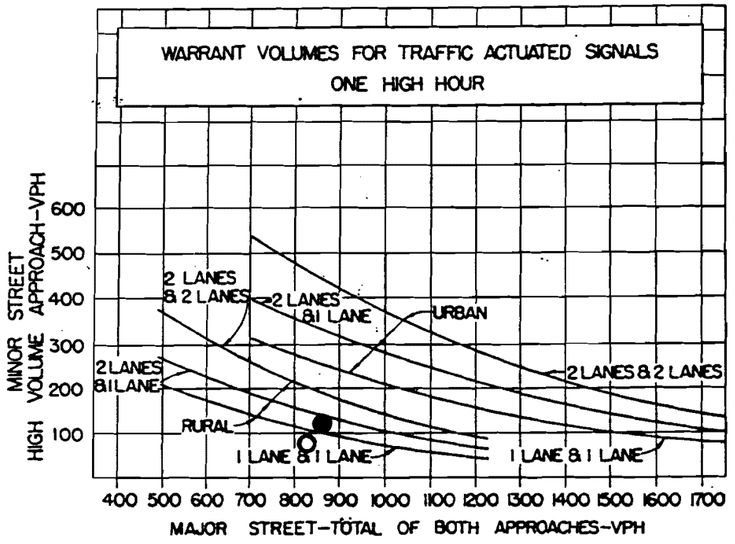
FIGURE 18

APPENDIX









LEGEND :

● WEST SIDE
○ EAST SIDE

TRAFFIC ENGINEERS, INC.
HOUSTON • AUSTIN • FORT WORTH

ACTUATED SIGNAL GUIDELINE WARRANTS

IH-820 AT WHITE SETTLEMENT ROAD

FORT WORTH, TEXAS

Division of Maintenance Operations

TRAFFIC SURVEY - COUNT ANALYSIS

Traffic Engineering Section

1971 MUTCD WARRANTS

DIST. NO. 02

INTERSECTIONS: IH-820 @ White Settlement Rd (West Side)

CONTROL:	SECTION:	8TH HIGH HOUR - MAJOR ST:	3 PM - 4 PM
DATE OF SURVEY:		8TH HIGH HOUR - MINOR ST:	8 PM - 9 PM

Population Latest Federal CENSUS	85%TILE SPEED MAJOR STREET	MAJOR STREET	MINOR STREET
		White Settlement Road	IH-820 SB Frontage Rd

1. MINIMUM VEHICULAR VOLUME

NUMBER OF LANES		MAJOR STREET-BOTH APPROACHES 8TH HIGHEST HOUR			MINOR STREET-HIGH VOL. APPR. 8TH HIGHEST HOUR		
MAJOR STREET	MINOR STREET	REQUIRED URBAN	REQUIRED RURAL	EXISTING OK %	REQUIRED URBAN	REQUIRED RURAL	EXISTING 57 %
1	1	500	350		150	105	
2 OR MORE	1	600	420 X	453	150	105X	60
2 OR MORE	2 OR MORE	600	420		200	140	
1	2 OR MORE	500	350		200	140	

2. INTERRUPTION OF CONTINUOUS TRAFFIC

NUMBER OF LANES		MAJOR STREET-BOTH APPROACHES 8TH HIGHEST HOUR			MINOR STREET-HIGH VOL. APPR. 8TH HIGHEST HOUR		
MAJOR STREET	MINOR STREET	REQUIRED URBAN	REQUIRED RURAL	EXISTING 72 %	REQUIRED URBAN	REQUIRED RURAL	EXISTING OK %
1	1	750	525		75	52	
2 OR MORE	1	900	630X	453	75	52X	60
2 OR MORE	2 OR MORE	900	630		100	70	
1	2 OR MORE	750	525		100	70	

8 HIGH HOURS*

TIME	MAJOR ST.-BOTH APP. VEH. TOTAL	MAJOR ST.-BOTH APP. PED. TOTAL	MINOR ST.-HI. VOL.APP. VEH. TOTAL	MINOR ST.-HI. VOL.APP. PED. TOTAL
1700	863		131	
1600	716		141	
1800	677		132	
700	661		224	
1900	550		61	
1200	537		101	
2000	459		60	
1500	453		113	

RECOMMENDATIONS:

*Lowest Volume of 8 Hour Study is the 8th Highest Hour. Major Street 8th High Hour does not have to be at the same hour as the Minor Street 8th High Hour.

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Over

3. MINIMUM PEDESTRIAN VOLUME

Major Street Traffic - Both Approaches 8th Highest Hour					Ped.-Hi. Vol. X-Walk Across Maj. St. 8th Highest Hour		
Required		Required W/4' Median		Existing	Required		Existing
Urban	Rural	Urban	Rural	____%	Urban	Rural	____%
600	420	1000	700		150	105	

4. SCHOOL CROSSING

Yes___ No___ Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period. Refer to Forms 8-72-1102, 8-72-1103 & 8-72-1104.

5. PROGRESSIVE MOVEMENT

	Distance Called For	Existing
	No traffic signal within 1000'	

Yes___ No___ Do adjacent signals constitute a progressive system

6. ACCIDENT EXPERIENCE

Accidents susceptible to correction by traffic signal

	Required	Existing
12 MONTH PERIOD	5	5

Yes___ No X 80% of Warrant #1, #2, or #3

7. SYSTEMS WARRANT

Peak Hour Volume at a common intersection of two or more major routes	Required 800	Number of Hours Above 800

Check applicable characteristic of major route as defined above.

____(a). It is part of street or highway system that serves as the principal network for through traffic flow.

____(b). It connects area of principal traffic generation.

____(c). It includes rural or suburban highways outside of, entering or traversing a city.

____(d). It has surface street, freeway or expressway ramp terminals.

____(e). It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.

8. COMBINATION WARRANT

Yes___ No X 80 percent or more of the stated values for two or more of Warrants #1, #2, or #3.

9. ACTUATED SIGNAL GUIDELINE WARRANTS.

Check Applicable Curve

Yes___ No X Meets one High Hour

Yes X No___ Meets each of two Highest Hours

Yes X No___ Meets each of four Highest Hours

Yes___ No X Meets each of eight Highest Hours

REMARKS:

Division of Maintenance Operations

TRAFFIC SURVEY - COUNT ANALYSIS

Traffic Engineering Section

1971 MUTCD WARRANTS

DIST. NO.

INTERSECTIONS: IH-820 @ White Settlement Road (East Side) 02

CONTROL: SECTION: 8TH HIGH HOUR - MAJOR ST: 12 PM -1 PM

DATE OF SURVEY: 8TH HIGH HOUR - MINOR ST: 6 AM - 7 AM

Population Latest Federal CENSUS	85%TILE SPEED MAJOR STREET	MAJOR STREET	MINOR STREET
		White Settlement Road	IH-820 NB Frontage Rd

1. MINIMUM VEHICULAR VOLUME

NUMBER OF LANES		MAJOR STREET-BOTH APPROACHES 8TH HIGHEST HOUR			MINOR STREET-HIGH VOL. APPR. 8TH HIGHEST HOUR		
MAJOR STREET	MINOR STREET	REQUIRED URBAN	REQUIRED RURAL	EXISTING OK %	REQUIRED URBAN	REQUIRED RURAL	EXISTING 66 %
1	1	500	350		150	105	
2 OR MORE	1	600	420 X	430	150	105 X	69
2 OR MORE	2 OR MORE	600	420		200	140	
1	2 OR MORE	500	350		200	140	

2. INTERRUPTION OF CONTINUOUS TRAFFIC

NUMBER OF LANES		MAJOR STREET-BOTH APPROACHES 8TH HIGHEST HOUR			MINOR STREET-HIGH VOL. APPR. 8TH HIGHEST HOUR		
MAJOR STREET	MINOR STREET	REQUIRED URBAN	REQUIRED RURAL	EXISTING 68 %	REQUIRED URBAN	REQUIRED RURAL	EXISTING OK %
1	1	750	525		75	52	
2 OR MORE	1	900	630 X	430	75	52 X	69
2 OR MORE	2 OR MORE	900	630		100	70	
1	2 OR MORE	750	525		100	70	

8 HIGH HOURS*

TIME	MAJOR ST.-BOTH APP. VEH. TOTAL	MAJOR ST.-BOTH APP. PED. TOTAL	MINOR ST.-HI. VOL.APP. VEH. TOTAL	MINOR ST.-HI. VOL.APP. PED. TOTAL
700	827		76	
1700	748		306	
1600	709		224	
1800	545		141	
1500	529		184	
600	504		69	
1100	502		195	
1200	430		168	

RECOMMENDATIONS:

*Lowest Volume of 8 Hour Study is the 8th Highest Hour. Major Street 8th High Hour does not have to be at the same hour as the Minor Street 8th High Hour.

File 18.296 - 1

Over

3. MINIMUM PEDESTRIAN VOLUME

Major Street Traffic - Both Approaches 8th Highest Hour					Ped.-Hi. Vol. X-Walk Across Maj. St. 8th Highest Hour		
Required		Required W/4' Median		Existing	Required		Existing
Urban	Rural	Urban	Rural	____%	Urban	Rural	____%
600	420	1000	700		150	105	

4. SCHOOL CROSSING

Yes___ No___ Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period. Refer to Forms 8-72-1102, 8-72-1103 & 8-72-1104.

5. PROGRESSIVE MOVEMENT

	Distance Called For	Existing
	No traffic signal within 1000'	

Yes___ No___ Do adjacent signals constitute a progressive system

6. ACCIDENT EXPERIENCE

Accidents susceptible to correction by traffic signal

	Required	Existing
12 MONTH PERIOD	5	3

Yes___ No X 80% of Warrant #1, #2, or #3

7. SYSTEMS WARRANT

Peak Hour Volume at a common intersection of two or more major routes	Required 800	Number of Hours Above 800

Check applicable characteristic of major route as defined above.

____(a). It is part of street or highway system that serves as the principal network for through traffic flow.

____(b). It connects area of principal traffic generation.

____(c). It includes rural or suburban highways outside of, entering or traversing a city.

____(d). It has surface street, freeway or expressway ramp terminals.

____(e). It appears as a major route on an official plan such as a major street plan in an urban area traffic and transportation study.

8. COMBINATION WARRANT

Yes___ No X 80 percent or more of the stated values for two or more of Warrants #1, #2, or #3.

9. ACTUATED SIGNAL GUIDELINE WARRANTS.

Check Applicable Curve

Yes___ No X Meets one High Hour

Yes___ No X Meets each of two Highest Hours

Yes X No___ Meets each of four Highest Hours

Yes___ No X Meets each of eight Highest Hours

REMARKS: